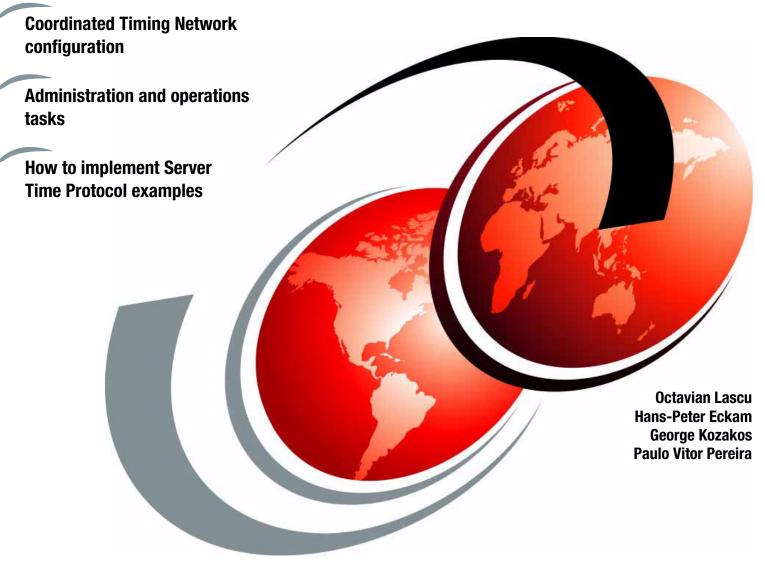


# Server Time Protocol Implementation Guide



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International Technical Support Organization

### Server Time Protocol Implementation Guide

June 2013

**Note:** Before using this information and the product it supports, read the information in "Notices" on page ix.

### Fourth Edition (June 2013)

This edition applies to the Server Time Protocol Facility on IBM System z10 Enterprise Class (z10 EC), System z10 Business Class (z10 BC), System z9 Enterprise Class (z9 EC), and System z9 Business Class (z9 BC).

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## Contents

	Notices	
	Preface	. xi
	Now you can become a published author, too!	
	Comments welcomeStay connected to IBM Redbooks	
	Summary of changes	
Part 1. Setting	up the Coordinated Timing Network	. 1
	Chapter 1. Configuring an External Time Source	. 3
	1.1 External Time Source	
	1.1.1 ETS configuration considerations	
	1.1.2 Dialing out to a telephone time service	
	1.2 Configuring an NTP server	
	1.2.1 NTP authentication support         1.2.2 Configuring an NTP server on the HMC	
	1.2.3 Configuring HMC as an NTP server	
	1.2.4 Removing an NTP server from the HMC	
	1.2.5 Configuring an NTP server on the PTS/CTS or BTS	
	1.3 Configuring an NTP server with pulse per second option	
	1.4 Configuring dial out on the HMC	
	1.4.1 HMC setup for ETS dial-out configuration.	
	1.4.2 Configuring to use dial out as External Time Source	37
	1.4.3 Configuring the ETS dial-out schedule	38
	1.5 Migrating an External Time Source	
	1.5.1 Migration from no ETS configuration to either NTP, or NTP with PPS	
	1.5.2 Migration from a dial-out configuration to either NTP, or NTP with PPS	41
	Chapter 2. Migrating from ETR to STP-only CTN	55
	2.1 Overview	
	2.2 Configuring the CTN ID	
	2.2.1 Setting the STP network ID.	
	2.2.2 Configuring other servers	
	2.3 Changing the server timing mode	
	<ul><li>2.4 Adding a new server in STP timing mode</li></ul>	
	2.5.1 Assigning CTN roles	
	2.5.1 Assigning Onvioles         2.5.2 Time-zone offset adjustment.	
	Chapter 3. Configuring an STP-only CTN	79
	3.1 Overview	
	3.2 Setting the CTN ID	80
	3.3 Initializing the time	
	3.3.1 Setting the leap seconds	82

	3.3.2 Setting the time zone	
	3.3.3 Setting the date and time	
	3.4 Assigning the CTN roles	
	3.4.1 Assigning the CTS and PTS	
	3.4.2 Assigning the BTS and the Arbiter	
	3.5 Adding a new server	
	3.6 Saving the STP configuration across PORs	
	3.6.1 Single-server CTN configuration	
	3.6.2 Two-server CTN saving its STP configuration across PORs	
	3.7 Case study: Configuring a single-server CTN	101
	Chapter 4. STP-only CTN: Adding a server in STP timing mode	107
	4.1 Starting point	
	4.1.1 z/OS DISPLAY ETR command	109
	4.1.2 z/OS DISPLAY XCF command	109
	4.1.3 System (Sysplex) Time tabs	
	4.2 Adding the server	
	4.3 End point	
	4.3.1 z/OS DISPLAY ETR command	
	4.3.2 z/OS DISPLAY XCF command	
	4.3.3 System (Sysplex) Time tabs	118
Part 2 CTN or	perations	123
		120
	Chapter 5. Operations in an ETR and Mixed CTN	
	5.1 Minimum requirements	
	5.2 Monitoring the Mixed CTN using the HMC	
	5.2.1 Timing Network tab	
	5.2.2 Network Configuration tab	
	5.2.3 ETR Configuration tab	
	5.2.4 ETR Status tab	
	5.2.5 ETS configuration	
	5.3 Monitoring the Mixed CTN using z/OS commands	
	5.3.1 z/OS commands	
	5.3.2 Coupling facility commands	
	5.4 Configuring a Mixed CTN	
		-
	5.4.2 Time initialization	
	5.5 CTN configuration changes.	
	5.5.1 Changing the CTN ID	
	5.5.2 Changing a server to STP timing mode	
	<ul><li>5.6 Time management</li></ul>	
		100
	Chapter 6. Operations in an STP-only CTN	
	6.1 Minimum requirements	
	6.2 Monitoring an STP-only CTN using the HMC	
	6.2.1 Timing Network tab.	
	6.2.2 Network Configuration tab	
	6.2.3 ETR Configuration tab	
	6.2.4 ETR Status tab	
	6.2.5 STP Configuration tab.	
	6.2.6 STP Status tab	
	6.2.7 ETS Configuration tab	167

	6.3 Monitoring an STP-only CTN using z/OS commands	169
	6.3.1 z/OS commands	169
	6.3.2 Coupling facility commands	175
	6.3.3 z/VM commands	176
	6.4 Configuring an STP-only CTN	178
	6.4.1 Support Element-to-NTP server connectivity	179
	6.4.2 CTN ID initialization.	179
	6.4.3 Configuring an NTP server or an NTP server with PPS as the ETS	181
	6.4.4 Time initialization	181
	6.4.5 Completing time initialization.	188
	6.4.6 Defining server roles	189
	6.5 CTN configuration changes.	191
	6.5.1 Changing the CTN ID	191
	6.5.2 Changing the CTS	
	6.5.3 CTS reassignment and ETS considerations	
	6.5.4 Changing the server roles	
	6.6 Time management	
	6.6.1 Adding an ETS to an existing CTN	
	6.6.2 Time adjustment	217
	6.6.3 Manual Time Adjustment through external time source	222
	6.6.4 Scheduled time adjustment through External Time Source	225
	6.6.5 STP offset adjustments	228
	6.7 Local time changes	239
	Chapter 7. Operational considerations	
	7.1 Disruptive actions on the Current Time Server	
	7.1.1 Example of a disruptive action on the CTS: DEACTIVATE	
	7.1.2 Protection of the CTS: CTN ID change.	
	7.2 Disruptive actions on the BTS or Arbiter	
	7.3 Last timing link validation	
	7.4 Restarting a CTN after a site power outage or CTS power-on reset.	
	7.4.1 Initializing the time	
	7.4.2 Assigning the CTN roles	260
Part 3. Migrati	ion scenarios	263
U		
	Chapter 8. ETR Network to Mixed CTN (ETR timing mode)	265
	8.1 Start point	
	8.1.1 z/OS DISPLAY ETR command	
	8.1.2 z/OS DISPLAY XCF command	
	8.1.3 System (Sysplex) Time tabs	
	8.2 Migration	
	8.2.1 Defining STP ID on SCZP201.	
	8.2.2 Defining STP ID on SCZP101.	
	8.3 End point.	
	8.3.1 z/OS DISPLAY ETR command.	
	8.3.2 z/OS DISPLAY XCF command.	
	8.3.3 System (Sysplex) Time tabs	276
	Chapter 9. Mixed CTN (ETR timing mode) to ETR Network	281
	9.1 Start point	
	9.1.1 z/OS DISPLAY ETR command.	
	9.1.2 z/OS DISPLAY XCF command	
	9.1.3 System (Sysplex) Time tabs	
	· · · · · · · · · · · · · · · · · · ·	

<ul> <li>9.2 Migration .</li> <li>9.2.1 Removing the STP ID on SCZP201</li></ul>	287 289 290 290 291
Chapter 10. Mixed CTN: Changing one server from ETR timing mode to STP timing	l
mode	295
10.1 Start point	
10.1.1 z/OS DISPLAY ETR command	
10.1.3 System (Sysplex) Time tabs	
10.2 Migration	
10.3 End point	
10.3.1 z/OS DISPLAY ETR command	304
10.3.2 z/OS DISPLAY XCF command	
10.3.3 System (Sysplex) Time tabs	305
Chapter 11. Mixed CTN: Changing one server from STP timing mode to ETR timing	l
mode	
11.1 Start point	
11.1.1 z/OS DISPLAY ETR command	
11.1.2 z/OS DISPLAY XCF command.	
11.1.3 System (Sysplex) Time tabs	
11.3 End point	
11.3.1 z/OS DISPLAY ETR command	
11.3.2 z/OS DISPLAY XCF command.	
11.3.3 System (Sysplex) Time tabs	
	004
Chapter 12. Mixed CTN: Adding a server in STP timing mode	
12.1.1 z/OS DISPLAY ETR command	
12.1.2 z/OS DISPLAY XCF command.	
	324
12.2 Migration	326
12.2.1 Defining the ETR Network ID on H40	
12.2.2 Defining the STP ID on H40	
12.3 End point	
12.3.1 z/OS DISPLAY ETR command.	
12.3.2 z/OS DISPLAY XCF command	
12.3.3 System (Sysplex) Time tabs	330
Chapter 13. Mixed CTN (two servers) to STP-only CTN.	335
13.1 Start point	
13.1.1 z/OS DISPLAY ETR command	
13.1.2 z/OS DISPLAY XCF command.	
13.1.3 System (Sysplex) Time tabs	
13.2 Migration	
13.3.1 z/OS DISPLAY ETR command	
13.3.2 z/OS DISPLAY XCF command	

	13.3.3 System (Sysplex) Time tabs	348
	Chapter 14. Mixed CTN (three servers) to STP-only CTN	355
	14.1 Start point	356
	14.1.1 z/OS DISPLAY ETR command	357
	14.1.2 z/OS DISPLAY XCF command	358
	14.1.3 System (Sysplex) Time tabs	358
	14.2 Migration .	
	14.3 End point	
	14.3.1 z/OS DISPLAY ETR command	
	14.3.2 z/OS DISPLAY XCF command	
	14.3.3 System (Sysplex) Time tabs	369
	Chapter 15. STP-only to Mixed CTN	
	15.1 Start point	
	15.1.1 z/OS DISPLAY ETR command	378
	15.1.2 z/OS DISPLAY XCF command	378
	15.1.3 System (Sysplex) Time tabs	378
	15.2 Migration	383
	15.2.1 Defining the ETR Network ID on SCZP201	
	15.2.2 STP-only CTN to Mixed CTN migration in progress	
	15.3 End point	
	15.3.1 z/OS DISPLAY ETR command	
	15.3.2 z/OS DISPLAY XCF command	
	15.3.3 System (Sysplex) Time tabs	393
Part 4. Append	dixes	399
	Appendix A. POR of a server in an STP-only CTN	401
	Procedure 1: POR of the server in a single-server STP-only CTN	
	Procedure 2: POR of a server in a two-server STP-only CTN	
	Procedure 3: POR of a server in a three or more-server STP-only CTN	
	Procedure 4: POR of both servers in a two-server STP-only CTN	
	Procedure 5: POR of all servers in a three or more-server STP-only CTN	406
	Appendix B. How to draw a CTN topology	407
	Introduction	
	Step 1: Identifying CPCs participating in CTN	
	Step 2: Identifying an active IODF	
	Step 3: HCD - Specifying IODF file	
	Step 4: Selecting a processor	
	Step 5: Selecting a channel subsystem	
	Step 6: Displaying the master list of CHPIDs	
		417
		100
	Step 7: Viewing CF CHPID connectivity information.	
	Step 7: Viewing CF CHPID connectivity information.         Sketching the diagram	423
	Step 7: Viewing CF CHPID connectivity information.         Sketching the diagram         Related publications	423 425
	Step 7: Viewing CF CHPID connectivity information.         Sketching the diagram         Related publications         IBM Redbooks publications	423 425 425
	Step 7: Viewing CF CHPID connectivity information.         Sketching the diagram         Related publications         IBM Redbooks publications         Other publications	423 425 425 425
	Step 7: Viewing CF CHPID connectivity information.         Sketching the diagram         Related publications         IBM Redbooks publications         Other publications         Online resources	423 425 425 425 426
	Step 7: Viewing CF CHPID connectivity information.         Sketching the diagram         Related publications         IBM Redbooks publications         Other publications         Online resources         How to get Redbooks publications.	423 425 425 425 426 427
	Step 7: Viewing CF CHPID connectivity information.         Sketching the diagram         Related publications         IBM Redbooks publications         Other publications         Online resources	423 425 425 425 426 427

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### Preface

Server Time Protocol (STP) is a server-wide facility that is implemented in the Licensed Internal Code (LIC) of IBM® zEnterprise® EC12 (zEC12), IBM zEnterprise 196 (z196), IBM zEnterprise 114 (z114), IBM System z10®, and IBM System z9®. It provides improved time synchronization in both a sysplex or non-sysplex configuration.

This IBM Redbooks® publication will help you configure a Mixed or STP-only Coordinated Timing Network. It is intended for technical support personnel requiring information about:

- Installing and configuring a Coordinated Timing Network
- Using STP functions and operations
- Migrating to a Coordinated Timing Network from various timing environments

Readers are expected to be familiar with IBM System z® technology and terminology. For planning, see our companion book, *Server Time Protocol Planning Guide*, SG24-7280. For information about how to recover your STP environment functionality, see *Server Time Protocol Recovery Guide*, SG24-7380.

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## **Summary of changes**

This section describes the technical changes made in this edition of the book and in previous editions. This edition might also include minor corrections and editorial changes that are not identified.

Summary of Changes for SG24-7281-03 for Server Time Protocol Implementation Guide as created or updated on October 31, 2016.

### June 2013, Fourth Edition

This revision reflects the addition, deletion, or modification of new and changed information described below.

### **New information**

- ► Enhanced accuracy provided by an NTP server with pulse per second (PPS)
- ► Support of IBM zEnterprise servers (zEC12, z196, and z114)
- ► STP Version 4 updates
- ► Hardware Management Console Application V2.12.0
- Network Time Protocol server on the Hardware Management Console
- NTP authentication support on the HMC

### **Changed information**

- ► Network Time Protocol (NTP) client support
- Support of IBM System z10 Enterprise Class server
- Hardware Management Console Application V2.11.1
- External Time Source Configuration tab on the System (Sysplex) Time task
- Exploitation of Going Away Signal for STP recovery
- Removal of operating systems no longer supported
- Removal of Mardware Management Console dial out support

# Part 1

## Setting up the Coordinated Timing Network

In this part, we introduce the basic operations for a user to set up a Coordinated Timing Network (CTN) implementing Server Time Protocol (STP). STP is designed to provide the capability for multiple servers and Coupling Facilities to maintain time synchronization with each other without requiring an IBM Sysplex Timer. STP can help provide functional and economic benefits when compared with the Sysplex Timer. STP allows concurrent migration from an External Timer Reference (ETR) network, and it can coexist with the ETR network. We describe the steps needed to:

- Configure an External Time Source (ETS).
- Migrate from an ETR-based CTN to a Mixed CTN.
- ► Activate an STP-only CTN.

### Overview

The STP design has introduced a new concept called Coordinated Timing Network. A CTN is a collection of servers and Coupling Facilities that are time synchronized to a time value called Coordinated Server Time. Typically, implementation of a Coordinated Timing Network has two paths:

- Migration from an existing ETR network
  - If one or more servers in the planned CTN are not STP enabled or one or more z/OS images are not running z/OS V1.7 or a later version, then the implementation is restricted to a Mixed CTN.
  - When all servers in the planned CTN are STP enabled and all z/OS images are running z/OS V1.7 or later, then implementation can be a Mixed CTN followed by a migration to an STP-only CTN.

Implementation of an STP-only CTN without an existing Sysplex Timer

**Important:** In an STP environment, if you plan to change your cabling topology, make sure that you understand the CTN roles of the servers subject to re-cabling, and perform the following tasks prior to any disruptive action:

- Update the IOCP for affected servers
- Test the changed links by configuring the channels online
- All servers must be STP enabled, and z/OS system images must be V1.7 or later.
- An STP-only CTN can also be configured in a single server environment to take advantage of an external time source.
- z/OS system images can be at any supported release if they use the SIMETRID statement in the CLOCKxx member of SYS1.PARMLIB.

In the setup section, the optional ETS feature is being configured in the first step, as we recommend using the ETS to initialize the time when activating an STP-only CTN.

The STP feature FC1021 is a chargeable feature, and must be ordered for each server and coupling facility (CF) that will participate in a CTN.

Installation of the feature is nondisruptive, but z/OS images must be IPLed after installation to recognize the new functions.

After installation of the STP feature, the server is STP enabled and STP windows are available from the System (Sysplex) Time task on the Support Element and HMC.

On the Hardware Management Console, default user IDs and roles are defined for operator, advanced operator, system programmer, HMC access administrator, and service representative. By default, only the system programmer and service representative roles are authorized to access the System (Sysplex) Time task.

The Access Administrator can assign new user IDs and passwords by using the user profiles task from the Console Actions Work Area. We recommend that access to the System (Sysplex) Time task be restricted to trained users.

An education module, *Introduction to Server Time Protocol (STP)*, is available in the education section of the IBM Resource Link® website at:

https://www.ibm.com/servers/resourcelink

For planning information, see *Server Time Protocol Planning Guide*, SG24-7280-03, and *Server Time Protocol Recovery Guide*, SG24-7380-01.

1

# Configuring an External Time Source

In this chapter, we introduce detailed procedures for configuring External Time Source (ETS) for an STP-only Coordinated Timing Network (CTN). We discuss the following possible configurations:

- ► Configuring an NTP server
  - Configuring an NTP server on the HMC and enabling HMC to act as an NTP server
  - Configuring an NTP server on the PTS/CTS or BTS
- ► Configuring an NTP server with pulse per second option
- Configuring dial out on the HMC<sup>1</sup>
- Migrating an External Time Source

<sup>&</sup>lt;sup>1</sup> Dial Out HMC function is available up to HMC 2.11.1. Starting with HMC 2.12.0 dial out support has been removed, thus it cannot be used for setting up dial out to a telephone time service.

### 1.1 External Time Source

To maintain time accuracy, the STP facility supports connectivity to an External Time Source (ETS). Using an ETS, regular adjustments might be performed either manually or automatically.

In a Mixed Coordinated Timing Network (CTN), if the Sysplex Timer has an ETS already configured, it will be used and time accuracy will be maintained by the Sysplex Timer. The Sysplex Timer ETS operation is not discussed in this book.

In an STP-only CTN, the Sysplex Timer is no longer used. Therefore, if an external time source will be used to maintain time accuracy, configure it prior to:

- Migrating from a Mixed to an STP-only CTN.
- Configuring a new STP-only CTN. If the ETS is used to initialize the Coordinated Server Time, the ETS must be configured before initializing the time.

The ETS can be configured as:

- NTP server
- NTP server with pulse per second (PPS) output
- Dial out to a telephone time service

**Important:** The dial-out option to a telephone time service is available up to HMC Version 2.11.1. Starting with HMC Version 2.12.0 the dial-out option is no longer available because this HMC does not support a modem connection.

### 1.1.1 ETS configuration considerations

The NTP server needs to be configured on the server that will be assigned as the Current Time Server, and it will be accessed once a server is configured as the Current Time Server within the CTN.

The ETS configuration of the PTS and the BTS can be different. For example, the PTS can use NTP, whereas the BTS can be configured for dial out on the HMC. The actual ETS type being used depends on which server is the Current Time Server. A CTS change (from PTS to the BTS) might result in another ETS being used to steer the CTS.

If an NTP server or an NTP server with PPS is used as ETS and configured on both the PTS and the BTS, the ETS operation is executed by both Support Elements. However, only the CTS utilizes the time information to steer the CST. Configuring an NTP server on the BTS allows:

- ► Continuous NTP access if the BTS takes over as the CTS.
- Continuous NTP server availability if the NTP server or PPS output at the PTS becomes unavailable. See sections "ETS recovery using NTP servers" and "ETS recovery using NTP servers with PPS" in Server Time Protocol Recovery Guide, SG24-7380.

### **1.1.2** Dialing out to a telephone time service

**Important:** Starting with HMC Version 2.12.0, the dial-out option is no longer available because this HMC does not support a modem connection, and thus it is not possible to configure dial-out ETS.

Using the dial out to a telephone time service consists of the following steps:

- 1. Configure an HMC to dial out to a telephone time service. At the Customize Outbound Connectivity task on the HMC, check both of the following check boxes to enable the configuration of the external time source:
  - Enable local system as a call-home server.
  - Allow external time source dialing using the local modem.

**Note:** Configure the ETS on multiple HMCs to have an alternate HMC for ETS queries.

- 2. Configure STP to use the dial out service as an ETS.
- Add scheduled operations to the Preferred Time Server (PTS) and the Backup Time Server (BTS), if applicable, to access the ETS. The HMC and SE support automatic retrieval of the time from a time service and automatic update of CST on a scheduled basis.

Setting up a schedule to dial out to the time service automatically can be done from the HMC. One of the following operations can be requested:

- A single scheduled operation at a specified date and time
- A recurring scheduled operation that occurs at a specified frequency

Scheduled operations that are to be executed by a server that is not the Current Time Server are ignored. At the scheduled time, the SE requests the HMC to dial out to the time service. The HMC sends the difference with the time obtained from the service to the STP facility, which makes gradual adjustments by steering the CST to the time obtained from the external time source.

### 1.2 Configuring an NTP server

The first ETS option is to use an NTP server. The NTP server can be either an external time source device available from several timekeeping device manufacturers, a local NTP server, or an NTP server configured on the HMC.

Starting with HMC Version 2.12.0, the HMC has implemented the capability to be set up to use authentication support when contacting a defined NTP server. This can be achieved by either using a symmetric key or an autokey.

This section assumes that the NTP server configured on the HMC will be used as the ETS. It first describes how the HMC can be enabled as an NTP server and then describes the steps required for the SNTP client on the SE to be configured to use the HMC's NTP server.

To retrieve time information used to steer the CST, STP uses the NTP client running on the Service Element (SE). The NTP client requires a LAN connection to an NTP server.

The NTP server can be either an appliance (external time source device) available from several timekeeping device manufacturers, a local NTP server, or an NTP server configured on the HMC. The NTP traffic between the Simple Network Time Protocol (SNTP) client (running on the Support Element) and the NTP server is not encrypted.

The NTP server or the NTP server with PPS configured as the ETS must be attached directly to the SE LAN. The SE LAN is considered in many configurations to be a private and dedicated LAN and must be kept as isolated as possible. Providing the HMC with the capability to act as an NTP server addresses a potential security concern, because the HMC is normally attached to the SE LAN.

The Simple Network Time Protocol (SNTP) client running on the Support Element can be connected to one HMC network adapter (eth0), as shown in Figure 1-1. The other HMC network adapter (eth1) is connected to the corporate network. Configuring an NTP server on the HMC can also be considered as a backup solution to provide NTP server redundancy. Note that the NTP server configured on the HMC is not capable of providing a pulse per second output.

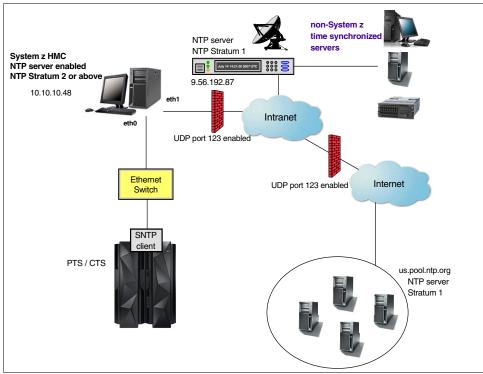


Figure 1-1 Example configuration - NTP server on HMC

### 1.2.1 NTP authentication support

The NTP server configured on the HMC can access another NTP server through a separate LAN connection. Starting with HMC Version 2.12.0 the connection between the HMC and the NTP server can be configured to use authentication support. When defining an NTP server (HMC Version 2.12.0 and above) you must choose between the following three authentication selections:

- None: If the NTP server does not support authentication or you decide to configure the NTP server without the authentication capability.
- Symmetric Key: If the NTP server has been set up to use Symmetric MD5 keys (NTP Version 3 and 4).
- Autokey: If the NTP server has been set up to use the autokey facility. This function can only be used if there is no network address translating (NAT) firewall between the HMC and the target NTP server (NTP Version 4).

You can define multiple NTP servers on the HMC while the authentication can be different for each NTP server.

### 1.2.2 Configuring an NTP server on the HMC

Maintaining HMC time accuracy is desirable if you plan to enable your HMC to act as an NTP server. In this section we also discuss how to enable the HMC to act as an NTP server that can be used as an External Time Source for the CTN.

**Note:** For HMC to access NTP servers on corporate network or Internet through a firewall requires UDP port 123 being enabled on the client firewall to allow NTP traffic between the local NTP server (running on HMC) and remote NTP servers.

### Adjusting HMC time to an NTP server

To configure an NTP server on the HMC, click **Customize Console Date and Time** at the appropriate HMC. This task is available in the HMC Management section. Selecting the **Configure NTP Settings** tab displays a window (Figure 1-2).

Customize Console Date and Time
Customize Date and Time Configure NTP Settings
NTP servers :
🖻 🖶 📽 🕐 Select Action 💌
Select Server Stratum Source Status Authentication
Total: 0 Filtered: 0 Selected: 0
The Network Time Protocol service is currently disabled on this console.  Enable NTP service Enable as time server If NTP servers cannot be reached, contact the IBM Service Support System
Manage Symmetric Keys Configure Autokey Issue NTP Commands
OK Cancel Help

Figure 1-2 Customize Console Date and Time

### Manage Symmetric Keys

The target NTP server configuration might be a mixture of NTP server without authentication, Symmetric Key authentication, or the autokey capability. If HMC authentication is used, the setup for the keys needs to be performed first. If it is planned to use a Symmetric Key for the communication of this HMC to any target NTP server, the keys will be set up first. Later, when the NTP server is entered, the association to a specific key will be established:

1. From the Configure NTP settings tab click **Manage Symmetric Keys** (Figure 1-3 on page 8).

Customize Console Date and Time
Customize Date and Time Configure Settings
NTP servers :
🖻 🖻 👾 📽 📑 Select Action 💌
Select Server Stratum Source Status Authentication
Total: 0 Filtered: 0 Selected: 0
The Network Time Protocol service is currently disabled on this console.         Enable NTP service         Enable as time server         If NTP servers cannot be reached, contact the IBM Service Support System         Manage Symmetric Keys         Configure Autokey         Issue NTP Commands

Figure 1-3 Manage Symmetric Keys in Configure NTP Settings

2. Initially no key exists. Click Add Key from the Select Action pull-down menu (Figure 1-4).

		P. d
🔇 Manage Symmetric Keys		i
Symmetric Keys:		
	Select Action 👻	
Select ^ Index ^ String ^	Select Action	
	Add Key	
Total: 0 Filtered: 0	Edit Key	
OK Cancel Help	Remove Key	
	— Table Actions —	
	Select All	
	Deselect All	
	Show Filter Row	
	Clear All Filters	
	Edit Sort	
	Clear All Sorts	
	Configure Columns	

Figure 1-4 Add Symmetric Key

3. The Key index and the Key string must be entered in the Add Symmetric Key Data panel (Figure 1-5). They need to match the definition in the target NTP server. Click **OK** when done. Repeat the steps if the NTP server has multiple keys defined and you want to optionally switch to a different key at any time later.

G Add Symmetric Key Data	
Key index : 1	_
Key string : NIZgy]t%*6DEp<	
OK Cancel Help	:

Figure 1-5 Add Key index and string

4. Once all the keys and strings have been entered, you can verify them in the Manage Symmetric Key panel and click **OK** to confirm the configuration (Figure 1-6 on page 9).

() Manage Symmetric Keys	1
Symmetric Keys:	
🖻 🖻 👯 🜮 🖉 😰 👘 🛛 Select Action	
Select ^ Index ^ String ^	
□ 1 NIZgy\]t%*6DEp<	
□ 6 }R{%d,f*Cmg_7RY	
Total: 2 Filtered: 2 Selected: 0	
OK Cancel Help	

Figure 1-6 Manage Symmetric Keys - final view

 The final confirmation for the symmetric key definition is shown. Click OK to confirm (Figure 1-7).

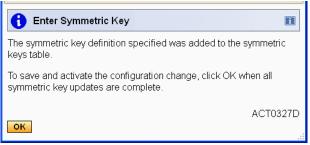


Figure 1-7 Symmetric Key definition confirmation

### **Configure Autokey**

The target NTP server configuration might be a mixture of NTP server without authentication, symmetric key authentication, or the autokey capability. If HMC authentication is used, the setup for the keys needs to performed first. If it is planned to use an Autokey authentication for the communication of this HMC to any target NTP server, the HMC key file needs to be generated first. Later, when the NTP server is entered, the association to this HMC key file will be established:

1. From the Configure NTP Settings tab click Configure Autokey (Figure 1-8).

Customize Console Date and Time
Customize Date and Time Configure NTP Settings
NTP servers :
🖻 🛱 🚏 🖝 Select Action 💌
Select Server Stratum Source Status Authentication
Total: 0 Filtered: 0 Selected: 0
The Network Time Protocol service is currently disabled on this console.  Enable NTP service Enable as time server If NTP servers cannot be reached, contact the IBM Service Support System
Manage Symmetric Keys Configure Autokey Issue NTP Commands
OK Cancel Help

Figure 1-8 Manage Symmetric Keys in Configure NTP Settings

2. In the Autokey Configuration panel select Generate Local Hosts Key to generate and store the local key file and certificate for this HMC (Figure 1-9). This needs to be done only once. If the Autokey Configuration panel shows an Autokey is already configured as shown in Figure 1-11, it basically means that an autokey was previously already configured. A new Local Host Key file can be generated any time.

Autokey Configuration	
Autokey is not currently configured. Click "Generate Local Host Key" to configure for Autokey.	
Generate Local Host Key	
OK Cancel Help	

Figure 1-9 Generate the Local Host Key file on the HMC

3. Select **OK** once the successful message ACT03297 is displayed; see Figure 1-10.

Customize Console Date/Time 🔳
The Local Autokey generation was successful.
ACT03297
ок

Figure 1-10 Autokey successfully generated

4. The Autokey has been successfully configured as shown in Figure 1-11. Select **OK** to leave the Autokey Configuration display.

Autokey Configuration 🔳
Autokey is configured.
Generate Local Host Key
OK Cancel Help

Figure 1-11 Autokey is configured

### Adding an NTP server to the HMC

1. On the Customize Console Date and Time panel, click **Select Action** and select **Add Server** (Figure 1-12 on page 11).

Customize Console D	ate and Time	I
Customize Date and Time Configure NTP Settings		
NTP servers :		
0 0 # * *	Select Action	✓
Select Server Stratum Sou	Select Action Add Server	n
Total: 0 Filte	Edit Server	
The Network Time Protocol se		on this console.
Enable NTP service	Query Servers	
Enable as time server	— Table Actions —	
☐ If NTP servers cannot be re		ervice Support System
Manage Symmetric Keys	Deselect All	sue NTP Commands
	Show Filter Row	
OK Cancel Help	Clear All Filters	
	Configure Columns	

Figure 1-12 Add NTP Server

The server host name or the IP address of a known NTP server must be entered in this window. You can define an NTP server that is available on the corporate network (9.56.192.87, as shown in Figure 1-1 on page 6). Figure 1-13 shows the IP address of a Stratum 1 NTP server on the corporate network.

**NTP authentication:** Symmetric key works for servers that are on the web. Autokey works as well, but cannot work if going through a Network Address Translation (NAT) firewall.

Specify which authentication should be used. This can be either **None**, **Symmetric Key** or **Autokey**. The Symmetric Key index needs to be selected if the Authentication Symmetric Key has been chosen. The list of previously entered Key strings is listed. Select **OK** to save the Network Time Server information.

Add Network Time Server
Enter the time server host name or IP address :
9.56.192.87
Authentication Selection :
Symmetric Key
Symmetric Key:
6
OK Cancel Help

Figure 1-13 NTP server on the corporate network to be accessed by the HMC

3. When **OK** is clicked, an information window displays to indicate that the NTP server has been added (Figure 1-14 on page 11).

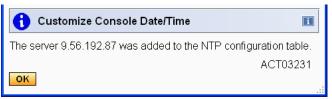


Figure 1-14 Message ACT03231 - Add NTP server information

4. Selecting OK displays the Customize Console Date and Time window (Figure 1-15).

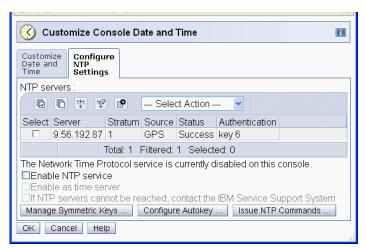


Figure 1-15 Corporate NTP server added

- 5. As shown in Figure 1-15, the new added NTP server (IP address 9.56.192.87) is an NTP Stratum 1 server, and its clock source is GPS (Table 1-1 on page 21). Success in the Status column indicates that it is a valid and usable time source for this HMC. The Authentication method is Symmetric key while key 6 is currently being used. Click Query Servers from the Select Action pull-down menu anytime to check the validation of all selected NTP servers. Also, the active key can be changed any time by selecting an NTP server and choosing Edit Server from the Select Action pull-down menu.
- 6. As shown in Figure 1-1 on page 6, you can also define an NTP source that is available through the Internet. From the Select Action menu on the Customize Console Date and Time window click Add Server to bring up a new window (Figure 1-16). The web address of the NTP server needs to be entered here. There is no authentication that can be used, and the Authentication Selection is therefore set to None.

() Add Network Time Server	Ī
Enter the time server host name or IP address :	
0.us.pool.ntp.org	
Authentication Selection :	
None	
OK Cancel Help	

Figure 1-16 Add an Internet - network time server

 The use of a web address requires you to customize and enable Domain Name Services on the HMC. For this, use the task Customize Network Settings → Name services in the Hardware Management Console Setting Work Area.

**Tip:** If the HMC is used as an NTP client/server, this step must be done **on the HMC** and **not** the Support Element.

8. When **OK** is clicked, message ACT03231 is displayed to indicate that the NTP server has been added. The Add Server function can be repeated until all NTP servers have been added. This example shows that three NTP servers have been defined on the HMC.

 The final panel listing all defined NTP servers with their status at the time of the last query is shown. The Network Time Protocol services are still disabled at that point in time. The final step to enable the NTP services on this HMC is done by selecting Enable NTP services, as shown in Figure 1-17.

Custom Date ar Time		re	and Time		I
NTP se	-				
		P 9	Select Action	~	
Select	Server	Stratum	Source	Status	Authentication
	9.56.192.87	1	GPS	Success	key 6
	0.us.pool.ntp.	.org 2	209.51.161.238	Success	none
	1.us.pool.ntp.	org 2	172.16.32.4	Success	none
	T	Fotal: 3 Filter	red: 3 Selected:	0	
<ul> <li>✓Enat</li> <li>○Enat</li> <li>○If NTf</li> <li>Manag</li> </ul>	ole NTP servic ole as time ser	e ver not be reache eys Con	e is currently disated, contact the IBN figure Autokey	1 Service	Support System

Figure 1-17 Enable Network Time Protocol service

10.Once Enable NTP service is checked, click **OK** to enable this console to synchronize its clock. Confirmation request ACT03237 is displayed (Figure 1-18).

<b>?</b> Customize Console Date/Time	
Are you sure you want to enable this console to synchronize its an NTP server?	clock to
AC	T03237

Figure 1-18 NTP server enable confirmation request ACT03237

11. Select **Yes** to synchronize this HMC to the NTP server. Message ACT03241 confirms the attachment to the NTP server (Figure 1-19 on page 14). Select **OK**; this closes the Customize Console Date/Time panel.

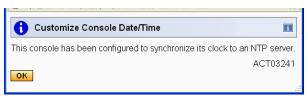


Figure 1-19 NTP server enable confirmation message ACT03241

**NTP server selection:** If more than one NTP server has been defined, you do not have the capability to specify which server is the primary server. The NTP service on HMC takes the defined NTP servers and tries to contact them. It looks at all of the servers and determines which one is the most accurate, based on stratum, dispersion, and consistency based on other servers.

For example, if you have four servers, and one has a significantly different time difference from the other three, that server will be considered an outlyer and will not be considered as a potential time server, until it ceases to be an outlyer.

### 1.2.3 Configuring HMC as an NTP server

At this point, the HMC has the NTP service enabled and gets its time from an NTP server. To enable the NTP server function on the HMC:

1. Check the **Enable as time server** check box (Figure 1-20).

🕑 Customize Conso	le Date a	nd Time		i
Customize Date and Time Configure NTP Settings				
NTP servers :				
	<b>)</b>   S	elect Action	~	
Select Server	Stratum	Source	Status	Authentication
9.56.192.87	1	GPS	Success	key 6
0.us.pool.ntp.org	2	209.81.9.7	Success	none
□ 1.us.pool.ntp.org	2	38.106.177.10	Success	none
Total	: 3 Filter	ed: 3 Selected	: 0	
The Network Time Protoc	ol service	e is currently ena	abled on th	is console.
Enable NTP service				
Enable as time server				
If NTP servers cannot b	be reache	ed, contact the IB	M Service	e Support System
Manage Symmetric Keys .	Cont	figure Autokey	Issue N	ITP Commands
OK Cancel Help				

Figure 1-20 Enable HMC as time server

2. Selecting **OK** displays a confirmation window (Figure 1-21).

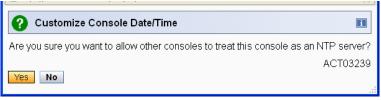


Figure 1-21 Message ACT03239 - Enable as time server confirmation

 Selecting Yes saves and enables the time server function. An information window displays (Figure 1-22).

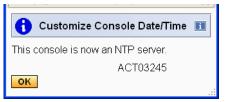


Figure 1-22 Message ACT03245 - NTP server function enabled

 After OK is clicked, select HMC Management → Customize Console Date and Time again, and the Customize Console Date and Time window displays (Figure 1-23).

<u>()</u> c	ustomize Conso	le Date a	ind Time			Ĩ
Custom Date a Time						
NTP se	ervers :					
	6 👯 🗐	•   S	elect Action	~		
Select	Server	Stratum	Source	Status	Authentication	
	9.56.192.87	1	GPS	Success	key 6	
	0.us.pool.ntp.org	2	204.123.2.5	Success	none	
	1.us.pool.ntp.org	2	128.252.19.1	Success	none	
	Tot	al: 3 Filt	ered: 3 Select	ted: 0		
Networ ☑Enat ☑Enat ☑If NT	twork Time Protoc k Time Protocol se ole NTP service ole as time server P servers cannot b ge Symmetric Keys . Cancel Help	erver. De reache	d, contact the I	BM Servic		em

Figure 1-23 Customize Console Date and Time - NTP server function enabled

The option is given to release a service call to the IBM Service Support System if any of the given NTP servers cannot be reached. Set the checkmark next to **If NTP servers cannot be reached, contact the IBM Service Support System**.

### 1.2.4 Removing an NTP server from the HMC

If one or multiple NTP servers need to be removed:

1. Select the check box of the NTP servers and click **Remove Server** in the Select Action pull-down menu (Figure 1-24).

Customize Date and Time       Configure NTP Settings         NTP servers :       Select Action          Select Server       Strawning         9,56,192.87       Select Action          9,56,192.87       Select Action          Md Server       Select Action          Add Server       Select Action          Md Server       Select Action          Md Server       Select Action          Md Server          Poilor	🔇 Customize Console D	Date and Time
Image: Select Server       Select Action       Image: Select Action         Select Server       Stra       Select Action       Image: Authentication Bess key 6         Image: Select Server       9.56.192.87       1       Edit Server       Bess key 6         Image: Select Server       9.56.192.87       1       Edit Server       Bess key 6         Image: Select Server       9.56.192.87       1       Edit Server       Bess key 6         Image: Select Server       Bess None       Bess None       Bess None       Bess None         Image: Select All       Image: Select All       Beselect All       Beselect All       Beselect All         Image: Server       Beselect All       Beselect All       Beselect All       Show Filter Row         Image: Server       Select All       Show Filter Row       Show Filter Row       Show Filter Row	Date and NTP	
Select Server       Stra      Select ActionAdd Server       5       Authentication         □       9.56.192.87       1       Add Server       5       key 6         ☑       0.us.pool.ntp.org       2       Remove Server       ss key 6         ☑       1.us.pool.ntp.org       2       Query Server       ss none         ☑       Total: 3      Table Actions       ss none         ☐       Total: 3        ss none         ☐       Total: 3        ss none         ☐       Select All       Deselect All       and this console is         ☑       Enable NTP service       Show Filter Row       Cloar All Eifore		
currently a Network Time Protocol se Deselect All ✓Enable NTP service Show Filter Row Close All Eitors	SelectServerStr9.56.192.871Image: 0.us.pool.ntp.org2Image: 0.us.pool.ntp.org2	e Select Action s Authentication Add Server ess key 6 Edit Server ess none Query Servers ess none I - Table Actions
Configure Autokey     Issue NTP Commands	currently a Network Time Pro ☑Enable NTP service ☑Enable as time server ☑If NTP servers cannot be re	Clear All Filters Configure Columns Configure Columns Configure Columns Configure Columns

Figure 1-24 Remove two NTP servers

**Note:** Multiple NTP servers can be selected for removal at the same time.

2. Selecting **Remove NTP Server** displays a confirmation window (Figure 1-25).



Figure 1-25 Message ACT03234 - Removal confirmation

3. When **Yes** is selected, the NTP servers are removed and an information window displays (Figure 1-26).

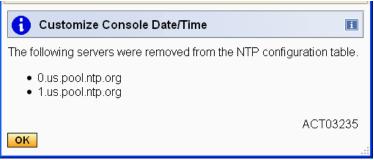


Figure 1-26 Message ACT03235 - NTP servers removed

4. If there is a need to remove the last NTP server, you can select it and click **Remove Server** in the Select Action pull-down menu (Figure 1-27).

Customize Console Date and Time	1
Customize Date and Time Configure NTP Settings	
NTP servers :	
Image: Constraint of the server       Select Action       ✓         Select Server       Stratum        Select Action         Image: Constraint of the server       Add Server         Image: Constraint of the server       Edit Server         Image: Constraint of the server       Total: 1	itication
The Network Time Protocol se currently a Network Time Proto- Enable NTP service If NTP servers cannot be re Manage Symmetric Keys OK Cancel Help	and this console is ervice Support System sue NTP Commands

Figure 1-27 Remove last NTP server

A confirmation window displays (Figure 1-28).

<b>?</b> Customize Console Date/Time
You requested to remove the following servers from the NTP configuration table.
• 9.56.192.87
Removing these servers will leave the NTP configuration table without a server.
<ul> <li>Removing these server will cause the NTP service that is currently running to terminate.</li> <li>Removing these server will disallow other consoles to treat this console as an NTP server</li> </ul>
Are you sure you wish to remove the servers listed above from the NTP configuration table?
ACT03260

Figure 1-28 Message ACT03260 - Last NTP server removal confirmation

5. When **Yes** is selected, the last NTP server is removed and an information window displays (Figure 1-29).

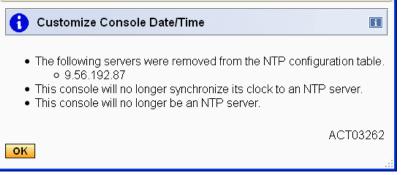


Figure 1-29 Message ACT03262 - Last NTP server removed

Note that the HMC is no longer acting as an NTP server and no longer synchronizes its time to an NTP server. The Customize Console Date and Time window gets closed when you click **OK**.

### 1.2.5 Configuring an NTP server on the PTS/CTS or BTS

The example in this section uses the NTP server defined on the HMC as described in 1.2.3, "Configuring HMC as an NTP server" on page 14.

The Simple Network Time Protocol client that runs on the Support Element (SE) on the Primary Time Server/Current Time Server (PTS/CTS) must be configured to communicate with an NTP server. Only the CTS is used to steer the Coordinated Server Time (CST). However, in an STP-only CTN where the NTP client function is used, configure the NTP function on each server that can potentially have a role in the CTS.

If the PTS/CTS fails, the Backup Time Server (if configured) takes over the CTS role and is able to steer the CST to its external time source. In case the NTP server configured to the PTS fails, the BTS calculates the required adjustment and propagates it to the PTS. Coupling connectivity is utilized for this communication. For detailed recovery information, see *Server Time Protocol Recovery Guide*, SG24-7380.

From the HMC workplace:

1. Select the servers to be set up. Click the **System (Sysplex) Time** option in the Configuration section. Select the **ETS Configuration** tab (Figure 1-30).

System (Sysplex) Time for SCZP401							
Timing Network	Network Configuration	STP Configuration	STP Status	ETS Configuration			
to attach	to an ETS devi	ce, an ETS conf	iguration	an STP-only CTN is required. Chai in the time source	nges made to		
External Time Source (ETS) ● None ● Use <u>MTP</u> ● Use NTP with <u>p</u> ulse per second (PPS)							
Apply NTP Thresholds Refresh Cancel Help							
					.:		

Figure 1-30 ETS Configuration: Use the NTP selection

The ETS Configuration tab displays for all servers that support NTP to allow an ETS configuration for every server that could potentially act as the CTS in the future.

**Note:** A z990 and z890 server does not support NTP and will not display the ETS Configuration tab, even though these servers can be part of the STP-only CTN.

**Important:** An IBM System zEC12 server is not supported in the same CTN with z9 EC, z9 BC, z990, or z890 servers. An IBM System z196 or z114 is not supportd in the same CTN with z990 or z890 servers.

- Selecting Use NTP displays the NTP Time Server information table. When at least one Configured check box is selected, the IP address or web address entered will be used as an NTP server (Figure 1-31 on page 20).
- The use of a web address requires you to customize and enable Domain Name Services on the SE. For this, use the task Customize Network Settings → Name services in the Support Element Console Applications.

**Tip:** If the HMC is used as an NTP client/server, this step must be done **on the HMC** and **not** the Support Element.

4. Up to two NTP servers can be configured for each supported CPC. A preferred NTP server is chosen by selecting the appropriate **Select** radio button. This NTP server is called the *selected* NTP server. If only one NTP server is configured, the select radio button must be checked (Figure 1-31 on page 20).

Sys	tem (Syspl	ex) Time for SCZP	401		1
Timing Network	Network Configurat	STP ion Configuration	STP Status	ETS Configuratio	n
_ Note —				-	]
to attach	n to an ETS	ble of Current Time device, an ETS con on have an immedia	figuration	is required. C	hanges made to
External	Time Source	e (ETS)			
⊙None ⊚Use≬ ⊙Use≬	<u>N</u> TP	lse per second (PP:	S)		
NTP Tin	ne Server Info	ormation ————			
Select	Configured	NTP Time Server	Str	atum Source	Status
۲	✓	9.56.192.87			
0		9.12.6.46			
Apply	Query	NTP Thresholds			
Refresh	Cancel	Help			

Figure 1-31 ETS Configuration: Configure and select the NTP server

 Clicking Query tests the designated servers, and message ACT39142 displays (Figure 1-32).



Figure 1-32 Message ACT39142 - NTP connection query

6. The Stratum level, Source, and Status table fields for the corresponding NTP server will be filled in (Figure 1-33 on page 21).

Timing Network	Network Configurat		TP ETS	figuration		
- Note -						
to attac	h to an ETS	ble of Current Time Ser device, an ETS configu on have an immediate	uration is re	quired. Chang	ges made to	
Externa	I Time Source	e (ETS)				
<ul> <li>○ None</li> <li>⊙ Use <u>NTP</u></li> <li>○ Use NTP with pulse per second (PPS)</li> </ul>						
	-					
	ne Server Info					
NTP Tir			Stratum	Source	Status	
NTP Tir		ormation	Stratum	Source GPS	Status Success	
<i>NTP Tir</i> Select	Configured	NTP Time Server			Success	
NTP Tir Select	Configured	NTP Time Server 9.56.192.87	1	GPS	Success	

Figure 1-33 ETS Configuration: Query results

- 7. The Status column displays Success if the related NTP server is accessible. A list of possible status fields is available by clicking **Help** on the ETS Configuration tab.
- 8. The Source column (see Figure 1-33) contains a description of the time source for the NTP server provided as information by the NTP server. Typically, the source for Stratum 1 servers will be GPS, or radio signals such as WWV. Table 1-1 shows a list of examples of known Stratum 1 source values. For NTP servers not at Stratum 1, this field contains the IP address of the higher stratum NTP server (64.113.32.5, as shown in Figure 1-33). This field is blank if the server is not available.

NTP source	Displayed source text	Description of source ID
ACTS	ACTS	NIST telephone modem service
CESM	Cesium	Calibrated Cesium clock
СНИ	CHU	Ottawa (Canada) Radio 3330, 7335, 14760 kHz
DCF	DCF	Mainflingen (Germany) Radio 77.5 kHz
GOES	GOES	Geostationary Orbit Environment Satellite
GPS	GPS	Global Positioning Service
HBG	HBG	Prangins, HB 75 kHz
IRIG	IRIG	Inter-Range Instrumentation Group
JJY	JJY	Fukushima, JP 40 kHz, Saga, JP 60 kHz
LOCL	Local	Un-calibrated local clock
LORC	LORAN-C	LORAN-C radio-navigation system
MSF	MSF	Rugby (UK) Radio 60 kHz

Table 1-1 NTP Stratum 1 clock sources

NTP source	Displayed source text	Description of source ID
OMEG	OMEGA	OMEGA radio-navigation system
PPS	PPS	Calibrated quartz clock or other pulse-per-second source
PTB	РТВ	PTB (Germany) telephone modem service
RBDM	Rubidium	Calibrated Rubidium clock
TDF	TDF	Allouis (France) Radio 164 kHz
USNO	USNO	USNO telephone modem service
WWV	WWV	Ft. Collins (US) Radio 2.5, 5, 10, 15, 20 MHz
WWVB	WWVB	Boulder (US) Radio 60 kHz
WWVH	WWVH	Kaui, Hawaii (US) Radio 2.5, 5, 10, 15 MHz

- 9. If two NTP servers have been configured, checks are made to compare the accuracy of the NTP servers. If a divergence is detected, the message in the Status column indicates success, but a note below the NTP server information table will indicate the divergence.
- When you click **Apply**, the NTP server configuration is saved on the Support Element and message ACT39145 displays (Figure 1-34). The configuration takes effect immediately if only one NTP server is configured.

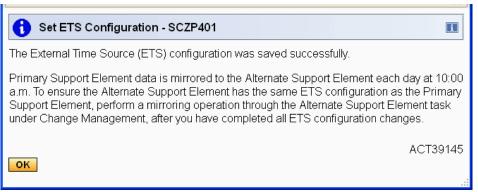


Figure 1-34 ETS configuration saved - mirroring information

If two NTP servers are configured, clicking **Apply** causes a verification of the NTP servers first. This helps you to choose the best NTP server as the selected one. Depending on the result, one of the following message windows might appear:

 If the selected NTP server has a higher Stratum level than the non-selected NTP server, the message shown in Figure 1-35 displays. In this case, you might consider defining the nonselected NTP server as the selected one.

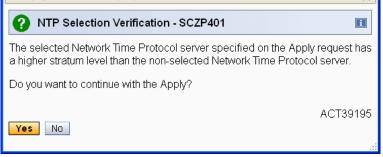


Figure 1-35 Message ACT39195 - Selected NTP has higher Stratum level

 The message shown in Figure 1-36 displays if the selected NTP server is less accurate than the nonselected NTP server. In this case, you might consider defining the nonselected NTP server as the selected one.

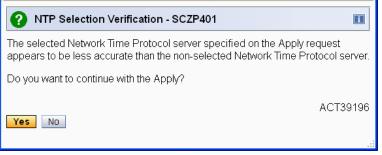


Figure 1-36 Message ACT39196 - NTP Selection Verification

11. There might be good reasons for such configurations. However, clicking Yes saves the NTP server configuration on the Support Element and the configuration takes effect. A message window displays (Figure 1-37).

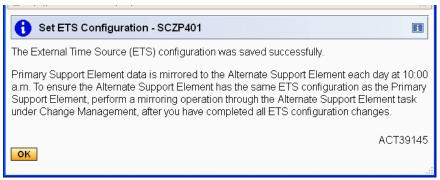


Figure 1-37 Message ACT39145 - ETS configuration saved successfully

12. In case the same IP address has been configured for both NTP servers, message ACT39206 displays (Figure 1-38 on page 24). Even if this is a valid configuration, it is a good idea to configure a separate NTP server for redundancy.

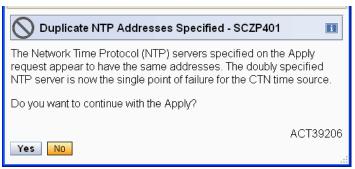


Figure 1-38 Message ACT39206 - Duplicate IP address

13. It is strongly advised to define two different NTP servers in order to have redundant NTP server capability; select **No** and define a different NTP server. Systems zEC12, z196, and z114 have the capability to define an optional NTP threshold. Select **NTP Thresholds** from the ETS Configuration (Figure 1-39).

System (Sys	olex) Time for SCZP401			ß
Timing Network Configura	ation STP ST Configuration St		; nfiguration	
to attach to an ETS	role of Current Time Serv S device, an ETS configur ion have an immediate ef	ation is re	quired. Chan	ges made to
	ulse per second (PPS)			
NTP Time Server In		Stratum	Caumaa	Status
	d NTP Time Server 9.56.192.87	] 1	GPS	Success
○ ☑	9.12.6.46	2	64.113.32.5	Success
Apply Query	NTP Thresholds			
Refresh Cancel	Help			

Figure 1-39 External TIme Source Configuration - NTP Thresholds

14. Setting an NTP threshold can be considered optional and is intended to tolerate certain NTP status changes that can be considered as normal. In the NTP Threshold panel select a Stratum level that must be reached before hardware and Operating System Messages are generated. Similarly, select a time period that must be reached before hardware and Operating System Messages are generated if the Source ID from a target NTP server changes. Select the Stratum level threshold and Source ID time threshold from the pull-down menu and select OK (Figure 1-40 on page 25).

NTP Thresholds - SCZP401	i
NTP Threshold Settings	
Stratum level threshold: 4	
Source ID time threshold: 2 hours 30 minutes	-
OK Reset Cancel Help	:

Figure 1-40 NTP thresholds

- 15. Once the NTP servers and the optional NTP threshold are configured and applied, the selected NTP server is used for time adjustments.
- 16.NTP server accessibility is checked once every 10 minutes, with a time adjustment issued every hour. In the case of NTP server access failures, or changes in stratum level or source ID, a hardware message is posted. No user message displays on the HMC when STP accesses the NTP server.

When a time adjustment is requested, a message is generated in the Support Element Console Events log. Table 1-2 shows the sample messages.

- 17. To view the console log from the HMC application, first select the CTS, then:
  - a. Select **Recovery**  $\rightarrow$  **Single Object Operations** to log on to the Support Element.
  - b. From the SE workplace, select **Service Management**  $\rightarrow$  **View Console Events**.

Table 1-2 Support Element Console events

Date	Time	Console event
09/21/2012	11:17:03.940	This CPC is requesting an adjustment to the Coordinated Server Time after contacting an External Time Source via NTP server: 9.56.192.87[-0.000171 seconds].
09/21/2012	10:17:03.780	This CPC is requesting an adjustment to the Coordinated Server Time after contacting an External Time Source via NTP server: 9.56.192.87 [ -0.000838 seconds].
09/21/2012	09:17:03.820	This CPC is requesting an adjustment to the Coordinated Server Time after contacting an External Time Source via NTP server: 9.56.192.87 [ 0.001748 seconds].

18. You might need to remove an NTP server. To do this, the configured check box of the appropriate NTP server needs to be *unchecked*. There might be reasons to remove the last NTP server (Figure 1-41 on page 26).

👼 Sys	System (Sysplex) Time for SCZP401							
Timing Network	Network Configurat	STP Configuration Sta		figuration				
This CF attach tu the ETS	Note This CPC has the role of Current Time Server for an STP-only CTN. If you plan to attach to an ETS device, an ETS configuration is required. Changes made to the ETS configuration have an immediate effect on the time source for the CTN. <i>External Time Source (ETS)</i> None							
OUse		se per second (PPS)						
		NTP Time Server	Stratum	Source	Status			
۲		9.56.192.87	1	GPS	Success			
0		9.12.6.46	2	64.113.32.5	Success			
Apply	Query	ITP Thresholds						
Refresh	Cancel	Help						

Figure 1-41 ETS Configuration - Remove last NTP server

19. When you click **Apply**, the message shown in Figure 1-42 displays.

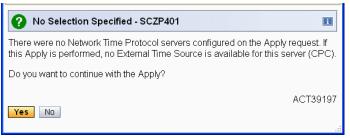


Figure 1-42 Message ACT39197 - Removing last NTP server

20. Clicking **Yes** confirms the request, and the new NTP configuration is saved on the Support Element. An information window displays (Figure 1-43).

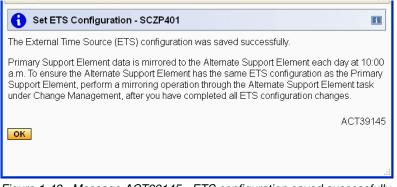


Figure 1-43 Message ACT39145 - ETS configuration saved successfully

## **1.3 Configuring an NTP server with pulse per second option**

The pulse per second (PPS) output option, offered by certain NTP server hardware vendors, is utilized in addition to the NTP time information. The time accuracy of an STP-only CTN has been improved by adding the capability to configure an NTP server that has a pulse per second output signal. This type of device is available world-wide from several vendors that provide network timing solutions. Figure 1-44 depicts the configuration that we used for this example.

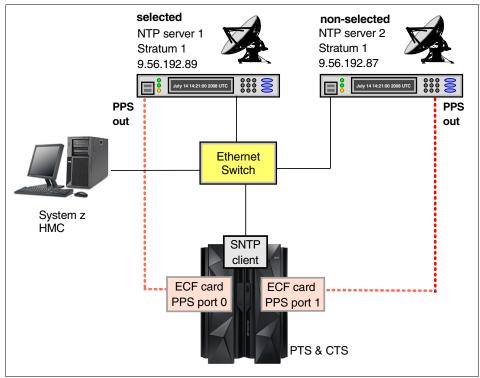


Figure 1-44 ETS using NTP with PPS

**Note:** The NTP server that can be configured on the HMC is not able to provide a PPS signal.

STP was designed to track to the highly stable, accurate PPS signal from the NTP server and maintain an accuracy of 10 microseconds, as measured at the PPS input of the System z server. In comparison, STP configured to use a dial-out time service or an NTP server without the PPS output option is designed to provide a time accuracy of 100 milliseconds to the ETS.

The PPS output is connected to the PPS ports on the ETR cards of the System z10 or System z9 server, or to the PPS ports on the ECF card for System zEC12, z196, and z114.

To configure the NTP server with PPS:

 Click the server to be set up for NTP on the HMC. Click the System (Sysplex) Time option in the Tasks section, select the ETS Configuration tab and select Use NTP with pulse per second (Figure 1-45).

Timing Network STP STP ETS Network Configuration Configuration Status	System (Sysplex) Time for P57							
Network Configuration Configuration								
Note This CPC has the role of Current Time Server for an STP-only CTN. If you plan to attach to an ETS device, an ETS configuration is required. Changes made to the ETS configuration have an immediate effect on the time source for the CTN.								
External Time Source (ETS)  None Use NTP Use NTP with pulse per second (PPS)  NTP Time Server Information								
Select Configured PPS NTP Time Server Stratum Source Status								
<ul> <li>0</li> </ul>								
©								
Apply Query NTP Thresholds								
Refresh Cancel Help								

Figure 1-45 ETS Configuration - Use NTP with pulse per second (PPS)

- 2. Selecting the **Use NTP with pulse per second (PPS)** radio button displays the NTP Time Server Information table. When at least one Configured check box is selected, the IP address or web address entered in the NTP Time Server column is used as the NTP server address (Figure 1-46 on page 29).
- The use of a web address requires that the Support Element be customized with Domain Name Services enabled. Select the task Customize Network Settings → Name services in the Support Element Console Applications.

**Tip:** If the HMC is used as an NTP client/server, this step must be done **on the HMC**, and **not** the Support Element.

Sys	System (Sysplex) Time for P57							
Timing Network	Network Configurat		STP Configuration	STP Status	ETS Configui	ration		
Note —								
to attac	This CPC has the role of Current Time Server for an STP-only CTN. If you plan to attach to an ETS device, an ETS configuration is required. Changes made to the ETS configuration have an immediate effect on the time source for the CTN.							
Externa	I Time Source	(ETS)						
	<u>N</u> TP	· ·	er second (PP	S)				
Select	Configured	PPS Port	NTP Time Se	erver	Stratum	Source	Status	
۲		0	9.56.192.89					
O	◎ ☑ 1 9.56.192.87							
Apply	Apply Query NTP Thresholds							
Refresh	Cancel	Help						

Figure 1-46 ETS Configuration - NTP with pulse per second (PPS) configured

4. The PPS Port column indicates the NTP server to PPS port correlation. As shown in Figure 1-46, PPS Port 0 corresponds to the NTP server defined in the upper row of the NTP Time Server Information table. The PPS output of this NTP server needs to be connected to PPS port 0 on the ECF card for System zEC12, z196 and z114 (ETR card on the z10). PPS Port 1 corresponds to the NTP server defined in the lower row of the NTP Time Server Information table. The PPS output of this NTP server needs to be connected to PPS port 1 corresponds to the NTP server defined in the lower row of the NTP Time Server Information table. The PPS output of this NTP server needs to be connected to PPS port 1 corresponds to the NTP server defined in the lower row of the NTP Time Server Information table. The PPS output of this NTP server needs to be connected to PPS port 1 on the ECF card.

The *Installation Manual for Physical Planning* (IMPP) manual for each server provides a description and location of the ECF or ETR feature cards. See "Related publications" on page 425 for information about these manuals.

**Note:** You are responsible for defining the correct NTP server IP address and connecting the corresponding PPS port to the correct ECF or ETR card port.

- 5. Up to two NTP servers can be configured. A preferred NTP server is chosen by selecting the appropriate **Select** radio button. This NTP server is called the *selected* NTP server. If only one NTP server will be configured, the Select radio button *must* be checked.
- 6. Clicking Query tests the IP connectivity, and message ACT39142 displays (Figure 1-47).

1 NTP Connection Query - P57	3
The NTP connection query completed. The status fields contain the query results for each NTP address	s.
АСТ3914	2

Figure 1-47 Message ACT39142 - NTP Connection Query

- 7. The Stratum level, Source, and Status table fields for the corresponding NTP server are filled in (Figure 1-48 on page 30).
- 8. The Status column displays Success if the related NTP server is accessible. A list of possible status fields is available by clicking **Help** on the ETS Configuration tab.
- 9. The Source field contains a description of the time source for the NTP server provided as information by the NTP server. Typically, the source for Stratum 1 servers is GPS or radio signals such as WWV. Table 1-1 on page 21 provides a list of examples of known Stratum 1 source values. This field is blank if the server is not available. The NTP configuration is not applied so far, and the PPS port status indicates **Not configured** for both PPS ports.

📕 Sys	System (Sysplex) Time for P57							
Timing Network	Network Configurat		STP STP Configuration Status	ETS Configu	ration			
attach t ETS co	This CPC has the role of Current Time Server for an STP-only CTN. If you plan to attach to an ETS device, an ETS configuration is required. Changes made to the ETS configuration have an immediate effect on the time source for the CTN.							
⊘ Non ⊚ Use ⊛ Use	External Time Source (ETS)  None  Use MTP  Use NTP with pulse per second (PPS)  NTP Time Server Information							
Select	Select Configured PPS Port NTP Time Server Stratum Source Status							
۲	●							
0	⊘ ℤ 1 9.56.192.87 1 GPS Success							
Port 0:1	PPS Port Status Port 0: Not configured, PPS signal detected Port 1: Not configured, PPS signal detected Apply Query NTP Thresholds							

Figure 1-48 NTP Server query done

- 10. If two NTP servers have been configured, checks are made to compare the time at the NTP servers. If a divergence is detected between the two NTP servers, the message in the Status column indicates Success, but a note displays below the NTP Time Server Information table.
- 11. When you click **Apply**, the NTP server configuration is saved on the Support Element, and message ACT39145 displays (Figure 1-49 on page 31). The configuration takes effect immediately if only one NTP server is configured.

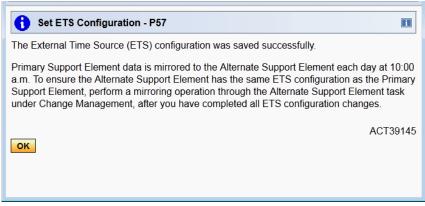


Figure 1-49 Message ACT39145 - ETS configuration saved successfully

12. If two NTP servers are configured, clicking **Apply** causes a verification of the NTP server first. This helps you choose the best NTP server as the selected one. Depending on the result, message ACT39196 might display (Figure 1-50).

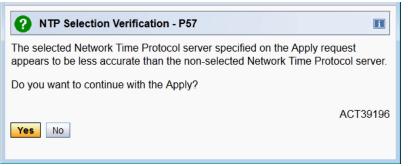


Figure 1-50 Message ACT39196 - The selected NTP server is less accurate

- 13. If the selected NTP server is less accurate than the nonselected NTP server, message ACT39196 displays (Figure 1-50). In this case, consider assigning the nonselected NTP server as the selected one.
- 14. There might be good reasons for such a configuration. However, clicking **Yes** (Figure 1-50) saves the NTP server configuration on the Support Element, and the configuration takes effect. Message ACT39145 displays (Figure 1-51).

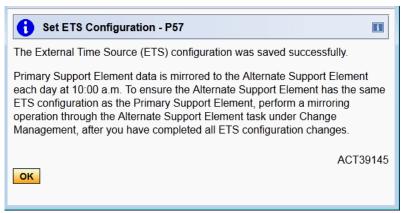


Figure 1-51 Message ACT39145 - ETS configuration saved successfully

- 15. The System (Sysplex) Time window returns and the PPS Port Status fields display the status after refresh (Figure 1-52). The possible port status messages are:
  - Not configured
  - No PPS signal
  - Acquiring consistent NTP information
  - Configuration error
  - Adjusting for PPS signal
  - Capable of tracking to PPS signal
  - Tracking to PPS signal

	System (Sysplex) Time for P57							
Timing Network								
Note — This CPC has the role of Current Time Server for an STP-only CTN. If you plan to attach to an ETS device, an ETS configuration is required. Changes made to the ETS configuration have an immediate effect on the time source for the CTN.								
External Time Source (ETS)  None  Use NTP Use NTP Use per second (PPS)  NTP Time Server Information								
Select	Configured	PPS Port	NTP Time Set	rver	Stratum	Source	Status	
Select	Configured		NTP Time Sei 9.56.192.89	rver	Stratum 1	Source GPS	Status Success	
	Ŭ	Port		rver				

Figure 1-52 ETS configuration

- 16. You can click Help for more information regarding the PPS Port Status field.
- 17. System zEC12, z196 and z114 have the capability to define an optional NTP threshold. Select **NTP Thresholds** from the ETS Configuration tab (Figure 1-52). This opens the NTP Threshold Settings shown in Figure 1-53.

NTP Thresholds - P57
NTP Threshold Settings
Stratum level threshold:
Source ID time threshold: No delay
OK Reset Cancel Help

Figure 1-53 NTP threshold specification

18. Setting an NTP threshold can be considered optional and is intended to tolerate certain NTP status changes that can be considered as normal. In the NTP Threshold panel select a Stratum level that must be reached before hardware and Operating System Messages are generated. Similarly, select a time period that must be reached before hardware and Operating System Messages are generated if the Source ID from a target NTP server changes. Select **Stratum level threshold** and **Source ID time threshold** from the pull-down menu and select **OK** (Figure 1-53).

- 19.Once the NTP servers and the optional NTP threshold are configured and the configuration is applied, the selected NTP server with PPS is used for time adjustments (unless one of the previously mentioned problems is encountered). NTP server availability is checked every minute when STP is utilizing the PPS signal.
- 20.If the NTP server cannot be accessed, or in case of failures or changes in the stratum level or source ID, a hardware message is posted, as well as a z/OS message (z/OS 1.11 or later). The PPS signal is sampled every second. If the PPS signal is not available or is unusable for more than two seconds, a hardware message is issued and STP tries to utilize another PPS signal. If no other PPS signal is available, STP uses the NTP time information (time accuracy downgraded from 10 microseconds to 100 milliseconds). For detailed recovery information, refer to *Server Time Protocol Recovery Guide*, SG24-7380.
- 21.If an NTP server must be removed, the configured check box of the appropriate NTP server needs to be unchecked. There might be reasons to remove the last NTP server (Figure 1-54). Removing an NTP server also deconfigures its associated PPS signal because the NTP server and its PPS signal are correlated.

🜉 Sy	System (Sysplex) Time for P57								
Timing Network	Network Configurat		STP Configuration	STP Status	ETS Configui	ration			
Note —	Note								
This CPC has the role of Current Time Server for an STP-only CTN. If you plan to attach to an ETS device, an ETS configuration is required. Changes made to the ETS configuration have an immediate effect on the time source for the CTN.									
External Time Source (ETS)									
<ul> <li>○ None</li> <li>○ Use <u>N</u>TP</li> <li>○ Use NTP with <u>p</u>ulse per second (PPS)</li> </ul>									
NTP Time Server Information									
Select Configured PPS Port NTP Time Server Stratum Source Status									
۲		0	9.56.192.89		1	GPS	Success		
I 9.56.192.87 I GPS Success									
PPS Po	rt Status								
Port 0:Tracking to PPS signal Port 1:Capable of tracking to PPS signal									
Apply	Query	NTP Th	resholds						
Refresh	Cancel	Help							

Figure 1-54 ETS Configuration - Remove last NTP server with PPS

22. When you click Apply, the message ACT39197 displays (Figure 1-55 on page 34).

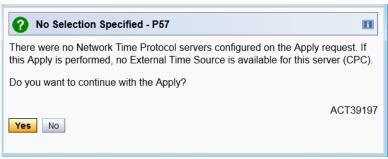


Figure 1-55 Message ACT39197 - Removing last NTP server

 Clicking Yes confirms the removal of the last NTP server, and the NTP configuration is saved on the Support Element. The information message ACT39145 displays (Figure 1-56).

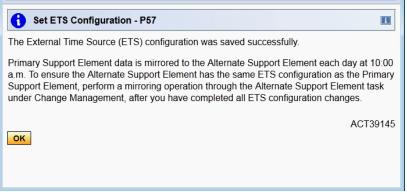


Figure 1-56 Message ACT30145 - ETS configuration saved successfully

# 1.4 Configuring dial out on the HMC

This section provides information about how to configure the External Time Source to use dial out on the Hardware Management Console.

**Note:** The dial-out option is available up to HMC Version 2.11.1. Starting with HMC Version 2.12.0 the dial-out option is not available since it does not support a modem connection anymore.

## 1.4.1 HMC setup for ETS dial-out configuration

The HMC setup can be considered the first step for the ETS dial-out configuration. It makes the HMC capable of dialing to a time service provider.

To configure the dial-out connection:

 Select the Service Management task on the Hardware Management Console application. Click the Customize Outbound Connectivity option available in the Work pane. Figure 1-57 shows the Call-Home Server Consoles task.

- Local Console Configuration Use the Configure button to confi call-home server and the connect the service provider.			
Configure			
The following call-home server co		handle call-hom	ne
requests submitted by this consol	ACCESSION REPORTS		<u>Seen</u>
Select IP Address or Host Name	ACCESSION REPORTS	Comment	
	ACCESSION REPORTS	Comment SCZHMC8	
Select IP Address or Host Name	Туре	SCZHMC8	

Figure 1-57 Call-Home Server Consoles

2. After clicking **Configure**, the Outbound Connectivity Setting window displays (Figure 1-58).

<ul> <li>✓ Allow external time source dialing using the local modem</li> <li><i>Protocol</i></li> <li>● <u>N</u>IST Automated Computer Time Service (ACTS)</li> <li>● <u>I</u>EN Telephone Date Code (CTD)</li> <li>● NRC Canadian Time <u>Service (CTS)</u></li> <li>● Modem</li> <li>Dial prefix: 0,</li> <li>Modem Configuration</li> <li>Phone Number</li> <li>Select Phone Number Comment</li> <li>Add Edit Remove Test</li> </ul>	Outbound Connect Enable the local conso	le as a call- <u>h</u> ome server
Dial prefix: 0, Modem Configuration  Phone Number Select Phone Number Comment	Protocol	nputer Time Service (ACTS) Code (CTD)
Select Phone Number Comment		Modem Configuration
	Select Phone Number	

Figure 1-58 Outbound Connectivity Setting - External Time Source

- 3. From the External Time Source tab, check **Allow external time source dialing using the local modem** to enable protocol configuration. Three protocols are available:
  - National Institute of Standards and Technology (NIST), representing the Automated Computer Time Service (ACTS), which is typically used in the USA
  - Istituto Elettrotecnico Nazionale (IEN), representing the Telephone Date Code (CTD), which is typically used in Europe
  - National Research Council (NRC), representing the Canadian Time Service (CTS), which is typically used in Canada

For each country, the time service must be contacted to verify the protocol that they support and the phone number to be used.

4. After clicking **Modem Configuration**, you can specify tone or pulse dialing. Wait for a dial tone, Enable speaker, and Dial prefix (Figure 1-59).

Modem Settings	
─ Dial Type ─	
Other Settings ✓ Wait for dial tone	
⊡ <u>E</u> nable speaker Dial prefix: <sub>9,</sub>	
OK Cancel Help	

Figure 1-59 Modem Settings window

 Once the Customize Modem Setting task has been completed, the telephone number can be added by clicking Add in the External Time Source tab. Figure 1-60 shows the Add External Time Source Phone Number window.

Add Exte	rnal Time So	ource Phone Number	i
Dial prefix: Phone number:	9, * 1-303-494	-4774	
Comment:	NIST		
Add Cancel	Help		

Figure 1-60 Add External Time Source Phone Number window

6. When the dial out phone number has been added, the **Test** button in the Customize Outbound Connectivity window becomes selectable and must be used to ensure that the correct configuration and connectivity to the time service provider has been accomplished (Figure 1-61).

Dial prefix: 9 Phone number: 1-303-494-4774 Comment: NIST - Test Status Test beginning Waiting for connection availability Request has been added to the queue. Opening connection Dialing 91-303-494-4774 for ACTS protocol. Closing connection Request has been removed from the queue. Test completed successfully	
Comment: NIST Test Status Test Status Waiting for connection availability Request has been added to the queue. Opening connection Dialing 91 -303-494-4774 for ACTS protocol. Closing connection Request has been removed from the queue.	· · · · · · · · · · · · · · · · · · ·
Test Status Test Status Waiting for connection availability Request has been added to the queue. Opening connection Dialing 91-303-494-4774 for ACTS protocol. Closing connection Request has been removed from the queue.	
Test beginning Waiting for connection availability Request has been added to the queue. Opening connection Dialing 91-303-494-4774 for ACTS protocol. Closing connection Request has been removed from the queue.	INIS I
Waiting for connection availability Request has been added to the queue. Opening connection Dialing 91 -303-494-4774 for ACTS protocol. Closing connection Request has been removed from the queue.	
	en added to the queue. tion 494-4774 for ACTS protocol. ion en removed from the queue.

Figure 1-61 Test External Time Source Phone Number

This completes the first step of the ETS dial-out configuration.

The HMC is now capable of handling ETS requests. For redundancy in case of HMC failure, we suggest configuring a second HMC for ETS dial-out capability. This can be achieved by doing the same steps for the second HMC that has all the CTS candidates defined.

## 1.4.2 Configuring to use dial out as External Time Source

To make the STP facility steer the CST to the time obtained from the dial-out function on the HMC, the Current Time Server needs to be configured to choose dial out as the External Time Source for STP. Do this configuration on any server that will be assigned as the Current Time Server for redundancy, especially for BTS.

Note: The default selection is to use dial out as ETS.

The steps are:

 To select the servers to be set up, click Configuration → System (Sysplex) Time from HMC Workplace, and select the ETS Configuration tab (Figure 1-62).

iming letwork	Network Configuration	ETR Configuration	ETR Status	STP Configuration	STP Status	ETS Configuration
ETS devi immediat	C has the role of C ice, an ETS config ie effect on the time Time Source (ETS)	uration is required	. Changes			
⊙Use <u>d</u> OUse <u>N</u>	ial out if configure		nagement	Console		
Annha						

Figure 1-62 ETS Configuration tab - Use dial out

2. Select the **Use dial out if configured on Hardware Management Console** radio button and click **Apply** to accomplish the configuration.

#### 1.4.3 Configuring the ETS dial-out schedule

The second part of the ETS dial-out configuration can be achieved by adding scheduled operations to the Support Element of the servers that are CTS candidates (PTS and BTS) and are using the HMC ETS dial-out function:

 Select the server as the target object, then select Operational Customization → Customize Scheduled Operations → Options → New, which opens the Add a Scheduled Operation task (Figure 1-63).

Select a	an Operation
Select	Operation
0	Single step code changes retrieve and apply
0	Backup critical hard disk information
0	Accept internal code changes
0	Install and activate concurrent code changes
0	Remove and activate concurrent code changes
0	Retrieve internal code changes
0	Activate selected CPC
0	Deactivate (Power off) selected CPC
۲	Access external time source
0	Transmit system availability data

Figure 1-63 Add a Scheduled Operation

2. Set the radio button to **Access external time source** and click **OK**. The "Set up a Scheduled Operation" task opens (Figure 1-64).

Set up a Scheduled Oper	ation - SCZP101
SCZP101 Select the date and time, and s The scheduled operation will st prevents its execution, a resour	be created for the selected objects listed below: elect a time window. tart at the specified date and time unless an existing condition ce constraint, for example. In this case, an attempt will be made within the time window starting at the specified date and time. Time Window 10 minutes 020 minutes 030 minutes 040 minutes 050 minutes 060 minutes
Save Cancel Help	

Figure 1-64 Set up a Scheduled Operation - Date and Time tab

- 3. Enter the date and time of the scheduled operation. The default time window of 10 minutes is sufficient in case this scheduled operation is prevented by any resource constraint. For the ETS query, we suggest that a repeated scheduled operation be set up for periodic time adjustment to continuously maintain time accuracy. By selecting the **Repeat** tab, the repeat option is shown (Figure 1-65).
- 4. Click Set up a repeated scheduled operation. Depending on the time accuracy requirement, select one or more days for the ETS to be contacted. Selecting an interval of one week has the ETS contacted once a week on the selected days. Check the option Repeat indefinitely to make sure that this scheduled operation never expires.

Set up a Scheduled Operation Date and Time Repeat The scheduled operations will be SCZP101 C Single or Repeated	created for the selected objects listed below:
<ul> <li>○ Set up a single scheduled op</li> <li>⊙ Set up a repeated scheduled</li> <li>- Days of the Week</li> <li>✓ Monday</li> <li>✓ Friday</li> <li>✓ Tuesday</li> <li>✓ Saturday</li> <li>✓ Wednesday</li> <li>✓ Sunday</li> <li>✓ Thursday</li> </ul>	2000년 국가 A2002년 - 영어의 12020년 국가 A2002년 - 영어의 12020년 국가 A2002년 - 4월
Save Cancel Help	

Figure 1-65 Set up a Scheduled Operation - Repeat tab

As previously mentioned, this scheduled operation setup needs to be done for those SEs that are using the HMC ETS dial-out function.

**Note:** No user message displays on the HMC when a dial out to the external time source occurs. But when STP generates a time adjustment, an entry message is generated in the Support Element Console Events log. To visualize the console log from the HMC application, first select the CTS, then:

- 1. Select **Recovery**  $\rightarrow$  **Single Object Mode** to log on to the Support Element.
- 2. From the SE workplace, select **Service Management**  $\rightarrow$  **View Console Events**.

## 1.5 Migrating an External Time Source

An existing External Time Source (ETS) may need to be reconfigured or migrated for certain reasons. Reconfigurations within the ETS do not affect the CTN operations. The only effect that may need to be considered can be a temporary loss of the External Time Source that has no impact to STP, but might cause the CTN to slowly drift away from ETS. Since a migration to a different ETS usually does not last over a long period of time, the drift can be considered to be insignificant.

**Note:** Starting with HMC level 2.12.0 the HMC dial-out External Time Source option is no longer available. A migration to a dial-out ETS, therefore, is beyond the scope of this section.

The following migration example may refer to an ETS interruption, which is independent from STP operations. It does *not* have any impact to the CTN, except a slow drift away from ETS depending on the period of time the access to ETS is unavailable.

In this section we describe the following migration scenarios:

- Migration from no ETS configuration to either NTP, or NTP with PPS
- Migration from a dial-out ETS configuration to either NTP, or NTP with PPS

Depending on ETS and Server availability, the ETS migration can be performed without drifting away from the external time reference. It is assumed that network connectivity as well as PPS port connectivity (if applicable) have already been established.

#### 1.5.1 Migration from no ETS configuration to either NTP, or NTP with PPS

Since the starting point of this migration is a CTN that is not attached to an External Time Source (ETS) so far, this migration to NTP or NTP with PPS can be considered a new ETS configuration. The CTN was previously not steered to any ETS and the accuracy of the CTN time was based on the initial time setup accuracy and possible subsequent manual time adjustments.

The key migration steps are:

- If an HMC is used as NTP server, follow the steps to configure the HMC as NTP server as described in 1.2.2, "Configuring an NTP server on the HMC" on page 7 and 1.2.3, "Configuring HMC as an NTP server" on page 14.
- Configure the NTP server using the Sysplex Timer panel of the PTS ETS tab as described in 1.2.5, "Configuring an NTP server on the PTS/CTS or BTS" on page 18 or 1.3, "Configuring an NTP server with pulse per second option" on page 27.

- 3. Define the NTP server using the same steps at the BTS if not already done. The purpose of this step is to have NTP server redundancy across both servers that can become the Current Timer Server.
- Verify the final ETS status on the Sysplex Timer ETS tab. The status column for NTP and NTP with PPS are the same. In addition, the NTP with PPS configuration does list the PPS Port Status (Figure 1-66):
  - The NTP server previously added shows status success.
  - The NTP server with PPS additionally shows PPS Port Status Tracking to PPS signal or Capable of tracking to PPS signal (only for NTP with PPS).

Because this CTN was not steered to an ETS previously, the time difference of the CTN to the newly added ETS might be more than 60 seconds, which prevents the automatic steering to start. The status would show "**CPC/NTP time difference** > **60 seconds**". This problem can be corrected concurrently based on operational constraints. This is discussed in more detail in the *Server Time Protocol Recovery Guide*, SG24-7380, Section 6.3, "Synchronizing the CTN to an ETS when the time difference is greater than the 60 second threshold".

Sys	stem (Syspl	ex) Ti	ime for P57					i				
Timing Network	Network Configurat		STP Configuration	STP Status	ETS Configu	ration						
_ Note —												
to attact the ETS	This CPC has the role of Current Time Server for an STP-only CTN. If you plan to attach to an ETS device, an ETS configuration is required. Changes made to the ETS configuration have an immediate effect on the time source for the CTN.											
Externa	I Time Source	(ETS)	)									
© Non ⊚ Use ⊚ Use	<u>N</u> TP	ilse pe	er second (PP	S)								
NTP Tin	ne Server Info	rmatio	n ———									
Select	Configured	PPS Port	NTP Time Se	rver	Stratum	Source	Status					
۲	<b>V</b>	0	9.56.192.89		1	GPS	Success					
O	<b>V</b>	1	9.56.192.87		1	GPS	Success					
PPS Po	rt Status —											
	Fracking to F Capable of tr		ignal g to PPS signa	al								
Apply	Query N	ITP Th	resholds									
Refresh	Cancel	Help										

Figure 1-66 ETS configuration CTS - NTP server setup

## 1.5.2 Migration from a dial-out configuration to either NTP, or NTP with PPS

The starting configuration is an ETS dial-out setup that is to be replaced by either NTP, or an NTP server with PPS capability. In this section we discuss different migration scenarios.

#### Switching to a non-HMC NTP server

There will be no ETS interruption. Switching from an HMC dial-out ETS to a different NTP source can be done at any time and does not cause any interruption to the External Time Source. Perform the following reconfiguration steps:

1. Define the new NTP server to the Support Element of the Current Time Server. It is suggested to also configure the NTP server to the Support Element of all other servers

that can become the CTS. This is typically the BTS, but can be any other server as well. For details refer to 1.2.5, "Configuring an NTP server on the PTS/CTS or BTS" on page 18 (a final setup example is shown in Figure 1-67) or 1.3, "Configuring an NTP server with pulse per second option" on page 27 (a final setup example for NTP with PPS is shown in Figure 1-68).

System (Sysplex) Time for SCZP401										
Timing Network	Network Configurat		STP ET Status Co	s nfiguration						
Note This CPC has the role of Current Time Server for an STP-only CTN. If you plan to attach to an ETS device, an ETS configuration is required. Changes made to the ETS configuration have an immediate effect on the time source for the CTN.										
⊙None ⊙Use [ ⊙Use I	<u>U</u> TP VTP with <u>p</u> ul	se per second (PPS)								
	e Server Info Configured	NTP Time Server	Stratum	Source	Status					
00100L		9.56.192.87	1	GPS	Success					
0		9.12.6.46	2	64.113.32.5	Success					
Apply	Query N	ITP Thresholds								
Refresh	Cancel	Help								

Figure 1-67 NTP server example

Timing Network         Network         STP Configuration         STP Status         ETS Configuration											
- Note											
This CPC has the role of Current Time Server for an STP-only CTN. If you plan to attach to an ETS device, an ETS configuration is required. Changes made to the ETS configuration have an immediate effect on the time source for the CTN.											
Externa	I Time Source	e (ETS)	)								
	NTP with pu		er second (PPS	)							
Protect         PPS         PPS         PPS         Stratum         Source         Status											
Select	j	FUIL									
Select	<b>v</b>	0	9.56.192.89		1	GPS	Success				
			9.56.192.89 9.56.192.87		1 1	GPS GPS	Success Success				
•		0		The second s	•		Cuttere				
© PPS Po Port 0:1	IT Status	0 1 PPS si	9.56.192.87		•		Cuttere				

Figure 1-68 NTP with a PPS server example

2. Delete the scheduled operation from all Support Elements that are currently configured to use the ETS dial-out capability. Select the servers to be changed, select **Operational** 

**Customization**, then select **Customize Scheduled Operations**. In the list of scheduled operations select all operations of type "Access external time source" (this might be multiple) and click **Options** and **Delete** (Figure 1-69).

-	Customize Scheduled Operations - SCZP201											
<u>O</u> ptions▼ <u>V</u> iew▼ <u>S</u> ort▼ <u>H</u> elp▼												
	New											
A	Dele	te	er	ations ar	e currently o	displayed.						
0,	Refr			Date	Time	Operation	Remaining					
		ect All elect All	1	9/25/12	4:52 PM	Transmit system availability data	Repetitions Indefinite	^				
$\mathbf{F}$	Exit		1	9/25/12	11:26 PM	Access external time source	Indefinite					
L		JCZF 20	1	9/26/12	4:52 PM	Transmit system availability data	Indefinite					
	$\checkmark$	SCZP20	1	9/26/12	11:26 PM	Access external time source	Indefinite					
		SCZP20	1	9/27/12	4:29 AM	Transmit system availability data	Indefinite					
		SCZP20	1	9/27/12	4:52 PM	Transmit system availability data	Indefinite					
	$\checkmark$	SCZP20	1	9/27/12	11:26 PM	Access external time source	Indefinite					
		SCZP20	1	9/28/12	4:29 AM	Transmit system availability data	Indefinite					
		SCZP20	1	9/28/12	4:30 AM	Backup critical hard disk information	Indefinite					
		SCZP20	1	9/28/12	4:52 PM	Transmit system availability data	Indefinite	V				

Figure 1-69 Delete dial out scheduled operation

3. On the "Confirm the action" panel click **OK** (Figure 1-70).

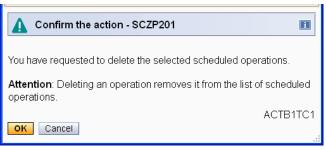


Figure 1-70 Delete scheduled operation confirmation

4. The final Customize Scheduled Operations panel confirms: there are no more access external time source scheduled operations to be executed (Figure 1-71).

🖪 c	Customize Scheduled Operations - SCZP201										
<u>O</u> ptior	<u>O</u> ptions▼ <u>V</u> iew▼ <u>S</u> ort▼ <u>H</u> elp▼										
All scheduled operations are currently displayed.											
Select	Target	Date	Time	Operation	Remaining Repetitions						
	SCZP201	9/25/12	4:52 PM	Transmit system availability data	Indefinite	^					
	SCZP201	9/26/12	4:52 PM	Transmit system availability data	Indefinite						
	SCZP201	9/27/12	4:29 AM	Transmit system availability data	Indefinite						
	SCZP201	9/27/12	4:52 PM	Transmit system availability data	Indefinite						
	SCZP201	9/28/12	4:29 AM	Transmit system availability data	Indefinite						
	SCZP201	9/28/12	4:30 AM	Backup critical hard disk information	Indefinite						
	SCZP201	9/28/12	4:52 PM	Transmit system availability data	Indefinite						
	SCZP201	9/29/12	4:52 PM	Transmit system availability data	Indefinite						
	SCZP201	9/30/12	7:00 AM	Backup critical hard disk information	Indefinite						
				Transmit system availability data	Indefinite	~					

Figure 1-71 Customize Scheduled Operations - access external time source removed

Repeat this step for every Support Element that was setup to access the external time source. This is most likely the PTS and the BTS, but could theoretically be any server.

#### Switching to another HMC acting as NTP server

The starting configuration is an ETS dial-out setup that is to be replaced by an HMC that will be set up to act as NTP server. Since an HMC cannot have an antenna attached, the HMC can only be an NTP Stratum 2 ETS, and does not provide the PPS capability.

Since the HMC that is already, or will be, set up to act as NTP server is a different one than the HMC that is providing the dial-out capability, this migration is without any interruption to the ETS.

Perform the following steps:

1. If not already done, set up the target HMC to act as server. Follow the steps given in 1.2.2, "Configuring an NTP server on the HMC" on page 7. If there is another HMC that is planned to additionally provide the NTP server function, perform the same steps for that HMC. An example is shown in Figure 1-72.

Customize Conso Customize Date and Time Configure NTP Settings	le Date a	nd Time			
NTP servers :					
	<b>)</b>   S	elect Action	*		
Select Server	Stratum	Source	Status	Authentication	
9.56.192.87	1	GPS	Success	key 6	
0.us.pool.ntp.org	2	204.123.2.5	Success	none	
1.us.pool.ntp.org	2	128.252.19.1	Success	none	
Tot	al: 3 Filt	ered: 3 Selec	ted: 0		
The Network Time Protoco Network Time Protocol se Penable NTP service Enable as time server If NTP servers cannot b Manage Symmetric Keys.	erver. De reache	d, contact the I	BM Servic	ce Support Syst	em

Figure 1-72 HMC NTP server example

2. Define the new NTP server to the Support Element of the Current Time Server. It is suggsted to also configure the NTP server to the Support Element of all other servers that can become the CTS. This is typically the BTS, but can be any other server as well.

For details refer to 1.2.5, "Configuring an NTP server on the PTS/CTS or BTS" on page 18. The target NTP server configuration can also be a combination of NTP servers such as one HMC acting as NTP server and one Stratum 1 (GPS attached) NTP server as shown in Figure 1-73 on page 45.

Timing Network	Network Configurat		TP ETS tatus Cor	figuration						
Note This CPC has the role of Current Time Server for an STP-only CTN. If you plan to attach to an ETS device, an ETS configuration is required. Changes made to the ETS configuration have an immediate effect on the time source for the CTN.										
	- Il Time Source	e (ETS)								
<ul> <li>O None</li> <li>O Use NTP</li> <li>O Use NTP with <u>p</u>ulse per second (PPS)</li> </ul>										
		lse per second (PPS)								
OUse										
OUse	NTP with <u>p</u> u me Server Info		Stratum	Source	Status					
OUse	NTP with <u>p</u> u me Server Info	ormation	Stratum	Source GPS	Status Success					
OUse NTP Til Select	NTP with pu me Server Info Configured	ntermation			Success					
OUse NTP Til Select	NTP with pu me Server Info Configured	NTP Time Server	1	GPS	Success					

Figure 1-73 NTP server example

 Delete the scheduled operation from all Support Elements that are currently configured to use the ETS dial-out capability. Select the servers to be changed, select **Operational Customization**, select **Customize Scheduled Operations**. In the list of scheduled operations select all operations of type **Access external time source** (this might be multiple) and click **Options** and **Delete** (Figure 1-74).

Customize Scheduled Operations - SCZP201										
<u>O</u> ptio	ns <del>▼</del> _ <u>V</u> ie	ew	<ul> <li>Sort</li> </ul>	.▼ <u>H</u> elp ▼						
New	<i>l</i>									
A Delete prations are currently displayed.										
Refr			Date	Time	Operation	Remaining				
	ect All elect All	1	9/25/12	4:52 PM	Transmit system availability data	Repetitions Indefinite				
Exit		1	9/25/12	11:26 PM	Access external time source	Indefinite				
	JCZF 20	1	9/26/12	4:52 PM	Transmit system availability data	Indefinite				
$\checkmark$	SCZP20	1	9/26/12	11:26 PM	Access external time source	Indefinite				
	SCZP20	1	9/27/12	4:29 AM	Transmit system availability data	Indefinite	-			
	SCZP20	1	9/27/12	4:52 PM	Transmit system availability data	Indefinite				
$\checkmark$	SCZP20	1	9/27/12	11:26 PM	Access external time source	Indefinite				
	SCZP201		9/28/12	4:29 AM	Transmit system availability data	Indefinite				
	SCZP20	1	9/28/12	4:30 AM	Backup critical hard disk information	Indefinite				
	SCZP20	1	9/28/12	4:52 PM	Transmit system availability data	Indefinite				

Figure 1-74 Delete dial-out scheduled operation

4. On the "Confirm the action" panel click **OK** (Figure 1-75 on page 46).

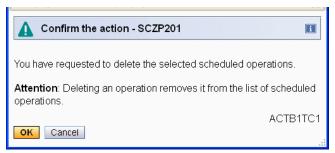


Figure 1-75 Delete scheduled operation confirmation

5. The final Customize Scheduled Operations panel confirms: there are no more access external time source scheduled operations to be executed (Figure 1-76).

Customize Scheduled Operations - SCZP201											
<u>O</u> ption	<u>O</u> ptions▼ <u>V</u> iew▼ <u>S</u> ort▼ <u>H</u> elp▼										
All scheduled operations are currently displayed.											
Select	Target	Date	Time	Operation	Remaining Repetitions						
	SCZP201	9/25/12	4:52 PM	Transmit system availability data	Indefinite	^					
	SCZP201	9/26/12	4:52 PM	Transmit system availability data	Indefinite						
	SCZP201	9/27/12	4:29 AM	Transmit system availability data	Indefinite						
	SCZP201	9/27/12	4:52 PM	Transmit system availability data	Indefinite						
	SCZP201	9/28/12	4:29 AM	Transmit system availability data	Indefinite						
	SCZP201	9/28/12	4:30 AM	Backup critical hard disk information	Indefinite						
	SCZP201	9/28/12	4:52 PM	Transmit system availability data	Indefinite						
				Transmit system availability data	Indefinite						
	SCZP201	9/30/12	7:00 AM	Backup critical hard disk information	Indefinite						
	SCZP201	9/30/12	4:52 PM	Transmit system availability data	Indefinite	~					

Figure 1-76 Customize Scheduled Operations - access external time source removed

Repeat this step for every Support Element that was set up to access the external time source. This is most likely the PTS and the BTS, but could theoretically be any server.

#### Switching the HMC to NTP (HMC Version 2.11.1 and earlier)

The starting configuration is an ETS dial-out setup that will be switched to NTP by changing the HMC from currently providing the dial-out capability to act as an NTP server. The key steps are switching the HMC to act as NTP server (using the same HMC) followed by reconfiguring the Support Elements to NTP. Because this HMC is currently providing the dial-out option, it can only be HMC Version 2.11.1 or earlier versions.

Because an HMC cannot have an antenna attached to it, the HMC can only become an NTP Stratum 2 ETS and does not provide the PPS capability.

Because the reconfiguration is done on the HMC that is currently providing the dial-out capability, the migration is going to interrupt the ETS synchronization for a short period of time. This will *not* impact the CTN operation. To switch the HMC to NTP, perform the following steps:

 Delete the scheduled operation from all Support Elements that are currently configured to use the ETS dial-out capability. Select the servers to be changed, select **Operational Customization**, then select **Customize Scheduled Operations**. In the list of scheduled operations select all operations of type **Access external time source** (this might be multiple) and click **Options** and **Delete** (Figure 1-77 on page 47).

_		ustonniz	c	Scheuu	eu operat	ions - SCZP201		i
1	<u>O</u> ptior	ns≖ ⊻ie	ew	🝷 <u>S</u> ort	. <b>-</b> <u>H</u> elp -			
	New	t						
d Delete			ər	ations ar	e currently o	displayed.		
-	Refre Sele	esh ect All		Date	Time	Operation	Remaining Repetitions	
	Deselect All		1	9/25/12	4:52 PM	Transmit system availability data	Indefinite	1
F	Exit		1	9/25/12	11:26 PM	Access external time source	Indefinite	
L		JCZF ZU	1	9/26/12	4:52 PM	Transmit system availability data	Indefinite	
		SCZP20	1	9/26/12	11:26 PM	Access external time source	Indefinite	
		SCZP20	1	9/27/12	4:29 AM	Transmit system availability data	Indefinite	
		SCZP20	1	9/27/12	4:52 PM	Transmit system availability data	Indefinite	
		SCZP20	1	9/27/12	11:26 PM	Access external time source	Indefinite	
		SCZP20	1	9/28/12	4:29 AM	Transmit system availability data	Indefinite	
		SCZP20	1	9/28/12	4:30 AM	Backup critical hard disk information	Indefinite	
		SCZP20	1	9/28/12	4:52 PM	Transmit system availability data	Indefinite	

Figure 1-77 Delete dial-out scheduled operation

2. On the "Confirm the action" panel click **OK** (Figure 1-78).

Confirm the action - SCZP201	
You have requested to delete the selected scheduled operations.	
Attention: Deleting an operation removes it from the list of scheduled operations.	t
OK Cancel	)1 :

Figure 1-78 Delete scheduled operation confirmation

3. The final Customize Scheduled Operations panel confirms: there are no more access external time source scheduled operations to be executed (Figure 1-79).

🖪 c	Customize Scheduled Operations - SCZP201						
<u>O</u> ption	ns▼ <u>V</u> iew	• <u>S</u> ort	: <b>▼</b> <u>H</u> elp	•			
All sche	duled oper	ations ar	e currently	displayed.			
Select	Target	Date	Time	Operation	Remaining Repetitions		
	SCZP201	9/25/12	4:52 PM	Transmit system availability data	Indefinite	^	
	SCZP201	9/26/12	4:52 PM	Transmit system availability data	Indefinite		
	SCZP201	9/27/12	4:29 AM	Transmit system availability data	Indefinite		
	SCZP201	9/27/12	4:52 PM	Transmit system availability data	Indefinite		
	SCZP201	9/28/12	4:29 AM	Transmit system availability data	Indefinite		
	SCZP201	9/28/12	4:30 AM	Backup critical hard disk information	Indefinite		
	SCZP201	9/28/12	4:52 PM	Transmit system availability data	Indefinite		
	SCZP201	9/29/12	4:52 PM	Transmit system availability data	Indefinite		
	SCZP201	9/30/12	7:00 AM	Backup critical hard disk information	Indefinite		
	SCZP201	9/30/12	4:52 PM	Transmit system availability data	Indefinite	~	

Figure 1-79 Customize Scheduled Operations - access external time source removed

Repeat this step for every Support Element that was set up to access the external time source. This is most likely the PTS and the BTS, but could theoretically be any server.

 Reconfigure the HMC to act as server. To configure an NTP server on the HMC, click Customize Console Date and Time at the appropriate HMC. This task is available in the HMC Management section. Selecting the Configure NTP Settings tab displays a window (Figure 1-80).

Customize Console		1
Customize Date and Time	Configure NTP Settings	
the NTP service is enable an existing server and clic Currently defined time ser		on file :
Add NTP Server	Remove NTP Server	Query NTP Servers
The Network Time Protoc	ol service is currently disab	led on this console.
🗆 Enable NTP service o	n this console	
🗆 Enable this Hardware	Management Console to a	ct as a time server
OK Cancel Help		

Figure 1-80 Customize Console Date and Time

- 5. Click **Add NTP Server** to bring up a new window (Figure 1-81). The server host name or the IP address of a known NTP server must be entered in this window.
- 6. Enter the IP address of the NTP server the HMC should be synchronized with (10.10.1.53) as shown in Figure 1-81 and click **OK**.

🕜 Add a Net	work Time Server	i
Enter the time se	rver host name or IP address :	
10.10.1.53		
Select the NTP p	protocol version :	
Not specified	<b>•</b>	
OK Cancel He		
Done	🔒 🔮 Internet	

Figure 1-81 NTP server example

7. The information window ACT03231 confirms that the NTP server has been added; click **OK**.

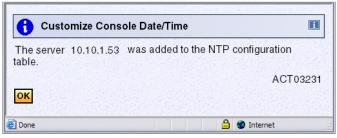


Figure 1-82 Message ACT03231 - Add NTP server information

8. A final HMC NTP server setup is shown in Figure 1-83 on page 49.

istom	ize Date and Time	Configure NT	P Setting	s ////////////////////////////////////		
ervice nd cli		k "Add NTP Se ? Server" to rer	erver" to nove a ti	add a new t me server.		Console if the NTP t an existing server
		NTP Version			Status	
	10.10.1.53	Not specified	1	GPS	Success	
	us.pool.ntp.org	Not specified	2	209.81.9.7	Success	
Ad	d NTP Server	Remove	NTP Ser	ver	Query NTP Servers	
🗆 En	etwork Time Prot able NTP service able this Hardwa	on this conso	le 📕		on this console.	_1 2

Figure 1-83 HMC NTP server configuration example - HMC version 2.11.1 and before

If there is another HMC that is planned to additionally provide the NTP server function, perform the same steps for that HMC.

If you want to configure the HMC as NTP server, you need first to enable the NTP client service (number 1 in Figure 1-83). This allows HMC to synchronize its time to one of the defined NTP servers. Furthermore, to enable the NTP server service on the HMC, you need to check the "Enable this Hardware Management Console to act as a time server" tick box (number 2 in Figure 1-83).

9. Define the new NTP server to the Support Element of the Current Time Server. It is suggested to also configure the NTP server to the Support Element of all other servers that can become the CTS. This is typically the BTS, but can be any other server as well. For details refer to 1.2.5, "Configuring an NTP server on the PTS/CTS or BTS" on page 18. The target NTP server configuration can also be a combination of NTP servers such as one HMC acting as NTP server and one Stratum 1 (GPS attached) NTP server as shown in Figure 1-84 on page 50.

💂 Sys	tem (Syspl	ex) Time for SCZP	401			i			
Timing Network	Network Configurati	on STP Configuration	STP Stat	us ETS Cor		PPS Control			
However plan to a ETS is c is config redunda configura	Note This CPC does not have the role of Current Time Server for an STP-only CTN. However, it is configured to become the Current Time Server, if necessary. If you plan to attach to an ETS device, an ETS configuration is recommended. If an ETS is configured, the ETS device is monitored and errors are logged. If an ETS is configured as NTP or NTP with pulse per second (PPS), it provides redundancy of the ETS for the STP-only CTN. Changes made to the ETS configuration for this CPC may affect the time source for the CTN. <i>External Time Source (ETS)</i>								
	-	se per second (PPS	S)						
NTP Tim	e Server Info	rmation ———							
Select 0	Configured	NTP Time Server		Stratum	Source	Status			
۲	● 🗹 10.10.1.53 1 GPS Success								
0	O ☑ us.pool.ntp.org 3 204.235.61.9 Success								
Apply	Query	ITP Thresholds							
Refresh	Cancel	Help				.:			

Figure 1-84 NTP server example

#### Upgrading the HMC to Version 2.12.0 or above

The starting configuration is an ETS dial-out setup that will be switched to NTP within an HMC version upgrade from 2.11.1 (or below) to HMC version 2.12.0 (or above). The HMC version upgrade itself is not within the scope of this section.

Because an HMC cannot have an antenna attached to it, the HMC can only become an NTP Stratum 2 ETS and does not provide the PPS capability.

Because the reconfiguration is done on the HMC that is currently providing the dial-out capability, the migration is going to interrupt the ETS synchronization. This will *not* impact the CTN operation. To remove the ETS dial-out operation on HMC, perform the following steps:

 Delete the scheduled operation from all Support Elements that are currently configured to use the ETS dial-out capability. Select the servers to be changed, select **Operational Customization**, then select **Customize Scheduled Operations**. In the list of scheduled operations select all operations of type "Access external time source" (this might be multiple) and click **Options** and **Delete** (Figure 1-85 on page 51).

5	Customi	ze	Schedul	ed Operat	ions - SCZP201		i
<u>O</u> pti	ons• ⊻	iew	▼ Sort	.▼ <u>H</u> elp ▼			
New							
Del	lete	er	ations ar	e currently o	displayed.		
Refresh Select All			Date	Time	Operation	Remaining Repetitions	
De	select All	1	9/25/12	4:52 PM	Transmit system availability data	Indefinite	
Exit		1	9/25/12	11:26 PM	Access external time source	Indefinite	
		-1	9/26/12	4:52 PM	Transmit system availability data	Indefinite	
$\checkmark$	SCZP2	01	9/26/12	11:26 PM	Access external time source	Indefinite	
	SCZP2	01	9/27/12	4:29 AM	Transmit system availability data	Indefinite	_
	SCZP2	01	9/27/12	4:52 PM	Transmit system availability data	Indefinite	
$\checkmark$	SCZP2	01	9/27/12	11:26 PM	Access external time source	Indefinite	
	SCZP2	01	9/28/12	4:29 AM	Transmit system availability data	Indefinite	
	SCZP2	01	9/28/12	4:30 AM	Backup critical hard disk information	Indefinite	
	SCZP2	01	9/28/12	4:52 PM	Transmit system availability data	Indefinite	

Figure 1-85 Delete dial-out scheduled operation

2. On the "Confirm the action" panel click OK (Figure 1-86).

Confirm the action - SCZP201	
You have requested to delete the selected scheduled operations.	
Attention: Deleting an operation removes it from the list of schedule operations.	d
ACTB1TC	21

Figure 1-86 Delete scheduled operation confirmation

3. The final Customize Scheduled Operations panel confirms: there are no more access external time source scheduled operations to be executed (Figure 1-87).

<u>O</u> ptio	ns▼ ⊻iew	·▼ <u>S</u> ort	.▼ <u>H</u> elp	•		
\II sche	duled oper	ations an	e currentlu	displayed.		
	Target	Date	Time	Operation	Remaining Repetitions	
	SCZP201	9/25/12	4:52 PM	Transmit system availability data	Indefinite	2
	SCZP201	9/26/12	4:52 PM	Transmit system availability data	Indefinite	
	SCZP201	9/27/12	4:29 AM	Transmit system availability data	Indefinite	
	SCZP201	9/27/12	4:52 PM	Transmit system availability data	Indefinite	
	SCZP201	9/28/12	4:29 AM	Transmit system availability data	Indefinite	
	SCZP201	9/28/12	4:30 AM	Backup critical hard disk information	Indefinite	
	SCZP201	9/28/12	4:52 PM	Transmit system availability data	Indefinite	
	SCZP201	9/29/12	4:52 PM	Transmit system availability data	Indefinite	
	SCZP201	9/30/12	7:00 AM	Backup critical hard disk information	Indefinite	
	SC7P201	9/30/12	4.22 PM	Transmit system availability data	Indefinite	

Figure 1-87 Customize Scheduled Operations - access external time source removed

Repeat this step for every Support Element that was set up to access the external time source. This is most likely the PTS and the BTS, but could theoretically be any server.

- 4. Have the IBM SSR perform the version update of the HMC. This upgrade removes the ETS dial-out capability of this HMC.
- 5. Set up the HMC to act as server. Follow the steps given in 1.2.2, "Configuring an NTP server on the HMC" on page 7. If there is another HMC that is planned to additionally provide the NTP server function, perform the same steps for that HMC. An example is shown in Figure 1-88.

🔇 C	ustor	mize Conso	ole Date a	Ind Time			i
Custom Date ar Time		Configure NTP Settings					
NTP se	rvers						
	D		<b>*</b>   S	elect Action	•		
Select	Serv	/er	Stratum	Source	Status	Authentication	
	9.56	.192.87	1	GPS	Success	key 6	
	0.us	.pool.ntp.org	2	204.123.2.5	Success	none	
	1.us	.pool.ntp.org	2	128.252.19.1	Success	none	
		То	tal: 3 Filt	ered: 3 Selec	ted: 0		
Networl CEnat CEnat If NTF Manag	Total: 3 Filtered: 3 Selected: 0         The Network Time Protocol service is currently enabled and this console is currently a         Network Time Protocol server.         Imable NTP service         Imable as time server         If NTP servers cannot be reached, contact the IBM Service Support System         Manage Symmetric Keys         Configure Autokey         Issue NTP Commands						

Figure 1-88 HMC NTP server example

6. Define the new NTP server to the Support Element of the Current Time Server. It is suggested to also configure the NTP server to the Support Element of all other servers that can become the CTS. This is typically the BTS, but can be any other server as well.

For details refer to 1.2.5, "Configuring an NTP server on the PTS/CTS or BTS" on page 18. The target NTP server configuration can also be a combination of NTP servers such as one HMC acting as NTP server and one Stratum 1 (GPS attached) NTP server, as shown in Figure 1-89 on page 53.

👼 Sys	stem (Syspl	ex) Time for SCZP	401		6			
Timing Network	Network Configurat	STP Configuration	STP Status	ETS Configuration				
Note This CPC has the role of Current Time Server for an STP-only CTN. If you plan to attach to an ETS device, an ETS configuration is required. Changes made to the ETS configuration have an immediate effect on the time source for the CTN.								
⊙None ⊙Use ⊙Use	<u>N</u> TP	se per second (PPS	5)					
Select	Configured	NTP Time Server	Stra	atum Source	Status			
۲		9.56.192.87	1	GPS	Success			
0		9.12.6.46	2	64.113.32.5	Success			
Apply Query NTP Thresholds								
Refresh	Cancel	Help						

Figure 1-89 NTP server example

# 2

# Migrating from ETR to STP-only CTN

In this chapter we describe how to migrate an existing External Timer Reference (ETR) network configuration to an STP-only CTN configuration and present the migration results. The starting point is an existing ETR network configuration consisting of one or more servers and Sysplex Timers. The intermediate status is a Mixed CTN, first in ETR timing mode, then in STP timing mode, preparing the migration to an STP-only CTN.

#### Important:

- ► An IBM System zEC12 server cannot be in the same CTN as z9 or previous servers.
- ► The IBM System z196 and z114 servers cannot be in the same CTN as z990 or z980.
- zEC12 will be the last server to support connections to a Mixed CTN

# 2.1 Overview

We assume that the Sysplex Timers are installed (optionally attached to an External Time Source) and that the time zone, leap seconds, date, and time have been set. The steps to configure an ETR network are not covered in this book. For details about how to do this, see *S/390 Time Management and IBM 9037 Sysplex Timer*, SG24-2070. We also assume that all servers or CFs that are going to join the CTN have a valid ETR Network ID configured and ETR connectivity already exists.

#### Important:

- ► An IBM System zEC12 server cannot be in the same CTN as z9 or previous servers.
- ► The IBM System z196 and z114 servers cannot be in the same CTN as z990 or z980.
- zEC12 will be the last server to support connections to a Mixed CTN.

A typical sequence for a migration from an ETR environment to an STP-only CTN consists of the following steps:

1. Configuring the CTN ID on each server already installed and part of the ETR network.

Assigning the CTN ID makes the server STP configured in a Mixed CTN. This step must be repeated on each server that will participate in the CTN.

2. Optional: Changing the server timing mode for one server from ETR to STP.

In a Mixed CTN, it is best for at least two Stratum 1 servers to be available during normal operations.

3. Adding a new server in STP timing mode.

This is an optional step when a new server is added to the configuration without connection to the Sysplex Timer, and the server must be time synchronized with servers already configured in the Mixed CTN.

4. Migrating the Mixed CTN to an STP-only CTN.

This section only covers a typical implementation sequence. Part 3, "Migration scenarios" on page 263 provides step-by-step installation and migration examples.

# 2.2 Configuring the CTN ID

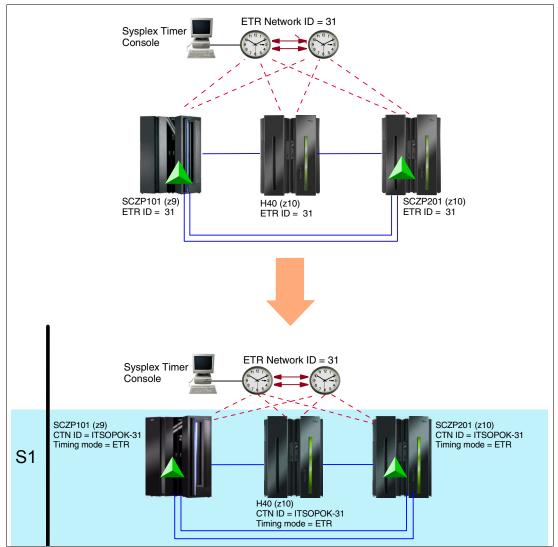


Figure 2-1 shows the migration scenario for this chapter.

Figure 2-1 Migration step 1 - Configuring the CTN ID on each server

The CTN ID is an identifier that is used to indicate that the server has been configured to be part of a CTN.

The CTN ID has the format [STP Network ID] - [ETR Network ID] and is the basis for the establishment of the Coordinated Timing Network. The format of these fields is:

CTN ID = "ccccccc - xx"

Where *ccccccc* is the STP Network ID and xx is the ETR Network ID:

- ► The STP network ID is case sensitive and is one to eight characters. The valid characters are A Z, a z, 0 9, -, and \_.
- ► The ETR Network ID is a numeric value ranging between 0 and 31.

For a Mixed CTN, we assume that the ETR Network ID is already set (Figure 2-3 and Figure 2-4 on page 59). If the ETR ID is blank, the server is not part of an existing ETR network.

To configure a Mixed CTN, the starting point is at least one STP-enabled server, synchronized to a Sysplex Timer. In this example, a server named SCZP201 is used. The server is STP-enabled and has ETR ports enabled. The System (Sysplex) Timer task displays all STP and ETR tabs.

The Timing Network tab (Figure 2-2) indicates that the server is in an ETR network, with ETR Network ID = 31.

ming etwork	Network Configuration	ETR Configuration	ETR Status	STP Configuration	STP Status	ETS Configuration
Time: 1:2: Date: 10/ <i>Offsets —</i> Leap seco	10/09	00				
	twork type: ed timing network (CTN	ETR I) ID: -31				

Figure 2-2 Timing Network tab - ETR network

**Important:** When two or more servers are selected in the System (Sysplex) Time task, it is necessary to click **Refresh** to update the displayed configuration information for *all* servers.

The ETR Configuration window (Figure 2-3) and the ETR Status window show that connections to the Sysplex Timer are operational.

👼 System (Sysplex) Time								
Timing Network	Network Configuration	ETR Configuration	ETR Status	STP Configuration	STP Status	ETS Configuration	SCZP SCZP	
ETR network II	O 31 (in decimal) Port 1 State ⊙ Enabled ○ Disabled ○ Off						<u>H40</u>	
Attention: A po 'Enabled'.	rt can be operational c	only when a valid E k Error Threshold	ETR network	ID is entered and	the port's ma	inual state is		

Figure 2-3 ETR Configuration tab

Figure 2-4 shows the ETR Status.

ming etwork	Network Configuration	ETR Configuration	ETR Status	STP Configuration	STP Status	ETS Configuration
ETR Statu						
	t control register: C8C7 node: ETR st	enning				
	ing port number: 0	opping				
Port 0 state						
Port 1 state	e: Operati	onal				
The second s	Word 1 - Port 0					
ETR netwo ETR ID (in	ork ID (in decimal): 31 decimal): 0					
	umber (in decimal): 0					
	Word 1 - Port 1	and the second				
ETR ID (in		Alexandre State				
ETR port n	umber (in decimal): 0					
ETR Card	Status					
	is: Light detected					
	is: Light detected	0235820 546000000				

Figure 2-4 ETR Status tab: ETR network

#### 2.2.1 Setting the STP network ID

Applying the STP network ID on an STP-enabled server configures the server STP and activates the Mixed CTN. The STP network ID is entered in the STP Configuration tab (Figure 2-5). This is a *local* change and is only effective for this server (SCZP201).

System (	Sysplex) Time						i
iming letwork	Network Configuration	ETR Configuration	ETR Status	STP Configuration	STP Status	ETS Configuration	SCZP20
Coordinated	timing network ID 🔳	SOPOK	- 31				H40
Apply :	Save STP Debug Data						1 1000

Figure 2-5 STP Configuration tab

When you click **Apply**, the HMC issues a confirmation message (Figure 2-6). Although the message indicates that the server is joining a Mixed CTN, adding the STP Network ID on the first server activates the Mixed CTN.

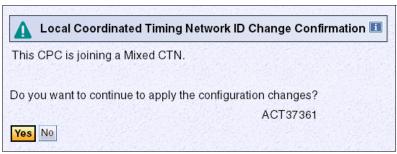


Figure 2-6 Message ACT37361 - Local Coordinated Timing Network ID Change Confirmation

Clicking Yes on the confirmation message displays the ACT37315 message (Figure 2-7).

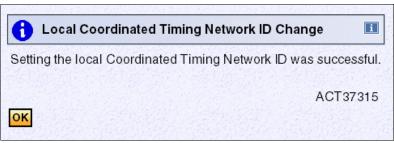


Figure 2-7 Message ACT37315 - Local Coordinated Timing Network ID Change

The server is now STP configured and participates in a Mixed CTN.

#### Verification on the HMC

To verify the successful configuration of the Mixed CTN, select the **Timing Network** tab.

As shown in Figure 2-8, the Network section indicates that the timing network type is a Mixed CTN. The CTN ID comprises both the STP network ID [ITSOPOK] and the ETR Network ID [31]. The CTN time source indicates a *Sysplex Timer connection*.

ming twork	Network Configuration	ETR Configuration	ETR Status	STP Configuration	STP Status	ETS Configuration	sc sc
Fime: 1:29 Date: 10/1 Offsets — Leap seco	10/09	)					<u>H4(</u>
	twork type: ed timing network (CTN) source:	Mixed CTN ID: ITSOPOK - 31 Sysplex Timer c	connection	7			

Figure 2-8 System (Sysplex) Time - Timing Network tab

The STP Status tab for SCZP201 (Figure 2-9) now shows that the server is in ETR timing mode and is a Stratum 1. Notice that in the System Information section there are no STP links initialized yet because, at this point, there is only one server that is STP configured. Coupling links only initialize for STP when servers at *both* ends of the link are STP configured with the same CTN ID.

iming etwork	Network Configuration	ETR Configuration	ETR Status	STP Configuratio	n STP Status	ETS Configuration	sc.
Timing state:	Syn	chronized	N. S. S.				H40
Usable clock							
Fiming mode:	ETR	(External Time Refere	ence)				
Stratum level:	1						
Maximum timi	ing stratum level: 3						
Maximum ST	P version: 4		-				
- Svstem Infor	mation						
Local STP		Attached System Syste	m Stratum	Active STP	Maximum STP		
	r(s) Type-MFG-Plant-				Version		
1 1 1 1 2 1 1 1 1 2 1 1 1 1 1 1 1 1 1 1	alized STP Links ———		11111				
Local STP	STP Link	Reason Code		n Code			
Link Identifie	~ ~ ~	Sent Self coursed corr	Receiv	rea		~	
	Coupling-peer	Self-coupled sen					1.10
0015	Coupling-peer	Self-coupled sen	ver				
001E 001F	Coupling-peer	Offline					
	Coupling-peer		VAR				
0034	Coupling-peer	Self-coupled sen					
0035	Coupling-peer	Self-coupled ser	ver				
003E 003F	Coupling-peer Coupling-peer	Offline					
		Offline					

Figure 2-9 STP Status tab - SCZP201

#### Verification in z/OS

On a z/OS image on SCZP201, the DISPLAY ETR command yields the z/OS message IEA282I, which now indicates the CTN ID in the last line shown in Example 2-1. The output also shows the synchronization mode, along with the ETR port details.

Example 2-1 DISPLAY ETR command and response in ETR mode

D ETR	
IEA282I 13.31.58 TIMING STATUS	504
SYNCHRONIZATION MODE = ETR	
CPC PORT 0 <== ACTIVE	CPC PORT 1
OPERATIONAL	OPERATIONAL
ENABLED	ENABLED
ETR NET ID=31	ETR NET ID=31
ETR PORT=00	ETR PORT=00
ETR ID=00	ETR ID=01
THIS SERVER IS PART OF TIMING	NETWORK ITSOPOK -31

Once the CTN has been activated and connectivity has been established where necessary, other servers can join this CTN by configuring them with the same CTN ID.

#### 2.2.2 Configuring other servers

Other STP-enabled servers or CFs can be STP configured to join the Mixed CTN. Making each server STP configured is accomplished in exactly the same way as configuring the server in the previous step.

Servers or CFs with active links to a Sysplex Timer are still running in ETR timing mode. To avoid a single point of failure in the CTN, have at least two Stratum 1 servers available during normal operations.

The server or CF must be STP configured with the same CTN ID. This is done from the STP configuration window (Figure 2-10). In this example, a z990 server named SCZP101 that is already part of ETR network [31] is being configured to join the CTN [ITSOPOK] - [31] that was activated in the previous step.

liming Network	Network Configuration	ETR Configuration	ETR Status	STP Configuration	STP Status	ETS Configuration	SCZI
Coordinated	d timing network ID 🔳	SOPOK	- 31				H40
Apply	Save STP Debug Data	<b>-</b> 120 - 210 M					12.4

Figure 2-10 STP Configuration tab - SCZP101

When you click **Apply**, confirmation message ACT37361 is issued (Figure 2-6 on page 59). Clicking **Yes** in the confirmation message displays ACT37315 (Figure 2-7 on page 60).

The server is now STP configured with CTN ID = [ITSOPOK] - [31].

#### Verification on the HMC

The server STP configuration can be verified from the Timing Network tab (Figure 2-11).

ng vork	Network Configuration	ETR Configuration	ETR STP Status Configura	ation STP Status	ETS Configuration
	ed Server Time ——— 5:44 PM				
te: 10/					
ffsets –					
ap seco tal time	ond: 24 (hours : minutes): -4 : 0	00			
etwork -					
	twork type: ed timing network (CTN				
	source:	Sysplex Timer con	nection		

Figure 2-11 Timing Network tab - SCZP101

The Timing network type now indicates that the server is a member in a Mixed CTN, with the Coordinated Timing Network ID = [ITSOPOK] - [31].

The STP Status window (Figure 2-12) indicates that the server timing mode is still ETR.

iming letwork	Network Configuration	ETR Configuration	ETR Stati		TP onfiguration	STP Status	ETS Configuration	SC2
Timing state:	Syn	chronized						H40
Usable clock s	ource: Yes							
Timing mode:	ETF	R (External Time R	eference	)				1 636
Stratum level:	1							1 2.3
	ig stratum level: 3						al the second second	
Maximum STP	version: 4							
- Svstem Inforn	nation —			the second		and the second	in the second	
Local STP	Remote Directly A	Attached System 8	System	Stratum	Active STP	Maximum STP		1 1/23
Link Identifier	(s) Type-MFG-Plant-		Vame	Level	Version	Version		1 235
0118,03D8	002097-IBM-02-0	0000001DE50	SCZP201	1	4	4		
	ized STP Links							1 2 1
Local STP	STP Link	Reason Co		leason Co	ada			
Link Identifier		Sent		eceived	Jue			
0019	Coupling-peer	Offline					~	1 659
001B	Coupling-peer	Offline						1 2.23
001E	Coupling-peer	Configuratio	n error					1 22
0029	Coupling-peer	Offline						1 600
002B	Coupling-peer	Offline						
002E	Coupling-peer	Configuratio	on error					1 222
0110	Coupling-peer	Offline						1 200
0111	Coupling-peer	Offline						1. 639

Figure 2-12 STP Status tab - SCZP901

If the server or CF added has coupling link connectivity to the first server configured in the Mixed CTN (SCZP201 in our example), the STP Status tab also reflects the fact that coupling links are initialized for STP because both ends of the link are configured. Similar information is now reflected on the STP Status tab at the other end of the links on server SCZP201.

#### Verification in z/OS

In the z/OS image on SCZP901, the response to the DISPLAY ETR command yields z/OS message IEA282I, which indicates the CTN ID (Example 2-2). The message also indicates the synchronization mode along with the ETR details.

Example 2-2 DISPLAY ETR command and response in ETR mode

```
D ETR
IEA282I 13.38.18 TIMING STATUS 570
SYNCHRONIZATION MODE = ETR
  CPC PORT 0 <== ACTIVE
                               CPC PORT 1
  OPERATIONAL
                               OPERATIONAL
  ENABLED
                               ENABLED
  ETR NET ID=31
                               ETR NET ID=31
  ETR PORT=01
                               ETR PORT=01
                               ETR ID=00
 ETR ID=01
  THIS SERVER IS PART OF TIMING NETWORK ITSOPOK -31
```

Other STP-enabled servers or CFs synchronized in the same ETR network (using the same ETR Network ID) can be configured into the Mixed CTN using the same method.

# 2.3 Changing the server timing mode

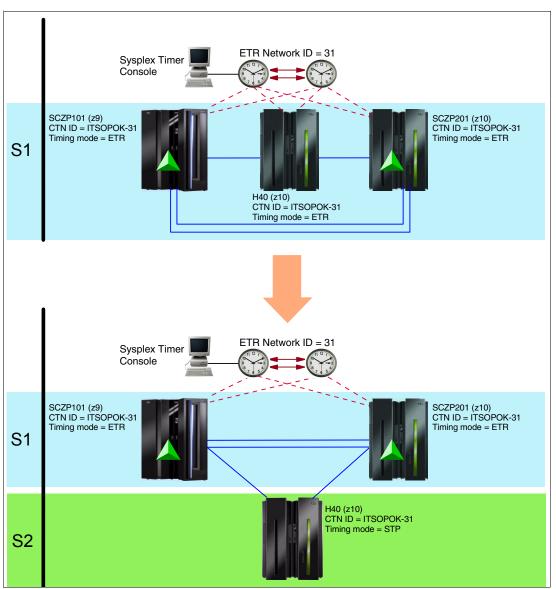


Figure 2-13 illustrates the migration scenario for this section.

Figure 2-13 Migration step 2 - Changing the server timing mode for one server from ETR to STP

A Mixed CTN always uses a Sysplex Timer as its time source. However, certain servers in a Mixed CTN can be configured to be synchronized directly to the Sysplex Timer (in ETR timing mode), and certain servers can be synchronized using STP messages (STP timing mode).

Changing the timing mode from ETR to STP can be considered as a first step of a phased migration to an STP-only CTN. Alternatively, the Mixed CTN can be migrated to an STP-only CTN in a one-step operation.

**Note:** As long as the configuration stays a Mixed CTN, the Sysplex Timer is the CTN time source and at least one server *must* remain in ETR timing mode.

To eliminate a single point of failure, leave at least two servers in ETR timing mode. For the same reason, it is a good idea for servers in STP timing mode to be connected by coupling links to at least two servers.

#### Changing a server from ETR to STP timing mode

The procedure described in this section shows how to migrate a server from ETR to STP timing mode.

The server or CF to be configured to STP timing mode needs to have coupling link connectivity to other STP configured servers in the CTN so that STP messages can be exchanged. Remember that this procedure cannot be used for the last server within the CTN (or rather, with the last two servers, because in a Mixed CTN it is good practice to preserve two Stratum 1 servers, which remain in ETR timing mode).

**Important:** You must *not* disable the ETR ports on the last Stratum 1 server because this removes the time source for the entire Mixed CTN.

Disabling the ETR ports on a server causes the server to switch to STP timing mode if there is STP connectivity to another Stratum 1 or Stratum 2 server in the same CTN.

In our example, a third server named H40 in ETR timing mode has been added to the CTN by following the procedure described in 2.2.2, "Configuring other servers" on page 62. The ETR ports of server H40 will be disabled to show the change of the timing mode.

Before disabling the ports, the attached system's connectivity must be verified from the STP Status tab. The ETR ports of the server H40 are enabled and operational, and the server is therefore currently in ETR timing mode.

The ETR ports are to be disabled from the ETR Configuration tab. Figure 2-14 shows the ETR ports being disabled for server H40.

iming etwork	Network Configuration	ETR Configuration	ETR Status	STP Configuration	STP Status	ETS Configuration	sc sc
TR network II	O 31 (in decimal	1)					H4
	Port 1 State						
○ <u>E</u> nabled ⊙Disabled	○Enabled ⊙Disabled						
O <u>O</u> ff	OO <u>f</u> f						
	rt can be operation	al only when a valid I	ETR network	ID is entered and	the port's ma	inual state is	
Enabled'.							1/20

Figure 2-14 System (Sysplex) Time - ETR Configuration tab

When you click **Apply**, the Port State Change Confirmation message ACT37388 displays (Figure 2-15).

Port State Change Confirmation	i
You requested to change the manual state of an 'ena	bled' port.
The action you requested may result in active images CPC and any attached CPC(s) in a Mixed CTN, being removed from the sysplex.	
Do you want to continue to save the configuration cha	inges?
A	CT37388
Yes No	

Figure 2-15 Message ACT37388 - Port State Change Confirmation

Click Yes and the message ACT37301 displays (Figure 2-16).

Apply ETR Configuration
The ETR configuration data was saved successfully.
To view the current status of the EAF ports, use the ETR Status page.
ACT37301
οκ

Figure 2-16 Message ACT37301 - Apply ETR Configuration

The change from ETR to STP timing mode can be reversed. Returning the server to ETR timing mode is accomplished by enabling the ETR ports from the ETR Configuration tab. This causes the server to change back to ETR timing mode.

#### Verification on the HMC

The timing mode after the ports are disabled can be checked using the STP Status tab. Figure 2-17 shows the results for the H40 server:

- The timing mode changed from ETR to STP.
- The Stratum level changed from Stratum 1 to Stratum 2.

iming etwork	Network Configuration	ETR Configuration	on ETR Stat	us (	STP Configuration	STP Status	ETS Configuration	
iming state:		Synchronized						
Jsable clock s	ource:	Yes						
Timing mode:		STP (Server Time	Protocol)					
Stratum level:		2						
Maximum timir	ig stratum level:	3						
Maximum STP	version:	4						
– Svstem Inforn	nation			11211		a a a a a a a a a a a a a a a a a a a	100000000000000000000000000000000000000	
Local STP	and a fact for an of the	ectly Attached Syste	m System	Stratum	Active STP	Maximum STP		
Link Identifier		Plant-Sequence	Name	Level	Version	Version		
0110	002094-IBM	-02-00000002991E	SCZP10	1 1	4	4		
0111	002097-IBM	-02-00000001DE50	SCZP20	1 1	4	4		
Local Uninitial	ized STP Links –							
Local STP	STP Link	Reason Code	Reason Co	do				
Link Identifier		Sent	Received	uc				
0118	Coupling-peer	Offline					~	
0119	Coupling-peer							
0200	Coupling-peer	Offline						
0201	Coupling-peer	Configuration error						
0208	Coupling-peer	Offline						
0209	Coupling-peer	Offline						
0500	Coupling-peer	Configuration error						
0501	Coupling-peer	Offline					~	

Figure 2-17 STP Status tab - STP timing mode (Stratum 2)

#### From z/OS

When its server is switched from ETR to STP timing mode, the response to the DISPLAY ETR command on a z/OS image on H40 shows key differences (Example 2-3):

- ► The message number changes from IEA282I (ETR) to IEA386I (STP).
- Synchronization mode now indicates STP.
- The Stratum level is shown.
- The number of usable timing links<sup>1</sup> displays.
- No ETR information displays.

```
Example 2-3 DISPLAY ETR command and response in STP mode
```

```
D ETR
IEA386I 13.54.37 TIMING STATUS
SYNCHRONIZATION MODE = STP
THIS SERVER IS A STRATUM 2
CTN ID = ITSOPOK -31
NUMBER OF USABLE TIMING LINKS = 2
```

```
--> IEA382I THIS SERVER HAS ONLY ONE LINK AVAILABLE FOR TIMING PURPOSES
```

<sup>&</sup>lt;sup>1</sup> The number of usable timing links for STP timing mode synchronization is given only on a non-Stratum 1 CEC because the Stratum 1 server does not need this information (Example 2-5 on page 76).

There are additional messages if the server has less than two timing links to each of its potential timing sources. If the server has only one usable timing link, the following message displays:

If the server has timing link connections to only one server with a higher stratum, the following message displays:

<sup>--&</sup>gt; IEA383I THIS SERVER RECEIVES TIMING SIGNALS FROM ONLY ONE NETWORK NODE

# 2.4 Adding a new server in STP timing mode

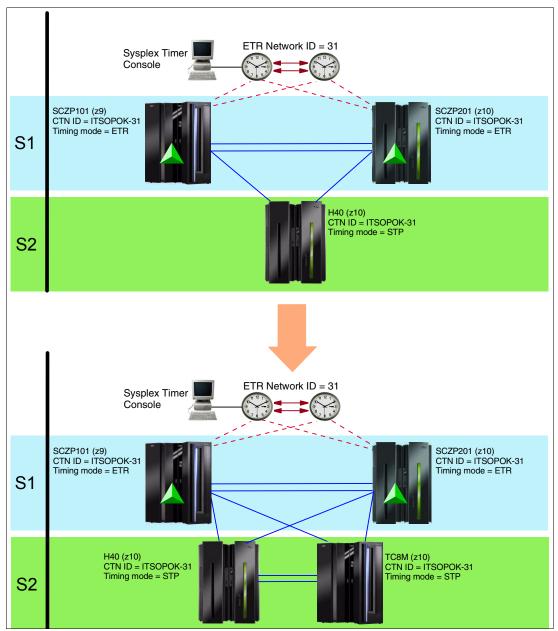


Figure 2-18 illustrates the migration scenario for this section.

Figure 2-18 Migration step 3 - Adding a new server in STP timing mode

Once the Mixed CTN has been configured, new servers can be added to the configuration. If STP is enabled, the new server can be configured to join the CTN. This is always done by setting the CTN ID on the new server. Even when the new server is not connected to the Sysplex Timer, it can be configured to join the Mixed CTN using STP timing mode. The server or CF to be added needs to have coupling link connectivity to other STP-configured servers in the CTN so that STP messages can flow between servers.

The addition of a new server is accomplished by defining its CTN ID to match the CTN ID already in use by the Mixed CTN.

Setting the CTN ID is done using one of the following methods, depending on whether the server to be added has ETR ports installed:

- If the server has ETR ports installed, the CTN ID is defined in two steps:
  - a. Enter the ETR Network ID on the ETR Configuration tab.
  - b. Enter the STP ID on the STP Configuration tab.
- If the server does not have ETR ports installed, the System (Sysplex) Time task does not display the ETR tabs. In this case, the CTN ID is defined by entering both the STP ID and the ETR Network ID on the STP Configuration tab.

The configuration presented is a Mixed CTN consisting of servers SCZP101, SCZP201, and H40. Server TC8M is added to this CTN using STP timing mode.

#### From the ETR Configuration tab

If the new server has ETR ports installed, definition of the ETR Network ID is done from the ETR Configuration tab.

From the ETR Configuration tab, set both the Port 0 and Port 1 states to Disabled and enter the ETR Network ID to match that of the existing Mixed CTN. When you click **Apply**, the CTN ID for the server becomes [] - [31], in line with the value already defined in our example Mixed CTN (Figure 2-19).

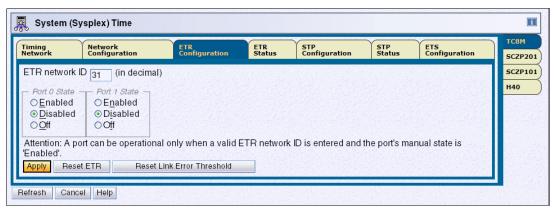


Figure 2-19 ETR Configuration tab - Define ETR Network ID

#### From the STP Configuration tab

If the ETR Network ID has already been defined from the ETR Configuration tab, enter only the STP ID. The ETR Network ID field is read only. It displays the value entered in the previous step (Figure 2-20).

If the ETR Network ID has not been defined from the ETR Configuration tab because the server does not have an ETR feature:

- 1. Enter the STP ID value in the STP ID part of the CTN ID ([ITSOPOK] in our example).
- 2. Enter the ETR Network ID value in the ETR Network ID part of the CTN ID ([31] in our example).

iming	Network	ETR	ETR	STP	STP	ETS	тсвм
etwork	Configuration	Configuration	Status	Configuration	Status	Configuration	SCZP
Coordinated	d timing network ID 📊	SOPOK	- 31				SCZP:
Apply	Save STP Debug Data						H40

Figure 2-20 STP Configuration tab - Define STP ID

When you click **Apply**, the CTN ID for the server becomes [ITSOPOK] - [31], which is in line with the value defined for the Mixed CTN. If the server has coupling link connectivity to other Stratum 1 or Stratum 2 servers in the Mixed CTN, STP automatically joins the server to the Mixed CTN.

Chapter 12, "Mixed CTN: Adding a server in STP timing mode" on page 321, provides a detailed example.

# 2.5 Migrating from Mixed CTN to an STP-only CTN

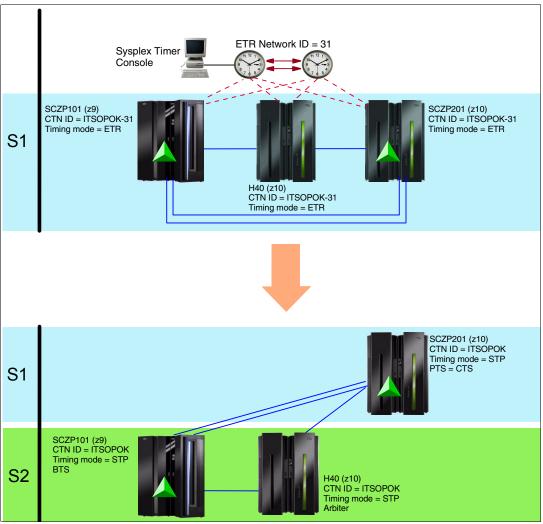


Figure 2-21 illustrates he migration scenario for this section.

Figure 2-21 Migration step 4 - Migrating the Mixed CTN to an STP-only CTN

The final migration step is a global step that changes the entire CTN from a Mixed CTN to an STP-only CTN. All servers are in ETR timing mode and are migrated to STP timing mode in one single step.

Once migration is complete, only the STP network ID remains in the CTN ID.

#### 2.5.1 Assigning CTN roles

The roles are assigned from the Network Configuration tab. This task must be accomplished from the server that will become the Current Time Server (CTS) in the STP-only CTN.

Assigning server roles is a global change to the CTN. It causes the CTN to transition from a Mixed CTN to an STP-only CTN.

For each of the roles—Preferred Time Server (PTS), Backup Time Server (BTS), and Arbiter—there are drop-down boxes listing the servers that can be selected. The roles being assigned require server connectivity through coupling links:

- ► The BTS must have connectivity to the PTS and to the Arbiter if one is being configured.
- An Arbiter cannot be configured without a BTS. The Arbiter must have connectivity to the PTS and to the BTS.

Any attempt to assign a role to a server that does not have the required connectivity to the other configured roles fails unless the Force configuration option is used.

Select the PTS, the BTS, and the Arbiter if one is available. Select either the Preferred Time Server or Backup Time Server to be the Current Time Server and click **Apply**.

Figure 2-22 shows a target configuration where SCZP201 is assigned the PTS and CTS roles, SCZP101 is assigned the BTS role, and H40 is the Arbiter. All servers are participating in a Mixed CTN with CTN ID [ITSOPOK] - [31], as indicated by the Coordinated timing network ID field at the bottom of the window.

ing work	Network Configuration	ETR Configuration	ETR Status	STP Configuration	STP Status	ETS Configuration	sc.
	twork Configuration —— I at (UTC):						H4(
	(0.0.0)	2201 (STP ID: IT:	SOPOK) -				
ackup tim	ne server (CPC) SCZ	2P101 (STP ID: ITS	SOPOK) 🔽				
rbiter	H40	(STP ID: ITSOPO	K) 🔽				
Only all	low the server(s) speci	fied above to be in	the CTN				
	configuration			-			
	ime Server (CPC) ed time server (CPC)						
○ <u>B</u> ackup	o time server (CPC)	-					
oordinate	ed timing network ID	SOPOK	- 31				
pply	Initialize Time De	econfigure	Cancel Migration	to Mixed CTN			

Figure 2-22 Network Configuration tab - Mixed CTN to STP-only CTN

When the configuration request is issued, the Global Timing Network ID Change Confirmation message ACT37355 displays (Figure 2-23).

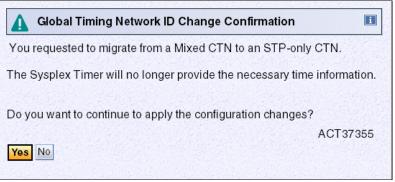


Figure 2-23 Message ACT37355 - Global Timing Network ID Change Confirmation

Click **Yes**. The process takes several seconds and then message ACT37341 displays (Figure 2-24).

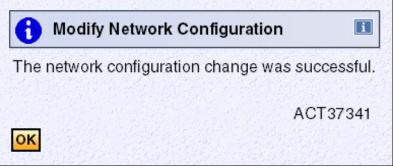


Figure 2-24 Message ACT37341 - Modify Network Configuration successful

The migration from a Mixed CTN to an STP-only CTN is also reflected by the z/OS system images on the servers (Example 2-4). The example shows the z/OS messages for three system images on servers being migrated.

Because every system image goes through a CTN ID change, there is a short period of time where XCF notes a synchronization discrepancy. This is indicated by XCF message IXC439E. This can be considered normal during a migration from a Mixed CTN to an STP-only CTN. The final message IXC435I informs you of the successful CTN ID change.

Example 2-4 Syslog message flow during STP-only activation

```
-> SC74 (running on SCZP201)
IEA390I TOD CLOCKS DYNAMICALLY ADJUSTED TO MAINTAIN STP SYNCHRONISM.
*IEA393I ETR PORT 0 IS NOT OPERATIONAL. THIS MAY BE A CTN CONFIGURATION CHANGE.
*IEA393I ETR PORT 1 IS NOT OPERATIONAL. THIS MAY BE A CTN CONFIGURATION CHANGE.
IEA380I THIS SYSTEM IS NOW OPERATING IN STP TIMING MODE.
IXC438I COORDINATED TIMING INFORMATION HAS BEEN UPDATED 854
        FOR SYSTEM: SC74
        PREVIOUS CTNID:
                          ITSOPOK -31
        CURRENT CTNID:
                          ITSOPOK
*IXC439E ALL SYSTEMS IN SYSPLEX PLEX75 ARE NOT SYNCHRONIZED 855
        TO THE SAME TIME REFERENCE.
       SYSTEM: SC74 IS USING CTNID: ITSOPOK
       SYSTEM: SC75 IS USING CTNID: ITSOPOK -31
       SYSTEM: SC73 IS USING CTNID: ITSOPOK -31
-> SC75 (running on SCZP101)
IEA390I TOD CLOCKS DYNAMICALLY ADJUSTED TO MAINTAIN STP SYNCHRONISM.
*IEA393I ETR PORT 0 IS NOT OPERATIONAL. THIS MAY BE A CTN CONFIGURATION CHANGE.
*IEA393I ETR PORT 1 IS NOT OPERATIONAL. THIS MAY BE A CTN CONFIGURATION CHANGE.
IEA380I THIS SYSTEM IS NOW OPERATING IN STP TIMING MODE.
IEA031I STP ALERT RECEIVED. STP ALERT CODE = 25
IEA031I STP ALERT RECEIVED. STP ALERT CODE = OB
IXC438I COORDINATED TIMING INFORMATION HAS BEEN UPDATED 640
        FOR SYSTEM: SC75
        PREVIOUS CTNID: ITSOPOK -31
        CURRENT CTNID: ITSOPOK
*IXC439E ALL SYSTEMS IN SYSPLEX PLEX75 ARE NOT SYNCHRONIZED 641
        TO THE SAME TIME REFERENCE.
       SYSTEM: SC74 IS USING CTNID: ITSOPOK
```

SYSTEM: SC75 IS USING CTNID: ITSOPOK SYSTEM: SC73 IS USING CTNID: ITSOPOK -31

-> SC73 (running on H40)

IEA390I TOD CLOCKS DYNAMICALLY ADJUSTED TO MAINTAIN STP SYNCHRONISM. IEA380I THIS SYSTEM IS NOW OPERATING IN STP TIMING MODE. IEA031I STP ALERT RECEIVED. STP ALERT CODE = 25 IEA031I STP ALERT RECEIVED. STP ALERT CODE = 0B IXC438I COORDINATED TIMING INFORMATION HAS BEEN UPDATED 517 FOR SYSTEM: SC75 PREVIOUS CTNID: ITSOPOK -31 CURRENT CTNID: ITSOPOK IXC435I ALL SYSTEMS IN SYSPLEX PLEX75 ARE NOW SYNCHRONIZED 518 TO THE SAME TIME REFERENCE. SYSTEM: SC74 IS USING CTNID: ITSOPOK SYSTEM: SC73 IS USING CTNID: ITSOPOK

The CTN is now STP-only. All ETR ports on the servers are disabled. However, leave the ETR links in place for a certain period of time to allow for a back-out plan. Depending on individual change management constraints, the ETR links can be disconnected once a migration back to a Mixed CTN is no longer being considered.

Because the time within the STP-only CTN can slowly drift, configure an external time source, as outlined in Chapter 1, "Configuring an External Time Source" on page 3.

#### 2.5.2 Time-zone offset adjustment

A migration from a Mixed CTN to an STP-only CTN inherits the time and the total offset from the Sysplex Timer. However, the CTN does not yet have a time zone algorithm defined.

Following a Mixed to STP-only migration (Figure 2-25), the Timing Network tab displays the total time (hours : minutes) for the offset. This only occurs when the time zone information (incorporating a daylight saving time offset, if any) has been inherited from a Sysplex Timer. It indicates that a time zone offset entry has not been defined and must be set.

ning twork	Network Configuration	ETR Configuration	ETR Status	STP Configuration	STP Status	ETS Configuration
Coordinate	ed Server Time					
ime: 2:11						
te: 10/1	10/09					
Offsets —						
eap seco						
otal time	(hours : minutes): -4 :	00				
Network -	<u> Angle Alger</u> ation					
	twork type:	STP-only CTN	1			
	ed timing network (CTI					
CTN time :	source:	Time inherited	from a previous	connection to a	a Sysplex Time	er
		djust Time	Adjust Leap Secor		djust Time Zone	

Figure 2-25 Timing Network tab

**Note:** If a time zone algorithm is not defined after a migration to STP-only CTN, it is not possible to schedule the next daylight saving time adjustment.

Selection of a time zone algorithm must be initiated from the CTS. The Adjust Time Zone button is only enabled on the CTS.

On the Timing Network tab, click **Adjust Time Zone** to display the Adjust Time Zone Offset window (Figure 2-26).

Adjust Time Zone Offset		
Fotal time offset (hours : minutes):	-4:00	
Fime zone	<not initialized=""></not>	Define
Clock Adjustment for Deutlight Source	(UTC-08.00) Pacine Time (Wexico) (PST/PDT)	
Clock Adjustment for Daylight Saving Daylight saving time offset (hours	(UTC-08:00) Pacific Time (US & Canada) (PST/PDT)	The State of the S
	(UTC-07:00) Mountain Time (Mexico) (MST/MDT)	
Automatically adjust Set standard time	(UTC-07:00) Mountain Time (US & Canada) (MST/MDT)	=
	(UTC-07:00) Mountain Standard Time (US Arizona) (MST)	
<ul> <li>Set daylight saving time</li> </ul>	(UTC-06:00) Central Time (Mexico) (CST/CDT)	
Schedule	(UTC-06:00) Central Time (US & Canada) (CST/CDT)	and the second second
Change immediately	(UTC-06:00) Central Standard Time (Saskatchewan, Central America) (CST)	a the the second
Schedule change on:	(UTC-05:00) Eastern Time (US & Canada) (EST/EDT)	
•	(UTC-05:00) Eastern Standard Time (Jamaica, Coral Harbour) (EST)	
Date 10/10/09	(UTC-05:00) Peru Time (Peru) (PET)	
Time 2:24:06 PM	(UTC-05:00) Acre Time (Brazil Rio Branco) (ACT)	
	(UTC-04:30) Venezuela Time (Venezuela) (VET)	1. 1. 1. 1. 1. 1.
K Canaal Halp	(UTC-04:00) Atlantic Time (Canada) (AST/ADT)	the second second
Cancel Help	(UTC-04:00) Amazon Time (Brazil Campo Grande) (AMT/AMST)	<b>v</b>

Figure 2-26 Timing Network tab - Adjust Time Zone Offset

From this window, select one of the supported time zones that is provided by default or use one of the five user-defined time zones to customize an entry to specifically meet your requirements.

Three choices must be made on the Adjust Time Zone Offset window:

- Select one of the values from the Time zone drop-down menu. Following a migration, the time zone is <*Not initialized*>. For the subsequent example shown, a time zone of (UTC-05:00) Eastern Time (US & Canada) (EST/EDT) has been selected from the drop-down menu.
- Click a radio button in the Clock Adjustment for Daylight Saving Time section to choose a Daylight Saving Time offset.

Automatically adjust is selected by default when the time zone selected supports automatic adjustment of daylight saving time. Otherwise, the button is disabled. If this option is selected, STP automatically selects the correct time zone offset based on the current date and time.

If the selected time zone does not support automatic adjustment or if the user does not wish to use automatic adjustment of daylight saving time, select **Set standard time** or **Set daylight saving time** depending on what is in effect at the time that the change is made.

In the Schedule section, click one of the radio buttons to choose when the time zone adjustment should be initiated. Following a Mixed to STP-only migration, select Change Immediately. The change takes place when you click OK.

Details of the Adjust Time Zone Offset window are discussed in 6.6.5, "STP offset adjustments" on page 228.

Click **OK** to save the settings and return to the Timing Network tab.

Note the changes in Figure 2-27 as compared to Figure 2-25 on page 74:

- The Total time offset field is no longer displayed after a time zone offset has been set and activated.
- The time zone offset from the UTC value is set to -5:00 and the daylight saving time value is set to 1:00, reflecting the changes made in Figure 2-26 on page 75.

iming etwork	Network Configuration	ETR Configuration	ETR Status	STP Configuration	STP Status	ETS Configuration	SCZP:
	d Server Time						H40
Time: Date:	2:25:50 PM 10/10/09						
		ern Time (US & Cana	ada) (EST/EDT)			2-24 22 22	
Currently:						and a state	
<u>36 1/3 5 1/3</u>							
Offsets — eap secor	ad:	24	Constant Constant of Constant	and the second of the			
	offset from UTC:	-5:00					1. 19.3
	iving time (hours : m		-				
					n an		
Network –	work type:	STP-only C1	TN				
		TN) ID: ITSOPOK -	H IN				
CTN time s			ed from a previous	connection to a S	Sysplex Tim	er	
Statistica Sec.		and helder and the state	ultaria di casi	<u>fan seither an Aussi</u>			
Adjustm	ent Steering	Adjust Time	Adjust Leap Secon	ds Adit	ust Time Zone	a	5 6 State / 8/16

Figure 2-27 Timing Network tab - After Time Zone Offset adjustment

At this stage, the time zone has been defined for a given period, the current example being standard time.

#### Verification on the HMC

After the STP-only CTN has been activated, run the following checks and notice the changes.

To verify the successful activation of the STP-only CTN, select the **Timing Network** tab in the System (Sysplex) Time task on the HMC workplace (Figure 2-27). The Network section indicates:

- ► Timing network type: STP-only CTN.
- Coordinated Timing Network (CTN) ID [ITSOPOK] is present, but the ETR Network ID is no longer part of the CTN ID.

When a CTN is migrated from a Mixed CTN to an STP-only CTN, the time is inherited from the Sysplex Timer. If there is no external time source configured that changes the time source, the information is reflected in the CTN time source that is shown in the last line of the Timing Network tab.

#### Verification in z/OS

The z/OS display commands DISPLAY ETR and DISPLAY XCF,S,ALL retrieve information that identifies the Timing Network as an STP-only CTN (Example 2-5 and Example 2-6 on page 77).

Example 2-5 DISPLAY ETR commands and responses

```
RO *ALL,D ETR 548
SC74 RESPONSES ------
IEA386I 14.30.30 TIMING STATUS 547
```

```
SYNCHRONIZATION MODE = STP
 THIS SERVER IS A STRATUM 1
 CTN ID = ITSOPOK
 THE STRATUM 1 NODE ID = 002097.E26.IBM.02.00000001DE50
 THIS IS THE PREFERRED TIME SERVER
SC75
       RESPONSES ------
IEA386I 14.30.30 TIMING STATUS 713
SYNCHRONIZATION MODE = STP
 THIS SERVER IS A STRATUM 2
 CTN ID = ITSOPOK
 THE STRATUM 1 NODE ID = 002097.E26.IBM.02.00000001DE50
 THIS IS THE BACKUP TIME SERVER
 NUMBER OF USABLE TIMING LINKS = 3
SC73
       RESPONSES -----
IEA386I 14.30.30 TIMING STATUS
SYNCHRONIZATION MODE = STP
 THIS SERVER IS A STRATUM 2
 CTN ID = ITSOPOK
 THE STRATUM 1 NODE ID = 002097.E26.IBM.02.00000001DE50
 THIS IS THE ARBITER SERVER
 NUMBER OF USABLE TIMING LINKS = 2
```

In response to the DISPLAY ETR command, the message ID is no longer IEA282I, but IEA386I. Message IEA386I holds information that reflects the STP timing mode.

Example 2-6 DISPLAY XCF, SYSTEM, ALL command and response

D XCF,S,ALL IXC335I 14.32.54 DISPLAY XCF 550 SYSPLEX PLEX75 SYSTEM TYPE SERIAL LPAR STATUS TIME SYSTEM STATUS SC75 2094 991E 1C 10/10/2009 14:32:50 ACTIVE TM=STP SC74 2097 DE50 2C 10/10/2009 14:32:53 ACTIVE TM=STP SC73 2097 961F 1A 10/10/2009 14:32:54 ACTIVE TM=STP

The timing mode for all systems in the sysplex is now STP.

# **Configuring an STP-only CTN**

In this chapter we describe how to configure and activate an STP-only CTN. This scenario applies to configurations with no previous time synchronization network.

In the scenarios we present in this chapter we cover:

- Setting the CTN ID
- Initializing the time
- Assigning the CTN roles
- Adding a new server
- Saving the STP configuration across PORs (one- or two-server CTN)
- Case study: Configuring a single-server CTN

## 3.1 Overview

The starting configuration for this scenario consists of one or more STP-enabled servers that need to be configured into an STP-only CTN.

The sequence of steps to configure an STP-only CTN is:

- 1. Set the CTN ID. In this case, this consists of only the STP ID portion.
- 2. Initialize the time. This includes setting the time zone, leap seconds, date, and time.
- 3. Assign CTN roles.

If using an ETS, dial out from the HMC, NTP server, or NTP server with pulse per second (PPS) must be configured and tested before setting up the CTN. More information about the dial-out function at the HMC and the required setup for the HMC/SE can be found in 1.4.1, "HMC setup for ETS dial-out configuration" on page 34.

Our test configuration consists of two zEnterprise servers connected to one NTP server and one NTP server configured on the HMC (Figure 3-1).

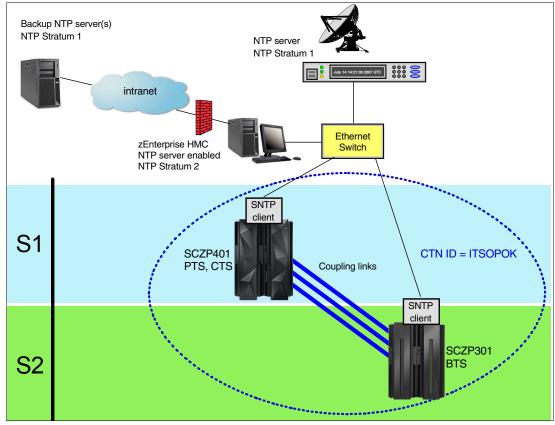


Figure 3-1 Test configuration

## 3.2 Setting the CTN ID

In this section, we discuss setting the CTN ID, which is an identifier used to indicate whether the server has been configured to be part of a CTN and, if so configured, identifies the CTN.

The CTN ID has the format [STP Network ID] - [ETR Network ID] and is the basis for establishing the Coordinated Timing Network.

The format of these fields is CTN ID = [*cccccccc*] - [xx], where [*cccccccc*] is the STP Network ID and [xx] is the ETR Network ID.

- ► The STP Network ID is case sensitive and is one to eight characters. The valid characters are A Z, a z, 0 9, -, and \_.
- ► The ETR Network ID is always null for an STP-only CTN.

#### Setting the STP network ID

The STP network ID is entered using the STP Configuration tab (Figure 3-2). The same CTN ID must be entered on every server that will participate in the STP-only CTN.

System (Sysplex) Time for SCZP401							
Timing Network	Network Configuration	STP Configuration	STP Status	ETS Configuration			
Note: The STP ID portion of the CTN ID is case sensitive. If the CTN ID is to be changed, make sure that the ID exactly matches the CTN to be joined.							
Coordinated timing network ID ITSOPOK							
Apply	Apply Save STP Debug Data						
Refresh	Cancel Hel			Gaunatian tak			

Figure 3-2 System (Sysplex) Time - STP Configuration tab

## 3.3 Initializing the time

The Initialize Time button is only enabled if the CTS and PTS roles have not been assigned yet and only after the CTN ID has been defined for the server that will become the CTS and PTS.

**Important:** Initializing the time must be done on the server that will become the Current Time Server for the STP-only CTN.

The Initialize Time button is accessed from the Network Configuration tab (Figure 3-3).

System (Sysplex) T	System (Sysplex) Time for SCZP401						
Timing Network Configuration	STP Configuration	STP Status	ETS Configuration				
Current Network Configurat	ion —						
Configured at (UTC): Preferred time server (CF	PC) Not configu	ired	•				
Backup time server (CPC) Not configured							
Arbiter	ired	•					
<u>Only allow the server(s) specified above to be in the CTN</u> <u>Force configuration</u> <u>Current Time Server (CPC)</u>							
<ul> <li>● Preferred time server (CPC)</li> <li>● Backup time server (CPC)</li> </ul>							
Coordinated timing netwo	ork ID ITSOPOI	K					
Apply Initialize Time	Deconfigure						
Refresh Cancel Help							

Figure 3-3 Initialize Time button

Clicking **Initialize Time** displays the Initialize Time window (Figure 3-4). There are three radio buttons on the window, each representing a task that needs to be completed before a network configuration can be applied to an STP-only CTN. The three tasks related to initializing the time are:

- Set leap seconds.
- Set time zone.
- Set date and time.

As each task is completed, the corresponding box in the Complete column is selected.

Initialize Time - SCZP401	i
Prior to setting the network configuration, som must be set on the server (CPC) that will be as the Current Time Server.	
Task	Complete
<ul> <li>Set leap seconds</li> <li>Set time zone</li> <li>Set date and time</li> </ul>	
OK Cancel Help	1

Figure 3-4 HMC workplace - Initialize Time

#### 3.3.1 Setting the leap seconds

Since January 1st, 1972, occasional corrections of exactly one second, called a leap second, have been inserted into the Coordinated Universal Time (UTC) scale to always keep UTC time within 0.9 second of UT1.

Leap seconds are either hypercritical or completely irrelevant, depending on the applications and business requirements:

If there are specific accuracy requirements to provide UTC or Greenwich Mean Time (GMT) to the very second, at any instant, then leap seconds need to be considered.

Examples of such specific requirements are legal or contractual requirements for time stamps to be within a certain tolerance of UTC, or time stamp use for time-dependant banking, scientific, or navigational purposes.

To account for leap-second corrections, the total accumulated number of leap seconds since January 1972 *must* be entered when setting the time.

Most sites have little awareness of leap seconds and ongoing leap second adjustments, and therefore this setting probably can be ignored. If there are no specific requirements for leap seconds, then you should specify a leap second value of zero.

Figure 3-5 shows the initial Adjust Leap Seconds Offset window. Although the installation might not be sensitive to leap seconds, a valid leap seconds offset value needs to be entered to complete the initialize time task. If leap seconds are not used, enter a value of zero.

**Note:** At the time of writing, the number of leap seconds was 25. The latest adjustment occurred on June 30th, 2012.

Adjust Leap Second Offset - SCZP401	i
Current Leap Seconds	
Offset 25	
OK Cancel Help	

Figure 3-5 Initialize time - Set leap seconds

#### 3.3.2 Setting the time zone

The window shown in Figure 3-6 is used to set the initial time zone parameters for the CTN. The current time zone needs to be set by selecting an entry from the Time zone drop-down box.



Figure 3-6 Adjust Time Zone Offset - Initial view

By selecting the Time zone drop-down arrow (Figure 3-7 on page 84), all of the provided time zones that are supported are shown. Each of the supported time zone entries has a defined offset from UTC, and might optionally have a time zone algorithm defined, which is used for daylight saving time offset adjustment purposes. The time zone algorithm defines:

- Daylight saving offset
- Optional: Daylight saving automatic adjustment information:
  - Daylight saving date and time start algorithm
  - Daylight saving date and time end algorithm

👼 Adjust	Time Zone Offset - SCZP401	i				
Current Time	Zone					
Time zone	Kot initialized>					
Clock Adjusti	<not initialized=""></not>	*				
Davlight sav	(UTC-12:00) International Date Line West (Baker Island) (IDLW)					
Automatic	ght sav (UTC-12:00) International Date Line West (Baker Island) (IDLW) (UTC-11:00) Samoa Standard Time (Midway Island) (SST) (UTC-10:00) Hawaiian Standard Time (US-Hawaii) (HST) (UTC-10:00) Hawaiian-Aleutian Time (US-Alaska) (HAST/HADT) (UTC-09:00) Alaska Time (US & Canada) (AKST/AKDT)					
© Set stand	(UTC-10:00) Hawaiian Standard Time (US-Hawaii) (HST)					
<ul> <li>Set daylic</li> </ul>	(UTC-10:00) Hawaiian-Aleutian Time (US-Alaska) (HAST/HADT)					
	(UTC-09:00) Alaska Time (US & Canada) (AKST/AKDT)	Ŧ				

Figure 3-7 Time zone drop-down menu

**Automatically adjust** is selected by default when the time zone selected supports automatic adjustment of daylight saving time. Otherwise, this button is disabled.

Even if automatic adjustment is supported, you still have the option of selecting Set standard time or Set daylight saving time. If automatic adjustment for daylight saving time is not supported by the selected time zone, you need to decide whether the time zone algorithm selected requires a daylight saving time adjustment and select the **Set standard time** or **Set daylight saving time** radio button accordingly.

If a time zone entry that meets the user requirements cannot be found, then one of the five user-defined time zones (that is, UD1 to UD5) can be used to define the desired time zone. If a user-defined time zone entry is selected, the Define button is enabled. It is used to display the Define Time Zone Algorithm window (Figure 3-8).

Define Time Zone Algorithm - SCZF	P401
Description	* (UTC+00:00) User defined timezone def 1 (UD1)
Standard time name	* UD1
UTC offset (hours : minutes)	
Daylight saving time name	
Daylight saving time offset (hours : minutes)	
Define adjustment of clock for daylight sa	aving time
Algorithm	
Scheduled by date (for example: Ma	) (for example: First Sunday in April at 7:00) arch 31 at 22:00) pecific date (for example: First Friday after March 15 at 7:00)
First Sunday in	January 1 at 12:00:00 AM
Daylight Saving Time End	
_ Algorithm	
Scheduled by date (for example: Se	o (for example: Last Sunday in October at 6:00) eptember 23 at 18:00) pecific date (for example: Last Sunday after October 15 at 6:00)
First Sunday in	n January 1 at 12:00:00 AM
OK Cancel Help	

Figure 3-8 Define Time Zone Algorithm

The Description (maximum 80 characters) and Standard time name fields (maximum four characters) must be entered. Otherwise, an error message displays when you click **OK**. The standard time name is an abbreviation displayed on various windows to differentiate standard time from daylight saving time.

The UTC offset must be entered in +/- hours and minutes and ranges from -14 to +14 hours.

Also, if the time zone is subject to daylight saving time adjustments, then the daylight saving time name and daylight saving offset must be specified. Optionally, algorithms for daylight saving time start and daylight saving time end can be defined to support automatic clock adjustment by selecting the **Define adjustment of clock for daylight saving time** option. The algorithm is saved when you click **OK**, but it is not sent to the STP facility until you click **OK** in the Adjust Time Zone Offset window.

#### 3.3.3 Setting the date and time

The final task in the sequence is to initialize the date and time. Several methods are provided:

- If the local date and time are to be set to specific values, click Set date and time. Date and time values can be entered in each field. The value filled in is the current time from the Support Element (SE) of the server on which the configuration task is being performed. An icon is also available to display an additional calendar dialog box.
- If an ETS is configured, initialize the date and time by selecting the Use External Time Source to set date and time option. This ensures that the Coordinated Server Time matches the time source.

Click the Use External Time Source to set date and time option (Figure 3-9). Click OK.



Figure 3-9 Set date and time through the external time source

The Support Element or HMC accesses the ETS to calculate the difference between the server time of day (TOD) clock and the time obtained from the external time source, either using dial out or NTP server (with or without PPS). When access to the ETS is successful, the resulting time value is not displayed to you but instead passed directly to the STP facility when you click **OK**.

Message ACT37382 displays upon successful completion of the set date and time operation (Figure 3-10). Click **OK**.

<b>1</b> Set Date and Time - SCZP401 🔳
Setting the date and time was successful.
АСТ37382 ОК

Figure 3-10 Message ACT37382 - Set Date and Time successful

The Initialize Time window (Figure 3-11 on page 86) displays again.

Initialize Time - SCZP401	1
Prior to setting the network configuration, son must be set on the server (CPC) that will be a the Current Time Server.	
Task	Complete
<ul> <li>Set leap seconds</li> <li>Set time zone</li> <li>Set date and time</li> </ul>	V V V
OK Cancel Help	

Figure 3-11 Initialize Time complete

To verify the date and time set by accessing the external time source, you can optionally select the **Set Date and Time** radio button a second time and click **OK** (Figure 3-12).

Set Date and Time - SCZP401		
<ul> <li>Set date and time</li> <li>Use the configured External Time Source to set date and time</li> <li>Modify time by delta to set date and time</li> <li>OK Cancel Help</li> </ul>	Date 9/16/12 Delta +00:00:00.000	Time 5:29:50 PM +/- hh:mm:ss.mmm

Figure 3-12 Set date and time through the external time source

This is the only way that you can verify the information obtained from the external time source. To leave the window without making any changes, click **Cancel**.

A delta value can be specified by selecting Modify time by delta to set date and time. The value specified is either positive (default) or negative and is entered in the +/-hh:mm:ss.mmm format.

Regardless of the method chosen, STP uses the information to calculate the Coordinated Server Time and set the server's' TOD clock when you click **OK**.

At this point, the tasks on the Initialize Time window have a check mark in the Complete column (Figure 3-11 on page 86). Click **Cancel** to exit the initialize time task and return to the Network Configuration tab.

The Coordinated Server Time is passed to other participating servers in the CTN when the server roles and the Current Time Server are assigned, as described in 3.4, "Assigning the CTN roles" on page 87.

# 3.4 Assigning the CTN roles

Now that the initialize time task has been completed, the Apply button on the Network Configuration window is enabled (Figure 3-13). The server roles can be assigned.

System (Sysplex) T	ime for SCZP4	01		
Timing Network Configuration	STP Configuration	STP Status	ETS Configuration	
Current Network Configurat	tion —			
Configured at (UTC): Preferred time server (CF	PC) Not configu	ired		
Backup time server (CPC	) Not configu	ired	<b>_</b>	
Arbiter	Not configu	ired	-	
<u>Only allow the server(s</u> <u>Force configuration</u> Current Time Server (CPC)		ve to be	in the CTN	
<ul> <li>● Preferred time server</li> <li>○ Backup time server (</li> </ul>				
Coordinated timing netwo	ork ID ITSOPO	<		
Apply Initialize Time	Deconfigure			
Refresh Cancel Help	]			

Figure 3-13 Network Configuration tab after time initialization

**Note:** Although it is possible to assign all roles in one step, it is best to perform this using two configuration changes. Performing the role assignment in two steps ensures that server connectivity checks are performed when assigning the BTS and Arbiter roles.

The CTN roles are assigned from the Network Configuration tab. The task must be accomplished from the server that will become the Current Time Server in the STP-only CTN:

1. Assign the PTS role, selecting the **Force configuration** check box.

The configuration of a new STP-only CTN requires the selection of the **Force configuration** check box (Figure 3-14). This option bypasses a number of validity checks of server connectivity. Force configuration specifies whether connectivity between the Preferred Time Server and other servers with a defined role are verified when a change in configuration is requested.

**Note:** If the new STP-only CTN consists of only one server, select the **Only allow the servers specified above to be members of the CTN** option. This prevents the server from being deconfigured when performing a power-on reset or power-off/on cycle. However, this option also limits the CTN to one server, unless the option is deselected, which can be performed concurrently at any time.

System (Sysplex) Time for SCZP401					
Timing Network	Network Configuration	STP Configuration STP Status Configuration			
Current I	Vetwork Configurat	ion ———			
Configured at (UTC): Preferred time server (CPC) SCZP401 (STP ID: ITSOPOK)					
Backup	time server (CPC	;) Not configu	ired		•
Arbiter Not configured			•		
□ <u>O</u> nly allow the server(s) specified above to be in the CTN □ <u>Force configuration</u> - Current Time Server (CPC)					
	erred time server kup time server ((				
Coordinated timing network ID ITSOPOK					
Apply	Initialize Time	Deconfigure			
Refresh	Cancel Help				

Figure 3-14 Configuring the PTS

 Assign the BTS, applicable for two or more servers (Figure 3-15). Do not select the Force Configuration check box, so that appropriate connectivity checks can be performed by STP.

System (Sysplex) Time for SCZP401				
Timing Network Configuration	STP Configuration	STP Status	ETS Configuration	
Current Network Configur	ation ———			
Configured at (UTC): Preferred time server (C Backup time server (CF	0021401	-		
Arbiter	Not configu	-		
Only allow the server(s) specified above to be in the CTN Force configuration Current Time Server (CPC)				
<ul> <li>● <u>P</u>referred time server</li> <li>○ <u>B</u>ackup time server</li> </ul>	· · ·			
Coordinated timing netv	vork ID ITSOPO	K		
Apply Initialize Time	Deconfigure			
Refresh Cancel Hel	p			

Figure 3-15 Configuring server roles in a two-CEC CTN

For three or more servers in the CTN, you can also assign the Arbiter. For each of the roles (PTS, BTS, and Arbiter), there are drop-down boxes listing the STP-capable servers currently available to the HMC. In this case, the Only allow the servers specified above to be members of the CTN check box must be unchecked so that additional servers can be configured in the CTN (Figure 3-16 on page 89).

👼 System (Sysplex) T	ime for SCZP4	01		i
Timing Network Configuration	STP Configuration	STP Status	ETS Configuration	
Current Network Configurat	tion ———			
Configured at (UTC): Preferred time server (CF	10021401(	STP ID: I	TSOPOK)	•
Backup time server (CPC	<sup>;)</sup> SCZP301 (	STP ID: I	TSOPOK)	•
Arbiter	Arbiter SCZP201 (STP ID: ITSOPOK)			
Only allow the server(s) specified above to be in the CTN  Current Time Server (CPC)				
<ul> <li>● Preferred time server</li> <li>○ Backup time server (</li> </ul>				
Coordinated timing network ID ITSOPOK				
Apply Initialize Time	Deconfigure			
Refresh Cancel Help				

Figure 3-16 Assigning PTS, BTS, and Arbiter at CTN configuration time

#### 3.4.1 Assigning the CTS and PTS

Select the PTS from the drop-down box listing. Because this is a new STP-only CTN where there is no CTS configured yet, the **Force configuration** check box must be selected. If the force option is not used, the request is rejected and message ACT37346 (Figure 3-17) displays. Click **OK** to return to the Network Configuration tab.

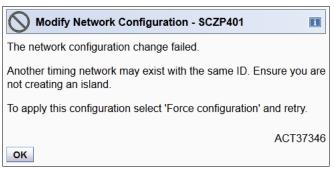


Figure 3-17 Message ACT37346 - Force configuration required

In Figure 3-18 on page 90, on the Network Configuration tab, the radio button in the Current Time Server (CPC) section is pointing to the PTS. Because the PTS will be the only server assigned in this first step, it has to be the CTS. Check the **Force configuration** box. This option *must* be specified when configuring a new STP-only CTN for the first time to bypass connectivity verification, as a Current Time Server does not yet exist.

Also, if this CTN consists of only one server, select the **Only allow the server(s) specified above to be members of the CTN** option to ensure that the CTN is not deconfigured during any power-on reset or power-off/on done on the CTS.

System (Sysplex) T	ime for SCZP401
Timing Network Configuration	STP Configuration STP ETS Status Configuration
Current Network Configurat	ion
Configured at (UTC):	9/16/12 6:56:45 PM
Preferred time server (CF	PC) SCZP401 (STP ID: ITSOTST)
Backup time server (CPC	() Not configured
Arbiter	Not configured
<u>Only</u> allow the server(s <u>Force configuration</u> Current Time Server (CPC)	s) specified above to be in the CTN
<ul> <li>● Preferred time server</li> <li>○ Backup time server (</li> </ul>	
Coordinated timing netwo	ork ID ITSOPOK
Apply Initialize Time	Deconfigure
Refresh Cancel Help	

Figure 3-18 Network Configuration tab - Define the CTS

Since the **Force configuration** option is selected, the Network Configuration Change Confirmation message ACT37348 displays (Figure 3-19).

Network Configuration Change Confirmation -     SCZP401
You requested to force the network configuration which results in the configuration being applied without verification. All connectivity checking between the Preferred Time Server, Backup Time Server (if defined), and the Arbiter (if defined) is bypassed.
The force option should only be used if:
1) You are defining a new STP-only CTN and you are certain that a Current Time Server with the same CTN ID is not currently defined.
or
2) You understand why connections between all the servers (CPCs) with defined roles are missing or are not currently online.
Using the force option for other reasons might result in two STP-only CTNs that are not synchronized to each other but that have the same CTN ID.
If you are not sure how to proceed, see the Server Time Protocol Implementation Guide, SG24-7281, for more information.
Do you want to force the network configuration changes?
ACT37348

Figure 3-19 Message ACT37348 - Network Configuration Change Confirmation

Click **Yes** to confirm. The assignment of the CTS globally transitions all servers with the same CTN ID to STP timing mode. This is confirmed by message ACT37341 (Figure 3-20 on page 91).

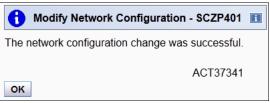


Figure 3-20 Message ACT37341 - Modify Network Configuration successful

#### 3.4.2 Assigning the BTS and the Arbiter

If the configuration contains more than one server, the second step is to assign other roles. The BTS role and optional Arbiter role (recommended for a CTN consisting of three or more servers) can be assigned (Figure 3-21). Because the CTS already exists, the Force configuration option is not required and is not a good idea in this step.

System (Sysplex) Time for SCZP401							
Timing Network Configuration	STP STP Configuration Stat	ETS Configuration					
Current Network Configurat	on						
Configured at (UTC):	9/16/12 6:17	':41 PM					
Preferred time server (CF	C) SCZP401 (STP I	D: ITSOPOK)					
Backup time server (CPC	) SCZP301 (STP I	D: ITSOPOK)					
Arbiter	Not configured	•					
<u>Only allow the server(s</u> <u>Force configuration</u> Current Time Server (CPC)		be in the CTN					
<ul> <li><u>P</u>referred time server</li> <li><u>B</u>ackup time server (6)</li> </ul>	· /						
Coordinated timing network ID ITSOPOK							
Apply Initialize Time	Deconfigure						
Refresh Cancel Help	]						

Figure 3-21 Network Configuration tab - Define BTS

Because there are two servers in our STP-only CTN (Figure 3-1 on page 80), only PTS and BTS are defined. However, any role that is going to be assigned requires server communication through coupling links to any other role within the CTN. Any attempt to assign a server role while there is no coupling link communication to the other roles in the CTN fails unless the Force configuration option is used.

If a CTN consists of only two servers, select the **Only allow the server(s) specified above to be members of the CTN** option to ensure that the CTN does not get deconfigured during any power-on reset or power-off/on done on the CTS.

The CTS can be assigned to either the PTS or the BTS. Select the appropriate radio button for the CTS and click **Apply**.

The Network Configuration Change Confirmation message ACT37357 displays (Figure 3-22 on page 92).

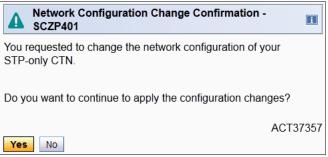


Figure 3-22 Message ACT37357 - Network Configuration Change Confirmation

Click **Yes** in the confirmation window. The Modify Network Configuration successful message ACT37341 displays (Figure 3-23).

Modify Network Configuration - SCZP401
The network configuration change was successful.
ACT37341
ок

Figure 3-23 Message ACT37341 - Modify Network Configuration

This completes the CTN configuration.

After the STP-only CTN has been configured, other STP-enabled servers can be configured to join this CTN. This is accomplished by setting the same CTN ID for them, as explained in 3.2, "Setting the CTN ID" on page 80. The Initialize Time task cannot be invoked when a new server joins an existing CTN because the new server picks up the Coordinated Server Time from the existing CTN.

#### Verification on the HMC

To verify the successful activation of the STP-only CTN, select the **Timing Network** tab (Figure 3-24 on page 93). The Network portion indicates:

- The Timing network type is STP-only CTN.
- ► The CTN Time Source is an NTP server.

The CTN time source reflects where the Coordinated Server Time is currently being steered from. Note that the Time field of the Coordinated Server Time section identifies the current time on the server.

Syste	System (Sysplex) Time for SCZP401									
Timing Network	Network Configuration	STP Configuration	STP Status	ETS Configuration						
Coordinat	ed Server Time -									
Time:	2:23:06 PM									
Date:	9/16/12									
		Eastern Time (	US & Car	nada) (EST/ED	T)					
Currently	EDT									
Offsets -										
Leap sec	ond:	2	5							
Time zon	e offset from U	TC: -	5: <b>00</b>							
Daylight s	saving time (ho	urs : minutes):1	: 00							
- Network -										
Timing ne	etwork type:	S	TP-only (	CTN						
Coordinat	ted timing netw	ork (CTN) ID: IT	SOPOK	-						
CTN time	source:	N	TP							
NTP strat	um level:	2								
Adjustmen	t Steering	Adjust Time	Adjust Lea	ap Seconds	Adjust Time Zone					
Refresh	Cancel Help									

Figure 3-24 System (Sysplex) Time - Timing Network tab

The timing mode and Stratum level can be displayed from the STP Status tab:

- The server must be in STP timing mode.
- ► The server that has been assigned to be the Current Time Server is Stratum 1.
- Other servers that have operational STP timing links to the CTS are Stratum 2.
- Servers that do not have an operational STP timing link to the CTS but that have an operational STP timing link to any Stratum 2 server are Stratum 3.

Figure 3-25 shows SCZP401 in STP timing mode. (It is the Stratum 1 server.)

Timing Network Confi		p nfiguration	STP Status	ETS Configuration					
Timing state: Synchronized									
Usable clock source: Yes									
Timing mode: STP (Server Time Protocol)									
Stratum level: 1									
Maximum timing	g stratum leve	el:3							
Maximum STP	version:	4							
System Informa	tion ———								
Local STP		Remote	e Directly	Attached Sys	tem	System	Stratum	Active STP	Maximum STP
Link Identifier(	s)	Type-M	FG-Plan	t-Sequence		Name	Level	Version	Version
[(0700,0704,0 072F)]	717,072C,072	<sup>2E,</sup> 002827	-IBM-02-	00000000B8E	07	SCZP301	2	4	4
Local Uninitializ	ed STP Links –								
	STP Link		Reasor			son Code			
Link Identifier	••		Sent	-	Rece	eived			
0110	Coupling-pee		Link fai	lure					<u>^</u>
0111	Coupling-pee		Offline						E
0118	Coupling-pee		Link fai						
0119	Coupling-pee		Link fai	lure					
0190	Coupling-pee		Offline						
0191	Coupling-pee		Offline						
0198	Coupling-pee		Link fai	lure					
0199	Coupling-pee	er	Offline						-
Refresh Cano	el Help								

Figure 3-25 STP Status tab - Stratum 1

Figure 3-26 shows SCZP301 in STP timing mode. It has connectivity to the current Stratum 1 server and is therefore a Stratum 2 server.

Timing Netw Network Confi	ork iguration	STP Configu	iration	STP Status	ETS Configuration	n				
Timing state: Synchronized										
Usable clock source: Yes										
Timing mode: STP (Server Time Protocol)										
Stratum level: 2										
Maximum timin	g stratum	level:3								
Maximum STP	version:	4								
- System Informa	tion ——									
Local STP			Remote	e Directly	Attached Sy	stem	System	Stratum	Active STP	Maximum STP
Link Identifier	(S)		Туре-М	IFG-Plan	t-Sequence		Name	Level	Version	Version
[(0700,0701,0	720,0724	,0731,	002827	.IBM_02	.00000000B8	D7	SCZP401	1	4	4
0732)]			002021	-10101-02-	.00000000000000000000000000000000000000	01	5021 401	•	7	-
- Local Uninitializ	ed STP Lir	nks ——								
Local STP	STP Link	c		Reasor	n Code	Reas	son Code			
Link Identifier				Sent		Rece				
0110	Coupling	-peer		Link fai	lure					
0111	Coupling	-peer		Offline						
0118	Coupling	-peer		Offline						
0190	Coupling	-peer		Offline						
0191	Coupling	-peer		Offline						
0198	Coupling	-peer	Link failure							
0199	Coupling	-peer		Offline						
0210 Coupling-peer Link failure										

Figure 3-26 STP timing mode - Stratum 2

#### Verification in z/OS

The Stratum level and synchronization status can be verified from the z/OS side as well. The z/OS command DISPLAY ETR returns message IEA386I and displays the following information:

- Synchronization mode
- Stratum level
- The node ID of the current Stratum 1 server in the CTN
- ► The server role, if applicable
- The number of usable timing links (does not apply for the CTS)

Example 3-1 shows the output of the DISPLAY ETR command for z/OS system images SC74 on the PTS (SCZP401) and SC75 on the BTS (SCZP301).

Example 3-1 DISPLAY ETR commands and responses

THE STRATUM 1 NODE ID = 002827.H43.IBM.02.0000000B8D7 THIS IS THE BACKUP TIME SERVER NUMBER OF USABLE TIMING LINKS = 11 THIS STP NETWORK HAS NO SERVER TO ACT AS ARBITER

The DISPLAY XCF, SYSPLEX command identifies the timing mode of all sysplex members that are STP (Example 3-2).

Example 3-2 DISPLAY XCF, SYSPLEX command and response

D XCF,SYSPLEX IXC336I 13.18.43 DISPLAY XCF 623 SYSPLEX PLEX75 SYSTEM TYPE SERIAL LPAR STATUS TIME SYSTEM STATUS SC74 2827 B8D7 01 09/21/2012 13:18:43 ACTIVE TM=STP SC75 2817 3BD5 05 09/21/2012 13:18:38 ACTIVE TM=STP SYSTEM STATUS DETECTION PARTITIONING PROTOCOL CONNECTION EXCEPTIONS: NONE SYSPLEX INITIALIZATION TIME: 09/16/2012 13:45:31.128859

### 3.5 Adding a new server

Once the new STP-only CTN is operational, it is possible for a new server to join the CTN at any time. This is always done by setting the CTN ID on the new server. The addition of a new server is accomplished by defining, on the new server, the same CTN ID that is defined on the existing STP-only CTN.

**Important:** If the configuration for the CTN has been saved (so-called *bounded* CTN), no other server can join this CTN unless the "Only allow the server specified above to be members of the CTN" option (Figure 3-28 on page 96) is deselected on the Network Configuration tab of the Current Time Server of the existing CTN. This can be performed concurrently at any time.

#### Defining the STP ID

On the new server, from the STP Configuration tab, enter the STP ID value in the STP ID part of the CTN ID. Assuming that it is best for the server to join our existing CTN, the same STP ID currently given for SCZP401/SCZP301 ([ITSOPOK], Figure 3-27), needs to be entered.

System (Sysplex) Time for SCZP201									
Timing NetworkNetworkETR ConfigurationETR StatusSTP ConfigurationETS Status									
make su	Note: The STP ID portion of the CTN ID is case sensitive. If the CTN ID is to be changed, make sure that the ID exactly matches the CTN to be joined.								
Coordinated timing network ID ITSOPOK - Apply Save STP Debug Data									
Refresh	Cancel Hel	р							

Figure 3-27 System (Sysplex) Time - STP Configuration tab

When you click **Apply**, the CTN ID for the server becomes [ITSOPOK], which is the value defined for the existing STP-only CTN. If the server has coupling link connectivity to a Stratum 1 or Stratum 2 server, STP automatically detects it and joins the server to the STP-only CTN.

The STP connectivity is only successful if the existing CTN was not configured to be restricted to its current servers. This option is called "Only allow the server specified above to be members of the CTN" and is available from the Network Configuration tab. If this option was used at the time that the existing STP-only CTN was created, the new server succeeds the CTN ID configuration, but does not join the existing CTN. As a consequence, the coupling links that do connect the server stay in the Local Uninitialized STP Links (available on the STP Status tab).

For detailed steps for adding a new server to the STP-only CTN, see Chapter 4, "STP-only CTN: Adding a server in STP timing mode" on page 107.

### 3.6 Saving the STP configuration across PORs

STP provides an option to save the configuration across power-on resets (PORs) for STP-only CTNs with one or two servers. The selection of this option is made via the **Only allow the server(s) specified above to be in the CTN** check box on the Network Configuration tab (Figure 3-28). When **Only allow the server(s) specified above to be in the CTN** has been selected, the CTN's timing and configuration settings are saved so that they will not need to be re-entered after a loss of power or a POR of the servers.

**Note:** For brevity's sake, the capability implemented by selecting **Only allow the server(s) specified above to be in the CTN** is referred to as the *save configuration* feature, and CTNs for which this capability is selected are referred to as *bounded* CTNs.

System (Sysplex) Time for SCZP401									
Timing Network	Network Configuration	ST Co	TP onfiguration	STP Status	ETS Configuration	n			
Current I	Current Network Configuration								
	Configured at (UTC): Preferred time server (CPC) SCZP401 (STP ID: ITSOPOK)								
Backupt	time server (CPC	STP ID: I	TSOPOK)	•					
Arbiter			Not configu	red		•			
<u> </u>	allow the server(s configuration Time Server (CPC	<i>.</i>	pecified abo	ve to be i	in the CTN				
_	erred time server kup time server (		· ·						
Coordina	ated timing netwo	ork		<	-				
Apply Initialize Time Deconfigure									
Refresh	Cancel Help								

Figure 3-28 Restricting a new CTN to only two servers

#### 3.6.1 Single-server CTN configuration

In this section, we discuss the implementation of a single-server STP-only CTN.

#### Prerequisites

For a single-server bounded CTN, the CTN must contain only a single server and be operating in STP-only mode. The configuration data saved includes both the server's role as the PTS/CTS reflected on the Network Configuration tab (Figure 3-29) and the timing configuration reflected on the Timing Network tab (Figure 3-30) of the System (Sysplex) Time task.

System (Sysplex) Time for SCZP401							
Timing Network Configuration	ST Co	ETS Configuration	n				
Current Network Configuration							
Configured at (UTC): Preferred time server (CPC) SCZP401 (STP ID: ITSOPOK)							
Backup time server (CPC	C)	Not configu	ired		•		
Arbiter		Not configu	ired		•		
<u>Only allow the server(s</u> <u>Force configuration</u> Current Time Server (CPC)	<i>.</i>	pecified abo	ve to be i	in the CTN			
<ul> <li>● Preferred time server</li> <li>○ Backup time server (</li> </ul>							
Coordinated timing network ID ITSOPOK							
Apply Initialize Time		Deconfigure					
Refresh Cancel Help							

Figure 3-29 Single CEC Network Configuration tab

System (Sysplex) Time for SCZP401										
Timing Network	Network Configuration	STP Configuration	STP Status	ETS Configuration						
Coordinat	Coordinated Server Time									
Time:	2:23:06 PM									
Date:	9/16/12									
Time zon Currently		Eastern Time (I	US & Car	nada) (EST/ED	Τ)					
Offsets —										
Leap sec	ond:	2	25							
Time zon	e offset from U	TC: -	5:00							
Daylight s	saving time (ho	urs : minutes):1	: 00							
Network -										
Timing ne	etwork type:	S	TP-only (	CTN						
Coordinat	ted timing netw	ork (CTN) ID:IT	SOPOK	-						
CTN time	source:	N	TP							
NTP strat	tum level:	2								
Adjustmen	t Steering	Adjust Time	Adjust Lea	ap Seconds	Adjust Time Zone					
Refresh	Cancel Help	)								

Figure 3-30 Timing Network tab for single CEC

#### Saving the configuration

To implement a single-server CTN that saves the STP configuration for this CTN across PORs, select **Only allow the server(s) specified above to be in the CTN**, and then select **Apply** on the Network Configuration tab (Figure 3-31). The timing and configuration data are now retained in the event of a loss of power or a power-on reset of the server. When power is restored, the server resumes its role as PTS/CTS using the timing configuration information previously provided.

System (Sysplex) Time for SCZP401									
Timing Network	Network Configuration	STP Configuration	STP Status	ETS Configuratio	'n				
Current Network Configuration									
	Configured at (UTC): Preferred time server (CPC) SCZP401 (STP ID: ITSOPOK)								
Backupt	time server (CPC)	) Not configu	ured		•				
Arbiter		Not configu	ured		-				
<b>E</b> orce	allow the server(s configuration Time Server (CPC)		ove to be	in the CTN					
_	erred time server kup time server (C	· · ·							
Coordina	Coordinated timing network ID ITSOPOK								
Apply	Initialize Time	Deconfigure							
Refresh	Cancel Help								

Figure 3-31 Enabling configuration save for single CEC CTN

**Note:** If the save configuration feature is used to limit the CTN to a one-server CTN, no other server can join this CTN unless this option is deselected in the Network Configuration window of the Current Time Server of the existing CTN.

This restriction can be removed concurrently at any time by deselecting **Only allow the** server(s) specified above to be in the CTN.

#### 3.6.2 Two-server CTN saving its STP configuration across PORs

In this section, we discuss the implementation of a dual-server STP-only CTN.

#### **Prerequisites**

For a dual-server bounded CTN, the CTN must contain two servers and be operating in STP-only mode. The servers that support STP are:

- ► z9 EC or BC with MCL bundle 44 (or higher)
- z10 EC or BC with MCL bundle 26 (or higher)
- ▶ z196 or z114
- ► zEC12

**Note:** A z9 EC or BC cannot be in the same CTN as a zEC12. This configuration is not supported.

Since the PTS/CTS is a single point of failure, define BTS in a dual-server CTN. For the remainder of this section, we assume that the CTN has been configured with both a PTS/CTS and a BTS.

The configuration data saved includes the servers' roles as the PTS/CTS and BTS, reflected on the Network Configuration tab (Figure 3-32), as well as the timing configuration reflected on the Timing Network tab (Figure 3-33 on page 100) of the System (Sysplex) Time task.

System (Sysplex) Time for SCZP401								
Timing Network	Network Configuration		TP onfiguration	STP Status	ETS Configuratio	n		
Current I	Current Network Configuration							
Configur	ed at (UTC):		9/16/12	2 6:17:41	PM			
Preferre	d time server (CP	PC)	SCZP401 (	STP ID: I	TSOPOK)	•		
Backup	time server (CPC	)	SCZP301 (	STP ID: I	TSOPOK)	•		
Arbiter			Not configu	red		•		
<u> </u>	allow the server(s configuration Time Server (CPC)	<u> </u>	pecified abo	ve to be i	n the CTN			
_	erred time server kup time server (0							
Coordina	Coordinated timing network ID ITSOPOK							
Apply	Initialize Time	D	econfigure					
Refresh	Cancel Help							

Figure 3-32 Two CEC configuration Network Configuration tab

Syste	System (Sysplex) Time for SCZP401									
Timing Network	Network Configuration	STP Configuration	STP Status	ETS Configuration						
Coordinat	Coordinated Server Time									
Time:	2:23:06 PM									
Date:	9/16/12									
		Eastern Time (	US & Car	nada) (EST/ED	T)					
Currently	EDT									
Offsets -										
Leap sec	ond:	2	25							
Time zon	e offset from U	TC: -	5 : <b>00</b>							
Daylight s	saving time (ho	urs : minutes):1	: 00							
- Network -										
Timing ne	etwork type:	S	TP-only (	CTN						
Coordinat	ted timing netw	ork (CTN) ID: IT	SOPOK	-						
CTN time	source:	N	TP							
NTP strat	um level:	2								
Adjustmen	t Steering	Adjust Time	Adjust Lea	ap Seconds	Adjust Time Zone					
Refresh	Cancel Help									

Figure 3-33 Timing Network tab in a dual CEC configuration

#### Saving the configuration

To implement a dual-server bounded CTN, select **Only allow the server(s) specified above to be in the CTN**, and then select **Apply** on the Network Configuration tab (Figure 3-34). The timing and configuration data are now retained in the event of a loss of power or a power-on reset of the servers.

Sys	System (Sysplex) Time for SCZP401										
Timing Network	Network Configuration	STP Configuration	STP Status	ETS Configuration	1						
Current I	Vetwork Configurat	tion —									
	ed at (UTC): d time server (CF	PC) SCZP401 (	STP ID: I	TSOPOK)	•						
Backup	time server (CPC	) SCZP301 (	STP ID: I	TSOPOK)	-						
Arbiter		Not configu	red		-						
<u> </u>	allow the server(s configuration Time Server (CPC	, ,	ve to be i	in the CTN	_						
_	erred time server kup time server (	· · ·									
Coordina	ated timing netwo	ork ID ITSOPO	<	-							
Apply	Initialize Time	Deconfigure		,							
Refresh	Cancel Help										

Figure 3-34 Saving STP configuration across PORs in a two CEC configuration

The two servers must be able to communicate via coupling links or this action is not permitted. This restriction cannot be circumvented by additionally selecting **Force** 

configuration. Selecting both Force configuration and Only allow the server(s) specified above to be in the CTN results in an error message.

When power is restored to both servers and coupling link path connectivity is reestablished, the servers resume their roles as PTS/CTS and BTS, using the timing configuration information previously provided. If power is only restored to one server or coupling link, then connectivity is not reestablished, and additional recovery actions are required, as outlined in *Server Time Protocol Recovery Guide*, SG24-7380.

**Important:** If the save configuration feature is used to limit the CTN to a dual-server CTN, a number of restrictions apply:

- No other server can join the CTN.
- The CTN ID cannot be changed.
- ► No server role assignment changes can be made.
- No reverse migration from STP-only to a mixed CTN.

These restrictions can be removed at any time by deselecting **Only allow the server(s) specified above to be in the CTN** from the CTS, as long as the two servers can communicate via coupling links.

## 3.7 Case study: Configuring a single-server CTN

The starting configuration for this scenario is one STP-enabled server that needs to be configured into an STP-only CTN.

There are three ways to configure an external time source for an STP-only CTN:

- NTP server without PPS (simply an NTP server)
- NTP server with PPS
- Dial out on the HMC<sup>1</sup>

More information about the dial-out function at the HMC and the required setup for the HMC/SE can be found in 1.4.1, "HMC setup for ETS dial-out configuration" on page 34.

Our sample configuration consists of one zEnterprise server connected to one NTP server and one NTP server configured on the HMC (Figure 3-35 on page 102).

<sup>&</sup>lt;sup>1</sup> Starting with HMC 2.12.0 dial out support has been discontinued, thus dial out ETS configuration is no longer available.

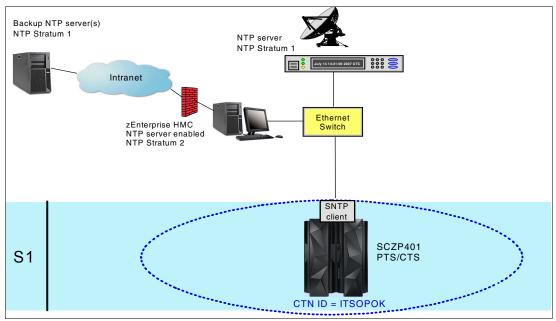


Figure 3-35 Test configuration

The sequence of steps to configure an STP-only CTN is:

- 1. Set the CTN ID. In this case, it consists of only the STP ID portion. See 3.2, "Setting the CTN ID" on page 80, for details.
- 2. Initialize the time. This includes setting the time zone, leap seconds, date, and time. See 3.3, "Initializing the time" on page 81, for details.
- 3. Assign CTN roles. In the case of a single-server CTN, only the PTS/CTS role is assigned

Note: The zEC12 HMC (Application level 2.12.0) does not support dial out.

#### Assigning the CTN roles

After the Initialize Time task has been completed, the Apply button on the Network Configuration window is enabled (Figure 3-36). The server roles can now be assigned.

System (Sysplex) T	ime for SCZP3	01	
Timing Network Configuration	STP Configuration	STP Status	ETS Configuration
Current Network Configurat	tion —		
Configured at (UTC): Preferred time server (CF	<sup>PC)</sup> Not configu	ired	<b></b>
Backup time server (CPC	) Not configu	ired	•
Arbiter	Not configu	ired	•
<u>Only allow the server(s</u> <u>Force configuration</u> Current Time Server (CPC)		ve to be i	in the CTN
<ul> <li>● Preferred time server</li> <li>○ Backup time server (</li> </ul>			
Coordinated timing netwo	ork ID ITSOPO	<	-
Apply Initialize Time	Deconfigure		
Refresh Cancel Help			

Figure 3-36 Network Configuration tab after time initialization

The CTN roles are assigned from the Network Configuration tab:

 Assign the PTS role from the drop-down menu. Note that the radio button in the Current Time Server (CPC) section (Figure 3-37) points to the PTS. Because the PTS is the only time server assigned, it has to be the CTS.

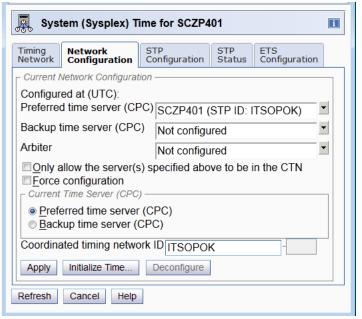


Figure 3-37 Assigning PTS for the new single-server STP-only CTN

- 2. Select the **Force configuration** check box. This option *must* be specified when configuring a new STP-only CTN for the first time to bypass connectivity verification, as a Current Time Server does not yet exist.
- 3. Since the new STP-only CTN consists of only one server, select the **Only allow the** server(s) specified above to be members of the CTN option. This prevents the server from getting deconfigured when doing a power-on reset or power off/on. However, this option also limits the CTN to one server, unless the option is deselected, which can be performed concurrently at any time.
- 4. Select **Apply** to activate your selections (Figure 3-38).

**Note:** If **Only allow the server(s) specified above to be members of the CTN** is selected, no other server can join this CTN unless this option is deselected in the Network Configuration window.

This restriction can be removed at any time by deselecting **Only allow the server(s)** specified above to be in the CTN.

System (Sys	System (Sysplex) Time for SCZP401									
Timing Network Configu		GTP Configuration	STP Status	ETS Configuration						
Current Network Co	onfiguration	า ———								
Configured at (UT Preferred time set		) SCZP401 (	STP ID: I	TSOPOK)	•					
Backup time serve	er (CPC)	Not configu	red		•					
Arbiter		Not configu	red		•					
☑ Only allow the second se	ation	specified abo	ve to be i	n the CTN	_					
<ul> <li>● Preferred time</li> <li>● Backup time s</li> </ul>		,								
Coordinated timin	g network		<	-						
Apply Initialize	Time	Deconfigure								
Refresh Cancel	Help									

Figure 3-38 Selecting "Force configuration" for the first server of the new CTN

5. Since the **Force configuration** option is selected, the Network Configuration Change Confirmation message ACT37348 displays (Figure 3-19 on page 90).

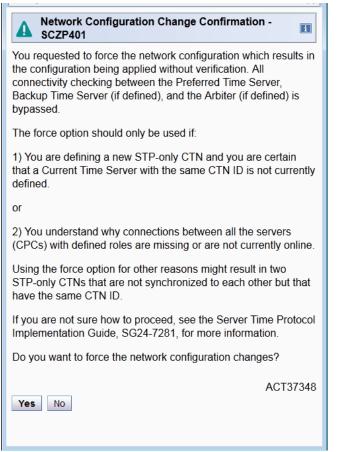


Figure 3-39 Message ACT37348 - Network Configuration Change Confirmation

6. Click Yes to confirm. This is confirmed by message ACT37341 (Figure 3-40).

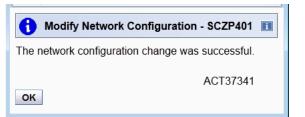


Figure 3-40 Message ACT37341 - Modify Network Configuration successful

The configuration of the single-server CTN is now complete. Figure 3-41 shows the resulting STP-only CTN.



Figure 3-41 Single-server STP-only CTN

# 4

# STP-only CTN: Adding a server in STP timing mode

In the example in this chapter<sup>1</sup>, one server is added to our sample STP-only CTN configuration. The new server *must* be added in STP timing mode to participate in the STP-only Coordinated Timing Network (CTN).

We cover the following topics:

- "Starting point" on page 108
- "Adding the server" on page 112
- "End point" on page 117

An STP-only CTN consists of servers in STP timing mode, with the server assigned as the Current Time Server (CTS) providing the timing source for the CTN.

This scenario proceeds to the point at which the new server joins the STP-only CTN, and the server time is adjusted to match the other servers already in the CTN. As a result, the time of day (TOD) clock is modified from local TOD stepping mode to STP timing mode in line with the Coordinated Server Time being provided by STP timing messages from attached servers.

**Important:** In an STP environment, if you plan to change your cabling topology, make sure that you understand the CTN roles of the servers subject to re-cabling, and perform the following tasks prior to any disruptive action:

- Update the IOCP for affected servers
- Test the changed links by configuring the channels online

<sup>&</sup>lt;sup>1</sup> See "Prerequisites" on page 263.

# 4.1 Starting point

The starting point for this scenario is an STP-only CTN (Figure 4-1).

Figure 4-1 STP Implementation environment - STP-only CTN

The STP-only CTN consists of two servers:

- SCZP301 is the Current Time Server.
- SCZP201 is the Backup Time Server (BTS).

The SCZP301 and SCZP201 servers are connected to each other in a redundant configuration using five coupling links, and each server has a z/OS image and Coupling Facility defined.

Since this starting configuration consists of two servers only, the configuration was previously saved across POR by selecting the function *Only allow the server(s) above to be in the CTN*. Because a three-or-more server CTN cannot be saved across PORs, this function must be deselected before a new server can join the CTN.

An additional server, SCZP401, will be added to the STP-only CTN in STP timing mode and will also be assigned to become the Arbiter within the CTN.

#### 4.1.1 z/OS DISPLAY ETR command

Figure 4-2 shows the output from the DISPLAY ETR command entered on the SC74 image, on SCZP301.

```
RO *ALL.D ETR
SC74
       RESPONSES ------
IEA386I 10.38.49 TIMING STATUS
SYNCHRONIZATION MODE = STP
 THIS SERVER IS A STRATUM 1
 CTN ID = ITSOPOK
 THE STRATUM 1 NODE ID = 002817.M32.IBM.02.000000B3BD5
 THIS IS THE PREFERRED TIME SERVER
 THIS STP NETWORK HAS NO SERVER TO ACT AS ARBITER
SC75
        RESPONSES -----
IEA386I 10.38.50 TIMING STATUS
SYNCHRONIZATION MODE = STP
 THIS SERVER IS A STRATUM 2
 CTN ID = ITSOPOK
 THE STRATUM 1 NODE ID = 002817.M32.IBM.02.000000B3BD5
 THIS IS THE BACKUP TIME SERVER
 THIS STP NETWORK HAS NO SERVER TO ACT AS ARBITER
 NUMBER OF USABLE TIMING LINKS = 5
```

Figure 4-2 DISPLAY ETR display - SC74 on SCZP301, STP-only CTN

This display shows that z/OS images SC74 and SC75 are resident on servers in an STP-only CTN. SC74 is on the PTS, and SC75 is on the BTS.

#### 4.1.2 z/OS DISPLAY XCF command

Figure 4-3 shows the output from the z/OS DISPLAY XCF command entered on the SC74 image, on SCZP301.

D XCF,S IXC336I 10.41.22 DISPLAY XCF 960 SYSPLEX PLEX75 SYSTEM TYPE SERIAL LPAR STATUS TIME SYSTEM STATUS SC74 2817 3BD5 2C 09/22/2012 10.41.19 ACTIVE TM=STP SC75 2097 DE50 1C 09/22/2012 10.41.21 ACTIVE TM=STP

Figure 4-3 DISPLAY XCF display - SC74 on SCZP301, STP-only CTN

This display shows that all z/OS images are in STP timing mode. They are all resident on separate servers, as evidenced by the different serial numbers.

#### 4.1.3 System (Sysplex) Time tabs

The tabs discussed in this section are available on the System (Sysplex) Time selection for each server. Only the tabs for the SCZP401 server are shown in this section.

#### **Timing Network tab**

Figure 4-4 on page 110 shows the Timing Network tab for the SCZP401 server.

Syst	em (Sysplex) 1	Time for SCZP4	401	
Timing Network	Network Configuration	STP Configuration	STP Status	ETS Configuration
Time: 12: Date: 9/2 Offsets Leap sec Total time - Network - Timing ne		U	nconfigur	red
Refresh	Cancel Help			

Figure 4-4 Timing Network tab (SCZP401)

This shows that the SCZP401 server is not configured in a CTN, and therefore is running in local TOD stepping mode.

#### **Network Configuration tab**

Figure 4-5 shows the Network Configuration tab for the SCZP401 server.

👼 Syst	tem (Sysplex) T	ime f	or SCZP4	01	i
Timing Network	Network Configuration	STP Con	figuration	STP Status	ETS Configuration
Current I	Vetwork Configurat	tion —			
0	ed at (UTC): d time server (CF	PC)	Not confi	gured	•
Backup	time server (CPC	;)	Not confi	gured	•
Arbiter			Not confi	gured	
<b>E</b> orce	allow the server(s configuration Time Server (CPC)	<i>.</i>	cified abo	ve to be i	in the CTN
	erred time server kup time server (	•			
Coordina Apply	ated timing netwo		onfigure		-
Refresh	Cancel Help	0			

Figure 4-5 Network Configuration tab (SCZP401)

Because SCZP401 is not STP configured, the Preferred Time Server, Backup Time Server, and Arbiter fields are not applicable, and the Coordinated Timing Network ID field is blank. Also, the Apply, Initialize Time, and Deconfigure buttons are disabled.

#### **STP Configuration tab**

Figure 4-6 on page 111 shows the STP Configuration tab for the SCZP401 server.

Syst	System (Sysplex) Time for SCZP401									
Timing Network	Network Configuration	STP Configuration	STP ETS Status Configuration							
ID is to b	-		se sensitive. If the CTN ID exactly matches the							
Coordinat Apply	ted timing netwo Save STP Debu	[	-							
Refresh	Cancel Hel	р								

Figure 4-6 STP Configuration tab (SCZP401)

Because the SCZP401 server has not been configured for STP, this tab shows the CTN ID field as blank.

#### **STP Status tab**

Figure 4-7 shows the STP Status tab for the SCZP401 server.

Timing Network Conf			STP Status	ETS Configurati	on				
Timing state:		Unsynchro	onized						
Jsable clock se	ource:	No							
Timing mode:		Local							
Maximum timin	g stratum l	evel:3							
Maximum STP	version:	4							
- System Informa	tion ———								
Local STP	Remot	e Directly Attac	hod Svet	tom Custor	n Stratum	Activ	STP	Maximum STP	
		/IFG-Plant-Sequ	-	Name	Level	Versi		Version	
Link Identifier	(s) Type-N	/IFG-Plant-Sequ	-	-					
Link Identifier	(s) Type-N	/IFG-Plant-Sequ	uence	Name	Level	Versi			
Link Identifier - Local Uninitializ Local STP	(s) Type-M red STP Link STP Link	/IFG-Plant-Sequ	Reason	Name	Level Reason (	Versi Code			
Link Identifier - Local Uninitializ Local STP Link Identifier	(s) Type-M red STP Link STP Link Type	MFG-Plant-Sequ	Reason Sent	Name	Level	Versi Code			
Link Identifier - Local Uninitializ Local STP Link Identifier 0700	(s) Type-M red STP Link STP Link Type Coupling	MFG-Plant-Seques	Reason Sent Offline	Name	Level Reason (	Versi Code			
Link Identifier Local Uninitializ Local STP Link Identifier 0700 0701	(s) Type-M red STP Link STP Link Type Coupling Coupling	NFG-Plant-Sequestion over InfiniBand over InfiniBand	Reason Sent Offline Offline	Name	Level Reason (	Versi Code			
Link Identifier Local Uninitializ Local STP Link Identifier 0700 0701 0702	(s) Type-M red STP Link STP Link Type Coupling Coupling Coupling	NFG-Plant-Sequences over InfiniBand over InfiniBand over InfiniBand over InfiniBand	Reason Sent Offline Offline	Name	Level Reason (	Versi Code			
Link Identifier Local Uninitializ Local STP Link Identifier 0700 0701 0702 0703	(s) Type-N ed STP Link Type Coupling Coupling Coupling Coupling	VFG-Plant-Sequests over InfiniBand over InfiniBand over InfiniBand over InfiniBand	Reason Sent Offline Offline Offline	Name Code	Level Reason ( Received	Versi Code			
Link Identifier Local Uninitializ Local STP Link Identifier 0700 0701 0702	(s) Type-N ed STP Link Type Coupling Coupling Coupling Coupling	NFG-Plant-Sequences over InfiniBand over InfiniBand over InfiniBand over InfiniBand	Reason Sent Offline Offline Offline	Name Code	Level Reason ( Received	Versi Code			
Link Identifier Local Uninitializ Local STP Link Identifier 0700 0701 0702 0703	(s) Type-N ed STP Link Type Coupling Coupling Coupling Coupling Coupling	VFG-Plant-Sequests over InfiniBand over InfiniBand over InfiniBand over InfiniBand	Reason Sent Offline Offline Offline Configu	Name Code	Level Reason ( Received	Versi Code			
Link Identifier Local Uninitializ Local STP Link Identifier 0700 0701 0702 0703 0704	(s) Type-M eed STP Link Type Coupling Coupling Coupling Coupling Coupling Coupling	VFG-Plant-Sequests over InfiniBand over InfiniBand over InfiniBand over InfiniBand over InfiniBand	Reason Sent Offline Offline Offline Offline Configu Offline	Name Code	Level Reason ( Received	Versi Code			

Figure 4-7 STP Status tab (SCZP401)

The SCZP401 server is shown as unsynchronized because it has no usable clock source. It is running in local TOD stepping mode. No stratum level is shown.

Also, the SCZP401 server does not have a CTN ID defined and is therefore not STP configured, so no servers display in the Remote Directly Attached Systems section, as SCZP401 is unable to send or receive STP control and timing messages. However, this tab displays the links defined in the IOCDS that are *eligible* for the exchange of STP messages once the STP ID portion of the CTN ID is defined.

**Note:** Each link remains in an *uninitialized* state until the servers at both ends of the link have a matching CTN ID defined that contains a valid STP ID.

### 4.2 Adding the server

The addition of a new server to an existing STP-only CTN involves defining the CTN ID on the new server to match the value already in use by the CTN. In our sample configuration, the CTN ID in use is [ITSOPOK] - [], so the new server must also have this value defined in line with existing servers.

Table 4-1 shows the before and after configuration details.

	Server	CTI	N ID	Server	Timing	Stratum
		STP ID	ETR ID	role	mode	level
Before	SCZP201	ITSOPOK		BTS	STP	2
migration	SCZP301	ITSOPOK		PTS & CTS	STP	1
	SCZP401	Null	Null		LOCAL	Not defined
After	SCZP201	ITSOPOK		BTS	STP	2
migration	SCZP301	ITSOPOK		PTS & CTS	STP	1
	SCZP401	ITSOPOK		Arbiter	STP	2

Table 4-1 Server configuration: adding a new server (SCZP401)

**Note:** The prerequisite STP preparation tasks are assumed to have been completed for this new server.

The new server also requires coupling link connectivity to the existing servers in the STP-only CTN. These links may be either coupling links or timing-only links, depending on the configuration.

The sample configuration uses both coupling links and timing-only links, because the new server attaches to two servers with Coupling Facilities (SCZP201 and SCZP301).

#### Removing the Save Config across POR option from existing CTN

Since the new Server SCZP401 is planned to join the current CTN, the option **Only allow server(s) specified above to be in the CTN** needs to be removed. This optional function can be used only in a single-server STP-only CTN or in a two-server STP-only CTN. Because our target configuration is a three-server CTN, this selection needs to be removed using the Current Time Server System (Sysplex) Time task.

At the HMC workplace, perform the following steps:

- 1. Highlight the SCZP301 server (*Current Time Server* of the *existing CTN*) and select System (Sysplex) Time.
- 2. Click the Network Configuration tab.
- Deselect the option Only allow server(s) specified above to be in the CTN and click Apply (Figure 4-8 on page 113).

System (Sysplex)	Time	e for SCZP3	01		i
Timing Network Configuration		TP onfiguration	STP Status	ETS Configuration	
Current Network Configur	ation				
Configured at (UTC):			12:24:10		
Preferred time server (0	CPC)	SCZP301 (	STP ID: I	TSOPOK)	•
Backup time server (CF	PC)	SCZP201 (	STP ID: I	TSOPOK)	•
Arbiter		Not configu	ired		•
<u>Only allow the server</u> <u>Force configuration</u> <u>Current Time Server (CF</u>		pecified abo	ve to be i	n the CTN	
<ul> <li>● <u>P</u>referred time server</li> <li>○ <u>B</u>ackup time server</li> </ul>					
Coordinated timing net	vork	ID ITSOPO	<	-	
Apply Initialize Time	. [	Deconfigure			
Refresh Cancel Hel	р				

Figure 4-8 Remove the save STP configuration option from the existing CTN

4. Select Yes on the configuration change confirmation panel (Figure 4-9).

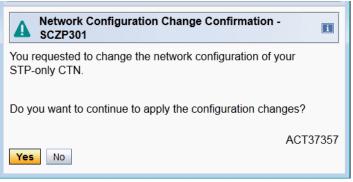


Figure 4-9 Configuration change confirmation - ACT37357

5. Select **OK** on the final confirmation message (Figure 4-10).

Modify Network Configuration - SCZP301
The network configuration change was successful.
АСТ37341 ОК

Figure 4-10 Configuration change confirmation - ACT373341

The existing CTN configuration has been changed; the CTN can now be joined by another server given that the connectivity and STP definition requirements are met.

#### Defining the STP ID on SCZP401

At the HMC workplace, perform the following steps:

- 1. Highlight the SCZP401 server and select System (Sysplex) Time.
- 2. Click the STP Configuration tab.
- 3. Enter the required STP ID (in our case ITSOPOK) in the Coordinated Timing Network ID field (Figure 4-11). Click **Apply**.

Sys	System (Sysplex) Time for SCZP401								
Timing Network	Network Configuration	STP Configuration	STP Status	ETS Configuration					
ID is to t CTN to t	be changed, ma be joined.	he CTN ID is cas ake sure that the ork ID ITSOPOK	ID exactly						
Refresh	Cancel Hel								

Figure 4-11 STP Configuration tab (SCZP401)

This displays the Local Coordinated Timing Network ID Change Confirmation, message ACT37363 (Figure 4-12).

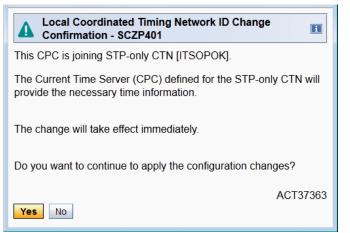


Figure 4-12 Message ACT37363 - Local CTN ID Change (SCZP401)

**Note:** The word *local* is included in this window to indicate that this change only applies to the selected server. It is *not* a global change, and thus it will *not* be propagated automatically throughout the CTN.

4. Confirm by clicking **Yes**. This displays the Local Coordinated Timing Network ID Change, message ACT37315 (Figure 4-13). Click **OK**.

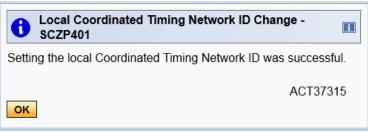


Figure 4-13 Message ACT37315 - CTN ID change success (SCZP401)

The new server, SCZP401, is now a member of the CTN ITSOPOK. From the STP Status panel the following can be confirmed for server SCZP401 (Figure 4-14):

- ► Server SCZP401 Timing state is Synchronized.
- ► Server SCZP401 is Stratum level 2.
- Server SCZP401 is connected to server SCZP301 through 6 CHPIDs (2 physical links) and to server SCZP201 through 4 CHPIDs (2 physical links).

iming Netw Network Confi	ork iguration	STP Cont	figuration	STP Status	ETS Config	uration					
iming state:			Synchron	zed							
Jsable clock so	ource:		Yes								
Fiming mode:			STP (Serv	/er Time	Protoco	ol)					
Stratum level:			2								
/laximum timing	g stratum	level	:3								
Maximum STP	version:		4								
- System Informa	tion ——										
Local STP			Remote D	irectly At	tached	System	Systen	n	Stratum	Active STP	Maximum STP
Link Identifier	(s)		Type-MFC	-Plant-S	equenc	e	Name		Level	Version	Version
	[(070E,0710,072B)], [(070F,0711,072C)] 002817-				M-02-0000000B3BD5		SCZPS	301	1	4	4
[(0704,0725)],	[(0708,07	26)]	002097-IB	M-02-00	000001	DE50	SCZP2	201	2	4	4
- Local Uninitializ	ed STP Lin	ks -									
Local STP	STP Link			Deeco	Codo	Reason	Code				
Link Identifier		•		Sent	I Code	Receive					
0700		over	InfiniBand			Reconc	, d				
0701			InfiniBand								
0702			InfiniBand								
0703	Coupling	over	InfiniBand	Offline							
0705	Coupling	over	InfiniBand	Offline							
0706	Coupling	over	InfiniBand	Offline							
0707	Coupling	over	InfiniBand	Offline							
0709	Counting		InfiniBand	Offline							

Figure 4-14 STP status of server SCZP401 after joining the CTN ITSOPOK

#### Assigning the Arbiter role to server SCZP401

Since the Arbiter-assisted recovery can be considered a more robust recovery mechanism, it is suggested to assign this role to the newly configured server in the CTN. More detailed planning considerations may need to be done in order to decide which role will be placed on which server; in this example the Arbiter role will be placed on the newly added server SCZP401.

Assigning the Arbiter is a global network configuration change and needs to be performed from the designated Current Time Server. At the HMC workplace, perform the following steps:

- 1. Highlight the SCZP301 (CTS) server and select System (Sysplex) Time.
- 2. Click the Network Configuration tab.
- 3. Select server SCZP401 from the Arbiter pull-down menu (Figure 4-15).
- 4. Select Apply.

System (Sysplex) Time for SCZP301						
Timing Network Configuration	STP STP ETS Configuration Status Configuration					
Current Network Configuration	on					
Configured at (UTC):	9/23/12 12:28:45 AM					
Preferred time server (CP	C) SCZP301 (STP ID: ITSOPOK)					
Backup time server (CPC)	SCZP201 (STP ID: ITSOPOK)					
Arbiter	SCZP401 (STP ID: ITSOPOK)					
□Only allow the server(s) □ <u>F</u> orce configuration Current Time Server (CPC)	specified above to be in the CTN					
● <u>P</u> referred time server     ○ <u>B</u> ackup time server (C)						
Coordinated timing networ	rk ID ITSOPOK					
Apply Initialize Time	Deconfigure					
Refresh Cancel Help						

Figure 4-15 Assigning server SCZP401 as Arbiter

5. Select Yes on the configuration change confirmation panel (Figure 4-16).

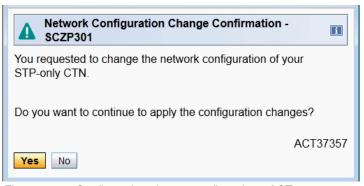


Figure 4-16 Configuration change confirmation - ACT37357

6. Select **OK** on the final confirmation message (Figure 4-17 on page 117).

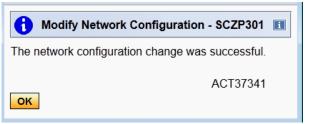


Figure 4-17 Configuration change confirmation - ACT373341

# 4.3 End point

The topology diagram of our sample configuration has been updated to include the new server (SCZP401) operating in STP timing mode (Figure 4-18).

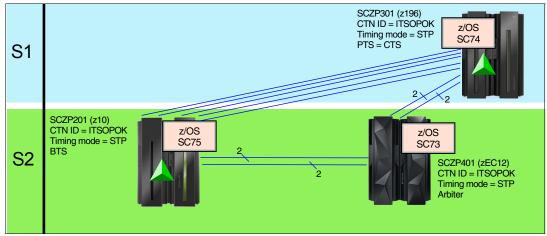


Figure 4-18 STP Implementation environment - STP-only CTN with new server (SCZP401)

There are six coupling channels (two physical links) between the existing server, SCZP301, and the new server, SCZP401, as evidenced by various HMC workplace displays.

The new server, SCZP401, is receiving timing messages from SCZP301 (Stratum 1) and from SCZP201 (Stratum 2) over the Coupling Facility links.

The STP clock selection algorithms favor a Stratum 1 server over a Stratum 2 server as the preferred clock source, so SCZP401 selects SCZP301 as its timing source and enters the CTN as a Stratum 2.

z/OS image SC73 is now IPLed on SCZP401 to issue z/OS commands.

#### 4.3.1 z/OS DISPLAY ETR command

Figure 4-19 shows the output from the DISPLAY ETR command entered on the SC73 image, on SCZP401.

D ETR IEA386I 16.48.33 TIMING STATUS 712 SYNCHRONIZATION MODE = STP THIS SERVER IS A STRATUM 2 THIS IS THE ARBITER SERVER CTN ID = ITSOPOK THE STRATUM 1 NODE ID = 002817.M32.IBM.02.000000B3BD5 NUMBER OF USABLE TIMING LINKS = 10

Figure 4-19 DISPLAY ETR - SC73 image on SCZP401, STP-only CTN

This display shows that SC73 is resident on a server operating in STP timing mode as a Stratum 2. It is participating in an STP-only CTN with a CTN ID of [ITSOPOK] - [] and has ten links available for timing messages (six CF channels through two physical links to SCZP301 and four CF channels through two physical links to SCZP201).

#### 4.3.2 z/OS DISPLAY XCF command

Figure 4-20 shows the output from the z/OS DISPLAY XCF command entered on the SC73 image, on TC8M.

16.57.37 DI	SPLAY	XCF 966		
PLEX75				
TYPE SERIAL	. LPAR	STATUS TIME	SYSTEM STATUS	
2817 3BD5	2C	09/23/2012 16:57:35	ACTIVE	TM=STP
2097 DE50	1C	09/23/2012 16:57:34	ACTIVE	TM=STP
2827 B8D7	1A	09/23/2012 16:57:37	ACTIVE	TM=STP
	PLEX75 TYPE SERIAL 2817 3BD5 2097 DE50	PLEX75 TYPE SERIAL LPAR 2817 3BD5 2C 2097 DE50 1C	TYPE SERIAL LPAR STATUS TIME2817 3BD52C09/23/201216:57:352097 DE501C09/23/201216:57:34	PLEX75         Serial LPAR STATUS TIME         System Status           2817         3BD5         2C         09/23/2012         16:57:35         ACTIVE           2097         DE50         1C         09/23/2012         16:57:34         ACTIVE

Figure 4-20 DISPLAY XCF - SC72 image on TC8M, STP-only CTN

This display shows that all z/OS images in the sysplex configuration are resident on servers operating in STP timing mode. Each of these z/OS images is resident on a separate server, as evidenced by the different serial numbers.

#### 4.3.3 System (Sysplex) Time tabs

The tabs discussed in this section are available on the System (Sysplex) Time selection for each server. Only the tabs for the SCZP401 server are shown.

#### **Timing Network tab**

Figure 4-21 shows the Timing Network tab for the SCZP401 server.

👼 Syst	em (Sysplex) 1	Time for SCZP4	401		E
Timing Network	Network Configuration	STP Configuration	STP Status	ETS Configuration	
Coordinat	ed Server Time -				
Time:	8:32:53 PM				
Date:	9/22/12				
	. ,	Eastern Time (	US & Car	ada) (EST/ED	T)
Currently	EDT				
Offsets -					
Leap sec	ond:	2	5		
Time zon	e offset from U	TC: -	5 : <b>00</b>		
Daylight s	saving time (ho	urs : minutes):1	: 00		
- Network -					
Timing ne	etwork type:	S	TP-only (	CTN	
Coordina	ted timing netw	ork (CTN) ID: IT	SOPOK	-	
CTN time	source:	N	TP		
NTP strat	tum level:	2			
Adjustmer	nt Steering	Adjust Time	Adjust Lea	ap Seconds	Adjust Time Zone
Refresh	Cancel Help				

Figure 4-21 Timing Network tab (SCZP401)

This shows that the SCZP401 server is now in an STP-only CTN with a CTN ID of [ITSOPOK] - []. The same tab is shown on all servers in the STP-only CTN. However, only the Current Time Server has the Adjust Time, Adjust Leap Seconds, and Adjust Time Zone tabs enabled.

The CTN time source field indicates that the time initialization of this CTN is through the Stratum 2 NTP server.

The leap second offset (set to 25), the time zone offset and the current Daylight saving time offset are shown. These may be modified using the **Adjust Leap Seconds** and **Adjust Time Zone** buttons accordingly (only available on the Current Time Server).

#### **Network Configuration tab**

Figure 4-22 shows the Network Configuration tab for the SCZP401 server.

System (Sysplex) Time for SCZP401						
Timing Network Configuration	STP Configuration	STP ETS Status Con	figuration			
Current Network Configura	tion ———					
Configured at (UTC):		3:20:01 PM				
Preferred time server (CF	<sup>PC)</sup> (SCZP301 (S	STP ID: ITSOP	ок) 🔳			
Backup time server (CPC	;) SCZP201 (S	STP ID: ITSOP	ок) 🔳			
Arbiter	SCZP401 (S	STP ID: ITSOP	ок) 🔳			
□Only allow the server(s) □Force configuration □Current Time Server (OPC		e to be in the C	TN			
<ul> <li>● Preferred time server</li> <li>○ Backup time server (</li> </ul>	· /					
Coordinated timing netwo	rk ID ITSOPOK		-			
Apply Initialize Time	Deconfigure					
Refresh Cancel Help						

Figure 4-22 Network Configuration tab (SCZP401)

This tab shows the server roles within the STP-only CTN and indicates which server is the Current Time Server. The CTN ID is also displayed. The same tab is shown on all servers in the STP-only CTN.

The Preferred Time Server, Backup Time Server, Arbiter, Current Time Server, and CTN ID fields may all be modified from this tab. However, the modifications are only accepted if they are performed on the server that *is going to become the CTS* once the network reconfiguration is complete.

Modifications performed from the Network Configuration tab are *global* and, as such, are propagated throughout the STP-only CTN.

The CTN ID can be changed to either of the following:

- Specify a different STP ID for the STP-only CTN.
- ► Define an ETR Network ID that will migrate the STP-only CTN to a Mixed CTN.

#### **STP Configuration tab**

Figure 4-23 shows the STP Configuration tab for the SCZP401 server.

System (Sysplex) Time for SCZP401							
Timing Network	Network Configuration	STP Configuration	STP Status	ETS Configuration			
	hanged, make	e CTN ID is case sure that the ID e					
Coordinat	ted timing netwo	ork ID <b> </b> TSOPOK		-			
Apply	Save STP Debu	g Data					
Refresh	Cancel Hel	p					

Figure 4-23 STP Configuration tab (SCZP401)

This tab shows that the SCZP401 server is in an STP-only CTN with a CTN ID of [ITSOPOK] - [], where ITSOPOK is the STP ID.

#### **STP Status tab**

Figure 4-24 shows the STP Status tab for the SCZP401 server.

iming Net Jetwork Cor	twork nfiguration	STP Configuration	STP Status	ETS Conf	iguration					
Timing state:		Synchroni:	zed							
Jsable clock s	source:	Yes								
Timing mode:		STP (Serv	er Time P	rotoco	d)					
Stratum level:		2								
Maximum timi	ng stratum le	evel: 3								
Maximum STF		4								
- System Inforn	nation ———									
Local STP Remote Dire							n			Maximum STP
· · · · · · · · · · · · · · · · · · ·				-Plant-Sequence Nam				Level	Version	Version
[(0704,0725)],[(0708,0726)] 002097-IE			3M-02-000	-02-00000001DE50 SCZP201		201	2	4	4	
[(070E,0710 [(070F,0711,		002817-IE	3M-02-000	00000	B3BD5	SCZP	301	1	4	4
- Local Uninitia	lized STP Lin	iks —								
Local STP	STP Link		Reason	Code	Reason	Code				
Link Identifie	r Type		Sent		Receive	d				
0700	Coupling	over InfiniBand	Offline							
0701	Coupling	over InfiniBand	Offline							
0702	Coupling	over InfiniBand	Offline							
0703	Coupling	over InfiniBand	Offline							
0705		over InfiniBand								
0706		over InfiniBand								
0707		over InfiniBand								
0709		over InfiniBand								

Figure 4-24 STP Status tab (SCZP401)

The SCZP401 server is shown to be synchronized in the STP-only CTN as a Stratum 2 server.

The Remote Directly Attached Systems section shows connectivity to other STP-configured servers. The SCZP301 server is the Stratum 1 server, and the SCZP201 server is a Stratum 2.

# Part 2

# **CTN** operations

This part discusses z/OS commands and Hardware Management Console (HMC) windows that are available to display or manage either a Mixed CTN or an STP-only CTN. The three chapters included in this part are:

- ► Chapter 5, "Operations in an ETR and Mixed CTN" on page 125
- ► Chapter 6, "Operations in an STP-only CTN" on page 153
- Chapter 7, "Operational considerations" on page 243

# 5

# Operations in an ETR and Mixed CTN

A Mixed Coordinated Timing Network (CTN) is a timing network that contains a collection of servers and has at least one Server Time Protocol (STP)-configured server stepping to timing signals provided by the Sysplex Timer. The STP-configured servers not stepping to a Sysplex Timer achieve synchronization by exchanging STP messages. The CTN ID contains a valid STP Network ID and an External Timer Reference (ETR) network ID.

This chapter discusses the following topics:

- Minimum requirements
- Monitoring the Mixed CTN using the HMC
- Monitoring the Mixed CTN using z/OS commands
- Configuring a Mixed CTN
- CTN configuration changes
- Time management: various considerations to be aware of while operating in a Mixed CTN environment
- Local time changes

## 5.1 Minimum requirements

When a Mixed CTN configuration is active, the Sysplex Timer provides the timekeeping information. The minimum requirements to configure a Mixed CTN are:

► There must be at least one STP-enabled server to configure a Mixed CTN.

**Important:** To avoid a single point of failure in a Mixed CTN, have a minimum of two STP-configured servers stepping to timing signals received from the Sysplex Timers before configuring any other server using STP messages for synchronization.

- ► The STP-enabled server or CF must be attached to a Sysplex Timer, or a pair of Sysplex Timers configured in an Expanded Availability configuration.
- The STP-enabled server or CF must be configured with the same CTN ID, with the format: [STP Network ID] - [ETR Network ID]

Given these requirements, in a typical Mixed CTN environment there are:

- One or more STP-configured servers synchronized to the Sysplex Timers through ETR links. These servers are Stratum 1 servers in ETR timing mode.
- One or more STP-configured servers synchronized to either a Stratum 1 or Stratum 2 server by exchanging STP messages through coupling links. Stratum 2 and Stratum 3 servers are in STP timing mode.

**Note:** Non-STP capable servers might also be time synchronized from the same Sysplex Timers but are not part of the Mixed CTN. They are not discussed in the ensuing examples.

## 5.2 Monitoring the Mixed CTN using the HMC

In a Mixed CTN, the Sysplex Timer console provides the user interface for all time-related functions, such as time initialization, time adjustment, and so on. This is not different from the operations in an ETR network. However, the HMC is used to initialize or modify the CTN ID. The HMC can also be used to configure the ETS prior to a STP-only migration.

**Restriction:** The information in this section refers to servers z10, z9, z990 and z890. Although newer servers, such as z196, z114, and zEC12, can stiil be part of a mixed CTN, these servers are only supported in the same CTN with z10 servers. For more details, refer to Chapter 2, "Planning hardware and software", and Chapter 3, "Operations", in *Server Time Protocol Planning Guide*, SG24-7280.

The features installed on the server determine the tabs that are available on the System (Sysplex) Time task:

► If only the ETR feature is installed, the System (Sysplex) Time task displays:

ETR Configuration and ETR Status

- If the ETR feature and the Server Time Protocol (STP) feature are both installed, the System (Sysplex) Time task displays:
  - For the z890 and z990 driver 55 K:

- Timing Network
- Network Configuration
- ETR Configuration and ETR Status
- STP Configuration and STP Status
- For the System z10 at driver 76D (and 79F) and System z9 at driver 67L:
  - Timing Network
  - Network Configuration
  - ETR Configuration and ETR Status
  - STP Configuration and STP Status
  - ETS Configuration
- If only the Server Time Protocol (STP) feature is installed, the System (Sysplex) Time task displays the following tabs:
  - For the z890 and z990 driver 55 K:
    - Timing Network
    - Network Configuration
    - STP Configuration and STP Status
  - For the System z10 at driver 76D (and 79F) and the System z9 at driver 67L:
    - Timing Network
    - Network Configuration
    - STP Configuration and STP Status
    - ETS Configuration
- If neither the ETR nor the STP feature is installed, the System (Sysplex) Time task is not available.

Although invoking the System (Sysplex) Time task is not disruptive to logical partitions, the Secondary Object Notification for Disruptive Task message displays whenever the task is called (Figure 5-1). This message reminds the user that time configuration commands can potentially be disruptive to operating system images on the target server.

	ATTENTION!	
Task:	System (Sysplex) Time	
One or more of the o by this task.	bjects to be targeted for the selected task have associated	secondary objects that will also be affected
Review the list of se	considered to be disruptive and will also cause disruption condary objects that will also be affected before continuing the task, understanding that secondary objects listed w e task.	this task.
Secondary Object N	ame Operating Status	
SCZP201:A0A	Not Operating	
SCZP201:A0B	Not Operating	
SCZP201:A0C	Not Operating	L
SCZP201:A0D	Operating	
SCZP201:A0E	Operating	
SCZP201:A0F	Operating	
SCZP201:A01	Not Operating	
SCZP201:A02	Operating	
SCZP201:A03	Not Operating	
	Operating	l

Figure 5-1 Secondary Object Notification for Disruptive Task

The following sections provide a brief description of the tabs available in the System (Sysplex) Time task and the operations that can be performed through these tabs.

**Important:** When two or more servers are selected in the System (Sysplex) Time task, it is necessary to click **Refresh** to update the displayed configuration information for *all* servers.

## 5.2.1 Timing Network tab

Use this tab to view the settings of the timing network. This window displays overall timing information for the ETR network or Coordinated Timing Network (CTN), including the current date and time, local time offsets, and general timing network information.

This tab is display-only, and information displayed is the same for all servers in the same ETR network or Mixed CTN configuration (CTN and ETR ID information can only be entered or modified in the HMC).

Figure 5-2 shows the Timing Network tab for an STP-enabled server in an ETR network. Figure 5-3 shows the Timing Network tab for a server STP configured in a Mixed CTN.

ning twork	Network Configuration	ETR Configuration	ETR Status	STP Configuration	STP Status	ETS Configuration
	ed Server Time ——— 7:52 PM					
ate: 10/						
Offsets –	ond: 24					
Total time	(hours : minutes): -4 : (	00				
– <i>Network</i> Timina ne	twork type:	ETR				
	ed timing network (CTN	그는 것은 것은 국민이들은 이 가슴이 가슴 것은				

Figure 5-2 Timing Network tab - ETR network

iming letwork	Network Configuration	ETR Configuration Sta	R STP atus Configuration	STP Status	ETS Configuration
Coordinat	ed Server Time				and the second
Date: 10/					
- Offsets –					
Leap seco Total time	nd: 24 (hours : minutes): -4 : (	00			
– Network -	(				
Timing ne	twork type:	Mixed CTN			
Coordinate CTN time	ed timing network (CTN	N) ID: ITSOPOK - 31 Sysplex Timer conn	action		Geller Steller
	30010C.	Syspiex Timer conin	ecuon		

Figure 5-3 Timing Network tab - Mixed CTN

The information displayed on this tab is:

- ► Coordinated Server Time: The local time and date for the ETR network or Mixed CTN.
- Offsets: The current offsets for an ETR network or a Mixed CTN. If the network is uninitialized, all values are zero.
  - Leap second displays the current number of leap seconds in effect for the network.
  - Total time displays the total time offset between current local time and Coordinated Universal Time (UTC). This includes the current time zone and daylight saving time offset set at the Sysplex Timer console.
- Timing network type displays in which type of network the server is participating. In an ETR network or Mixed CTN, the possible values are:
  - ETR: Directly attached to Sysplex Timers. The Sysplex Timer provides the time information.
  - Mixed CTN: Directly attached to Sysplex Timers or attached to an STP-capable server. The Sysplex Timer provides the time information.
- Coordinated Timing Network (CTN) ID displays the ID for the Coordinated Timing Network that the server is participating in. The format is [STP ID] - [ETR ID].

If the server is not a member of any timing network, there is no value in this field. If a server is a member of an ETR network, the STP ID is blank (Figure 5-2 on page 128). If a server is a member of a Mixed CTN, both STP ID and ETR ID are not blank (Figure 5-3 on page 129).

- CTN time source identifies the clock source according to the STP facility. CTN time source is not displayed for an ETR network. When the server is in a Mixed CTN, the possible values are:
  - Sysplex Timer connection: The time source is the Sysplex Timer.
  - Uninitialized: if the server is set up in a Mixed CTN but the time source has not yet been assigned.

When a migration from an STP-only CTN has been initiated, possible values are:

 Migration from an STP-only CTN to a Mixed CTN is in progress: A migration procedure is currently running, but the server is still in an STP-only CTN. The transition from STP-only to Mixed CTN only occurs when the procedure completes.  Migration from an STP-only CTN to a Mixed CTN failed to complete: A migration procedure has stopped due to a problem or has been cancelled by the user. The CTN remains an STP-only CTN.

## 5.2.2 Network Configuration tab

In a Mixed CTN, the Network Configuration tab is only used to initiate the migration to an STP-only CTN.

Figure 5-4 shows the Network Configuration tab in a Mixed CTN. The Apply button is enabled, but none of the server roles are defined, and the following are disabled:

- ► The Coordinated Timing Network (CTN) ID field
- ► The Initialize Time button
- ► The Deconfigure button
- The Cancel Migration to Mixed CTN button

ming etwork	Network Configuration	ETR Configurat	ion Status	STP Configuration	STP Status	ETS Configuration	sc.
Configured	etwork Configuration —						
Preferred t	ime server (CPC) No	t configured	-	Ν			
		t configured	-				
Arbiter	No	t configured	-				
🗆 Only al	low the server(s) spec	cified above to b	e in the CTN		>		
Eorce c	configuration				1		
	ime Server (CPC)						
Contraction in the second second	ed time server (CPC) p time server (CPC)						
Coordinate	ed timing network ID	TSOPOK	- 31				
and the part		)econfigure		on to Mixed CTN			

Figure 5-4 Network Configuration tab

The Apply button is used to configure server roles and to initiate the migration from a Mixed CTN to STP-only CTN.

When a Mixed CTN is *already* configured, and a valid server is selected from the Preferred Time Server drop-down menu, clicking **Apply** causes the entire CTN to globally transition from a Mixed CTN to a STP-only CTN.

Note: Configuration changes made in this window affect all servers in the CTN.

The information on the Network Configuration tab is the same for all servers participating in the CTN. However, when the HMC being used does not have connectivity to all servers' Support Elements (SEs) in the CTN, there might be differences in the way the information displays on the Network Configuration and the STP Status tabs.

## 5.2.3 ETR Configuration tab

The ETR Configuration tab only displays when ETR cards are installed in the server. Configuration changes made on this window only affect this particular server. They are *not* globally applied to the entire CTN.

This tab is used to configure the ETR Attachment Facility (EAF) ports in the server. The ETR Attachment Facility provides two ports that allow the server to synchronize to the Sysplex Timer. It is possible to set and display the state for each EAF port and the ETR Network ID for both EAF ports:

► ETR Network ID: specifies the External Timer Reference network ID of the attached Sysplex Timers. The network ID is a decimal number of 0 – 31. It indicates the Sysplex Timer network to which the EAF must be synchronized.

If a network ID is not specified, the server is not configured to be part of an ETR network or Mixed CTN.

When a server leaves a Mixed CTN and joins an STP-only CTN, the ETR Network ID value is removed.

- Port 0 State and Port 1 State can be enabled or disabled.
  - Enabled: allows the ETR Attachment Facility port to be operational.

Figure 5-5 shows the view from a server in a Mixed CTN that is in ETR timing mode. In ETR timing mode, the ETR ports are normally enabled.

In a Mixed CTN, successfully enabling Ports 0 and 1 changes the timing mode from STP to ETR. The server switches from Stratum 2 to Stratum 1.

👼 System (S	ysplex) Time							i
Timing Network Conf		figuration	ETR Status	STP Configuration	STP Status	ETS Configuration		SCZP201
ETR network ID	31 (in de	ecimal)						
Port 0 State © Enabled © Disabled © Off © Test Wrap Test Note: To perform Attention: A por	Enabled     Disabled     Off     Ofest     Wrap Test n a Wrap Test, s t can be operati				ID is ente	red and the por	ťs	
manual state is Apply Reset		Link Error Th	nreshold					

Figure 5-5 ETR Configuration tab - Server in ETR timing mode

- Disabled: prevents the ETR Attachment Facility port from being operational. The EAF port is allowed to enter the semi-operational state, and the control program can read information being transmitted.
- Off: prevents the ETR attachment facility from using this port.
- Test: used to perform a wrap test (wrap plug must be available)

For a server that is in STP timing mode, the ETR ports are disabled (Figure 5-6).

Provided that the server has STP connectivity to another server in the Mixed CTN, disabling ports 0 and 1 changes the timing mode from ETR to STP. The server switches from Stratum 1 to Stratum 2 or 3.

Syst	em (Sysplex) T	īme					i
Timing	Network	ETR	ETR	STP	STP	ETS	SCZP201
Network ETR netw	Configuration ork ID 31 ate Port 1 Sta	Configuration	Status	Configuration	Status	Configuration	SCZP101
O <u>E</u> nabl ⊙ <u>D</u> isab ⊙ <u>O</u> ff	ed OE <u>n</u> able	ed					
O Test							
Attention:	A port can be c ate is 'Enabled'		hen a vali		ID is ente	ered and the port's	5
Refresh	Cancel Help	1					

Figure 5-6 ETR Configuration tab - Server in STP timing mode

The Reset ETR button re-initializes the ETR Attachment Facility (EAF) ports without a power-on reset of the entire server.

The re-initialization of the ports is only necessary if the EAF has been determined to be in a solid hard error state after reaching the error threshold. Note that as long as the ports are fenced, their state can be displayed as semi-operational on the ETR Status tab.

After the problem has been fixed, a reset of the EAF ports is needed to allow them to become operational again. If the ports do not require re-initialization and the **Reset ETR** button is clicked, message ACT37308 displays (Figure 5-7).

Beset ETR	
The ETR attachment facility (EAF) ports were not needed.	not reset. A reset was
	ACT37308
OK	

Figure 5-7 Message ACT37308 - Reset ETR

The Reset Link Error Threshold button is used to reset the link error threshold and error time stamps and collect ETR error data.

The link error threshold and error time stamps are used to prevent posting the same link error codes within a 24-hour period. However, when ETR link problems are being repaired, it is important to know whether a problem still exists. Resetting the link error threshold and error time stamps ensures that the immediate result of a repair action is observed.

Selecting this button also collects ETR data used to resolve ETR and Sysplex Timer problems. This data is collected concurrently. After this button is clicked, message ACT37309 displays (Figure 5-8).

🔒 Reset Link Erro	Threshold	
The link error threshol	was reset successfully. ACT37309	
ок		

Figure 5-8 Message ACT37309 - Reset Link Error Threshold success

## 5.2.4 ETR Status tab

This tab displays the status of the ETR Attachment Facility ports that attach Sysplex Timers to the server. The ETR Status tab displays the ETR status word, ETR data word 1 of each EAF port of a Sysplex Timer, and the ETR card status. This tab only displays when the ETR feature is installed in the server.

This is a display-only tab. Any modifications to the ETR configuration, such as setting the ETR Network ID and ETR unit IDs, must be done using the Sysplex Timer console.

- ETR Status Word displays the current configuration of the ETR Attachment Facility ports sent by the Sysplex Timer. The information displayed indicates the state or mode of the ETR Attachment Facility ports.
  - Attachment control register indicates the current value in the ETR attachment control register.
  - Stepping mode identifies which mode is used to synchronize the time of day (TOD) clock. The stepping mode can be either ETR stepping or local.
  - EAF stepping port number indicates the port number for the ETR Attachment Facility stepping mode. When the EAF is in ETR-stepping mode, the stepping port number displays. When the EAF is in the local-stepping mode, the stepping port number displayed is zero.
  - Port state (0, 1) indicates whether the EAF port is available to the selected system for synchronizing its TOD clock with the attached Sysplex Timer.
- ETR Data Word 1 (Port 0, 1) displays data of the ETR Attachment Facility (EAF) ports as sent by the Sysplex Timer. The information displays link-connection information.
  - ETR Network ID (in decimal) identifies the ETR network of the Sysplex Timer to which the ETR Attachment Facility ports are connected.
  - ETR ID (in decimal) identifies the Sysplex Timer that sends the ETR-data word.
  - ETR port number (in decimal) identifies the port number of the Sysplex Timer output port that sends the ETR-data word.
- ETR Card Status displays the status of the External Timer Reference card installed in the server. This field indicates whether the port is able to receive and process optical signals from its attached Sysplex Timer.

The *state* of a port describes its ability to communicate with its host system. The *status* of a port describes its ability to receive and process signals from its attached Sysplex Timer.

To synchronize the TOD clock of the selected system, a port must be able to communicate with the system, and it must be able to receive and normally process optical signals from

its attached Sysplex Timer. A port meets these requirements when its state is operational and its status is *light detected*, respectively.

The port statuses are:

- Light detected: indicates that the EAF port is receiving optical signals from the Sysplex Timer and is processing them normally
- Loss of light: indicates that the EAF port is not receiving an optical signal from the Sysplex Timer, or it is receiving a signal that is too weak to process

Information displayed varies slightly depending on whether the server is in ETR timing mode or in STP timing mode.

- ► For a server in ETR timing mode (Figure 5-9):
  - ETR Status Word  $\rightarrow$  Stepping Mode is ETR stepping.
  - ETR Status Word  $\rightarrow$  Port 0 State and Port 1 State shows Operational.
  - The ETR port number in the ETR Data Word sections reflects the Sysplex Timer port to which the two server ports are cabled.

ning twork	Network Configuration	ETR Configuration	ETR Status	STP Configuration	STP Status	ETS Configuration	sci
	nt control register: C8	C7					
Stepping I	node: ET bing port number: 0	R stepping					
Port 0 stat		erational					
Port 1 stat		erational					
ETR Data	Word 1 - Port 0						1 day
	ork ID (in decimal):	31					
	n decimal): number (in decimal):	1					
		· · · · · · · · · · · · · · · · · · ·					
	Word 1 - Port 1	31					1 days
	i a contratiji	0					1.45
ETR port i	number (in decimal):	1					
ETR Card	The second s						
	us: Light detected us: Light detected						
onerotat	ao. Light deteoted	all and a second second					

Figure 5-9 ETR Status tab - Server in ETR timing mode

- ► For a server in STP timing mode (Figure 5-10):
  - ETR Status Word  $\rightarrow$  Stepping Mode is Local.
  - ETR Status Word → Port 0 State and Port 1 State shows Semi-operational because the ETR ports have been disabled.
  - The ETR port number in the ETR Data Word section reflects the Sysplex Timer port to which the two server ports are cabled.

iming letwork	Network Configuration	ETR Configuration	ETR Status	STP Configuration	STP Status	ETS Configuration	scz scz
ETR Statu Attachmen	s Word t control register: 08C4						
Stepping n							
Port 0 state	e: Semi-	operational					
Port 1 state	e: Semi-	operational					
11.7	Word 1 - Port 0 ork ID (in decimal): 31						
ETR ID (in	decimal): 0						
	umber (in decimal): 0						
	Word 1 - Port 1 ork ID (in decimal): 31						
ETR ID (in	decimal): 1 umber (in decimal): 0						
- ETR Card	and the second						
Port 0 statu	s: Light detected						
Port 1 statu	is: Light detected	Section Section Section					

Figure 5-10 ETR Status tab - Server in STP timing mode

### STP Configuration tab

The STP Configuration tab shows the Coordinated Timing Network ID for the server. In a Mixed CTN, the tab is used to enter the STP Network ID for the server in order to join a CTN or to remove the server from a CTN by blanking out the STP network ID. If a server with no ETR feature installed joins a Mixed CTN, the ETR ID is also specified on this tab.

Configuration changes made on this tab only affect this particular server. They are not applied to the entire CTN.

When migration from an STP-only CTN to a Mixed CTN has been initiated, the Apply button is disabled until the process is complete.

- Coordinated Timing Network ID: specifies the ID for the Coordinated Timing Network in which the server is participating. The form is [STP ID] - [ETR ID].
  - If the server is not a member of any timing network, there is no value in the fields.
  - If the server is participating in an ETR network, the CTN ID displays -[ETR ID].
  - If the server is participating in a Mixed CTN, the CTN ID displays [STP ID] [ETR ID].

**Note:** The valid characters for the STP ID are A - Z, a - z, 0 - 9, -, and \_. The STP ID is case-sensitive.

To join a Mixed CTN or STP-only CTN, a valid STP ID must be specified. To leave a Mixed CTN, the STP ID must be removed (nullified). This results in the server participating in an ETR network, if a valid ETR ID is specified, or no timing network.

When a server has the ETR feature installed, the ETR ID portion displays to assist the user, but a change is not allowed (Figure 5-11). To change the ETR ID, the ETR Configuration tab must be used.

When a server does not have the ETR feature installed, an ETR ID can be specified so that the server can participate in a Mixed CTN. The ID must be the same as the ETR Network ID of the Sysplex Timer that is the time source for the Mixed CTN, even though the server is not physically connected to the Sysplex Timer. To leave a Mixed CTN, the ETR ID must be removed. This results in the server participating in an STP-only CTN (if the STP ID is specified) or no timing network.

Save STP Debug Data button: collects data used for STP problem determination. The data is collected concurrently. The STP debug data file is automatically sent back to the IBM Service Support System.

ning twork	Network Configuration	ETR Configuration	ETR Status	STP Configuration	STP Status	ETS Configuration	SC SC
oordinat	ed timing network	ID ITSOPOK	al la constanta de la constanta.				
pply	Save STP Debug	Data					

Figure 5-11 STP Configuration tab

### STP Status tab

The STP Status tab is used to view the STP status information for a specific server. The information includes:

- Timing state: indicates the timing state in which the server is operating. The value can be unsynchronized, synchronized, or stopped. If it has a value other than synchronized, then the server is not actively participating in an ETR network or CTN.
- Usable clock source: indicates whether a usable clock source is available in order to synchronize the server TOD. The value is yes or no.
- Timing mode: indicates whether the TOD clock is attempting to synchronize to a timing network, and if so what type of network it is. In a Mixed CTN, the values can be ETR (external time reference), STP (Server Time Protocol), or local if a time source has not yet been configured.
- Stratum level: indicates the hierarchy of this server within the CTN. The value can be 1, 2, or 3. A stratum level of 0 indicates that the server has no time source. This line is not displayed when the server is in ETR timing mode and did not join a Mixed CTN yet.
- Maximum timing stratum level: contains a number indicating how far a server can be from the Stratum 1 and still be in a synchronized state. The maximum timing stratum level is 3.
- Maximum STP version: specifies a number indicating the maximum level of STP facility code supported by this server.
- System Information: This table identifies the remote servers that are directly attached to this server for STP purposes.

This server's coupling links or time-only links that are initialized to transport STP messages are listed using the PCHID addresses and are grouped according to the system that is directly attached to the links. Additionally, the stratum level, active STP version, and maximum STP version for each directly attached system is shown.

Servers with different maximum STP versions can coexist in the same CTN. When the local and remote servers do not have the same maximum STP version installed, communication between the servers uses the lowest version installed. The STP version used is indicated in the active STP version column.

Connecting the information provided in this table from all servers in the STP-only CTN can help build a topology diagram of the CTN at that precise moment in time. If a CTN reconfiguration command has been applied from any other tab in the System (Sysplex) Time task, it is necessary to first click **Refresh** to ensure the validity of the information displayed.

Local Uninitialized STP links: This table identifies all possible coupling links defined in the Input Output Configuration Data Set (IOCDS) that might be used by this server to exchange STP messages.

All links in this table are in the uninitialized state. The table shows the STP link identifier (physical channel ID (PCHID) without any channel path identifier (CHPID) information), link type, the reason code sent, and the reason code received. The reason code (for example, offline or link failure) identifies the reason that STP has not initialized the link. The help function is available to look up any specific reason code.

The STP Status tab is display-only and appears slightly different depending on whether it is addressing a server that is in ETR timing mode or a server in STP timing mode.

On a server in ETR timing mode, timing mode is ETR (External Time Reference) and Stratum level is 1 (Figure 5-12).

ning twork	Network Configuration	ETR Configuration	ETR Status	STP Configuration	n STP Status	ETS Configuration
iming state:	Svn	chronized				
Isable clock s						Self Street
Timing mode:	ETF	(External Time Refe	erence)			
Stratum level:	1					
Maximum timir	ng stratum level: 3	and the second state of the second				Section 2 Section
Maximum STP	version: 4					
– Svstem Inforn	nation		(1997) 1997)			
Local STP	and the first of the second	ttached System Sys	tem St	atum Active ST	<b>FP</b> Maximum ST	P
	(s) Type-MFG-Plant-			vel Version	Version	
0118,03D8		0000001DE50 SC	ZP201 1	4	4	
				<u>ter des entres</u>		
– Local Uninitial	ized STP Links STP Link	Reason Code	Deer	on Code	<u>Alla Maria ana a</u> ng katalan kata	
Link Identifier		Sent	Rece			
0019	Coupling-peer	Offline	nece	iveu		~
001B	Coupling-peer	Offline				<b>—</b> 1
001E	Coupling-peer	Configuration e	error			
0029	Coupling-peer	Offline	,			
002B	Coupling-peer	Offline				
002E	Coupling-peer	Configuration e	error			
	Coupling-peer	Offline				
0110						

Figure 5-12 STP Status - Server in ETR timing mode

On a server in STP timing mode, timing mode is STP (Server Time Protocol). The Stratum level value can be 2 or 3. In the example in Figure 5-13, the Stratum level is 2.

	Network Configuration	ETR Configuration	ETR Status	STP Configur	ation	STP Status	ETS Configuration
iming state: Isable clock s iming mode: stratum level: Maximum timin Maximum STF System Inforr	ource: Yes STF 2 ng stratum level: 3 2 version: 4	chronized ? (Server Time Protoc	ol)	]			
Local STP	Remote Directly A (s) Type-MFG-Plant-	Attached System Syst Sequence Nan				Maximum STF Version	>
0111.0301	002094-IBM-02-0		P101 1	4		4	
10000000		0000020012 002		10000	1000 - 11 - 11 - 11 - 11 - 11 - 11 - 11	Statute (See	
<ul> <li>Local Uninitia</li> <li>Local STP</li> </ul>	lized STP Links STP Link	Reason Code	Dee	son Code		aliter de artes	
Link Identifier		Sent	Rece				
0014	Coupling-peer	Self-coupled se		neu			
0015	Coupling-peer	Self-coupled se					
001E	Coupling-peer	Link failure					
	Coupling-peer	Offline					
001F	Coupling-peer	Self-coupled se	rver				
001F 0034							
001F 0034 0035	1 01	Self-coupled se	iver				1.8 E
0034	Coupling-peer Coupling-peer	Self-coupled se Offline	iver				

Figure 5-13 STP Status tab - Server in STP timing mode

## 5.2.5 ETS configuration

With driver 67L on the System z9 and driver 76D or later on the System z10, the System (Sysplex) Time task is enhanced to support the use of NTP servers as external time sources in an STP-only CTN. To support both dial out and NTP, the user needs to configure which method will be used. The configuration of the ETS method will be done through the new ETS Configuration tab in the System (Sysplex) Time task shown here.

After the migration to an STP-only CTN, the external time source selection specified in the ETS Configuration window is only used to adjust the central processing complex (CPC) time if that SE is representing the Current Time Server (CTS). Despite that, the ETS Configuration window displays for all CPCs that support NTP, regardless the CTN type. That enables the ETS configuration of every existing CPC in a Mixed CTN before migrating to an STP-only network.

A newly installed CPC, which joins this Mixed CTN and becomes a CTS candidate when migrating to a STP-only configuration in the future, can also be configured at installation time. It is typical for the CTS to be the Preferred Time Server (PTS). If there is already a configured Backup Time Server (BTS), it is a very good idea to configure a viable ETS as well. There are three ETS types available (Figure 5-14):

- Selecting the Use dial out if configured on Hardware Management Console radio button specifies that the ETS is the dial out mechanism if configured on the HMC Customize Console Date/Time task.
- Selecting the Use NTP radio button displays the NTP Time Server Information table, which allows one or two NTP time servers to be configured. Once configured, the Query button tests the NTP Time Server's accesses and fills in the Stratum, Source, and Status fields.
- Selecting the Use NTP with pulse per second (PPS) radio button displays the NTP Time Server Information table, which allows one or two NTP time servers to be configured. Once configured, the Query button tests the NTP Time Server's accesses. The PPS Port, Stratum, Source, and Status fields will be filled. The PPS Port Status displays below the NTP Time Server Information table.

Timing Network	Network Configu		ation ETR Statu	STP Configurat	ion STI	tus (	TS Configuration
configu only if t <i>Extern</i> OUse oUse	iration is not his CPC is a <u>al Time Source</u> dial out if co <u>N</u> TP	utomatically becom required. Changes issigned the role of onfigured on Hardw ulse per second (PF	made to the E Preferred or B are Managem	TS configuratio ackup Time Se	on are save	ed and a	re used
1224 - 2011 - Sta	ime Server In	formation NTP Time Server	Stratum	Source	Status		
()	V	192.168.1.46	2	132.163.4.101			
0		192.168.1.48	2	132.163.4.101	Success		
Apply	Query Cancel H	elp					

See 1.1, "External Time Source" on page 4, for more information.

Figure 5-14 ETS Configuration tab - CTN not configured

Clicking **Apply** saves the configuration. The configured ETS can be used to adjust the CST once the CTN is migrated to STP-only. The message ACT39145 displays (Figure 5-15).

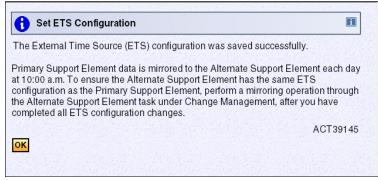


Figure 5-15 Message ACT39145 - Saved ETS configuration

In HMC menus, CPCs that do not support NTP (z990 and z890) do not display the ETS Configuration tab for the target CPCs. However, these servers can continue to be part of the STP-only CTN using an NTP server as the ETS.

## 5.3 Monitoring the Mixed CTN using z/OS commands

The output from various z/OS commands that display time-related information varies depending on:

- Which server is hosting the z/OS system
- The type of timing network
- The timing mode that the server is using

## 5.3.1 z/OS commands

In this section, we discuss the z/OS commands for monitoring a Mixed CTN.

### **DISPLAY ETR**

Prior to STP, the DISPLAY ETR (D ETR) command was used to display the synchronization mode and the status of the ETR ports seen by z/OS.

With STP support, the command itself has not changed and no new options have been provided. However, the output has been updated to support various STP environments and displays STP-related information where applicable.

#### Mixed CTN on a server in ETR timing mode

When a server has joined a Mixed CTN through the process of defining a CTN ID but is still directly synchronized to a Sysplex Timer, then the DISPLAY ETR command shows both Sysplex Timer related information and CTN ID information (Figure 5-16).

```
D ETR
IEA282I 14.48.26 TIMING STATUS 951
SYNCHRONIZATION MODE = ETR
 CPC PORT 0 <== ACTIVE
                               CPC PORT 1
 OPERATIONAL
                               OPERATIONAL
  ENABLED
                               ENABLED
  ETR NET ID=31
                               ETR NET ID=31
 ETR PORT=01
                               ETR PORT=01
 ETR ID=01
                               ETR ID=00
 THIS SERVER IS PART OF TIMING NETWORK ITSOPOK -31
```

Figure 5-16 z/OS DISPLAY ETR in a Mixed CTN with ETR timing mode

Note that the format is similar to the information returned from a DISPLAY ETR command issued in a ETR network configuration, except that an extra line is added to the output display to show the CTN ID.

In a Mixed CTN on a server in ETR timing mode, the DISPLAY ETR command shows that:

- ► The Synchronization Mode is ETR.
- ► An extra informational line indicates the CTN ID ([ITSOPOK] [31] in our example).

#### Mixed CTN on a server in STP timing mode

It is also possible to have servers in a Mixed CTN that are synchronized using STP messages, without an active connection to a Sysplex Timer. These servers can be either Stratum 2 or Stratum 3 servers in STP timing mode.

When a server is in STP timing mode in a Mixed CTN, the CTN ID contains both the STP ID and ETR Network ID components. Figure 5-17 on page 142 shows a DISPLAY ETR command example, where:

- Synchronization Mode is STP.
- Stratum Level is 2.
- ► The CTN ID contains both the STP ID [ITSOPOK] and the ETR Network ID [31].
- The number of usable timing links is 2.
- ► There is an indication that the server only has a single source of timing signals.

Although there are two coupling links initialized for STP, they are both connected to a single server. This indicates a single point of failure in the configuration. The DISPLAY ETR output in Figure 5-17 matches the information displayed on the STP Status tab in Figure 5-13 on page 138.

```
D ETR
IEA386I 14.51.27 TIMING STATUS 888
SYNCHRONIZATION MODE = STP
THIS SERVER IS A STRATUM 2
CTN ID = ITSOPOK -31
NUMBER OF USABLE TIMING LINKS = 2
THIS SERVER HAS ONLY A SINGLE SOURCE OF TIMING SIGNALS
```

Figure 5-17 z/OS DISPLAY ETR in a Mixed CTN with ETR timing mode

**Note:** The number of usable timing links is only displayed for a Stratum 2 or a Stratum 3 server that is hosting the z/OS image. The z/OS image on the Stratum 1 server does not show the number of usable timing links because the server does not rely on external STP links. For a Stratum 2 or Stratum 3 server, only STP *initialized* links to a Stratum 1 or a Stratum 2 are included in the number of usable timing links.

## SETETR PORT=n

The SETETR command can only be used to enable ETR ports that have been previously disabled by z/OS as a consequence of a hardware error. This command cannot be used when the server is in STP timing mode. If it is, the z/OS message IEA384I displays:

IEA384I SETETR COMMAND IS NOT VALID IN STP TIMING MODE

## DISPLAY XCF, SYSPLEX, ALL<sup>1</sup>

The DISPLAY XCF,SYSPLEX,ALL command displays the system status, timing mode, and the last recorded system status monitor time stamp for each system in the sysplex.

Figure 5-18 shows a Mixed CTN where:

- ► SC74 is in STP timing mode, as indicated by TM=STP.
- ► SC75 is in ETR timing mode, as indicated by TM=ETR.

```
D XCF,SYSPLEX,ALL

IXC335I 14.53.36 DISPLAY XCF 969

SYSPLEX PLEX75

SYSTEM TYPE SERIAL LPAR STATUS TIME SYSTEM STATUS

SC74 2097 DE50 2C 10/03/2009 14:53:33 ACTIVE TM=STP

SC75 2094 991E 1C 10/03/2009 14:53:36 ACTIVE TM=ETR
```

Figure 5-18 z/OS DISPLAY XCF,SYSPLEX,ALL in a Mixed CTN

## **DISPLAY CF**

The DISPLAY CF command does not directly provide information regarding the CTN type or timing mode of the server. However, the output displays the CF Request Time Ordering status. If the CTN is a Mixed CTN or STP-only CTN in a Parallel Sysplex® configuration, the requirement is that all servers support the Message Time Ordering Facility (MTOF).

<sup>&</sup>lt;sup>1</sup> For z/OS 1.13 and later, command syntax is **D** XCF, SYSPLEX, and the message id is IXC336I

Note: CF Request Time Ordering is also referred to as the MTOF.

The DISPLAY CF command can be used to verify whether MTOF is required and enabled (Figure 5-19).

D CF IXL150I 14.55.46 DISPLAY CF 975 COUPLING FACILITY 002094.IBM.02.00000002991E PARTITION: 2C CPCID: 00 CONTROL UNIT ID: FFFC NAMED CF7B COUPLING FACILITY SPACE UTILIZATION ..... CFCC RELEASE 15.00, SERVICE LEVEL 02.09 BUILT ON 04/30/2009 AT 14:18:00 COUPLING FACILITY HAS 1 SHARED AND 0 DEDICATED PROCESSORS DYNAMIC CF DISPATCHING: ON CF REQUEST TIME ORDERING: REQUIRED AND ENABLED .....

Figure 5-19 z/OS DISPLAY CF

STP requires that each coupling facility within a Parallel Sysplex is *enabled* for CF Request Time Ordering before migration of any server within the Parallel Sysplex to either a Mixed CTN or a STP-only CTN. If this is not the case, the coupling facility becomes unusable and all structures require rebuilding into a CF Request Time Ordering *enabled* coupling facility.

Figure 5-20 displays the other CF Request Time Ordering messages that could appear in the output of the DISPLAY CF command.

CF REQUEST TIME ORDERING: NOT-REQUIRED AND ENABLED CF REQUEST TIME ORDERING: NOT-REQUIRED AND NOT-ENABLED CF REQUEST TIME ORDERING: REQUIRED AND NOT-ENABLED CF REQUEST TIME ORDERING: REQUIRED AND WILL NOT BE ENABLED REASON: FUNCTION NOT INSTALLED ON THIS SYSTEM REASON: ETR NOT CONNECTED TO COUPLING FACILITY REASON: REQUEST TIME ORDERING FUNCTION FAILURE REASON: REQUEST TIME ORDERING NOT INSTALLED ON THIS SYSTEM REASON: ETR NETID MISMATCH - CF ETR NETID: etr netid REASON: CTNID MISMATCH - CF CTNID: cfstpid REASON: CF IS OUT OF SYNCH WITH TIMING NETWORK

Figure 5-20 Possible CF Request Time Ordering messages

## 5.3.2 Coupling facility commands

In a Parallel Sysplex environment, coupling facilities require time awareness to support CF Request Time Ordering (MTOF) when in a Mixed CTN or a STP-only CTN. The server TOD is used for this purpose.

Coupling facilities also support the concept of time zone offset, which is used only for the purpose of time stamping messages that are displayed on the console.

Unlike z/OS, there is no Coupling Facility Control Code (CFCC) command available to display the time. However, all messages that appear on the CF console include a time stamp in local time format, which is the server TOD with the time-zone offset applied.

Therefore, the current local date and time at the CF console can be indirectly determined by entering any command (valid or invalid) and reviewing the time stamp in the response.

Because the CF supports a local time format that incorporates the time-zone offset, it also provides methods to both display the current time-zone offset setting and to change it if required.

#### DISPLAY TIMEZONE

Use the CFCC DISPLAY TIMEZONE command to display the current time-zone offset being used by the coupling facility. This produces a single line indicating how many hours and minutes the current time zone is east or west of Greenwich mean time (Figure 5-21).

```
2009276 11:06:47 => DISPLAY TIMEZONE
2009276 11:06:47 CF0271I Timezone is 04:00 West of Greenwich Mean Time.
```

```
Figure 5-21 CFCC DISPLAY TIMEZONE command
```

#### TIMEZONE

The CFCC supports the TIMEZONE command, allowing the time-zone offset to be changed if this is a requirement. The syntax is:

TIMEZone {0|hh|hh:mm|:mm} {East|West}

Use this command to adjust the local time displayed in messages on the coupling facility console for the onset and removal of daylight saving time (Figure 5-22).

```
2009276 15:17:31 => TIMEZONE 05:00 west
2009276 14:17:31 CF0271I Timezone is 05:00 West of Greenwich Mean Time
```

```
Figure 5-22 CFCC TIMEZONE command
```

#### Coupling facility implications at daylight saving time changes

When a CF image partition is activated and the server is using Server Time Protocol or a Sysplex Timer source, the CFCC uses only one of the time offset options:

- ► The logical partition time offset specified in the image profile User Specified Time Offset
- The TIMEZ offset

The TIMEZ offset overrides the logical partition time offset. We recommend that the TIMEZ command be used for DST changes, as described in *Coupling Facility - TIMEZ Command during Daylight Saving Time Changes* at:

http://w3-03.ibm.com/support/techdocs/atsmastr.nsf/WebIndex/TD103077

## 5.4 Configuring a Mixed CTN

This section discusses how to configure a Mixed CTN starting from an ETR-only CTN.

## 5.4.1 CTN ID initialization

The Sysplex Timer is the time source in a Mixed CTN, so to avoid a single point of failure, at least two servers or CFs must be in ETR timing mode (Stratum 1). For the same reason, if Stratum 2 servers or CFs are configured in the Mixed CTN, each must be connected to at least two Stratum 1 servers or CFs, with at least two coupling links to each Stratum 1 server or CF.

When more than two servers or CFs are configured in a Mixed CTN, additional (STP) Stratum 1 servers (besides the two recommended) can be individually configured in STP timing mode. Changing the timing mode for a given server or CF is done by disabling its ETR ports from the ETR Configuration tab. (The procedure is described in 5.5.2, "Changing a server to STP timing mode" on page 147.)

Applying the STP Network ID as the first portion of the CTN ID activates a Mixed CTN. The STP Network ID is entered on the STP Configuration tab (Figure 5-23). The same CTN ID needs to be entered on every server that will participate in the Mixed CTN.

ming etwork	Network Configuration	ETR Configuration	ETR Status	STP Configuration	STP Status	ETS Configuration	SCZP SCZP
Coordina	ted timing network			31			
Apply	Save STP Debu	g Data	all all				

Figure 5-23 System (Sysplex) Time - STP Configuration tab

The CTN ID format is [STP Network ID] - [ETR Network ID]. If the server has the ETR feature installed, the ETR Network ID already assigned to the ETR network is grayed out and cannot be changed. Only the STP Network ID portion of the CTN ID is specified. When the configuration is applied, the Local Coordinated Timing Network ID Change Confirmation message ACT37361 displays (Figure 5-24).

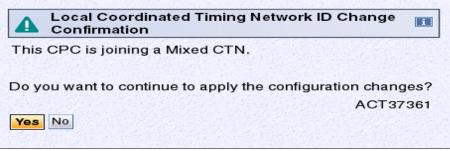


Figure 5-24 Message ACT37361 - Local Coordinated Timing Network ID Change Confirmation

When the change is complete, the server is defined in a Mixed CTN, with CTN ID = [ITSOPOK] - [31].

The server is now STP configured. The response to the z/OS DISPLAY ETR command, message IEA282I, now includes the CTN ID (Example 5-1).

Example 5-1 DISPLAY ETR command and response

D ETR	
IEA282I 14.39.57 TIMING STATUS	292
SYNCHRONIZATION MODE = ETR	
CPC PORT 0 <== ACTIVE	CPC PORT 1
OPERATIONAL	OPERATIONAL
ENABLED	ENABLED
ETR NET ID=31	ETR NET ID=31
ETR PORT=01	ETR PORT=01
ETR ID=01	ETR ID=00
THIS SERVER IS PART OF TIMING	NETWORK ITSOPOK -31

## 5.4.2 Time initialization

In an ETR-only network or a Mixed CTN environment, the Sysplex Timer provides the timekeeping information. When migrating from an ETR network to a Mixed CTN, the following timing information is inherited from the Sysplex Timer:

- Date and time
- Leap second offset
- Total time-zone offset (the combination of time-zone offset and DST offset)

If there are specific requirements to provide accurate time relative to an external time standard for data processing applications, consider using the external time source (ETS) function. In a Mixed CTN, the ETS function is provided by the Sysplex Timer.

## 5.5 CTN configuration changes

In this section we discuss CTN configuration changes.

## 5.5.1 Changing the CTN ID

In a Mixed CTN, a global CTN ID change cannot be made using the Network Configuration tab. No global change is possible.

However, a change of the STP ID from the STP Configuration tab is possible for each individual server.

If a server already participates in a Mixed CTN and the current STP ID is changed, the server leaves the current Mixed CTN to join another one or create a new one. Figure 5-25 illustrates this change. The CTN ID is changed from [ITSOPOK] - [31] to [ITSOnew] - [31].

ning twork	Network Configuration	ETR Configuration	ETR Status	STP Configuration	STP Status	ETS Configuration	SCZ SCZ
oordina	ted timing network			- 31			
pply	Save STP Debu	g Data					

Figure 5-25 STP Configuration tab - Changed STP ID

**Important:** Cross System Coupling Facility (XCF) tolerates a mismatch of the STP Network ID between systems for a matter of seconds only. When the timing limit is reached, those systems with inconsistent CTN IDs are varied out of the sysplex. Consequently, where multiple servers are involved, this operation is not a good idea, as the manual actions might exceed the XCF time limit.

Message ACT37364 (Figure 5-26) is issued and requires confirmation.

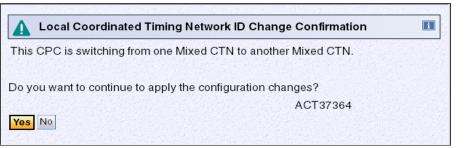


Figure 5-26 Message ACT37364 - Local Coordinated Timing Network ID Change Confirmation

When the change is complete, message ACT37315 displays and the server is STP configured with CTN ID = [ITSOnew] - [31].

To leave a Mixed CTN, remove the STP ID in the STP Configuration window. This results in the server participating in an ETR-only network (if an ETR ID is specified) or no timing network.

## 5.5.2 Changing a server to STP timing mode

When a Mixed CTN has been configured, it is possible to change the timing mode of one or more servers from ETR to STP timing mode.

The server being migrated to STP timing mode must have connectivity to an existing Stratum 1 or Stratum 2 server for the operation to be successful. Otherwise, the server transitions to local mode.

For each server that is to be migrated to STP timing mode:

 From the STP Status tab, verify that the server has STP connectivity to an acceptable time source. In the System Information area of the System (Sysplex) Time task of the server, verify the Local STP Link Identifier to ensure that there is least one PCHID initialized to a Stratum 1 or Stratum 2 server. An attempt to connect to a Stratum 3 server would fail since the target server would become a Stratum 4 (not supported in STP).

For example, Figure 5-27 shows that the SCZP201 server has two PCHIDs initialized to communicate to a Stratum 1 server with system name SCZP101. The SCZP201 server can be switched to STP timing mode. However, the resulting configuration has a single point of failure because SCZP201 is connected to only one Stratum 1 server.

iming letwork	Network Configuration	ETR Configuration S	TR tatus	STP Configuration	STP Status	ETS Configuration	SCZI SCZI
Timing state:		nchronized					
Jsable clock s							1 6.2
Fiming mode:	(ET	R (External Time Refer	rence)				
Stratum level:	1						
	ng stratum level: 3						
Maximum STP	version: 4			/			
- System Inforn	and the first of the second					1	
Local STP		Attached System Syste		tum Active STI		STP	1.000
	(s) Type-MFG-Plan				Version		
0111,0301	002094-IBM-02-	00000002991E SCZ	P101 1	4	4		1000
– Local Uninitiai	ized STP Links ——						
Local STP	STP Link	Reason Code	Reaso	on Code			1. 1. 1. 1. 1.
Link Identifier		Sent	Recei	ved			
0014	Coupling-peer	Self-coupled ser				<u>^</u>	
0015	Coupling-peer	Self-coupled ser	rver				
001E	Coupling-peer	Link failure					
001F	Coupling-peer	Offline					
0034	Coupling-peer	Self-coupled ser	rver				6.00
0035	Coupling-peer	Self-coupled ser	rver				
	Coupling-peer	Offline					
003E		Offline					1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

Figure 5-27 STP Status tab - Stratum 1

 From the ETR Configuration tab of the server, disable the ETR ports by selecting the Disabled radio buttons for each port and then click Apply (Figure 5-28). The server recognizes the loss of the Sysplex Timer signals and automatically switches to STP timing mode. The server synchronizes to an existing Stratum 1 or Stratum 2 server using STP messages.

ming etwork	Network Configuration	ETR Configuration	ETR Status	STP Configuration	STP Status	ETS Configuration	SCZP SCZP
TR netw	ork ID <sub>31</sub> (in d	ecimal)					
	ate <u>Port 1 Sta</u> ed OE <u>n</u> able ed ⊙Disable OOff	d					
nanual sta	A port can be ope te is 'Enabled'. Reset ETR	erational only whe		ETR network ID is	s entered a	and the port's	

Figure 5-28 ETR Configuration tab - Disable ETR ports

3. Operation completion can be verified on the STP Status tab (Figure 5-29). Click **Refresh** to update the configuration information. The Stratum level value of 2 indicates that the server's migration to STP timing mode was successful.

etwork	Network Configuration	ETR Configuration	ETR STP Status Configuration	STP Status	ETS Configuration SC
Aaximum ST - <i>System Info</i> Local STP Link Identifi	source: Yes STP ining stratum level: 3 P version: 4 Remote Directly A er(s) Type-MFG-Plant-		em Stratum Active S ne Lyvel Version	TP Maximum S1 Version	P
0111,0301	002094-IBM-02-0	0000002991E SCZ	P101 1 4	4	
<ul> <li>Local Uninit</li> <li>Local STP</li> </ul>	alized STP Links STP Link	Reason Code Sent	Reason Code Received		
Link Identifi	er Type				
	er Type Coupling-peer	Self-coupled se			
Link Identifi	21 VI		rver		
Link Identifi 0014	Coupling-peer	Self-coupled se	rver		
Link Identifi 0014 0015	Coupling-peer Coupling-peer	Self-coupled se Self-coupled se	rver		
Link Identifi 0014 0015 001E	Coupling-peer Coupling-peer Coupling-peer	Self-coupled se Self-coupled se Link failure	rver rver		
Link Identifi 0014 0015 001E 001F	Coupling-peer Coupling-peer Coupling-peer Coupling-peer	Self-coupled se Self-coupled se Link failure Offline	rver rver		
Link Identifi 0014 0015 001E 001F 0034	Coupling-peer Coupling-peer Coupling-peer Coupling-peer Coupling-peer	Self-coupled se Self-coupled se Link failure Offline Self-coupled se	rver rver		

Figure 5-29 STP Status tab - Stratum 2

The new timing mode and Stratum level are also reflected on the STP information tab in the CPC Details (SCZP201) (Figure 5-30).

Instance Information	Acceptable Status	Product Information	Network Information	STP Information
<ul> <li>STP Informa</li> <li>Timing state</li> <li>Timing mode</li> </ul>	: Synchr	ronized Server Time Proto		
Timing netw Stratum leve	ork [ID]: Mixed	CTN[ITSOPOK -	승규는 것 같아요. 이렇게 잘 안 없는 것이다. 말 안 있는 것 같아요. 같이 많이	

Figure 5-30 CPC details - STP Information tab

## 5.6 Time management

When a Mixed CTN configuration is active, the Sysplex Timer provides and manages the timekeeping information, so time management operations normally performed through the Sysplex Timer are also valid in a Mixed CTN.

### **External Time Source**

In a Mixed CTN, the existing Sysplex Timer is the time source for the CTN. If an external time source is attached to the Sysplex Timer, it is configured using the Sysplex Timer console. Time management functions normally performed through the Sysplex Timer are still performed on the Sysplex Timer console (and not on the HMC) and are valid also in a Mixed CTN, but now have an effect on the entire CTN, including servers operating in STP Timing mode.

## 5.7 Local time changes

z/OS allows either STCK time, UTC time, or local time to be obtained depending on the requirements. The difference between UTC time and local time is, under normal circumstances, the time-zone offset. The time-zone offset can be managed at the z/OS level by specifying the ETRZONE=NO and STPZONE=NO options in the CLOCKxx PARMLIB member. The relevant option that applies depends on whether the server is in ETR timing mode or STP timing mode.

The TIMEZONE parameter in the CLOCKxx member is used to set the time-zone offset at IPL, and a number of z/OS SET commands can be used to dynamically adjust this offset if required. Similarly, the coupling facility supports the concept of time-zone offset and allows dynamic modification of the time-zone offset.

## z/OS commands

On a z/OS system, the local date and time can be modified dynamically. The ability to do this depends on what options have been specified in the CLOCKxx member at IPL.

Option	Adjust	time using z/OS co	ommand
	Local time ZONE=LT	UTC time ZONE=UTC	STCK time STCK
ETRMODE NO, ETRZONE NO	Yes	Yes <sup>a</sup>	Yes <sup>a</sup>
ETRMODE YES, ETRZONE NO	Yes	No	No
ETRMODE YES, ETRZONE YES	No	No	No
STPMODE NO, STPZONE NO	Yes	Yes <sup>a</sup>	Yes <sup>a</sup>
STPMODE YES, STPZONE NO	Yes	No	No
STPMODE YES, STPZONE YES	No <sup>b</sup>	No	No

Table 5-1 z/OS time adjustment through command cross-reference

a. If ETRMODE NO and STPMODE YES (the default) is specified z/OS will issue IEA888A to prompt the operator to set the TOD clock during system initialization. This will occur regardless of whether OPERATOR PROMPT or NOPROMPT has been specified. IEA888A is issued as system initialization has detected that STPMODE YES was requested but STP is not available. The operator is prompted to notify that local Server time is being used and allow the time to be adjusted if required. IEA888A is issued regardless of whether OPERATOR PROMPT or NOPROMPT is specified in CLOCKxx. For more information, go to the following website: http://www-03.ibm.com/support/techdocs/atsmastr.nsf/WebIndex/FLASH10576

b. If ERTMODE YES and ETRZONE YES, or STPMODE YES and STPZONE YES are specified, any attempt to change the local time or date produces the z/OS message IEA279I: IEA279I ALL CLOCK RELATED SET COMMANDS ARE IGNORED WHEN IN STP MODE. If a server is in ETR or STP mode with ETRZONE NO or STPZONE NO, then SET CLOCK commands to change the local time are allowed.

### DISPLAY TIME

The DISPLAY TIME command can be used to display the local time and date and the UTC time and date (Figure 5-31).

DISPLAY TIME IEE136I LOCAL: TIME=15.07.47 DATE=2009.276 UTC: TIME=19.07.47 DATE=2009.276

Figure 5-31 z/OS DISPLAY TIME command

#### SET DATE

The SET DATE command can be used to change the local date, but only in the circumstances given in Table 5-1. The syntax is:

SET DATE=yyyy.ddd

This command has the following restrictions:

- ► yyyy is the year and must be in the range 1900 2042. The value specified must consist of four digits and must be within 70 years of the UTC date, or the SET command is ignored.
- ► *ddd* is the day and must be in the range 001 366 and meet leap (bisect) year restrictions.

The maximum date that can be specified is 2042.260.

### SET CLOCK

The SET CLOCK command is used to change the local time and is also restricted to the settings given in Table 5-1. The syntax is:

SET CLOCK=hh.mm.ss

This command is used in conjunction with the SET DATE command to set a maximum value of 23.53.47 on 2042.260. The server's TOD clock is not updated by this command, and neither is the logical TOD of the logical partition on which this z/OS image is operating. The change made by this command is effective for the duration of this IPL only.

Also, z/OS does not change the date when the new time implies a change of date, so either use the DATE parameter or wait for the time to pass midnight if the new time is for tomorrow.

#### SET RESET

The SET RESET command causes the time-zone offset to be reset to the value that was read in from the CLOCKxx member during IPL causing the local date and time to be changed accordingly. The syntax is:

SET RESET

This annuls all previous SET DATE, SET CLOCK, and SET TIMEZONE commands, and re-establishes the relationship of:

local date and time = UTC date and time + time-zone offset

#### SET TIMEZONE

The SET TIMEZONE command is new in z/OS V1.7 and may be used to change the time-zone offset to a separate value from that specified at IPL through the TIMEZONE parameter in CLOCKxx. This automatically adjusts the local date and time accordingly. The syntax is:

SET TIMEZONE={W|E}.hh[.mm]

The time-zone offset direction is west (W) or east (E). West is the default if the offset is not specified. The value for *hh* must be between 00 and 15, and the value for *mm* must be between 00 and 59.

The daylight saving time changes may be handled manually using the SET CLOCK command rather than having it done automatically through the Sysplex Timer.

Using this method, there is always a degree of error, as the difference between the local time and the UTC time will not exactly match the time-zone offset that would have been achieved by updating the TIMEZONE statement in CLOCKxx and IPLing.

The new z/OS SET TIMEZONE command overcomes this problem by applying the correct offset value in the CVTLDTO field, causing an exact time-zone offset to be applied.

# 6

## **Operations in an STP-only CTN**

An STP-only CTN contains a collection of servers configured in STP timing mode. An STP-only CTN can only be configured with STP-enabled servers. None of the servers in an STP-only CTN can be in External Timer Reference (ETR) timing mode. The Sysplex Timer does not provide stepping signals to any server in the CTN.

This chapter discusses the operations required to manage time and the CTN in an STP-only CTN. The operations are discussed both from a hardware (Hardware Management Console, or HMC) and software (z/OS) standpoint. This chapter discusses the following topics:

- Minimum requirements
- Monitoring an STP-only CTN using the HMC
- Monitoring an STP-only CTN using z/OS commands
- Configuring an STP-only CTN
- CTN configuration changes
- ► Time management
- Local time changes

## 6.1 Minimum requirements

An STP-only CTN is a timing network in which all servers are configured to be in STP timing mode. At a minimum, before an STP-only CTN configuration can become active and servers can exchange timekeeping messages, the following conditions need to be met:

- ► There must be at least one STP-enabled server to configure an STP-only CTN.
- The STP-enabled servers must be configured with the same CTN ID, with the format STP network ID - ETR Network ID. The STP network ID can be from one to eight characters in length.

Valid characters are upper case letters A - Z, lower case letters a - z, numerals 0 - 9, dash (-), and underscore (\_). The STP network ID is case sensitive.

In an STP-only CTN, the ETR Network ID must not be specified. After the CTN ID is assigned, the servers are STP configured.

If the STP-only CTN is not the result of a migration from the Mixed CTN, time has to be initialized.

If the STP-only CTN *is* the result of a migration from a Mixed CTN, time information is inherited from the Sysplex Timer.

- The Preferred Time Server and the Current Time Server must be assigned. The server assigned the role of Current Time Server becomes the active Stratum 1. In most cases, the Preferred Time Server is also the Current Time Server.
- An optional Backup Time Server can be assigned. If three or more servers or CFs are configured in the CTN and a Backup Time Server is assigned, an Arbiter can also be assigned.

Assigning a PTS and BTS requires coupling connectivity between the PTS and the BTS. Assigning a PTS, BTS, and Arbiter requires coupling link connectivity between each server. Any attempt to assign a BTS or Arbiter role to a server that does not have the required coupling link connectivity fails unless the Force configuration option is used. Use of this option is discussed in detail in 6.5.4, "Changing the server roles" on page 200.

The servers that are planned to be synchronized to either the preferred or the Backup Time Servers need coupling link connectivity (ISC-3 Peer, ICB-4, or InfiniBand) to the servers to which they are planned to be synchronized. All servers in an STP-only CTN are in STP timing mode.

## 6.2 Monitoring an STP-only CTN using the HMC

In an STP-only CTN, the HMC provides the user interface for all time-related functions, such as time initialization and time adjustment. This is different from the operations in an ETR network, where these tasks are performed at the Sysplex Timer console. Figure 6-1 on page 155 shows the System (Sysplex) Time console for IBM System zEC12, z166, and z114.

💂 Syste	m (Sysplex) Time	z10 🔳								
Timing Network	Network ETR ETR STP Configuration Configuration Status Configuration	STP ETS Status Configuration SCZP301 SCZP201								
Dat Time	System (Sysplex) Time	<b>z196</b>								
N	Cur SCZP401 Timing Network STP STP ETS SCZP401 Status Configuration Status Configuration SCZP301									
Т		zEC12 I								
C		ETS Configuration								
	Coordinated Server Time Time: 2:25:51 PM Date: 9/27/12 Time zone: (UTC-05:00) Eastern Time (US & Can Currently: EDT	SCZP201								

Figure 6-1 System (Sysplex) Time tabs

The number of tabs displayed on the HMC task *System (Sysplex) Time* along the top varies, depending on the type of server and the features are installed on it, as shown in Table 6-1.

Multiple CPCs can be selected (this requires *Multiple object selection* to be enabled for the user ID being used), which displays them as tabs on the right side of the window.

Server <sup>a</sup>	Timing network	Network config	ETR config	ETR status	STP config	STP status	ETS config
zEC12 (STP only)	✓	~			~	~	✓
z196 (STP only)	✓	~			~	~	✓
z10 <sup>b</sup> w/ETR and STP feature	✓	~	~	~	~	~	✓
z9 w/ETR and STP feature	✓	~	~	~	~	~	✓
z9 w/STP feature only	✓	✓			~	~	✓
z990/z890 <sup>c</sup> w/ETR and STP features	✓	✓	~	~	~	~	
z990/890 <sup>c</sup> w/STP feature only	✓	~			~	~	
All Servers w/ETR feature only			~	~			

Table 6-1 Tabs displayed on the server

a. z9 and earlier generation servers are not supported in the same CTN with the zEC12 server.

b. z10 includes the ETR feature, by default.

c. z990/z890 servers are not supported in the same CTN with the z196/z114 or newer servers.

In an STP-only CTN, additional buttons are available on the System (Sysplex) Time tabs for the management of time, leap seconds, and time zones. These buttons are available on every server in the STP-only CTN, but are only enabled on the Current Time Server to ensure that all time and offset adjustments are done at the CTN time source. Adjustments made on the CTS are distributed throughout the CTN. In an STP-only CTN, the ETS Configuration tab on

the CTS allows you to adjust the Coordinated Server Time (CST) using one of the NTP time servers as a source.

**Important:** When two or more servers are selected in the System (Sysplex) Time task, it is necessary to click **Refresh** to update the configuration information for *all* displayed servers.

## 6.2.1 Timing Network tab

Use this tab to view the CTN settings. This tab displays overall timing information for the CTN, including the current date and time, local time offsets, and general timing network information.

The window appears slightly different depending on whether it is viewed from the CTS or another server in the CTN, and on whether the server has NTP client support (with or without PPS). The ETS Configuration tab only displays when NTP client support is available on the target server.

Figure 6-2 shows the view from the Current Time Server in a CTN with two servers:

The Adjust Time, Adjust Leap Seconds, and Adjust Time buttons are enabled. Time adjustments are only permitted from the Current Time Server. These buttons are only enabled on the server that is the Current Time Server.

The Adjustment Steering button is enabled after the first adjustment is made and remains enabled (Figure 6-2).

System (Sysplex) Time for SCZP301	i
Timing Network         Network         STP Configuration         STP Status         ETS Configuration	
Coordinated Server Time	1
Time: 8:58:34 AM	
Date: 9/16/12	
Time zone: (UTC-05:00) Eastern Time (US & Canada) (EST/EDT)	
Currently: EDT	
Coffsets	1
Leap second: 25	
Time zone offset from UTC: -5 : 00	
Daylight saving time (hours : minutes):1 : 00	
Network	1
Timing network type: STP-only CTN	
Coordinated timing network (CTN) ID: ITSOPOK -	
CTN time source: NTP	
NTP stratum level: 2	
Adjustment Steering Adjust Time Adjust Leap Seconds Adjust Time Zone	1
Aujust nine Aujust nine Aujust Leap Seconds Aujust nine Zone	
Refresh Cancel Help	

Figure 6-2 Timing Network tab from Current Time Server

Information about leap seconds, time zone, and daylight saving time displays in the Offsets section of the window. See 6.6.2, "Time adjustment" on page 217, for time and offsets adjustments.

 CTN time source (see Figure 6-2) identifies where the clock source is according to the STP facility. When the server is in an STP-only CTN, the possible values are:

- Time set manually on console
- Dial-out time source through the Hardware Management Console<sup>1</sup>
- NTP
- NTP with pulse per second
- Previous adjustment interrupted due to a network configuration change
- Time inherited from a previous connection to a Sysplex Timer
- Migration from an STP-only CTN to a Mixed CTN is in progress
- Migration from an STP-only to a Mixed CTN failed to complete

When the CTN time source is either NTP or NTP with pulse per second (PPS), and if the Current Time Server cannot obtain the NTP information from its configured NTP time servers, then the NTP information from the Backup Time Server is used (or from the Preferred Time Server, if the Backup Time Server is the Current Time Server). If this happens, the CTN time source also identifies the source server. This is described in detail in the *Server Time Protocol Recovery Guide*, SG24-7380.

When the CTN time source indicates NTP, the Network section of the window may also display additional information:

- When a time adjustment is active and the target server has NTP client support, the Network section shows the NTP stratum level.
  - If the NTP stratum level is 1, the NTP source ID displays.
  - If the NTP stratum level is greater than 1, the NTP source ID is not shown.

The Adjustment Steering button is enabled after the first adjustment is made.

When the time source is NTP but the target server does not have NTP client support (for example, z990 or z890), the NTP stratum level and NTP source ID are not displayed, regardless of whether a time adjustment is active.

The Adjustment Steering button is enabled after the first adjustment is made and can be used to display detailed information about the last adjustment.

When the CTN time source is NTP but no time adjustment is active, then the NTP stratum level and NTP source ID are not displayed.

When the Adjustment Steering button is enabled, information about the last time adjustment can be displayed (Figure 6-3).

Adjustment Steer	ing Information - SCZP301
Steering	
Status:	Steering completed
Amount (seconds):	0.000327
Start time (UTC):	9/18/12 1:12:38 AM
Estimated finish time (U	TC):9/18/12 1:16:02 AM
CTN time source:	NTP
NTP stratum level:	2
OK Help	

Figure 6-3 NTP Adjustment Steering Information

When the Adjustment Steering results are the result of HMC dial-up or from a manual adjustment, the NTP stratum level and the NTP source ID are not displayed.

<sup>&</sup>lt;sup>1</sup> Dial out not available for HMC version 2.12.0 and later.

## 6.2.2 Network Configuration tab

This tab shows the current STP-only CTN configuration. Changes made on this tab affect all servers that are members of the STP-only CTN. This is commonly called a *global* change in the CTN versus a *local* change in the CTN.

This window appears slightly different depending on whether it is viewed from the Current Time Server or another server in the CTN. Figure 6-4 shows the view from the Current Time Server. The Deconfigure button is enabled.

Syst	tem (Sysplex) Ti	ime	for SCZP3	01		i
Timing Network	Network Configuration	ST Co	P nfiguration	STP Status	ETS Configuration	
Current I	Vetwork Configurat	ion -				
Configur	ed at (UTC):		9/16/12	2 7:12:36	PM	
Preferre	d time server (CF	°C)	SCZP301 (	STP ID: I	TSOPOK)	•
Backup	time server (CPC	;) [	SCZP401 (	STP ID: I	TSOPOK)	•
Arbiter		ĺ	SCZP201 (	STP ID: I	TSOPOK)	•
<u> </u>	allow the server(s configuration Time Server (CPC,		ecified abo	ve to be i	n the CTN	
_	erred time server kup time server (0		,			
Coordina	ated timing netwo	ork II		<	-	
Apply	Initialize Time	De	econfigure	-		
Refresh	Cancel Help					

Figure 6-4 Network Configuration tab from Current Time Server

Figure 6-5 shows the view from a server that is not a CTS. The Deconfigure button is disabled.

Important: Deconfiguring the CTN is only permitted from the current time server (CTS).

System (Sysplex) Time	for SCZP4	01		i
Timing Network Configuration	rp onfiguration	STP Status	ETS Configuration	n
Current Network Configuration				
Configured at (UTC):	9/16/12	2 7:12:36	PM)	
Preferred time server (CPC)	SCZP301 (	STP ID: I	TSOPOK)	•
Backup time server (CPC)	SCZP401 (	STP ID: I	TSOPOK)	•
Arbiter	SCZP201 (	STP ID: I	TSOPOK)	•
<u>Only</u> allow the server(s) sp <u>Force configuration</u> <i>Current Time Server (CPC)</i>	pecified abo	ve to be i	n the CTN	
<ul> <li>● Preferred time server (C</li></ul>				
Coordinated timing network		<	_	
Refresh Cancel Help				

Figure 6-5 Network Configuration tab - View from Backup Time Server

Note the following points:

- ► Configured at (UTC) displays the UTC time when this configuration was applied.
- Current Time Server specifies whether the Preferred Time Server or the Backup Time Server is, or will become, the Current Time Server. The Current Time Server identifies the server that is the Stratum 1 for the STP-only CTN.
- In the Current Network Configuration section, the Preferred Time Server, Backup Time Server, and Arbiter fields each display a drop-down list of selectable servers.
  - Preferred Time Server identifies the server (CPC) that is the current Preferred Time Server or that will become the Preferred Time Server for the CTN. If a Preferred Time Server is not defined, Not configured displays in this field.

To reassign the role, select another server from the list by using the down arrow next to the field and making a selection.

 Backup Time Server identifies the server (CPC) that is the current Backup Time Server or that will become the Backup Time Server for the CTN. If a Backup Time Server is not defined, Not configured displays in this field.

To reassign the role, select another server from the list by using the down arrow next to the field and make a selection.

 Arbiter identifies the server (CPC) that is the current Arbiter or the new Arbiter for the CTN. If an Arbiter is not defined, Not configured displays in this field.

To reassign the role, select another server from the list by using the down arrow next to the field and make a selection.

Which servers display in the drop-down list depends on information drawn from the HMC and the STP facility. Under normal circumstances, when LAN connectivity exists between the HMC and the servers, and STP connectivity exists between all of the servers (CPCs), the list looks the same for all servers participating in the same CTN. All STP-capable servers connected to the HMC are listed.

In a normal situation, when the HMC has connectivity to the server, the STP ID information (STP ID: xxxxx) is shown if there is an initialized STP link to the target server and the server participates to the same CTN. If the HMC has lost connectivity to a server

in the CTN, the server entry displays information based on the CPC descriptor node ID. For example, consider the configuration shown in Figure 6-6.

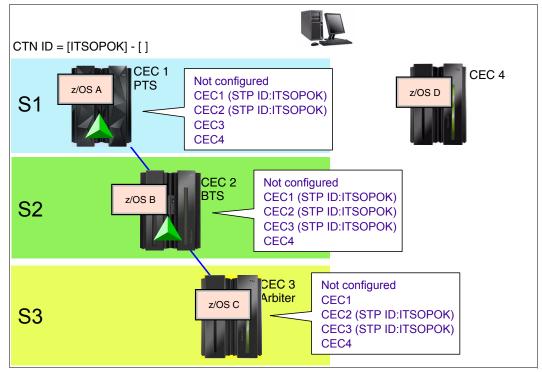


Figure 6-6 Network configuration - Role assignment drop-down list

The HMC has connectivity to the CEC1, CEC2, CEC3, and CEC4 servers. All servers are connected to the HMC and are STP-capable. The captions indicate the drop-down lists displayed in the Network Configuration window when assigning roles.

CEC4 is STP-capable but is either not STP configured or configured in another CTN. For this reason the STP ID portion for CEC4 is not shown.

The CEC1, CEC2, and CEC3 servers are part of CTN [ITSOPOK]. However, the (STP ID: ITSOPOK) visibility varies per server:

- On CEC1, the (STP ID: ITSOPOK) part is only shown for CEC2 because there is no STP-initialized link between CEC1 and CEC3.
- On CEC2, the (STP ID: ITSOPOK) part displays for CEC1 and CEC3 because both conditions are satisfied:
  - CEC2 has initialized STP links to both CEC1 and CEC3.
  - The STP ID on CEC1 and CEC3 is the same as the one on CEC2.
- On CEC3, the (STP ID: ITSOPOK) is only shown for itself and CEC2 because there is no STP initialized link between CEC3 and CEC1.

Additional information about the status of the links between servers is also available from the STP Status tab for each server.

Figure 6-7 on page 162 shows the Network Configuration window following a Mixed CTN to STP-only migration. The following information and actions are available:

 "Only allow the servers specified above to be members of the CTN" limits a CTN to a single-server or dual-server configuration. This option is used to save the CTN configuration across a power-on reset or power off/on for the servers specified.

- Force configuration specifies whether connectivity between the Current Time Server and other servers with a defined role will be verified when a change in configuration is requested.
  - When Force configuration is checked, the configuration change is applied without verification. The change is accepted even if connections between the Current Time Server and other specified server roles are not online or do not exist.
  - When Force configuration is not selected, various verifications are done prior to allowing the configuration to be set. For example, connections between the Preferred Time Server, Backup Time Server (if present), and Arbiter (if present) are verified. If the connections are not online, the configuration request fails.

**Important:** The Force configuration option *must* be specified when configuring a new STP-only CTN for the first time to bypass connectivity verification, because a Current Time Server does not yet exist. This is *not* applicable to a migration scenario from Mixed CTN to STP-only.

- Coordinated Timing Network ID specifies the ID for the Coordinated Timing Network in which the server is participating. The form is [STP ID] - [ETR ID].
  - If the server is not a member of any timing network, there are no values in the fields.
  - When the server is participating in an STP-only CTN, the field shows [STP ID]. The valid characters for the STP ID are A Z, a z, 0 9, -, and \_.

**Important:** STP ID is *case sensitive*. You might end up with separate Coordinated Timing Networks, that is, one with lower case and one with upper case characters.

 Changes made to the Coordinated Timing Network ID are applied to the entire CTN. If a valid STP ID exists, changing the ID results in all servers in the STP-only CTN becoming members of a different CTN.

To migrate an STP-only CTN to a Mixed CTN, you have to supply the ETR Network ID then click **Apply** to initiate the migration process. Several confirmation messages are issued before the migration process begins.

Cancel Migration to Mixed CTN is used to cancel a migration from an STP-only to a Mixed CTN process after a successful migration initiation. If the migration is cancelled, the Current Time Server defined for the STP-only CTN continues to provide the time information to all members of the STP-only CTN.

This button is only enabled when a migration to a Mixed CTN has been initiated; that is, an ETR Network ID number has been entered in the CTN ID field on the Network Configuration window, **Apply** has been clicked, and confirmation messages have been accepted.

The migration process cannot be cancelled if an error occurred, if the procedure is close to completion, or if it has completed.

Until the migration is complete, the Apply, Initialize Time, and Deconfigure buttons are disabled. An information message displays (Figure 6-7).

The Initialize Time task is described in 6.4.4, "Time initialization" on page 181.

ing work	Network Configuration	Í	ETR Configuration	ETR Status	STP Configuration	STP Status	ETS Configuration S
	etwork Configuration	n ———		10/0/00 0:07:	10 DM		
and the second second	l at (UTC): ime server (CPC)	SC7P2	01 (STP ID: ITS	10/3/09 9:27:4 OPOK)	42 PM		
ackup tim	ne server (CPC)	222222233	01 (STP ID: ITS	Sector Contractor Inc.			
rbiter		Not con					
		Transfer OF					and the states of the
1972 1982 1989	low the server(s) : configuration	specified	above to be in t	nectiv			
1	ime Server (CPC)		and the second second		and the second sec		
	ed time server (C						
Top Contract	p time server (CP)	Par de las					and the second second
oordinate	ed timing network		POK	-			
pply	Initialize Time	Decon	figure (	Cancel Migratio	n to Mixed CTN		
All	the state of the second second	1. 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	the second the second	200 y 100 00 200		and the state	CONTRACTOR DESCRIPTION OF

Figure 6-7 Network Configuration tab after migration from STP-only to Mixed CTN

Deconfigure is used to deconfigure the Preferred Time Server, Backup Time Server, and Arbiter. This action is disruptive to all z/OS images that need time synchronization. Consider this action only if the Current Time Server must no longer provide time information to the entire STP-only CTN.

Deconfigure is only available from the Current Time Server.

Attention: Deconfiguring the CTN results in the loss of the clock source for all servers in the CTN. This action is disruptive to all z/OS images, running in a sysplex or non-sysplex, when running with STPMODE YES.

Only use Deconfigure to shut down the entire CTN.

## 6.2.3 ETR Configuration tab

The ETR Configuration tab, even though available from the System (Sysplex) Time task if the ETR feature is installed, is not used in an STP-only CTN. The ETR Network ID is blank and the ETR Ports are disabled (Figure 6-8).

A configuration change made in this window removes the server from the STP-only CTN. The change only affects this particular server. The configuration request is rejected if the action is attempted on the Current Time Server.

iming etwork	Network Configuration	ETR Configuration	ETR Status	STP Configuration	STP Status	ETS Configuration	SCZ SCZ
ETR network I	D (in decimal	)					H40
- Port 0 State ○Enabled ⊙Disabled ○Off	● Port 1 State ● E <u>n</u> abled ● D <u>i</u> sabled ● O <u>f</u> f						
Attention: A po Enabled'.	ort can be operation	al only when a valid	ETR network	ID is entered and	the port's ma	inual state is	

Figure 6-8 ETR Configuration tab - Server in STP timing mode

# 6.2.4 ETR Status tab

The ETR status tab, even though available from the System (Sysplex) Time task if the ETR feature is installed, is seldom used in an STP-only CTN. This tab is for display only (Figure 6-9).

iming Ietwork	Network Configuration	ETR Configuration	ETR Status	STP Configuration	STP Status	ETS Configuration	s
Stepping m EAF steppi Port 0 state Port 1 state	t control register: 08C4 node: Local ing port number: 0 e: Semi-o s: Semi-o	perational perational					H
ETR netwo ETR ID (in ETR port n	umber (in decimal): 0						
ETR netwo ETR ID (in	Word 1 - Port 1 ork ID (in decimal): 31 decimal): 1 umber (in decimal): 0						
	Status Is: Light detected Is: Light detected						

Figure 6-9 ETR Status tab - Server in STP timing mode

In an STP-only CTN, the ETR Status Word Stepping Mode is Local. This window is only useful for displaying the configuration and status of the Sysplex Timer connections when a migration from an STP-only CTN to a Mixed CTN is planned. Even though the ports are disabled, the ETR links are monitored and z/OS message IEA393I is posted when a failure occurs. This allows a failing link to be repaired before migrating to a Mixed CTN.

In an STP-only CTN, the state of the ports is *semi-operational* because the ports were automatically disabled. The port status is *light detected*, indicating that the Sysplex Timer links are still connected and the Sysplex Timers ports are online.

If the server has the PTS or BTS role and the external time source is configured to use NTP with pulse per second, Port 0 state and Port 1 state show that the PPS ports on the ETR card

are being used. The ETR Data Word and ETR Card Status sections are not applicable when using PPS (Figure 6-10).

Timing Network	Network Configuration	ETR Configuration	ETR Status	STP Configuration	STP Status	ETS Configuration
Stepping n	t control register: 08C node: Loc ing port number: 0 e: PPS					
	Word 1 - Port 0 ——— nation is not applicable	e when using PPS.	]			
	Word 1 - Port 1 — nation is not applicable	e when using PPS.	]			
	Status JS: Not applicable wh JS: Not applicable wh		]			

Figure 6-10 ETR Status tab - Server configured with NTP and PPS

# 6.2.5 STP Configuration tab

The STP Configuration tab (Figure 6-11) is used to enter the STP ID for the server to join a CTN, or to remove the server from a CTN by blanking out the STP ID.

 Coordinated Timing Network ID: specifies the ID for the Coordinated Timing Network in which the server is participating.

The form is [STP ID] - [ETR ID]. When the server is participating in an STP-only CTN, the CTN ID displays [STP ID].

**Note:** The valid characters for the STP ID are A - Z, a - z, 0 - 9, -, and \_. The STP ID is case sensitive.

System (Sysplex) Time for SCZP301									
Timing Network	Network Configuration	STP Configuration	STP Status	ETS Configuration					
Note: The STP ID portion of the CTN ID is case sensitive. If the CTN ID is to be changed, make sure that the ID exactly matches the CTN to be joined.									
Coordinat	ted timing netwo	ork ID ITSOPOK		-					
Apply Save STP Debug Data									
Refresh	Cancel Hel	р							

Figure 6-11 STP Configuration tab

To join an STP-only CTN, a valid STP ID must be specified. To leave an STP-only CTN, the STP ID must be removed (nullified).

A configuration change made on this tab affects only this particular server. It is *not* globally applied to an entire timing network. The configuration request is rejected if the action is attempted on the Current Time Server.

Save STP Debug Data: collects data used for STP problem determination. The data is collected concurrently. The STP debug data file is automatically sent back to the IBM Service Support System. Only use this button upon request from the IBM Support Center.

A configuration change made on this tab affects only this particular server. It is *not* globally applied to an entire timing network.

# 6.2.6 STP Status tab

The STP Status tab (Figure 6-12) is used to view the STP status information for a specific server. The information includes:

- Timing state: Indicates the timing state the server is operating in. The status is Unsynchronized, Synchronized, or Stopped. If it has a value of anything other than Synchronized, the server is not actively participating in a CTN.
- Usable clock source: Indicates whether a usable clock source is available to synchronize the server TOD. Possible values are yes or no.

iming Netw etwork Confi	ork iguration	STP Configu	uration	STP Status	ETS Configuration	ı				
iming state:		S	ynchron	ized						
Jsable clock so	ource:	Ye	es							
Timing mode: STP (Server Time Protocol)										
Stratum level: 1										
Aaximum timin	g stratum	level:3								
/laximum STP	version:	4								
System Informa	tion ——									
Local STP			Remote	e Directly	Attached Sys	stem	System	Stratum	Active STP	Maximum STP
Link Identifier	(s)		Type-N	IFG-Plant	t-Sequence		Name	Level	Version	Version
0119,0219,[(0	702,0722	,0723)]	002097	7-IBM-02-	00000001DE	50	SCZP201	2	4	4
[(0700,0701,0 0732)]	720,0724	,0731,	002827	7-IBM-02-	0000000088	D7	SCZP401	2	4	4
/1										
- Local Uninitializ	ed STP Li	nks ——								
Local STP	STP Link	ĸ		Reason			son Code			
Link Identifier				Sent		Rece	eived			
0110	Coupling			Link fai	lure					
0111	Coupling			Offline						
0118	Coupling			Offline						
0190	Coupling	g-peer		Offline						
0191	Coupling			Offline						
0198	Coupling	peer		Link fai	lure					
0400	Coupling	g-peer		Offline						
0199		peer		Link fai						

Figure 6-12 STP Status tab: displayed from Stratum 1 server

- Timing mode: Indicates whether the TOD clock is attempting to synchronize to a timing network and if so, what type of network it is. When the server is participating in an STP-only CTN, the value should be Server Time Protocol (STP).
- Stratum level: Indicates the hierarchy of this server within the CTN. The value can be 1, 2, or 3. A stratum level of 0 indicates that the server has no time source.
- Maximum timing stratum level: Contains a number indicating how far a server can be from the Stratum 1 and still be in a synchronized state. The maximum timing stratum level is 3.

- Maximum STP version: Specifies a number indicating the maximum level of STP facility code supported by this server.
- System Information: This table identifies the remote servers that are directly attached to this server for STP purposes.

This server's coupling links that are initialized to transport STP messages are listed using the PCHID addresses, and are grouped according to the system that is directly attached to the links. Additionally, the stratum level, active STP version, and maximum STP version for each directly attached system are shown.

Servers with different maximum STP versions can coexist in the same CTN. When the local and remote servers do not have the same maximum STP version installed, communication between the servers uses the lowest version installed, which is indicated in the active STP version column.

Using the information provided in this table, across all servers in the STP-only CTN, can help build a topology diagram of the CTN at that precise moment in time. If a CTN reconfiguration command has been applied from any other tab in the System (Sysplex) Time task, it is necessary to first click **Refresh** to ensure the validity of the information displayed.

 Local Uninitialized STP links: This table identifies all the possible coupling links defined in the IOCDS that may be used by this server to exchange STP messages.

This table identifies this server's coupling links that may not be used to exchange STP messages with other servers. All links in this table are in an uninitialized state. The table shows the STP link identifier (PCHID, but without any CHPID information), link type, Reason Code Sent, and Reason Code Received.

The Uninitialized Reason Code (for example, Offline or Link Failure) identifies the reason that STP has not initialized the link. The Help function is available to look up any specific reason code.

On a server in STP timing mode, timing mode is STP (Server Time Protocol). Stratum level values can be 1, 2, or 3. The example shown in Figure 6-12 on page 165 provides information for the Current Time Server, which is Stratum 1. Examples in this section show STP status tabs with maintenance for Maximum STP Version 4.

Figure 6-13 shows the view from a Stratum 2 server.

		STP Configuration	STP Status	ETS Config	uration				
Fiming state:		Synchror	nized						
Jsable clock so	ource:	Yes							
Fiming mode:		STP (Ser	ver Time	Protoco	ol)				
Stratum level: 2									
Maximum timin	g stratum I	level:3							
Maximum STP	version:	4							
- System Informa	tion ———								
Local STP		Remote E	irectly At	tached	System	System	Stratum	Active STP	Maximum STP
Link Identifier	· /	Type-MF0				Name	Level	Version	Version
		26)] 002097-18	3M-02-00	000001	DE50	SCZP20	12	4	4
[(070E,0710,0		002817-18	3M-02-00	00000E	3BD5	SCZP30	1 1	4	4
[(070F,0711,0	72C)]								
- Local Uninitializ	ed STP Lini	ks —							
Local STP	STP Link		Reasor	n Code	Reason	Code			
Link Identifier	Туре		Sent		Receive	d			
0700	1 3	over InfiniBan							
0701		over InfiniBan							
0702		over InfiniBan							
0703		over InfiniBan							
0705		over InfiniBan							
		over InfiniBan							
0706	Coupling	over InfiniBan	d Offline						
0706 0707 0709		over InfiniBan							

Figure 6-13 STP Status tab - Displayed from a Stratum 2 server

# 6.2.7 ETS Configuration tab

Configuration of the ETS method is performed through the ETS Configuration tab in the System (Sysplex) Time task on the HMC, and it is shown in Figure 6-14 on page 168.

After a migration to an STP-only CTN, the time source selection specified on the ETS Configuration tab is only used to adjust the Coordinated Server Time (CST) through the CTS (Current Time Server) CPC.

However, the ETS Configuration window displays for all CPCs that support NTP, regardless of the type of CTN. This enables the ETS configuration of every existing CPC before its migration to an STP-only CTN.

A newly installed CPC, which will join this CTN and will be a candidate to become the CTS when migrating to a STP-only CTN in the future, can also be configured at installation time. It is typical for the CTS to be the PTS. If there is a configured BTS, configure it with a viable ETS as well. If the PTS cannot access the NTP server or the PPS signal from the NTP server (which is the ETS for this server), the BTS, if configured to a separate NTP server, might be able to calculate the adjustment required and propagate it to the PTS. The PTS, in turn, performs the necessary time adjustment.

You have the following options:

- Selecting None means that this server will not be able to steer the CTN in case this CPC becomes the CTS.
- Selecting the Use NTP radio button displays the NTP Time Server Information table. See 1.2, "Configuring an NTP server" on page 5 for more information about this topic.

When an NTP server is configured, clicking **Query** tests the NTP Time Server's access and fills the Stratum, Source, and Status fields. In addition, a Select column displays where the user can chose a preferred NTP server (Figure 6-14 on page 168).

Sys	stem (Syspl	ex) Time for SCZF	°301		i					
Timing Network	Network Configurat	STP Configuration		TS onfiguration						
plan to made to for the	Note — This CPC has the role of Current Time Server for an STP-only CTN. If you plan to attach to an ETS device, an ETS configuration is required. Changes made to the ETS configuration have an immediate effect on the time source for the CTN. <i>External Time Source (ETS)</i>									
	<u>N</u> TP	Ilse per second (PF	PS)							
		NTP Time Server	Stratun	n Source	Status					
۲	V	9.12.6.46	2	64.113.32.5	Success					
O		9.12.6.48	3	66.228.35.252	2 Success					
Apply	Query	ITP Thresholds								
Refresh	Cancel	Help								

Figure 6-14 NTP Time Server Information table

Selecting Use NTP with pulse per second (PPS) displays the NTP Time Server Information table. In addition, the PPS Port column displays, showing which NTP server corresponds to which PPS port. A PPS Port Status section displays to indicate the status of the PPS ports (Figure 6-15).

The possible port status messages are:

- Not configured
- No PPS signal
- Acquiring consistent NTP information
- Configuration error
- Adjusting for PPS signal
- Capable of tracking to PPS signal
- Tracking to PPS signal

Sys	stem (Syspl	ex) Ti	ime for SCZP	301				I		
Timing Network	Network Configurat		STP Configuration	STP Status	ETS Configu	ration				
to attact the ETS	Note This CPC has the role of Current Time Server for an STP-only CTN. If you plan to attach to an ETS device, an ETS configuration is required. Changes made to the ETS configuration have an immediate effect on the time source for the CTN. <i>External Time Source (ETS)</i>									
© Non ⊚ Use ⊛ Use	External Time Source (ETS)     None     Use <u>M</u> TP     Use NTP with <u>pulse</u> per second (PPS) <i>NTP Time</i> . Server Information									
Select	Configured	PPS Port	NTP Time Se	rver	Stratum	Source	Status			
۲	<b>V</b>	0	9.56.192.89		1	GPS	Success			
0		1	9.56.192.87		1	GPS	Success			
PPS Po	rt Status —									
	Port 0: Tracking to PPS signal Port 1: Capable of tracking to PPS signal									
Apply	Query	NTP Th	nresholds							
Refresh	Cancel	Help								

Figure 6-15 NTP Time Server and PPS information

See 1.3, "Configuring an NTP server with pulse per second option" on page 27. The PPS Port Status displays when the configured External Time Source (ETS) is NTP with PPS and the server (CPC) has the role of PTS or BTS in an STP-only CTN.

**Important:** Starting w/ HMC version 2.12.0, the HMC dial out capability has been removed. If you have an HMC version 2.11.1 or earlier (with STP support), you can still use the dial out option.

Selecting **Use dial out if configured on Hardware Management Console** specifies that the ETS will be the dial out mechanism if configured on the HMC Customize Outbound Connectivity task. See 1.2, "Configuring dial out on the HMC" on page 5.

# 6.3 Monitoring an STP-only CTN using z/OS commands

The output from various z/OS commands that display time-related information varies, depending on the following conditions:

- Which server is hosting the z/OS system
- The type of timing network
- The timing mode that the server is using

### 6.3.1 z/OS commands

The following z/OS commands are used to monitor an STP-only CTN.

## **DISPLAY ETR**

Prior to STP, the DISPLAY ETR command was used to display the synchronization mode and the status of the ETR ports as seen by z/OS.

With STP support, even though there is no ETR in an STP-only CTN, the command itself has not changed, but is also used to display information about the STP-only CTN. The output has been updated to support various STP environments, and displays STP-related information where applicable.

In an STP-only CTN, the TOD clock is being steered to the time provided by the CTS. No reference to a Sysplex Timer displays.

The output from the DISPLAY ETR command in an STP-only CTN incorporates the following additional information:

- Node ID information for the CTS server
- ► Informational lines whose display varies depending on:
  - CTN topology.
  - Where the DISPLAY ETR command is being executed from. If the command is issued from the Preferred Time Server, Backup Time Server, or Arbiter, a line displays indicating what server role has been assigned to that particular server.

### In an STP-only CTN, on Preferred Time Server, no Arbiter

In an STP-only CTN (Figure 6-16), the DISPLAY ETR command shows:

- Synchronization mode as STP.
- CTN ID that contains only the STP ID (that is, ITSOPOK).
- Server role, if it has been configured for this server. This is the Preferred Time Server.
- An optional information line if an Arbiter has not been configured. If an Arbiter has been configured for the example, the last informational line is not displayed.

```
D ETR
IEA386I 17.21.13 TIMING STATUS 368
SYNCHRONIZATION MODE = STP
THIS SERVER IS A STRATUM 1
CTN ID = ITSOPOK
THE STRATUM 1 NODE ID = 002827.H43.IBM.02.0000000B8D7
THIS IS THE PREFERRED TIME SERVER
THIS STP NETWORK HAS NO SERVER TO ACT AS ARBITER
```

Figure 6-16 z/OS DISPLAY ETR in STP-only CTN, Preferred Time Server, no Arbiter

The Current Time Server is the active Stratum 1 server in an STP-only CTN. There can only be one active Stratum 1 server in an STP-only CTN, and only the Preferred Time Server or the Backup Time Server can be assigned to be the active Stratum 1 server. Because this is an STP-only CTN and DISPLAY ETR indicates that the server is a Stratum 1, we can conclude that the Preferred Time Server also acts as the Current Time Server.

### In an STP-only CTN, on Backup Time Server, no Arbiter

The information shown in Figure 6-17 is similar to that shown in Figure 6-16 on page 170, except that the DISPLAY ETR command was issued from the Backup Time Server. If an Arbiter has been configured, the last line in Figure 6-17 is not displayed.

```
D ETR
IEA386I 17.23.44 TIMING STATUS 476
SYNCHRONIZATION MODE = STP
THIS SERVER IS A STRATUM 2
CTN ID = ITSOPOK
THE STRATUM 1 NODE ID = 002827.H43.IBM.02.00000000B8D7
THIS IS THE BACKUP TIME SERVER
NUMBER OF USABLE TIMING LINKS = 15
THIS STP NETWORK HAS NO SERVER TO ACT AS ARBITER
```

Figure 6-17 z/OS DISPLAY ETR in STP-only CTN, Backup Time Server, no Arbiter

### In an STP-only CTN, on Arbiter

As in Figure 6-18, the server role of Arbiter displays when the DISPLAY ETR command is issued from the Arbiter in a configuration with all three server roles defined.

```
D ETR

IEA386I 17.27.11 TIMING STATUS 938

SYNCHRONIZATION MODE = STP

THIS SERVER IS A STRATUM 2

CTN ID = ITSOPOK

THE STRATUM 1 NODE ID = 002827.H43.IBM.02.0000000B8D7

THIS IS THE ARBITER SERVER

NUMBER OF USABLE TIMING LINKS = 9
```

Figure 6-18 z/OS DISPLAY ETR in STP-only CTN - Arbiter

### In an STP-only CTN, on a member of the CTN

In Figure 6-19, the STP-only CTN only has a PTS defined. There is no Backup Time Server or Arbiter. In this example, the DISPLAY ETR command was issued from a server with no special role assigned.

```
D ETR
IEA386I 17.30.47 TIMING STATUS 483
SYNCHRONIZATION MODE = STP
THIS SERVER IS A STRATUM 2
CTN ID = ITSOPOK
THE STRATUM 1 NODE ID = 002827.H43.IBM.02.00000000B8D7
NUMBER OF USABLE TIMING LINKS = 15
THIS STP NETWORK HAS NO BACKUP TIME SERVER
THIS STP NETWORK HAS NO SERVER TO ACT AS ARBITER
```

Figure 6-19 z/OS DISPLAY ETR in STP-only CTN - Member of the CTN

The number of usable timing links accounts for the number of STP-initialized links that supply, or *can* supply, timing information to this server. This is why this line does not appear in the D ETR output of a Current Time Server because it is the source of timing information. A Stratum 2 server includes links to another Stratum 2 server because, if it were to transition to a Stratum 3 server, those links become sources of timing signals.

### SETETR PORT=n

The SETETR command can only be used to enable ETR ports that have been previously disabled by z/OS as a consequence of hardware error. This command cannot be used when the server is in STP timing mode. If the command is attempted on a server in STP timing mode, z/OS message IEA384I displays:

IEA384I SETETR COMMAND IS NOT VALID IN STP TIMING MODE

### **DISPLAY XCF, SYSPLEX**

The DISPLAY XCF, SYSPLEX command displays the system status and the last recorded system status monitor time stamp for each system in the sysplex.

Figure 6-20 shows an STP-only CTN where both SC74 and SC75 are in STP timing mode, as indicated by TM=STP.

D XCF,SYSPLEX IXC336I 17.33.37 DISPLAY XCF 371 SYSPLEX PLEX75 SYSTEM TYPE SERIAL LPAR STATUS TIME SYSTEM STATUS SC74 2827 B8D7 01 09/27/2012 17:33:37 ACTIVE TM=STP SC75 2817 3BD5 05 09/27/2012 17:33:32 ACTIVE TM=STP

Figure 6-20 z/OS DISPLAY XCF,SYSPLEX,ALL - STP-only CTN

### **DISPLAY CF**

The DISPLAY CF command does not directly provide information regarding the CTN type or timing mode of the server. However, the output does display the CF Request Time Ordering status (MTOF). If the CTN is a Mixed CTN or STP-only CTN in a Parallel Sysplex configuration, the requirement is that all servers support MTOF.

The DISPLAY CF command can be used to verify whether MTOF is required and enabled (Figure 6-21).

D CF IXL150I 17.35.47 DISPLAY CF 373 COUPLING FACILITY 002817.IBM.02.000000B3BD5 PARTITION: OD CPCID: 00 CONTROL UNIT ID: FFDB NAMED CF7B COUPLING FACILITY SPACE UTILIZATION ....<snippet>>.... MAX REQUESTED DUMP SPACE: 0 M VOLATILE: STORAGE INCREMENT SIZE: 1 M YES CFLEVEL: 17 CFCC RELEASE 17.00, SERVICE LEVEL 10.15 BUILT ON 07/18/2012 AT 13:09:00 COUPLING FACILITY HAS 1 SHARED AND 0 DEDICATED PROCESSORS DYNAMIC CF DISPATCHING: ON COUPLING FACILITY IS NOT STANDALONE CF REQUEST TIME ORDERING: REQUIRED AND ENABLED COUPLING FACILITY SPACE CONFIGURATION IN USE FREE TOTAL CONTROL SPACE: 51 M 583 M 532 M 0 M 0 M 0 M NON-CONTROL SPACE: ....<<snippet>>....

Figure 6-21 z/OS DISPLAY CF command

STP requires that each coupling facility within a Parallel Sysplex is *enabled* for CF Request Time Ordering before migration of any server within the Parallel Sysplex to either a Mixed or STP-only CTN. If this is not the case, the coupling facility becomes unusable and all structures require rebuilding into a CF Request Time Ordering *enabled* coupling facility if possible.

**Note:** CF Request Time Ordering is also referred to as the Message Time Ordering Facility (MTOF).

For images running on zEC12 servers, the D CF,CFNAME=cfname command also displays the **AID** and **PORT**, as shown in Figure 6-22 on page 174.

D CF,CFNAME=CF7B							
IXL150I 13.39.55		8					
COUPLING FACILITY			3D5				
	PARTITION: OD						
	CONTROL UNIT II		, ,				
NAMED CF7B							
COUPLING FACILITY	SPACE UTILIZAT	ION					
ALLOCATED SPACE STRUCTURES: DUMP SPACE: FREE SPACE:		DUMP SPA	CE UTILIZATION				
STRUCTURES:	49 M	STRUCTL	JRE DUMP TABLES:		0 M		
DUMP SPACE:	2 M		TABLE COUNT:		0		
FREE SPACE:	532 M	FREE DUN	1P SPACE:		2 M		
TOTAL SPACE:	583 M	TOTAL DUN	1P SPACE:		2 M		
	1	MAX REQUES	STED DUMP SPACE:		0 M		
TOTAL SPACE:	YES	STORAGE	INCREMENT SIZE:		1 M		
CFLEVEL:	17						
CFCC RELEASE	17.00, SERVICE	LEVEL 10.1	.5				
BUILT ON 07/18/2012 AT 13:09:00							
COUPLING FACILITY HAS 1 SHARED AND 0 DEDICATED PROCESSORS							
DYNAMIC CF DI	SPATCHING: ON						
COUPLING FACI	LITY IS NOT STAI	NDALONE					
CF REQUEST TIME O	RDERING: REQUIR	ED AND ENA	BLED				
COUPLING FACILITY							
			FREE				
CONTROL SPACE:	51 M		532 M	583 M			
NON-CONTROL SPACE	: 0 M		0 M	0 M			
PATH PHYSI	CAL	LOGICAL	CHANNEL TYPE	AID	PORT		
B2 / 0710 ONLIN	E	ONLINE	CIB 12X-IFB3	000A	02		
PATH PHYSI B2 / 0710 Onlin B6 / 0711 Onlin	E	ONLINE	CIB 12X-IFB3	001A	02		
		THE					
COUPLING FACILITY							
TOTAL: 14 IN			U NUT USABL	_E: 0			
OPERATIONAL DEVI	FD3A / 1D65	LJ: 		· / 1067			
FU39 / 1004	FD3A / 1D65 FD3E / 1D69	LD3R		, / IUO/			
FU3U / 1008	FD3E / 1D69 FD49 / 1D6D		/ 100A FD4/	) / 1DCL			
FD48 / ID80 ED40 / 1070	FD49 / 1060 FD4D / 1071	FU4A	/ IDOE FD4E	AOUI ( C			
FD4C / ID/O	FU4U / IU/I						

Figure 6-22 z/OS DISPLAY CF command on zEC12

Figure 6-23 displays the other CF Request Time Ordering messages that might appear in the output of DISPLAY CF.

CF REQUEST TIME ORDERING: REQUIRED AND ENABLED CF REQUEST TIME ORDERING: NOT-REQUIRED AND ENABLED CF REQUEST TIME ORDERING: NOT-REQUIRED AND NOT-ENABLED CF REQUEST TIME ORDERING: REQUIRED AND NOT-ENABLED CF REQUEST TIME ORDERING: REQUIRED AND WILL NOT BE ENABLED REASON: FUNCTION NOT INSTALLED ON THIS SYSTEM REASON: ETR NOT CONNECTED TO COUPLING FACILITY REASON: REQUEST TIME ORDERING FUNCTION FAILURE REASON: REQUEST TIME ORDERING NOT INSTALLED ON THIS SYSTEM REASON: CTNID MISMATCH - CF CTNID: cfstpid REASON: ETR NETID MISMATCH - CF ETR NETID: etr netid REASON: CF IS OUT OF SYNCH WITH TIMING NETWORK

Figure 6-23 Possible CF Request Time Ordering messages

### 6.3.2 Coupling facility commands

In a Parallel Sysplex environment, coupling facilities require time awareness to support CF Request Time Ordering (MTOF) when in a Mixed CTN or STP-only CTN. The server TOD is used for this purpose.

Coupling facilities also support the concept of time zone offset, which is used only for the purpose of time stamp messages that are displayed on the console.

Unlike z/OS, there is no CFCC command available to display time. However, all messages that appear on the CF console include a time stamp in local time format, which is the server TOD with the time zone offset applied.

Therefore, the current local date and time at the CF console can be indirectly determined by entering any command (valid or invalid) and reviewing the time stamp in the resulting response.

Because the CF supports a local time format that incorporates the time zone offset, it also provides methods to both display the current time zone offset setting and to change it if required.

### DISPLAY TIMEZONE

Use the CFCC DISPLAY TIMEZONE command to display the current time zone offset being used by the coupling facility. This produces a single line indicating how many hours and minutes the current time zone is east or west of Greenwich Mean Time (GMT) (Figure 6-24).

```
2012271 17:57:48 => DISPLAY TIMEZONE
2012271 17:57:48 CF0271I Timezone is 04:00 West of Greenwich Mean Time.
```

Figure 6-24 CFCC DISPLAY TIMEZONE command

### TIMEZONE

The CFCC supports the TIMEZONE command that allows the time zone offset to be changed, if required. The syntax is:

TIMEZone {0|hh|hh:mm|:mm} {East|West}

Use this command to adjust the local time displayed in messages on the coupling facility console for the onset and removal of daylight saving time (Figure 6-25).

```
2005272 11:17:31 => TIMEZONE 05:00 west
2005272 10:17:31 CF0271I Timezone is 05:00 West of Greenwich Mean Time
```

Figure 6-25 CFCC TIMEZONE command

### Coupling facility implications at daylight saving time changes

When a CF image partition is activated and it is connected to a Sysplex Timer, the CFCC uses only one of the following time offset options:

- The logical partition time offset specified in the image profile.
- The TIMEZONE offset. The TIMEZONE offset overrides the logical partition time offset.

Use the TIMEZONE command for DST changes, as described at the following web page:

http://www-03.ibm.com/support/techdocs/atsmastr.nsf/WebIndex/TD103077

### 6.3.3 z/VM commands

If your z/VM® LPAR has been configured for STP time synchronization, you can perform a number of administrative tasks that will allow you to retrieve information pertaining to STP.

### Configuration

Changing the STP time zone in the z/VM LPAR configuration file is shown in Figure 6-26.

```
/*
                                                      */
                    Features Statement
Features,
   isable ,
Set_Privclass ,
Auto_Warm_IPL ,
                       /* Disable the following features */
/* Disallow SET PRIVCLASS command */
/* Prompt at IPL always */
  Disable ,
   Clear_TDisk ,
                          /* Don't clear TDisks at IPL time */
  Enable,
                    STP_TZ ,
  Retrieve ,
   Default 20 ,
   Maximum 255,
  MaxUsers noLimit ,
  Passwords_on_Cmds ,
                          /* ... AUTOLOG does
   Autolog yes,
                                                      */
   Link yes, /* ... LINK does
Logon yes, /* ... and LOGON
                                                      */
                          /* ... and LOGON does, too
                                                      */
  Vdisk Userlim 144000 blocks /* Maximum vdisk allowed per user */
```

Figure 6-26 System configuration with STP enabled

### z/VM commands

This section presents the commands used to retrieve timing information in a z/VM LPAR. Querying STP information using the **Q STP** command shows that STP is active (Figure 6-27). 11:02:54 Q STP
11:02:54 Server Time Protocol synchronization activated.

Figure 6-27 Querying STP information

### Testing the impact that changing the time zone has on z/VM

First we issue the **QUERT TIME** command in z/VM (Figure 6-28). Notice the time in the highlighted information. The command has been issued on a system located in the US Eastern Standard Time zone, before entering the time zone information in the HMC.

```
11:02:52 Q T
11:02:52 TIME IS 11:02:52 EDT SUNDAY 09/23/12
11:02:52 CONNECT= 00:01:00 VIRTCPU= 000:00.00 TOTCPU= 000:00.02
```

Figure 6-28 Query time information in z/VM

Next, we also query the time zone information (Figure 6-29).

```
11:02:59 Q TIMEZONES
11:02:59 Zone Direction Offset
                                              Boundary
                                Status
11:02:59 UTC
            ----
                       00.00.00 Inactive
               ----
11:02:59 GMT
                       00.00.00 Inactive
               West
11:02:59 EDT
                       04.00.00 Active-(STP)
11:02:59 EST
               West
                       05.00.00 Inactive-(STP) 02:01:09 11/04/12
```

Figure 6-29 Checking time zone

If STP\_TZ has been set in the z/VM LPAR configuration, the **Q** TIMEZONES command will retrieve this information from STP. We change the time zone in the HMC panels, which triggers the time zone change in z/VM also.

The following messages are displayed on the operator console and in the MAINT user console:

10:06:55 HCPTZN6759I The time zone has changed to EST.

After the time zone change, the **Q** TIMEZONES command displays the information shown in Figure 6-30.

10:08:34 Q TIM	EZONES			
10:08:34 Zone	Direction	Offset	Status	Boundary
10:08:34 UTC		00.00.00	Inactive	
10:08:34 GMT		00.00.00	Inactive	
10:08:34 EDT	West	04.00.00	Inactive-(STP)	19:00:00 00/30/00
10:08:34 EST	West	05.00.00	Active-(STP)	

Figure 6-30 Querying time zone information after changing the time zone

And the Q TIME command reflects the summer time for US EST, as shown in Figure 6-31.

```
10:08:31 Q T
10:08:31 TIME IS 10:08:31 EST SUNDAY 09/23/12
10:08:31 CONNECT= 00:06:39 VIRTCPU= 000:00.00 TOTCPU= 000:00.02
```

Figure 6-31 Time information with daylight saving in effect

# Testing z/VM when server loses STP synchronization, then time synchronization is restored

We check whether STP is active using the **Q** STP command:

10:08:33 Q STP
10:08:33 Server Time Protocol synchronization activated.

The STP Status pane on the HMC in the System (Sysplex) Time task shows that the Timing state is Synchronized.

If the server loses synchronization, the messages shown in Figure 6-32 will be displayed on the OPERATOR console (one message per virtual CPU).

```
11:11:57 HCPMCI9101I MACHINE CHECK ON CPU 0000. MCIC = 04000F3F 403B0000
11:11:57 HCPMCI9109I System operation continues.
11:11:57 HCPSTI988I TOD Clock synchronization suspended
11:11:57 HCPSTI985E STP clock source is not usable
```

Figure 6-32 OPERATOR console message when synchronization is lost

We check in the STP status pane on the HMC for the Timing state - Not synchronized, and also query STP information in z/VM. The Q STP shows that synchronization is suspended:

```
11:13:35 Q STP
11:13:35 Server Time Protocol synchronization suspended.
```

When the failure is repaired, STP synchronization is restored and the message presented in Figure 6-33 is displayed in the z/VM OPERATOR console.

```
11:15:18 HCPMCI9101I MACHINE CHECK ON CPU 0000. MCIC = 04000F3F 403B0000
11:15:18 HCPMCI9109I System operation continues.
11:15:18 HCPSTI986I TOD Clock synchronized via STP
```

Figure 6-33 Message on OPERATOR console after STP synchronization restored

The STP Status pane on the HMC in the System (Sysplex) Time task shows again that the Timing state is Synchronized. We issue the Q STP command to check:

11:16:21 Q STP
11:16:21 Server Time Protocol synchronization activated.

# 6.4 Configuring an STP-only CTN

This section discusses configuration in an STP-only CTN.

**Note:** Unless otherwise specified, operations in this section are performed on the HMC. The HMC controlling the CTN *must* be at the highest level for the servers that can become STP Stratum 1.

The starting point is that one or more STP-enabled servers need to be configured into an STP-only CTN.

Follow these steps to configure an STP-only CTN:

- Establish connectivity between the CEC Support Element and an NTP server that is, or is connected to, a reliable source of time.
- 2. Set the CTN ID on each server to be configured in the STP-only CTN. In the case of an STP-only CTN, the CTN ID only contains the STP ID portion.
- 3. Configure NTP or NTP with PPS as the external time source.
- 4. Initialize the time. This includes setting the time zone, leap seconds, and date and time. If an NTP server is configured, date and time should be initialized by using the ETS option.
- 5. Assign the CTN roles.

In the following sections, we explain each of these steps in greater detail.

### 6.4.1 Support Element-to-NTP server connectivity

We assume that the NTP server has been set up and its connectivity to the Support Element has been established before the configuration of the STP-only CTN. See the 1.1, "External Time Source" on page 4.

### 6.4.2 CTN ID initialization

On a server where the STP feature has just been installed, the CTN ID field on the STP Configuration tab is initially blank, as shown in the HMC window in Figure 6-34.

System (Sysplex) Time for SCZP301									
Timing Network	Network Configuration	STP Configuration	STP Status	ETS Configuration					
Note: The STP ID portion of the CTN ID is case sensitive. If the CTN ID is to be changed, make sure that the ID exactly matches the CTN to be joined.									
	Coordinated timing network ID								
Apply	Apply Save STP Debug Data								
Refresh	Cancel Hel	р							

Figure 6-34 STP Configuration tab - CTN ID

The CTN ID format is [STP Network ID] - [ETR Network ID] and is the basis for establishing the Coordinated Timing Network. The ETR Network ID is always null for an STP-only CTN.

In an STP-only CTN, the CTN ID only contains the STP ID portion. The STP network ID is case sensitive and is one to eight characters. The valid characters are A - Z, a - z, 0 - 9, -, and \_. The STP Network ID is entered in the STP Configuration tab (Figure 6-35). The same CTN ID must be entered on every server that will participate in the STP-only CTN.

📕 Sys	tem (Sysplex)	01	i					
Timing Network	Network Configuration	STP Configuration	STP Status	ETS Configuration				
Note: The STP ID portion of the CTN ID is case sensitive. If the CTN ID is to be changed, make sure that the ID exactly matches the CTN to be joined.								
Coordinated timing network ID ITSOPOK - Apply Save STP Debug Data								
Refresh	Cancel Hel	р						

Figure 6-35 STP Configuration tab with a new CTN ID

Fill in a value for the STP ID field (for example, ITSOTST) and click **Apply**. The confirmation message ACT37363 displays (Figure 6-36).

Local Coordinated Timing Network ID Change Confirmation - SCZP301
This CPC is joining STP-only CTN [ITSOPOK].
The Current Time Server (CPC) defined for the STP-only CTN will provide the necessary time information.
The change will take effect immediately.
Do you want to continue to apply the configuration changes?
ACT37363

Figure 6-36 Local Coordinated Timing Network ID change confirmation

Clicking Yes results in the ACT37315 message being displayed (Figure 6-37).

Local Coordinated Timing Network ID Change - SCZP301	i
Setting the local Coordinated Timing Network ID was such	essful.
АС <sup>-</sup>	37315

Figure 6-37 ACT37315 message - Successful CTN ID setting

After the STP ID has been accepted, the server is STP configured. Because no role has been defined yet, the CTN still has no timing source and it remains a Stratum 0 at this stage.

# 6.4.3 Configuring an NTP server or an NTP server with PPS as the ETS

The ETS has to be configured for an NTP server or an NTP server with PPS before initializing the CTN time. See 1.1, "External Time Source" on page 4.

### 6.4.4 Time initialization

When migrating from a Mixed CTN to an STP-only CTN, the timing information is inherited from the Sysplex Timer. When configuring a new STP-only CTN, the time information must be entered on the server that will become the Current Time Server. This is done from the Network Configuration tab on the HMC. The method does not depend on the number of servers in the CTN.

The following sequence of time initialization steps consists of a newly installed, single CEC CTN. The same sequence applies to a multiserver CTN.

After the server is STP configured but not part of a CTN, the Initialize Time button on the Network Configuration tab is enabled and selectable (Figure 6-38).

System (Sysplex) Time for SCZP301				
Timing Network	Network Configuration	STP Configuration	STP Status	ETS Configuration
Current I	Vetwork Configurat	ion —		
Configured at (UTC): Preferred time server (CPC) Not configured				
Backup time server (CPC) Not configured				
Arbiter	Arbiter Not configured			
Only allow the server(s) specified above to be in the CTN Force configuration Current Time Server (CPC)				
<ul> <li>● Preferred time server (CPC)</li> <li>● Backup time server (CPC)</li> </ul>				
Coordinated timing network ID ITSOPOK				
Apply Initialize Time Deconfigure				
Refresh	Cancel Help			

Figure 6-38 Network Configuration tab - Initialize Time button enabled

The initialize time button is only selectable when the CTN has not yet been initialized, such as for a new installation or for a previously active CTN that has been deconfigured (either intentionally or following a CTN failure).

**Important:** Initializing the time *must* be performed on the server that will become the CTS.

Click Initialize Time and the main Initialize Time window displays (Figure 6-39).

Initialize Time - SCZP301	i			
Prior to setting the network configuration, some initial time values must be set on the server (CPC) that will be assigned the role of the Current Time Server.				
Task	Complete			
<ul> <li>Set leap seconds</li> <li>Set time zone</li> <li>Set date and time</li> </ul>				
OK Cancel Help				

Figure 6-39 Network Configuration tab - Initialize Time anchor window

The Initialize Time window anchors the various time initialization tasks and options. The time initialization process consists of the following three tasks:

- 1. Set leap seconds.
- 2. Set time zone.
- 3. Set date and time.

These three tasks must each be completed before a network configuration can be applied for an STP-only CTN. The first task is to set the leap seconds.

### Initialize time: Set leap seconds

To set leap seconds:

 Select the Set leap seconds radio button and click OK. The Adjust Leap Second Offset displays (Figure 6-40).

Initialize Time - SCZP301	i
Prior to setting the network configuration, som must be set on the server (CPC) that will be as the Current Time Server.	
Task	Complete
<ul> <li>Set leap seconds</li> <li>Set time zone</li> <li>Set date and time</li> </ul>	
OK Cancel Help	

Figure 6-40 Initialize Time - Set leap seconds

 To account for leap second corrections, the total accumulated number of leap seconds since January 1972 must be entered when setting the time. Most installations have little awareness of leap seconds and on-going leap second adjustments. However, an offset value must be specified to complete the task (Figure 6-41).

Adjust Leap Second Offset - SCZP301	i
Current Leap Seconds	
Offset 25	
OK Cancel Help	

Figure 6-41 Initialize time - Adjust leap Second Offset

If leap seconds are not used, specify a value of 0 in the Offset input box. Otherwise, enter the current leap seconds value. Do not enter any other value.

**Note:** If an external time source is configured to an NTP server, the UTC time information obtained from public servers *includes* the current leap seconds offset.

We discuss z/OS considerations for further leap seconds adjustments in 6.6.5, "STP offset adjustments" on page 228. Also see *STP Planning Guide*, SG24-7280, for information about the use of leap seconds.

3. Click **OK**. If successful, the completion message ACT37322 displays (Figure 6-42).

Leap Second Offset Adjustment - SCZP301	i	
The leap second offset adjustment was successful.		
АСТ37322		

Figure 6-42 Leap Second Offset Adjustment successful message

4. Click **OK** to clear this message and return to the main Initialize Time window.

### Initialize time: Set time zone

In Figure 6-43, you can see that the Set time zone radio button is preselected and there is a grayed-out check box in the Complete column next to the Set leap seconds task. This indicates that the first task, setting leap seconds, has already been successfully completed.

Perform the following steps:

1. Select the Set time zone radio button and click OK.

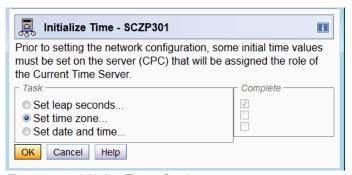


Figure 6-43 Initialize Time - Set time zone

As shown in Figure 6-44, the Time Zone drop-down selection is initially set to <Not Initialized>.

👼 Adjust T	īme Zone Offset - SC	ZP301	
- Current Time Z	lone		
Time zone	<not initialized=""></not>	Define	
Clock Adjustment for Daylight Saving Time			
Daylight saving time offset (hours : minutes):0 : 00			
<ul> <li>Automatically adjust</li> </ul>			
Set standa			
<ul> <li>Set daylig</li> </ul>	ht saving time		

Figure 6-44 Initialize Time - Adjust Time Zone Offset - Not initialized

2. Select a value from the Time Zone drop-down menu (Figure 6-45).



Figure 6-45 Initialize Time - Adjust Time Zone Offset - Time zone selection

If a time zone entry that meets the user requirements cannot be found, then one of the five user-defined time zones (that is, UD1 to UD5) may be used to define the desired time zone.

If a user-defined time zone entry is selected, the Define button is enabled, and the Define Time Zone Algorithm window becomes available (Figure 6-46 on page 185).

Define Time Zone Algorithm - SCZF	·301	E		
Description	* (UTC+00:00) User defir	ned timezone def 1 (UD1)		
Standard time name	* UD1			
UTC offset (hours : minutes)	-5 🖨	-30		
Daylight saving time name				
Daylight saving time offset (hours : minutes)	1	: 0		
Define adjustment of clock for daylight sa     Daylight Saving Time Start	ving time			
Algorithm				
<ul> <li>Scheduled by day of week in month (for example: First Sunday in April at 7:00)</li> <li>Scheduled by date (for example: March 31 at 22:00)</li> <li>Scheduled by day of week after a specific date (for example: First Friday after March 15 at 7:00)</li> </ul>				
First Sunday in	March 1	▼ at 12:00:00 AM		
Daylight Saving Time End				
Algorithm				
<ul> <li>Scheduled by day of week in month (for example: Last Sunday in October at 6:00)</li> <li>Scheduled by date (for example: September 23 at 18:00)</li> <li>Scheduled by day of week after a specific date (for example: Last Sunday after October 15 at 6:00)</li> </ul>				
Last Sunday ir	October 1	▼ at 12:00:00 AM		
OK Cancel Help				

Figure 6-46 Initialize Time - User-defined time zone

The Description (maximum 80 characters) and Standard time name fields (maximum four characters) must be filled in. Otherwise, an error message displays when **OK** is clicked. The standard time name is an abbreviation displayed in various windows to differentiate standard time from daylight saving time.

The UTC offset must be entered in +/- hours and minutes and ranges from -14 to +14 hours.

Also, if the time zone is subject to daylight saving time adjustments, the daylight saving time name and daylight saving offset must be specified. Optionally, algorithms for daylight saving time start and daylight saving time end can be defined to support automatic clock adjustment by selecting the **Define adjustment of clock for daylight saving time** option. The algorithm is saved when **OK** is clicked, but it is not sent to the STP facility until **OK** is clicked in the Adjust Time Zone Offset window; see Figure 6-45 on page 184.

3. Select one of the radio buttons for clock adjustment for daylight saving time.

The Automatically adjust radio button is enabled and selected by default when the time zone selected supports automatic adjustment of daylight saving time. Otherwise, this button is disabled.

If automatic adjustment for daylight saving time is not supported by the selected time zone, or if you prefer to manually control the daylight saving time, select the **Set standard time** or **Set daylight saving time** radio buttons, accordingly; see Figure 6-44 on page 184.

See *STP Planning Guide*, SG24-7280, for information about the use of automatic adjustment.

In Figure 6-44 on page 184, the Set standard time button is selected. Click **OK**. Completion message ACT37328 displays (Figure 6-47).

1 Time Zone Algorithm - SCZP301
Setting the time zone algorithm was successful.
АСТ37328

Figure 6-47 Time Zone Algorithm successful apply message

4. Click **OK** to clear the message and return to the Initialize Time window (Figure 6-48).

### Initialize Time: Set date and time

In the Initialize Time window, notice that the Set date and time radio button is automatically preselected and that there is now a second grayed-out check box in the Complete column next to the Set time zone task. This indicates that both the Set leap seconds and Set time zone tasks have been successfully completed.

As in Figure 6-48, select the Set date and time radio button and click OK.

Initialize Time - SCZP301	1		
Prior to setting the network configuration, some initial time values must be set on the server (CPC) that will be assigned the role of the Current Time Server.			
_ Task	Complete		
<ul> <li>Set leap seconds</li> <li>Set time zone</li> <li>Set date and time</li> </ul>			
OK Cancel Help	1		

Figure 6-48 Initialize Time - Set date and time

The window shown in Figure 6-49 displays.

Set Date and Time - SCZP301		i
Set date and time     Set date and time	Date 9/16/12	6 PM
<ul> <li>Use the configured External Time Source to set date and time</li> <li>Modify time by delta to set date and time</li> </ul>	Delta +00:00:00.000 +/- hh:mm:	ss.mmm
OK Cancel Help		

Figure 6-49 Set Date and Time through External Time Source

Three time initialization methods are provided:

Set date and time.

Select this option to manually set the date and time to specific values. When selected, the initial values that appear in the fields are taken from the current time from the Support Element of the server on which the configuration task is being performed. An icon beside the date field is also available to display a calendar dialog box.

Use External Time Source to set date and time.

Use this option (Figure 6-49 on page 186) to attain greater accuracy to UTC. After being configured through the steps listed in 1.1, "External Time Source" on page 4, the ETS may be used to calculate the difference between the server's time and UTC.

Using the Support Element or the HMC, access the ETS to calculate the difference between the server TOD clock and the time obtained from the external time source, which can be either dial out, or an NTP server with or without PPS. When access to the ETS is successful, the resulting time value is not displayed to the user and is instead passed directly to the STP facility when **OK** is clicked.

Message ACT37382 displays upon successful completion of the Set Date and Time operation (Figure 6-50). Click **OK**.

<b>1</b> Set Date and Time - S	CZP301 🔳
Setting the date and time was	s successful.
ОК	ACT37382

Figure 6-50 Set Date and Time - Successful

The Initialize Time window displays again. To verify the date and time set by accessing the external time source, the user can optionally select the **Set Date and Time** radio button a second time and click **OK** (Figure 6-51). This is the only way that the user can verify the information obtained from the external time source.

To leave the window without making any changes, click **Cancel**.

**Attention:** After using the ETS to set the date and time, go back into the Set Date and Time window, shown in Figure 6-51, to verify that a date and time were obtained.

Set Date and Time - SCZP301		1
Set date and time     Set the configured External Time Source to set date and time	Date 9/16/12	Time 1:36:46 PM
<ul> <li>Use the configured External Time Source to set date and time</li> <li>Modify time by delta to set date and time</li> </ul>	Delta +00:00:00.000	+/- hh:mm:ss.mmm
OK Cancel Help		

Figure 6-51 Confirm Date and Time set by External Time Source

Modify time by delta to set date and time.

Alternatively, you can specify a delta value that may be either positive (default) or negative, and that is entered in the +/-hh:mm:ss.mmm format (Figure 6-52).

Set Date and Time - SCZP301		
◎ Set date and time	Date 9/16/12	Time 1:36:46 PM
<ul> <li>Set date and time</li> <li>Use the configured External Time Source to set date a</li> <li>Modify time by delta to set date and time</li> </ul>	and time Delta +00:00:00.000	+/- hh:mm:ss.mmm
OK Cancel Help		

Figure 6-52 Set Date and Time - Modify time by delta

Click **OK**. Regardless of the method chosen, the server TOD is set to the resulting date and time when you click **OK**. If successful, confirmation message ACT37382 displays. Click **OK** to clear the message and return to the Initialize Time window.

# 6.4.5 Completing time initialization

Observe that the Set date and time radio button is still preselected (Figure 6-53) and that all three check boxes in the Complete column are grayed out. This indicates that all tasks necessary to initialize the time have been successfully completed.

Initialize Time - SCZP301	1
Prior to setting the network configuration, son must be set on the server (CPC) that will be a the Current Time Server.	
_ Task	Complete
<ul> <li>Set leap seconds</li> <li>Set time zone</li> <li>Set date and time</li> </ul>	V V V
OK Cancel Help	_

Figure 6-53 Initialize Time - All tasks complete

Clicking **OK** causes the Set date and time process to be repeated again, because the Set date and time radio button is preselected. To exit out of the Initialize Time task, click **Cancel**. This returns control to the Network Configuration tab (Figure 6-54).

System (Sysplex) Time for SCZP301							
Timing Network	Network Configuration						
Current I	Vetwork Configurat	tion					
	ed at (UTC): d time server (CF	PC)	Not configu	ired		•	
Backup t	time server (CPC	)	Not configu	ired		•	
Arbiter			Not configu	ired		•	
<u>Only allow the server(s) specified above to be in the CTN</u> <u>Force configuration</u> <u>Current Time Server (CPC)</u>							
<ul> <li>● Preferred time server (CPC)</li> <li>● Backup time server (CPC)</li> </ul>							
Coordinated timing network ID ITSOPOK -							
Apply Initialize Time Deconfigure							
Refresh	Cancel Help						

Figure 6-54 Network Configuration tab - After time has been initialized

The Coordinated Server Time is passed to other participating servers in the CTN when the server roles and the Current Time Server are assigned, as described in the next section.

Notice that now, because the server TOD has been initialized, the Apply button is enabled. The Initialize Time button remains enabled. Any of the steps in the Initialize Time task can be repeated until the CTN *is made active by assigning a CTS*. After configuration of the server roles and activation of the STP-only CTN, the Initialize Time button becomes disabled and the task cannot be performed again unless the timing network is deconfigured, which is disruptive to the Coordinated Server Time.

At this point, server role definitions and activation of the STP-only CTN can proceed.

# 6.4.6 Defining server roles

Activation of an STP-only CTN is done by configuring a Current Time Server. The configuration change is done from the Network Configuration tab (Figure 6-55). The change must be initiated from the server that will become the CTS.

System (Sysplex) Time for SCZP301					
	TP STP ETS onfiguration Status Configuration				
Current Network Configuration					
Configured at (UTC): Preferred time server (CPC)	SCZP301 (STP ID: ITSOPOK)				
Backup time server (CPC)	Not configured				
Arbiter	Not configured				
Only allow the server(s) specified above to be in the CTN Force configuration Current Time Server (CPC)					
<ul> <li>● <u>P</u>referred time server (C</li> <li>● <u>B</u>ackup time server (CP</li> </ul>					
Coordinated timing network ID ITSOPOK					
Apply Initialize Time	Deconfigure				
Refresh Cancel Help					

Figure 6-55 Network Configuration tab - Force configuration selected

Here we consider a CTN with two servers. The time initialization was performed. When the PTS/CTS and the BTS will be configured, define the server roles in two steps.

For a single CEC CTN, perform only the first step to configure the PTS/CTS:

1. Configure only the Current Time Server using the Force configuration option (Figure 6-55).

Because the Force configuration option is checked, the Network Configuration Change Confirmation message (Figure 6-56) displays when you click **Apply**. Read the message carefully.

Network Configuration Change Confirmation -     SCZP301
You requested to force the network configuration which results in the configuration being applied without verification. All connectivity checking between the Preferred Time Server, Backup Time Server (if defined), and the Arbiter (if defined) is bypassed.
The force option should only be used if:
1) You are defining a new STP-only CTN and you are certain that a Current Time Server with the same CTN ID is not currently defined.
or
2) You understand why connections between all the servers (CPCs) with defined roles are missing or are not currently online.
Using the force option for other reasons might result in two STP-only CTNs that are not synchronized to each other but that have the same CTN ID.
If you are not sure how to proceed, see the Server Time Protocol Implementation Guide, SG24-7281, for more information.
Do you want to force the network configuration changes?
ACT37348
Yes No

Figure 6-56 Network Configuration Change Confirmation

Note that this is one of two situations in which the Force configuration must be used. We discuss the second situation later in this chapter.

**Note:** The Force configuration option in *not* selected during a migration from a Mixed CTN to an STP-only even though it might sound like you are defining a new STP-only CTN.

The Current Time Server specified can only be the Preferred Time Server. When the configuration is applied, the assignment of the CTS globally transitions all servers with the same CTN ID-to-STP timing mode.

Upon completion, message ACT37341 displays (Figure 6-57).

Modify Network Configuration - SCZP301	i
The network configuration change was successful.	
АСТ37341	

Figure 6-57 Modify Network Configuration - Successful

Important: If the CTN consists of a single server, the next step is skipped.

2. Configure additional server roles for the Backup Time Server and Arbiter. If the STP-only CTN consists of two servers, the Arbiter remains unassigned.

Because there is already a CTS assigned, this is a modification of an existing CTN configuration, and use of the Force configuration check box is not needed.

Modification of the server roles in an existing STP-only CTN is described in 6.5.4, "Changing the server roles" on page 200.

From the HMC, the role and stratum level of a server can be easily verified from the CPC details about the STP Information tab (Figure 6-58).

SCZP301 Details - SCZP301					
Instance Information	Acceptable Status	Product Information	Network Information	STP Information	Energy Management
┌ STP Informa	ation —				
Timing state:       Synchronized         Timing mode:       STP (Server Time Protocol)         Timing network [ID]:       STP-only CTN[ITSOPOK]         Stratum level:       1         Role of CPC in CTN: Preferred Time Server (CPC), Current Time Server					
Time zone: (UTC-05:00) Eastern Time (US & Canada) (EST/EDT)					
OK Apply Change Options Cancel Help					

Figure 6-58 CPC Details - STP Information tab

# 6.5 CTN configuration changes

This section discusses CTN configuration changes.

# 6.5.1 Changing the CTN ID

The STP facility supports modification of the CTN ID in either a Mixed CTN or a STP-only CTN. For example, if the CTN ID contains a value no longer relevant, this can be changed dynamically for the entire CTN without an outage. Recall that with ETR, a change in the ETR Network ID was disruptive to the Sysplex.

**Important**: The only field within the CTN ID that can be changed dynamically is the STP network ID. In a Mixed CTN, the ETR Network ID forms the second part of the CTN ID. This second field requires an outage of all systems within the CTN to force this change.

### Considerations for a CTN ID change in an STP-only CTN

This is a global change made from the Network Configuration tab on the Current Time Server. Because only one change is necessary for the entire CTN, this is a valid operation (Figure 6-59).

**Important**: In an STP-only CTN, changing the STP network ID must be made from the Current Time Server. Otherwise, the request is rejected.

System (Sysplex) Time for SCZP301					
Timing Network Configuration	STP Configuration	STP Status	ETS Configuration	1	
Current Network Configu	ration —				
Configured at (UTC):	9/16/1	2 6:37:25	PM		
Preferred time server (	CPC) SCZP301	(STP ID: I	TSOPOK)	•	
Backup time server (CF	PC) SCZP401	(STP ID: I	TSOPOK)	•	
Arbiter	Not configu	ured		•	
<u>Only allow the server(s) specified above to be in the CTN</u> <u>Force configuration</u> <u>Current Time Server (CPC)</u>					
<ul> <li>● Preferred time server (CPC)</li> <li>● Backup time server (CPC)</li> </ul>					
Coordinated timing network ID ITSOnew					
Apply Initialize Time Deconfigure					
Refresh Cancel He	lp				

Figure 6-59 Network Configuration tab - Change CTN ID

As shown in Figure 6-59, the CTN ID selected is ITSOnew. After clicking **Apply** a confirmation window (Figure 5-50) reminds you that this is a global change. Selecting **Yes** propagates the new CTN ID in a coordinated fashion to all servers within the CTN.

Global Timing Network ID Change Confirmation - SCZP301
You requested a global change to the Coordinated Timing Network ID of your STP-only CTN.
Do you want to continue to apply the configuration changes?
Yes No

Figure 6-60 Global Timing Network ID Change Confirmation

### Temporary inconsistent CTN ID within the CTN

During a CTN ID change, all z/OS systems and Coupling Facilities running on the servers might not recognize the CTN ID change at exactly the same time.

This can cause an inconsistent timing source scenario to occur in the interim between various components in the sysplex until the new CTN ID has been fully implemented across the CTN. This temporary condition is recognized, tolerated for 30 seconds and indicated by IXC439E, and automatically resolved. When the change has completed on all servers IXC435I is then issued.

During this period, various timing-related error messages might be sent to the console by both Cross System Coupling Facility (XCF) and Cross Systems Extended Services (XES) as inconsistent CTN IDs between z/OS logical partitions and coupling facilities are detected.

# 6.5.2 Changing the CTS

The STP facility supports dynamically changing the Current Time Server role to a separate server. For example, in a maintenance situation when there is a need to remove the Current Time Server role from a particular server, changing the Current Time Server is done without disruption to the z/OS and coupling facility components within the CTN. An informational z/OS message is produced to inform the operations staff that the CTS role has changed. The z/OS message is:

IEA395I THE CURRENT TIME SERVER HAS CHANGED TO THE cccccccc

Where cccccccc is PREFERRED or BACKUP.

However, there is no such message produced at the coupling facility. A recovery event affecting the current CTS might similarly result in an automatic CTS configuration change.

The role change can be confirmed by issuing a DISPLAY ETR command and identifying which server is performing the Stratum 1 role (Figure 6-61).

```
D ETR
IEA386I 17.19.59 TIMING STATUS 795
SYNCHRONIZATION MODE = STP
THIS SERVER IS A STRATUM 1
CTN ID = ITSOPOK
THE STRATUM 1 NODE ID = 002827.S18.IBM.02.00000002991E
THIS IS THE PREFERRED TIME SERVER
THIS STP NETWORK HAS NO SERVER TO ACT AS ARBITER
```

Figure 6-61 z/OS DISPLAY ETR - STP-only CTN - Current Time Server

From the HMC, the Network Configuration tab within the System (Sysplex) Time task is used to change the CTS assignment from one server to another.

Under normal circumstances, the Preferred Time Server is also the Current Time Server. Use any of the following methods to move the Current Time Server role to another server in the CTN, depending on the requirements:

 Switch the Current Time Server from the Preferred Time Server to the Backup Time Server.

This facility is provided specifically for a scenario in which the intent is to remove the Preferred Time Server for maintenance purposes and there is a need to relocate the Current Time Server function for the duration. After the maintenance has been completed, reverse the process to restore the original CTN configuration.

 Retain the Current Time Server as the Preferred Time Server and reconfigure the CTN to a new Preferred Time Server.

This method provides greater flexibility. It utilizes a server role change to move the role of the Current Time Server to another server.

This can be used in a scenario where permanent changes are made to the CTN configuration. Depending on the requirements, a number of incremental changes could be made or combined into a single network configuration change.

Switch the Current Time Server from the Preferred Time Server to the Backup Time Server and at the same time, reconfigure the CTN to define a new Backup Time Server.

This is a combination of the two previous methods and can be performed as a single reconfiguration change.

**Note:** Regardless of which method is chosen to move the Current Time Server function, there is one rule that applies in all timing network reconfiguration circumstances: The CTN configuration changes must be done from the server that *will become* the Current Time Server when the reconfiguration is complete.

# 6.5.3 CTS reassignment and ETS considerations

Reconfiguration of the CTS from one server to another has an effect on the Coordinated Server Time because when the new CTS is configured, its ETS configuration becomes active for the CTN at the time that the configuration switch occurs.

If the ETS is configured on the target CTS to dial out with NTP or NTP with PPS, the following actions occur:

- Any ongoing time adjustment is cancelled.
- ► A new time adjustment is generated from the new external time source configured.

The following sections describe the sequence when the CTS reconfiguration changes the ETS from dial out to a NTP client, or from a NTP client to dial out. Changes from the NTP client to NTP client or dial out to dial out are not described here, but would show a similar sequence of events.

# Changing ETS from dial out to NTP server

**Important:** This scenario assumes that you have an HMC that has the dial out capability (V2.11.1 or earlier). In case you plan to add a new zEC12 server as an STP Stratum 1 candidate (HMC version 2.12.0 or later), you must use NTP or NTP with PPS as ETS for this server.

In this scenario (shown in Figure 6-62):

- Server CEC2 is the BTS and the CTS, and is set up to use dial out if configured on the Hardware Management Console.
- Server CEC1 is part of the same CTN. It is the PTS but not the CTS. NTP is configured as its external time source.

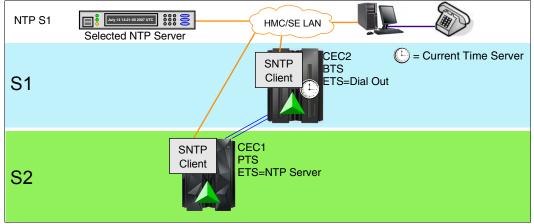


Figure 6-62 Changing ETS from dial out to NTP server

The following steps show the reconfiguration of the CTS from CEC2 to CEC1:

 Display the CEC1 CPC Details → STP Information window (Figure 6-63). Note that CEC1 is indeed Stratum 2 because even though it is the PTS, it is not the CTS.

SCZP301 Details - SCZP301					
Instance Information	Acceptable Status	Product Information	Network Information	STP Information	Energy Management
STP Informa	ntion ———				
STP Information         Timing state:       Synchronized         Timing mode:       STP (Server Time Protocol)         Timing network [ID]:       STP-only CTN[ITSOPOK]         Stratum level:       2         Role of CPC in CTN:       Preferred Time Server (CPC)					ST/EDT)
Time zone: (UTC-05:00) Eastern Time (US & Canada) (EST/EDT)					
OK Apply	Change O	ptions Ca	ncel Help		

Figure 6-63 CPC Details of CEC1 (PTS but Stratum 2)

 In the System (Sysplex) Time task from CEC1, go to the ETS Configuration tab, and query the NTP Time Server information field (Figure 6-64). Also note the statements in the top portion of the window indicating that because this server is not the CTS, changes made to the ETS configuration have no immediate effect on the CTN.

System (Sysplex) Time for SCZP301								
Timing Network	Network Configurati	on Configuration		TS Configuration				
CTN. H necessa recomm errors a second Change source	owever, it is ary. If you pla nended. If ar re logged. If (PPS), it pro- es made to th for the CTN.		me the Cur TS device, , the ETS d ed as NTP of the ETS	rent Time Server an ETS configur evice is monitore or NTP with puls for the STP-only	, if ation is ed and e per CTN.			
© None ⊚ Use	<u>N</u> TP	lse per second (PP	S)					
NTP Tin	ne Server Info	rmation ———						
Select	Configured	NTP Time Server	Stratur	n Source	Status			
۲		9.12.6.46	2	64.113.32.5	Success			
O	V	9.12.6.48	3	66.228.35.252	Success			
Apply	Query N	TP Thresholds						
Refresh	Cancel	Help						

Figure 6-64 ETS Configuration tab

**Note:** On the ETS Configuration tab, whenever changes are made to the NTP Time Server Information portion, ensure that you click **Apply**.

Figure 6-65 shows the NTP Connection Query Completion message.

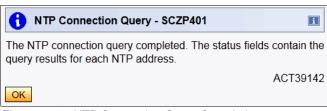


Figure 6-65 NTP Connection Query Completion

3. Figure 6-66 shows the Network Configuration tab. A request is issued to reconfigure the CTN so that CEC1 becomes the CTS.

Syst	tem (Sysplex) Ti	ime	ofor SCZP3	01		i
Timing Network	Network Configuration	ST Co	TP onfiguration	STP Status	ETS Configuration	n
Current I	Vetwork Configurat	ion				
Configur	ed at (UTC):		9/16/12	2 6:37:25	PM	
Preferre	d time server (CF	PC)	SCZP301 (	STP ID: I	TSOPOK)	-
Backup	time server (CPC	;)	SCZP401 (	STP ID: I	TSOPOK)	•
Arbiter			Not configu	ired		•
<u> </u>	allow the server(s configuration Time Server (CPC,		pecified abo	ve to be i	in the CTN	
	erred time server kup time server (0					
Coordina	ated timing netwo	ork	ID ITSOnew	/	-	
Apply	Initialize Time	D	econfigure			
Refresh	Cancel Help					

Figure 6-66 Network Configuration tab - Assigning CTS role to PTS

4. The Network Configuration Change Confirmation message ACT37357 displays (Figure 6-67). Click **Yes** to confirm.

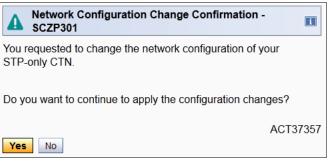


Figure 6-67 Network Configuration Change Confirmation

5. When the reconfiguration is complete, CEC1 becomes the CTS. Click **Refresh** to update the information. The Timing Network tab (Figure 6-68) shows that the CTN Time Source is NTP, the NTP Stratum Level is 1, and the NTP Source ID is GPS. The Adjustment Steering button is now enabled because a new time adjustment has been generated.

Syst	em (Sysplex) 1	Time for SCZP	301		i					
Timing Network	Network Configuration	STP Configuration	STP Status	ETS Configuration						
Coordinat	ed Server Time –									
Time: Date:	11:26:59 PM 9/17/12									
D dito.	e:(UTC-05:00)	Eastern Time (I	US & Car	nada) (EST/ED	T)					
Offsets -	Coffsets									
Leap second: 25										
Time zone offset from UTC: -5 : 00										
Daylight saving time (hours : minutes):1 : 00										
- Network -										
Timing network type: STP-only CTN										
Coordinated timing network (CTN) ID: ITSOPOK -										
CTN time source: NTP										
NTP stratum level: 2										
Adjustmer	nt Steering	Adjust Time	Adjust Lea	ap Seconds	Adjust Time Zone					
Refresh	Cancel Help									

Figure 6-68 Timing Network tab - CTN time source changed to NTP

6. When you click **Adjustment Steering**, the Adjustment Steering Information window displays (Figure 6-69). It shows the steering adjustment data, including the difference between the NTP external reference and the Coordinated Server Time. It also estimates when the steering process will finish.

Adjustment Steering	Information - SCZP301 🔳
Steering	
Status:	Steering completed
Amount (seconds):	0.001144
Start time (UTC):	9/18/12 3:12:38 AM
Estimated finish time (UTC	):9/18/12 3:17:20 AM
CTN time source:	NTP
NTP stratum level:	2
ОК Неір	

Figure 6-69 Adjustment Steering Information

# Changing ETS from NTP server to dial out

**Note:** This scenario is presented simply for completeness of the information, because it is highly unlikely to revert to a dial out ETS configuration after you have included a zEC12 in your CTN. This scenario pertains to older servers (z196, z114, and earlier generations).

This scenario assumes that you have an HMC which has the dial out capability (V2.11.1 or earlier). In case you plan to add a new zEC12 server as an STP Stratum 1 candidate (HMC version 2.12.0 or later) you must use NTP or NTP w/ PPS as ETS for this server.

In this scenario (as shown in Figure 6-70):

- CEC2 is part of the CTN. It is the BTS, and is set up to use dial out if configured on the Hardware Management Console.
- CEC1 is part of the same CTN. It is the PTS and the CTS, and NTP is configured as its external time source.

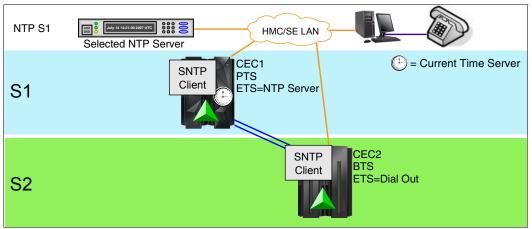


Figure 6-70 Changing ETS from NTP server to dial out

To reconfigure the CTS from CEC1 to CEC2:

1. Select the **Network Configuration** tab for CEC2 to assign it as the new CTS (Figure 6-71).

ming etwork	Network Configuration		ETR Configuration	ETR Status	STP Confi	guration	STP Status	ETS Configuration	CEC
Current Ne	twork Configuration at (UTC):			10/3/09 7:	6:05 PM				
		CEC1 (S	TP ID: ITSOF	10.59.5° J. 5.5.5	•				
Backup time server (CPC)		CEC2 (STP ID: ITSOPOK)		OK)	-				
Arbiter		Not configured		-					
🗖 <u>O</u> nly all	ow the server(s) s	pecified	above to be in	the CTN					
	onfiguration								
	me Server (CPC) – ed time server (CF	C)							
⊙ <u>B</u> ackup	time server (CPC	;)							
Coordinate	d timing network I		юк	-					
Apply	nitialize Time	Deconf	aure	Cancel Migr	ation to Mix	ed CTN			

Figure 6-71 Network Configuration tab for CEC2

2. The Network Configuration Change Confirmation message ACT37357 displays. Click **Yes**. Message ACT37341 displays (Figure 6-72).



Figure 6-72 Modify Network Configuration

 Click OK to return to the Network Timing tab (Figure 6-73). The CTN Time source now indicates "Dial up time source via the Hardware Management Console". The Adjustment Steering button is enabled.

iming letwork	Network Configuration	ETR Configuration	ETR Status	STP Configuration	STP Status	ETS Configuration
	ed Server Time					
	4:17:22 PM					Refer Constant
	10/10/09 :: (UTC-05:00) Easter	n Time /LIS & Ca				
Currently:			iaua) (EST/EDT)			
ouronay.		tine - se suite	tine for a statio	<u>(1943) (1970)</u>	<u>edest og skild</u>	<u>na s</u> e segura
– Offsets –						
Leap seco		0				19.22
	offset from UTC:	-5:00				
Daylights	aving time (hours : mii	iules). 1:00				
– Network -	and the second		<u>en de la construcción de la constru Construcción de la construcción de l</u>	Charles Carlos	and the second	<u></u>
		STP-only (				
	ed timing network (CT	전문을 위한 것을 많이 있는 것을 다 같이 많이 한 것을				
CTN time	source:	Dial-up tim	ie source via Hardv	vare Manageme	ent Console	and a state
and the second	ent Steering	Adjust Time	Adjust Leap Seco	1	Adjust Time Zone	

Figure 6-73 Timing Network Tab - CTN time source now HMC dial-up

4. Click **Adjustment Steering**, and the Adjustment Steering Information displays (Figure 6-74).

- Steering	a service and the service of the ser
Status:	Steering completed
Amount (seconds):	-0.013674
Start time (UTC):	10/10/09 8:13:32 PM
Estimated finish time (UTC):	10/10/09 8:30:57 PM
CTN time source:	Dial-up time source via Hardware Management Console

Figure 6-74 Adjustment Steering Information

5. On the CPC Details window (Figure 6-75) the STP Information shows that CEC1 is the PTS but is no longer the CTS.

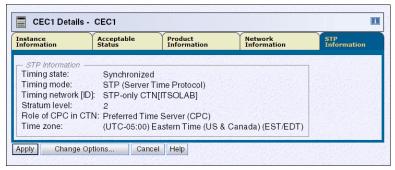


Figure 6-75 CPC Details for CEC1

# 6.5.4 Changing the server roles

The STP-only CTN roles of Preferred Time Server, Backup Time Server, and Arbiter are displayed and modified using the Network Configuration tab within the System (Sysplex) Time task.

The restrictions associated with changing the CTN roles are the same as when initially converting to an STP-only CTN:

- Only the Preferred Time Server role needs to be defined. This server automatically becomes the Current Time Server. Running without a Backup Time Server is not advisable, because the Preferred Time Server becomes a single point of failure in the CTN.
- An Arbiter can only be defined if a Backup Time Server has also been defined. The roles of Backup Time Server and Arbiter can be removed by assigning these as *not configured*.
- No server can assume multiple roles.

**Tip:** The same rule applies to changing the CTN server roles as it does to changing the Current Time Server, namely that the CTN configuration changes must be performed from the server that *will become* the Current Time Server when the reconfiguration is complete.

# Reconfiguring the PTS, BTS, and Arbiter

There is no requirement to stage changes in increments, although this is possible. All the server roles within an STP-only CTN may be redefined in one single reconfiguration request.

Consider the initial configuration (shown in Figure 6-76). It is possible in one single request to the System (Sysplex) Task to perform the following tasks:

- Reconfigure all three roles.
  - Preferred Time Server
  - Backup Time Server
  - Arbiter
- Change the Current Time Server from the PTS to the BTS.

System (Sysplex) T	Time for SCZP301
Timing Network Configuration	STP Configuration Status Configuration
Current Network Configurat	tion
Configured at (UTC): Preferred time server (CF	PC) SCZP401 (STP ID: ITSOPOK)
Backup time server (CPC	C) SCZP301 (STP ID: ITSOPOK)
Arbiter	SCZP201 (STP ID: ITSOPOK)
<u>Only allow the server(s</u> <u>Force configuration</u> Current Time Server (CPC)	s) specified above to be in the CTN
<ul> <li>● Preferred time server</li> <li>○ Backup time server (</li> </ul>	
Coordinated timing netwo	ork ID ITSOPOK
Apply Initialize Time	Deconfigure
Refresh Cancel Help	

Figure 6-76 Network Configuration tab - Initial view

To adhere to the rule, after all changes are made, ask yourself:

- 1. PTS or BTS: Who has the radio button selected for Current Time Server?
- 2. Which server is assigned the role of [answer of question 1]?
- 3. Am I on the Network Configuration tab belonging to server [answer of question 3]?

System (Sysplex) T	ime for SCZP	301		i
Timing Network Configuration	STP Configuration	STP Status	ETS Configuration	
Current Network Configurat	tion —			
Configured at (UTC): Preferred time server (CF	PC) SCZP201	(STP ID:	ITSOPOK)	•
Backup time server (CPC	C) SCZP301	(STP ID:	ITSOPOK)	•
Arbiter SCZP401 (STP ID: ITSOPOK)				
Only allow the server(s <u>Force configuration</u> <i>Current Time Server (CPC)</i>		ove to be	in the CTN	
<ul> <li>○ <u>P</u>referred time server</li> <li>● <u>B</u>ackup time server (</li> </ul>	· · ·			
Coordinated timing netwo	ork ID ITSOPC	ж 	-	
Refresh Cancel Help				

Figure 6-77 Reassigning roles from Network Configuration tab

Based on the changes to be applied in Figure 6-77 on page 201, if the configuration changes are attempted from either SCZP101 or H40, error message ACT37336 is displayed (Figure 6-78).

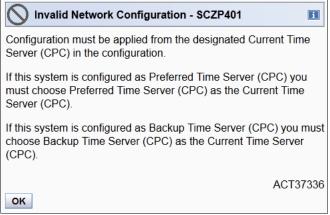


Figure 6-78 Invalid Network Configuration message

Also, before allowing a configuration change to proceed, the STP facility checks that initialized STP links exist between the servers that are defined under the various roles. Figure 6-79 shows that no initialized STP links exist between H40 and any other servers. This might be a result of all coupling links being configured off, or a hardware maintenance outage on the servers.

iming Netw etwork Confi	ork guration	STP Configuration	STP Status	ETS Con	figuration	'n			
iming state:		Synchroni	zed						
Jsable clock so	urce:	Yes							
iming mode:		STP (Serv	er Time	Proto	ocol)				
Stratum level:		2							
Aaximum timin	g stratum	level:3							
Aaximum STP	version:	4							
System Informa	tion ——	•							
Local STP	Domo	to Directly Attac	hod Sve	tom	System	Stratum	Active	Maximum STD	
Local STP					-			Maximum STP Version	
Link Identifier	s) Type-l	MFG-Plant-Seq			System Name	Stratum Level	Active Versio	Maximum STP Version	
	s) Type-l	MFG-Plant-Seq			-				
Link Identifier	(s) Type-I ed STP Lin STP Link	MFG-Plant-Seq			Name		Versio		
Link Identifier	(s) Type-I ed STP Lin STP Link	MFG-Plant-Seq	uence		Name le l	Level	Versio		
Link Identifier	(s) Type-l ed STP Lin STP Link Type	MFG-Plant-Seq	Reasor Sent		Name le l	Level Reason C	Versio		
Link Identifier Local Uninitializ Local STP Link Identifier	s) Type-l ed STP Link STP Link Type Coupling	MFG-Plant-Seq iks	Reasor Sent Offline		Name le l	Level Reason C	Versio		
Link Identifier Local Uninitializ Local STP Link Identifier 0700	s) Type-l ed STP Link STP Link Type Coupling Coupling	MFG-Plant-Seq ks over InfiniBand	Reasor Sent Offline		Name le l	Level Reason C	Versio		
Link Identifier Local Uninitializ Local STP Link Identifier 0700 0701	s) Type-l ed STP Link STP Link Type Coupling Coupling Coupling	MFG-Plant-Seq iks over InfiniBand over InfiniBand	Reasor Sent Offline Offline Offline		Name le l	Level Reason C	Versio		
Link Identifier Local Uninitializ Local STP Link Identifier 0700 0701 0702	s) Type-l ed STP Link Type Coupling Coupling Coupling Coupling	MFG-Plant-Seq iks over InfiniBand over InfiniBand over InfiniBand	Reasor Sent Offline Offline Offline Offline	n Cod	Name le l	Level Reason C	Versio		
Link Identifier Local Uninitializ Local STP Link Identifier 0700 0701 0702 0703	s) Type-I ed STP Link Type Coupling Coupling Coupling Coupling Coupling	MFG-Plant-Seq ks over InfiniBand over InfiniBand over InfiniBand over InfiniBand	Reasor Sent Offline Offline Offline Offline Configu	n Cod	Name le l	Level Reason C	Versio		
Link Identifier Local Uninitializ Local STP Link Identifier 0700 0701 0702 0703 0704	s) Type-I ed STP Link Type Coupling Coupling Coupling Coupling Coupling Coupling	MFG-Plant-Seq ks over InfiniBand over InfiniBand over InfiniBand over InfiniBand over InfiniBand	Reasor Sent Offline Offline Offline Offline Configu Offline	n Cod	Name le l	Level Reason C	Versio		

Figure 6-79 No initialized STP links between SCPZ401 and SCZP301 or SCZP201

If connectivity conditions are not satisfied, the configuration request is rejected. An error message displays depending on which connection is missing. Figure 6-80 shows there are no links between BTS and PTS.

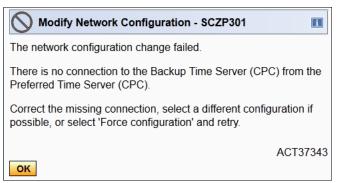


Figure 6-80 Modify Network Configuration - No links between BTS and PTS

Figure 6-81 shows there are no links between the Arbiter and CTS.

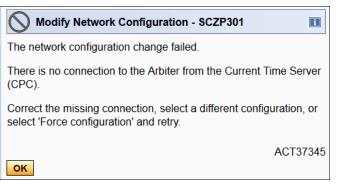


Figure 6-81 Modify Network Configuration - No links between Arbiter and CTS

Figure 6-82 shows that there are no links between the Arbiter and BTS.

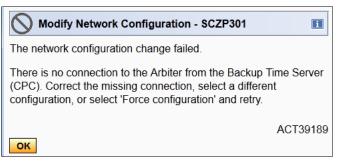


Figure 6-82 Modify Network Configuration - No links between Arbiter and BTS

# Force configuration

If it is understood that connectivity requirements are not being met at the time that a reconfiguration is being performed, use the **Force configuration** option to bypass the checking (Figure 6-83).

System (Sysplex) T	ime for SCZP3	01		i
Timing Network Configuration	STP Configuration	STP Status	ETS Configuration	ı
Current Network Configurat	ion ———			
Configured at (UTC): Preferred time server (CF	PC) SCZP201 (	(STP ID: I	TSOPOK)	•
Backup time server (CPC	;) SCZP301 (	STP ID: I	TSOPOK)	-
Arbiter	SCZP401 (	STP ID: I	TSOPOK)	•
□Only allow the server(s ■ <u>Force configuration</u> <sub>C</sub> Current Time Server (CPC)	<i>,</i> ,	ove to be i	n the CTN	
<ul> <li>○ <u>P</u>referred time server</li> <li>● <u>B</u>ackup time server (</li> </ul>	· · ·			
Coordinated timing netwo	Deconfigure	к ]	_	
Refresh Cancel Help	]			

Figure 6-83 Network Configuration tab - Force configuration selected

This is one of two scenarios whereby the **Force configuration** option is enabled, as described in the warning message displayed (Figure 6-84) after you click **Apply**.

Network Configuration Change Confirmation -     SCZP301
You requested to force the network configuration which results in the configuration being applied without verification. All connectivity checking between the Preferred Time Server, Backup Time Server (if defined), and the Arbiter (if defined) is bypassed.
The force option should only be used if:
1) You are defining a new STP-only CTN and you are certain that a Current Time Server with the same CTN ID is not currently defined.
or
2) You understand why connections between all the servers (CPCs) with defined roles are missing or are not currently online.
Using the force option for other reasons might result in two STP-only CTNs that are not synchronized to each other but that have the same CTN ID.
If you are not sure how to proceed, see the Server Time Protocol Implementation Guide, SG24-7281, for more information.
Do you want to force the network configuration changes?
ACT37348

Figure 6-84 Network Configuration Change Confirmation

The other scenario pertains to configuring an STP-only CTN from scratch described in 6.4, "Configuring an STP-only CTN" on page 178. Again, this does *not* pertain to a migration from a Mixed CTN to an STP-only CTN.

The message in Figure 6-85 displays when the configuration change is successful.

Modify Network Configuration - SCZP301	i
The network configuration change was successful.	
АСТ37341	

Figure 6-85 Modify Network Configuration message

**Attention:** Use Force configuration with care, because it might unintentionally implement an STP-only CTN that is not tolerant of Current Time Server failure.

The Force configuration option only bypasses the connectivity checking, as previously outlined. It does not allow reconfigurations that are invalid, such as a CTN with an Arbiter defined but no Backup Time Server specified.

# **Configuring a Backup Time Server**

Definition of a Backup Time Server is optional and is done using the Network Configuration tab by specifying the required server in the Backup Time Server box and clicking **Apply** (Figure 6-86).

System (Sysplex) Time	for SCZP301
Timing Network ST Network Configuration Co	P STP ETS nfiguration Status Configuration
Current Network Configuration	
Configured at (UTC):	9/16/12 6:37:25 PM
Preferred time server (CPC)	SCZP301 (STP ID: ITSOPOK)
Backup time server (CPC)	SCZP401 (STP ID: ITSOPOK)
Arbiter	Not configured
□ <u>O</u> nly allow the server(s) sp □ <u>F</u> orce configuration <sub>Γ</sub> Current Time Server (CPC) —	pecified above to be in the CTN
<ul> <li>● Preferred time server (CI</li> <li>○ Backup time server (CPC</li> </ul>	
Coordinated timing network I	
Apply Initialize Time D	econigure
Refresh Cancel Help	

Figure 6-86 Network Configuration tab - BTS defined

Because this is a network configuration change, it needs to be performed from the Current Time Server. As shown in Figure 6-86, the preferred (and current) time server is SCZP201, so this reconfiguration request must be performed from server SCZP201.

**Recommendation:** Configuring a Backup Time Server is optional, but a useful idea. Otherwise, the Preferred Time Server is a single point of failure in the CTN.

A Backup Time Server needs direct timing link connectivity to the Preferred Time Server. This is verified as part of the reconfiguration process (unless the Force configuration option has been selected).

There are no messages sent to the z/OS console during the definition of the Backup Time Server, unlike the removal of the Backup Time Server that causes message IEA389I for automation purposes (see "Removing the Backup Time Server" on page 210).

Alternately, issue the z/OS DISPLAY ETR command before the reconfiguration and determine that the CTN does not have a Backup Time Server (Figure 6-87).

The last two lines of the display indicate that there is only a Preferred Time Server configured, and that neither a Backup Time Server or an Arbiter have been configured.

```
D ETR

IEA386I 19.36.33 TIMING STATUS 385

SYNCHRONIZATION MODE = STP

THIS SERVER IS A STRATUM 1

CTN ID = ITSOPOK

THE STRATUM 1 NODE ID = 002817.S18.IBM.02.00000002991E

THIS IS THE PREFERRED TIME SERVER

THIS STP NETWORK HAS NO BACKUP TIME SERVER

THIS STP NETWORK HAS NO SERVER TO ACT AS ARBITER
```

Figure 6-87 z/OS DISPLAY ETR - Backup Time Server is not configured

After the reconfiguration is complete, issue the DISPLAY ETR again. The absence of the second-to-last line of Figure 6-88 indicates that the CTN now supports a Backup Time Server.

```
D ETR
IEA386I 20.06.18 TIMING STATUS 395
SYNCHRONIZATION MODE = STP
THIS SERVER IS A STRATUM 1
CTN ID = ITSOPOK
THE STRATUM 1 NODE ID = 002817.S18.IBM.02.00000002991E
THIS IS THE PREFERRED TIME SERVER
THIS STP NETWORK HAS NO SERVER TO ACT AS ARBITER
```

Figure 6-88 z/OS DISPLAY ETR - Backup Time Server is configured

# Configuring an Arbiter

Defining an Arbiter is optional and is performed on the Network Configuration tab by specifying the required server in the Arbiter box and clicking **Apply**. Because this is a CTN configuration change, it needs to be performed from the Current Time Server.

**Recommendation:** Configuring an Arbiter is optional, but is a useful idea to enhance the failure detection and recovery capabilities of an STP-only CTN.

If an Arbiter is included in a STP-only CTN, then ensure that a Backup Time Server is also defined. Otherwise, the reconfiguration is rejected.

The role of the Arbiter is to assist in reconfiguring the Current Time Server role from the Preferred Time Server to the Backup Time Server in recovery scenarios. As a result, the Arbiter must have link connectivity to both of these servers. Any attempt to assign an Arbiter without having the required coupling link connectivity to the PTS and BTS fails.

**Note:** The connectivity check can be bypassed by specifying Force configuration on the Network Configuration tab. However, do not do this under normal circumstances.

No z/OS messages are produced during definition of an Arbiter. As with the Backup Time Server, issue the z/OS DISPLAY ETR command to determine whether the STP-only CTN has an Arbiter defined (Figure 6-89).

```
D ETR
IEA386I 21.02.15 TIMING STATUS 405
SYNCHRONIZATION MODE = STP
THIS SERVER IS A STRATUM 1
CTN ID = ITSOPOK
THE STRATUM 1 NODE ID = 002817.S18.IBM.02.00000002991E
THIS IS THE PREFERRED TIME SERVER
```

Figure 6-89 z/OS DISPLAY ETR - Arbiter defined

As in Figure 6-89, the absence of a line pertaining to the presence of an Arbiter (as compared to Figure 6-88 on page 207) indicates that an Arbiter is defined.

# Configuring the same server to multiple CTN server roles

Each of the server roles in the CTN must be allocated to a separate server or set to a value of Not Configured, except for the Preferred Time Server, which must be defined.

If an attempt is made to assign multiple roles to the same server, the configuration request is rejected and message ACT37338 displays (Figure 6-90).

Ninvalid Network Configuration - SCZP301	i
The Preferred Time Server (CPC), Backup Time Server (CP Arbiter must be unique.	C), and
AC	T37338

Figure 6-90 Invalid Network Configuration - Roles must be unique

# Removing the Preferred Time Server

All STP-only CTNs need to have a Preferred Time Server defined. Any attempt to set the Preferred Time Server to <Not Configured> in an initialized CTN is rejected as an invalid configuration and causes message ACT37332 to be displayed (Figure 6-91).

Ninvalid Network Configuration - SCZP301	i
The Preferred Time Server (CPC) must be configured	red.
АСТ37	332

Figure 6-91 Invalid Network Configuration - PTS must be configured

The Preferred Time Server role can only be removed by deconfiguring the STP-only CTN by using the **Deconfigure** button.

# Removing the Arbiter

The Arbiter may be removed from an STP-only CTN. The Arbiter can be removed without regard to the Current Time Server role. Successful removal of the Arbiter does not produce any messages at the z/OS console.

Issue the DISPLAY ETR command to determine whether the CTN currently has an Arbiter defined. Figure 6-92 demonstrates issuing DISPLAY ETR from the Backup Time Server in a

configuration without an Arbiter. The last line of the display indicates the absence of an Arbiter in the configuration.

```
D ETR

IEA386I 17.19.59 TIMING STATUS 428

SYNCHRONIZATION MODE = STP

THIS SERVER IS A STRATUM 2

CTN ID = ITSOPOK

THE STRATUM 1 NODE ID = 002827.S18.IBM.02.00000002991E

THIS IS THE BACKUP TIME SERVER

NUMBER OF USABLE TIMING LINKS = 6

THIS STP NETWORK HAS NO SERVER TO ACT AS ARBITER
```

Figure 6-92 z/OS DISPLAY ETR - No Arbiter

Figure 6-93 demonstrates issuing DISPLAY ETR from the Backup Time Server in a configuration *with* an Arbiter.

This is almost identical to the display in Figure 6-92, except that the message indicating the absence of an Arbiter does not appear in Figure 6-93.

```
D ETR

IEA386I 18.06.54 TIMING STATUS 216

SYNCHRONIZATION MODE = STP

THIS SERVER IS A STRATUM 2

CTN ID = ITSOPOK

THE STRATUM 1 NODE ID = 002827.C24.IBM.02.000000026A3A

THIS IS THE BACKUP TIME SERVER

NUMBER OF USABLE TIMING LINKS = 7
```

Figure 6-93 z/OS DISPLAY ETR: Arbiter present

## Removing the Backup Time Server

There might be a requirement to remove the Backup Time Server role from the CTN. This can be achieved from the Network Configuration tab by setting the Backup Time Server field to **Not configured** (Figure 6-94).

System (Sysplex) Time for SCZP301
Timing Network         Network Configuration         STP Configuration         STP Status         ETS Configuration
Current Network Configuration
Configured at (UTC): 9/16/12 6:37:25 PM
Preferred time server (CPC) SCZP301 (STP ID: ITSOPOK)
Backup time server (CPC) Not configured
Arbiter Not configured
<u>Only</u> allow the server(s) specified above to be in the CTN <u>Force configuration</u> <i>Current Time Server (CPC)</i>
<ul> <li>● Preferred time server (CPC)</li> <li>● Backup time server (CPC)</li> </ul>
Coordinated timing network ID ITSOPOK
Apply Initialize Time Deconfigure
Refresh Cancel Help

Figure 6-94 Network Configuration tab - BTS definition removed

Before the BTS can be removed, the user needs to make sure that the Arbiter is not defined and that the BTS is not the Current Time Server; otherwise, an error message displays.

The example shown in Figure 6-95 results in a failure, because a configuration with an Arbiter but no BTS is not valid.

System (Sysplex) Time for SCZP301							
Timing Network Configuration	STP Configuration Status Configuration						
Current Network Configura	ation —						
Configured at (UTC):	9/16/12 7:12:36 PM						
Preferred time server (C	PC) SCZP301 (STP ID: ITSOPOK)						
Backup time server (CP	C) Not configured						
Arbiter	SCZP201 (STP ID: ITSOPOK)						
Only allow the server(s) specified above to be in the CTN  Force configuration Current Time Server (CPC)							
<ul> <li>● Preferred time server (CPC)</li> <li>● Backup time server (CPC)</li> </ul>							
Coordinated timing network ID ITSOPOK							
Apply Initialize Time Deconfigure							
Refresh Cancel Help							

Figure 6-95 Network Configuration tab - Arbiter defined without BTS

The error message ACT37333 displays (Figure 6-96). In this case, the Arbiter must also be removed before the Backup Time Server can be removed.

Nrvalid Network Configuration - SCZP301	i
The Backup Time Server (CPC) must be configured when the Arbiter is configured.	e
ОК	Г37333

Figure 6-96 Invalid Network Configuration - BTS must be configured

If the Backup Time Server is also the Current Time Server, the request also fails, and the error message ACT37336 displays (Figure 6-97).

Nrvalid Network Configuration - SCZP301
Configuration must be applied from the designated Current Time Server (CPC) in the configuration.
If this system is configured as Preferred Time Server (CPC) you must choose Preferred Time Server (CPC) as the Current Time Server (CPC).
If this system is configured as Backup Time Server (CPC) you must choose Backup Time Server (CPC) as the Current Time Server (CPC).
АСТ37336

Figure 6-97 Invalid Network Configuration - Must be applied from CTS

When removal of the Backup Time Server is successful, z/OS message IEA389I displays on each z/OS console, warning that the CTN no longer has a time server backup available:

IEA389I THIS STP NETWORK HAS NO SERVER TO ACT AS BACKUP

This is the *only* message that displays during a reconfiguration of the STP roles. There are no equivalent messages displayed when a Backup Time Server is added to the CTN, or upon removal or addition of an Arbiter.

Use the DISPLAY ETR command to determine whether the CTN currently has a Backup Time Server defined.

The presence of the last two lines in Figure 6-98 indicates that both the Backup Time Server and Arbiter roles are not currently defined. Absence of the Backup Time Server automatically implies that there is no Arbiter, because a configuration with a Preferred Time Server and an Arbiter but no Backup Time Server is not valid.

```
D ETR
IEA386I 15.41.12 TIMING STATUS 470
SYNCHRONIZATION MODE = STP
THIS SERVER IS A STRATUM 1
CTN ID = ITSOPOK
THE STRATUM 1 NODE ID = 002817.S18.IBM.02.00000002991E
THIS IS THE PREFERRED TIME SERVER
THIS STP NETWORK HAS NO BACKUP TIME SERVER
THIS STP NETWORK HAS NO SERVER TO ACT AS ARBITER
```

Figure 6-98 z/OS DISPLAY ETR - Backup server and Arbiter not defined

# Deconfiguring a CTN

Through the HMC, it is possible to deconfigure the STP-only CTN by removing the roles of the Preferred Time Server, Backup Time Server, and Arbiter.

**Attention:** Deconfiguring the CTN results in the loss of the clock source for all servers in the CTN. This action is disruptive to all z/OS images, running in a sysplex or non-sysplex, when running with STPMODE YES.

Deconfigure should only be used to shut down the entire CTN.

This Deconfigure button is accessed from the Network Configuration tab and is only enabled on the Current Time Server (Figure 6-99).

System (Sysplex) Time for SCZP301							
Timing Network	Network Configuration		rp onfiguration	STP Status	ETS Configuration		
Current I	Vetwork Configurat	ion					
	ed at (UTC):			2 5:18:55	PM		
Preferree	d time server (CF	PC)	SCZP301 (	STP ID: I	TSOPOK)	-	
Backup t	ime server (CPC	;)	SCZP401 (	STP ID: I	TSOPOK)	•	
Arbiter			SCZP201 (	STP ID: I	TSOPOK)	•	
Eorce	Only allow the server(s) specified above to be in the CTN     Force configuration     Current Time Server (CPC)						
	erred time server aup time server (	· ·	· ·				
Coordinated timing network ID ITSOPOK							
Apply	Initialize Time	D	econfigure		,		
Refresh	Cancel Help						

Figure 6-99 Network Configuration tab - Deconfigure

When you click Deconfigure, confirmation message ACT37384 displays (Figure 6-100).

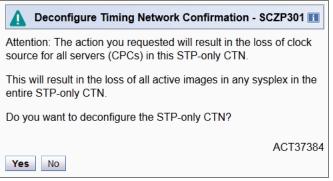


Figure 6-100 Deconfigure Timing Network Confirmation message

Clicking **Yes** results in the loss of the clock source for all servers in the STP-only CTN, which in turn causes the loss of all active sysplex images and access to coupling facilities using CF Request Time Ordering. In essence, this operation renders all servers to Stratum 0.

To reestablish a deconfigured CTN, see Chapter 7, "Operational considerations" on page 243

# 6.6 Time management

In this section we discuss time management.

# 6.6.1 Adding an ETS to an existing CTN

There are several possible configurations that can already be in use for an STP-only CTN as a starting point. Moreover, when migrating from an STP-only CTN to an STP-only CTN with the NTP client, the effect on the CTN depends on the role of the server being configured:

- If the Current Time Server is configured to use an NTP server or an NTP server with PPS, the NTP client on the CTS accesses the NTP server and the time adjustments are used to steer the Coordinated Server Time. This occurs when the NTP configuration is applied on the ETS configuration tab.
- If the server that is configured to use an NTP server or an NTP server with PPS is not the Current Time Server (but is either the PTS or the BTS), the NTP client on the PTS or BTS accesses the NTP time server, but the time adjustments may not be used to steer the Coordinated Server Time. Instead, the NTP server will be monitored as long as it is not the CTS. This monitoring is done to detect an NTP server access problem. The NTP server is used to steer the Coordinated Server Time When the server becomes the CTS or the NTP server on the CTS is not accessible. See "ETS recovery using NTP servers" and "ETS recovery using NTP servers with PPS" in the Server Time Protocol Recovery Guide, SG24-7380, for more details.
- If the server that is configured to use an NTP server or an NTP server with PPS is neither the PTS nor the BTS, the NTP server is not accessed, and its availability has no immediate effect on the CTN.

Table 6-2 gives an overview of the dependencies of the current role of a server in an STP-only CTN and the ETS configuration usage.

CTS	Current role in the STP-only CTN	ETS configuration required	ETS configuration effect
Yes	PTS or BTS	Yes	Immediately
No	PTS or BTS	No, but suggested	When server becomes CTS
No	Not PTS nor BTS	No, but suggested	When a server is defined as PTS or BTS and becomes CTS

Table 6-2 Server role in an STP-only CTN and NTP client support enabled

**Note:** The ETS configuration is stored at the target server, independent of the current role of this server.

To configure the ETS to use an NTP server in an STP-only CTN:

- 1. Connect an NTP server to an STP-capable server that is already part of or that will become part of an STP-only CTN. The LAN connectivity between the NTP server and the Support Element network varies depending on the user requirements and preexisting environments. See 1.2, "Configuring an NTP server" on page 5, for more information.
- 2. On the ETS Configuration tab, select **Use NTP** or **Use NTP with pulse per second (PPS)** and configure the appropriate NTP servers.
- 3. Reassign CTN roles if necessary.

### Configuring an NTP server

Without regular adjustment, the time within the CTN slowly drifts, which might or might not be acceptable depending on the time accuracy requirements.

First, configure the NTP client function on the PTS/CTS. If the selected NTP server is valid but the time difference between the NTP server and the Coordinated Server Time is more than 60 seconds, an error status of CPC/NTP time difference > 60 seconds displays (Figure 6-101).

🜉 Sys	tem (Syspl	ex) Time for SCZP301	1		1	
Timing Network	Network Configurati	on Configuration St		'S onfigurat	ion	
device,	Note This CPC has the role of Current Time Server for an STP-only CTN. If you plan to attach to an ETS device, an ETS configuration is required. Changes made to the ETS configuration have an immediate effect on the time source for the CTN.					
© None ⊚ Use <u>I</u> ⊚ Use I	NTP NTP with <u>p</u> u	lse per second (PPS)				
	e Server Info.		Stratum	Course	Ctatua	
Select		NTP Time Server 9.12.6.46	Stratum	Source	CPC/NTP time difference > 60 seconds	
0	<b>V</b>	9.12.6.48			CPC/NTP time difference > 60 seconds	
Apply Query NTP Thresholds						
Refresh	Cancel	Help				

Figure 6-101 ETS Configuration tab - NTP time difference > 60 seconds

This can occur, for example, if this is a new STP-only CTN and time was initially entered manually without referencing an ETS. Another example might be that the time was inherited from a Sysplex Timer during a Mixed CTN to STP-only CTN migration and the time on the Sysplex Timer had not referenced an ETS ever.

This condition does not prohibit you from configuring the NTP server as an ETS. However, in this case the STP facility does not automatically create a time adjustment to steer the CST to the time provided by the NTP server configured at the CTS because it can only track to under 60 seconds. You must manually adjust the time in increments of 60 seconds (and let the steering complete) until the difference is under 60 seconds, at which point the STP facility is then able to automatically make time adjustments and steer the CST. Figure 6-102 shows the results for our example when we select **Adjust Time** on the Timing Network tab.

Adjust Time - SCZP301	E
Enter the adjustment amount. Adjustment amount +734.18731	-60.000000 to 60.000000 seconds
Access External Time Source           OK         Cancel           Help	

Figure 6-102 Adjust time accessing an ETS that differs from the CST by over 60 seconds

We have to replace +734.18731 with +60, let the steering complete, and repeat this a dozen times until +14.18731 is left over, at which point the STP facility is able to take over and make automatic adjustments. This example is an extreme case because each 60-second steering iteration takes about 17.5 days, for a total of 210 days.

If there is no error, the new ETS configuration becomes instantly active when you click **Apply**, and STP creates a time adjustment to steer the current server time to the time provided by the NTP server configured at the CTS. The Adjustment Steering button on the Timing Network tab provides information about this created time adjustment and its completion time.

#### Verification

To verify, follow these steps:

From the HMC

To verify the successful configuration of the ETS, select the **Timing Network** tab (Figure 6-103). The Network portion indicates that:

- The timing network type is STP-only CTN.
- The CTN time source is NTP.
- The NTP stratum level is 1.
- The NTP source ID is GPS.

The CTN time source reflects from where the Coordinated Server Time is currently being steered. Typically, the user must expect to see one of the NTP server clock sources described in Table 1-1 on page 21.

System (Sysplex) Time for SCZP301								
Timing Network	Network Configuration	STP Configuration	STP Status	ETS Configuration				
┌ Coordinat	Coordinated Server Time							
Time: Date:	0/2/1/12							
Currently	. ,	Eastern Time (	US & Car	iada) (EST/ED	)T)			
Leap sec	ond:	2	25					
	e offset from U saving time (ho	TC:	5 : 00   : 00					
- Network -								
Timing ne	etwork type:	S	TP-only (	CTN				
Coordina	ted timing netw	ork (CTN) ID: IT	SOPOK	-				
CTN time	source:	N	TP					
NTP strat	NTP stratum level: 1							
NTP source ID: GPS								
Adjustmer	nt Steering	Adjust Time	Adjust Lea	ap Seconds	Adjust Time Zone			
Refresh Cancel Help								

Figure 6-103 Timing Network tab - CTN time source indicates NTP

After clicking **Adjustment Steering**, the Adjustment Steering Information window displays (Figure 6-104). The following information is given:

- The status, which can be:
  - · Steering completed
  - Steering in progress
  - Tracking to PPS signal
- The difference between the NTP server time and the CST.
- The time that the adjustment started.
- The estimated time to finish the adjustment. This information is not shown if NTP with pulse per second is used.
- The CTN time source is NTP.
- The NTP stratum level.
- The NTP source ID, only displayed if the STP server is a Stratum 1.

Adjustment Steering	Information - SCZP301 🔳
Steering	
Status:	Steering completed
Amount (seconds):	0.000313
Start time (UTC):	9/21/12 5:17:04 PM
Estimated finish time (UTC	):9/21/12 5:20:51 PM
CTN time source:	NTP
NTP stratum level:	1
NTP source ID:	GPS
OK Help	

Figure 6-104 Adjustment Steering Information

From z/OS

z/OS images have no knowledge of the external time source, whether the server is configured to dial out, an NTP server, or an NTP server with PPS. Only the server stratum level and synchronization status can be verified from a z/OS image.

# 6.6.2 Time adjustment

Without regular adjustment, the time within the CTN slowly drifts, which might or might not be acceptable depending on the time accuracy requirements. Adjustments to time can be made either manually through application of an adjustment offset or automatically using a previously configured ETS. In either case, the adjustments are made in small enough increments that the operating system and subsystem software are unaware that time is speeding up or slowing down. This capability is known as *steering*.

When an ETS is used, it needs to be configured before it can be used to steer the time. After the ETS is configured, the current server time is typically adjusted to the ETS automatically on a periodic basis. You can also choose manual adjustment using the ETS.

The ETS can be achieved either through a dial out telephone connection through a modem on the HMC, or through the NTP client function at the SE connected to an NTP server or an NTP server with PPS. Time adjustments are only permitted from the Current Time Server, which propagates the adjustments throughout the STP-only CTN. The following adjustments are possible:

Adjustment steering

STP supports adjustment steering, which allows the time at the Current Time Server to be changed by up to +/- 60 seconds. Adjustments greater than 60 seconds can be implemented in multiple increments of +/- 60 seconds. This might take considerable elapsed time to achieve.

The offset specified is gradually incorporated into the STP messages in small enough increments or decrements such that the operating systems, subsystems, and applications are unaware that time is speeding up or slowing down.

The input of the offset to be steered out is done either manually, or through the ETS. When an ETS is used, it is invoked manually, configured to run on a regular basis using Customize Scheduled Operations on the Support Element, or is invoked automatically if using an NTP server (see item 15 on page 25).

**Note:** In an STP-only CTN, the rate at which adjustment steering is applied is approximately a one-second adjustment every 7 hours. Compared to ETR network or Mixed CTN, the Sysplex Timer provides steering at a rate of a one-second adjustment approximately every 11 hours.

Base steering

Base steering is similar to adjustment steering. This is an automatic function requiring no user control. It is performed at the Current Time Server, and requires a dial out or a Stratum 1 NTP server configured as ETS.

By comparing the UTC time obtained from multiple dial out events with the corresponding Current Time Server time values, STP can compute the amount of drift that has occurred between the dial out events. This represents the inherent inaccuracy of the Current Time Server oscillator over time.

With this information, STP can automatically introduce a compensation offset into the timing messages by additional steering to counter the drift. As a result, the Current Time Server self-corrects over time so that the offset returned from future dial out events approaches zero as greater accuracy is achieved.

Time adjustments can only be performed at the Current Time Server. This may be done in the following ways:

- Manually
- Manually through an external time source
- Automatically by scheduling a dial out to a time service
- Automatically by configuring an NTP server or NTP server with PPS

The manual time adjustments are performed by using the Adjust Time button on the Timing Network tab.

The Adjustment Steering button allows the current steering status to be displayed. It is initially grayed out and disabled (Figure 6-105), but becomes enabled after the first time adjustment and remains enabled as long as the STP-only CTN is configured.

🧸 Syst	em (Sysplex) 1	Time for SCZP	301		E		
Timing Network	Network Configuration	STP Configuration	STP Status	ETS Configuration			
Coordinat	ed Server Time -						
	11.20.001 m						
_ Offsets —							
	ond: e offset from U saving time (ho	TC: -	25 5 : 00 I : 00				
Network Timing network type: STP-only CTN Coordinated timing network (CTN) ID:ITSOPOK - CTN time source: NTP							
NTP strat	tum level:	2					
Adjustmer	nt Steering	Adjust Time	Adjust Lea	ap Seconds	Adjust Time Zone		
Refresh	Cancel Help						

Figure 6-105 Timing Network tab - Prior to first time adjustment

All manual time adjustments in an STP-only CTN are done through the Adjust Time button on the Timing Network tab.

#### Creating a manual time adjustment

In Figure 6-106, the Adjust Time window displays when the Adjust Time button is clicked.

Through the Adjust Time window, it is possible to manually initiate a time adjustment and to modify or delete a previous time adjustment that is still in progress.

For a manual time adjustment, an adjustment amount needs to be entered. Presumably, the user has previously determined the offset correction required, so it is just a case of entering the appropriate value with a positive (+) or negative (-) correction direction indication.

Figure 6-106 illustrates a positive adjustment of 2 seconds. Click **OK**.

Adjust Time - SCZP301	1
Enter the adjustment amount. Adjustment amount 2	-60.000000 to 60.000000 seconds
Access External Time Source           OK         Cancel         Help	

Figure 6-106 Adjust time by +2 seconds

If an acceptable value is entered message ACT37326 displays, indicating that the adjustment steering has been activated and an estimate is provided as to when the steering is expected to complete (Figure 6-107).

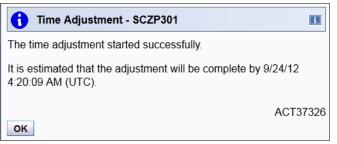


Figure 6-107 Time Adjustment window - Estimated completion time

Click **OK** to return to the Timing Network tab. When a time adjustment is in progress, the Adjustment Steering button on the Timing Network tab becomes active, as compared to Figure 6-105 on page 219, where it was grayed out.

In Figure 6-108, the CTN time source field is set to "Time set manually on console," which indicates that time was manually entered.

Syste	em (Sysplex)	Time for SCZP	301		i			
Timing Network	Network Configuration	STP Configuration	STP Status	ETS Configuration				
Coordinat	Coordinated Server Time							
Date:		Eastern Time (	US & Car	nada) (EST/ED	T)			
Time zon	Offsets Leap second: 25 Time zone offset from UTC: -5 : 00 Daylight saving time (hours : minutes): 1 : 00							
	<u> </u>	ork (CTN) ID:I1			nsole			
Adjustmen	t Steering	Adjust Time	Adjust Lea	ap Seconds	Adjust Time Zone			

Figure 6-108 Timing Network tab - CTN time source shows that time was set manually

Click **Adjustment Steering** to display information about the currently active steering request, including the adjustment amount, start time, and estimated finish time.

The Adjust Time button is only enabled on the Current Time Server. However, when a time adjustment has been entered, the **Adjustment Steering** button is enabled on all servers in the CTN. Visibility of the adjustment steering information is not restricted to the current time server.

As shown in Figure 6-109, the CTN time Source field is set to "Time set manually on console," which indicates that the time was adjusted manually. Click **OK** to return to the Timing Network tab.

Adjustment Steerin	ng Information - SCZP301
Steering	
Status:	Steering in progress
Amount (seconds):	2.000000
Start time (UTC):	9/23/12 2:18:26 PM
Estimated finish time (UT	C):9/24/12 4:20:07 AM
CTN time source:	Time set manually on console
ОК Неір	

Figure 6-109 Adjustment Steering Information - CTN time source shows time set manually

#### Modifying a manual time adjustment

When a time adjustment is in progress, the Adjustment Steering button becomes active after the first time adjustment and remains enabled as long as the STP-only CTN is configured. The Adjust Time button on the Timing Network tab remains active, allowing the activation and specification of a new time adjustment request.

The process of modifying a manual time adjustment is similar to creating a manual time adjustment (see "Creating a manual time adjustment" on page 219). Each time that you click Adjust Time, a new request to adjust the time is sent to the STP facility. As a consequence, the new request replaces the existing request, causing new values to be calculated for adjustment amount, start time, and estimated finish time. These new values are subsequently displayed through the Adjustment Steering window.

#### Deleting a manual time adjustment

To terminate a manual time adjustment that is currently being applied:

- 1. Go to the Timing Network tab.
- 2. Click Adjust Time.
- 3. On the Adjust Time window, enter a new adjustment amount value of zero (Figure 6-110).

Adjust Time - SCZP301	
Enter the adjustment amount. Adjustment amount	-60.000000 to
Access External Time Source           OK         Cancel         Help	60.000000 seconds

Figure 6-110 Adjust Time window - 0 entered to remove previous manual time adjustment

Specifying a value of zero is interpreted as a deletion of the currently active manual time adjustment. Selecting **OK** presents the message in Figure 6-111.

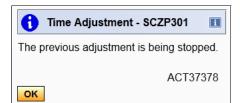


Figure 6-111 Time Adjustment - Previous time adjustment is being stopped message

# 6.6.3 Manual Time Adjustment through external time source

If installed and configured, an external time source (ETS) may be used to calculate the adjustment offset to be used in the Adjust Time window rather than entering the value manually.

The ETS provides the current UTC time, which is compared with the TOD of the Current Time Server, and the calculated difference (either positive or negative) is used to populate the adjustment amount field.

**Tip**: Using the Access External Time Source button on the Adjust Time window is an excellent way to accurately determine the time difference between the Current Time Server and UTC time.

### Creating a manual time adjustment via ETS

The normal context for NTP is an hourly automatic adjustment (that is, there is no need to manually adjust the time). Although the Adjustment Steering Information window (Figure 6-109 on page 221) provides the delta amount with the NTP server, the (manual) Adjust Time window may also be used to verify new configured NTP servers.

The ETS configured in this example is HMC Dial-up time source.

To perform a manual time adjustment through ETS:

- 1. Go to the Timing Network tab.
- 2. Click Adjust Time to open the Adjust Time window (Figure 6-112).

Adjust Time - SCZP301	I
Enter the adjustment amount.	
Adjustment amount	-60.000000 to
	60.000000 seconds
Access External Time Source	
OK Cancel Help	

Figure 6-112 Adjust Time window - Select Access ETS

3. Instead of specifying an adjustment amount, click Access External Time Source.

An ETS request is submitted. When the process completes successfully, the Adjust Time window displays and the difference between the Current Time Server time and the UTC time returned from the ETS is calculated and placed in the Adjustment amount field. As shown in Figure 6-113, the value returned is -0.000726 seconds. The adjustment amount may then be modified if required and applied as though it were manually entered (Figure 6-113 on page 222).

Adjust Time - SCZP301	
Enter the adjustment amount.	
Adjustment amount -0.000726	-60.000000 to
	60.000000 seconds
Access External Time Source	
OK Cancel Help	

Figure 6-113 Adjust Time window - Accessing ETS to get adjustment amount

**Note:** The Adjustment amount returned by the External Time Source might not be within the +/-60 second requirement of the Adjust Time window. The value returned needs to be reviewed for validity before clicking **OK**. Values larger than +/-60 seconds need to be applied in multiple increments until the total offset adjustment is accounted for.

Error message ACT37325 (Figure 6-114) displays if the adjustment amount is not within the +/- 60 seconds boundary. Click **OK** to return to the Adjust Time window.

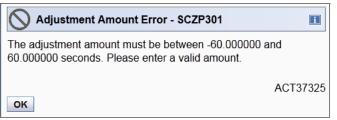


Figure 6-114 Adjustment Amount Error

4. In the window shown in Figure 6-113 on page 222, click **OK**. If an acceptable value is entered message ACT37326 displays, indicating that the time adjustment has been activated, and an estimate is provided as to when the steering is expected to complete (Figure 6-115).

1 Time Adjustment - SCZP301				
The time adjustment started successfully.				
It is estimated that the adjustment will be complete by 9/24/12 4:20:09 AM (UTC).				
АСТ37326 ОК				

Figure 6-115 Time Adjustment window - Estimated completion time for current time adjustment

5. Click **OK** to return to the Timing Network tab.

As shown in Figure 6-116, note that the CTN time source field is set to "Dial-up time source via Hardware Management Console," which indicates that the time was adjusted through the ETS.

ming stwork	Network Configuration	ETR Configuration	ETR Status	STP Configuration	STP Status	ETS Configuration	scz scz
Coordinate	ed Server Time						
Time:	4:17:22 PM						
	10/10/09						
Time zone Currently:	: (UTC-05:00) Easter	rn Time (US & Can	ada) (EST/EDT)				
Junenuy.	EDI	ann an that a stat	ne (ser aleta)	el el constante de la constante		<u>Der en statis</u> ti	
Offsets -							
eap seco		0				West Contractor	
		-5:00					
Daylight s	aving time (hours : mi	nutes): 1:00					
Network -	and a start and a start of the st		and the second	and the second	and the second		
Timing net	work type:	STP-only C	TN				
	ed timing network (CT	N) ID: ITSOLAB -				a le la constante	
CTN time :	source:	Dial-up time	e source via Hardv	ware Manageme	ent Console		
and the states of	ent Steering	Adjust Time	Adjust Leap Seco	1	Adjust Time Zone	and the second second	

Figure 6-116 Timing Network tab - Adjustment Steering button now enabled

- 6. Click **Adjustment Steering** to display information about the currently active adjustment steering request, including the adjustment amount, start time, and estimated finish time.
- 7. As shown in Figure 6-117, the Source field is set to "Dial-up time source via Hardware Management Console," which indicates that the time was adjusted through the ETS and is the same as what appears in Figure 6-116 on page 224. The estimated finish time is the same as what appears in Figure 6-115 on page 223. Click **OK** to return to the Timing Network tab.

- Steering	
Status:	Steering completed
Amount (seconds):	-0.000726
Start time (UTC):	10/15/09 5:27:09 PM
Estimated finish time (UTC):	10/15/09 5:44:04 PM
CTN time source:	Dial-up time source via Hardware Management Console

Figure 6-117 Adjustment Steering Information window - Steering completed

8. Click **OK** to return to the Timing Network tab.

#### Modifying a manual time adjustment through ETS

This process is similar to the process described in "Creating a manual time adjustment via ETS" on page 222. The adjustment amount for the subsequent request can be entered either of the following ways:

- Manually
- Through the ETS, to populate the Adjustment amount field with a value representing the calculated offset between UTC time, as provided by the ETS and the Current Time Server time

### Deleting a manual time adjustment through ETS

This process is similar to the process described in "Deleting a manual time adjustment" on page 221. Deletion of an existing time adjustment is done through initiation of a subsequent request specifying an offset value of zero.

# 6.6.4 Scheduled time adjustment through External Time Source

For ETS considerations, see 1.1, "External Time Source" on page 4.

All timing adjustments in an STP-only CTN are issued from the Current Time Server. Therefore, the scheduled call to the ETS must be defined to the Support Element of the Current Time Server.

**Note:** Changing the Current Time Server from the Preferred Time Server to the Backup Time Server might invalidate a scheduled operation to dial an ETS. Define the same scheduled operation on both the Preferred Time Server and the Backup Time Server to ensure that the time adjustment completes successfully on one of the servers, regardless of the Current Time Server location.

# Creating a scheduled time adjustment through ETS using HMC dial out

To do this, follow these steps:

 In the HMC task list, select Operational Customization → Customize Scheduled Operations (Figure 6-118).

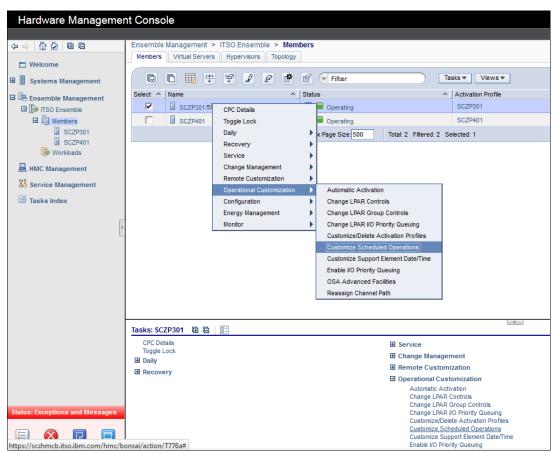


Figure 6-118 Customize Scheduled Operations task

The Customize Scheduled Operations window (Figure 6-119) displays scheduled operations already defined to the Support Element.

[	Customize Scheduled Operations - SCZP301							
	<u>O</u> ptions ▼ <u>View ▼ S</u> ort ▼ <u>H</u> elp ▼							
1	New							
A	Pelete erations are currently displayed.							
•	Refre Sele	esh ct All		Date	Time	Operation	Remaining Repetitions	
			1	9/18/12	10:00 PM	Access external time source	Indefinite	
ŀ			1	9/19/12	10:00 PM	Access external time source	Indefinite	
L			1	9/20/12	1:00 AM	Backup critical hard disk information	Indefinite	
		SCZP30	)1	9/20/12	10:00 PM	Access external time source	Indefinite	
		SCZP30	)1	9/21/12	10:00 PM	Access external time source	Indefinite	
		SCZP30	)1	9/21/12	11:01 PM	Transmit system availability data	Indefinite	
		SCZP30	)1	9/22/12	10:00 PM	Access external time source	Indefinite	
		SCZP30	)1	9/23/12	10:00 PM	Access external time source	Indefinite	
		SCZP30	)1	9/24/12	3:00 AM	Backup critical hard disk information	Indefinite	
					10:00 PM	Access external time source	Indefinite	
av	vascript:menuItemLaunchAction();							

Figure 6-119 Customize Scheduled Operations task

 Select Options → New to create a new entry. The Add a Scheduled Operation window displays (Figure 6-120), allowing the selection of the type of new scheduled operation to be created. Select the Access external time source radio button and click OK.

Select a	an Operation	
Select	Operation	
0	Backup critical hard disk information	
0	Accept internal code changes	
0	Install and activate concurrent code changes	
0	Remove and activate concurrent code changes	
0	Retrieve internal code changes	
0	Activate selected CPC	
0	Deactivate (Power off) selected CPC	=
0	Transmit system availability data	
0	Change LPAR weights	
0	Set power saving	
0	Audit and Log Management	
۲	Access external time source	

Figure 6-120 Add a Scheduled Operation

The window shown in Figure 6-121 displays, allowing a date and time to be entered. The newly scheduled operation can be saved immediately after the Date, Time, and Time window settings have been made, which causes a single occurrence entry to be created.

🖪 s	et up a S	cheduled Ope	ration - SCZP301	i
Date and Time	Repeat			
The fo	llowing so	cheduled operat	tion will be created :	
Acce	ess exter	rnal time sourc	e	
Select	the date	and time of the	initial execution, then select a time window.	
_ Date a	and Time -		Time Window	
<u>D</u> ate :	* 9/18/12	2	○ 10 minutes ○ 20 minutes ○ 30 minutes	
Time	* 12:37 /	M	○ 40 minutes ○ 50 minutes ◎ 60 minutes	
Save	Cancel	Help		

Figure 6-121 Set up a Scheduled Operation window - Date and Time tab

3. Further settings (if required) need to be entered using the Repeat tab to define a recurring scheduled operation (Figure 6-122).

Set up a Scheduled O	peration - SCZP301			
Date and Time Repeat				
The following scheduled ope	ration will be created :			
Access external time sou	Irce			
Single or Repeated				
<ul> <li>Set up a single scheduled operation</li> <li>Set up a repeated scheduled operation</li> </ul>				
Days of the Week	Coptions			
<u>■M</u> onday <u></u> Friday	Interval : 1 🖨 1 to 26 weeks			
□ <u>T</u> uesday □ S <u>a</u> turday □ Wednesday □ Sunday	Repetitions : 1 🗧 1 to 100			
Instage Interesting Interesti	Repeat in <u>d</u> efinitely			
Save Cancel Help				

Figure 6-122 Set up a Scheduled Operation window - Repeat tab

4. Various options regarding days of the week, interval between repetitions, and specific number of repetitions are available. After the settings are correct, the new entry can be saved by clicking **Save**. A confirmation message then displays (Figure 6-123).

Action Completed - SCZP301	i
The scheduled operation was added.	
ACTB1TI3	
ОК	

Figure 6-123 Action Completed

# Modifying a scheduled time adjustment through ETS

There is no option provided to modify an existing entry within scheduled operations at the Support Element. The only method available is to delete the scheduled time adjustment and then define a new adjustment, as described in the preceding section, to recreate the entry with the modification as required.

# Deleting a scheduled time adjustment through ETS

To delete an existing scheduled operation:

- 1. Go to the Customized Scheduled Operations window (Figure 6-119 on page 226).
- 2. Select the entry to be deleted.
- 3. From the action bar, select **Options** → **Delete**. This displays confirmation message ACTB1TC1 (Figure 6-124).

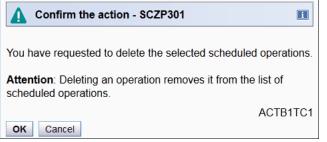


Figure 6-124 Confirm the action to remove selected scheduled operation

4. Click **OK** to confirm the entry deletion.

# 6.6.5 STP offset adjustments

The STP timing message includes:

- Coordinated server time
- Leap second offset
- ► Time zone offset
- Daylight saving time offset

These values are transmitted from the CTS to all servers in the CTN. How the z/OS system image uses these values depends on options specified in the TIME macro in combination with options specified in CLOCKxx at IPL.

Different time results can be received depending on the options specified in the TIME macro (Table 6-3).

Option	TIME macro with ZONE=LT	TIME macro with ZONE=UTC	TIME macro with STCK
Include TOD in result.	Yes	Yes	Yes
Include leap second offset.	Yes	Yes	No
Include time-zone offset.	Yes	No	No

Table 6-3 TIME macro options

In addition, the parameters specified in the CLOCKxx member at IPL determine where these values are obtained.

See Table 6-4 for a z/OS system resident on a server in ETR timing mode.

Option	ETRMODE=NO ETRZONE=NO	ETRMODE=YES ETRZONE=NO	ETRMODE=YES ETRZONE=YES
Step TOD to Sysplex Timer.	No	Yes	Yes
Include leap second offset from Sysplex Timer.	No	Yes	Yes
Include time-zone offset from ETR.	No	No	Yes
Include time-zone offset from CLOCKxx.	Yes	Yes	No
Allow local time adjustment via z/OS SET commands.	Yes	Yes	No

Table 6-4z/OS system on a server in ETR timing mode

Similarly, an equivalent table can be established with STP-related parameters for z/OS systems resident on a server in STP timing mode (Table 6-5).

Option	STPMODE=NO STPZONE=NO	STPMODE=YES STPZONE=NO	STPMODE=YES STPZONE=YES
Step TOD to Current Time Server.	No	Yes	Yes
Include leap second offset from Current Time Server.	No	Yes	Yes
Include time-zone offset from Current Time Server.	No	No	Yes
Include time-zone offset from CLOCKxx.	Yes	Yes	No
Allow local time adjustment via z/OS SET commands.	Yes	Yes	No

Table 6-5 z/OS system on a server in STP timing mode

#### Leap second considerations

Operating system and subsystem components use the STCK time format because this is not subject to either leap second offset or time zone offset changes. Two successive invocations of the Assembler TIME macro in STCK format yield different results, and the second result is later than the first result.

**Attention:** Despite the fact that leap seconds are not included in STCK time, the application of positive leap second offset changes can be disruptive and must be done with extreme caution.

During the implementation of a *positive* leap second offset change, z/OS becomes non-dispatchable for the duration of the delta between the current leap second offset and the new leap second offset to insert the delta between STCK time and UTC time.

The non-dispatchability can potentially lead to time-out scenarios between z/OS and network-connected off-host components that are time sensitive.

Example 6-1 assumes that a program is displaying time in various formats at the rate of one line per second. The user notices that the current leap second offset is set to 18 by mistake and decides to set it to the currently correct value of 23, resulting in a positive 5-second delta.

Example 6-1 Positive leap second offset change

STCK:	ZONE=LT	ZONE=UTC	CVTTZ	
18:35:58	14:35:40	18:35:40	FFFFCA5B	
18:35:59	14:35:41	18:35:41	FFFFCA5B	<- Leap second offset
applied				
z/OS made no	n-dispatchable	for 5 seconds		
18:36:05	14:35:42	18:35:42	FFFFCA5B	
18:36:06	14:35:43	18:35:43	FFFFCA5B	
The Time zon	e offset is -4	hours. The high	h order word:	s of the CVTLDTO field are
stored in the	e CVTTZ field	in units of 1.04	48576 second	s and can be converted to
seconds as f	ollows:			
X'FFFFCA5B'	(-13733) * 1.04	48576 = -14400	seconds = $-4$	hours

The non-dispatchability is required to insert the leap second difference between STCK time and UTC time. In effect, the positive leap second offset delta is subtracted from the current UTC time, which causes duplicate UTC time stamps if the non-dispatch ability is not in effect for the same interval.

Negative leap second offset changes are implemented directly by adding the leap second offset delta to the current UTC time. In this case, there is no requirement for z/OS to be made non-dispatchable, because this does not result in duplicate UTC time stamps, and therefore there is minimal disruption.

Example 6-2 assumes that the current leap second offset is set to 28 by mistake and that the user decides to set it to the currently correct value of 23, resulting in a negative 5-second delta.

STCK:	ZONE=LT	ZONE=UTC	CVTTZ	
18:35:58	14:35:30	18:35:30	FFFFCA5B	
18:35:59	14:35:31	18:35:31	FFFFCA5B	<- Leap second offset
applied				
18:36:00	14:35:37	18:35:37	FFFFCA5B	
18:36:01	14:35:38	18:35:38	FFFFCA5B	

Example 6-2 Negative leap second offset change

There will not be any requirement to perform such a change, because leap second offset changes have always been positive thus far.

#### Time zone considerations

Like the leap second offset, the time zone offset is applied in a single positive or negative amount rather than being spread over a period of time. This is implemented through a direct modification to the high word of CVTLDTO field (CVTTZ), which is in units of 1.048576 seconds.

Time zone offset changes do not affect operating system or subsystem components, because these use the Assembler TIME macro with the STCK or ZONE=UTC parameters, which do

not incorporate the time zone offset. However, applications that use local time obtained using ZONE=LT might be impacted, depending on how time is used within the application logic.

Positive time zone offset changes are usually the result of the onset of daylight saving time (*spring forward*). These changes result in the delta between the old time zone offset and the new time zone offset being added to the time returned from ZONE=LT.

Example 6-3 assumes that the time zone offset is being changed from -4 hours to -3 hours as the result of a daylight saving time change. The leap second offset is 22 seconds.

Example 0-3	FOSILIVE LITTE-2011	e onset change		
STCK:	ZONE=LT	ZONE=UTC	CVTTZ	
18:35:57	14:35:35	18:35:35	FFFFCA5B	
18:35:58	14:35:36	18:35:36	FFFFCA5B	<- Time Zone offset
applied				
18:35:59	15:35:37	18:35:37	FFFFD7C4	
18:36:00	15:35:38	18:35:38	FFFFD7C4	

Example 6-3 Positive time-zone offset change

In this scenario, the ZONE=LT time jumps forward by the delta amount, so there is no potential for duplicate time stamps to be returned to your application. However, if your applications are using ZONE=LT format time for interval calculation purposes, then they might potentially be impacted by the unexpected time change.

Negative time zone offset changes usually occur at the end of the daylight saving time period *(fall back)* through subtraction of the daylight saving time offset.

Negative time-zone offset changes are also implemented through direct modification of the CVTLDTO field. However, in this scenario, the offset delta is subtracted from the time returned through ZONE=LT, resulting in a duplicate time stamps for the duration of the offset.

Example 6-4 assumes that the time zone offset is being changed from -3 hours to -4 hours as the result of a daylight saving time change. The leap second offset is 22 seconds.

	-			
STCK:	ZONE=LT	ZONE=UTC	CVTTZ	
18:35:57	15:35:35	18:35:35	FFFFD7C4	
18:35:58	15:35:36	18:35:36	FFFFD7C4	<- Time Zone offset applied
18:35:59	14:35:37	18:35:37	FFFFCA5B	
18:36:00	14:35:38	18:35:38	FFFFCA5B	

Example 6-4 Negative time-zone offset change

The duplicate time stamp effect might be quite dangerous for applications using the ZONE=LT time format. Therefore, changes of this nature need to be done with this in mind.

**Important:** Applications must be reviewed on an individual basis to determine whether positive or negative adjustments to the time zone offset can be dynamically tolerated before such adjustments are applied.

Often, a positive offset adjustment can be applied dynamically. However, a negative offset adjustment requires an application outage for the duration of the adjustment to avoid the duplicate time stamp effect.

In ETR timing mode, when a daylight saving time change occurs, message IEA271I is issued by z/OS images running on the server:

IEA271I ETR TIME OFFSET CHANGES HAVE OCCURRED.

When the server is in STP timing mode and a daylight saving time change occurs, a new message IEA392I is issued:

IEA392I STP TIME OFFSET CHANGES HAVE OCCURRED

Automation rules that rely on message IEA2711 must be changed.

#### Leap second offset adjustment

**Note:** Only perform leap second offset adjustments if your environment is sensitive to leap second changes.

If the applications at your site are sensitive to leap seconds, then the Leap Second adjustment window must be used to apply the leap second offsets when they become available.

To adjust leap seconds, follow these steps:

1. Go to the **Timing Network** tab of the Current Time Server (Figure 6-125).

System (Sysplex) Time for SCZP301								
Timing Network	Network Configuration	STP Configuration	STP Status	ETS Configuration				
Coordinat	ed Server Time -							
Time:	12:40:20 AM							
Date:	9/18/12							
Time zon	e:(UTC-05:00)	Eastern Time (	US & Car	nada) (EST/ED	T)			
Currently	EDT							
Offsets -								
Leap sec	ond:	2	4					
Time zon	e offset from U <sup>-</sup>	TC: -	5 : <b>00</b>					
Daylight s	saving time (ho	urs : minutes):1	: 00					
- Network -								
Timina ne	etwork type:	s	TP-only (	CTN				
		ork (CTN) ID: IT	-					
CTN time	source:	N	TP					
NTP strat	tum level:	2						
Adjustmer	t Steering	Adjust Time	Adjust Lea	ap Seconds	Adjust Time Zone			
				•	•			
Refresh	Cancel Help							

Figure 6-125 Timing Network tab - Leap seconds = 23

Note that the Leap Second field of the Offsets section is set to 23.

 Click Adjust Leap Seconds to display the Adjust Leap Second Offset window (Figure 6-125).

Adjust Leap Second Offset - SCZP301	i
Current Leap Seconds	
Offset 25	
Change offset immediately	
© Schedule offset change on June 30th	
Schedule offset change on December 31st	
Schedule offset change on:	
Date 9/18/12	
OK Cancel Help	

Figure 6-126 Adjust Leap Second Offset

When the Adjust Leap Second Offset window displays, the current leap second offset in effect for the STP-only CTN value displays in the Offset input box.

This value might have been inherited from the ETR during the migration process from an ETR-only network, or have been set through the Initialize Time function, as documented in 6.4.4, "Time initialization" on page 181.

- 3. Enter a new value in the Offset input box. Enter 24, as shown in Figure 6-126.
- 4. Schedule the change (immediate or on a later date) and click **OK** to return to the Timing Network tab.

The Leap second field in the Offsets section of the Timing Network tab displays the new value of 24 (Figure 6-127).

👼 Syste	System (Sysplex) Time for SCZP301								
Timing Network	Network Configuration	STP Configuration	STP Status	ETS Configuration					
- Coordinat	ed Server Time –								
Time: Date: Time zon	12.10.217	Eastern Time (	US & Car	nada) (EST/ED	Т)				
Currently	EDT								
- Offsets —									
Leap sec	ond:	2	25						
•	e offset from U <sup>-</sup>	FC: -	5:00						
Daylight s	saving time (ho	urs : minutes):1	: 00						
- Network -									
Timing ne	etwork type:	s	TP-only (	CTN					
-	ted timing netw								
CTN time	-		TP						
NTP stratum level: 2									
Adjustmen	nt Steering	Adjust Time	Adjust Lea	ap Seconds	Adjust Time Zone				
Refresh	Cancel Help								

Figure 6-127 Timing Network tab - Leap seconds adjusted

**Note:** Leap seconds are automatically built into the UTC time obtained from an external time source. Any leap second offset that is defined is taken into account when calculating the delta between your Current Time Server and the time received from the ETS. This is required to prevent double accounting.

If you decide to rely on the ETS to incorporate an additional leap second into the Current Time Server TOD, then be aware that this is a breach of the requirement that leap second adjustments occur at the same time worldwide. This is because TOD adjustments through the ETS are implemented over a period of time through adjustment steering rather than immediately. For most sites, this is not a problem, but if your site is leap-second sensitive, then the Adjust Leap Seconds facility must be used to ensure that the new offset is applied as a single adjustment at the correct time.

# Time-zone offset adjustment

The Offsets section of the Timing Network tab displays the current time zone offset information of the STP-only CTN.

As shown in Figure 6-128, if this tab displays the Total time (hours : minutes) field, then a time zone offset entry has not yet been set from the Adjust Time Zone Offset window, but has been inherited from a Sysplex Timer during a migration from a Mixed to STP-only CTN. In this instance, the time zone must be set.

🧸 Syste	em (Sysplex) Ti	me					i
Timing Network	Network Configuration	STP Configuration	STP Status	ETS Configuration	PPS Control		SCZP401 SCZP301
Time:	ted Server Time – 5:26:10 PM 1/27/13						
Leap sec	ond:	25					
	etwork type: ted timing netwo source:			TN			
NTP strat	um level:	3 Adjust Time		ap Seconds	Adjust Tin	ne Zone	
Refresh	Cancel Help						

Figure 6-128 Timing Network tab - Time zone not set

To adjust the time zone:

1. Click Adjust Time Zone to display the Adjust Time Zone Offset window (Figure 6-129).

Adjust Time Zone Offset - SCZP301
Current Time Zone
Time zone (UTC-05:00) Eas Define
Clock Adjustment for Daylight Saving Time
Daylight saving time offset (hours : minutes):1:00 Automatically adjust Set standard time Set daylight saving time
Schedule
Change immediately     Schedula change on:
© Schedule change on: Date 9/18/12
Time 12:43:34 AM
Scheduled Clock Adjustment for Daylight Saving Time
Local time name: EST Offset (hours : minutes):0 : 00 Scheduled time (UTC): 11/4/12 6:00:00 AM
OK Cancel Help

Figure 6-129 Adjust Time Zone Offset

- From this window, select one of the supported time zones that is provided by default or use one of the five user-defined time zones to customize an entry to specifically meet your requirements.
- 3. There are three choices that must be made on the Adjust Time Zone Offset window:
  - a. Select one of the values from the Time zone drop-down menu.

Following a migration, the Time zone entry displays <Not initialized>. In the example shown in Figure 6-129 on page 235, "Time zone (UTC-05:00) Eastern Time (US & Canada) (EST/EDT)" has been selected from the drop-down menu.

b. In the Clock Adjustment for Daylight Saving Time section, choose a daylight saving time offset.

**Automatically adjust** is selected by default when the time zone selected supports automatic adjustment of daylight saving time. Otherwise, the button is disabled. If this option is selected, STP automatically selects the correct time zone offset based on the current date and time.

If the selected time zone does not support automatic adjustment or if the user does not want to use automatic adjustment of daylight saving time, select **Set standard time** or **Set daylight saving time**, depending on what is in effect at the time that the change is made.

c. In the Schedule section, click one of the radio buttons to choose when the time zone adjustment is to be initiated.

Change Immediately indicates that the change will take place when **OK** is clicked. This is the best choice following a Mixed to STP-only migration.

If the Schedule change on radio button is selected, the user enters the local date and time when the change is to occur. Then STP does the conversion and displays the results of when it is scheduled in UTC time.

4. Click **OK** to save the settings and return to the Timing Network tab.

As compared to the original state shown in Figure 6-128 on page 234, note that in the Offsets section shown in Figure 6-130:

- The Total time offset field is no longer displayed after a time zone offset has been set.
- The time zone offset from UTC value is set to -5:00 and the daylight saving time value is set to 1:00, reflecting the changes made in Figure 6-129 on page 235.

Timing Network       Network Configuration       STP Configuration       STP Status       ETS Configuration         Coordinated Server Time	System (Sysplex) Time for SCZP301
Time: 12:40:24 AM Date: 9/18/12 Time zone: (UTC-05:00) Eastern Time (US & Canada) (EST/EDT) Currently: EDT - Offsets Leap second: 25 Time zone offset from UTC: -5:00 Daylight saving time (hours : minutes):1:00 - Network Timing network type: STP-only CTN Coordinated timing network (CTN) ID: ITSOPOK - CTN time source: NTP	
Date:       9/18/12         Time zone: (UTC-05:00) Eastern Time (US & Canada) (EST/EDT)         Currently:       EDT         Offsets         Leap second:       25         Time zone offset from UTC:       -5 : 00         Daylight saving time (hours : minutes): 1 : 00         Network         Timing network type:       STP-only CTN         Coordinated timing network (CTN) ID: ITSOPOK -         CTN time source:       NTP	Coordinated Server Time
Leap second: 25 Time zone offset from UTC: -5 : 00 Daylight saving time (hours : minutes):1 : 00 Network Timing network type: STP-only CTN Coordinated timing network (CTN) ID: ITSOPOK - CTN time source: NTP	Date: 9/18/12 Time zone: (UTC-05:00) Eastern Time (US & Canada) (EST/EDT)
Time zone offset from UTC:       -5 : 00         Daylight saving time (hours : minutes):1 : 00         Network         Timing network type:       STP-only CTN         Coordinated timing network (CTN) ID: ITSOPOK -         CTN time source:       NTP	- Offsets
Daylight saving time (hours : minutes):1 : 00 <i>Network</i> Timing network type: STP-only CTN Coordinated timing network (CTN) ID:ITSOPOK - CTN time source: NTP	Leap second: 25
Network       Timing network type:     STP-only CTN       Coordinated timing network (CTN) ID:ITSOPOK -       CTN time source:     NTP	Time zone offset from UTC: -5 : 00
Timing network type: STP-only CTN Coordinated timing network (CTN) ID: ITSOPOK - CTN time source: NTP	Daylight saving time (hours : minutes):1 : 00
Coordinated timing network (CTN) ID:ITSOPOK - CTN time source: NTP	_ Network
CTN time source: NTP	· · · · · · · · · · · · · · · · · · ·
Adjustment Steering     Adjust Time     Adjust Leap Seconds     Adjust Time Zone       Refresh     Cancel     Help	

Figure 6-130 Timing Network tab - Time zone offset now showing

### Supported time-zone offsets

A number of supported time zone offset entries are provided by default (Figure 6-131). Each of these entries has a defined offset from UTC, and an entry can be selected that is suitable for the time zone.

Adjust Time Zone Offset - SCZP301	i
Current Time Zone	
Time zone (UTC-05:00) Eas Define	
Clock Adjustr (UTC-U7:UU) Mountain Time (Mexico) (MST/MDT)	-
Daylight sav (UTC-07:00) Mountain Time (US & Canada) (MST/MDT)	
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	
<ul> <li>Automatic Set stand (UTC-06:00) Central Time (Mexico) (CST/CDT)</li> <li>Set stand (UTC-06:00) Central Time (US &amp; Canada) (CST/CDT)</li> </ul>	=
Set daylig (UTC-06:00) Central Time (US & Canada) (UST/CDT) (UTC-06:00) Central Standard Time (Saskatchewan, Central America) (CST)	
Schedule — (UTC-05:00) Eastern Time (US & Canada) (EST/EDT)	
Change ir (UTC-05:00) Eastern Standard Time (Jamaica, Coral Harbour) (EST)	-
Schedule (UTC-05:00) Peru Time (Peru) (PET)	
Date 9/18 (UTC-04:00) Acre Time (Brazil Rio Branco) (ACT)	
(LTC 04:20) Vanazuola Tima (Vanazuola) (VET)	
Time 12:4 (UTC-04:00) Atlantic Time (Canada) (AST/ADT)	
Scheduled Clop (UTC-04:00) Amazon Time (Brazil Campo Grande) (AMT/AMST)	
UTC-04:00) Amazon Time (Brazil Manaus) (AMT)	
Local time na (UTC-03:30) Newfoundland Time (Canada) (NST/NDT)	
Offset (hours (UTC-03:00) Central Brazil Time (Sao Paulo) (BRT/BRST)	+
Scheduled tinke (ซา ฮ): าทัศารช.บฮ.บฮ.บฮ.พัก	
OK Cancel Help	

Figure 6-131 Adjust Time Zone Offset window - Predefined zones

In addition, these entries may optionally have a time zone algorithm defined that contains the following daylight saving time information:

- Daylight saving time offset
- Optional: Daylight saving time automatic adjustment information:
  - Daylight saving date and time start algorithm
  - Daylight saving date and time end algorithm

When the operation is complete, message ACT37328 displays (Figure 6-132).

1 Time Zone Algorithm - SCZP301	i
Setting the time zone algorithm was success	sful.
АСТ37	328

Figure 6-132 Setting time zone successful message

If the selected time zone offset supports automatic clock adjustment for daylight saving time by providing an algorithm with the necessary start and end information, then the Automatically adjust radio button can be used to activate automatic adjustment.

Alternatively, the time zone offset might not support automatic adjustment or the installation might prefer not to use automatic adjustment of daylight saving time. Two radio buttons, "Set standard time" and "Set daylight saving time," provide the ability to set local time to either standard or daylight saving time.

Select either **Set standard time** or **Set daylight saving time**, depending on what is in effect at the time that the change is made. If the time zone does not have a daylight saving time offset, only the Set standard time button is enabled.

Selecting **Daylight Saving Time** and clicking **OK** displays message ACT37330 (Figure 6-133).

Set Daylight Saving Time - SCZP301	Ĩ
Setting local time to daylight saving time was su	iccessful.
ОК	CT37330

Figure 6-133 Setting DST was successful

As in Figure 6-134, selecting Standard Time and clicking OK displays message ACT39139.

• Set Standard Time - SCZP301	i
Setting local time to standard time was success	sful.
АСТ39	139

Figure 6-134 Setting standard time successful

#### User-defined time zone offsets

There are five user-defined time zone offset entries that may be customized and applied if none of the provided entries meet the requirements.

These entries are named UD1 to UD5, and when one of these is selected, the Define button on the Adjust Time Zone Offset window is enabled. It can then be used to modify the selected entry to meet the requirements. Figure 6-135 shows UD1 being defined with an offset of 3 hours and 30 minutes and a DST offset called DST1 of one hour.

Define Time Zone Algorithm - SCZ	P301	B
Description	* (UTC+00:00) User defin	ned timezone def 1 (UD1)
Standard time name	* UD1	
UTC offset (hours : minutes)	-3 븆	: -30 🗧
Daylight saving time name	DST1	
Daylight saving time offset (hours : minutes	)1	: 0
Define adjustment of clock for daylight sa     Daylight Saving Time Start	aving time	
┌ Algorithm ───		
<ul> <li>Scheduled by day of week in month</li> <li>Scheduled by date (for example: Main Scheduled by day of week after a single schedules after a single</li></ul>	arch 31 at 22:00)	
First Sunday in	March 1	✓ at 12:00:00 AM
Daylight Saving Time End     Algorithm     Scheduled by day of week in month     Scheduled by date (for example: Se     Scheduled by day of week after a si	ptember 23 at 18:00)	ay in October at 6:00) Last Sunday after October 15 at 6:00)
First Sunday	n October 1	✓ at 12:00:00 AM
OK Cancel Help		

Figure 6-135 Define Time Zone Algorithm window

### 6.7 Local time changes

z/OS allows either STCK time, UTC time, or local time to be obtained depending on your requirements. The difference between UTC time and local time is usually the time zone offset under normal circumstances (that is, with no leap seconds offset defined).

The time zone offset is managed at the z/OS level by specifying the ETRZONE=NO and STPZONE=NO options in the CLOCKxx PARMLIB member, and the relevant option applies depending on whether the server is in ETR timing mode or STP timing mode.

When this is done, the TIMEZONE parameter in the CLOCKxx member is used to set the time-zone offset at IPL, and a number of z/OS SET commands can be used to dynamically adjust this offset if required. Similarly, the coupling facility supports the concept of time zone offset and allows dynamic modification of the time zone offset through a command.

### z/OS commands

On a z/OS system, the local date and time my be modified dynamically. The ability to do this depends on what options have been specified in the CLOCKxx member at IPL (Table 6-6).

Option	Adjust time using z/OS command			
	Local time ZONE=LT	UTC time ZONE=UTC	STCK time STCK	
ETRMODE=NO, ETRZONE=NO	Yes	Yes <sup>a</sup>	Yes <sup>a</sup>	
ETRMODE=YES, ETRZONE=NO	Yes	No	No	
ETRMODE=YES, ETRZONE=YES	No	No	No	
STPMODE=NO, STPZONE=NO	Yes	Yes <sup>a</sup>	Yes <sup>a</sup>	
STPMODE=YES, STPZONE=NO	Yes	No	No	
STPMODE=YES, STPZONE=YES	No	No	No	

Table 6-6 z/OS time adjustment through command cross-reference

a. If ETRMODE NO and STPMODE YES (the default) is specified, z/OS will issue IEA888A to prompt the operator to set the TOD clock during system initialization. This will occur regardless of whether OPERATOR PROMPT or NOPROMPT has been specified. IEA888A is issued because system initialization has detected that STPMODE YES was requested but STP is not available. The operator is prompted to notify that local server time is being used and allow the time to be adjusted if required. IEA888A is issued regardless of whether OPERATOR PROMPT or NOPROMPT is specified in CLOCKxx. For more information, go to the following website: http://www-03.ibm.com/support/techdocs/atsmastr.nsf/WebIndex/FLASH10576

### DISPLAY TIME

This command can be used to display the local time and date, and the UTC time and date (Figure 6-136).

DISPLAY TIME IEE136I LOCAL: TIME=17.06.33 DATE=2006.290 UTC: TIME=21.06.33 DATE=2006.290

Figure 6-136 z/OS DISPLAY TIME command

Under normal circumstances, the difference between local time and UTC time is the time zone offset (incorporating daylight saving time offset, if any) applicable to the time zone.

### SET DATE

This command is not permitted in an STP-only CTN. Any attempt to change the local time or date when the server is operating in STP mode and if STPZONE YES is specified, receives z/OS message IEA279I:

IEA279I ALL CLOCK RELATED SET COMMANDS ARE IGNORED WHEN IN STP MODE.

### SET CLOCK

This command is not permitted in an STP-only CTN. Any attempt to change the local time or date when the server is operating in STP mode receives message IEA279I.

### SET RESET

This command causes the time zone offset to be reset to the value that was read in from the CLOCKxx member during IPL, causing the local date and time to be changed accordingly. The syntax is:

SET RESET

This annuls all previous SET DATE, SET CLOCK, and SET TIMEZONE commands and reestablishes the relationship local date and time = UTC date and time + time zone offset.

### SET TIMEZONE

This command can be used to change the time zone offset to a different value from that specified at IPL through the TIMEZONE parameter in CLOCKxx. This automatically adjusts the local date and time accordingly. The syntax is:

SET TIMEZONE={W|E}.hh[.mm]

The time zone offset direction is west (W) or east (E). West is the default if it not specified. The value for *hh* must be between 00 and 15, and the value for *mm* must be between 00 and 59.

The daylight saving time changes may be handled manually using the SET CLOCK command rather than having it done automatically by the STP facility or the Sysplex Timer.

Using this method there is always a degree of error, because the difference between the local time and UTC time does not exactly match the time zone offset that would have been achieved by updating the TIMEZONE statement in CLOCKxx and IPLing.

The z/OS SET TIMEZONE command overcomes this problem by applying the correct offset value in the CVTLDTO field, causing an exact time zone offset to be applied.

**Tip:** If the SET CLOCK command is used to change local time for daylight saving time offset purposes, then we advise using the SET TIMEZONE command instead for far greater accuracy.

Remember that if the time zone offset for daylight saving time purposes is changed dynamically using either the z/OS SET CLOCK command or the SET TIMEZONE command, the TIMEZONE statement in CLOCKxx must be updated so that the new offset is not regressed upon the next IPL.

# 7

## **Operational considerations**

The loss of timing synchronization for servers in a Coordinated Timing Network (CTN) might have grave consequences for system images running in a Parallel Sysplex. New safeguards have been added to prevent the following actions:

- Execution of a disruptive task on a server that is configured as the Current Time Server and has Server Time Protocol (STP) connectivity to Stratum 2 servers
- Execution of a disruptive task on a server that is configured as the BTS or Arbiter
- Accidental deconfiguration of the last timing link between any two servers

With these new safeguards, the user must complete additional steps prior to executing the disruptive action. New messages draw the attention of the user when certain STP configuration conditions are not met. These conditions are described in the following sections.

**Important:** In an STP environment, if you plan to change your cabling topology, make sure that you understand the CTN roles of the servers subject to re-cabling, and perform the following tasks prior to any disruptive action:

- Update the IOCP for affected servers
- ► Test the changed links by configuring the channels online

### 7.1 Disruptive actions on the Current Time Server

A disruptive action on the Current Time Server (CTS) can jeopardize the entire CTN. Protection has been added to *prevent* a disruptive task from being performed on a server in the following conditions:

- On a server that is configured as the Current Time Server. Checking is only performed for the Current Time Server in an STP-only CTN. It does not apply to other server roles.
- On a server that has initialized STP links to Stratum 2 servers.

Only the combination of CTS role and active STP links conditions is checked. The protection only applies if *both* conditions are met. There is no protection enforced for a CTS that consists of a single server, because the active STP links condition is not met. See *Server Time Protocol Planning Guide,* SG24-7280, for detailed information about single server considerations.

When both conditions are met, the server is locked for disruptive tasks such as activate, deactivate, power off, power-on reset, and disruptive switch to alternate Support Element (SE). The protection also prevents modification of the server STP ID, the External Timer Reference (ETR) Network ID on the STP Configuration tab, or the ETR Network ID on the ETR Configuration tab.

### 7.1.1 Example of a disruptive action on the CTS: DEACTIVATE

If an attempt is made to perform a disruptive task on a server that is currently the CTS while other servers are attached through initialized STP links (being Stratum 2), that disruptive task fails. In the following example, a deactivate request on a server that matches both criteria is shown:

- 1. When the deactivate request is clicked for server H40, the normal Secondary Object Notification for Disruptive task gets posted.
- 2. The normal Deactivate Task Confirmation message gets posted.

3. The Disruptive Task Confirmation window prompts for the current user's password (Figure 7-1).

Disru	uptive 1	Fask Confirma	tion : Deactivate - H40
Attention:	The Dea	activate task is	s disruptive.
before contin	uing wit	vate task may a h the Deactivat ffected by the E	
Name	Туре	Status	Confirmation Text
H40:T13A01	Image	Not Operating	Deactivate may cause information in memory for the target to be lost, since the target is in a stopped or disabled wait state.
Do you want	to execi	ute the Deactiv	ate task?
Type the pas	sword b	elow for user "	SYSPROG" then click "Yes".
•	•••••		
Yes No	Help		

Figure 7-1 Disruptive Task Confirmation window

4. However, the Deactivate Progress window returns a failed status. Details are available (Figure 7-2).

Deactivate Progress - H40	
Function duration time:	00:15:00
Elapsed time:	00:00:01
Select Object Name Status	
<ul> <li>H40</li> <li>Failed; details are availab</li> </ul>	le
OK Details Cancel Help	

Figure 7-2 Deactivate Progress

 Clicking Details displays message ACTZ01C7 (Figure 7-3). No alternative action is possible from this window. The user can only acknowledge that the request failed and click OK.

Deactivate Task Details for Target H40
The operation failed because you attempted a disruptive action to a server (CPC) that has the role of the Current Time Server (CTS) in an STP-only Coordinated Timing Network (CTN). A disruptive action to a CTS may result in servers and Coupling Facilities (CFs) in the same CTN becoming unsynchronized. This may result in a multi-system outage for systems that are dependent on time synchronization from this CPC (for example, systems in a Parallel Sysplex).
Recommended action:
<ul> <li>If you have a different server or CF in the CTN that has the capability of being assigned as CTS, use the "System (Sysplex) Time" task to change the assignment of the role of the CTS.</li> </ul>
If you are unable to reassign the CTS role to another server, a <b>disruptive</b> procedure must be performed before you can continue with the disruptive action on this CPC. Use one of the following methods to complete this task:
<ul> <li>Deactivate all attached CPCs.</li> <li>Configure off all coupling links to the CTS (which might be disruptive to the rest of the CPCs in the CTN).</li> </ul>
The STP Status tab in the "System (Sysplex) Time" task can be used to determine which CPCs to deactivate or which links to configure off.
ACTZ01C7
<u>ok</u>

Figure 7-3 Message ACTZ01C7 - Deactivate Task details

If the request really must be pursued, the solution is to first change the STP configuration by reconfiguring the Current Time Server to another server from the Network Configuration window of the server that will become the new CTS. Only then can the deactivate request be accepted.

If the CTS *cannot* be reassigned, the alternatives will be disruptive to maintaining synchronization for other servers in the CTN. The alternatives are:

- Deactivate all the Stratum 2 and Stratum 3 servers in the CTN first. After that is done, the disruptive action on the CTS can be performed.
- Configure off all the coupling link CHPIDs from the CTS to all its attached servers. The special procedure that must be adhered to in order to configure off all, or more precisely, the last CHPID used for STP timing, is described in 7.3, "Last timing link validation" on page 248. The disruptive action on the CTS can be performed after this action is completed.

### 7.1.2 Protection of the CTS: CTN ID change

In a multisystem CTN environment, the Current Time Server is also protected from a local configuration change. This includes the following functions:

- ETR ID change from either the ETR configuration tab or the STP Configuration tab for servers without the ETR feature
- ► STP ID change from the STP configuration tab

A local CTN ID change basically removes the server from the current CTN to move to a separate CTN. Such a configuration change on a CTS is disruptive to the CTN.

Changing the CTN ID of a server that is not the CTS can also be globally disruptive. For example, consider the case of changing the CTN ID of a Stratum 2 server that is the sole time source for a Stratum 3 server that was supposed to remain in the original CTN. The modification of the ETR ID on the ETR Configuration tab or STP ID on the STP Configuration tab results in the message ACT39161 (Figure 7-4).

Apply ETR Configuration	
Changing the STP ID or ETR ID of a server (CPC) that has the role of Current Time Serv	ver is not allowed.
This action is disruptive and may result in servers and Coupling Facilities (CFs) in the sa unsynchronized, causing a multi-system outage for systems that are dependent on time s	
OK Cancel	ACT39161

Figure 7-4 Message ACT39161

### 7.2 Disruptive actions on the BTS or Arbiter

Disruptive actions are now blocked for the BTS and Arbiter. This new function was introduced with the MCL levels listed in Table 7-1.

Driver/Server	MCL	Bundle	Release date
D86E/z196	N29809.277	45	8 September 2011
D86E/z196	N29802.420	45	8 September 2011
D79F/z10	N24415.078	50	28 September 2011
D79F/z10	N24409.184	50	28 September 2011
D93G/z114 and z196 GA2	Integrated	N/A	9 September 2011

Table 7-1 MCL levels which introduced blocking of STP disruptive actions

This provides the same safeguards for the BTS and Arbiter as described in "Disruptive actions on the Current Time Server"; it prevents a disruptive action causing the CTS to give up the S1 role and go S0. For example, if the PTS has the CTS role and then the Arbiter (or BTS) has a planned or unplanned outage, then a disruptive action on the BTS (or Arbiter) causes the CTS to give up the S1 role and go S0 as it loses communication to both the BTS and Arbiter.

Attention: This recent restriction that a disruptive action cannot be taken against the server assigned with the BTS role has changed how the "Only allow the server(s) specified above to be in the CTN" button is used, because it requires that a BTS is assigned in a two-server CTN.

This means that the BTS server has to be removed from the CTN when the BTS role is removed to allow the "Only allow the server(s) specified above to be in the CTN" button to be selected when the PTS is power-on reset.

## 7.3 Last timing link validation

The loss of a server's last coupling link might cause the loss of timing synchronization for all system images on the server that is being synchronized (Stratum 2 or Stratum 3). To prevent accidental misconfiguration of the last coupling link that is being used to deliver STP timing between any two servers, additional safeguards are provided to prevent operational errors.

The last coupling link that is being used to deliver STP timing between any two servers is also referred to as the *last timing link*. A last timing link condition occurs when the following conditions are true:

To identify a physical channel, a physical channel identifier (PCHID) is assigned to each possible location that can support a channel card or that can provide I/O connectivity (for example, ESCON or FICON, networking, and coupling interfaces) or a logical interface, such as cryptographic attachments. PCHIDs represent the physical location of the I/O ports within the server. CHPIDs are then mapped to PCHIDs.

The PCHID is initialized for STP timing messages, whether it is defined to HCD as a coupling link or as a timing-only link.

The PCHID is listed in the Local STP Link Identifier(s) column of the System information section on the STP Status tab, and is the only remaining PCHID between any two servers in a Mixed or STP-only CTN.

The CHPID status is online to only one logical partition. That is, the CHPID only has one partition remaining in its access list.

Note that the status of the logical partitions defined in the CHPID access list is not used to determine whether a last timing link condition exists. STP messages will flow on any coupling link if CHPIDs at both ends of the link are online, regardless of whether the logical partition that the CHPIDs are defined to is active.

In the example configuration displayed in Figure 7-5, the PCHIDs are shown in such a way so that the reader can relate the STP Status information shown in this section to the CTN topology. In this example, the coupling link between the SCZP101 server and the H40 server is a potential last timing link. The coupling link between the SCZP201 server and the H40 server is also a potential last timing link.

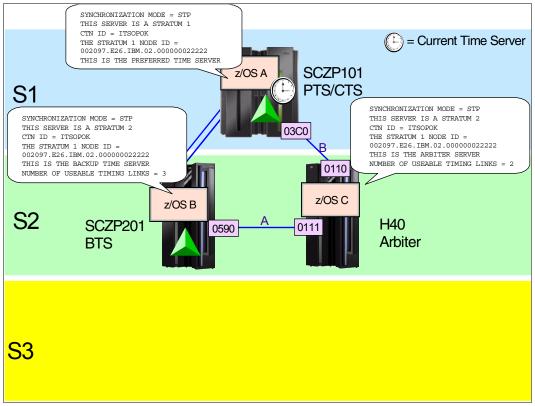


Figure 7-5 Example configuration - SCZP101, SCZP201, and H40 servers

This means that the SCZP101 and SCZP201 servers each have one potential last timing link, and whereas server H40 has two coupling links available for STP messages, each one can raise a last timing link condition because each of these links is the last link that is being used to deliver STP timing between two servers.

When a last timing link condition is detected, any attempt to remove the channel path from a z/OS image at either end of the link using the z/OS command CONFIG CHP(xx),OFF is rejected. In the example shown in Figure 7-5, an attempt to configure off from z/OS image z/OS C on H40 results in message IEE148I:

IEE148I CHP(xx) NOT RECONFIGURED - WOULD REMOVE A CPC-CRITICAL STP TIMING LINK

The CONFIG OFF request is also rejected if the FORCE option is specified on the z/OS or CFCC command.

When a last timing link condition exists, the configuration change must be completed on the HMC or Support Element. Also, a new confirmation message has been added to the configure Channel Path On/Off task to reflect this.

To demonstrate the last timing link safeguards, the following example steps through the process of configuring off a CHPID mapped on PCHID 0110 of H40. Figure 7-5 on page 249 shows the configuration.

- From the HMC application, select the server H40, then from the task list select Recovery → Single Object Operations to access the Support Element Workplace.
- On the Support Element Workplace, expand System Management and the appropriate server and click Channels to open the Channels Work Area where the PCHID can be selected. Then choose CHPID Operations → Configure On/Off from the task list.

In our example, access the Channels Work area for H40 and select **PCHID 0110.** This is the PCHID between SCZP101 and H40 in our configuration.

3. The Configure Channel Path On/Off window displays the list of CHPIDs associated with the PCHID. In the example shown in Figure 7-6, PCHID 0110 has decades CHPIDs shared across logical partitions.

Only one CHPID remains online, for logical partition T13A01. Notice that a Not Allowed message displays. The last timing link condition does exist.

			state, then click					1224
						ils" to g	et more informatio	n.
				IPIDs are configu e CHPID will cau				
				ing system facilit			ort Element (SE)	
	CSS.CHPID:L			Desired State	Message	ie euppe	in Elonioni (OE)	
	0.C0:CF1			Online Pending				
	0.C0:T13A01		Online	Online	Notallowed			
	0.C0:T13A02		Online Pending	Online Pending				
	0.C0:T13A03		Online Pending	Online Pending				
	0.C0:T13A04		Online Pending	Online Pending				
	0.C0:T13A05		Online Pending	Online Pending				
	0.C0:T13A06		Online Pending	Online Pending				
	0.C0:T13A07		Online Pending	Online Pending				
	0.C0:T13A08		Online Pending	Online Pending				
	0.C0:T13A09		Online Pending	Online Pending				
	1.C0:CF2		Online Pending	Online Pending				
	1.C0:T13A11		Online Pending	Online Pending				
Detail	s							
Apply	Select All	Deselect All	Toggle All O	n Toggle All	Off Toggle	Cancel	Help	

Figure 7-6 Configure Channel Path On/Off

In the CSS.CHPID:LPAR Name table, there is a Not allowed message for the last logical partition that has the timing link online. Click the check box for the partition and click **Details**. Message ACT20042 displays, which indicates the last timing link condition (Figure 7-7).

Configure Channel Path On/Off - PCHID0110	i
This is the last Timing Link for STP messaging to an attached Server.	
LPAR images relying on STP time synchronization may switch to Loc	al Mode.
Do you want to allow this link to be configured off ?	
AC	T20042

Figure 7-7 Message ACT20042 - Configure Channel Path On/Off

The message also gives the user the option to override.

4. Click **Yes** if the reconfiguration is to proceed. This removes the last timing link lock for the CHPID and returns control to the Configure Channel Path window. The Not Allowed message no longer displays in the Message column (Figure 7-8).

oggle	e the CHPIDs to the desired	d state, then click	"Apply".	Section Section		13/2
					tails" to get more information.	
	perating system will not be					
	ext operation from the opera sible, configure the CHPIDs				the Support Flomont (SE)	
and the second second	CSS.CHPID:LPAR Name	and the second	Desired State	Message	the Support Element (SE)	293821)
	0.C0:CF1	Online Pending		Meeoouge	]	-
	0.C0:T13A01	Online	Online (		)	
	0.C0:T13A02	Online Pending	Online Pending			
	0.C0:T13A03	Online Pending	Online Pending			
	0.C0:T13A04	Online Pending	Online Pending			4
	0.C0:T13A05	Online Pending	Online Pending			
	0.C0:T13A06	Online Pending	Online Pending			
	0.C0:T13A07	Online Pending	Online Pending			
	0.C0:T13A08	Online Pending	Online Pending			
	0.C0:T13A09	Online Pending	Online Pending			
	1.C0:CF2	Online Pending	Online Pending			
	1.C0:T13A11	Online Pending	Online Pending			~
Detail	ls					
Apply	Select All Deselect All	Toggle All O	n Toggle All	Off Toggle	Cancel Help	

Figure 7-8 Configure Channel Path On/Off

It is now possible to proceed with the reconfiguration of the last online CHPID.

	Configure Channel Path C					l
	e the CHPIDs to the desired					
					tails" to get more information.	
	perating system will not be ext operation from the opera					
	sible, configure the CHPIDs				the Support Element (SE)	
	t CSS.CHPID:LPAR Name		Desired State	Message		D157(55)
	0.C0:CF1		Online Pending	9		
	0.C0:T13A01	Online	Standby			
	0.C0:T13A02	Online Pending	Online Pending			
	0.C0:T13A03	Online Pending	Online Pending			
	0.C0:T13A04	Online Pending	Online Pending			L
	0.C0:T13A05	Online Pending	Online Pending			
	0.C0:T13A06	Online Pending	Online Pending			
	0.C0:T13A07	Online Pending	Online Pending			
	0.C0:T13A08	Online Pending	Online Pending			
	0.C0:T13A09	Online Pending	Online Pending			
	1.C0:CF2	Online Pending	Online Pending			
	1.C0:T13A11	Online Pending	Online Pending			
Detail	ls					200
Apply	Select All Deselect All	Toggle All O	n Toggle All	Off Toggle	Cancel Help	

Figure 7-9 Configure Channel Path On/Off

5. Click the check box for the CHPID:LPAR name, 0.C0:T13A01, in the example. Click Toggle to switch the desired state to standby and click Apply (Figure 7-9 on page 251). Now that the last timing link security has been removed, the CHPID reconfiguration continues normally. The Configure Channel Path On/Off Progress window displays the completion of the operation (Figure 7-10).

Configure Channel Pa	th On/Off Progr	ess - PCHID0110
Function duration time:		00:00:12
Elapsed time:		00:00:00
Select Object Name	Status	
<ul> <li>CHPID- 0.C0:T13A01</li> </ul>	Completed	
OK Cancel Help		

Figure 7-10 Configure Channel Path On/Off progress

When the removal of the last CHPID is complete, all traffic on the coupling link is stopped. The Channels Work Area on the server reflects the fact the PCHID is now in standby because all its CHPIDs are now configured off. See PCHID 0110 in Figure 7-11.

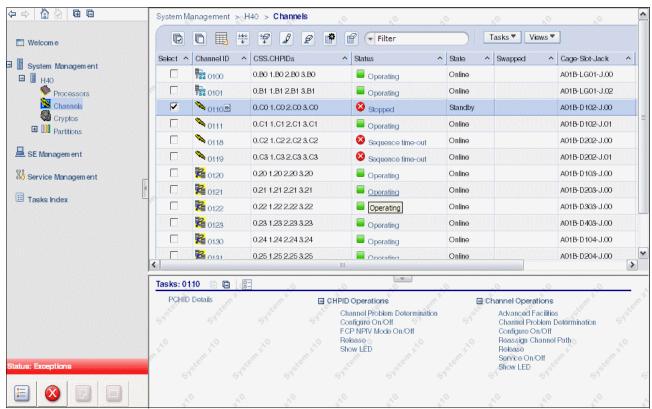


Figure 7-11 Channels Work Area: H40

The CHPID configuration change is reflected on the physical channel at the other end of the link. On SCZP101, although still online, PCHID 03C0 now reports an error condition, such as Loss of synchronization (Figure 7-12).

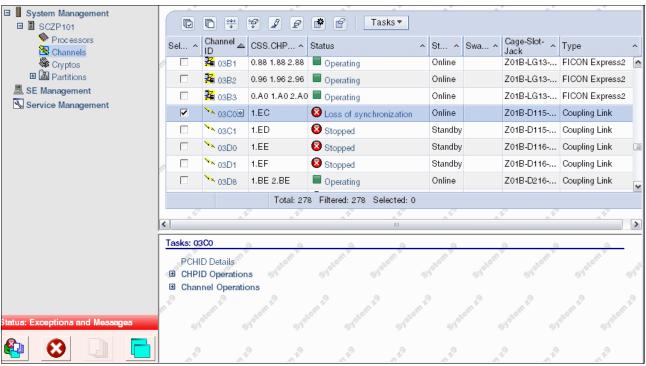


Figure 7-12 Channels Work Area - SCZP101

The same information is also reflected in the STP Status tab on each server. Figure 7-13 shows the STP Status information for server H40. Notice that PCHID 0110 has now been moved to the Local Uninitialized Link section and the uninitialized reason code indicates 0ffline.

iming etwork	Network Configuration	ETR Configuration	ETR Status	STP Conf	figuration	STP Status	ETS Configuration	SCZ H40
iming state:		Synchronized						
Jsable clock s	ource:	Yes						Topologica de la composición d
iming mode:		STP (Server Time	Protocol)					
Stratum level:		3						
/laximum timin	g stratum level:	3						244
Aaximum STP	version:	4						
- System Inform	ation				and the first of the	ACREAL PA	Sector Sector	1.44
Local STP	and the first of the state of the state	ectly Attached Syste	m System	Stratum	Active STP	Maximum ST	P	a terre
		Plant-Sequence			Version	Version		
0111		-02-00000001DE50		2	4	4		
19132101017		23.10.200.000				1.5000000	the second of the	
	ized STP Links –							
	STP Link	Reason Code	Reason Coc	de				6.23
Link Identifier		Sent	Received					1.11
0110	Coupling-peer		)					
0118	Coupling-peer							
0119	Coupling-peer							
0200	Coupling-peer							
0201		Configuration error						Sec.
0208	Coupling-peer							
0209 0500	Coupling-peer							
	Coupling-peer	Configuration error					× 1	1 100 100 100

Figure 7-13 STP Status tab - H40

At the other end of the link, on SCZP101, the STP Status tab shows that PCHID 03C0 has also been moved to the Local Uninitialized Link section with a reason code that indicates link failure (Figure 7-14).

iming letwork	Network Configuration	ETR Configuration	ETR Statu	is C	TP onfiguration	STP Status	ETS Configuration	SCZP
Timing state:	Synchro	nized						
Usable clock s							1.5.2.1.1.1.1.1.1.1.1.1	
Timing mode:	STP (Se	erver Time Pr	otocol)					12/19
Stratum level:	1							
	ng stratum level: 3						West and the second	144
Maximum STF	<sup>o</sup> version: 4							
– System Inforr	nation	<u></u>						
Local STP	Remote Directly Attac	ched System	System	Stratum	Active STP	Maximum STF		
Link Identifie	r(s) Type-MFG-Plant-Sec		Name	Level	Version	Version		265
0118,03D8	002097-IBM-02-0000	0001DE50	SCZP201	2	4	4		
	line of OTD Line							11/1
Local STP	Ilzed STP Links STP Link	Reason Co	do E	Reason C	ada			
Link Identifie		Sent		eceived	oue			
02B0	Coupling-peer	Offline					~	diffe
02B1	Coupling-peer	Offline						1.2.2
03C0	Coupling-peer	Link failure						12.6
03C1	Coupling-peer	Offline						1000
03D0	Coupling-peer	Offline						
03D1	Coupling-peer	Offline					≡	2/12
03D9	Coupling-peer	Offline						
	Coupling over InfiniBan	1 000						100.2279

Figure 7-14 STP Status tab - SCZP101

Figure 7-15 shows the resulting configuration. Figure 7-15 also shows the output of a DISPLAY ETR command from a z/OS image on each server, following the CHPID reconfiguration.

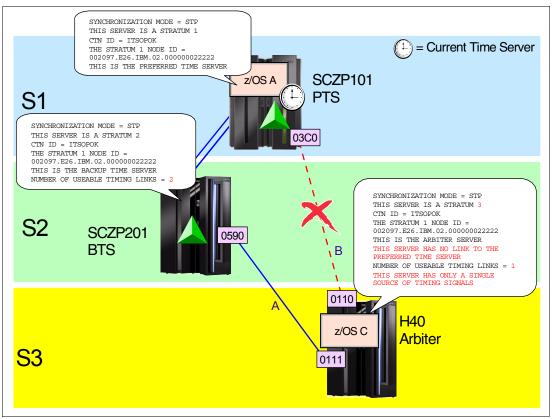


Figure 7-15 Example configuration - After removal of one link

In the example described above, there was no hard consequence because STP automatically adjusted to use alternate links. However, H40 is now a Stratum 3 and has only one single source and one single link remaining to receive STP messages, resulting in a configuration containing a single point of failure (SPOF). An IEA382I message is posted to indicate the SPOF:

IEA382I THIS SERVER HAS ONLY A SINGLE LINK AVAILABLE FOR TIMING PURPOSES.

The decision to reply yes to message ACT20042 and pursue a reconfiguration must be reviewed carefully. To assess the consequences of forcing a CHPID reconfiguration in a last timing link scenario requires the user to understand the CTN topology at that precise moment in time. Unfortunately, the CTN topology is not something readily available in one single place in the system. It has to be reconstructed from various HMC and z/OS sources.

STP messages flow from one server to another but are not directed to any logical partition. As a consequence, STP messaging requires the CHPIDs to be online at both ends of the link, but does not require any logical partition in the CHPID access list to be activated. A CF link is available for STP messaging as long as one CHPID is online to any logical partitions in its access list, whether the partition is activated or not.

Remember also that when a CHPID is configured OFF to an inactive logical partition, the effect is immediate. However, when it is configured ON to an inactive logical partition, the LPAR will queue the request and the CHPID will only be brought online the next time that the logical partition is activated.

The primary source of information for operations is z/OS messages. However, z/OS messages give no information about the last timing link condition because a DISPLAY ETR command on a z/OS system image has no visibility to CHPIDs defined to partitions other than its own.

The output of the z/OS DISPLAY ETR command identifies coupling links (PCHIDs), and only as viewed from the z/OS system image. Note that the number of usable timing links is only displayed for a Stratum 2 or a Stratum 3 server that is hosting the z/OS image. The z/OS image on the Stratum 1 server does not show the number of usable timing links because the server does not rely on external STP links. For a Stratum 2 or Stratum 3 server, only STP *initialized* links to a Stratum 1 or a Stratum 2 are included in the number of usable timing links.

- z/OS counts physical links (PCHIDs).
  - In the configuration shown in Figure 7-5 on page 249, on H40, the DISPLAY ETR command output on the z/OS image identifies no single point of failure:

NUMBER OF USABLE TIMING LINKS = 2

However, links 0590 to 0111 and 03C0 to 0110 might raise a last timing link condition if one online CHPID only remains mapped to the PCHID on each server.

 In Figure 7-15 on page 255 on H40, the DISPLAY ETR information about the Z/OS image identifies a single point of failure:

NUMBER OF USABLE TIMING LINKS = 1 THIS SERVER HAS ONLY A SINGLE SOURCE OF TIMING SIGNALS

The user needs to go to the STP Status tabs to map the link to PCHID 0590 to 0111. Again, this does not automatically imply a last timing link condition on H40 (or at the other end of the link, on SCZP201), because the last timing link condition depends on the contents of the CHPID access list.

- ► The DISPLAY ETR command output provides information only for PCHIDs that are input to the server hosting the z/OS image. It does not consider coupling links to dependent systems. For example, in the configuration shown in Figure 7-15 on page 255:
  - On SCZP101, which has the Current Time Server role, the *number of usable timing links* is not indicated. Because the CTS owns the Current Server Time and does not rely on external links, links are not considered a single point of failure for images on the server.
  - On SCZP201, the *number of usable timing links* at this point in time is now two, because z/OS only counts the number of PCHIDs from its host server to the Current Time Server, SCZP101.

Notice the difference with the configuration in Figure 7-5 on page 249. Prior to the reconfiguration, the z/OS image running on SCZP201 recognized three usable timing links (PCHIDs) because at the time, H40 had connectivity to the Current Time Server and was a possible source of STP timing messages.

The DISPLAY ETR information is not available for dedicated coupling facilities, because the CFCC has no DISPLAY ETR equivalent.

A CTN configuration diagram with PCHID and CHPID information is a useful starting point. It can be created manually or be derived from HCD or HCM if the installation uses a single IODF. However, given the real-life constraints of any IT installation, a diagram might not always reflect the status of the CHPID access lists at that precise moment in time.

Before attempting to override a last timing link condition, review and understand the DISPLAY ETR command output from z/OS system images on each server, and check the STP

connectivity information using both the STP Status windows and the CHPID access list information from the Configure Channel Path On/Off windows.

## 7.4 Restarting a CTN after a site power outage or CTS power-on reset

A fundamental aspect of STP algorithms is to monitor the STP links and the state of the attached servers (preferred, backup, and Arbiter) and to make decisions based on the states of those entities.

An STP-configured server that is being powered on is unable to do that and must rely on information from other servers, if they exist. An individual server that is powered up does not know, when it returns, whether the entire data center has been shut down, whether there has been a physical or logical reconfiguration during the shutdown, whether the user might *not* want to reinstate the previous CTN, and so on.

As a consequence, an STP-only CTN is deconfigured in case of a power outage that affects all servers in the CTN. This can happen in the case of a site power outage, or even in a multisite configuration if the loss of power is caused by a failure in the regional or national electric grid.

The CTN may also be deconfigured for a single server CTN when a power-on reset or other disruptive action is made. Disruptive actions are not blocked on a single server CTN.

The server roles therefore need to be reassigned after these actions:

- The CTS in a single server CTN has been power-on reset or has gone through a power-off, power-on sequence and has not been specified to be the only member of the CTN.
- The PTS and BTS in a dual-server CTN have been power-on reset or have gone through a power-off, power-on sequence and have not been specified to be the only servers of the CTN.

**Note:** If a single server CTN or a dual-server CTN is specified to be the only members of the CTN, it saves its time and configuration information across power-on reset and power outage scenarios. Otherwise, a single server CTN or a dual-server CTN still needs to go through the procedures outlined below.

For planning information, see "Activating the STP-only CTN" in 3.2.2 "Configuring an STP-only CTN" of the *Server Time Protocol Planning Guide*, SG24-7280.

- ► Any STP-only CTN is deconfigured intentionally by the user.
- The PTS and the BTS, if assigned, experience a power outage (for example, a data center power outage).

When the site power is restored, the CTN remains deconfigured, with all participating servers being Stratum 0. The Network Configuration tab shows that the PTS, BTS, and Arbiter are not configured (Figure 7-16). Servers rely on explicit instructions from the console to reestablish a new time source and reconfigure the CTN. This is a change from the restart procedures used in a similar situation when using a Sysplex Timer configuration. Operating procedures must be modified accordingly.

etwork	Network Configuration	ETR Configuration	ETR Status	STP Configuration	STP Status	ETS Configuration
	etwork Configuration d at (UTC):					
Preferred	10001	Not configured				
Backup tir	ne server (CPC)	Not configured				
Arbiter		Not configured	•			
□ <u>F</u> orce <i>Current</i> ⊙ <u>P</u> refer	Ilow the server(s) sp configuration Fime Server (CPC) – red time server (CPC p time server (CPC	C) )	e in the CTN			
	ed timing network II		-			
Coordinat	and a state of the state of the					

Figure 7-16 HMC workplace - System (Sysplex) Time Network Configuration

The sequence to restart an STP-only CTN is:

- 1. Set the time zone offset, leap seconds, and date and time.
- 2. Assign the CTN roles.

### 7.4.1 Initializing the time

The Initialize Time button is accessed from the Network Configuration tab (Figure 7-16 on page 258). The Initialize Time button becomes enabled when the CTN is deconfigured as a result of a site power failure or power-on reset of a single CEC CTN.

Clicking **Initialize Time** displays the Initialize Time window (Figure 7-17). The three tasks related to initializing the time are listed here:

- Set leap seconds.
- Set time zone.
- Set date and time.

Prior to setting the n	etwork configuration, some initial time values must be set on the server (CPC) that will be assigned the
Task	Complete
<ul> <li>Set leap seconds</li> <li>Set time zone</li> <li>Set date and time</li> </ul>	
OK Cancel Help	

Figure 7-17 HMC workplace - Initialize Time

Set leap seconds and Set time zone are described in "Initialize time: Set leap seconds" on page 182 and "Initialize time: Set time zone" on page 183.

The final task is to initialize the date and time using the **Set date and time** button. The task is detailed in "Initialize Time: Set date and time" on page 186.

Following a power outage or power-on reset of the CTS, the date and time can be set, depending on the following items:

- If the ETS is configured and is already available at the time of the recovery, the preferred method is to use the Use External Time Source option.
- For customers who do not have an ETS, select Modify time by delta to set date and time and enter a delta value of zero (Figure 7-18).

STP uses the date and time from the server Support Element to calculate the Coordinated Server Time and set the server time of day (TOD) clock when you click **OK**.

Set Date and Time		B
○ Set date and time	Date 10/9/09	Time 2:26:45 PM
<ul> <li>O Use the configured External Time Source to set date and time</li> <li>● Modify time by delta to set date and time</li> </ul>	Delta +00:00:00.000	+/- hh:mm:ss.mmm
OK Cancel Help		

Figure 7-18 Set Date and Time

When all three tasks on the Initialize Time window have a check mark in the Complete column, the user needs to click **Cancel** to exit the Initialize Time task (Figure 7-19).

Prior to setting the n	network configuration, some initial time values must be set on the server (CPC) that will be assigned
Task O Set leap seconds O Set time zone	Complete
<ul> <li>Set date and time</li> <li>OK Cancel Help</li> </ul>	

Figure 7-19 Initialize Time

### 7.4.2 Assigning the CTN roles

After the Initialize Time task has been completed, the Apply button on the Network Configuration tab becomes enabled. The server roles must be assigned. Under normal circumstances, perform this in two distinct steps. However, following a site power outage, it might be convenient to force the configuration in one step, because not all servers might be in a POR-complete state.

The CTN roles are assigned from the Network Configuration tab. The task must be done from the server that will become the Current Time Server. Take these steps:

- 1. Assign the PTS role.
- 2. Assign the BTS, applicable for two or more servers, and Arbiter if the CTN has three or more participating servers.
- 3. Assign the CTS role.
- 4. Click the Force configuration check box. This is necessary to configure a new STP-only CTN. Because this option bypasses a number of validity checks on server connectivity, it allows the configuration of servers that might not be in POR-complete state or that do not yet have coupling link connectivity to the designated CTS.
- 5. Click Apply.

For each of the Preferred Time Server (PTS), Backup Time Server (BTS), and Arbiter roles, there are drop-down boxes listing the servers currently available. Only STP-enabled servers with their Support Element visible to the HMC are selectable.

In a normal situation, when the HMC has connectivity to the server, the STP ID information (STP ID: xxxxx) is shown if there is an initialized STP link to the target server and the server participates to the same CTN. In the current recovery situation, certain server Support Elements can be visible to the HMC, but the STP ID is not available. Either the activation of this particular server is not complete, or coupling link connectivity to the CTS has not yet been reestablished.

In the example in Figure 7-20:

- H40 is selected as the PTS and CTS. The STP ID is (ITSOPOK).
- ► TC8M is selected as the BTS. The STP ID is (ITSOPOK).

ning work	Network Configuration		ETR Configuration	ETR Status	STP Configur		STP Status	ETS Configuration	T H
	twork Configuration	n ——							
	me server (CPC)	H40 (ST	P ID: ITSOPOK	.) <b>-</b>					
ackup tim	e server (CPC)	TC8M (	STP ID: ITSOPC	DK) 🔻					
rbiter		Not con	figured	•					
Only all	low the server(s)	specified	above to be in t	he CTN					
	onfiguration								
	ime Server (CPC) ed time server (C	PC)				and the second			
the second s	time server (CP	and the second							
oordinate	d timing network	ID ITSO	POK	- [	<u> </u>				
	Initialize Time		figure (	ancol Mic	ration to Mixe	LOTN	1		

Figure 7-20 Network Configuration tab

Because the Force configuration option is checked, the Network Configuration Change Confirmation message ACT37348 displays. Click **Yes** to confirm. When the configuration is successful, message ACT37341 displays. Click **OK**.

The assignment of the CTS globally configures into the CTN all servers that meet the following conditions:

- They are already powered-on and in a POR-complete state.
- They have the same CTN ID as the CTS.
- They have coupling link connectivity to the CTS.

Other servers that are not yet in POR-complete state, or that have not yet reestablished connectivity to the CTS, automatically join the CTN and recognize their role assignments when their operating conditions return to normal. After all conditions have returned to normal, reconfigure the server roles in the CTN to the configuration that was in place before the outage.

# Part 3

# **Migration scenarios**

There are many potential implementation and migration scenarios for establishing a Mixed CTN or an STP-only CTN. The scenarios presented in this part discuss the most common situations. These scenarios are:

- ETR Network to Mixed CTN (ETR timing mode)
- Mixed CTN (ETR timing mode) to ETR Network
- ► Mixed CTN: Changing one server from ETR timing mode to STP timing mode
- Mixed CTN: Changing one server from STP timing mode to ETR timing mode
- Mixed CTN: Adding a server in STP timing mode
- Mixed CTN (two servers) to STP-only CTN
- Mixed CTN (three servers) to STP-only CTN
- STP-only to Mixed CTN (a.k.a "Reverse migration")

In this part each migration scenario is performed and then followed by a related scenario to return the CTN to the timing state that it had at the start of the previous migration. The scenarios involving the addition of new processors (to a Mixed CTN or to an STP-only CTN) do not have a related removal scenario, as these do not involve any changes to the existing STP environment. In addition, the successful migration endpoint of one scenario may become the starting point of the next scenario as we work our way through the chapter.

### Prerequisites

All STP planning requirements have been completed. Check the *Server Time Protocol (STP) Solution Assurance Product Review (SAPR) Guide*, SA06-012, to ensure that you have a proper STP Migration checklist.

### External Timer Reference (ETR)

All Sysplex Timers used in the migration scenarios have the ETR LIC installed.

### STP feature installation

All servers used in each of the migration scenarios are STP capable and have been STP enabled. This implies that all prerequisite hardware tasks have been performed and that all resident z/OS images have been IPLed at z/OS V1.7 or later with maintenance.

### CLOCKxx member

The CLOCKxx member used by all z/OS systems uses the defaults supplied with the z/OS maintenance, as shown in the following example:

OPERATOR NOPROMPT TIMEZONE W.04.00.00 ETRMODE YES ETRZONE YES STPMODE YES STPZONE YES TIMEDELTA 10

**Important:** When two or more servers are selected in the System (Sysplex) Time task, it is necessary to click **Refresh** to update the displayed configuration information for *all* servers.

This part describes migration scenarios for a Mixed CTN or a STP-only CTN. The content in these examples must be referenced according to your own implementation requirements.

# 8

# ETR Network to Mixed CTN (ETR timing mode)

In this scenario<sup>1</sup>, all servers in our sample configuration are migrated from an External Timer Reference (ETR) Network to a Mixed Coordinated Timing Network (CTN) through updating the CTN ID on all servers to define the Server Time Protocol (STP) ID. In this chapter we work through the following sections:

- ► "Start point" on page 266
- "Migration" on page 272
  - "z/OS DISPLAY ETR command" on page 267
  - "Defining STP ID on SCZP101" on page 274
- "End point" on page 275

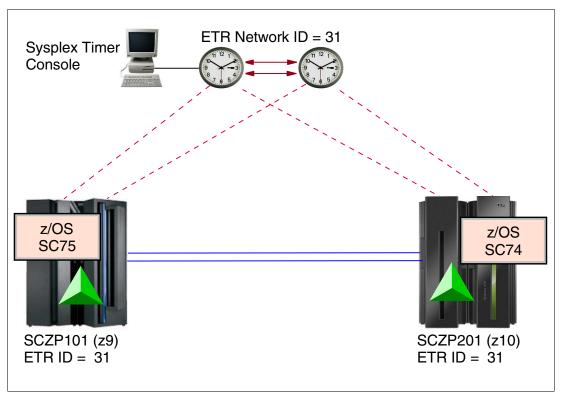
A Mixed CTN might consist of servers in ETR timing mode only, or a combination of servers in ETR timing mode and STP timing mode. In both cases, the ETR is the time source for the CTN.

This scenario proceeds to the point that all servers have a CTN ID defined that includes both an STP ID and an ETR Network ID, but are still *in ETR timing mode*.

Migration of a server in a Mixed CTN to use STP timing mode is the subject of another migration scenario discussed in this chapter. See Chapter 10, "Mixed CTN: Changing one server from ETR timing mode to STP timing mode" on page 295.

<sup>&</sup>lt;sup>1</sup> See "Prerequisites" on page 263.

## 8.1 Start point



The starting environment for this scenario is the ETR Network shown in Figure 8-1.

Figure 8-1 STP implementation environment - ETR network

This configuration consists of two STP-capable processors, each of which has connectivity to two Sysplex Timers in an Expanded Availability ETR configuration. Both of these servers are STP enabled. This means that all of the prerequisite tasks from the preparation and installation phases are complete. These servers are still in ETR timing mode, because the configuration and activation tasks have not been addressed.

Each server is connected to the other server in a redundant configuration using multiple coupling links, and each server has a z/OS image and a coupling facility defined. There are six coupling links between these servers, as evidenced by various Hardware Management Console (HMC) workplace displays. However, only two links are shown for clarity.

Because existing coupling links are already available, these may be used for STP timing messages. In instances where timing-only links are necessary, they must be defined using the Hardware Configuration Dialog (HCD) prior to the start of this migration.

### 8.1.1 z/OS DISPLAY ETR command

Figure 8-2 shows the output from the DISPLAY ETR command entered on the SC74 z/OS image, on SCZP201.

```
D ETR

IEA282I 13.12.05 TIMING STATUS 823

SYNCHRONIZATION MODE = ETR

CPC PORT 0 <== ACTIVE CPC PORT 1

OPERATIONAL OPERATIONAL

ENABLED ENABLED

ETR NET ID=31 ETR NET ID=31

ETR PORT=00 ETR PORT=00

ETR ID=01
```

Figure 8-2 DISPLAY ETR display - SC74 image on SCZP201 ETR network

This display indicates that SC74 is using an ETR as its timing source. Server SCZP201 is connected to two Sysplex Timers in an ETR Network, which has an ETR Network ID of 31. The server ETR port that is currently being used to receive timing signals is port 0, connected to the Sysplex Timer with ETR ID of 00.

**Note:** There is no STP-related information shown, because this server (while *enabled* for STP) does not have an STP ID defined at this stage.

### 8.1.2 z/OS DISPLAY XCF command

Figure 8-3 shows the output from the DISPLAY XCF command entered on the SC74 z/OS image, on SCZP101.

D XCF,S,	ALL				
IXC335I	13.12.46	ISPLA	Y XCF 825		
SYSPLEX	PLEX75				
SYSTEM	TYPE SERIAL	. LPAR	STATUS TIME	SYSTEM STATUS	
SC74	2097 DE50	2C	10/03/2009 13:12:46	ACTIVE	TM=ETR
SC75	2094 991E	1C	10/03/2009 13:12:42	ACTIVE	TM=ETR

Figure 8-3 DISPLAY XCF display - SC74 image on SCZP201 ETR network

This display shows that SC74 is a member of a sysplex that also includes image SC75, on a separate server, as evidenced by the different CPU serial number. Both SC74 and SC75 are in ETR timing mode.

### 8.1.3 System (Sysplex) Time tabs

After an STP-capable server or coupling facility has been STP enabled through installation of the STP feature, additional tabs become available for the server on both the Support Element and the HMC workplace.

The following tabs are available through the System (Sysplex) Time selection for each selected server and are discussed in turn to provide the starting basis for this scenario:

- Timing Network
- Network Configuration
- ETR Configuration (only shown if the server has ETR ports installed)
- ► ETR Status (only shown if the server has ETR ports installed)
- ► STP Configuration
- STP Status
- ETS Configuration

The following figures reference the detail behind the tabs in relation to an ETR Network.

#### Timing Network tab

Figure 8-4 shows the Timing Network tab for the SCZP201 server.

iming letwork	Network Configuration	ETR Configuration	ETR Status	STP Configuration	STP Status	ETS Configuration
oordinate ne: 1:07 ite: 10/3						
Offsets — _eap seco						
- Network - Timing net	• • • • • • • • • • • • • • • • • • • •	ETR				

Figure 8-4 Timing Network tab (SCZP201)

The Coordinated Timing Network ID is shown on this tab as -31. From an STP point of view, this is represented as [] - [31], where:

- ► The STP ID component of the CTN ID is blank.
- The ETR Network ID component of the CTN ID is 31.

This indicates that only the ETR Network ID has been defined for the SCZP201 server.

Other fields on the Timing Network tab that are of interest include the leap second offset (set to 24) and the total time offset (set to -4). Because this server is in an ETR network, the values of these fields originate from the Sysplex Timer and are included in the timing signal from the ETR.

### Network Configuration tab

Figure 8-5 shows the Network Configuration tab for the SCZP101 server.

ming Network etwork Configuration	ETR Configuration	ETR Status Co	P onfiguration	STP Status	ETS Configuration
Current Network Configuration				<u>.</u>	
Preferred time server (CPC)	Not configured	<b>-</b>			
Backup time server (CPC)	Not configured	<b>.</b>			
Arbiter	Not configured	<b>_</b>			
<ul> <li><u>O</u>nly allow the server(s) s</li> <li><u>F</u>orce configuration</li> </ul>	pecified above to be in	the CTN			
<ul> <li>Current Time Server (CPC)</li> <li>Preferred time server (CPC)</li> <li>Backup time server (CPC)</li> </ul>					
Coordinated timing network I	D	- 31			
Apply Initialize Time	Deconfigure	Cancel Migration to I	lixed CTN		

Figure 8-5 Network Configuration tab (SCZP201)

Because SCZP101 is in an ETR Network, the Preferred Time Server, Backup Time Server, and Arbiter fields are not applicable, and the Apply, Initialize Time, and Deconfigure buttons have been disabled.

The Coordinated Timing Network ID field has also been disabled. However, the contents of this field contain the current CTN ID in use by the SCZP101 server. In this case, it contains [] - [31], representing a blank STP ID and an ETR Network ID of 31.

#### ETR Configuration tab

Figure 8-6 shows the ETR Configuration tab for the SCZP101 server.

iming etwork	Network Configuration	ETR Configuration	ETR Status	STP Configuration	STP Status	ETS Configuration	SCZ SCZ
<ul> <li>● Enabled</li> <li>○ Disabled</li> <li>○ Off</li> </ul>	Port 1 State © Enabled © Disabled © Off						
Enabled'.	<u> </u>	al only when a valid Link Error Threshold	ETR network	( ID is entered and	the port's ma	nual state is	

Figure 8-6 ETR Configuration tab (SCZP201)

This tab displays the current ETR Network ID of 31. It also shows the current state of the SCZP201 server ETR ports as enabled and allows these to be modified to another state if required.

**Important:** The ETR Network ID can be modified through the ETR Configuration tab. However, this is not necessary except in the specific circumstance where a new server is being added to an existing Mixed CTN. Changing this value to an incorrect or invalid value causes the server to lose the ability to use the connected ETR as the timing source and causes the server to enter local time of day (TOD) stepping mode. Resident z/OS images in a sysplex configuration that rely on the Sysplex Timer are impacted.

### ETR Status tab

Figure 8-7 shows the ETR Status tab for the SCZP101 server.

ming etwork	Network Configuration	ETR Configuration	ETR Status	STP Configuration	STP Status	ETS Configuration	SCZ SCZ
ETR Status							
Attachment Stepping m	control register: C8C7	apping					140
	node: ETR st ng port number: 0	epping					
Port 0 state	: Operat					Sector Contraction	
Port 1 state	: Operat	ional					
	Nord 1 - Port 0						
ETR netwo ETR ID (in	rk ID (in decimal): 31 decimal): 0						
	umber (in decimal): 0						
ETR Data	Nord 1 - Port 1						
ETR netwo	rk ID (in decimal): 31	1.41 1.200.5				n 525 - 256 n.C	
ETR ID (in	decimal): 1 umber (in decimal): 0						
1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1	and the second states						
ETR Card	Status s: Light detected						
	s: Light detected	Eliste Personale				alter and the stand	
State 1		the state of the s					1942

Figure 8-7 ETR Status tab (SCZP201)

This is a status display tab only, and no modifications to the configuration can be made from here. This provides ETR status information for the SCZP101 server ETR ports in line with what displays through the DISPLAY ETR command (Figure 8-2 on page 267).

### STP Configuration tab

Figure 8-8 shows the STP Configuration tab for the SCZP201 server.

ming twork	Network Configuration	ETR Configuration	ETR Status	STP Configuration	STP Status	ETS Configuration
oordinated	I timing network ID		- 31			
Apply	Save STP Debug Data		The state			

Figure 8-8 STP Configuration tab (SCZP201)

This tab is used to define the STP ID portion of the CTN ID. The ETR Network ID is also displayed. However, the field has been disabled to prevent modification.

As it currently stands, the CTN ID is defined as [] - [31], indicating that the SCZP201 server is in an ETR Network.

#### STP Status tab

Figure 8-9 shows the STP Status tab for the SCZP101 server.

iming etwork	Network Configuration	ETR Configuration	ETR Status	STP Configuration	STP Status	ETS Configuration
Fiming state:		chronized				
Jsable clock :	and the construction of the second					
Fiming mode:		R (External Time Ref	ference)			
	ng stratum level: 3					
Aaximum STR	o version: 4					
- System Infori	mation					
Local STP		Attached System Sy	stem Stratum	Active STP Maxi	mum STP	
Link Identifie	r(s) Type-MFG-Plant-			Version Vers		
					Carlos Carlos	
<ul> <li>Local Uninitia</li> </ul>						
	lized STP Links			<b>-</b>		
Local STP	STP Link	Reason Code		Reason Code		
Local STP Link Identifie	STP Link r Type	Sent		Reason Code Received		
Local STP Link Identifie 0014	STP Link r Type Coupling-peer	Sent Initialization is	s not complete			
Local STP Link Identifie 0014 0015	STP Link r Type Coupling-peer Coupling-peer	Sent Initialization is Initialization is	s not complete			
Local STP Link Identifie 0014 0015 001E	STP Link r Type Coupling-peer Coupling-peer Coupling-peer	Sent Initialization is Initialization is Link failure	s not complete			2
Local STP Link Identifie 0014 0015 001E 001F	STP Link r Type Coupling-peer Coupling-peer Coupling-peer Coupling-peer	Sent Initialization is Initialization is Link failure Offline	s not complete s not complete			2
Local STP Link Identifie 0014 0015 001E 001F 0034	STP Link r Type Coupling-peer Coupling-peer Coupling-peer Coupling-peer Coupling-peer	Sent Initialization is Initialization is Link failure Offline Initialization is	s not complete s not complete s not complete			2
Local STP Link Identifie 0014 0015 001E 001F	STP Link r Type Coupling-peer Coupling-peer Coupling-peer Coupling-peer	Sent Initialization is Initialization is Link failure Offline	s not complete s not complete s not complete			

Figure 8-9 STP Status tab (SCZP201)

As shown on the ETR Status tab in Figure 8-7 on page 270, the STP Status tab contains status information only, and no modifications can be made from this location. As expected, no STP configuration details are shown, because the SCZP201 server is in ETR timing mode.

This tab displays the links defined in the IOCDS that are *eligible* for the exchange of STP messages. However, no links are initialized for STP until the STP ID is defined in the CTN ID as part of the migration to a Mixed CTN or an STP-only CTN.

**Note:** Each link remains in an *uninitialized* state until the servers at both ends of the link have a matching CTN ID defined that contains a valid STP ID.

#### ETS Configuration tab

Figure 8-9 on page 271 shows the ETS Configuration tab for the SCZP201 server.

ming etwork	Network Configuration	ETR Configuration	ETR Status	STP Configuration	STP Status	ETS Configuration
quired. Ch	annot automatically bec anges made to the ETS Backup Time Server for	configuration ar	e saved and are			
<i>External Tin</i> ○Use <u>d</u> ial ⊙Use <u>N</u> TF ○Use NTF	ne Source (ETS) out if configured on Hard with <u>p</u> ulse per second (	dware Managem				
- External Tin ○Use <u>d</u> ial ⊙Use <u>N</u> TF ○Use NTF NTP Time S	ne Source (ETS) out if configured on Hard	dware Managem (PPS)	ent Console	Status		
- External Tin ○Use <u>d</u> ial ⊙Use <u>N</u> TF ○Use NTF - NTP Time S	ne Source (ETS) out if configured on Hard with <u>p</u> ulse per second ( ierver information	dware Managem (PPS)	ent Console			

Figure 8-10 ETS Configuration tab (SCZP201)

This tab shows the configuration of the External Time Sources (ETS) that is used when the CPC is assigned the role of a Preferred or Backup Time Server for an STP-only CTN. However, we are still in an ETR network, so the entries are of no relevance at this point.

#### 8.2 Migration

The migration from an ETR Network to a Mixed CTN requires one change per server and a stand-alone coupling facility. This change involves defining the STP ID portion of the CTN ID using the STP Configuration tab (Figure 8-8 on page 270).

For our migration, the CTN ID is set to [ITSOPOK] - [31] on both the SCZP101 server and the SCZP201 server, where ITSOPOK represents the STP ID, and 31 is the ETR Network ID that is in use by the existing ETR network.

Table 8-1 shows the before and after configuration details.

	Server	CTI	N ID	Server	Timing	Stratum
		STP ID	ETR ID	role	mode	level
Before	SCZP101	Null	31	N/A	ETR	Not defined
migration	SCZP201	Null	31	N/A	ETR	Not defined
After	SCZP101	ITSOPOK	31	N/A	ETR	1
migration	SCZP201	ITSOPOK	31	N/A	ETR	1

Table 8-1 Server configuration - ETR Network to Mixed CTN migration

#### 8.2.1 Defining STP ID on SCZP201

At the HMC workplace, perform the following steps in order:

- 1. Highlight server SCZP101 and select System (Sysplex) Time.
- 2. Click the STP Configuration tab.
- 3. Enter the required STP ID (in our case, ITSOPOK) in the Coordinated Timing Network ID fields (Figure 8-11).

System (Sysplex) Time								
	Network Configuration	ETR Configuration	ETR Status	STP Configuration	STP Status	ETS Configuration	SCZP20 SCZP10	
Coordinated tim	ning network ID TTSC	DPOK	- 31					
Apply Sav	e STP Debug Data						An	

Figure 8-11 STP Configuration tab - Define STP ID (SCZP201)

4. Click **Apply**. This displays the Local Coordinated Timing Network ID Change Confirmation, message ACT37361 (Figure 8-12).

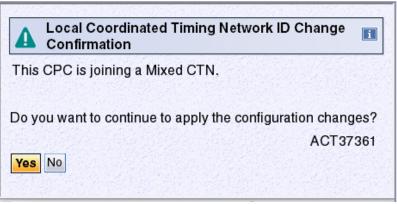


Figure 8-12 Message ACT37361 - Local Coordinated Timing Network ID Change Confirmation

**Note:** The word *local* is included in this window to indicate that this change only applies to the selected server. It is not a *global* change that will be propagated automatically throughout the CTN.

 Confirm the configuration change by clicking Yes. This displays the Local Coordinated Timing Network ID Change, message ACT37315, indicating that the change was successful (Figure 8-13).

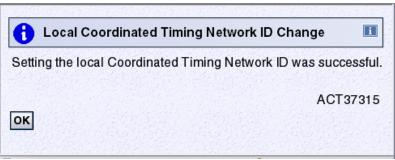


Figure 8-13 Message ACT37315 - Local Coordinated Timing Network ID Change (SCZP201)

The change to the CTN ID is also flagged by XCF with message IXC438I on the console and SYSLOG of z/OS images in a sysplex configuration resident on SCZP101 (Figure 8-14).

IXC438I COORDINATED TIMING INFORMATION HAS BEEN UPDATED 842 FOR SYSTEM: SC74 PREVIOUS ETR NETID: 31 CURRENT CTNID: ITSOPOK -31

Figure 8-14 SYSLOG messages - SC74 image on SCZP201 STP ID definition

This informational message confirms the success of the CTN ID change from an XCF perspective. It is only issued by z/OS images using the Sysplex Timer in a sysplex configuration.

#### 8.2.2 Defining STP ID on SCZP101

At this stage, only one server has been switched from an ETR Network to a Mixed CTN.

This process now needs to be done for the remaining servers in the CTN using the same CTN ID of [ITSOPOK] - [31] in each case.

In our scenario, the CTN consists of one other server, so the process defined in step 1 needs to be repeated for SCZP101 only. In a large CTN, this process might need to be performed many times until all servers have the same CTN ID defined.

After this has been done for SCZP101, the migration is complete.

#### 8.3 End point

SczP101 (z9) CTN ID = ITSOPOK-31 Timing mode = ETR S1

At the completion of the scenario, the topology diagram changes to reflect the new definitions (Figure 8-15).

Figure 8-15 STP implementation environment - Mixed CTN with ETR timing mode only

Because the servers now have a valid STP ID defined, they are considered to be STP configured rather than STP enabled, and the CTN ID needs to be shown in full to reflect the importance of this value to the CTN.

In addition, the servers are now defined with valid Stratum levels, and these also need to be shown. Because both servers are still connected to the ETR network, they are defined as Stratum 1, as per the STP architecture specification.

It is also important to note that at this stage, STP timing messages will be flowing over the coupling links. However, the servers ignore these messages in favor of the Sysplex Timers as the selected timing source.

#### 8.3.1 z/OS DISPLAY ETR command

Figure 8-16 shows the output from the DISPLAY ETR command entered on the SC74 z/OS image, on SCZP101.

D ETR IEA282I 13.55.59 TIMING STATUS 8 SYNCHRONIZATION MODE = ETR	844
CPC PORT 0 <== ACTIVE	CPC PORT 1
OPERATIONAL	OPERATIONAL
ENABLED	ENABLED
ETR NET ID=31	ETR NET ID=31
ETR PORT=00	ETR PORT=00
ETR ID=00	ETR ID=01
THIS SERVER IS PART OF TIMING	NETWORK ITSOPOK -31 (1)

Figure 8-16 DISPLAY ETR display - SC74 image on SCZP201 Mixed CTN

Note that an extra line displays (see (1) in Figure 8-16) containing the CTN ID when the server is in a Mixed CTN with an STP ID defined.

All other information in the DISPLAY ETR output is the same as prior to the server change to a Mixed CTN. In particular, the timing mode (ETR) remains unchanged, indicating that the ETR is the time source for this server.

#### 8.3.2 z/OS DISPLAY XCF command

Figure 8-17 shows the output from the z/OS DISPLAY XCF command entered on the SC74 z/OS image, on SCZP101.

D XCF,S,	ALL				
IXC335I	13.56.38	DISPLA	Y XCF 846		
SYSPLEX	PLEX75				
SYSTEM	TYPE SERIA	L LPAR	STATUS TIME	SYSTEM STATUS	
SC74	2097 DE50	2C	10/03/2009 13:56:38	ACTIVE	TM=ETR
SC75	2094 991E	1C	10/03/2009 13:56:36	ACTIVE	TM=ETR

Figure 8-17 DISPLAY XCF display - SC74 image on SCZP201 Mixed CTN

The z/OS DISPLAY XCF command output is unchanged by the migration. Whereas XCF is aware of the CTN ID change, the CTN ID is not displayed in the output of this command.

#### 8.3.3 System (Sysplex) Time tabs

The System (Sysplex) Time tabs have also undergone minor changes as a result of the definition of an STP ID in the CTN ID.

#### **Timing Network tab**

Figure 8-18 shows that three changes occurred on the Timing Network tab.

ming stwork	Network Configuration	ETR Configuration St	R STP atus Configuration	STP Status	ETS Configuration
C 11 0 0 0 0 0 0 0	d Server Time				
ne: 1:53 te: 10/3	ここ 花 しょうふう きんしんじ ひっこう どうい				
offsets —					
eap seco					
<u>19 - 5 - 7 - 5 - 7 - 7 - 7 - 7 - 7 - 7 - 7</u>	(hours : minutes): -4 :	00			
Network - Timina net	work type:	Mixed CTN			
	d timing network (CT				
CTN time :	source:	Sysplex Timer conn	ection		

Figure 8-18 Timing Network tab (SCZP201)

The timing network type now indicates *Mixed*. The Coordinated Timing Network ID field has been updated to reflect the new CTN ID. In addition, an extra line has been added in the Network section indicating that the Sysplex Timer is the CTN time source.

#### **Network Configuration tab**

The Network Configuration tab is basically unchanged, except for the Coordinated Timing Network ID field now containing the new CTN ID that was specified during the migration.

Note: The Coordinated Timing Network ID field is disabled.

No modifications to either the STP ID or the ETR Network ID are possible from this location until this server is migrated to an STP-only CTN or joins an existing STP-only CTN.

However, the previously disabled Apply button has now been enabled, allowing a full STP conversion to proceed at this point (Figure 8-19).

ning twork	Network Configuration		ETR Configuration	ETR Status	STP Con	figuration	STP Status	ETS Configuration	SCZP
Configured	etwork Configuration I at (UTC):								
Preferred t	ime server (CPC)	Not con	ligured		-				
Backup tim	ne server (CPC)	Not con	ligured		-				
Arbiter		Not con	ligured		-				
1835 Track 1993	low the server(s) s configuration	pecified	above to be in th	ie CTN					
⊙ Preferr	ime Server (CPC) - ed time server (CP p time server (CPC)								
Coordinate	ed timing network		POK	- 31	1.000				
Apply	Initialize Time	Decon	figure C	ancel Migra	tion to Mix	ed CTN			

Figure 8-19 Network Configuration tab (SCZP201)

After all servers in the Mixed CTN have the same CTN ID, it is possible to transition into an STP-only CTN and remove the ETR as the time source. After the STP connectivity between servers has been verified, this is done by defining a Preferred Time Server and (optionally) a Backup Time Server and Arbiter. The server to become the Current Time Server must also be selected at this stage.

#### **ETR Configuration and ETR Status tabs**

These tabs remain unchanged, because no modifications have been performed to the ETR network or server ETR ports.

#### **STP Configuration tab**

The STP Configuration tab is much the same as when the STP ID was entered during migration (Figure 8-20).

iming letwork	Network Configuration	ETR Configuration	ETR Status	STP Configuration	STP Status	ETS Configuration	SCZ
Coordinated	timing network ID ॥ति	SOPOK	- 31				
Apply	Save STP Debug Data		The day				

Figure 8-20 STP Configuration tab (SCZP201)

The STP ID portion of the CTN ID is *enabled*, allowing the STP ID to be removed for backout purposes or changed to another value to select a different Mixed CTN if required.

**Note:** The ETR Network ID portion of the Coordinated Timing Network ID field is *disabled*, forcing all changes to this value to be done from the ETR Configuration tab only.

#### **STP Status tab**

The STP Status tab also has multiple changes as a result of conversion to Mixed CTN (Figure 8-21).

ming etwork	Network Configuration		TR Status (	TP Configuration	STP Status	ETS Configuration	sc
iming state:	Syn	chronized					
sable clock s							
iming mode:	ETR	(External Time Referen	nce)				
tratum level:	1						
laximum timir	ig stratum level: 3					all and a start of the	
laximum STP	version: 4						
Svstem Inform	action						12.2
_ocal STP		Attached System System	n Stratum	Active STP	Maximum STP		
	(s) Type-MFG-Plant-			Version	Version		
0111.0301		0000002991E SCZP		4	4		
10000000				1000000	A CARLON COLOR		
	ized STP Links ———						
Local STP	STP Link	Reason Code	Reason (				
Link Identifier		Sent	Received				12
0014	Coupling-peer	Self-coupled serve					
0015	Coupling-peer	Self-coupled serve	er				24
001E	Coupling-peer	Offline					1
001F	Coupling-peer						
0034	Coupling-peer	Self-coupled serve					
0035	Coupling-peer	Self-coupled serve	er				
003E	Coupling-peer Coupling-peer	Offline					
003F		Offline					

Figure 8-21 STP Status tab (SCZP201)

An extra line has been added, indicating the stratum level of the server. In our case, the SCZP201 server remains connected to the Sysplex Timer, so the stratum level must be Stratum 1, as per STP architectural requirements.

Also, the Remote Directly Attached Systems section now has an entry for the SCZP101 server, showing all the STP Link Identifiers over which STP timing messages are being passed.

**Note:** The equivalent display of the STP Status tab for the SCZP101 server also shows a Stratum level of 1, because SCZP101 also retains connectivity to the Sysplex Timers. However, the Remote Directly Attached Systems section displays information for the SCZP201 server and the associated STP Link Identifiers usable by SCZP101 for STP messages.

#### **ETS Configuration tab**

This tab also remains unchanged, because no modifications have been performed to the ETS configuration.

### 9

# Mixed CTN (ETR timing mode) to ETR Network

In this scenario<sup>1</sup>, all servers in our sample configuration are migrated from a Mixed Coordinated Timing Network (CTN) to an External Timer Reference (ETR) Network by updating the CTN ID on all servers in our Mixed CTN to remove the Server Time Protocol (STP) ID.

In this chapter we work through the following sections:

- "Start point" on page 282
- "Migration" on page 287
  - "Removing the STP ID on SCZP201" on page 287
  - "Removing the STP ID on SCZP101" on page 289
- "End point" on page 290

A Mixed CTN may consist of servers in ETR timing mode only or a combination of servers in ETR timing mode and STP timing mode. In both cases, the ETR is the time source for the CTN.

This scenario proceeds to the point that all servers have a CTN ID defined that includes only an ETR Network ID.

**Note:** At the completion of this scenario, the CTN is returned to the start point for the migration scenario described in Chapter 8, "ETR Network to Mixed CTN (ETR timing mode)" on page 265. This chapter can be considered a backout procedure for that scenario.

<sup>&</sup>lt;sup>1</sup> See "Prerequisites" on page 263.

#### 9.1 Start point

The starting environment for this scenario is a Mixed CTN with both servers operating in ETR timing mode (Figure 9-1).

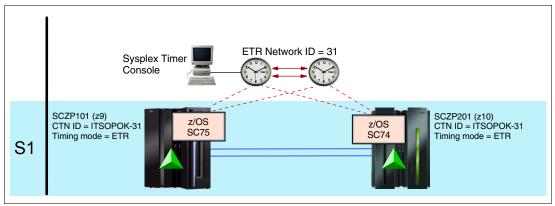


Figure 9-1 STP implementation environment - Mixed CTN with ETR timing mode only

The Mixed CTN consists of two servers:

- SCZP101
- SCZP901

Both servers are STP configured and are operating in ETR timing mode, meaning that they both have connectivity to the ETR network.

Each server is connected to the other server in a redundant configuration using multiple coupling links, and each server has a z/OS image and coupling facility defined. There are six coupling links between these servers, as evidenced by various HMC workplace displays. However, only two links have been shown for clarity.

This is the same configuration shown as the endpoint for the ETR Network to Mixed CTN scenario previously described. See Chapter 8, "ETR Network to Mixed CTN (ETR timing mode)" on page 265, for further details.

#### 9.1.1 z/OS DISPLAY ETR command

Figure 9-2 shows the output from the DISPLAY ETR command entered on the SC74 image, on SCZP101.

```
D ETR
IEA282I 12.49.39 TIMING STATUS 816
SYNCHRONIZATION MODE = ETR
  CPC PORT 0 <== ACTIVE
                                CPC PORT 1
  OPERATIONAL
                                OPERATIONAL
  ENABLED
                                ENABLED
  ETR NET ID=31
                                ETR NET ID=31
  ETR PORT=00
                                ETR PORT=00
  ETR ID=00
                                ETR ID=01
  THIS SERVER IS PART OF TIMING NETWORK ITSOPOK -31
```

Figure 9-2 DISPLAY ETR display - SC74 image on SCZP201 Mixed CTN

This display shows that SC74 is using an ETR as its timing source. The active server ETR port is port 0, which is connected to an ETR with an ID of 00 in an ETR Network with an ID of 31. The server on which the SC74 image is resident is in a Mixed CTN with a CTN ID of [ITSOPOK] - [31].

#### 9.1.2 z/OS DISPLAY XCF command

Figure 9-3 shows the output from the z/OS DISPLAY XCF command output entered on the SC74 z/OS image, on SCZP101.

D XCF,S,ALL IXC335I 12.51.42 DISPLAY XCF 818 SYSPLEX PLEX75 SYSTEM TYPE SERIAL LPAR STATUS TIME SYSTEM STATUS SC74 2097 DE50 2C 10/03/2009 12:51:42 ACTIVE TM=ETR SC75 2094 991E 1C 10/03/2009 12:51:40 ACTIVE TM=ETR

Figure 9-3 DISPLAY XCF display - SC74 image on SCZP101 Mixed CTN

This shows that both z/OS images SC74 and SC75 are operating in ETR timing mode. These z/OS images are resident on separate servers, as evidenced by the different serial numbers. However, there is no indication from this command output as to whether these servers have CTN IDs defined.

#### 9.1.3 System (Sysplex) Time tabs

The tabs discussed in this section are available on the System (Sysplex) Time selection for each server. Only the tabs for the SCZP101 server are shown in this section.

#### **Timing Network tab**

Figure 9-4 shows the Timing Network tab for the SCZP101 server.

ning twork	Network Configuration	ETR Configuration	TR Status	STP Configuration	STP Status	ETS Configuration
me: 12:54 ite: 10/3/0 offsets	99					
Network — Timing netw Coordinated CTN time so	timing network (CTN) ID:	Mixed CTN : ITSOPOK - 31 Sysplex Timer conr	nection			

Figure 9-4 Timing Network tab (SCZP201)

This shows that the SCZP201 server is in a Mixed CTN with a CTN ID of [ITSOPOK] - [31]. Because the ETR network is the CTN time source, the leap second offset (set to 24) and the total time offset (set to -4) originate from the Sysplex Timer as part of the timing signal.

#### **Network Configuration tab**

Figure 9-5 shows the Network Configuration tab for the SCZP201 server.

iming etwork	Network Configuration	ETR Configuratio	n Status	STP Configuration	STP Status	Configuration
	twork Configuration					
Configured Preferred til	(000)	Not configured				
Backup tim	e server (CPC)	Not configured				
Arbiter	[	Not configured	<b>•</b>			
Set and the set of the	a share the second second second second	pecified above to be	in the CTN			
	onfiguration me Server (CPC) —					
⊙ Preferre	ed time server (CP					
S. OF GALLS	time server (CPC	and the second frage				
Coordinate	d timing network IE		- 31			
	nitialize Time,	Deconfigure	Cancel Migration	to Mixed CTN		22123028-0228

Figure 9-5 Network Configuration tab (SCZP201)

Because SCZP201 is in an ETR network, the Preferred Time Server, Backup Time Server, and Arbiter fields are not applicable. Only the Apply button is enabled to allow a full STP conversion to proceed. See Chapter 13, "Mixed CTN (two servers) to STP-only CTN" on page 335, for further details of this process.

#### **ETR Configuration tab**

Figure 9-6 shows the ETR Configuration tab for the SCZP201 server.

network ID 31 (in decimal) <i>it 0 State Port 1 State</i> nabled ©Enabled	
가 가슴 것 같아요. 이렇게 잘 잘 잘 잘 잘 잘 잘 잘 잘 잘 잘 잘 잘 잘 잘 잘 하는 것 같아요. 이렇게 잘 잘 하는 것 같아요. 이렇게 잘 잘 하는 것 같아요. 이렇게 잘 하는 것 같아요. 이 가 있는 것 이 가 있는 것 같아요. 이 가 있 않아요. 이 가 있는 것 같아요. 이 하는 것 같아요. 이 하는 것 같아요. 이 하는 것 같아요. 이 이 이 이 하는 것 같아요. 이 이 하는 것 같아요. 이 하는 것 같아요. 이 이 아요. 이 이 이 이 이 이 이 이 이 이 이 이 이 이 이 이 이 이 이	
nabled   • Enabled	
Disabled ODisabled	
Ŋŧ OOĨ	
ttion: A port can be operational only when a valid ETR network ID is entered and the port's manual state is oled'.	S
Reset ETR Reset Link Error Threshold	

Figure 9-6 ETR Configuration tab (SCZP201)

This shows that server SCZP201 is connected to an ETR network with an ETR Network ID of 31. Both server ETR ports are enabled. This corresponds with the DISPLAY ETR command output shown in Figure 9-2 on page 282.

#### ETR Status tab

Figure 9-7 shows the ETR Status tab for the SCZP201 server.

'iming letwork	Network Configuration	ETR Configuration	ETR Status	STP Configuration	STP Status	ETS Configuration	SCZP20
– ETR Status							
Stepping m	t control register: C8C7 node: ETR st	enning					1 March
	ing port number: 0	opping					
Port 0 state							1 200
Port 1 state	e: Operat	ional					
- ETR Data	Word 1 - Port 0						
	ork ID (in decimal): 31						
ETR ID (in							
EIRponn	umber (in decimal): 0						1 6.05
	Word 1 - Port 1						
ETR netwo	ork ID (in decimal): 31 decimal): 1						
	umber (in decimal): 0						
la de sector de trades	and the second						
- ETR Card	Status IS: Light detected						
	is: Light detected						
Fort I Statu	is. Light detected	and a state of					

Figure 9-7 ETR Status tab (SCZP201)

This is a status tab only, and no modifications to the server ETR ports are possible from here. This tab shows that the TOD on the SCZP201 server is being stepped by the ETR connected to server ETR port 0.

The connected ETR has an ETR ID of 0 and is in ETR Network ID 31, and a second ETR is available on server ETR port 1, which has an ETR ID of 1. Both server ETR ports are operational. Again, this corresponds to the DISPLAY ETR command output shown in Figure 9-2 on page 282.

#### **STP Configuration tab**

Figure 9-8 shows the STP Configuration tab for the SCZP101 server.

iming etwork	Network Configuration	ETR Configuration	ETR Status	STP Configuration	STP Status	ETS Configuration	SCZR SCZR
Coordinated	d timing network ID 📊	SOPOK	- 31				
Apply	Save STP Debug Data						

Figure 9-8 STP Configuration tab (SCZP201)

This shows that the SCZP201 server is in a mixed CTN with a CTN ID of [ITSOPOK] - [31], where ITSOPOK is the STP ID and 31 is the ETR Network ID.

The STP ID component of the CTN ID can be changed from this location. However, the ETR Network ID field is disabled, and all changes to this field must be done from the ETR Configuration tab.

Removing the STP ID migrates this server from the Mixed CTN to an ETR Network configuration.

Changing the STP ID from its existing value of ITSOPOK to another value causes the server to move from the current Mixed CTN to another Mixed CTN. This is rarely required and is disruptive to resident z/OS images in a sysplex configuration, because they will appear to have a different time source in comparison to the other z/OS images.

#### **STP Status tab**

Figure 9-9 shows the STP Status tab for the SCZP201 server.

etwork	Network Configuration		TR Status	GTP Configuration	STP Status	ETS Configuration
ming state:	Syne	chronized				
sable clock s	ource: Yes					
iming mode:	ETR	(External Time Referen	nce)			
Stratum level:						
Maximum timir	ig stratum level: 3					
Maximum STP	version: 4					
- System Inforn	nation		in fail faile.		N. A. S. S. S. S. S. S.	Section Providence
Local STP	and the first start of the second start of the	ttached System System	n Stratun	Active STP	Maximum STP	
Link Identifier	(s) Type-MFG-Plant-		Level	Version	Version	
0111,0301	002094-IBM-02-0	0000002991E SCZP	101 1	4	4	
	ized STP Links STP Link	Reason Code	Reason	Codo		
	STF LIIK					
Local STP Link Identifier	Type	Sent	Received	1		-
Link Identifier		Sent Self-coupled serve	Received	1		
	Coupling-peer	Self-coupled serve	er	1		
Link Identifier 0014	Coupling-peer Coupling-peer		er	1		
Link Identifier 0014 0015	Coupling-peer	Self-coupled server	er	1		
Link Identifier 0014 0015 001E	Coupling-peer Coupling-peer Coupling-peer Coupling-peer	Self-coupled server Self-coupled server Link failure Offline	er er	1		
Link Identifier 0014 0015 001E 001F	Coupling-peer Coupling-peer Coupling-peer	Self-coupled serve Self-coupled serve Link failure	er er			
Link Identifier 0014 0015 001E 001F 0034	Coupling-peer Coupling-peer Coupling-peer Coupling-peer Coupling-peer	Self-coupled serv Self-coupled serv Link failure Offline Self-coupled serv	er er			

Figure 9-9 STP Status tab (SCZP201)

Figure 9-9 shows that the SCZP201server is in ETR timing mode and, because it is also a Stratum 1, it must have a CTN ID defined and be in a Mixed CTN. As a result, it is considered to be STP configured.

This server also has STP connectivity to the SCZP101 server over a number of links, as identified by the STP link identifiers. This implies that the SCZP101 server is also STP *configured*. Because SCZP101 is also a Stratum 1, it also must have connectivity to the ETR network and be in ETR timing mode.

#### **ETS Configuration tab**

The ETS Configuration tab is irrelevant for this scenario, because the time source for the mixed CTN is the ETR and, therefore, no ETS is used.

#### 9.2 Migration

The migration process for a Mixed CTN to an ETR Network is similar to the migration of an ETR Network to a Mixed CTN, except that the STP ID is being *removed* from the CTN ID instead of being *defined*.

The CTN ID is currently defined as [ITSOPOK] - [31] on both SCZP101 and SCZP201, where ITSOPOK represents the STP ID, and 31 is the ETR Network ID that is already in use by the existing ETR network.

This migration requires one change per server to remove the STP ID portion of the CTN ID. This is done using the STP Configuration tab to set the CTN ID to [] - [31], which changes each server from being STP configured to STP enabled.

**Note:** This is a *local* change that must be done on each server using the STP Configuration tab.

The Network Configuration tab also shows the full CTN ID. However, the field is disabled, so removal of the STP ID is not possible from this location. This tab is used to perform *global* changes to the CTN in an STP-only CTN.

Table 9-1 lists the before and after configuration details.

	Server	СТІ	N ID	Server	Timing	Stratum
		STP ID	ETR ID	role	mode	level
Before	SCZP101	ITSOPOK	31		ETR	1
migration	SCZP201	ITSOPOK	31		ETR	1
After	SCZP101	Null	31		ETR	Not defined
migration	SCZP201	Null	31		ETR	Not defined

Table 9-1 Server configuration - ETR Network to Mixed CTN migration

The order in which the servers are modified does not matter, because both servers retain connectivity to the Sysplex Timers throughout the scenario.

#### 9.2.1 Removing the STP ID on SCZP201

At the HMC workplace, perform the following steps:

- 1. Highlight the SCZP201 server and select System (Sysplex) Time.
- 2. Click the STP Configuration tab.

3. Remove the existing STP ID (in our case, ITSOPOK) from the Coordinated Timing Network ID field (Figure 9-10).

ing work	Network Configuration	ETR Configuration	ETR Status	STP Configuration	STP Status	ETS Configuration
rdinated	timing network ID	a na ann an ann an ann a' ann a'	- 31			
ly s	Save STP Debug Data					

Figure 9-10 STP Configuration tab - Remove STP ID (SCZP201)

 Click Apply. This displays the Local Coordinated Timing Network ID Change Confirmation, message ACT37360 (Figure 9-11).

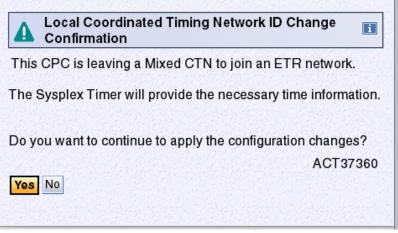


Figure 9-11 Message ACT37360 - Local Coordinated Timing Network ID Change Confirmation

**Note:** The word *local* is included in this window to indicate that this change only applies to the selected server and must be performed on all other servers in the CTN. It is not a *global* change that will be propagated automatically throughout the CTN.

 Confirm the configuration change by clicking Yes. This displays the Local Coordinated Timing Network ID Change, message ACT37315, indicating that the change was successful (Figure 9-12).

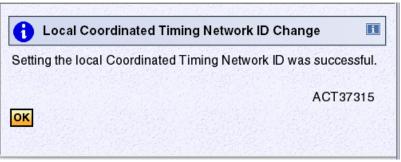


Figure 9-12 Message ACT37315 - Local Coordinated Timing Network ID Change

The change to the CTN ID is also flagged by XCF with message IXC438I on the console and SYSLOG of z/OS images in a sysplex configuration resident on SCZP901 (Figure 9-13).

```
IXC438I COORDINATED TIMING INFORMATION HAS BEEN UPDATED 821
FOR SYSTEM: SC74
PREVIOUS CTNID: ITSOPOK -31
CURRENT ETR NETID: 31
```

Figure 9-13 SYSLOG messages - SC74 image on SCZP901 STP ID removal

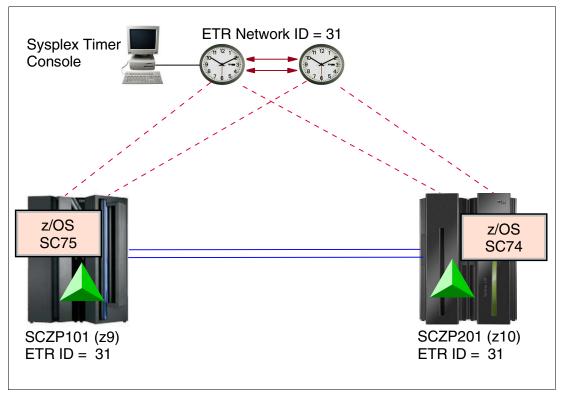
This information message confirms the success of the CTN ID change from an XCF perspective. It is only issued by z/OS images using the Sysplex Timer in a sysplex configuration. Non-sysplex images, monoplex images, and sysplex images using a simulated timer (through SIMETRID) are not aware of the CTN ID change.

#### 9.2.2 Removing the STP ID on SCZP101

At this stage, only one server has been backed out from a Mixed CTN to an ETR Network. This process now needs to be done for the remaining servers in the CTN by setting the CTN ID to [] - [31] in each case.

In our scenario, the CTN consists of one other server, so the process defined in step 1 needs to be repeated for SCZP101 only.

#### 9.3 End point



At the completion of the scenario, the network topology has changed (Figure 9-14).

Figure 9-14 STP Implementation environment - ETR Network

Each of the servers has changed from STP configured to STP enabled, and the CTN ID is replaced by the ETR Network ID. The STP ID and stratum levels are no longer relevant.

#### 9.3.1 z/OS DISPLAY ETR command

Figure 9-15 shows the output from the DISPLAY ETR command entered on the SC74 image, on SCZP201.

D ETR	
IEA282I 13.12.05 TIMING STATUS	823
SYNCHRONIZATION MODE = ETR	
CPC PORT 0 <== ACTIVE	CPC PORT 1
OPERATIONAL	OPERATIONAL
ENABLED	ENABLED
ETR NET ID=31	ETR NET ID=31
ETR PORT=00	ETR PORT=00
ETR ID=00	ETR ID=01

Figure 9-15 DISPLAY ETR display - SC74 image on SCZP201 ETR Network

This display shows that SC74 is using an ETR as its timing source. Because the SCZP201 server no longer has a CTN ID defined, the extra line that previously appeared in the DISPLAY ETR command output prior to the migration (Figure 9-2 on page 282) is no longer apparent.

#### 9.3.2 z/OS DISPLAY XCF command

Figure 9-16 shows the output from the z/OS DISPLAY XCF command entered on the SC74 image, on SCZP201.

D XCF,S,ALL IXC335I 13.12.46 DISPLAY XCF 825 SYSPLEX PLEX75 SYSTEM TYPE SERIAL LPAR STATUS TIME SYSTEM STATUS SC74 2097 DE50 2C 10/03/2009 13:12:46 ACTIVE TM=ETR SC75 2094 991E 1C 10/03/2009 13:12:42 ACTIVE TM=ETR

Figure 9-16 DISPLAY XCF display - SC74 image on SCZP201 ETR Network

This shows that both z/OS images SC74 and SC75 are operating in ETR timing mode. There is no indication from this command output that the CTN ID has changed.

#### 9.3.3 System (Sysplex) Time tabs Sample numbered list

The System (Sysplex) Time tabs have undergone minor changes as a result of the removal of the STP ID from the CTN ID.

#### **Timing Network tab**

Figure 9-17 shows the Timing Network tab for the SCZP101 server.

ming etwork	Network Configuration	ETR Configuration	ETR Status	STP Configuration	STP Status	ETS Configuration	sczi sczi
	ed Server Time						
Time: 1:07 Date: 10/3	こう 花 ゆうぶん さんさんがん かんぶ オペル いえいき						
Offsets -							
Leap seco Total time	nd: 24 (hours : minutes): -4 : 00						
Network -		 					
Timing ne	twork type:	ETR					
Coordinate	ed timing network (CTN) II	J: -31					

Figure 9-17 Timing Network tab (SCZP201)

The Coordinated Timing Network ID field has changed from [ITSOPOK] - [31] to [] - [31]. Also, the additional line in the Network section regarding the CTN time source is no longer shown.

#### **Network Configuration tab**

Figure 9-18 shows the Timing Network tab for SCZP101 (Figure 9-16 on page 291).

iming letwork	Network Configuration	ETR Configuratio	n ETR Status	STP Configuration	STP Status	ETS Configuration
	etwork Configuration					
Preferred t	ime server (CPC)	Not configured	<b>.</b>			
Backup tin	ne server (CPC)	Not configured	<b>.</b>			
Arbiter		Not configured				
Current T	configuration Ime Server (CPC) —	pecified above to be	in the CTN		_	
	ed time server (CP p time server (CPC					
Coordinate	ed timing network IE	)	- 31			
Apply	Initialize Time,	Deconfigure	Cancol Migrati	on to Mixed CTN		

Figure 9-18 Network Configuration tab (SCZP201)

The Network Configuration tab no longer has the STP ID shown in the Coordinated Timing Network ID field. Only the ETR Network ID of 31 is shown. Also, the Apply, Initialize Time, and Deconfigure buttons have all been disabled, because these functions are STP related and this server is no longer STP configured.

#### **ETR Configuration and ETR Status tabs**

These tabs remain unchanged, because no modifications have been performed to the ETR network or ETR server ports.

#### **STP Configuration tab**

Figure 9-19 shows the STP Configuration tab for SCZP201 (Figure 9-16 on page 291).

iming etwork	Network Configuration	ETR Configuration	ETR Status	STP Configuration	STP Status	ETS Configuration
Coordinated	I timing network ID	n bernen sen gesternen in heren.	- 31			
Apply	Save STP Debug Data					

Figure 9-19 STP Configuration tab (SCZP201)

This shows that the STP ID component of the CTN ID is no longer defined. The ETR Network ID of 31 is shown. However, the field is disabled, thus forcing all changes to this value to be performed from the ETR Configuration tab.

#### **STP Status tab**

Figure 9-20 shows the STP Status tab for the SCZP101 server.

ming etwork	Network Configuration	ETR Configuration	ETR Status	STP Configuration	STP Status	ETS Configuration	•
ming state:	Syn	chronized					66.5
sable clock s							Chester 1
iming mode:	ETF	R (External Time Refer	ence)				22
aximum timin	ig stratum level: 3						
laximum STP	version: 4						
	ation						0.327
							S. S. Marchard
System Inform		Atta ahad Eviatam Eviat	Ctratum	Active CTD May	Imum CTD		
Local STP	Remote Directly A	Attached System Syste					
Local STP				Active STP Max Version Vers			
Local STP Link Identifier	Remote Directly A						
Local STP Link Identifier Local Uninitial Local STP	Remote Directly A (s) Type-MFG-Plant- lzed STP Links STP Link						
Local STP Link Identifier	Remote Directly A (s) Type-MFG-Plant- lzed STP Links STP Link	Sequence Nam		Version Vers			
Local STP Link Identifier Local Uninitial Local STP	Remote Directly A (s) Type-MFG-Plant- lzed STP Links STP Link	Sequence Nam Reason Code	e Level	Version Vers Reason Code			
Local STP Link Identifier Local Uninitial Local STP Link Identifier	Remote Directly A (s) Type-MFG-Plant- lzed STP Links STP Link Type	Sequence Nam Reason Code Sent	e Level	Version Vers Reason Code			
Local STP Link Identifier Local Uninitial Local STP Link Identifier 0014	Remote Directly A (s) Type-MFG-Plant- lized STP Links STP Link Type Coupling-peer	Sequence Nam Reason Code Sent Initialization is n	e Level	Version Vers Reason Code			
Local STP Link Identifien Local Uninitial Local STP Link Identifier 0014 0015	Remote Directly A (s) Type-MFG-Plant- ized STP Links STP Link Type Coupling-peer Coupling-peer	Sequence Nam Reason Code Sent Initialization is n Initialization is n	e Level	Version Vers Reason Code			
Local STP Link Identifien Local STP Link Identifier 0014 0015 001E	Remote Directly A (s) Type-MFG-Plant- lzed STP Links STP Link Type Coupling-peer Coupling-peer Coupling-peer	Sequence Nam Reason Code Sent Initialization is n Initialization is n Link failure	e Level ot complete ot complete	Version Vers Reason Code			
Local STP Link Identifien Local Uninitial Local STP Link Identifier 0014 0015 001E 001F	Remote Directly A (s) Type-MFG-Plant- ized STP Links STP Link Type Coupling-peer Coupling-peer Coupling-peer Coupling-peer	Sequence Nam Reason Code Sent Initialization is n Initialization is n Link failure Offline	e Level ot complete ot complete ot complete	Version Vers Reason Code			
Local STP Link Identifien - Local Uninitial Local STP Link Identifier 0014 0015 001E 001F 0034	Remote Directly A (s) Type-MFG-Plant- ized STP Links STP Link Type Coupling-peer Coupling-peer Coupling-peer Coupling-peer Coupling-peer	Sequence Nam Reason Code Sent Initialization is n Initialization is n Link failure Offline Initialization is n	e Level ot complete ot complete ot complete	Version Vers Reason Code			

Figure 9-20 STP Status tab (SCZP201)

Because the SCZP201 server is no longer STP configured, this tab no longer shows a stratum level. Also, the Remote Directly Attached Systems section does not show any connected servers that are STP configured, because this server is unable to send or receive STP-related control or timing messages.

#### **ETS Configuration tab**

This tab also remains unchanged, because no modifications have been performed to the ETS configuration.

# 10

### Mixed CTN: Changing one server from ETR timing mode to STP timing mode

In this example<sup>1</sup>, one server in our sample configuration is converted from External Timer Reference (ETR) timing mode to Server Time Protocol (STP) timing mode by *disabling* connectivity of this server to the ETR timing network. The server then uses STP timing messages to remain synchronized in the Coordinated Timing Network (CTN).

In this chapter we work through the following sections:

- "Start point" on page 296
- "Migration" on page 301
- Step 1: Disable ETR connectivity on SCZP901" on page 302
- "End point" on page 304

A Mixed CTN may consist of servers in ETR timing mode only, or a combination of servers in ETR timing mode and STP timing mode. In both cases, the ETR is the time source for the CTN.

This scenario proceeds to the point where one server in the Mixed CTN is converted from ETR timing mode to STP timing mode.

<sup>&</sup>lt;sup>1</sup> See "Prerequisites" on page 263.

#### 10.1 Start point

The starting point for this scenario is the Mixed CTN with servers operating in ETR timing mode only (Figure 10-1).

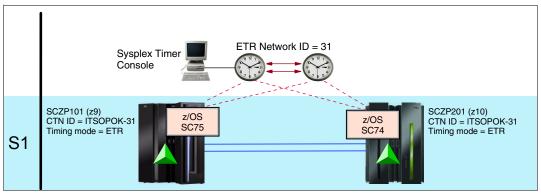


Figure 10-1 STP Implementation environment - Mixed CTN with ETR timing mode only

The Mixed CTN consists of two servers, SCZP101 and SCZP201. Both servers are STP configured and are operating in ETR timing mode, meaning that they both have connectivity to the ETR network.

Each server is connected to the other server in a redundant configuration using multiple coupling links, and each server has a z/OS image and coupling facility defined. There are actually two coupling links between these servers, as evidenced by various HMC workplace displays.

This is the same configuration shown as the endpoint for the ETR Network to Mixed CTN scenario previously described. See Chapter 9, "Mixed CTN (ETR timing mode) to ETR Network" on page 281, for further details.

#### 10.1.1 z/OS DISPLAY ETR command

The output from the DISPLAY ETR command entered on the SC74 image, on SCZP201, is shown in Figure 10-2.

D ETR IEA282I 09.10.19 TIMING STATUS 3	130
SYNCHRONIZATION MODE = ETR	
CPC PORT 0 <== ACTIVE	CPC PORT 1
OPERATIONAL	OPERATIONAL
ENABLED	ENABLED
ETR NET ID=31	ETR NET ID=31
ETR PORT=00	ETR PORT=00
ETR ID=00	ETR ID=01
THIS SERVER IS PART OF TIMING	NETWORK ITSOPOK -31

Figure 10-2 DISPLAY ETR display - SC74 on SCZP201, Mixed CTN with ETR timing mode

This shows that SC74 is using an ETR as its timing source. The active server ETR port is port 0, which is connected to an ETR with an ID of 00 in an ETR Network with and ID of 31. The server on which the SC74 image is resident is in a Mixed CTN with a CTN ID of [ITSOPOK] - [31].

#### 10.1.2 z/OS DISPLAY XCF command

Figure 10-3 shows the output from the z/OS DISPLAY XCF command entered on the SC74 image, on SCZP901.

```
D XCF,S,ALL
IXC335I 09.14.59 DISPLAY XCF 132
SYSPLEX PLEX75
SYSTEM TYPE SERIAL LPAR STATUS TIME SYSTEM STATUS
SC75 2094 991E 1C 10/04/2009 09:14:56 ACTIVE TM=ETR
SC74 2097 DE50 2C 10/04/2009 09:14:59 ACTIVE TM=ETR
```

Figure 10-3 DISPLAY XCF display - SC74 on SCZP201, Mixed CTN with ETR timing mode

This shows that both z/OS images SC74 and SC75 are operating in ETR timing mode. These z/OS images are resident on different servers, as evidenced by the different serial numbers. However, there is no indication from this command output as to whether these servers have CTN IDs defined.

#### 10.1.3 System (Sysplex) Time tabs

The following tabs are available on the System (Sysplex) Time window for each server. Only the tabs for server SCZP901 are shown in this section.

#### **Timing Network tab**

Figure 10-4 shows the Timing Network tab for server SCZP201.

iming etwork	Network Configuration	ETR Configuration St	STP STP Configuration	STP Status	ETS Configuration
Coordinat	ed Server Time ——— 9:39 AM				
)ate: 10/	4/09				
Offsets -	nd: 24				
	(hours : minutes): -4 : (	00			
Network					
	twork type:	Mixed CTN			
CTN time	ed timing network (CTN source:	Sysplex Timer conn	ection		

Figure 10-4 Timing Network tab (SCZP201)

This shows that server SCZP201 is in a Mixed CTN with a CTN ID of [ITSOPOK] - [31]. Because the ETR network is the CTN time source, the leap second offset (set to 24) and the total time offset (set to -4) originate from the Sysplex Timer as part of the timing signal.

#### **Network Configuration tab**

Figure 10-5 shows the Network Configuration tab for server SCZP201.

etwork	Network Configuration	ET	R onfiguration	ETR Status		P nfiguration	STP Status	ETS Configuration
	etwork Configuration d at (UTC):	1			and and a second se			
Preferred	time server (CPC)	Not configu	ured		<b>-</b>			
Backup time server (CPC)		Not configu			•			
Arbiter		Not configu	ured	100000000000000	-			
🗆 <u>O</u> nly a	llow the server(s)	specified ab	ove to be in th	e CTN				
신신 전화되었는	configuration							
	Time Server (CPC)	PC)	1		The Co	1111111		
	red time server (C							
O Prefer	red time server (C Ip time server (CP	C)					022   Katala (A.S.)	
⊙ <u>P</u> refer ○ <u>B</u> acku		Par and a star	K	- 31	]	<u></u>		

Figure 10-5 Network Configuration tab (SCZP201)

Because SCZP201 is in an ETR network, the Preferred Time Server, Backup Time Server, and Arbiter fields are not applicable. Only the **Apply** button is enabled to allow a full STP conversion to proceed. See Chapter 13, "Mixed CTN (two servers) to STP-only CTN" on page 335, for a detailed description of this process.

#### **ETR Configuration tab**

Figure 10-6 shows the ETR Configuration tab for server SCZP901.

ning twork	Network Configuration	ETR Configuration	ETR Status	STP Configuration	STP Status	ETS Configuration	sc sc
TR network	ID <mark> 31</mark> (in decima	I)					
Port 0 State ⊙ Enabled	● Port 1 State ●						
○ <u>D</u> isabled	ODisabled						
O <u>O</u> ff	OO∰						
ttention: A p nabled'.	ort can be operation	al only when a valid l	ETR network	ID is entered and	the port's ma	inual state is	
pply Rese	et ETR Reset	Link Error Threshold					

Figure 10-6 ETR Configuration tab (SCZP201)

This shows that server SCZP201 is connected to an ETR network with an ETR Network ID of 31. Both server ETR ports are enabled. This corresponds with the DISPLAY ETR command output shown in Figure 10-2 on page 296.

#### **ETR Status tab**

Figure 10-7 shows the ETR Status tab for server SCZP201.

ming etwork	Network Configuration	ETR Configuration	ETR Status	STP Configuration	STP Status	ETS Configuration	SCZP SCZP
ETR Statu							
Attachmen Stepping n	t control register: C8C7	tepping					
	ng port number: 0	lepping					
Port 0 state	: Opera						
Port 1 state	: Opera	tional					
A TANK TO A DOWN	Word 1 - Port 0						
	rk ID (in decimal): 31						
ETR ID (in	decimal): 0 umber (in decimal): 0						
	Word 1 - Port 1						
ETR ID (in	rk ID (in decimal): 31 decimal): 1						
	umber (in decimal): 0						
ETR Card	status is: Light detected						
	s: Light detected	William Prairie					

Figure 10-7 ETR Status tab (SCZP201)

This is a status tab only, and no modifications to the server ETR ports are possible from here. The ETR Attachment Feature (EAF) indicates that the TOD on server SCZP201 is being stepped by the ETR connected to server ETR port 0. Both Port 0 and Port 1 are operational.

The connected ETR has an ETR ID of 0 and is in ETR Network ID 31. A second ETR is available on server ETR port 1, which has an ETR ID of 1. Both server ETR ports are operational. Again, this corresponds to the DISPLAY ETR command output shown in Figure 10-2 on page 296.

#### **STP Configuration tab**

Figure 10-8 shows the STP Configuration tab for server SCZP201.

ming etwork	Network Configuration	ETR Configuration	ETR Status	STP Configuration	STP Status	ETS Configuration	SC2
oordinated	timing network ID 🕅	SOPOK	- 31				
Apply	Save STP Debug Data						12

Figure 10-8 STP Configuration tab (SCZP201)

This shows that server SCZP201 is in a mixed CTN with a CTN ID of [ITSOPOK] - [31], where ITSOPOK is the STP ID, and 31 is the ETR Network ID.

The STP ID component of the CTN ID can be changed from this location. The ETR Network ID field is disabled, and all changes to this field must be done from the ETR Configuration tab.

Removing the STP ID will migrate this server from the Mixed CTN to an ETR Network configuration.

Changing the STP ID from its existing value of ITSOPOK to another value will cause the server to move from the current Mixed CTN to another Mixed CTN. This is rarely required and would be *disruptive* to any resident z/OS image in a sysplex configuration, because they would appear to have a different time source in comparison to the other z/OS images.

#### STP Status tab

Figure 10-9 shows the STP Status tab for server SCZP201.

ning twork	Network Configuration	ETR Configuration S	TR S tatus C	TP onfiguration	STP Status	ETS Configuration	SC SC
ming state:	Svno	chronized					
sable clock s							
ming mode:	ETR	(External Time Referen	nce)				120
tratum level:	1						
aximum timir	ng stratum level: 3					all the second second	
aximum STP	version: 4						
System Inform	ation					A CARLES AND AND	
ocal STP		ttached System System	Stratum	Active STP	Maximum STP		
	(s) Type-MFG-Plant-S		Level	Version	Version		
0111.0301		0000002991E SCZP1		4	4		
					ing a constant		
	ized STP Links						
ocal STP	STP Link	Reason Code	Reason C				
ink Identifier		Sent	Received				12
0014	Coupling-peer	Self-coupled serve					
015	Coupling-peer	Self-coupled serve	er			=	
001E	Coupling-peer	Link failure					12/2
001F	Coupling-peer	Offline					
0034	Coupling-peer	Self-coupled serve					
035	Coupling-peer	Self-coupled serve	er				120
003E 003F	Coupling-peer	Offline					1
	Coupling-peer	Offline				× 1	

Figure 10-9 STP Status tab (SCZP201)

This shows that SCZP201 is in ETR timing mode. Also, because it is a Stratum 1, it must have a CTN ID defined and be in a Mixed CTN. As a result, it is considered to be STP configured.

SCZP201 also has STP connectivity to server SCZP101 over two links, as identified by the Local STP link identifiers. This implies that server SCZP101 is also STP configured. Because SCZP101 is also a Stratum 1, it must have connectivity to the ETR network and be in ETR timing mode.

The server's connectivity to another Stratum 1 or Stratum 2 server must be verified at this stage, because this will be necessary to maintain synchronization when disabling the ETR ports in the next step.

#### **ETS Configuration tab**

The ETS Configuration tab is irrelevant for this scenario, because the time source for the mixed CTN is the ETR and therefore no ETS is used.

#### 10.2 Migration

This step can be considered as optional and should *not* be used for the last server in the Mixed CTN.

**Important:** The user should *not* disable the ETR ports on the last Stratum 1 server, because this would remove the time source for the entire Mixed CTN.

The migration of a server in a Mixed CTN from ETR timing mode to STP timing mode involves a single change on that server. This change consists of disabling connectivity of the server to the ETR network. Because connectivity to the ETR network is no longer available, the server selects the STP timing messages that are being provided over the coupling links as the timing source.

Important: This operation should always be performed from the ETR Configuration tab.

ETR ports should *never* be disabled at the Sysplex Timer, or by removing ETR link cables, when migrating a server from ETR timing mode to STP timing mode.

Even though the server no longer has connectivity to the ETR network, no changes are made to the CTN ID, which remains set to [ITSOPOK] - [31] in our case.

This might appear confusing, because the CTN ID defined for this server contains the ETR Network ID, but the server will not be using the ETR network as its time source after migration to STP timing mode is complete.

Whenever a CTN ID includes a valid ETR Network ID, it implies that the time source for the CTN is being provided by the ETR Network, which is distinct from the time source for each individual server.

Table 10-1 lists the before and after configuration details.

	Server	ITO	N ID	Server	Timing	Stratum
		STP ID	ETR ID	role	mode	level
Before	SCZP101	ITSOPOK	31	N/A	ETR	1
migration	SCZP201	ITSOPOK	31	N/A	ETR	1
After	SCZP101	ITSOPOK	31	N/A	ETR	1
migration	SCZP201	ITSOPOK	31	N/A	STP	2

Table 10-1 Server configuration - Mixed CTN, ETR timing mode to STP timing mode for SCZP201

**Important:** It is strongly *not recommended*, in a mixed CTN consisting of two servers, to migrate one server to STP timing mode, just as it is demonstrated in this scenario. This will produce a single point of failure for the sysplex. If the server that is connected to the ETR fails, then the other server in STP timing mode will also go down.

Only consider migrating one server in a mixed CTN to STP timing mode, if at least two servers remaining in ETR timing mode are left.

#### Step 1: Disable ETR connectivity on SCZP901

At the HMC workplace, perform the following steps in this sequence:

- 1. Ensure that this CEC has established STP connectivity over the CF links to an attached Stratum 1, as shown in the System Information table in the STP Status tab shown in Figure 10-9 on page 300.
- 2. Highlight server SCZP201 and select System (Sysplex) Time.
- 3. Click the ETR Configuration tab.
- 4. Set both Port 0 and Port 1 states to Disabled (Figure 10-10).

👼 System (Sysplex) Time							i
Timing Network	Network Configuration	ETR Configuration	ETR Status	STP Configuration	STP Status	ETS Configuration	SCZP201 SCZP101
<ul> <li>○ Enabled</li> <li>● Disabled</li> <li>○ Off</li> </ul>	Port 1 State ○ Enabled ○ Disabled ○ Off rt can be operational of ETR Reset Lin	only when a valid I k Error Threshold	ETR network	ID is entered and	the port's ma	nual state is	

Figure 10-10 ETR Configuration tab - Disable ETR Ports (SCZP201)

**Note:** Do not change or remove the ETR Network ID, because this would remove the server from the existing Mixed CTN.

 Click Apply. This displays the Port State Change Confirmation, message ACT37388 (Figure 10-11).

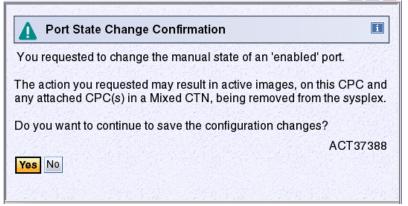


Figure 10-11 Message ACT37388 - Port State Change Confirmation (SCZP201)

 Confirm the configuration change by clicking Yes. This will display the Apply ETR Configuration, message ACT37301, indicating that the change was successful (Figure 10-12).

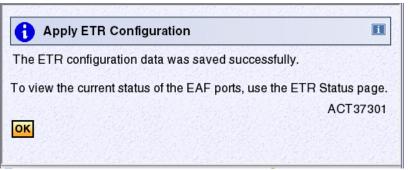


Figure 10-12 Message ACT37301: Apply ETR Configuration (SCZP201)

Messages will also appear on the console and a SYSLOG of z/OS images in a sysplex configuration resident on SCZP201 (Figure 10-13).

IEA390I TOD CLOCKS DYNAMICALLY ADJUSTED TO MAINTAIN STP SYNCHRONISM. *IEA393I ETR PORT 0 IS NOT OPERATIONAL. THIS MAY BE A CTN CONFIGURATION CHANGE. *IEA393I ETR PORT 1 IS NOT OPERATIONAL. THIS MAY BE A CTN CONFIGURATION CHANGE.	(1) (2)
IEA380I THIS SYSTEM IS NOW OPERATING IN STP TIMING MODE.	(3)
IEA031I STP ALERT RECEIVED. STP ALERT CODE = 25	(4)
IEA031I STP ALERT RECEIVED. STP ALERT CODE = 0B	(5)

Figure 10-13 SYSLOG messages: SC74 image on SZCP201, ETR ports disabled

Notes:

- (1) IEA390I is issued on a server when conversion from ETR timing mode to STP timing mode is started.
- (2) IEA393I is issued on a server in ETR timing mode as the server ETR ports are disabled.
- (3) IEA380I is issued on a server when conversion from ETR timing mode to STP timing mode is complete.
- (4) IEA0311 is received when a change occurred with respect to the external time source for the CTN. STP Alert Code 25 indicates that the non-preferred NTP server is accessible. However, the NTP server is not used, the time source for the CTN still is the ETR.
- (5) STP Alert Code 0B indicates that the NTP server switched to the preferred NTP server. However, the NTP server is not used, the time source for the CTN still is the ETR

**Important:** At this stage, the server ETR ports have been disabled, but the ETR link cabling between the server and the Sysplex Timers is still in place, allowing the ports to be enabled at a future time. Only remove the ETR link cabling when the server has no further requirement for ETR timing mode.

#### 10.3 End point

The topology diagram of our sample configuration needs to be updated to cater to the migration of SCZP901 to STP timing mode (Figure 10-14).

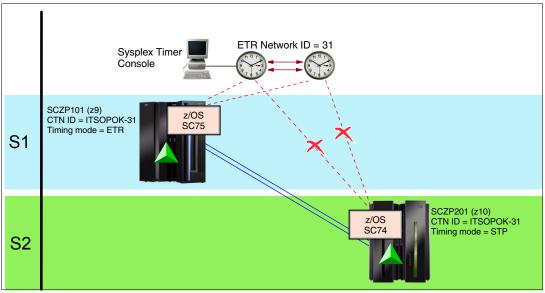


Figure 10-14 STP Implementation environment: Mixed CTN with STP timing mode (SCZP201)

The connectivity between SCZP201 and the ETR network has been disabled. SCZP201 is now shown as a Stratum 2, because it is receiving timing messages over coupling links from SCZP101, which is a Stratum 1. The timing mode of SCZP201 has also changed from ETR to STP.

If SCZP101 is removed from the Mixed CTN for any reason, the CTN will have lost its timing source because SCZP101 is the only server connected to the ETR network. The remaining server, SCZP201, will transition to Stratum 0 as a result. For this reason, we recommend that a Mixed CTN always have multiple servers with connectivity to the ETR network to avoid this single point of failure.

#### 10.3.1 z/OS DISPLAY ETR command

Figure 10-15 shows the output from the DISPLAY ETR command entered on the SC75 image, on SCZP901.

```
D ETR

IEA386I 09.50.09 TIMING STATUS 663

SYNCHRONIZATION MODE = STP (1)

THIS SERVER IS A STRATUM 2 (2)

CTN ID = ITSOPOK -31 (3)

NUMBER OF USABLE TIMING LINKS = 2 (4)

THIS SERVER HAS ONLY A SINGLE SOURCE OF TIMING SIGNALS (5)
```

Figure 10-15 DISPLAY ETR command - SC75 image on SCZP901, Mixed CTN with STP timing mode

The DISPLAY ETR command now contains only STP-related information, because connectivity to the ETR network has been disabled and is no longer relevant.

Notes:

- (1) The timing mode has changed from ETR to STP, as shown by the Synchronization Mode field.
- (2) The server has transitioned from Stratum 1 to Stratum 2, because it is receiving its timing signals from SCZP101 through the coupling links rather than directly from the ETR network.
- (3) The CTN ID of the SCZP901 server is unchanged as a result of this migration and remains as [ITSOPOK] - [31].
- (4) There are currently six usable coupling links between SCZP101 and SCZP201. The STP Link Identifiers on the STP Status tab identify the PCHIDs for these links.
- (5) An optional line is included in the display output advising a single point of failure situation, because SCZP201 is receiving timing signals only from one other server. This is because our sample configuration consists of only two servers at this stage. A larger configuration would most likely implement a redundant configuration where each server is connected to multiple other servers by either coupling facility or timing-only links, in which case this message would not be displayed.

#### 10.3.2 z/OS DISPLAY XCF command

Figure 10-16 shows the output from the z/OS DISPLAY XCF command entered on the SC74 image, on SCZP201.

```
D XCF,S,ALL
IXC335I 09.51.15 DISPLAY XCF 665
SYSPLEX PLEX75
SYSTEM TYPE SERIAL LPAR STATUS TIME SYSTEM STATUS
SC74 2097 DE50 2C 10/04/2009 09:51:14 ACTIVE TM=STP (1)
SC75 2094 991E 1C 10/04/2009 09:51:11 ACTIVE TM=ETR
```

Figure 10-16 D XCF display - SC74 image on SCZP201, Mixed CTN with STP timing mode

Notes:

(1) The timing mode of the SC74 image resident on server SCZP201 has changed from ETR to STP. This implies that SC74 must be resident on an STP-configured server. There is no indication from this command output as to whether SC75 is resident on an STP capable, STP-enabled, or STP-configured server.

XCF must ensure that all images in the sysplex are using the same timing source, to maintain timing integrity for resource sharing and data sharing purposes. XCF allows only certain CTN ID combinations to occur among the sysplex members within a sysplex configuration.

The migration from ETR timing mode to STP timing mode does not involve a change in the CTN ID, and no XCF-related messages are issued during this process.

#### 10.3.3 System (Sysplex) Time tabs

The System (Sysplex) Time tabs have undergone minor changes as a result of the migration of SCZP201 from ETR timing mode to STP timing mode.

#### **Timing Network and Network Configuration tabs**

These tabs remain unchanged, because they make no reference to timing mode.

#### **ETR Configuration tab**

Figure 10-17 shows the ETR Configuration tab for server SCZP901.

System (S iming letwork	ysplex) Time Network Configuration	ETR Configuration	ETR Status	STP Configuration	STP Status	ETS Configuration	S
	Port 1 State	)					
<ul> <li>○ <u>E</u>nabled</li> <li>○ <u>D</u>isabled</li> <li>○ <u>O</u>ff</li> </ul>	<ul> <li>○ E<u>n</u>abled</li> <li>○ D<u>i</u>sabled</li> <li>○ O<u>f</u>f</li> </ul>						
	ort can be operationa	al only when a valid E	TR network	ID is entered and t	the port's ma	anual state is	

Figure 10-17 ETR Configuration tab (SCZP201)

Both server ETR ports are now shown as disabled. The ETR Network ID is still defined, allowing the ports to the ETR network to be enabled at a future time.

**Note:** Do not change or remove the ETR Network ID, because this would remove the server from the existing Mixed CTN.

#### ETR Status tab

Figure 10-18 shows the ETR Status tab for server SCZP201.

ming etwork	Network Configuration	ETR Configuration	ETR Status	STP Configuration	STP Status	ETS Configuration	scz scz
ETR Status							
Attachmen Stepping n	t control register: 08C4 node: Local						
	ng port number: 0						
Port 0 state		perational					
Port 1 state	: Semi-o	perational					
	Word 1 - Port 0						
	ork ID (in decimal): 31						
ETR ID (in ETR port n	umber (in decimal): 0						
	Word 1 - Port 1 ork ID (in decimal): 31	Contraction of the					
ETR ID (in							
ETR port n	umber (in decimal): 0						
ETR Card	Status						
	is: Light detected						
Port 1 statu	is: Light detected	States in the starts					

Figure 10-18 ETR Status tab (SCZP201)

This shows the server ETR port states as *semi-operational*, which indicates that connectivity exists between the server and the ETR network, but the server ETR ports have been disabled.

#### **STP Configuration tab**

This tab remains unchanged.

#### **STP Status tab**

Figure 10-19 shows the STP Status tab for server SCZP201.

ming etwork	Network Configuration	ETR Configuration	ETR Status	STP Configuration	STP Status	ETS Configuration
iming state:	Syn	chronized				
Jsable clock s	ource: Yes					
iming mode:	STF	o (Server Time Proto	col)			
Stratum level:	2					
Aaximum timin	ig stratum level: 3					at the state of the
Aaximum STP	version: 4					
- System Inform	nation	all and the second		and a second second		And the second second
Local STP		Attached System Sys	stem Strat	um Active STR	P Maximum STP	
	(s) Type-MFG-Plant				Version	
0111.0301	002094-IBM-02-0		ZP101 1	4	4	
in the second						
	ized STP Links ———					
Local STP	STP Link	Reason Code		n Code		
Link Identifier		Sent Self sourced a	Recei	vea		
0014	Coupling-peer	Self-coupled s				
0015 001E	Coupling-peer	Self-coupled s	erver			
	Coupling-peer	Enneranaro				
001F	Coupling-peer	Offline				
0034	Coupling-peer	Self-coupled s				
0035	Coupling-peer	Self-coupled s	erver			
003E	Coupling-peer Coupling-peer	Offline				
003F						

Figure 10-19 STP Status tab (SCZP201)

The SCZP201 server is now shown to be using STP timing mode and has transitioned to Stratum 2 to remain synchronized in the Mixed CTN.

The information for the connectivity to SCZP101 in the Remote Directly Attached Systems section remains unchanged, because no modifications were made to this server.

#### **ETS Configuration tab**

This tab also remains unchanged, because no modifications have been performed to the ETS configuration.

# 11

# Mixed CTN: Changing one server from STP timing mode to ETR timing mode

In the example in this chapter<sup>1</sup>, one server in our sample configuration is reverted from Server Time Protocol (STP) timing mode to External Timer Reference (ETR) timing mode by *enabling* connectivity of this server to the ETR network. The server then uses ETR timing messages to remain synchronized in the Coordinated Timing Network (CTN).

In this chapter we work through the following sections:

- "Start point" on page 310
- "Migration" on page 315
- "Enable ETR connectivity on SCZP201" on page 315
- "End point" on page 317

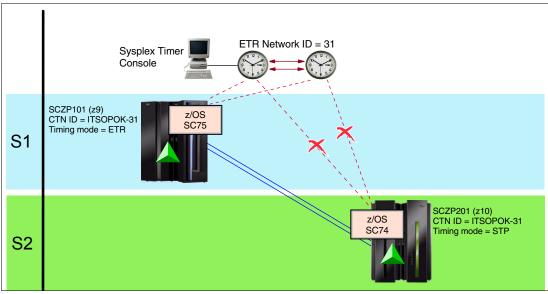
A Mixed CTN may consist of servers in ETR timing mode only, or a combination of servers in ETR timing mode and STP timing mode. In both cases, the ETR is the time source for the CTN.

This scenario proceeds to the point where one server in the Mixed CTN that is currently in STP timing mode will be converted to ETR timing mode.

**Note:** At the completion of this scenario, the CTN is returned to the start point for the migration described in Chapter 10, "Mixed CTN: Changing one server from ETR timing mode to STP timing mode" on page 295. This section may be considered a back-out procedure for that scenario.

<sup>&</sup>lt;sup>1</sup> See "Prerequisites" on page 263.

# 11.1 Start point



The starting environment for this scenario is a Mixed CTN, with one server operating in ETR timing mode and the other server operating in STP timing mode (Figure 11-1).

Figure 11-1 STP implementation environment - Mixed CTN with STP timing mode (SCZP201)

The Mixed CTN consists of two servers:

- SCZP101
- SCZP201

Both servers are *STP configured*, but are operating in different timing modes:

- SCZP101 retains connectivity to the ETR network and is in ETR timing mode.
- SCZP201 has had connectivity to the ETR network disabled and is in STP timing mode.

Each server is connected to the other server in a redundant configuration using multiple coupling links, and each server has a z/OS image and coupling facility defined. There are six coupling links between these servers, as evidenced by various HMC workplace displays. However, only two links have been shown for clarity.

This is the same configuration shown for the endpoint for the scenario described in Chapter 10, "Mixed CTN: Changing one server from ETR timing mode to STP timing mode" on page 295.

The ETR network connectivity is reinstated to return SCZP201 to ETR timing mode.

#### 11.1.1 z/OS DISPLAY ETR command

Figure 11-2 shows the output from the DISPLAY ETR command entered on the SC74 image, on SCZP201.

```
D ETR
IEA386I 09.50.09 TIMING STATUS 663
SYNCHRONIZATION MODE = STP
THIS SERVER IS A STRATUM 2
CTN ID = ITSOPOK -31
NUMBER OF USABLE TIMING LINKS = 2
THIS SERVER HAS ONLY A SINGLE SOURCE OF TIMING SIGNALS
```

Figure 11-2 DISPLAY ETR display - SC74 image on SZCP201, Mixed CTN with STP timing mode

This display shows that SC74 is resident on a server operating in STP timing mode as a Stratum 2 and is using STP messages as its timing source. Even though it is using STP messages, it is in a Mixed CTN, as evidenced by the CTN ID of [ISTOPOK] - [31], which indicates that the timing source for the CTN is an ETR Network with an ID of 31.

#### 11.1.2 z/OS DISPLAY XCF command

Figure 11-3 shows the output from the z/OS DISPLAY XCF command entered on the SC74 image, on SCZP201.

D XCF,S,ALL IXC335I 09.51.15 DISPLAY XCF 665 SYSPLEX PLEX75 SYSTEM TYPE SERIAL LPAR STATUS TIME SYSTEM STATUS SC74 2097 DE50 2C 10/04/2009 09:51:14 ACTIVE TM=STP SC75 2094 991E 1C 10/04/2009 09:51:11 ACTIVE TM=ETR

Figure 11-3 DISPLAY XCF display - SC74 image on SZCP201, Mixed CTN

This display shows that SC75 is resident on a server operating in ETR timing mode and therefore must have connectivity to an ETR network. However, SC74 is resident on a server operating in STP timing mode.

#### 11.1.3 System (Sysplex) Time tabs

The tabs discussed in this section are available on the System (Sysplex) Time selection for each server. Only the tabs for the SCZP201 server are shown in this section.

#### **Timing Network tab**

Figure 11-4 shows the Timing Network tab for the SCZP201 server.

iming etwork	Network Configuration	ETR ET Configuration St	R STP atus Configuration	STP Status	ETS Configuration
	ed Server Time				
Fime: 9:5: Date: 10/4					
Offsets -					
Leap seco	nd: 24 (hours : minutes): -4 : (	20			
<u>line (C. 1976)</u>	(nouis . minutes)4. (		the second second		n state i state
<ul> <li>Network</li> <li>Timina net</li> </ul>	twork type:	Mixed CTN			
	ed timing network (CTN		1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1		
CTN time	source:	Sysplex Timer conn	ection		

Figure 11-4 Timing Network tab (SCZP201)

This window shows that the SCZP201 server is in a Mixed CTN with a CTN ID of [ITSOPOK] - [31]. Because the ETR network is the CTN time source, the leap second offset (set to 24) and the total time offset (set to -4) originate from the Sysplex Timer as part of the timing signal.

#### **Network Configuration tab**

Figure 11-5 shows the Network Configuration tab for the SCZP201 server.

'iming letwork	Network Configuration	ETR Configura	tion Status	STP Configuration	STP Status	ETS Configuration
Configured	work Configuration at (UTC):					
	ne server (CPC)	Not configured		•		
Backup time	e server (CPC)	Not configured		<b>•</b>		
Arbiter		Not configured		-		
Only all	ow the server(s) s	pecified above to	be in the CTN		2.4	
Eorce co	onfiguration					
	me Server (CPC) —					
	d time server (CP time server (CPC					
Coordinated	d timing network II		- 31			
Apply	nitialize Time	Deconfigure	Cancol Migr	ation to Mixed CTN		

Figure 11-5 Network Configuration tab (SCZP201)

Because SCZP201 is in a Mixed CTN, the Preferred Time Server, Backup Time Server, and Arbiter fields are not applicable. Only the Apply button is enabled to allow a full STP conversion to proceed. See Chapter 13, "Mixed CTN (two servers) to STP-only CTN" on page 335, for a detailed description of this process.

#### **ETR Configuration tab**

Figure 11-6 shows the ETR Configuration tab for the SCZP201 server.

iming etwork	Network Configuration	ETR Configuration	ETR Status	STP Configuration	STP Status	ETS Configuration	SCZP SCZP
TR network	ID <mark>β1</mark> (in decima	1)					
	Port 1 State						
<ul> <li><u>Enabled</u></li> <li>Disabled</li> </ul>	<ul> <li>○ E<u>n</u>abled</li> <li>⊙ Disabled</li> </ul>						
<u>○</u> Off	OO <u>f</u> f						
	ort can be operation	al only when a valid	ETR network	ID is entered and	the port's ma	inual state is	
Enabled'.		Link Error Threshold	<u> 114</u> - 114 - 1				1. 12.14

Figure 11-6 ETR Configuration tab (SCZP201)

This shows that the SCZP201 server is physically connected to an ETR network with the ETR Network ID of 31. However, connectivity is not currently available, because both server ETR ports are disabled. This corresponds with the DISPLAY ETR command output (Figure 11-2 on page 311).

#### **ETR Status tab**

Figure 11-7 shows the ETR Status tab for the SCZP201 server.

ming etwork	Network Configuration	ETR Configuration	ETR Status	STP Configuration	STP Status	ETS Configuration	s s
ETR Status							
Stepping m	control register: 08C4 ode: Local						
	ng port number: 0						
Port 0 state:	경구 그 거들 것은 아이는 것 않는 사람 것이다. 거들것은	operational					
Port 1 state:		operational					
ETD Data k	Vord 1 - Port 0						
	rk ID (in decimal): 31	SALANE SALA					
ETR ID (in							
ETR port nu	umber (in decimal): 0	State of the second					
– ETR Data V	Vord 1 - Port 1						
	rk ID (in decimal): 31	States and					
ETR ID (in		Mederal Land					
ETR port nu	umber (in decimal): 0						
- ETR Card S	status						
States and the states of the	s: Light detected						
Port 1 status	s: Light detected	St. Barris Sine House St.					

Figure 11-7 ETR Status tab (SCZP201)

This is a status tab only, and no modifications to the server ETR ports are possible from here. This tab shows the server ETR port states as *semi-operational*, which indicates that connectivity exists between the server and the ETR network, but that the server ETR ports have been disabled.

#### **STP Configuration tab**

Figure 11-8 shows the STP Configuration tab for the SCZP201 server.

ng /ork	Network Configuration	ETR Configuration	ETR Status	STP Configuration	STP Status	ETS Configuration
ordinated	timing network ID ITS	SOPOK	- 31			
ly	Save STP Debug Data		the states			

Figure 11-8 STP Configuration tab (SCZP201)

This shows that the SCZP201 server is in a mixed CTN with a CTN ID of [ITSOPOK] - [31], where ITSOPOK is the STP ID, and 31 is the ETR Network ID.

#### **STP Status tab**

Figure 11-9 shows the STP Status tab for the SCZP201 server.

twork	Network Configuration	ETR Configuration	ETR Stat	tus C	TP onfiguration	STP Status	ETS Configuration
iming state:	Syn	chronized					
sable clock s	ource: Yes						
iming mode:	STF	(Server Time P	rotocol)				
tratum level:	2						
laximum timir	ng stratum level: 3						
laximum STF	version: 4						
System Inform	nation		N. B. S. C. S.				
_ocal STP	Remote Directly A	Attached System	System	Stratum	Active STP	Maximum STP	
ink Identifier	(s) Type-MFG-Plant-		Name	Level	Version	Version	
0111.0301	002094-IBM-02-0	0000002991E	SCZP10	1 1	4	4	
19-59-6-19-17							
Local Uninitia _ocal STP	Ized STP Links	Reason Co	a dia	Reason C	a da		
_ocal STP _ink Identifier	STP Link	Sent		Received	ode		
	Coupling-peer	Self-couple		Heceiveu			~
0015	Coupling-peer	Self-couple					
001E	Coupling-peer	Link failure					
	Coupling-peer	Offline					
001F	1 91	Self-couple	ed server				
001F	Coupling-peer						
001F 0034 0035	Coupling-peer Coupling-peer		ed server				
0034	Coupling-peer Coupling-peer Coupling-peer	Self-couple Offline	ed server				

Figure 11-9 STP Status tab (SCZP201)

The SCZP201 server is in STP timing mode, is a Stratum 2, and is synchronized in the Mixed CTN.

This server also has STP connectivity to the SCZP101 server over two links, as identified by the STP link identifiers. Because SCZP101 is a Stratum 1, it must have connectivity to the ETR network and be in ETR timing mode.

#### **ETS Configuration tab**

The ETS Configuration tab is irrelevant for this scenario because the time source for the Mixed CTN is the ETR and therefore, no ETS is used.

# 11.2 Migration

The migration process for a Mixed CTN server in STP timing mode to ETR timing mode involves enabling the server ETR ports to establish connectivity to the ETR network.

	Server	CTN ID		Server	Timing	Stratum
		STP ID	ETR ID	role	mode	level
Before	SCZP101	ITSOPOK	31	N/A	ETR	1
migration	SCZP201	ITSOPOK	31	N/A	STP	2
After	SCZP101	ITSOPOK	31	N/A	ETR	1
migration	SCZP201	ITSOPOK	31	N/A	ETR	1

Table 11-1 Server configuration - Mixed CTN, STP timing mode to ETR timing mode for SCZP201

In our sample configuration, only SCZP201 was previously converted to STP timing mode, so only this server needs to be migrated to ETR timing mode to return the CTN to full ETR timing mode.

For a larger configuration, this procedure needs to be repeated on all servers running in STP timing mode if a return to a Mixed CTN with full ETR timing mode is required.

#### Enable ETR connectivity on SCZP201

At the HMC workplace, perform the following steps:

Table 11-1 lists the before and after configuration details.

- 1. Highlight the SCZP201 server and select System (Sysplex) Time.
- 2. Click the ETR Configuration tab.
- 3. Ensure that the ETR Network ID is correct, and set both Port 0 and Port 1 states to Enabled (Figure 11-10).

network ID is entere	ed and the port's	manual state is	
	network ID is enter	network ID is entered and the port's	network ID is entered and the port's manual state is

Figure 11-10 ETR Configuration tab - Enable ETR Ports (SCZP201)

4. Click **Apply**. This displays the Apply ETR Configuration, message ACT37301, indicating that the change was successful (Figure 11-11).

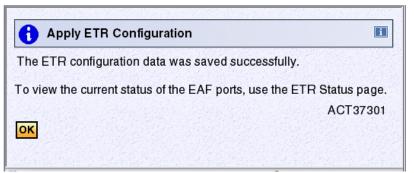


Figure 11-11 Message ACT37301 - ETR Configuration tab - Enable ETR Ports success (SCZP201)

Messages also display on the console and SYSLOG of z/OS images in a sysplex configuration resident on SCZP201 (Figure 11-12).

IEA267I ETR PORT O IS NOW AVAILABLE.	(1)
IEA267I ETR PORT 1 IS NOW AVAILABLE.	
IEA260I THE CPC IS NOW OPERATING IN ETR MODE.	(2)
IEA031I STP ALERT RECEIVED. STP ALERT CODE = 25	(3)
IEA031I STP ALERT RECEIVED. STP ALERT CODE = OB	(4)
IEA031I STP ALERT RECEIVED. STP ALERT CODE = OB	(4)

Figure 11-12 SYSLOG messages for SC74 image - ETR ports enabled

The following notes apply to Figure 11-12:

- (1) IEA267I is issued by each z/OS image as each server ETR port is enabled.
- (2) IEA260I is issued by each z/OS image when conversion from STP timing mode to ETR timing mode is complete.
- (4) IEA031I is received when a change occurred with respect to the external time source for the CTN. STP Alert Code 25 indicates that the non-preferred NTP server is accessible. However, the NTP server is not used, and the time source for the CTN still is the ETR.
- (5) STP Alert Code 0B indicates that the NTP server switched to the preferred NTP server. However, the NTP server is not used, and the time source for the CTN still is the ETR.

### 11.3 End point

At the completion of the scenario, each server is operating in ETR timing mode due to the available connectivity with the ETR network (Figure 11-13).

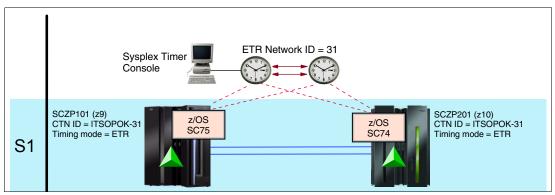


Figure 11-13 STP implementation environment - Mixed CTN with ETR timing mode only

Each server is defined as a Stratum 1 in the Mixed CTN, and the CTN ID of each server remains unchanged at [ITSOPOK] - [31]. Both servers are operating in ETR timing mode.

#### 11.3.1 z/OS DISPLAY ETR command

Figure 11-14 shows the output from the DISPLAY ETR command entered on the SC74 image, on SCZP201.

D ETR IEA282I 10.10.51 TIMING STATUS ( SYNCHRONIZATION MODE = ETR	577
CPC PORT 0 <== ACTIVE	CPC PORT 1
OPERATIONAL	OPERATIONAL
ENABLED	ENABLED
ETR NET ID=31	ETR NET ID=31
ETR PORT=00	ETR PORT=00
ETR ID=00	ETR ID=01
THIS SERVER IS PART OF TIMING	NETWORK ITSOPOK -31

Figure 11-14 DISPLAY ETR display - SC75 image on SCZP201 - Mixed CTN with ETR timing mode

This shows that SC74 is using an ETR as its timing source. The active server ETR port is port 0, which is connected to an ETR with an ID of 00 in an ETR Network with an ID of 31. The server on which the z/OS image SC74 resides is in a Mixed CTN with a CTN ID of [ITSOPOK] - [31].

#### 11.3.2 z/OS DISPLAY XCF command

Figure 11-15 shows the z/OS DISPLAY XCF command entered on the SC74 image, on SCZP201.

D XCF,S,ALL IXC335I 10.11.35 DISPLAY XCF 679 SYSPLEX PLEX75 SYSTEM TYPE SERIAL LPAR STATUS TIME SYSTEM STATUS SC74 2097 DE50 2C 10/04/2009 10:11:35 ACTIVE TM=ETR SC75 2094 991E 1C 10/04/2009 10:11:34 ACTIVE TM=ETR

Figure 11-15 DISPLAY XCF display - SC74 image on SCZP201 - Mixed CTN with ETR timing mode

This shows that both z/OS images SC74 and SC75 are operating in ETR timing mode. These z/OS images are resident on separate servers, as evidenced by the different serial numbers. However, there is no indication from this command output as to whether these servers have CTN IDs defined.

#### 11.3.3 System (Sysplex) Time tabs

The System (Sysplex) Time tabs have undergone minor changes as a result of the migration of SCZP201 from STP timing mode to ETR timing mode.

#### **Timing Network and Network Configuration tabs**

These tabs remain unchanged, as these tabs make no reference to timing mode.

#### **ETR Configuration tab**

Figure 11-16 shows the ETR Configuration tab for the SCZP201 server.

'iming letwork	Network Configuration	ETR Configuration	ETR Status	STP Configuration	STP Status	ETS Configuration	SCZP: SCZP:
ETR network II	O 31 (in decimal)						
- Port 0 State -	Port 1 State						
⊙ <u>E</u> nabled	⊙ E <u>n</u> abled						
○ <u>D</u> isabled ○ Off	ODisabled OOff						
Attention: A po	rt can be operationa	i only when a valid i	= I R network	CID IS entered and	ine ports ma	inual state is	
Enabled'.							1 92-36S

Figure 11-16 ETR Configuration tab (SCZP201)

Both server ETR ports are now shown as enabled.

#### **ETR Status tab**

Figure 11-17 shows the ETR Configuration tab for the SCZP201 server.

iing work	Network Configuration	ETR Configuration	ETR Status	STP Configuration	STP Status	ETS Configuration
tepping mo AF steppin ort 0 state: ort 1 state: ETR Data W TR network TR ID (in d	control register: C8C5 de: ETR st g port number: 0 Operat Operat ord 1 - Port 0 < ID (in decimal): 31					
TR network TR ID (in d	ord 1 - Port 1 k ID (in decimal): 31 ecimal): 1 mber (in decimal): 0 atus					

Figure 11-17 ETR Status tab (SCZP201)

Both server ETR ports are now operational.

#### STP Configuration tab

This tab remains unchanged.

#### STP Status tab

Figure 11-18 shows the STP Status tab for the SCZP901 server.

ning twork	Network Configuration	ETR Configuration	ETF Sta		STP Configuration	STP Status	ETS Configuration
ming state:	Stor	oped	(1995) - 11				
sable clock s							
ming mode:	ETF	R (External Time F	Referenc	e)			
tratum level:	1						
aximum timin	g stratum level: 3						
aximum STP	version: 4						
System Inform	ation	Action of Sec				and the second	and the second second
ocal STP	Remote Directly /	Attached System	System	Stratun	Active STP	Maximum STP	
	s) Type-MFG-Plant-		Name	Level	Version	Version	
0111.0301	002094-IBM-02-0		SCZP10	1 1	4	4	
	zed STP Links			-			
.ocal STP .ink Identifier	STP Link	Reason Co Sent	ae	Reason Received			
014	Coupling-peer	Self-couple	deanvar		<b>,</b>		
014	Coupling-peer	Self-couple					
015 01E	Coupling-peer	Link failure	u server				
01F	Coupling-peer	Offline					
0034	Coupling-peer	Self-couple	d server				
0035	Coupling-peer	Self-couple					
003E	Coupling-peer	Offline					
	Coupling-peer	Offline					
003F							

Figure 11-18 STP Status tab (SCZP201)

The SCZP201 server is now using ETR timing mode and has transitioned to Stratum 1, because it now has connectivity to the ETR network.

The information for the connectivity to SCZP101 in the Remote Directly Attached Systems section remains unchanged, because no modifications were done to this server.

#### **ETS Configuration tab**

This tab also remains unchanged, because no modifications have been performed to the ETS configuration.

# 12

# Mixed CTN: Adding a server in STP timing mode

In the example in this chapter<sup>1</sup>, one server is added to our sample Mixed Coordinated Timing Network (CTN) network. The new server has no connectivity to the External Timer Reference (ETR) network and can only participate in the Mixed CTN in Server Time Protocol (STP) timing mode.

In this chapter we work through the following sections:

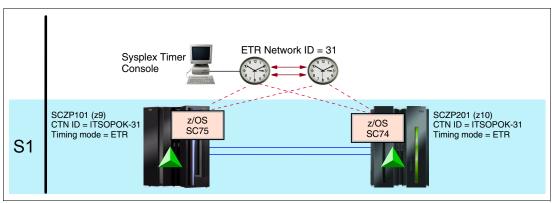
- "Start point" on page 322
- "Migration" on page 326
  - "Defining the ETR Network ID on H40" on page 327
  - "Defining the STP ID on H40" on page 328
- "End point" on page 329

A Mixed CTN can consist of servers in ETR timing mode only or a combination of servers in ETR timing mode and STP timing mode. In both cases, the ETR is the time source for the CTN.

This scenario proceeds to the point that all servers have a CTN ID defined that includes both an STP ID and an ETR Network ID. The servers with connectivity to the ETR network operate in ETR timing mode as a Stratum 1. The new server operates in STP timing mode as Stratum 2.

<sup>&</sup>lt;sup>1</sup> See "Prerequisites" on page 263

# 12.1 Start point



The starting point for this scenario is a Mixed CTN (Figure 12-1).

Figure 12-1 STP implementation environment - Mixed CTN with both servers in ETR timing mode

The Mixed CTN consists of two servers:

- ► SCZP101
- ► SCZP201

Both servers are STP configured, retain connectivity to the ETR network, and are in ETR timing mode (Stratum 1).

Each server is connected to the other server in a redundant configuration using two coupling links, and each server has a z/OS image and coupling facility defined.

This is the same configuration for the endpoint for the scenario described in Chapter 11, "Mixed CTN: Changing one server from STP timing mode to ETR timing mode" on page 309.

An extra server, H40, which does not have connectivity to the ETR network, will be added to the Mixed CTN in STP timing mode.

#### 12.1.1 z/OS DISPLAY ETR command

Figure 12-2 shows the output from the **DISPLAY ETR** command entered on the SC74 image, on SCZP201.

IEE4211 RO *ALL,D ETR 815 SC74 RESPONSES IEA2821 09.13.16 TIMING STATUS	
SYNCHRONIZATION MODE = ETR	
CPC PORT 0 <== ACTIVE	CPC PORT 1
OPERATIONAL	OPERATIONAL
ENABLED	ENABLED
ETR NET ID=31	ETR NET ID=31
ETR PORT=00	ETR PORT=00
ETR ID=00	ETR ID=01
THIS SERVER IS PART OF TIMING	
SC75 RESPONSES	
IEA282I 09.13.16 TIMING STATUS	612
SYNCHRONIZATION MODE = ETR	
CPC PORT 0 <== ACTIVE	CPC PORT 1
OPERATIONAL	OPERATIONAL
ENABLED	ENABLED
ETR NET ID=31	ETR NET ID=31
ETR PORT=01	ETR PORT=01
ETR ID=01	ETR ID=00
THIS SERVER IS PART OF TIMING	NETWORK ITSOPOK -31

Figure 12-2 DISPLAY ETR display - SC74 image on SZCP201 - Mixed CTN

This display shows that SC74 and SC75 are resident on servers operating in ETR timing mode through connectivity to an ETR network. The CTN ID is [ISTOPOK] - [31], which indicates that the timing source for the CTN is an ETR Network with the ID of 31.

#### 12.1.2 z/OS DISPLAY XCF command

Figure 12-3 shows the output from the z/OS **DISPLAY XCF** command entered on the SC74 image, on SCZP201.

```
D XCF,S,ALL
IXC335I 09.15.01 DISPLAY XCF 817
SYSPLEX PLEX75
SYSTEM TYPE SERIAL LPAR STATUS TIME SYSTEM STATUS
SC74 2097 DE50 2C 10/10/2009 09:15:00 ACTIVE TM=ETR
SC75 2094 991E 1C 10/10/2009 09:14:56 ACTIVE TM=ETR
```

Figure 12-3 DISPLAY ETR display - SC74 image on SZCP201 - Mixed CTN

This shows that both images SC74 and SC75 are operating in ETR timing mode. These z/OS images are resident on separate servers, as evidenced by the different serial numbers.

### 12.1.3 System (Sysplex) Time tabs

The tabs discussed in this section are available in the System (Sysplex) Time window for each server. Only the tabs for the H40 server are shown in this section.

#### **Timing Network tab**

Figure 12-4 shows the Timing Network tab for the H40 server.

ing work	Network Configuration	ETR Configuration	ETR Status	STP Configuration	STP Status	ETS Configuration
ne: 1:19 te: 10/1 ffsets — ap seco	0/09	0				
	work type: d timing network (CTN	Unconfigured				

Figure 12-4 Timing Network tab (H40)

This shows that the H40 server is not configured in a CTN and, therefore, is running in local time-of-day (TOD) stepping mode.

#### **Network Configuration tab**

Figure 12-5 shows the Network Configuration tab for the H40 server.

ning twork	Network Configuration	ETR Configuration	ETR Status	STP Configuration	STP Status	ETS Configuration	so
Current Net	work Configuration —						H4
	me server (CPC)	Not configured	]				
ackup time	e server (CPC)	Not configured	<b>-</b>				
rbiter		Not configured	<b>_</b>				
Carlow Contractor	San State State Proventier	cified above to be in t	he CTN				
전 전 영상 전 영양	onfiguration						
	me Server (CPC) —— ed time server (CPC)	)					
and the second	time server (CPC)						
oordinated	d timing network ID						1
pply Ir	nitialize Time	Deconfigure C	Cancel Migratio	n to Mixed CTN			

Figure 12-5 Network Configuration tab (H40)

Because H40 is not STP configured, the Preferred Time Server, Backup Time Server, and Arbiter fields are not applicable, and the Coordinated Timing Network ID is blank. Also, the Apply, Initialize Time, and Deconfigure buttons have been disabled.

#### **ETR Configuration and ETR Status tabs**

These tabs are not relevant to this scenario, because server H40 does not have connectivity to the ETR network.

#### **STP Configuration tab**

Figure 12-6 shows the STP Configuration tab for the H40 server.

System (Sysplex) Time								
Timing Network	Network Configuration	ETR Configuration	ETR Status	STP Configuration	STP Status	ETS Configuration	SCZP201 SCZP101	
a star and a star and a	ming network ID						H40	
Refresh Canc	el Help							

Figure 12-6 STP Configuration tab (H40)

Because the H40 server has not been configured for STP, this tab shows the CTN ID as blank.

#### **STP Status tab**

Figure 12-7 shows the STP Status tab for the H40 server.

etwork	Network Configuration	ſ	ETR Configuration	Ì	TR Status	STP Configurat	ion	STP Status	ETS Configur	ation
iming state:		Unsynd	chronized							
lsable clock s	ource:	No								
iming mode:		Local								
laximum timir	ig stratum level:	: 3								
laximum STP	version:	4								
System Inforn	nation			244						
Local STP		ectly Atta	ched System Sy	/ster	n Stratum	Active STR	Maxin	num STP		
	(s) Type-MFG-F				Level	Version	Versi			
The second second second	Strate Barriel	267245		and a	1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1		101240			
	ized STP Links –									
Local STP	STP Link	Reason	ı Code		Reason (	Code				
Local STP Link Identifier	STP Link Type	Sent			Reason ( Received	Code			<u></u>	
Local STP Link Identifier 0110	STP Link Type Coupling-peer	Sent Link fail	ure			Code				
Local STP Link Identifier 0110 0111	STP Link Type Coupling-peer Coupling-peer	Sent Link fail Initializa				Code				~
Local STP Link Identifier 0110 0111 0118	STP Link Type Coupling-peer Coupling-peer Coupling-peer	Sent Link fail Initializa Offline	ure			Code				•
Local STP Link Identifier 0110 0111 0118 0119	STP Link Type Coupling-peer Coupling-peer Coupling-peer Coupling-peer	Sent Link fail Initializa Offline Offline	ure			Code				
Local STP Link Identifier 0110 0111 0118 0119 0200	STP Link Type Coupling-peer Coupling-peer Coupling-peer Coupling-peer	Sent Link fail Initializa Offline Offline	ure ation is not comp	lete		Code				
Local STP Link Identifier 0110 0111 0118 0119 0200 0201	STP Link Type Coupling-peer Coupling-peer Coupling-peer Coupling-peer Coupling-peer	Sent Link fail Initializa Offline Offline Initializa	ure	lete		Code				
Local STP Link Identifier 0110 0111 0118 0119 0200	STP Link Type Coupling-peer Coupling-peer Coupling-peer Coupling-peer	Sent Link fail Initializa Offline Offline Initializa Offline	ure ation is not comp	lete		Code				

Figure 12-7 STP Status tab (H40)

The H40 server is shown as unsynchronized, because it has no usable clock source. It is running in local TOD stepping mode. No stratum level is shown.

Also, the H40 server does not have a CTN ID defined and is therefore not STP configured. So, no servers appear in the Remote Directly Attached Systems section, because H40 is unable to send or receive STP control and timing messages. However, this tab displays the links defined in the IOCDS that are *eligible* for the exchange of STP messages after the STP ID portion of the CTN ID is defined.

**Note:** Each link remains in an *uninitialized* state until the servers at both ends of the link have a matching CTN ID defined that contains a valid STP ID.

#### **ETS Configuration tab**

The ETS Configuration tab is irrelevant for this scenario because the time source for the mixed CTN is the ETR and therefore, no ETS is used.

### 12.2 Migration

The addition of a new server to an existing Mixed CTN involves defining the CTN ID on the new server to match the value already in use by the Mixed CTN. In our sample configuration, the CTN ID in use is [ITSOPOK] - [31], so the new server must also have this value defined in line with the existing servers. This might seem confusing, because the CTN ID defined for this server contains an ETR Network ID. However, the server does not use the ETR network as its time source after migration to STP timing mode is complete.

Whenever a CTN ID includes a valid ETR Network ID, it implies that the time source for the CTN provided by the ETR Network is distinct from the time source for each individual server. Every server in the CTN must have a matching CTN ID to establish STP connectivity through the coupling links. The ETR Network ID must be specified on every server, even though certain servers might not have connectivity to the ETR network.

**Important:** Setting the CTN ID *must* be done using different methods, depending on whether the server has ETR ports installed, which in turn determines whether the ETR Configuration and ETR Status tabs are available within System (Sysplex) Time:

If the server has ETR ports installed, the CTN ID is defined in two steps:

- 1. Define the ETR Network ID on the ETR Configuration tab.
- 2. Define the STP ID on the STP Configuration tab.

If the server does not have ETR ports installed, the CTN ID is defined in a single step, which is to define the STP ID and the ETR Network ID on the STP Configuration tab.

Table 12-1 shows the before and after configuration details.

	Server	СТІ	NID	Server	Timing	Stratum
		STP ID	ETR ID	role	mode	level
Before	SCZP101	ITSOPOK	31	N/A	ETR	1
migration	SCZP201	ITSOPOK	31	N/A	ETR	1
	H40	Null	Null	N/A	LOCAL	Not defined
After	SCZP101	ITSOPOK	31	N/A	ETR	1
migration	SCZP201	ITSOPOK	31	N/A	ETR	1
	H40	ITSOPOK	31	N/A	STP	2

Table 12-1 Server configuration - Mixed CTN - ETR timing mode to STP timing mode for H40

The prerequisite STP preparation tasks are assumed to have been completed for this new server.

The new server also requires coupling link connectivity to the existing servers in the Mixed CTN. These links might be either coupling links or timing-only links, depending on the configuration. The sample configuration uses coupling links, because each existing server in the Mixed CTN contains a coupling facility.

#### 12.2.1 Defining the ETR Network ID on H40

Because the new H40 server in our sample configuration has ETR ports installed, definition of the CTN ID must be done in two stages, with the ETR Network ID being defined first, followed by the STP ID. At the completion of this step, the CTN ID is [] - [31] for the new server, which is in line with the value defined for the existing servers.

At the HMC workplace, perform the following steps in order:

- 1. Highlight the H40 server and select System (Sysplex) Time.
- 2. Click the ETR Configuration tab.
- 3. Enter an ETR Network ID of 31 and set both Port 0 and Port 1 states to Disabled (Figure 12-8).

ming etwork	Network Configuration	ETR Configuration	ETR Status	STP Configuration	STP Status	ETS Configuration	scz scz
TR network	ID 31 (in decima	l)					H40
Port 0 State	Port 1 State						1
○ Enabled O Disabled	<ul> <li>○ Enabled</li> <li>⊙ Disabled</li> </ul>						
	OO <u>f</u> f						
		al only when a valid l	ETR network	ID is entered and	the port's ma	anual state is	
ttention: A p	ort can be operation	ar only whom a value					

Figure 12-8 ETR Configuration tab - Define ETR Network ID (H40)

4. Click **Apply**. This displays the Local Coordinated Timing Network ID Change Confirmation, message ACT37359 (Figure 12-9).

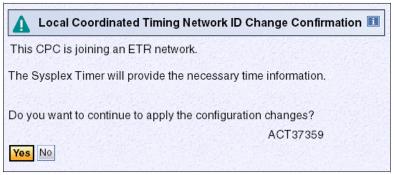


Figure 12-9 Message ACT37359 - Local Coordinated Timing Network ID Change (H40)

5. Confirm by clicking **Yes**. This displays the Apply ETR Configuration, message ACT37301, indicating that the change was successful (Figure 12-10).

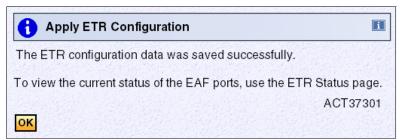


Figure 12-10 Message ACT37301 - Apply ETR Configuration (H40)

#### 12.2.2 Defining the STP ID on H40

The second step of the definition involves defining the STP ID in the CTN ID. At the end of this step, the CTN ID defined for the new server will be [ITSOPOK] - [31], which matches the CTN ID already in use by the Mixed CTN.

At the HMC workplace, perform the following steps:

- 1. Highlight the H40 server and select System (Sysplex) Time.
- 2. Click the STP Configuration tab.
- Enter the required STP ID (in our case, ITS0P0K) in the Coordinated Timing Network ID field (Figure 12-11).

iming etwork	Network Configuration	ETR Configuration	ETR Status	STP Configuration	STP Status	ETS Configuration	SCZ SCZ
Coordinate	d timing network ID IT:	SOPOK	- 31				H40
Apply	Save STP Debug Data						

Figure 12-11 STP Configuration tab - Define STP ID (H40)

4. Click **Apply**. This displays the Local Coordinated Timing Network ID Change Confirmation, message ACT37361 (Figure 12-12).

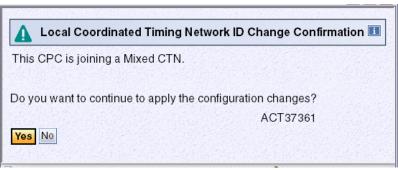


Figure 12-12 Message ACT37361 - Local Coordinated Timing Network ID Change (H40)

**Note:** The word *local* is included in this window to indicate that this change only applies to the selected server and might need to be performed on all other servers in the CTN. It is not a *global* change that will be propagated automatically throughout the CTN.

5. Confirm by clicking **Yes**. This displays the Local Coordinated Timing Network ID Change, message ACT37315, indicating that the change was successful (Figure 12-13).

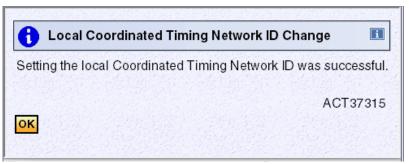


Figure 12-13 Message ACT37315 - Local Coordinated Timing Network ID Change (H40)

# 12.3 End point

The topology diagram of our sample configuration has been updated to include the addition of the H40 server operating in STP timing mode (Figure 12-14).

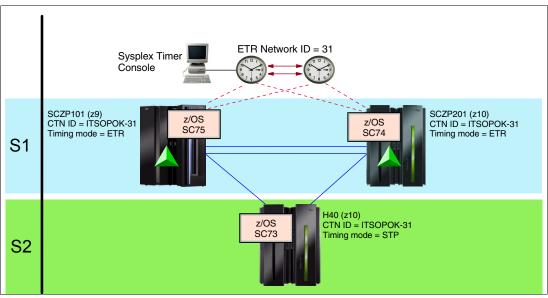


Figure 12-14 STP Implementation environment - Mixed CTN with new server (H40)

The new server H40 is receiving STP timing messages from both Stratum 1 servers SCZP101 and SCZP201 over the coupling links. Note that our sample configuration only has one coupling link available from H40 to each of the other servers in the Mixed CTN. This is *not* a recommended configuration.

If connectivity between one of the Stratum 1 servers SCZP101 or SCZP201and H40 is lost due to a coupling link failure, H40 remains synchronized in the Mixed CTN by automatically selecting the other Stratum 1 server as the time source.

It is useful for a Mixed CTN to always have multiple servers with connectivity to the ETR network to avoid a single point of failure. If there is only one server connected to the ETR and running in Stratum 1, and the other two servers have no ETR connection and are running in Stratum 2, then if this Stratum 1 server is removed from the Mixed CTN for any reason, the CTN will have lost its timing source. Both remaining servers transition to Stratum 0 as a result.

z/OS image SC73 is now IPLed on H40 to issue z/OS commands.

The Mixed CTN [ITSOPOK-31] cannot be migrated back to an ETR CTN [31] until H40 has an ETR connectivity established.

#### 12.3.1 z/OS DISPLAY ETR command

Figure 12-15 shows the output from the **DISPLAY ETR** command entered on the SC73 image, on H40.

```
D ETR
IEA282I 09.34.27 TIMING STATUS 837
SYNCHRONIZATION MODE = STP
THIS SERVER IS A STRATUM 2
CTN ID = ITSOPOK -31
NUMBER OF USABLE TIMING LINKS = 2
```

Figure 12-15 DISPLAY ETR - SC73 image on H40 - Mixed CTN

This display shows that SC73 is resident on a server operating in STP timing mode as a Stratum 2. It is participating in a Mixed CTN with a CTN ID of [ITSOPOK] - [31] and has two links available for STP timing messages.

#### 12.3.2 z/OS DISPLAY XCF command

Figure 12-16 shows the output from the z/OS **DISPLAY XCF** command entered on the SC73 image, on H40.

D XCF,S,					
IXC335I	09.36.58 D	ISPLA	Y XCF 839		
SYSPLEX	PLEX75				
SYSTEM	TYPE SERIAL	LPAR	STATUS TIME	SYSTEM STATUS	
SC74	2097 DE50	2C	10/10/2009 09:36:58	ACTIVE	TM=ETR
SC75	2094 991E	1C	10/10/2009 09:36:54	ACTIVE	TM=ETR
SC73	2097 961F	1A	10/10/2009 09:36:51	ACTIVE	TM=STP

Figure 12-16 DISPLAY XCF - SC73 image on H40 - Mixed CTN

This display shows that SC74 and SC75 are resident on separate servers operating in ETR timing mode and therefore must have connectivity to an ETR network. However, SC73 is resident on a server operating in STP timing mode.

#### 12.3.3 System (Sysplex) Time tabs

The tabs discussed in this section are available on the System (Sysplex) Time selection for each server. Only the tabs for the P000STP2 server are shown in this section.

#### **Timing Network tab**

Figure 12-17 shows the Timing Network tab for the H40 server.

ning twork	Network Configuration	ETR Configuration St	R STP atus Configurati	ion Status	ETS Configuration
	ed Server Time				
ie: 9:32 ie: 10/1	2:22 AM 10/09				
ffsets —					Salari Alba
eap seco otal time	nd: 24 (hours : minutes): -4 : 00				
Network -					
	twork type: ed timing network (CTN) ID	Mixed CTN TSOPOK - 31			
TN time		Sysplex Timer conne	ection		

Figure 12-17 Timing Network tab (H40)

This shows that the H40 server is now in a Mixed CTN with a CTN ID of [ITSOPOK] - [31], and the CTN time source is the ETR network. This is the same information that will be displayed on the Timing Network tab for the other STP-configured servers in the Mixed CTN.

#### **Network Configuration tab**

Figure 12-18 shows the Network Configuration tab for the H40 server.

iming letwork	Network Configuration	ETR Configura	ation ETR Status	STP Configuration	STP Status	ETS Configuration	sc sc
Configured	etwork Configuration						H4(
Preferred t	ime server (CPC)	Not configured		-			
Backup tin	ne server (CPC)	Not configured		-			
Arbiter	]	Not configured		•			
Eorce of Current T	low the server(s) sp configuration Time Server (CPC)		be in the CTN				
2.8-4.1 ( <del></del>	ed time server (CP p time server (CPC	Stand Stand State State State State States					
Coordinate	ed timing network II		- 31				
Apply	Initialize Time	Deconfigure	Cancel Migra	tion to Mixed CTN			1.10

Figure 12-18 Network Configuration tab (H40)

Because the H40 server is in a Mixed CTN, the Preferred Time Server, Backup Time Server, and Arbiter fields are not applicable. Only the Apply button is enabled to allow a full STP conversion to proceed. See Chapter 13, "Mixed CTN (two servers) to STP-only CTN" on page 335, for a detailed description of this process.

#### **ETR Configuration and ETR Status tabs**

These tabs are only available if the new H40 server has ETR ports configured.

If that is the case, the ETR Configuration tab contains the ETR Network ID of 31 and shows the server ETR ports in a disabled state. The ETR Status tab is not relevant, because the server is not connected to the ETR in our sample configuration.

#### **STP Configuration tab**

Figure 12-19 shows the STP Configuration tab for the H40 server.

iming etwork	Network Configuration	ETR Configuration	ETR Status	STP Configuration	STP Status	ETS Configuration	SCZP2 SCZP1
Coordinated	I timing network ID	SOPOK	- 31				H40
Apply	Save STP Debug Data		and the				1.1

Figure 12-19 STP Configuration tab (H40)

This shows that the H40 server is in a Mixed CTN with a CTN ID of [ITSOPOK] - [31], where ITSOPOK is the STP ID, and 31 is the ETR Network ID.

#### **STP Status tab**

Figure 12-20 shows the STP Status tab for the H40 server.

ing work	Network Configuration	ETR Configuratio	on ETR Stat	tus C	TP Configuration	STP Status	ETS Configuration
ning state:		Synchronized					
able clock s	ource:	Yes					
ning mode:		STP (Server Time	Protocol)				
atum level:		2					
ximum timir	ng stratum level:	3					
ximum STP	version:	4					
System Inform	nation			1. Call			<u>Maria Maria M</u>
ocal STP	and a fact the second second	ectly Attached Syste	m System	Stratum	Active STP	Maximum STP	
		Plant-Sequence	Name	Level	Version	Version	
111		-02-00000001DE50	SCZP20	1 1	4	4	
110	002094-IBM	-02-00000002991E	SCZP10	1 1	4	4	
	ized STP Links –	<b>D</b>		<u></u>		en de la compañía de	
	STP Link	Reason Code Sent	Reason Co Received	ode			
nk Identifier 118	Coupling-peer		Received				
118	Coupling-peer						
200	Coupling-peer						
200		Configuration error					
201	Coupling-peer						
208 209	Coupling-peer						
209 500		Configuration error					
501	Coupling-peer	Olline					×

Figure 12-20 STP Status tab (H40)

The H40 server is shown to have joined the Mixed CTN as a Stratum 2 and is time synchronized. It has two Remote Directly Attached Systems, SCZP901and SCZP101, both a Stratum 1.

Connectivity to each of the Remote Directly Attached Systems is by one coupling link only, as evidenced by the single STP Link Identifier registered for each attached server. This is *not* a recommended configuration.

#### **ETS Configuration tab**

This tab also remains unchanged, because no modifications have been performed to the ETS configuration.

# 13

# Mixed CTN (two servers) to STP-only CTN

In the scenario in this chapter<sup>1</sup>, a sample configuration consisting of two servers is converted from a Mixed CTN to an STP-only CTN.

In this chapter we work through the following sections:

- "Start point" on page 336
- "Migration" on page 341
- "Defining the server roles on SCZP901" on page 342
- "End point" on page 346

Once in an STP-only CTN, there is no further reliance on the External Timer Reference (ETR) network, because all servers previously operating in ETR timing mode have their ETR connectivity disabled as part of the migration process.

**Important:** After conversion to an STP-only CTN is complete, the timing source for the CTN is the Stratum 1 server, and no further timing signals are used from the ETR network. After this occurs, the respective time in the ETR Network and the Stratum 1 server might slowly drift apart, because they are no longer being kept aligned.

A subsequent migration from an STP-only CTN back to a Mixed CTN might be impacted by this time differential, and the potential for this to occur is proportionally related to the period during which the two timing sources are no longer being kept aligned.

When planning to perform a test migration from a Mixed CTN to an STP-only CTN, and then migrating back to a Mixed CTN, try to minimize the time spent in the STP-only CTN configuration to limit this potential impact.

<sup>&</sup>lt;sup>1</sup> See "Prerequisites" on page 263.

## 13.1 Start point

The starting point for this scenario is a Mixed CTN consisting of two servers, with both servers in ETR timing mode (Figure 13-1). This configuration is the result of a previous migration step in which a timing mode change was done.

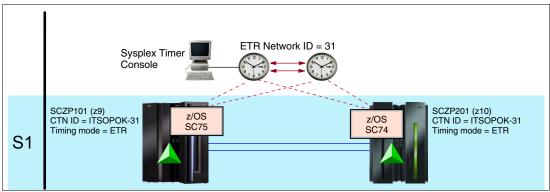


Figure 13-1 STP Implementation environment: Mixed CTN with two servers

The Mixed CTN consists of two servers:

- SCZP101
- SCZP201

Both servers are STP configured, and both servers are in ETR timing mode because they retain connectivity to the ETR network.

The SCZP101 and SCZP201 servers are connected to each other in a redundant configuration using two coupling links, and each of these servers has a z/OS image and coupling facility defined.

This is the same configuration that is the endpoint for the scenario for adding a new server to an existing Mixed CTN, as discussed in Chapter 8, "ETR Network to Mixed CTN (ETR timing mode)" on page 265, and Chapter 11, "Mixed CTN: Changing one server from STP timing mode to ETR timing mode" on page 309.

#### 13.1.1 z/OS DISPLAY ETR command

Figure 13-2 shows the output from the DISPLAY ETR command entered on the SC74 image, on SCZP201.

```
IEE421I RO *ALL.D ETR
SC74
       RESPONSES -----
IEA282I 18.48.27 TIMING STATUS 528
SYNCHRONIZATION MODE = ETR
 CPC PORT 0 <== ACTIVE CPC PORT 1
 OPERATIONAL
                         OPERATIONAL
 FNABLED
                        ENABLED
 ETR NET ID=31
                        ETR NET ID=31
 ETR PORT=00
                        ETR PORT=00
 ETR ID=00
                         ETR ID=01
 THIS SERVER IS PART OF TIMING NETWORK ITSOPOK -31
SC75
       RESPONSES ------
IEA282I 18.48.27 TIMING STATUS 953
SYNCHRONIZATION MODE = ETR
 CPC PORT 0 <== ACTIVE
                        CPC PORT 1
 OPERATIONAL
                          OPERATIONAL
 ENABLED
                         ENABLED
 ETR NET ID=31
                        ETR NET ID=31
 ETR PORT=01
                         ETR PORT=01
 ETR ID=01
                         ETR ID=00
 THIS SERVER IS PART OF TIMING NETWORK ITSOPOK -31
```

Figure 13-2 DISPLAY ETR display - SC74 image on SCZP201 - Mixed CTN

This display shows that SC74 and SC75 are resident on separate servers operating in ETR timing mode through connectivity to an ETR network.

All servers are in the same Mixed CTN with a CTN ID of [ITSOPOK] - [31], which indicates that the timing source for the CTN is an ETR network with an ETR Network ID of 31.

#### 13.1.2 z/OS DISPLAY XCF command

Figure 13-3 shows the output from the z/OS DISPLAY XCF command entered on the SC74 image, on SCZP201.

```
D XCF,S,ALL
IXC335I 18.49.36 DISPLAY XCF 531
SYSPLEX PLEX75
SYSTEM TYPE SERIAL LPAR STATUS TIME SYSTEM STATUS
SC75 2094 991E 1C 10/03/2009 18:49:33 ACTIVE TM=ETR
SC74 2097 DE50 2C 10/03/2009 18:49:35 ACTIVE TM=ETR
```

Figure 13-3 DISPLAY XCF display - SC74 image on SCZP201 - Mixed CTN

This display shows that SC74 and SC75 are resident on separate servers operating in ETR timing mode and therefore must have connectivity to an ETR network.

#### 13.1.3 System (Sysplex) Time tabs

The following tabs are available on the System (Sysplex) Time selection for each server. Only the tabs for the SCZP201 server are shown in this section.

#### **Timing Network tab**

Figure 13-4 shows the Timing Network tab for the SCZP201 server.

- Coordinated Server Time Time: 6:38:02 PM Date: 10/3/09	
Date: 10/3/09	
	1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1
Offsets	
Leap second: 24 Total time (hours : minutes): -4 ; 00	
	1612
Network —	
Coordinated timing network (CTN) ID: ITSOPOK - 31	
CTN time source: Sysplex Timer connection	

Figure 13-4 Timing Network tab (SCZP201)

This shows that the SCZP201 server is in a Mixed CTN with a CTN ID of [ITSOPOK] - [31], and the CTN time source is the ETR network. This is the same information that is shown on the Timing Network tab for the other STP-configured server in the Mixed CTN.

#### **Network Configuration tab**

Figure 13-5 shows the Network Configuration tab for the SCZP201 server.

etwork	Network Configuration	ETR Configurat	ion ETR Status	STP Configuration	STP Status	ETS Configuration
	twork Configuration – I at (UTC):					
	10001	ot configured	•			
Backup tim	e server (CPC) N	ot configured	-			
Arbiter	N	ot configured	-			
Only al	ow the server(s) spe	cified above to b	e in the CTN			
Eorce o	onfiguration					
	ime Server (CPC) — ed time server (CPC	<b>,</b>				
	o time server (CPC)	)				
		al an and a state of the	and a start of the start of the	Ale and the second second		en state fanne
⊙ <u>B</u> ackup	d timing network ID	ITSOPOK	<sup>-</sup> 31		5 6 S. S. S. C. S.	

Figure 13-5 Network Configuration tab (SCZP201)

Because the SCZP201 server is in a Mixed CTN, the Preferred Time Server, Backup Time Server, and Arbiter fields are not applicable. Only the Apply button is enabled to allow a full STP conversion to proceed.

#### **ETR Configuration tab**

Figure 13-6 shows the ETR Configuration tab for the SCZP201 server.

ming etwork	Network Configuration	ETR Configuration	ETR Status	STP Configuration	STP Status	ETS Configuration	SCZP SCZP
TR network I	D <mark> 31 (</mark> in decimal)						
Port 0 State	Port 1 State						
<ul> <li><u>D</u>isabled</li> </ul>	OD <u>i</u> sabled						
<u>○O</u> ff	OOff						
Attention: A po Enabled'.	ort can be operationa	l only when a valid	ETR network	ID is entered and	the port's ma	inual state is	
nabled.	t ETR Reset L	ink Error Threshold	<u>ter</u> re di bis				

Figure 13-6 ETR Configuration tab (SCZP201)

Because the SCZP201 server is operating in ETR timing mode, both server ETR ports are shown as enabled.

#### **ETR Status tab**

Figure 13-7 shows the ETR Status tab for the SCZP201 server.

liming Network	Network Configuration	ETR Configuration	ETR Status	STP Configuration	STP Status	ETS Configuration	sc.
– ETR Statu							
	t control register: C8C7 node: ETR st	enning					
	ing port number: 0	opping					
Port 0 state							
Port 1 state	e: Operat	ional					
	Word 1 - Port 0						
	ork ID (in decimal): 31						
ETR ID (in	decimal): 0 number (in decimal): 0						
	Word 1 - Port 1 ork ID (in decimal): 31	Contraction of the second					
ETR ID (in							12
ETR port n	umber (in decimal): 0						
– ETR Card	Status						
	us: Light detected						
Port 1 statu	us: Light detected	Spiriture Victoria Sp					

Figure 13-7 ETR Status tab (SCZP201)

This is a status tab only and no modifications to the server ETR ports are possible from here. This tab shows the server ETR port states as *operational*, which indicates that connectivity exists between the server and the ETR network, and that the server ETR ports have been enabled.

#### **STP Configuration tab**

Figure 13-8 shows the STP Configuration tab for the SCZP201 server.

iming etwork	Network Configuration	ETR Configuration	ETR Status	STP Configuration	STP Status	ETS Configuration	SCZ SCZ
Coordinated	timing network ID ITS	OPOK	- 31				
Apply S	Save STP Debug Data						110

Figure 13-8 STP Configuration tab (SCZP201)

This shows that the SCZP201 server is in a Mixed CTN with a CTN ID of [ITSOPOK] - [31], where ITSOPOK is the STP ID, and 31 is the ETR Network ID.

#### **STP Status tab**

Figure 13-9 shows the STP Status tab for the SCZP201 server.

etwork	Network Configuration	ETR Configuration	ETR Stat	us C	TP onfiguration	STP Status	ETS Configuration
iming state:	Sync	hronized					
sable clock s	ource: Yes						
iming mode:	ETR	(External Time F	Reference	e)			
tratum level:	1						
laximum timir	ng stratum level: 3						
1aximum STP	version: 4						
System Inforn	ation						
Local STP	Remote Directly A	ttachod System	Svetom	Stratum	Activo STD	Maximum STP	
	(s) Type-MFG-Plant-		Name	Level	Version	Version	
0111.0301	002094-IBM-02-00				4	4	
0111,0001	COLCO TIDINI OL O	COULDER L	OOLI IV				
	ized STP Links ———						
Local STP	STP Link	Reason Co		Reason C	ode		
Link Identifier	2 T	Sent		Received			
0014	Coupling-peer	Self-couple					<u>^</u>
0015	Coupling-peer	Self-couple	d server				
001E	Coupling-peer	Link failure					
	Coupling-peer	Offline					
001F	Coupling-peer	Self-couple	d server				
001F 0034		Self-couple	d server				
	Coupling-peer						
0034	Coupling-peer Coupling-peer	Offline					

Figure 13-9 STP Status tab (SCZP201)

The SCZP201 server is shown as participating in the Mixed CTN as a Stratum 1 and is time synchronized. It has one Remote Directly Attached Systems, SCZP101, which is a Stratum 1.

Connectivity of SCZP901 to the other server is shown in the Remote Directly Attached Systems section, and the STP Link Identifiers show the PCHIDs of the coupling links or timing-only links that are used for STP control and timing messages.

#### **ETS Configuration tab**

Figure 13-10 shows the ETS Configuration for the SCZP201 server.

work		vork figuration	ETR Configuration	ETR Status	STP Configuration	STP Status	ETS Configuration	so
Note								
		iutomatically beco made to the ETS of					configuration is not igned the role of	
referre	ed or Backu	p Time Server for a	an STP-only CT	N.				
	nal Time Sour	ce (ETS)						
		onfigured on Hardv	ware Managem	ent Console				
Use	<u>N</u> TP	onfigured on Hardv ulse per second (F	22 - C. B. B. B.	ent Console				
Use Use	<u>N</u> TP	ulse per second (F	22 - C. B. B. B.	ent Console				
Use Use	• <u>N</u> TP • NTP with <u>p</u> - <i>ime Server Ir</i>	ulse per second (F	PPS)		Status			
Use Use	• <u>N</u> TP • NTP with <u>p</u> - <i>ime Server Ir</i>	ulse per second (F	PPS)					
Use Use VTP T elect	NTP NTP with <u>p</u> <i>Time Server Ir</i> Configured	ulse per second (F formation NTP Time Server	PPS)	Source	Success			

Figure 13-10 ETS Configuration tab (SCZP201)

Two NTP time servers have been defined as time sources, if SCZP201 will ever become the Current Time Server for an STP-only CTN. These are the two Hardware Management Consoles (HMCs) of the configuration. Both of them are Stratum 2 NTP servers connected to an external Stratum 1 NTP server and have been successfully contacted. However, SCZP201 now is not defined as a Preferred Time Server or as a Backup Time Server to the CTN, so the ETS configuration is not used. The time source of the CTN still is the ETR.

### **13.2 Migration**

The migration to an STP-only CTN involves a single change that *must* be performed from the server that will become the Current Time Server (CTS).

**Note:** Migration to an STP-only CTN is a *global* change that only needs to be performed once within the CTN.

In most circumstances, the server assigned to be the Preferred Time Server (PTS) becomes the CTS.

The configuration of server roles is performed using the Network Configuration tab, within System (Sysplex) Time, at the HMC workplace. This tab may also be used to subsequently change the server roles in the STP-only CTN and to move the CTS function between the PTS and BTS servers, if this is required.

The servers that assume the PTS, BTS, and Arbiter roles must have connectivity to one another. Otherwise, the **Force configuration** check box must be selected.

**Note:** Any STP-configured server in the Mixed CTN can assume any of the server roles and change the stratum level during the migration accordingly.

In our case, the following changes in stratum levels occur during the migration:

- SCZP101 was previously a Stratum 1 and must transition to a Stratum 2, because it is being defined as the BTS.
- SCZP201 was previously a Stratum 1, and it remains a Stratum 1 to assume the CTS role as defined.

Table 13-1 shows the before and after configuration details.

	Server	СТМ	N ID	Server	Timing	Stratum
		STP ID	ETR ID	role	mode	level
Before	SCZP101	ITSOPOK	31		ETR	1
migration	SCZP201	ITSOPOK	31		ETR	1
After	SCZP101	ITSOPOK		BTS	STP	2
migration	SCZP201	ITSOPOK		PTS & CTS	STP	1

 Table 13-1
 Server configuration - Mixed CTN to STP-only CTN migration

During the migration process, the CTN ID is updated by the *STP facility* to remove references to the ETR Network ID, and all remaining connectivity to the ETR network is disabled.

The CTN ID on all servers in the Mixed CTN prior to migration is [ITSOPOK] - [31]. At the completion of this scenario, the global change initiated from the Network Configuration tab causes the CTN ID on all servers in the CTN to become [ITSOPOK] - [].

It is the migration process that causes the ETR Network ID to be removed from the CTN ID. This is performed by the STP facility in a *coordinated* manner across all of the STP-configured servers in the CTN.

#### Defining the server roles on SCZP901

At a minimum, a PTS must be defined. If this is the only server defined, then by default it must assume the CTS role. If a BTS is also defined, the definition of an Arbiter becomes optional. Because this is a two-server scenario, there is no Arbiter.

In this scenario, the server roles are defined as follows:

- ► PTS and CTS = SCZP201
- BTS = SCZP101

**Note:** Because the CTS role is to be allocated to the SCZP201 server, we must perform the Mixed CTN to STP-only CTN migration from *this* server.

At the HMC workplace, perform the following steps:

- 1. Highlight the SCZP201 server and select System (Sysplex) Time.
- 2. Click the Network Configuration tab.

3. Select the Preferred Time Server, Backup Time Server, and Arbiter from the drop-down boxes, which list all of the STP-configured servers in the Mixed CTN (Figure 13-11).

'iming letwork	Network Configuration	ETR Configuratio	n Status	STP Configuration	STP Status	ETS Configuration
	etwork Configuration d at (UTC):					
Preferred t	ime server (CPC)	SCZP201 (STP ID: I	TSOPOK) -			
Backup tin	ne server (CPC)	SCZP101 (STP ID: I	TSOPOK) -			
Arbiter		Not configured	-			
120 To 10 10 10	low the server(s) s configuration	pecified above to be	in the CTN			
⊙ Prefer	<i>Time Server (CPC) —</i> red time server (CP p time server (CPC					
Coordinate	ed timing network II		- 31			
Apply	Initialize Time	Deconfigure	Cancel Migratio	n to Mixed CTN		

Figure 13-11 Network Configuration tab - Define roles (SCZP201)

4. Click **Apply**. This displays the Global Timing Network ID Change Confirmation, message ACT37355 (Figure 13-12).

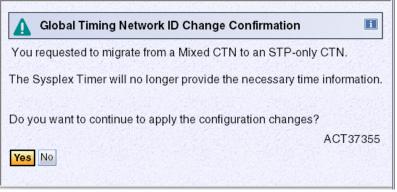


Figure 13-12 Message ACT37355 - Network Configuration tab (SCZP201)

**Note:** The word *global* is included in this window to indicate that this change is a global change that will affect all STP-configured servers in the Mixed CTN.

5. Confirm by clicking **Yes**. This displays the Modify Network Configuration, message Message ACT37341, indicating that the change was successful (Figure 13-13).

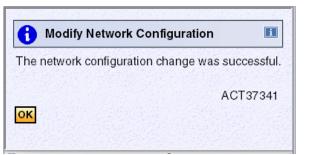


Figure 13-13 Network Configuration - Define roles success (SCZP201)

The STP facility propagates the CTN ID change from [ITSOPOK] - [31] to [ITSOPOK] - [] in a coordinated manner across all servers in the Mixed CTN. As this occurs, messages will be displayed on the console and the SYSLOG of z/OS images in a sysplex configuration resident on these servers.

In the interim, XCF notes that images in the sysplex use different time sources for synchronization, as evidenced by the different CTN ID. In normal circumstances, this is an invalid condition and z/OS images are partitioned out of the sysplex to maintain timing integrity for resource-sharing and data-sharing purposes.

To prevent this, XCF has been updated to recognize a global CTN ID change and tolerate the CTN ID mismatch for a short time. XCF reports the status so that the user can see each system in the sysplex transition to the new CTN ID over the course of multiple messages (Figure 13-14).

-> SC74 IEA390I TOD CLOCKS DYNAMICALLY ADJUSTED TO MAINTAIN STP SYNCHRONISM. \*IEA393I ETR PORT 0 IS NOT OPERATIONAL. THIS MAY BE A CTN CONFIGURATION CHANGE. (2) \*IEA393I ETR PORT 1 IS NOT OPERATIONAL. THIS MAY BE A CTN CONFIGURATION CHANGE. IEA380I THIS SYSTEM IS NOW OPERATING IN STP TIMING MODE. (3) IEA031I STP ALERT RECEIVED. STP ALERT CODE = 84 IXC438I COORDINATED TIMING INFORMATION HAS BEEN UPDATED 226 (1) FOR SYSTEM: SC74 PREVIOUS CTNID: ITSOPOK -31 CURRENT CTNID: ITSOPOK -> SC75 IEA390I TOD CLOCKS DYNAMICALLY ADJUSTED TO MAINTAIN STP SYNCHRONISM. \*IEA393I ETR PORT 0 IS NOT OPERATIONAL. THIS MAY BE A CTN CONFIGURATION CHANGE. (2) \*IEA393I ETR PORT 1 IS NOT OPERATIONAL. THIS MAY BE A CTN CONFIGURATION CHANGE. IEA380I THIS SYSTEM IS NOW OPERATING IN STP TIMING MODE. (3) IEA031I STP ALERT RECEIVED. STP ALERT CODE = 83 IEA0311 STP ALERT RECEIVED. STP ALERT CODE = 84 IXC438I COORDINATED TIMING INFORMATION HAS BEEN UPDATED 066 (1)FOR SYSTEM: SC75 PREVIOUS CTNID: ITSOPOK -31 CURRENT CTNID: ITSOPOK \*IXC439E ALL SYSTEMS IN SYSPLEX PLEX75 ARE NOT SYNCHRONIZED 067 (4) TO THE SAME TIME REFERENCE. SYSTEM: SC74 IS USING CTNID: ITSOPOK -31 SYSTEM: SC75 IS USING CTNID: ITSOPOK IXC435I ALL SYSTEMS IN SYSPLEX PLEX75 ARE NOW SYNCHRONIZED 068 (5) TO THE SAME TIME REFERENCE. SYSTEM: SC74 IS USING CTNID: ITSOPOK SYSTEM: SC75 IS USING CTNID: ITSOPOK

Figure 13-14 SYSLOG messages - Mixed CTN to STP-only CTN migration

The following information applies to Figure 13-14:

- (1) IXC438I is issued on each z/OS image in the sysplex as the CTN ID changes.
- (2) IEA393I is issued by each z/OS image in the sysplex on a server in ETR timing mode as the server ETR ports are disabled.
- (3) IEA380I is issued by each z/OS image in the sysplex when conversion from ETR timing mode to STP timing mode is complete.
- (4) IXC439E is issued by XCF once per second while z/OS images in the sysplex are not synchronized to the same time reference, as evidenced by the different CTN IDs shown.
- (5) IXC435I is issued by XCF after the CTN ID mismatch has been resolved.

**Attention:** Disable the ETR ports to the CECs in STP Timing Mode on the Sysplex Timer after a successful migration. Otherwise, during a POR, the CEC initially adjusts its internal clock using the timing signals from the Sysplex Timer and later adjusts it to the CTN-time.

Depending on the discrepancy, this adjustment might take a significant amount of time. Remember to enable the ports on the Sysplex Timer again when you plan a reverse migration.

## 13.3 End point

The topology diagram of our sample configuration has been updated to account for the conversion of the Mixed CTN to an STP-only CTN (Figure 13-15).

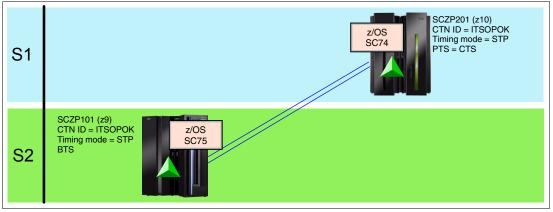


Figure 13-15 STP Implementation environment - STP-only CTN - two servers

All servers are now using STP timing mode. Each server has been allocated a role within the STP-only CTN, with the SCZP201 server being both the Preferred Time Server and the Current Time Server at the end of the migration. The SCZP101 server is the Backup Time Server.

The CTN ID of all servers is now [ITSOPOK] - [] with only an STP ID defined. The ETR Network ID has been removed and all server ETR ports have been disabled, so there is no longer any connectivity with the ETR network. This occurs on all servers within the Mixed CTN that had connectivity to the ETR network at the start of the migration.

All ETR ports on the servers are disabled. However, leave the ETR links in place for a certain period of time to allow for a back-out plan. Depending on individual change management constraints, the ETR links can be disconnected after a migration back to a Mixed CTN is no longer being considered.

Even when the ETR ports are disabled, the ETR signals of both links are still monitored to be able to perform a reverse migration. Furthermore, disconnecting the links is considered an ETR link failure, and z/OS message IEA393I is posted:

IEA393I ETR PORT n IS NOT OPERATIONAL. THIS MAY BE A CTN CONFIGURATION CHANGE.

#### 13.3.1 z/OS DISPLAY ETR command

Figure 13-16 shows the output from the DISPLAY ETR command entered on the SC73 image, on P000STP2.

```
RO *ALL.D ETR
SC74
       RESPONSES ------ (1)
IEA386I 19.40.38 TIMING STATUS
SYNCHRONIZATION MODE = STP
 THIS SERVER IS A STRATUM 1
 CTN ID = ITSOPOK
 THE STRATUM 1 NODE ID = 002097.E26.IBM.02.00000001DE50
 THIS IS THE PREFERRED TIME SERVER
 THIS STP NETWORK HAS NO SERVER TO ACT AS ARBITER
SC75
        RESPONSES -----
                                                                 (2)
IEA386I 19.40.38 TIMING STATUS
SYNCHRONIZATION MODE = STP
 THIS SERVER IS A STRATUM 2
 CTN ID = ITSOPOK
 THE STRATUM 1 NODE ID = 002097.E26.IBM.02.00000001DE50
 THIS IS THE BACKUP TIME SERVER
 NUMBER OF USABLE TIMING LINKS = 3
 THIS STP NETWORK HAS NO SERVER TO ACT AS ARBITER
```

Figure 13-16 DISPLAY ETR display - SC75 image on SCZP901 - STP-only CTN

The following notes refer to Figure 13-16:

- (1) SC74 is resident on SCZP201, the PTS. It is a Stratum 1 because it currently is the CTS.
- (2) SC75 is resident on SCZP101, the BTS. It is a Stratum 2 because the CTS function is currently on SCZP201, the PTS.

**Note:** The DISPLAY ETR output contains additional lines depending on whether a BTS and Arbiter are configured as follows:

THIS STP NETWORK HAS NO BACKUP TIME SERVER THIS STP NETWORK HAS NO SERVER TO ACT AS BACKUP

Both messages are displayed if both the BTS and the Arbiter are not configured.

#### 13.3.2 z/OS DISPLAY XCF command

Figure 13-17 shows the output from the z/OS DISPLAY XCF command entered on the SC74 image, on SCZP201.

```
D XCF,S,ALL

IXC335I 19.41.28 DISPLAY XCF 161

SYSPLEX PLEX75

SYSTEM TYPE SERIAL LPAR STATUS TIME SYSTEM STATUS

SC74 2097 DE50 2C 10/03/2009 16:43:47 ACTIVE TM=STP

SC75 2094 991E 1C 10/03/2009 16:43:46 ACTIVE TM=STP
```

Figure 13-17 DISPLAY XCF display - SC75 image on SCZP901, STP-only CTN, two servers

All z/OS images are now shown to be resident on servers that are in STP timing mode. Each of these z/OS images is resident on a separate server, as evidenced by the different serial numbers.

#### 13.3.3 System (Sysplex) Time tabs

The tabs discussed in this section are available on the System (Sysplex) Time selection for each server. Only the tabs for the SCZP901 server are shown in this section.

#### **Timing Network tab**

Figure 13-18 shows the Timing Network tab for the SCZP201 server.

ning twork	Network Configuration	ETR Configurat	tion Status	STP Configuration	STP Status	ETS Configuration	s
	d Server Time ——						
ime: 7:09							
Date: 10/3	/09						
Offsets —							
eap secor		24					
otal time (	hours : minutes):	-4:00				Second States	
Network -							
	work type:	STP-only					
		CTN) ID: ITSOPOI	K -			Sector Sector	
CTN time s		NTP					
ITP stratu	m level:	2					
	ent Steering	Adjust Time	Adjust Leap Seco	onde A	djust Time Zone		

Figure 13-18 Timing Network tab (SCZP201)

This shows that the SCZP201 server is in an STP-only CTN with a CTN ID of [ITSOPOK] - [].

The same information is shown on all servers in the STP-only CTN. However, only the Current Time Server has the Adjust Time, Adjust Leap Seconds, and Adjust Time Zone buttons enabled.

Adjustments of up to 60 seconds may be made to Coordinated Server Time using the steering facility within Adjust Time. See 6.6.2, "Time adjustment" on page 217, for further details.

The CTN time source field indicates that the time source is a Stratum 2 NTP server. This is specified in the ETS Configuration tab (Figure 13-24 on page 353).

Because the STP-only CTN no longer has connectivity to the ETR network, the leap second offset and the total time offset, set respectively to 0 and -5 in the example shown in Figure 13-18, are now maintained by the Current Time Server.

A migration from a Mixed CTN to an STP-only CTN inherits the time and the total offset from the Sysplex Timer. As shown in Figure 13-18, the Timing Network tab displays the total time (hours : minutes) for the offset. This only occurs when the time zone information (incorporating a daylight saving time offset, if any) has been inherited from a Sysplex Timer.

**Note:** For a reverse migration, the leap second offset and local time-of-day offset are taken from the Sysplex Timer. This means that any changes made after the migration to STP are lost on a reverse migration.

To finalize the Mixed to STP-only migration, a time zone offset entry *must* be set. Selection of the time zone algorithm must be initiated from SCZP201, because the Adjust Time Zone button is only enabled on the CTS. If a time zone algorithm is not defined following a migration from Mixed CTN to STP-only CTN, it is not possible to schedule the next daylight saving time adjustment. See 2.5.2, "Time-zone offset adjustment" on page 74, for further details.

#### **Network Configuration tab**

Figure 13-19 shows the Network Configuration tab for the SCZP201 server.

ming etwork	Network Configuration	ETR Configuration	ETR Status	STP Configuration	STP Status	ETS Configuration	SCZP SCZP
	etwork Configuration — I at (UTC):		10/3/09 7:16:	05 PM			
		CZP201 (STP ID: ITS	SOPOK) -				
Backup tim	ne server (CPC) So	CZP101 (STP ID: ITS	SOPOK) -				
Arbiter	N	ot configured	•				
Only al	low the server(s) spe	cified above to be in	the CTN				
CARLE CONTRACT	configuration						
	ime Server (CPC) ed time server (CPC	)					
and a state of the state of the	p time server (CPC)						
Coordinate	ed timing network ID	ITSOPOK	<u> </u>				
Apply	Initialize Time	Deconfigure	Cancel Migratio	n to Mixed CTN			

Figure 13-19 Network Configuration tab (SCZP201)

This tab now shows the server roles within the STP-only CTN and indicates which server is the Current Time Server. The CTN ID is also displayed. The same information is shown on all servers in the STP-only CTN.

The Preferred Time Server, Backup Time Server, Arbiter, Current Time Server, and CTN ID fields may all be modified from this tab. However, the modifications are accepted only if they are performed on the server that is *going to become* the CTS after the network reconfiguration is complete.

Modifications performed from the Network Configuration tab are *global* and, as such, are propagated throughout the STP-only CTN.

The CTN ID can be changed to either:

- Specify a separate STP ID for the STP-only CTN.
- Define an ETR Network ID that will migrate the STP-only CTN to a Mixed CTN.

The Deconfigure button removes all definitions in the STP-only CTN, causing all servers to become unsynchronized. This should never need to be used.

#### **ETR Configuration tab**

Figure 13-20 shows the ETR Configuration tab for the SCZP201 server.

liming Network	Network Configuration	ETR Configuration	ETR Status	STP Configuration	STP Status	ETS Configuration	SCZP:
ETR network	ID (in decimal	)					
- Port 0 State	STORE AND A REPORT OF THE STORE AND A STORE						
<ul> <li><u>Enabled</u></li> <li><u>D</u>isabled</li> </ul>	○E <u>n</u> abled ⊙Disabled						
OOff	OO <u>f</u> f						
	oort can be operation	al only when a valid l	ETR network	k ID is entered and	the port's ma	anual state is	
Enabled'.	et ETR Reset	Link Error Threshold	<u>terr</u> e de la composition de				1000

Figure 13-20 ETR Configuration tab (SCZP201)

Prior to migration, this tab specified an ETR Network ID of 31. The migration from a Mixed CTN to an STP-only CTN has disabled the ETR ports, and the ETR Network ID has been removed. The new CTN ID is now [ITSOPOK] - [], with only the STP ID part defined.

#### **ETR Status tab**

Figure 13-21 shows the ETR Status tab for the SCZP201 server.

iming etwork	Network Configuration	ETR Configuration	ETR Status	STP Configuration	STP Status	ETS Configuration	SCZP SCZP
- ETR Status	Word t control register: 08C4						
Stepping m							
	ng port number: 0						
		operational operational					
	Nord 1 - Port 0	sponsorial					
	rk ID (in decimal): 31						120
ETR ID (in							
ETR port n	umber (in decimal): 0						
	Word 1 - Port 1						
ETR ID (in	rk ID (in decimal): 31 decimal): 1	Antonia de Carl					
	umber (in decimal): 0						
- ETR Card	Status						
	is: Light detected						
Port 1 statu	s: Light detected	Construction in the					

Figure 13-21 ETR Status tab (SCZP201)

Even though the SCZP201 server has disabled connectivity to the ETR network and has removed the ETR Network ID from the CTN ID, the ETR Status tab retains details of the connected Sysplex Timers until the ETR network is physically disconnected.

If an ETR link failure occurs while in STP-only mode, then z/OS message IEA393I appears (Example 13-1). The purpose is to be able to repair a failing link as long as a reverse migration to a Mixed CTN is scheduled.

Example 13-1 Message IEA3931

IEA393I ETR PORT n IS NOT OPERATIONAL. THIS MAY BE A CTN CONFIGURATION CHANGE.

#### STP Configuration tab

Figure 13-22 shows the STP Configuration tab for the SCZP201 server.

ng /ork	Network Configuration	ETR Configuration	ETR Status	STP Configuration	STP Status	ETS Configuration
rdinated	timing network ID	SOPOK				
<u>and an teach</u>	Save STP Debug Data					

Figure 13-22 STP Configuration tab (SCZP201)

This shows that the SCZP201 server is in an STP-only CTN with a CTN ID of [ITSOPOK] - [], where ITSOPOK is the STP ID. No ETR Network ID is defined, because connectivity to the ETR network has been fully disabled as a result of the migration.

**Important:** Modification of the STP ID (or the ETR ID) is not permitted on the STP Configuration tab for the Current Time Server.

On other servers in the CTN, the STP Configuration tab allows an STP ID to be modified. However, if performed from this location, it is a *local* change only, causing this server to transition from the existing STP-only CTN to another STP-only CTN with another CTN ID.

This is disruptive to z/OS images on this server if they are in a sysplex configuration with z/OS images remaining in the STP-only CTN. XCF would detect multiple time sources in the sysplex and begin to remove sysplex members until the situation was resolved.

Modification of the STP ID can only be done nondisruptively from the Network Configuration tab on the Current Time Server, where it is managed as a *global* change.

#### **STP Status tab**

Figure 13-23 shows the STP Status tab for the SCZP201 server.

twork	Network Configuration	ETR Configuration	ETR Stat	tus C	TP onfiguration	STP Status	ETS Configuration
iming state:	Svn	chronized					
sable clock s							
iming mode:	STF	o (Server Time Pro	tocol)				
tratum level:	1						
laximum timin	g stratum level: 3						all start and start and
laximum STP	version: 4						
System Inform	ation	and the state of the second	12122	1. Sala			All and the second
Local STP		Attached System S	system	Stratum	Active STP	Maximum STP	
	s) Type-MFG-Plant-		lame	Level	Version	Version	
0111.0301	002094-IBM-02-0		CZP10	12	4	4	
			and the second s				
Local Uninitial		-		_			
Local STP Link Identifier	STP Link	Reason Cod Sent		Reason C Received	ode		
0014	Coupling-peer	Self-coupled		Received			
0014	Coupling-peer	Self-coupled					
0015 001E	Coupling-peer	Link failure	Server				
001E	Coupling-peer	Offline					
0034	Coupling-peer	Self-coupled	sonior				
0035	Coupling-peer	Self-coupled					
0035 003E	Coupling-peer	Offline	Server				
		Offline					
003F	Coupling-peer						

Figure 13-23 STP Status tab (SCZP201)

The SCZP201 server is shown to be synchronized in the STP-only CTN as the Stratum 1 server. There is one Stratum 2 server in the Remote Directly Attached Systems.

This server has connectivity to the SCZP201 server over the coupling facility or timing-only links, as identified by the STP Link Identifiers.

#### **ETS Configuration tab**

Figure 13-24 shows the ETS Configuration for the SCZP201 server.

iming letwork	Netw Conf	vork figuration	ETR Configuration		STP Configuration	STP Status	ETS Configuration	SCZP2 SCZP1
– Note -						<u></u>		
							IS device, an ETS time source for	
the CTI								
States and	al Time Cours	TTO)		Contraction and a Contract	1992 10 14 19 19 19		COMPLEX (CARDER)	
	al Time Sourc	and the second						
OUse	dial out if co	onfigured on Hard	lware Managem	ent Console				
⊙Use ⊙Use	<u>d</u> ial out if co <u>N</u> TP	and the second		ent Console				
OUse ⊙Use OUse	<u>d</u> ial out if co <u>N</u> TP	onfigured on Harc ulse per second (		ent Console				
OUse ⊙Use OUse - NTP T	dial out if co <u>N</u> TP NTP with <u>p</u> <i>ime Server In</i>	onfigured on Harc ulse per second (	PPS)		Status			
OUse ⊙Use OUse - NTP T	dial out if co <u>N</u> TP NTP with <u>p</u> <i>ime Server In</i>	onfigured on Harc ulse per second ( formation	PPS)					
OUse ⊙Use OUse - NTP T Select	dial out if co <u>N</u> TP NTP with <u>p</u> <i>ime Server In</i> Configured	onfigured on Harc ulse per second ( formation NTP Time Serve	PPS)	Source				

Figure 13-24 ETS Configuration tab (SCZP201)

Two NTP time servers have been defined as time sources. Because SCZP201 is the Current Time Server for the STP-only CTN, the selected NTP server is used as the time source for SCZP201.

# 14

# Mixed CTN (three servers) to STP-only CTN

In the scenario in this chapter<sup>1</sup>, a sample configuration consisting of three servers is converted from a Mixed CTN to an STP-only CTN.

In this chapter we work through the following sections:

- "Start point" on page 356
- ▶ "Migration" on page 362
- Defining the server roles on SCZP901" on page 363
- "End point" on page 367

Once in an STP-only CTN, there is no further reliance on the External Timer Reference (ETR) network, because all servers previously operating in ETR timing mode will have their ETR connectivity disabled as part of the migration process.

**Important:** After the conversion to an STP-only CTN is complete, the timing source for the CTN is the Stratum 1 server, and no further timing signals are used from the ETR network. Once this occurs, the respective times in the ETR Network and the Stratum 1 server might slowly drift apart, because they are no longer being kept aligned.

A subsequent migration from an STP-only CTN back to a Mixed CTN might be impacted by this time differential, and the potential for this to occur is proportionally related to the period of time that the two timing sources are no longer kept aligned.

When planning to perform a test migration from a Mixed CTN to an STP-only CTN and then migrate back to a Mixed CTN, try to minimize the time spent in the STP-only CTN configuration to limit this potential impact.

<sup>&</sup>lt;sup>1</sup> See "Prerequisites" on page 263.

# 14.1 Start point

The starting point for this scenario is a Mixed CTN with two servers in ETR timing mode, and one server in STP timing mode (Figure 14-1). This configuration is the result of a previous migration step in which a timing mode change was done. The H40 server has the ETR ports disabled and is therefore in STP timing mode.

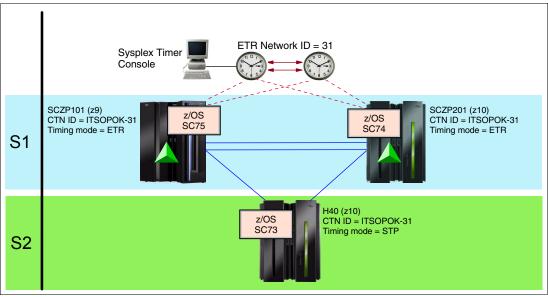


Figure 14-1 STP Implementation environment - Mixed CTN with three servers

The Mixed CTN consists of three servers:

- ► SCZP101
- SCZP201
- ► H40

All servers are STP configured, but SCZP101 and SCZP201 are in ETR timing mode because they retain connectivity to the Sysplex Timer, and H40 is in STP timing mode.

The SCZP101 and SCZP201 servers are connected to each other in a redundant configuration using two coupling links, and each of these servers has a z/OS image and coupling facility defined.

The H40 server contains a z/OS image only. It is connected to the SCZP101 and SCZP201 servers using only one coupling link in each case.

**Note:** The configuration shown in Figure 14-1 is not a recommended configuration because the H40 server must have at least two coupling links to both SCZP101 and SCZP201 servers for redundancy. From a timing perspective, it is not a major problem if one of these links becomes unusable, because the H40 server can still use the remaining link for STP messages. However, loss of a coupling link also means the loss of access to the coupling facility, which might cause disruption within the Parallel Sysplex.

This is the same configuration that is the endpoint for the scenario for adding a new server to an existing Mixed CTN, as discussed in Chapter 12, "Mixed CTN: Adding a server in STP timing mode" on page 321.

#### 14.1.1 z/OS DISPLAY ETR command

Figure 14-2 shows the output from the **DISPLAY ETR** command entered on the SC74 image, on SCZP201.

```
RO *ALL.D ETR
SC74
      RESPONSES -----
IEA282I 09.58.25 TIMING STATUS
SYNCHRONIZATION MODE = ETR
 CPC PORT 0 <== ACTIVE CPC PORT 1
OPERATIONAL OPERATIONAL
                        ENABLED
 FNABLED
 ETR NET ID=31
                        ETR NET ID=31
 ETR PORT=00
                        ETR PORT=00
 ETR ID=00
                         ETR ID=01
 THIS SERVER IS PART OF TIMING NETWORK ITSOPOK -31
SC75
       RESPONSES ------
IEA282I 09.58.25 TIMING STATUS
SYNCHRONIZATION MODE = ETR
 CPC PORT 0 <== ACTIVE CPC PORT 1
 OPERATIONAL
                        OPERATIONAL
                        ENABLED
 ENABLED
                       ETR NET ID=31
 ETR NET ID=31
 ETR PORT=01
                        ETR PORT=01
                     ETR ID=00
 ETR ID=01
 THIS SERVER IS PART OF TIMING NETWORK ITSOPOK -31
SC73
       RESPONSES -----
IEA386I 09.58.25 TIMING STATUS
SYNCHRONIZATION MODE = STP
  THIS SERVER IS A STRATUM 2
  CTN ID = ITSOPOK -31
 NUMBER OF USABLE TIMING LINKS = 2
```

Figure 14-2 DISPLAY ETR display - SC74 image on SCZP201 - Mixed CTN

This display shows that SC74 and SC75 are resident on two separate servers operating in ETR timing mode through connectivity to a Sysplex Timer. SC73 is resident on a server operating in STP timing mode, which is a Stratum 2 using STP messaging as its time source.

All servers are in the same Mixed CTN with a CTN ID of [ITSOPOK] - [31], which indicates that the timing source for the CTN is a Sysplex Timer with an ETR Network ID of 31.

#### 14.1.2 z/OS DISPLAY XCF command

Figure 14-3 shows the output from the z/OS **DISPLAY XCF** command entered on the SC74 image, on SCZP201.

D XCF,S,ALL IXC335I 10.00.01 DISPLAY XCF 847 SYSPLEX PLEX75 SYSTEM TYPE SERIAL LPAR STATUS TIME SYSTEM STATUS SC74 2097 DE50 2C 10/10/2009 10:00:01 ACTIVE TM=ETR SC75 2094 991E 1C 10/10/2009 09:59:59 ACTIVE TM=ETR SC73 2097 961F 1A 10/10/2009 09:59:56 ACTIVE TM=STP

Figure 14-3 DISPLAY XCF display - SC74 image on SCZP201 - Mixed CTN

This display shows that SC74 and SC75 are resident on two separate servers operating in ETR timing mode and therefore must have connectivity to a Sysplex Timer. However, SC73 is resident on a separate server operating in STP timing mode.

#### 14.1.3 System (Sysplex) Time tabs

The tabs discussed in this section are available on the System (Sysplex) time selection for each server. Only the tabs for the SCZP201 server are shown in this section.

#### **Timing Network tab**

Figure 14-4 shows the Timing Network tab for the SCZP201 server.

iming etwork	Network Configuration	ETR Configuration S	TR STP tatus Configuration	STP Status	ETS Configuration	scz
Time: 9:51 Date: 10/1 - Offsets — Leap seco	10/09	00				<u>H40</u>
And the second second second	twork type: ed timing network (CTN source:	Mixed CTN N) ID: ITSOPOK - 31 Sysplex Timer conr	nection			

Figure 14-4 Timing Network tab (SCZP201)

This shows that the SCZP201 server is in a Mixed CTN with a CTN ID of [ITSOPOK] - [31], and the CTN time source is the Sysplex Timer. This is the same information that is shown on the Timing Network tab for the other STP-configured servers in the Mixed CTN.

#### **Network Configuration tab**

Figure 14-5 shows the Network Configuration tab for the SCZP201 server.

iming letwork	Network Configuration	ETR Configuration	ETR Status	STP Configuration	STP Status	Configuration	sc
	etwork Configuration - d at (UTC):						H40
		lot configured	•				
Backup tin	ne server (CPC)	lot configured	•				
Arbiter	1	lot configured					
Current 7	configuration Time Server (CPC) — red time server (CPC	and the second	n the CTN				
1000 T 3000	p time server (CPC) ed timing network ID		- 31				
	Initialize Time	Deconfigure	Cancel Migration	to Mixed CTN			

Figure 14-5 Network Configuration tab (SCZP201)

Because the SCZP201 server is in a Mixed CTN, the Preferred Time Server, Backup Time Server, and Arbiter fields are not configured. Only the Apply button is enabled to allow a full STP conversion to proceed.

#### **ETR Configuration tab**

Figure 14-6 shows the ETR Configuration tab for the SCZP201 server.

ming etwork	Network Configuration	ETR Configuration	ETR Status	STP Configuration	STP Status	ETS Configuration	SC2
TR network	ID <sub>31</sub> (in decimal	)					H40
	Port 1 State						
⊙ <u>E</u> nabled ○ <u>D</u> isabled	⊙E <u>n</u> abled ○D <u>i</u> sabled						
<u>○O</u> ff	OOff						
	ort can be operation	al only when a valid l	ETR network	ID is entered and t	the port's ma	nual state is	
nabled'.	et ETR Reset	Link Error Threshold	<u>1874</u> - Nisan			B. S. C. Level and S.	12

Figure 14-6 ETR Configuration tab (SCZP201)

Because the SCZP201 server is operating in ETR timing mode, both server ETR ports are shown as enabled.

#### **ETR Status tab**

Figure 14-7 shows the ETR Status tab for the SCZP201 server.

ning twork	Network Configuration	ETR Configuration	ETR Status	STP Configuration	STP Status	ETS Configuration	SCZP SCZP
ETR Status	Word						H40
	control register: C8C7						
	node: ETR st ng port number: 0	epping					
	: Operati	onal					
	: Operati						
ETR Data 1	Nord 1 - Port 0	ting and the second					
	rk ID (in decimal): 31						
TR ID (in							
: I R port ni	umber (in decimal): 0						
STATE STATE AND AND A	Nord 1 - Port 1						
TR netwo TR ID (in	rk ID (in decimal): 31						
	umber (in decimal): 0						
<u>an sente an composition de la composition de la</u>	and the second second						
ETR Card S	Status Is: Light detected						
	s: Light detected	1980 - MARINE					

Figure 14-7 ETR Status tab (SCZP201)

This is a status tab only, and no modifications to the server ETR ports are possible from here. This tab shows the server ETR port states as operational, which indicates that connectivity exists between the server and the ETR network, and that the server ETR ports have been enabled.

#### **STP Configuration tab**

Figure 14-8 shows the STP Configuration tab for the SCZP201 server.

iming etwork	Network Configuration	ETR Configuration	ETR Status	STP Configuration	STP Status	ETS Configuration	SCZP:
		_		-			SUZP
Coordinated	d timing network ID 📊	SOPOK	- 31				H40
and the second second	Save STP Debug Data						

Figure 14-8 STP Configuration tab (SCZP201)

This shows that the SCZP201 server is in a Mixed CTN with a CTN ID of [ITSOPOK] - [31], where ITSOPOK is the STP ID, and 31 is the ETR Network ID.

#### **STP Status tab**

Figure 14-9 shows the STP Status tab for the SCZP201 server.

ning twork	Network Configuration	ETR Configuration	ETR State	us S	rp onfiguration	STP Status	ETS Configuration
ming state:	Syn	chronized					
sable clock s	ource: Yes						
ming mode:	ETF	R (External Time	Reference	e)			
ratum level:	1						
	ng stratum level: 3						
aximum STP	version: 4						
System Inforn	nation ———		in the second				
ocal STP	Remote Directly A	Attached System	System	Stratum	Active STP	Maximum STP	
ink Identifier.	(s) Type-MFG-Plant-		Name	Level	Version	Version	
0111,0301	002094-IBM-02-0	0000002991E	SCZP10	1 1	4	4	
590	002097-IBM-02-0	0000008961F	H40	2	4	4	
	lized STP Links						
ocal STP	STP Link	Reason Co	nde	Reason C	ode		
ink Identifier.		Sent		Received	Joue		
014	Coupling-peer	Self-couple	ed server				~
015	Coupling-peer	Self-couple					
01E	Coupling-peer	Link failure	)				
01F	Coupling-peer	Offline					
034	Coupling-peer	Self-couple	ed server				
035	Coupling-peer	Self-couple	ed server				
03E	Coupling-peer	Offline					
03F	Coupling-peer	Offline					~

Figure 14-9 STP Status tab (SCZP201)

The SCZP201 server is shown as participating in the Mixed CTN as a Stratum 1 and is time synchronized. It has two Remote Directly Attached Systems:

- SCZP101 (a Stratum 1)
- ► H40 (a Stratum 2)

Connectivity of SCZP201 to the other servers is shown in the Remote Directly Attached Systems section, and the STP Link Identifiers show the PCHIDs of the coupling links or timing-only links that are used for STP control and timing messages.

#### **ETS Configuration tab**

Figure 14-10 shows the ETS Configuration for the SCZP201 server.

Fiming Network		work figuration	ETR Configuration	ETR Status	STP Configuration	STP Status	ETS Configuration	SCZP1
require Preferre	d. Changes	utomatically becor made to the ETS c p Time Server for a	onfiguration ar	e saved and are				
⊙Use ⊙Use	<u>d</u> ial out if co <u>N</u> TP	onfigured on Hardw ulse per second (P	an an the second	ent Console				
⊙Use ⊙Use ⊙Use	<u>d</u> ial out if co <u>N</u> TP	onfigured on Hardw ulse per second (P	an an the second	ent Console				
OUse ⊙Use OUse – NTP T	dial out if controls MTP NTP with points of the server line server	onfigured on Hardw ulse per second (P	PS)	ent Console Source	Status			
OUse ⊙Use OUse	dial out if controls MTP NTP with points of the server line server	onfigured on Hardw ulse per second (P Iformation	PS)					

Figure 14-10 ETS Configuration tab (SCZP201)

Two NTP time servers have been defined as time sources, in case SCZP201 ever becomes the Current Time Server for an STP-only CTN. These are the two Hardware Management Consoles (HMCs) of the configuration. Both of them are Stratum 2 NTP servers connected to an external Stratum 1 NTP server, and both of them have been successfully contacted.

However, SCZP201 now is not defined as a Preferred or as a Backup Time Server to the CTN, so the ETS configuration is not used. The time source of the CTN still is the Sysplex Timer.

## 14.2 Migration

The migration to an STP-only CTN involves a single change that *must* be performed from the server that will become the Current Time Server (CTS).

**Note:** Migration to an STP-only CTN is a *global* change that only needs to be performed once within the CTN.

In most circumstances, the server assigned to be the Preferred Time Server (PTS) is also assigned the CTS.

The configuration of server roles is done using the Network Configuration tab, within System (Sysplex) Time, at the HMC workplace. This tab may also be used to subsequently change the server roles in the STP-only CTN and to move the CTS function between the PTS and BTS servers, if this is required.

The servers that assume the PTS, BTS, and Arbiter roles must have connectivity to one another. Otherwise, the **Force configuration** check box must be selected.

**Note:** Any STP-configured server in the Mixed CTN can assume any of the server roles, and can change stratum level during the migration accordingly.

In our case, the following changes in stratum levels occur during the migration:

- SCZP101 was previously a Stratum 1 and must transition to a Stratum 2, as it is being defined as the BTS.
- SCZP201 was previously a Stratum 1, and it remains a Stratum 1 to assume the CTS role as defined.
- ► H40 remains a Stratum 2.

Table 14-1 shows the before and after configuration details.

	Server	CTI	N ID	Server	Timing	Stratum
		STP ID	ETR ID	role	mode	level
Before	SCZP101	ITSOPOK	OK 31		ETR	1
migration	SCZP201	ITSOPOK 31			ETR	1
	H40	ITSOPOK	31		STP	2
After	SCZP101	ITSOPOK		BTS	STP	2
migration	SCZP201	ITSOPOK		PTS & CTS	STP	1
	H40	ITSOPOK		Arbiter	STP	2

Table 14-1 Server configuration - Mixed CTN to STP-only CTN migration

During the migration process, the CTN ID is updated by the *STP* facility to null out the ETR Network ID, and all remaining connectivity to the Sysplex Timer is disabled.

The CTN ID on all servers in the Mixed CTN prior to migration is [ITSOPOK] - [31]. At the completion of this scenario, the global change initiated from the Network Configuration tab causes the CTN ID on all servers in the CTN to become [ITSOPOK] - [].

It is the migration process that causes the ETR Network ID to be removed from the CTN ID. This is performed by the STP facility in a *coordinated* manner across all of the STP-configured servers in the CTN.

#### Defining the server roles on SCZP901

At a minimum, a PTS must be defined. If this is the only server defined, then by default it must assume the CTS role. If a BTS is also defined, the definition of an Arbiter becomes optional.

In this scenario, the server roles are defined as follows:

- PTS & CTS = SCZP201
- ► BTS = SCZP101
- ► Arbiter = H40

**Note:** Because the CTS role is to be allocated to the SCZP201 server, we must perform the Mixed CTN to STP-only CTN migration *from this server*.

At the HMC workplace, perform the following steps:

- 1. Highlight the SCZP201 server and select System (Sysplex) Time.
- 2. Click the Network Configuration tab.
- 3. Select the Preferred Time Server, Backup Time Server, and Arbiter from the drop-down menus, which list all of the STP-configured servers in the Mixed CTN (Figure 14-11).

ming etwork	Network Configuration	ETR Configura	tion ETR	IS	STP Configuration	STP Status	ETS Configuration	s s
	etwork Configuration d at (UTC):	ı —						H
	ime server (CPC)	SCZP201 (STP I	D: ITSOPOK)	-				
Backup tin	ne server (CPC)	SCZP101 (STP I	D: ITSOPOK)	-				
Arbiter		H40 (STP ID: ITS	OPOK)	-				
Only a	low the server(s)	specified above to	be in the CTN					
2010 - State -	configuration							
	Fime Server (CPC) red time server (C	PC)			and the second			
Strange Strange Strange Strange	p time server (CP	Service and the service of the servi						
Coordinate	ed timing network		-	31				
Apply	Initialize Time	Deconfigure	Cancel Mi	gration	to Mixed CTN			

Figure 14-11 Network Configuration tab - Define roles (SCZP201)

 Click Apply. This displays the Global Timing Network ID Change Confirmation, message ACT37355 (Figure 14-12).

Global Timing Network ID Change Confirmation
You requested to migrate from a Mixed CTN to an STP-only CTN.
The Sysplex Timer will no longer provide the necessary time information.
Do you want to continue to apply the configuration changes?
ACT37355

Figure 14-12 Message ACT37355 - Network Configuration tab (SCZP201)

**Note:** The word *global* is included in this window to indicated that this change is a global change that affects all STP-configured servers in the Mixed CTN.

5. Confirm by clicking **Yes**. This displays the Modify Network Configuration, message Message ACT37341, indicating that the change was successful (Figure 14-13).

0	Modify Network Config	guration	i
The	network configuration ch	ange was succ	essful.
		ACT	37341
<mark>0K</mark>			

Figure 14-13 Network Configuration - Define roles success (SCZP201)

The STP facility propagates the CTN ID change from [ITSOPOK] - [31] to [ITSOPOK] - [] in a coordinated manner across all servers in the Mixed CTN. As this occurs, messages are displayed on the console and SYSLOG of z/OS images in a sysplex configuration resident on these servers.

In the interim, XCF notes that images in the sysplex use separate time sources for synchronization, as evidenced by the different CTN IDs. Under normal circumstances this is an invalid condition, and z/OS images would be partitioned out of the sysplex to maintain timing integrity for resource-sharing and data-sharing purposes.

To prevent this, XCF has been updated to recognize a global CTN ID change and tolerate the CTN ID mismatch for a short time. XCF reports the status so that the user can see each of the systems in the sysplex transition to the new CTN ID over the course of multiple messages (Figure 14-14).

-> SC74 IEA390I TOD CLOCKS DYNAMICALLY ADJUSTED TO MAINTAIN STP SYNCHRONISM. \*IEA393I ETR PORT O IS NOT OPERATIONAL. THIS MAY BE A CTN CONFIGURATION CHANGE. (2) \*IEA393I ETR PORT 1 IS NOT OPERATIONAL. THIS MAY BE A CTN CONFIGURATION CHANGE. IEA380I THIS SYSTEM IS NOW OPERATING IN STP TIMING MODE. (3) IXC438I COORDINATED TIMING INFORMATION HAS BEEN UPDATED 854 (1)FOR SYSTEM: SC74 PREVIOUS CTNID: ITSOPOK -31 CURRENT CTNID: ITSOPOK \*IXC439E ALL SYSTEMS IN SYSPLEX PLEX75 ARE NOT SYNCHRONIZED 855 (4) TO THE SAME TIME REFERENCE. SYSTEM: SC74 IS USING CTNID: ITSOPOK SYSTEM: SC75 IS USING CTNID: ITSOPOK -31 SYSTEM: SC73 IS USING CTNID: ITSOPOK -31 -> SC75 IEA390I TOD CLOCKS DYNAMICALLY ADJUSTED TO MAINTAIN STP SYNCHRONISM. \*IEA393I ETR PORT 0 IS NOT OPERATIONAL. THIS MAY BE A CTN CONFIGURATION CHANGE. (2) \*IEA393I ETR PORT 1 IS NOT OPERATIONAL. THIS MAY BE A CTN CONFIGURATION CHANGE. IEA380I THIS SYSTEM IS NOW OPERATING IN STP TIMING MODE. (3) IEA031I STP ALERT RECEIVED. STP ALERT CODE = 25 IEA031I STP ALERT RECEIVED. STP ALERT CODE = OB IXC438I COORDINATED TIMING INFORMATION HAS BEEN UPDATED 640 (1)FOR SYSTEM: SC75 PREVIOUS CTNID: ITSOPOK -31 CURRENT CTNID: ITSOPOK \*IXC439E ALL SYSTEMS IN SYSPLEX PLEX75 ARE NOT SYNCHRONIZED 641 (4) TO THE SAME TIME REFERENCE. SYSTEM: SC74 IS USING CTNID: ITSOPOK SYSTEM: SC75 IS USING CTNID: ITSOPOK SYSTEM: SC73 IS USING CTNID: ITSOPOK -31 -> SC73 IEA390I TOD CLOCKS DYNAMICALLY ADJUSTED TO MAINTAIN STP SYNCHRONISM. IEA380I THIS SYSTEM IS NOW OPERATING IN STP TIMING MODE. (3) IEA031I STP ALERT RECEIVED. STP ALERT CODE = 25 IEA031I STP ALERT RECEIVED. STP ALERT CODE = OB IXC438I COORDINATED TIMING INFORMATION HAS BEEN UPDATED 517 (1) FOR SYSTEM: SC75 PREVIOUS CTNID: ITSOPOK -31 CURRENT CTNID: ITSOPOK IXC435I ALL SYSTEMS IN SYSPLEX PLEX75 ARE NOW SYNCHRONIZED 518 (5) TO THE SAME TIME REFERENCE. SYSTEM: SC74 IS USING CTNID: ITSOPOK SYSTEM: SC75 IS USING CTNID: ITSOPOK SYSTEM: SC73 IS USING CTNID: ITSOPOK

Figure 14-14 SYSLOG messages - Mixed CTN to STP-only CTN migration

The following notes refer to Figure 14-14 on page 366:

(1) IXC438I is issued on each z/OS image in the sysplex as the CTN ID changes.

(2) IEA393I is issued by each z/OS image in the sysplex on a server in ETR timing mode as the server ETR ports are disabled.

(3) IEA380I is issued by each z/OS image in the sysplex when conversion from ETR timing mode to STP timing mode is complete.

(4) IXC439E is issued by XCF once per second while z/OS images in the sysplex are not synchronized to the same time reference, as evidenced by the different CTN IDs shown.

(5) IXC435I is issued by XCF after the CTN ID mismatch has been resolved.

**Note:** Disable the ETR ports to the CECs in STP Timing Mode on the sysplex timer after a successful migration. Otherwise, during a POR the CEC initially adjusts its internal clock using the timing signals from the Sysplex Timer and later adjusts it to the CTN time. Depending on the discrepancy, this adjustment might take a significant amount of time. Remember to enable the ports on the sysplex timer again when you plan a reverse migration.

### 14.3 End point

SCZP201 (z10) CTN ID = ITSOPOK z/OS Timing mode = STP PTS = CTS SC74 **S1** SCZP101 (z9) CTN ID = ITSOPOK z/OS 7/0S Timing mode = STP SC75 SC73 BTS **S2** H40 (z10) CTN ID = ITSOPOK Timing mode = STP Arbite

The topology diagram of our sample configuration has been updated to account for the conversion of the Mixed CTN to an STP-only CTN (Figure 14-15).

Figure 14-15 STP Implementation environment - STP-only CTN, three servers

All servers are now using STP timing mode. Each server has been allocated a role within the STP-only CTN, with the SCZP201 server being both the Preferred Time Server and the Current Time Server at the end of the migration. The SCZP101 server is the Backup Time Server and H40 is the Arbiter.

The CTN ID of all servers is now [ITSOPOK] - [] with only an STP ID defined. The ETR Network ID has been removed and all server ETR ports have been disabled, so there is no longer any connectivity to the Sysplex Timer. This occurs on all servers within the Mixed CTN that had connectivity to the Sysplex Timer at the start of the migration.

Even though all ETR ports on the servers are disabled, leave the ETR links in place for a certain period of time to allow for a back-out plan. Depending on individual change management constraints, the ETR links can be disconnected after a migration back to a Mixed CTN is no longer being considered.

Even when the ETR ports are disabled, the ETR signals of both links are still monitored to be able to perform a reverse migration. Furthermore, disconnecting the links is considered an ETR link failure, and z/OS message IEA393I is posted:

IEA393I ETR PORT n IS NOT OPERATIONAL. THIS MAY BE A CTN CONFIGURATION CHANGE.

#### 14.3.1 z/OS DISPLAY ETR command

Figure 14-16 shows the output from the **DISPLAY ETR** command entered on the SC73 image, on P000STP2.

```
RO *ALL,D ETR
SC74
      RESPONSES ------ (1)
IEA386I 10.34.34 TIMING STATUS
SYNCHRONIZATION MODE = STP
 THIS SERVER IS A STRATUM 1
 CTN ID = ITSOPOK
 THE STRATUM 1 NODE ID = 002097.E26.IBM.02.00000001DE50
 THIS IS THE PREFERRED TIME SERVER
SC75
       RESPONSES ------
                                                            (2)
IEA386I 10.34.34 TIMING STATUS
SYNCHRONIZATION MODE = STP
 THIS SERVER IS A STRATUM 2
 CTN ID = ITSOPOK
 THE STRATUM 1 NODE ID = 002097.E26.IBM.02.00000001DE50
 THIS IS THE BACKUP TIME SERVER
 NUMBER OF USABLE TIMING LINKS = 3
       RESPONSES ------ (3)
SC73
IEA386I 10.34.34 TIMING STATUS
SYNCHRONIZATION MODE = STP
 THIS SERVER IS A STRATUM 2
 CTN ID = ITSOPOK
 THE STRATUM 1 NODE ID = 002097.E26.IBM.02.00000001DE50
 THIS IS THE ARBITER SERVER
 NUMBER OF USABLE TIMING LINKS = 2
```

Figure 14-16 DISPLAY ETR display - SC75 image on SCZP901, STP-only CTN

Note the following information about Figure 14-16:

- (1) SC74 is resident on SCZP201, the PTS. It is a Stratum 1 because it currently is the CTS.
- (2) SC75 is resident on SCZP101, the BTS. It is a Stratum 2 because the CTS function is currently on SCZP201, the PTS.
- (3) SC73 is resident on H40, the Arbiter. It is a Stratum 2.

**Note:** The **DISPLAY ETR** output contains additional lines, depending on whether a BTS and Arbiter are configured:

THIS STP NETWORK HAS NO BACKUP TIME SERVER THIS STP NETWORK HAS NO SERVER TO ACT AS BACKUP

Both messages are displayed if both the BTS and the Arbiter are not configured.

#### 14.3.2 z/OS DISPLAY XCF command

Figure 14-17 shows the output from the z/OS **DISPLAY XCF** command entered on the SC74 image, on SCZP201.

D XCF,S,ALL IXC335I 10.40.23 DISPLAY XCF 874 SYSPLEX PLEX75 SYSTEM TYPE SERIAL LPAR STATUS TIME SYSTEM STATUS SC74 2097 DE50 2C 10/10/2009 10:40:22 ACTIVE TM=STP SC75 2094 991E 1C 10/10/2009 10:40:19 ACTIVE TM=STP SC73 2097 961F 1A 10/10/2009 10:40:17 ACTIVE TM=STP

Figure 14-17 DISPLAY XCF display - SC74 image on SCZP201, STP-only CTN, three servers

All z/OS images are now shown to be resident on servers that are in STP timing mode. Each of these z/OS images is resident on a separate server, as evidenced by the different serial numbers.

#### 14.3.3 System (Sysplex) Time tabs

The tabs discussed in this section are available on the System (Sysplex) time selection for each server. Only the tabs for the SCZP201 server are shown in this section.

#### Timing Network tab

Figure 14-18 shows the Timing Network tab for the SCZP201 server.

ning twork	Network Configuration	ETR Configurat	ion ETR Status	STP Configuration	STP Status	ETS Configuration	so so
Coordinate	d Server Time						H4
ime: 10:1							
ate: 10/1	0/09						
Offsets —							
eap secor		24					
otal time (	hours : minutes):	-4 : 00	ay leader the	and the second	enter desta	1. State States	
Network –						the start	12
	work type:	STP-only					
oordinate TN time s		CTN) ID: ITSOPO	< -			atter a substan	
TP stratur		NTP 2					
ir stratui	in level.	2	and a start of the s	all and the second	eller tagin	and the second	
A divertee	ent Steering	Adjust Time	Adjust Leap Se	conds A	djust Time Zone	A Statistics	

Figure 14-18 Timing Network tab (SCZP201)

This shows that the SCZP201 server is in an STP-only CTN with a CTN ID of [ITSOPOK] - [].

The same information is shown on all servers in the STP-only CTN. However, only the Current Time Server has the Adjust Time, Adjust Leap Seconds, and Adjust Time Zone buttons enabled.

Adjustments of up to 60 seconds may be made to Coordinated Server Time using the steering facility within Adjust Time. See 6.6.2, "Time adjustment" on page 217, for further details.

The CTN time source field indicates that the time source is a Stratum 2 NTP server. This is specified in the ETS Configuration tab (Figure 14-24 on page 374).

Because the STP-only CTN no longer has connectivity to the Sysplex Timer, the leap second offset and the total time offset, set to 24 and -4, respectively, in the example shown in Figure 14-18 on page 369, are now maintained by the Current Time Server.

A migration from a Mixed CTN to an STP-only CTN inherits the time and the total offset from the Sysplex Timer. As shown in Figure 14-18 on page 369, the Timing Network tab displays the total time (hours : minutes) for the offset. This is the time zone information (incorporating a daylight saving time offset, if any) that has been inherited from a Sysplex Timer.

**Note:** For a reverse migration, the leap second offset and local time of day offset are taken from the Sysplex Timer. This means that any changes made after the migration to STP are lost on a reverse migration.

To finalize the Mixed to STP-only migration, a time-zone offset entry *must* be set. Selection of the time zone algorithm must be initiated from SCZP201, because the Adjust Time Zone button is only enabled on the CTS. If a time zone algorithm is not defined following a migration from Mixed CTN to STP-only CTN, it is not possible to schedule the next daylight saving time adjustment. See 2.5.2, "Time-zone offset adjustment" on page 74, for further details.

#### **Network Configuration tab**

Figure 14-19 shows the Network Configuration tab for the SCZP201 server.

ing Network work Configuration		ETR Configuration	ETR Status	STP Configuration	STP Status	ETS Configuration	so
Current Network Configuratio	n ———	10/1	0/00 0:11:0	DM			H4
onfigured at (UTC): referred time server (CPC)	SCZP2	)1 (STP ID: ITSO	10/09 2:11:3: POK)	3 PIVI			
ackup time server (CPC)	SCZP1	)1 (STP ID: ITSO	POK)				
rbiter	H40 (ST	P ID: ITSOPOK)	•				
Only allow the server(s)	specified	above to be in th	e CTN				
Current Time Server (CPC)							
oordinated timing network	ID ITSO	POK					
pply Initialize Time	Decom	figure Ca	uncel Migratio	n to Mixed CTN			

Figure 14-19 Network Configuration tab (SCZP201)

This tab now shows the server roles within the STP-only CTN and indicates which server is the Current Time Server. The CTN ID is also displayed. The same information is shown on all servers in the STP-only CTN.

The Preferred Time Server, Backup Time Server, Arbiter, Current Time Server, and CTN ID fields can all be modified from this tab. However, the modifications are only accepted if they are performed on the server that *is going to become* the CTS after the network reconfiguration is complete.

Modifications performed from the Network Configuration tab are *global* and, as such, are propagated throughout the STP-only CTN.

The CTN ID can be changed to either:

- Specify a different STP ID for the STP-only CTN.
- Define an ETR Network ID that will migrate the STP-only CTN to a Mixed CTN.

**Important:** The Deconfigure button removes all definitions in the STP-only CTN, causing all servers to become unsynchronized. This should be used with extreme caution, and only if absolutely required.

#### **ETR Configuration tab**

Figure 14-20 shows the ETR Configuration tab for the SCZP201 server.

iming letwork	Network Configuration	ETR Configuration	ETR Status	STP Configuration	STP Status	ETS Configuration	SCZI SCZI
ETR network I	D (in decimal	)					H40
- Port 0 State ○Enabled ⊙Disabled ○Off	Port 1 State ○Enabled ⊙Disabled ○Off						
Enabled'.		I only when a valid I ∟ink Error Threshold	ETR network	ID is entered and	the port's ma	nual state is	

Figure 14-20 ETR Configuration tab (SCZP201)

Prior to migration, this tab specified an ETR Network ID of 31. The migration from a Mixed CTN to an STP-only CTN has disabled the ETR ports, and the ETR Network ID has been removed. The new CTN ID is now [ITSOPOK] - [] with only the STP ID part defined.

#### **ETR Status tab**

Figure 14-21 shows the ETR Status tab for the SCZP201 server.

ing work	Network Configuration	ETR Configuration	ETR Status	STP Configuration	STP Status	ETS Configuration	SC:
ETR Status							H40
ttacnment tepping m	control register: 08C4 lode: Local						120
	ng port number: 0	- A. A. D. A.					
		perational				Section States	
ort 1 state	: Semi-o	perational					
ETR Data V	Nord 1 - Port 0					n State State	
	rk ID (in decimal): 31						
	decimal): 0						
TR port ni	umber (in decimal): 0						
	Nord 1 - Port 1						
	rk ID (in decimal): 31	3.4 C.				n an	
	decimal): 1 umber (in decimal): 0						
in poir in							
ETR Card S							1913
ort o statu	s: Light detected s: Light detected						

Figure 14-21 ETR Status tab (SCZP201)

Even though the SCZP201 server has disabled connectivity to the ETR network and has removed the ETR Network ID from the CTN ID, the ETR Status tab retains details of the connected Sysplex Timers until the ETR network is physically disconnected.

If an ETR link failure occurs while in STP-only mode, then z/OS message IEA393I appears (Example 14-1). The purpose is to be able to repair a failing link in case a reverse migration to a Mixed CTN is scheduled.

```
Example 14-1 Message IEA3931
```

TFA393T	FTR	PORT	n	15	NOT	OPERATIONAL	THIS	ΜΔΥ	RF	Α	CTN	CONFIGURATION	CHANGE
1 2/10 2/01	<b>L</b> 1 1 V	1 0111		10	1101		11110			<i>'</i> '	0111		

#### **STP Configuration tab**

Figure 14-22 shows the STP Configuration tab for the SCZP201 server.

ming etwork	Network Configuration	ETR Configuration	ETR Status	STP Configuration	STP Status	ETS Configuration	SCZP SCZP
oordinated	timing network ID 📊	SOPOK					H40
Apply	Save STP Debug Data		and the second				

Figure 14-22 STP Configuration tab (SCZP201)

This shows that the SCZP201 server is in an STP-only CTN with a CTN ID of [ITSOPOK] - [], where ITSOPOK is the STP ID. No ETR Network ID is defined, because connectivity to the ETR network has been fully disabled as a result of the migration.

**Important:** Modification of the STP ID (or the ETR ID) is not permitted on the STP Configuration tab for the Current Time Server.

On other servers in the CTN, the STP Configuration tab allows an STP ID to be modified, but if done from this location, it is a *local* change only, causing this server to transition from the existing STP-only CTN to another STP-only CTN with a different CTN ID.

This is disruptive to z/OS images on this server if they are in a sysplex configuration with z/OS images remaining in the STP-only CTN. XCF detects multiple time sources in the sysplex and begins to remove sysplex members until the situation is resolved.

Modification of the STP ID can only be done nondisruptively from the Network Configuration tab on the Current Time Server, where it is managed as a *global* change.

#### STP Status tab

Figure 14-23 shows the STP Status tab for the SCZP201 server.

ming etwork	Network Configuration	ETR Configuration	ETR Stat	tus C	TP onfiguration	STP Status	ETS Configuration	s
iming state:	Sync	hronized						H
lsable clock s	ource: Yes							
Fiming mode:	STP	(Server Time Pr	rotocol)					
Stratum level:	1							
	ng stratum level: 3							
Maximum STP	version: 4							
– Svstem Inforn	nation		N. C. Starten	19 Stalle				
Local STP	Remote Directly A	ttached System	System	Stratum	Active STP	Maximum STP		
Link Identifier	(s) Type-MFG-Plant-S		Name	Level	Version	Version		
0111,0301	002094-IBM-02-00	0000002991E	SCZP10	12	4	4		
0590	002097-IBM-02-00	0000008961F	H40	2	4	4		
Lenel Heinitie	ized STP Links							-
Local STP	STP Link	Reason Co	aha	Reason C	ode.		e Suid-Afrika e California	
Link Identifier		Sent		Received				
0014	Coupling-peer	Self-couple					~	
0015	Coupling-peer	Self-couple						
001E	Coupling-peer	Link failure						
001F	Coupling-peer	Offline						
0034	Coupling-peer	Self-couple	ed server					
0035	Coupling-peer	Self-couple						
003E	Coupling-peer	Offline						
003F	Coupling-peer	Offline						

Figure 14-23 STP Status tab (SCZP201)

The SCZP201 server is shown to be synchronized in the STP-only CTN as the Stratum 1 server. There are two Stratum 2 servers in the Remote Directly Attached Systems. Each of these servers is Stratum 2 and has connectivity to the SCZP201 server over the coupling facility or timing-only links, as identified by the STP Link Identifiers.

#### **ETS Configuration tab**

Figure 14-24 shows the ETS Configuration for the SCZP201 server.

liming Network	Network Configuration	ETR Configuration	ETR Status	STP Configuration	STP Status	ETS Configuration	sczi sczi
	has the role of Currer on is required. Chang						š
– <i>External T</i> OUse <u>d</u> ia ⊙Use <u>N</u> T	ime Source (ETS) I out if configured on P P with <u>p</u> ulse per seco	the state of the	ment Console				
– <i>External T</i> OUse <u>d</u> ia ⊙Use <u>N</u> T OUse NT	l out if configured on P	the state of the	ment Console				
– External T O Use dia ⊙ Use <u>N</u> T O Use NT – <i>NTP Tim</i> e	l out if configured on P P with <u>p</u> ulse per seco	ond (PPS)	ment Console m Source	Status			
– External T O Use dia ⊙ Use <u>N</u> T O Use NT – <i>NTP Tim</i> e	l out if configured on P P with <u>p</u> ulse per seco <i>Server Information</i> —	ond (PPS)					

Figure 14-24 ETS Configuration tab (SCZP201)

Two NTP time servers have been defined as time sources. Because SCZP201 is the Current Time Server for the STP-only CTN, the selected NTP server is used as the time source for SCZP201.

# 15

# **STP-only to Mixed CTN**

In the scenario in this chapter<sup>1</sup>, our sample configuration is converted from an STP-only CTN to a Mixed CTN by defining the External Timer Reference (ETR) Network ID in the CTN ID.

This is done as a single *global* change, distinct from the scenario described in Chapter 9, "Mixed CTN (ETR timing mode) to ETR Network" on page 281, where the ETR Network ID is defined in the CTN ID of each server as a *local* change.

In this chapter we work through the following sections:

- "Start point" on page 377
- "Migration" on page 383
  - "Defining the ETR Network ID on SCZP201" on page 384
  - "STP-only CTN to Mixed CTN migration in progress" on page 386
- "End point" on page 391

An STP-only CTN can consist of several servers in STP timing mode.

This scenario proceeds to the point that all servers have a CTN ID defined that includes both an STP ID and an ETR Network ID.

The timing mode of each server at the end of the migration depends its their role within the STP-only CTN:

- The Preferred Time Server (PTS) and Backup Time Server (BTS), if defined, have their server ETR ports enabled, and transition to ETR timing mode and become Stratum 1.
- The remaining servers do not have their server ETR ports enabled, and remain in STP timing mode and are either Stratum 2 or Stratum 3, depending on available coupling link connectivity.

<sup>&</sup>lt;sup>1</sup> See "Prerequisites" on page 263.

A migration from an STP-only CTN to a Mixed CTN might take considerable time due to the potential difference in time between the Current Time Server and the Sysplex Timer at the start of the migration. After the migration is selected, the STP facility must steer the Coordinated Server Time (CST) toward the time provided by the Sysplex Timer.

An estimate of how long this steering process will take is provided in a confirmation window. If this time is excessive, the user may decide not to proceed with the migration process at this time. After the migration has started, it can be cancelled at any time. Any steering adjustment to the Current Time Server that has occurred in the interim is retained.

# 15.1 Start point

The starting environment for this scenario is an STP-only CTN with all servers operating in STP timing mode (Figure 15-1).

Figure 15-1 STP Implementation environment - STP-only CTN

The STP-only CTN consists of two servers:

- SCZP201 is the Current Time Server.
- ► SCZP101 is the Backup Time Server.

There is no Arbiter defined.

Each server is connected to the other server in a redundant configuration using multiple coupling links, and each server has a z/OS image and coupling facility defined. There are two coupling links between these servers, as evidenced by the various HMC workplace displays.

This configuration is migrated to a Mixed CTN operating in ETR timing mode.

#### 15.1.1 z/OS DISPLAY ETR command

Figure 15-2 shows the output from the **DISPLAY ETR** command entered on the SC74 image, on SCZP201.

```
RO *ALL.D ETR
SC74
        RESPONSES -----
IEA386I 16.42.46 TIMING STATUS
SYNCHRONIZATION MODE = STP
 THIS SERVER IS A STRATUM 1
 CTN ID = ITSOPOK
 THE STRATUM 1 NODE ID = 002097.E26.IBM.02.00000001DE50
 THIS IS THE PREFERRED TIME SERVER
 THIS STP NETWORK HAS NO SERVER TO ACT AS ARBITER
SC75
        RESPONSES -----
IEA386I 16.42.46 TIMING STATUS
SYNCHRONIZATION MODE = STP
 THIS SERVER IS A STRATUM 2
 CTN ID = ITSOPOK
 THE STRATUM 1 NODE ID = 002097.E26.IBM.02.00000001DE50
 THIS IS THE BACKUP TIME SERVER
 NUMBER OF USABLE TIMING LINKS = 2
 THIS STP NETWORK HAS NO SERVER TO ACT AS ARBITER
```

Figure 15-2 DISPLAY ETR display - SC74 on SCZP201, STP-only CTN

This display shows that z/OS image SC74 is resident on a processor that is both the Preferred Time Server and the Current Time Server, and that z/OS image SC75 is resident on the Backup Time Server. There is no Arbiter in this STP-only CTN.

#### 15.1.2 z/OS DISPLAY XCF command

Figure 15-3 shows the output from the z/OS **DISPLAY XCF** command entered on the SC74 image, on SCZP201.

```
D XCF,S,ALL
IXC335I 16.43.48 DISPLAY XCF 161
SYSPLEX PLEX75
SYSTEM TYPE SERIAL LPAR STATUS TIME SYSTEM STATUS
SC74 2097 DE50 2C 10/03/2009 16:43:47 ACTIVE TM=STP
SC75 2094 991E 1C 10/03/2009 16:43:46 ACTIVE TM=STP
```

Figure 15-3 DISPLAY XCF display - SC74 image on SCZP201, STP-only CTN

This display shows that both z/OS images SC74 and SC75 are operating in STP timing mode. They are resident on separate servers, as evidenced by the different serial numbers.

#### 15.1.3 System (Sysplex) Time tabs

The tabs discussed in this section are available on the System (Sysplex) time selection for each server. Only the tabs for the SCZP201 server are shown in this section.

#### **Timing Network**

Figure 15-4 shows the Timing Network tab for the SCZP201 server. As shown in the Offsets section, the Total time (hours : minutes) field indicates that a time zone offset entry has not yet been set from the Adjust Time Zone Offset window, but has been inherited from a Sysplex Timer during a migration from a Mixed to STP-only CTN. In this instance, the time zone must be set. See 2.5.2, "Time-zone offset adjustment" on page 74 for details.

ming etwork	Network Configuration	ETR Configuration	ETR Status	STP Configuration	STP Status	ETS Configuration
	d Server Time					
	4:45:15 PM 10/3/09					The start
5 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -	(UTC-05:00) Eastern	Time (US & Cana	da) (EST/EDT)			
Currently:						and a subscription
Offsets —						
Leap secor	nd:	24		and the second		
	offset from UTC:	-5:00				
Daylight sa	ving time (hours : min	utes): 1 : 00				
Network -						
Timing net		STP-only CT	N			
	d timing network (CTN					3.4 S. 1991
CTN time s NTP stratu		NTP				
NTP stratu	n level.	2		ale a state		Carlos Carlos
Adjustm	ent Steering A	djust Time	Adjust Leap Secon	ds A	djust Time Zone	

Figure 15-4 Timing Network tab (SCZP201)

This shows that the SCZP201 server is in an STP-only CTN with a CTN ID of [ITSOPOK] - []. The same information is shown on all servers in the STP-only CTN. However, only the Current Time Server has the Adjust Time, Adjust Leap Seconds, and Adjust Time Zone buttons enabled.

The CTN time source field indicates that the time initialization of this CTN is through an NTP server.

Because the STP-only CTN no longer has connectivity to the ETR network, the leap second offset (set to 24) and the total time offset (set to -5) are now maintained by the Current Time Server. These can be modified using the Adjust Leap Seconds and Adjust Time Zone buttons accordingly.

#### **Network Configuration tab**

Figure 15-5 shows the Network Configuration tab for the SCZP201 server.

ning twork	Network Configuration	ETR Configuration	ETR Status	STP Configuration	STP Status	ETS Configuration	S
	etwork Configuration d at (UTC):		10/3/09 7:16:0				
		SCZP201 (STP ID: I	ALCONT PROVIDENCE	J5 P IVI			
Backup tin	ne server (CPC)	SCZP101 (STP ID: I					
Arbiter		Not configured	-				
<u> 23 7 7 68 7</u> 7 7 8 9	llow the server(s) sp configuration	pecified above to be	in the CTN				
⊙ Prefer	Fime Server (CPC) — red time server (CP p time server (CPC						
Coordinate	ed timing network II		-				
Apply	Initialize Time	Deconfigure	Cancel Migratio	n to Mixed CTN			

Figure 15-5 Network Configuration tab (SCZP201)

This tab shows the server roles with the STP-only CTN and indicates which server is the Current Time Server. The CTN ID is also displayed. The same information is shown on all servers in the STP-only CTN.

The Preferred Time Server, Backup Time Server, Arbiter, Current Time Server, and CTN ID fields can all be modified from this tab. However, the modifications are accepted only if they are performed on the server that is *going to become* the CTS after the network reconfiguration is complete.

Modifications performed from the Network Configuration tab are *global* and, as such, are propagated throughout the entire STP-only CTN.

The CTN ID can be changed to either:

- Specify a different STP ID for the STP-only CTN.
- Define an ETR Network ID that will migrate the STP-only CTN to a Mixed CTN.

The Deconfigure button removes all definitions in the STP-only CTN, causing all servers to become unsynchronized.

#### **ETR Configuration tab**

Figure 15-6 shows the ETR Configuration tab for the SCZP201 server.

ming etwork	Network Configuration	ETR Configuration	ETR Status	STP Configuration	STP Status	ETS Configuration	scz scz
TR network I	D (in decimal	)					
Port 0 State -	Port 1 State						
<ul> <li>● <u>D</u>isabled</li> </ul>	⊙ D <u>i</u> sabled						
<u>○O</u> ff	OOţf						
ttention: A po nabled'.	rt can be operation	al only when a valid	ETR network	k ID is entered and	the port's ma	anual state is	
and the second	t ETR Reset	Link Error Threshold					

Figure 15-6 ETR Configuration tab (SCZP201)

As the SCZP201 only is in an STP-only CTN, there is no connectivity to the ETR network, so the ETR Network ID is not defined, and the server ETR ports are disabled.

**Important:** The STP facility does not allow the ETR Network ID to be specified on the ETR Configuration tab of the Current Time Server. Definition of an ETR Network ID to migrate the STP-only CTN to a Mixed CTN can only be done nondisruptively from the Network Configuration tab where it is managed as a *global* change.

#### ETR Status tab

Figure 15-7 shows the ETR Status tab for the SCZP201 server.

iming letwork	Network Configuration	ETR Configuration	ETR Status	STP Configuration	STP Status	ETS Configuration	SCZP20
– ETR Statu							
Stepping n	t control register: 08C4 node: Local						
	ing port number: 0						
Port 0 state Port 1 state		operational operational					1.00
Contraction of the second							
	Word 1 - Port 0 ork ID (in decimal): 31						a de la
ETR ID (in							
EIRportn	umber (in decimal): 0						
	Word 1 - Port 1 ork ID (in decimal): 31						
ETR ID (in							1.00
ETR port n	umber (in decimal): 0						
- ETR Card							
	us: Light detected us: Light detected						
1 on 1 statt	S. Light detected	and the second states of					

Figure 15-7 ETR Status tab (SCZP201)

Even though the SCZP201 server has disabled connectivity to the ETR network and has removed the ETR Network ID from the CTN ID, the ETR Status tab retains details of the connected Sysplex Timers until the ETR network is physically disconnected.

#### **STP Configuration tab**

Figure 15-8 shows the STP Configuration tab for the SCZP201 server.

Timing Network	Network Configuration	ETR Configuration	ETR Status	STP Configuration	STP Status	ETS Configuration	SCZP SCZP
Coordinated	l timing network ID ITS	SOPOK	-				
Apply	Save STP Debug Data						

Figure 15-8 STP Configuration tab (SCZP201)

This shows that the SCZP201 server is in an STP-only CTN with a CTN ID of [ITSOPOK] - [], where ITSOPOK is the STP ID. No ETR Network ID is defined, as connectivity to the ETR network has been disabled.

#### **STP Status tab**

Figure 15-9 shows the STP Status tab for the SCZP201 server.

ming twork	Network Configuration	ETR Configuration	Status C	TP onfiguration	STP Status	ETS Configuration	SC:
iming state:	Sync	chronized					
sable clock s	ource: Yes					Salar Salar	
iming mode:	STP	(Server Time Protocol	)				132
tratum level:	1						120
laximum timin	ig stratum level: 3					Alter and the	19
laximum STP	version: 4						124
System Inform	nation					1000 C	
_ocal STP		ttached System Syste	m Stratum	Active STP	Maximum STP		
	(s) Type-MFG-Plant-			Version	Version		
0111,0301		0000002991E SCZP	101 2	4	4		
the second							120
Local Uninitial							199
	STP Link	Reason Code	Reason C	ode			
_ink Identifier		Sent	Received				12
0014	Coupling-peer	Self-coupled serv					20
0015	Coupling-peer	Self-coupled serv	ver				
001E 001F	Coupling-peer	Link failure					1992
	Coupling-peer	Offline					
0034	Coupling-peer	Self-coupled serv					
0035	Coupling-peer	Self-coupled serv	rer				638
003E 003F	Coupling-peer	Offline					100
	Coupling-peer	Offline				× 1	121/2

Figure 15-9 STP Status tab (SCZP201)

This tab shows that the SCZP201 server is synchronized in the STP-only CTN as the Stratum 1 server. There is a single Stratum 2 server, SCZP101, shown in the Remote Directly Attached Systems. Connectivity from SCZP201 to SCZP101 is over the coupling links, as identified by the STP link identifiers.

#### **ETS Configuration tab**

Figure 15-10 shows the ETS Configuration for the SCZP201 server.

liming Network		vork figuration	ETR Configuration	ETR Status	STP Configuration	STP Status	ETS Configuration	SCZP1
configu the CT	uration is req N.	uired. Changes m					S device, an ETS e time source for	
	같은 프로그램에서 아파 가슴을 걸었어?	ce (ETS) onfigured on Hard	ware Managem	ent Console				
OUse ⊙Use OUse	e <u>d</u> ial out if c e <u>N</u> TP e NTP with <u>p</u>	onfigured on Hard ulse per second (f		ent Console				
OUse ⊙Use OUse − NTP 1	e <u>d</u> ial out if c e <u>N</u> TP e NTP with <u>p</u> <i>Time Server In</i>	onfigured on Hard ulse per second (f	PPS)	ent Console Source	Status			
OUse ⊙Use OUse − NTP 1	e <u>d</u> ial out if c e <u>N</u> TP e NTP with <u>p</u> <i>Time Server In</i>	onfigured on Hard ulse per second (f	PPS)					

Figure 15-10 ETS Configuration tab (SCZP201)

Two NTP time servers have been defined as time sources. These are the two Hardware Management Consoles (HMCs) of the configuration. Both are Stratum 2 NTP servers connected to an external Stratum 1 NTP server, and both have been successfully contacted. Because SCZP201 is the Current Time Server for the STP-only CTN, the selected NTP server is used as the time source for SCZP201.

#### **15.2 Migration**

The migration process for an STP-only CTN to a Mixed CTN involves defining the ETR Network ID in the CTN ID. In this case, the CTN ID changes from [ITSOPOK] - [] to [ITSOPOK] - [31] to match the ETR Network ID transmitted by the Sysplex Timers and displayed in the ETR Status tab (Figure 15-7 on page 381).

Because this is a *global* change affecting the entire CTN, it needs to be done from the Network Configuration tab on the Current Time Server. In the configuration being used, the SCZP201 server is the CTS.

Table 15-1 shows the before and after configuration details.

	Server	CTI	N ID	Server	Timing	Stratum
		STP ID	ETR ID	role	mode	level
Before	SCZP101	ITSOPOK		BTS	STP	2
migration	SCZP201	ITSOPOK		PTS & CTS	STP	1
After	SCZP101	ITSOPOK	31	Not defined	ETR	1
migration	SCZP201	ITSOPOK	31	Not defined	ETR	1

Table 15-1 Server configuration - STP-only CTN to Mixed CTN migration

During the migration process, the STP facility steers the Coordinated Server Time (CST) to the time of the ETR network, and this might take a while. See the *Server Time Protocol Planning Guide*, SG24-7280, for more information about the implications of the ETRDELTA setting.

After the times are aligned, the STP facility adds the ETR Network ID to the CTN ID on all servers and enables the server ETR ports on both the Current Time Server and the Backup Time Server, converting them to ETR timing mode. Both servers transition to Stratum 1. Other servers in the CTN, if any, remain in STP timing mode as either Stratum 2 or Stratum 3, depending on available connectivity.

**Important:** In a migration from an STP-only CTN to a Mixed CTN, only the Preferred Time Server and the Backup Time Server (if defined) have their ETR ports enabled and transition to ETR timing mode.

The Arbiter (if defined) and any other servers in the CTN remain in STP timing mode, because their server ETR ports are not enabled as part of the migration process.

#### 15.2.1 Defining the ETR Network ID on SCZP201

Note that because the CTS role is currently allocated to SCZP201, the migration must be performed from this server.

**Important:** Check whether the ETR ports are enabled and if they are receiving valid time data.

At the HMC workplace, perform the following steps:

- 1. Highlight the SCZP201 server and select System (Sysplex) Time.
- 2. Click the Network Configuration tab.
- 3. Enter the ETR Network ID in the Coordinated Timing Network ID field (Figure 15-11).

ing Netw work Confi	ork guration	ETR Configuration	ETR Status	STP Configuration	STP Status	ETS Configuration	SCZ SCZ
Current Network Cor onfigured at (UTC referred time serve	):	1 P201 (STP ID: ITSC	0/3/09 7:16:0 POK) ▼	5 PM			
ackup time server	(0.0.0)	P101 (STP ID: ITSC	1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1				
rbiter		configured ied above to be in th					
<u>Force configurat</u>	ion		e onn				
Current Time Serve ● Preferred time s ● Backup time served	erver (CPC)						
oordinated timing	network ID IT	SOPOK	- 31				
pply Initialize T	ime De	configure C	ancel Migratior	to Mixed CTN			

Figure 15-11 Network Configuration tab (SCZP201)

 Click Apply. This displays the Migration to Mixed CTN Confirmation, message ACT37354 (Figure 15-12).

Migration to Mixed CTN Confirmation	i
You requested to migrate from an STP-only CTN to a Mixed of This request affects all members of the STP-only CTN. The C Time Server (CPC) will no longer provide the necessary time information to all members of the STP-only CTN. Verify that the network ID portion of the CTN ID you entered is the same as to network ID of the Sysplex Timer that this server (CPC) is control	Current ne ETR the ETR
Do you want to start the migration procedure?	
Yes No	CT37354

Figure 15-12 Message ACT37354 - Migration to Mixed CTN confirmation

5. Click **Yes** to confirm. This displays the Migration to Mixed CTN Confirmation, message ACT39128 (Figure 15-13). This is a second confirmation window that provides an estimate of how long the migration process will take.

Migration to Mixed CTN Confirmation	i
The ETR ports will be enabled and the Sysplex Timer w necessary time information to all members of the Mixed C migration procedure from an STP-only CTN to a Mixed C 37 second(s) to complete.	CTN. The
Do you want to continue with the migration procedure?	
Yes No	ACT39128

Figure 15-13 Message ACT39128 - Migration to Mixed CTN confirmation

 Confirm the migration by clicking Yes. This displays the Migration to Mixed CTN, message ACT39136 (Figure 15-14).

<b>i</b> Migration to Mixed CTN	i
Migration from an STP-only CTN to a Mixed CTN is in p migration procedure runs in the background. Updates to not allowed until this procedure completes. Check Hard Messages or Console Events for the CPC for completion	the CTN are ware
οκ	ACT39136

Figure 15-14 Message ACT39136 - Migration to Mixed CTN in progress

#### 15.2.2 STP-only CTN to Mixed CTN migration in progress

During the migration process, the STP facility steers the Current Time Server to the time of the ETR network, and this might take some time. While the migration is in progress, the Current Time Server continues to provide the time information. Although certain functions are disabled, the CTN still is an STP-only CTN.

The tabs discussed in this section are available on the System (Sysplex) time selection for each server. Only the tabs for SCZP201 are shown.

#### **Timing Network tab**

Figure 15-15 shows the Timing Network tab for the SCZP201 server.

ming etwork	Network Configuration	ETR Configuration		TP onfiguration	STP Status	ETS Configuration
	ated Server Time 30:21 PM				and and a second se The second sec	
Date: 10						
Offsets						
Leap sec Total tim	ond: 2 e (hours : minutes): -4					
- Network						
	etwork type:	STP-only				
CTN time	ted timing network (C source:		 from an STP-o	nly CTN to a l	Mixed CTN	is in progress
	ment Steering	Adjust Time,	Adjust Leap	Seconds	Adjus	t Time Zone,
Adjust	ineni Steering					

Figure 15-15 Timing Network tab (SCZP201)

The Adjust Time, Adjust Leap Seconds, and Adjust Time Zone buttons are no longer enabled. Only the Adjustment Steering button is available. The Adjustment Steering Information window (Figure 15-16) displays the amount of time (seconds) to steer and the estimated finish time for the migration.

- Steering	<b>.</b>
Status:	Steering in progress
Amount (seconds):	-0.000007
Start time (UTC):	10/3/09 9:35:23 PM
Estimated finish time (UTC):	10/3/09 9:35:48 PM
CTN time source:	Migration from an STP-only CTN to a Mixed CTN is in progress

Figure 15-16 Adjustment Steering Information

The amount of time to steer represents the difference between the time at the Sysplex Timer and the Coordinated Server Time at the CTS.

#### **Network Configuration tab**

Figure 15-17 shows the Network Configuration tab for the SCZP201 server.

twork C	etwork onfiguration	ETR Configuration	ETR Status	STP Configuration	STP Status	ETS Configuration	so
Current Network							
Configured at (U Preferred time se	(0.0.0)	2 1201 (STP ID: ITS	0/3/09 9:27:4	12 PM			14
ackup time ser	(000)		Sector Contractor Tol				
	scz	P101 (STP ID: ITS	OPOK)				
rbiter	Not	configured	•				
Only allow th	e server(s) specit	fied above to be in t	he CTN				
Eorce configu	uration						
Current Time Se							
<ul> <li><u>Preferred time</u></li> <li>Backup time</li> </ul>	ne server (CPC)						
	a la constante da ser			and the second		dente filler and and	
coordinated timi	ng network ID 🕅	SOPOK	-				12
Apply Initializ	ze Time De	econfigure C	Cancel Migratio	n to Mixed CTN			
				N is in progress. S			193

Figure 15-17 Network Configuration tab (SCZP201)

During the migration, only the Cancel Migration to Mixed CTN is enabled. The tab reflects an STP-only CTN, because the switch to Mixed CTN only occurs at the end of the migration.

#### **ETR Configuration tab**

Figure 15-18 shows the ETR Configuration tab for the SCZP201 server.

letwork	Network Configuration	ETR Configuration	ETR Status	STP Configuration	STP Status	ETS Configuration
ETR network II <i>Port 0 State -</i> - ⊙Enabled ○Disabled ○Off	D $[31]$ (in decimal Port 1 State $\odot E_nabled$ $\bigcirc D_{isabled}$ $\bigcirc O_{fi}$	)				
Attention: A po Enabled'. Apply Reset		al only when a valid Link Error Threshold	ETR network	k ID is entered and	the port's ma	anual state is

Figure 15-18 ETR Configuration tab (SCZP201)

This tab shows that the SCZP201 server is connected to an ETR network with an ETR Network ID of 16. Both server ETR ports are enabled. A note indicates that a migration procedure from an STP-only CTN to a Mixed CTN in currently in progress.

#### **ETR Status tab**

Figure 15-19 shows the ETR Status tab for the SCZP201 server.

'iming letwork	Network Configuration	ETR Configuration	ETR Status	STP Configuration	STP Status	ETS Configuration
– ETR Status						
Stepping m	control register: 08C4 ode: Loca	見らざん みんじや パンボ クロト に見らざん				
EAF steppi	ng port number: 0					
Port 0 state		i-operational				
		i-operational				
and the second	Vord 1 - Port 0 rk ID (in decimal): 31					
ETR ID (in						
	umber (in decimal): 0	Section and Con-				Caller and Ca
– ETR Data V	Vord 1 - Port 1					
	rk ID (in decimal): 31	$n \in \mathbb{N}^{n}$				en State (1997)
ETR ID (in	decimal): 1 umber (in decimal): 0					
la de sector de la competencia.	and the second					
- ETR Card S	status s: Light detected					
	s: Light detected					
		and and a second second				alter antital a section of the

Figure 15-19 ETR Status tab (SCZP201)

This tab shows that the server ETR port states are operational and the ETR Attachment facility is stepping to port 0. The ETR ID is 0 and the ETR Network ID is 31.

As for the ETR Configuration tab, a note indicates that a migration procedure from an STP-only CTN to a Mixed CTN is currently in progress.

#### **STP Configuration tab**

Figure 15-20 shows the STP Configuration tab for SCZP201. It shows that SCZP201 is still in an STP-only CTN with a CTN ID of [ITSOPOK] - [].

	Configuration	Configuration	Status	Configuration	Status	Configuration
Coordinated ti	ming network ID 🕅	SOPOK				
Apply Sa	ave STP Debug Data					
to: The migre	ation procedure from	an STR only CTN t	a a Mixad C	TN is in prograss 9	omo taek bi	ittens have been

Figure 15-20 STP Configuration tab (SCZP201)

When the STP facility completes steering of the Current Time Server so that it is aligned with the time at the Sysplex Timer, the CTN switches from STP-only to Mixed, and the CTN ID change from [ITSOPOK] - [] to [ITSOPOK] - [31] is propagated in a coordinated manner across all servers. As this occurs, messages are displayed on the console and SYSLOG of z/OS images in a sysplex configuration resident on these servers.

When the CTN ID change occurs, XCF notes that images in the sysplex are using different time sources for synchronization, as evidenced by the different CTN IDs.

In normal circumstances, this is an invalid condition, and z/OS images would be partitioned out of the sysplex to maintain timing integrity for resource sharing and data sharing purposes. To prevent this, XCF has been updated to recognize a global CTN ID change and tolerate the CTN ID mismatch for a short period of time. XCF reports the status so that the user can see each of the systems in the sysplex transition to the new CTN ID (Figure 15-21).

IEA267I ETR PORT O IS NOW AVAILABLE. (1)IEA267I ETR PORT 1 IS NOW AVAILABLE. IEA260I THE CPC IS NOW OPERATING IN ETR MODE. IEA031I STP ALERT RECEIVED. STP ALERT CODE = 25 IEA031I STP ALERT RECEIVED. STP ALERT CODE = OB (2) IXC438I COORDINATED TIMING INFORMATION HAS BEEN UPDATED 514 FOR SYSTEM: SC74 PREVIOUS CTNID: ITSOPOK CURRENT CTNID: ITSOPOK -31 IXC439E ALL SYSTEMS IN SYSPLEX PLEX75 ARE NOT SYNCHRONIZED 517 (3) TO THE SAME TIME REFERENCE. SYSTEM: SC75 IS USING CTNID: ITSOPOK SYSTEM: SC74 IS USING CTNID: ITSOPOK -31 IEA267I ETR PORT O IS NOW AVAILABLE. IEA267I ETR PORT 1 IS NOW AVAILABLE. IEA260I THE CPC IS NOW OPERATING IN ETR MODE. (4)IEA273I TOD CLOCKS DYNAMICALLY ADVANCED TO MAINTAIN ETR SYNCHRONISM. (5) IEA031I STP ALERT RECEIVED. STP ALERT CODE = 25 IEA031I STP ALERT RECEIVED. STP ALERT CODE = OB IXC438I COORDINATED TIMING INFORMATION HAS BEEN UPDATED 946 FOR SYSTEM: SC75 PREVIOUS CTNID: ITSOPOK CURRENT CTNID: ITSOPOK -31 IXC435I ALL SYSTEMS IN SYSPLEX PLEX75 ARE NOW SYNCHRONIZED 518 (6) TO THE SAME TIME REFERENCE. SYSTEM: SC75 IS USING CTNID: ITSOPOK -31 SYSTEM: SC74 IS USING CTNID: ITSOPOK -31

Figure 15-21 SYSLOG messages - S14 image on SCZP201, STP-only to Mixed CTN migration

The following information refers to Figure 15-21:

- (1) IEA267I is issued by each z/OS image in the sysplex on a server in ETR timing mode as the server ETR ports are enabled.
- (2) IXC438I is issued on each z/OS image in the sysplex as the CTN ID changes.
- (3) IXC439E is issued by XCF once per second, whereas z/OS images in the sysplex are not synchronized to the same time reference, as evidenced by the different CTN IDs shown.
- (4) IEA260 is issued by each z/OS image in the sysplex when conversion from STP timing mode to ETR timing mode is complete.
- (5) IEA273I is issued when the server's TOD is aligned to the ETR.
- (6) IXC435I is issued by XCF after the CTN ID mismatch is resolved.

#### 15.3 End point

The topology diagram of our sample configuration has been updated to account for the conversion of the STP-only CTN to a Mixed CTN (Figure 15-22).

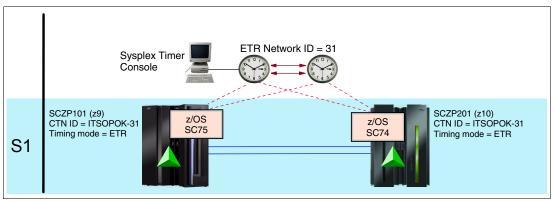


Figure 15-22 STP Implementation environment - Mixed CTN

Both servers are now running in ETR timing mode, because connectivity to the ETR network has been reinstated and server ETR ports enabled. As a result, the SCZP101 server has transitioned to a Stratum 1.

Also, none of the servers have STP roles defined, because these are available only to an STP-only CTN. The CTN ID on all servers has changed from [ITSOPOK] - [] to [ITSOPOK] - [16] with the definition of the ETR Network ID.

#### 15.3.1 z/OS DISPLAY ETR command

Figure 15-23 shows the output from the **DISPLAY ETR** command entered on the S14 image, on SCZP201.

```
RO *ALL.D ETR
SC74
       RESPONSES ------
IEA282I 18.48.27 TIMING STATUS 528
SYNCHRONIZATION MODE = ETR
 CPC PORT 0 <== ACTIVE CPC PORT 1
 OPERATIONAL
                          OPERATIONAL
 FNABLED
                         ENABLED
 ETR NET ID=31
                         ETR NET ID=31
 ETR PORT=00
                         ETR PORT=00
 ETR ID=00
                          ETR ID=01
 THIS SERVER IS PART OF TIMING NETWORK ITSOPOK -31
       RESPONSES ------
SC75
IEA282I 18.48.27 TIMING STATUS 953
SYNCHRONIZATION MODE = ETR
 CPC PORT 0 <== ACTIVE
                          CPC PORT 1
 OPERATIONAL
                          OPERATIONAL
 ENABLED
                          ENABLED
 ETR NET ID=31
                         ETR NET ID=31
 ETR PORT=01
                         ETR PORT=01
                          ETR ID=00
 ETR ID=01
 THIS SERVER IS PART OF TIMING NETWORK ITSOPOK -31
```

Figure 15-23 DISPLAY ETR display - S14 on SCZP201, Mixed CTN in ETR timing mode

This display shows that both z/OS images SC74 and SC75 are now running in ETR timing mode connected to an ETR network with an ETR Network ID of 31. They are also shown to be part of a Mixed CTN through display of the CTN ID of [ITSOPOK] - [31].

#### 15.3.2 z/OS DISPLAY XCF command

Figure 15-24 shows the output from the z/OS **DISPLAY XCF** command entered on the S14 image, on SCZP201.

```
D XCF,S,ALL
IXC335I 18.49.36 DISPLAY XCF 531
SYSPLEX PLEX75
SYSTEM TYPE SERIAL LPAR STATUS TIME SYSTEM STATUS
SC75 2094 991E 1C 10/03/2009 18:49:33 ACTIVE TM=ETR
SC74 2097 DE50 2C 10/03/2009 18:49:35 ACTIVE TM=ETR
```

Figure 15-24 DISPLAY XCF display - S14 on SCZP201, Mixed CTN

Both z/OS images are now shown to be resident on servers that are in ETR timing mode. Each of these z/OS images is resident on a separate server, as evidenced by the different serial number.

#### 15.3.3 System (Sysplex) Time tabs

When the migration is finished, the System (Sysplex) Time task tabs reflect information applicable to a Mixed CTN. Only the tabs for the SCZP201 server are shown.

#### **Timing Network tab**

Figure 15-25 shows the Timing Network tab for the SCZP201 server.

ning twork	Network Configuration	ETR Configuration	ETR Status	STP Configuration	STP Status	ETS Configuration	scz
	ed Server Time						
ime: 6:38 ate: 10/3							
ate. 10/3	3/09						
Offsets — eap seco	nd: 24						
	(hours : minutes): -4 : 00						
Network -							
	work type:	Mixed CTN					
	ed timing network (CTN) ID		and the second				
TN time :	source:	Sysplex Timer con	nection				

Figure 15-25 Timing Network tab (SCZP201)

The timing network type is Mixed CTN and the Coordinated Timing Network (CTN) ID is [ITSOPOK] - [31]. The CTN time source is a Sysplex Timer connection. The Adjustment buttons are no longer displayed.

**Note:** The leap second offset and local time of day settings are not propagated from the STP setting. The values specified on the Sysplex Timer are used.

#### **Network Configuration tab**

Figure 15-26 shows the Network Configuration tab for the SCZP201 server. When the migration is complete, SCZP201 is in a Mixed CTN. Server roles are not configured. Only the Apply button is enabled to allow a future conversion to STP-only CTN to proceed.

ming twork	Network Configuration	ETR Configura	tion ETR Status	STP Configuration	STP Status	ETS Configuration
Configured	etwork Configuration					
Preferred t	ime server (CPC)	Not configured		-		
Backup tin	ne server (CPC)	Not configured		-		
Arbiter		Not configured		<b>-</b>		
A State State States	low the server(s) : configuration	specified above to I	be in the CTN			
Operation	Time Server (CPC) red time server (C p time server (CP)	Sale of the second s				
Coordinate	ed timing network		- 31	]		
Apply	Initialize Time	Deconfigure	Cancel Migra	tion to Mixed CTN		

Figure 15-26 Network Configuration tab (SCZP201)

#### **ETR Configuration tab**

Figure 15-27 shows the ETR Configuration tab for the SCZP201 server.

			10100000000000000000000000000000000000
			San In
1	en a valid ETR netwo	en a valid ETR network ID is entered and the	en a valid ETR network ID is entered and the port's manual state

Figure 15-27 ETR Configuration tab (SCZP201)

This tab shows that the SCZP201 server is connected to an ETR network with an ETR Network ID of 31. Both server ETR ports are enabled.

#### **ETR Status tab**

Figure 15-28 shows the ETR Status tab for the SCZP201 server.

liming Network	Network Configuration	ETR Configuration	ETR Status	STP Configuration	STP Status	ETS Configuration	SC:
- ETR Statu:	Word t control register: C8C7						
Stepping n		tepping					
	ng port number: 0						
Port 0 state Port 1 state							
ETD Data	Word 1 - Port 0						
	ork ID (in decimal): 31						12
ETR ID (in							
EIRporth	umber (in decimal): 0						
	Word 1 - Port 1	12932 BASE					
ETR ID (in		and all the					
ETR port n	umber (in decimal): 0						
- ETR Card	Status					in the states	
	is: Light detected						
Port 1 statt	is: Light detected						1 1030

Figure 15-28 ETR Status tab (SCZP201)

This tab shows that the server ETR port states are operational and the server is synchronized to the ETR attached to server ETR port 0. This ETR has an ETR ID of 0 and is in an ETR network with an ETR Network ID of 31.

#### **STP Configuration tab**

Figure 15-29 shows the STP Configuration tab for the SCZP201 server.

iming etwork	Network Configuration	ETR Configuration	ETR Status	STP Configuration	STP Status	ETS Configuration	SCZ SCZ
Coordinated	timing network ID 🕅	SOPOK	- 31				
Apply	Save STP Debug Data						1 Mary

Figure 15-29 STP Configuration tab (SCZP201)

This shows that SCZP201 is in a Mixed CTN with a CTN ID of [ITSOPOK] - [31], where ITSOPOK is the STP ID, and 31 is the ETR Network ID.

#### **STP Status tab**

Figure 15-30 shows the STP Status tab for the SCZP201 server.

	Network Configuration	ETR Configuration Sta	R Si atus Co	P onfiguration	STP Status	ETS Configuration
ning state:	Syn	chronized				
able clock s	ource: Yes	i te da la secta de la sec				
ning mode:	ETF	R (External Time Referen	ce)			
atum level:	1					
ximum timir	ng stratum level: 3					
ximum STP	version: 4					
System Inforn	nation					
ocal STP		Attached System System	Stratum	Active STP	Maximum STP	
nk Identifier	(s) Type-MFG-Plant			Version	Version	
111,0301	002094-IBM-02-0	00000002991E SCZP1	01 1	4	4	
	lead of D Lieles					
ocal STP	Ized STP Links ——— STP Link	Reason Code	Reason C	aha	and the set of the second second	Carlotta Charles Carlos
nk Identifier		Sent	Received	oue		
	Coupling-peer	Self-coupled serve	r			~
J14	Coupling-peer	Self-coupled serve				
014 015						
		Link failure				
015	Coupling-peer Coupling-peer	Link failure Offline				
015 01E	Coupling-peer		r			
015 01E 01F	Coupling-peer Coupling-peer	Offline				
015 01E 01F 034	Coupling-peer Coupling-peer Coupling-peer	Offline Self-coupled serve				

Figure 15-30 STP Status tab (SCZP201)

This tab shows that the SCZP201 server is in a Mixed CTN and is time synchronized. It is operating in ETR timing mode and is therefore a Stratum 1, because it has connectivity to the ETR network.

SCZP201 has a single Remote Directly Attached System, SCZP101, which is also a Stratum 1, and therefore is also in ETR timing mode. Connectivity of SCZP201 to SCZP101 is through the coupling links identified in the Local STP Link Identifiers column.

#### **ETS Configuration tab**

Figure 15-31 shows the ETS Configuration for the SCZP201 server.

Network		vork figuration	ETR Configuration	ETR Status	STP Configuration	STP Status	ETS Configuration	SCZP2
- Note -	PC cannot a	utomatically beco	me the Current	Time Server for	r an STP-only (	TN An ETS c	onfiguration is not	
required	I. Changes	made to the ETS of Time Server for a	configuration ar	e saved and are				
11-16- 26-18- 19-19-19-19-19-19-19-19-19-19-19-19-19-1				- IN.				
	al Time Sour dial out if c	onfigured on Hardv	vare Managem	ent Console				
⊙Use	- Contract Contract Pro-							
OUse	NTP with p	ulse per second (F	PS)					
		formation —		0	Status			
1	me Server Ir Confiaured		Stratum	Source				
1		NTP Time Server 9.12.6.48	Stratum	Source 132.163.4.101				
Select	Configured	NTP Time Server			Success			

Figure 15-31 ETS Configuration tab (SCZP201)

Two NTP time servers have been defined as time sources, in case SCZP201 ever becomes the Current Time Server for an STP-only CTN. These are the two HMCs of the configuration. Both are Stratum 2 NTP servers connected to an external Stratum 1 NTP server, and both have been successfully contacted. However, SCZP201 now is not defined as a Preferred Time Server or as a Backup Time Server to the CTN, so the ETS configuration is not used. The time source of the CTN now is the ETR.





### **Appendixes**

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## Α

# POR of a server in an STP-only CTN

This appendix documents IBM-recommended best practices for the power-on-reset (POR) of a server in an STP-only CTN. Following these recommendations ensures that the impact for systems running on the other servers is kept to a minimum and the optimum level STP recovery capability is maintained.

When there are four or more servers, STP recovery functionality should not be impacted because the STP role of the server being POR'ed can be reassigned, provided the required connectivity exists via coupling or timing only links.

If the STP-only CTN consists of exactly three servers, STP recovery functionality will be impacted by the temporary removal of one of the servers. In this case the recommended STP-only configuration that has a PTS, BTS and Arbiter cannot be maintained. As the Arbiter role must be removed, Arbiter-assisted recovery will not be available while one of the servers is down.

In a two-server CTN there will be no BTS available to take over if the PTS/CTS fails. However, in this case all systems will fail because the only remaining server has failed.

The steps for the POR of a server in an STP-only CTN make the following assumptions:

- ► The server has at least one CF LPAR. If this is not the case for your planned server maintenance, the CF-related steps are not required.
- There was no change to the CF definition in the CFRM policy and the same links and control units are to be used to access the CFs. This means the logical state of the paths after the POR will be OFFLINE.
- The BTS role has been assigned in a two-server STP-only CTN. However, the actions for the BTS remain valid when performed on the non-PTS server.
- ► The BTS and Arbiter roles have been assigned in a three-or-more server STP-only CTN.
- The STP configuration will be saved across the POR by selecting Only allow the server(s) specified above to be in the CTN on the Network Configuration panel. This is only allowed for one- or two-server CTNs but is incorporated in the POR procedures for three-or-more server CTNs.

**Note:** When the first server in an STP-only CTN is activated after a site shutdown, the STP configuration is restored and the STP time is taken from the support element (SE). This means it is critical to ensure that the SE time is correct before activating the first server when all servers are being POR'ed.

The suggested steps for server POR actions for the followng procedures will be shown in the following sections:

- Procedure 1: POR of the server in a single-server STP-only CTN
- Procedure 2: POR of a server in a two-server STP-only CTN
- Procedure 3: POR of a server in a three-or-more server STP-only CTN
- Procedure 4: POR of all servers in a two-server STP-only CTN
- Procedure 5: POR of all servers in a three-or-more server STP-only CTN

**Restriction:** New safeguards for STP role servers that prevent a disruptive action being taken for PTS, BTS or Arbiter change how the "Only allow the server(s) specified above to be in the CTN" button is used because it requires that a BTS is assigned in a two-server CTN. This means that the BTS server has to be removed from the CTN when the BTS role is removed to allow the "Only allow the server(s) specified above to be in the CTN" button to be selected when the PTS is POR'ed.

#### Procedure 1: POR of the server in a single-server STP-only CTN

The following steps document the suggested procedure to POR the server in a single-server STP-only CTN. The steps taken assume that the "Only allow the server(s) specified above to be in the CTN" button on the Network Configuration panel is selected.

- 1. Shut down z/OS systems and deactivate all z/OS and CF LPARs.
- Select the "Only allow the server(s) specified above to be in the CTN" button on the Network Configuration panel should be selected. To cause the STP configuration to be saved across the POR.
- 3. Ensure that the time on the SE is accurate. The SE time will be used to initialize the STP time when the PTS server is activated.
- 4. Perform the POR.
- 5. Check the server status via the STP status pane to ensure that the server timing state is synchronized.
- 6. Reactivate all z/OS and CF LPARs.
- 7. IPL the z/OS systems.

#### Procedure 2: POR of a server in a two-server STP-only CTN

The following steps document the suggested procedure to POR a server in a two-server STP-only CTN.

Quiesce all work on z/OS images that reside on the CPC being POR'ed. Remove z/OS
images from the sysplex using V XCF,sysname,OFFLINE. Ensure that all systems on the
server being POR'ed are not active in the sysplex.

- 2. If there is a CF LPAR on the server being POR'ed, move the CF structures to a CF on the other server. This ensures that systems running on the other server are not impacted. The CF structures are moved via the XCF MAINTMODE and REALLOCATE commands. The following commands are used to move the CF structures from CFA:
  - a. SETXCF START, MAINTMODE, CFNAME=CFA
  - b. D XCF, REALLOCATE, TEST
  - c. SETXCF START, REALLOCATE
  - d. D XCF,CF,CFNAME=CFA and check for structures that did not move
    - D XCF, REALLOCATE, REPORT
    - SETXCF START, REBUILD, STRNAME=strname, LOC=OTHER
- 3. Vary paths to the CFs on the server being POR'ed offline from all systems in the sysplex:

V PATH(CFA,xx,CFA,yy),OFFLINE,UNCOND

The paths used by the CF are part of the D XCF,CF,CFNAME=CFA output. Taking the paths offline causes the z/OS systems to take the CHPIDs connected to the CFs logically offline.

- 4. Issue the SHUTDOWN command via the CF OPERMSG console and deactivate the CF LPARs. Issuing the SHUTDOWN command ensures that all CF structures have been moved so that the CF LPARs can be deactivated safely.
- 5. If the PTS/CTS is being POR'ed, perform the following steps via the Network configuration panel on the server that is the current BTS:
  - Unselect the "Only allow the server(s) specified above to be in the CTN" button.
  - Assign the PTS role to the server that is the current BTS.
  - Remove the BTS role.
- 6. If the BTS is being POR'ed, perform the following steps via the Network configuration panel on the server that is the PTS:
  - Unselect the "Only allow the server(s) specified above to be in the CTN" button.
  - Remove the BTS role.
- 7. Perform the POR.
- 8. Confirm that the STP link status for links from this server are initialized. Verify that there are at least two initialized STP links between the two servers.
- Use the Network configuration panel to revert back to the original assignments for PTS/CTS and BTS and to select the "Only allow the server(s) specified above to be in the CTN" button.
- 10. Reactivate all z/OS and CF LPARs.
- 11. Vary the paths to the CFs online from all systems in the sysplex. Because there were no link configuration changes, the paths will be offline for the z/OS systems on the other server that remained active.
- 12. Move the CF structures back to the CFs on the POR'ed server. This is done via the XCF MAINTMODE and REALLOCATE commands:
  - SETXCF STOPT, MAINTMODE, CFNAME=CF7A
  - SETXCF START, REALLOCATE
  - D XCF, REALLOCATE, REPORT
- 13.IPL the z/OS systems.

#### Procedure 3: POR of a server in a three or more-server STP-only CTN

The following steps document the suggested procedure to POR a server in a three or more-server STP-only CTN.

- Quiesce all work on z/OS images that reside on the CPC being POR'ed. Remove z/OS
  images from the sysplex using V XCF,sysname,OFFLINE. Ensure that all systems on the
  server being POR'ed are not active in the sysplex.
- If there is a CF LPAR on the server being POR'ed, move the CF structures to a CF on another server. This ensures that systems running on the other server are not impacted. The CF structures are moved via the XCF MAINTMODE and REALLOCATE commands. The following commands are used to move the CF structures from CFA:
  - a. SETXCF START, MAINTMODE, CFNAME=CFA
  - b. D XCF, REALLOCATE, TEST
  - c. SETXCF START, REALLOCATE
  - d. D XCF,CF,CFNAME=CFA and check for structures that did not move
    - D XCF,REALLOCATE,REPORT
    - SETXCF START, REBUILD, STRNAME=strname, LOC=OTHER
- 3. Vary paths to the CFs on the server being POR'ed offline from all systems in the sysplex:

V PATH(CFA,xx,CFA,yy),OFFLINE,UNCOND

The paths used by the CF are part of the D XCF,CF,CFNAME=CFA output. Taking the paths offline causes the z/OS systems to take the CHPIDs connected to the CFs logically offline.

- Issue the SHUTDOWN command via the CF OPERMSG console and deactivate the CF LPARs. Issuing the SHUTDOWN command ensures that all CF structures have been moved so that the CF LPARs can be deactivated safely.
- 5. If the server has an STP special role assigned (PTS, BTS, or Arbiter) the role should be either reassigned or removed.
- 6. Perform the POR.
- Confirm that the STP link status for links from this server is initialized and the server has the expected stratum level via the STP status panel. We suggest the following best practices for STP connectivity:
  - There are at least two initialized STP links between the two servers.
  - There should be at least two attached servers.
  - If the server will become an STP special role server in step 8, ensure that the STP links to the other two servers that will have STP special roles are initialized.
  - If the server is a Stratum 2, ensure that it has at least two links to the server that will become the BTS in step 8.
- 8. Use the Network configuration panel to revert back to the original assignments for PTS/CTS and BTS.
- 9. Reactivate all z/OS and CF LPARs.
- 10. Vary the paths to the CFs online from all systems in the sysplex. Because there were no link configuration changes, the paths will be offline for the z/OS systems on the other server that remained active.

- 11.Move the CF structures back to the CFs on the POR'ed server. This is done via the XCF MAINTMODE and REALLOCATE commands:
  - SETXCF STOPT, MAINTMODE, CFNAME=CF7A
  - SETXCF START, REALLOCATE
  - D XCF, REALLOCATE, REPORT

12.IPL the z/OS systems.

#### Procedure 4: POR of both servers in a two-server STP-only CTN

The following steps document the suggested procedure to POR both servers in a two-server STP-only CTN.

- 1. Shut down z/OS systems and deactivate all z/OS and CF LPARs.
- 2. Unselect the "Only allow the server(s) specified above to be in the CTN" button via the Network Configuration panel. This needs to be done so that the BTS role can be removed and must be performed via the server that is the PTS/CTS.
- 3. Remove the BTS role because a server with a special role cannot be deactivated.
- 4. Deactivate the server that had the BTS role. This will allow the PTS/CTS to be POR'ed because it will not have any initialized STP links.
- Select Only allow the server(s) specified above to be in the CTN via the Network Configuration panel. This causes the single-server STP configuration to be saved across the POR.
- 6. Ensure that the time on the SE is accurate. The SE time will be used to initialize the STP time when the PTS server is activated.
- 7. Perform the POR of the PTS server. This server must be activated first because it is assigned as the PTS/CTS in the saved STP configuration.
- 8. Check the server status via the STP status panel to verify that the server timing state is synchronized.
- Unselect the "Only allow the server(s) specified above to be in the CTN" button via the Network Configuration panel. This will allow the server that had the BTS role to join the CTN.
- 10. Activate the server that had the BTS role. An Activate is required since the server was Deactivated in Step 4.
- 11. Verify that there are at least two initialized STP links between the two servers.
- 12. Assign the BTS role. The IBM recommendation is to always assign a BTS to avoid a single point of failure.
- 13.Select **Only allow the server(s) specified above to be in the CTN** via the Network Configuration panel.
- 14. Reactivate all z/OS and CF LPARs.
- 15.IPL the z/OS systems.

#### Procedure 5: POR of all servers in a three or more-server STP-only CTN

The following steps document the suggested procedure to POR all servers in a three or more-server STP-only CTN. The steps taken use the "Only allow the server(s) specified above to be in the CTN" button via the Network Configuration panel so that the STP configuration is saved when the last server is POR'ed.

- 1. Shut down z/OS systems and deactivate all z/OS and CF LPARs.
- 2. Remove the BTS and Arbiter roles via the Network Configuration panel.
- Deactivate all servers except the PTS. This will allow the "Only allow the server(s) specified above to be in the CTN" button on the Network Configuration panel to be selected.
- Select Only allow the server(s) specified above to be in the CTN on the Network Configuration panel .This causes the single-server STP configuration to be saved across the POR.
- 5. Ensure that the time on the SE is accurate. The SE time will be used to initialize the STP time when the PTS server is activated.
- 6. Perform the POR of the PTS server. This server must be activated first because it is assigned as the PTS/CTS in the saved STP configuration.
- 7. Check the server status via the STP status panel to verify that the server timing state is synchronized.
- 8. Unselect the "Only allow the server(s) specified above to be in the CTN" button on the Network Configuration panel. This will allow the other servers to join the CTN.
- 9. Activate the other servers. An Activate is required because the servers were Deactivated in Step 2.
- 10. Confirm that the STP link status for each server is initialized and the server has the expected stratum level via the STP status panel. IBM recommends the following best practices for STP connectivity:
  - There are at least two initialized STP links between the two servers.
  - There should be at least two attached servers.
  - If the server will become an STP special role server in Step 11, ensure that the STP links to the other two servers that will have STP special roles are initialized.
  - If the server is a Stratum 2, ensure that it has at least two links to the server that will become the BTS in Step 10.
- 11.Assign the BTS role and Arbiter roles. The IBM recommendation is to always assign a BTS to avoid a single point of failure and to assign an Arbiter for STP recovery.
- 12. Reactivate all z/OS and CF LPARs.
- 13.IPL the z/OS systems.

## Β

### How to draw a CTN topology

As part of the planning process, it is important that a graphic depiction of the Coordinated Timing Network (CTN) topology be drawn up and made available to systems programmers and operations staff who are responsible for Parallel Sysplex time-related tasks.

Having an understanding and image of the CTN topology at the channel path identifier (CHPID) level is useful not only for informational purposes, but also for recovery and last path validation, for example.

This appendix provides general instructions about how to compile the information necessary to draw up a basic diagram for a given CTN topology. We assume that the diagram will be updated periodically because the CTN configuration (what Central Processor Complexes (CPCs) participate in the CTN) and link information (coupling links or timing links) change over time.

#### Introduction

The process to draw a CTN topology comprises the following steps:

- 1. Identifying the CPCs that will participate in the CTN.
- 2. Compiling the CHPID and physical channel identifier (PCHID) information from Hardware Configuration Definition (HCD).
- 3. Sketching the CTN topology diagram.

The logical flow of this process is described in detail in Figure B-1.

```
Identify CECs
Identify active IODF and enter HCD
FOR each processor
. .FOR each channel subsystem
. . .FOR each CHPID of interest
. . . .Gather PCHID and connectivity information
. . .ENDFOR
. .ENDFOR
ENDFOR
Sketch CTN diagram
```

Figure B-1 Basic logic flow to draw a CTN topology diagram

Figure B-2 on page 409 shows a completed topology diagram for a sample CTN configuration. This diagram is referenced in the following sections to describe the steps involved in compiling the information necessary to arrive at the final diagram shown.

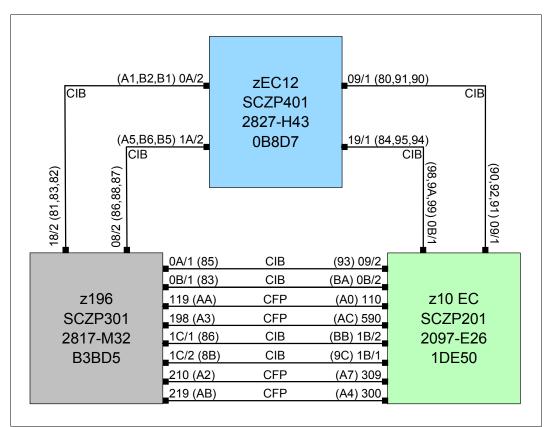


Figure B-2 Sample completed CTN topology diagram

#### Step 1: Identifying CPCs participating in CTN

As part of the planning process, it is necessary to determine all the CPCs that will participate in the CTN configuration. As shown in Table B-1, there are three CPCs in the sample CTN configuration.

CEC	Model type
SCZP201	z10 EC
SCZP301	z196
SCZP401	zEC12

Table B-1 CPC Information for Sample CTN

#### Step 2: Identifying an active IODF

Once the participating CPCs have been identified, the next step is to gather the CHPID and PCHID from the HCD. However, the input provided to HCD is an Input/Output Definition File (IODF), and the correct IODF file must be identified prior to entering HCD.

**Note:** A production IODF defines one or more valid I/O configurations, which can be activated dynamically or selected during IPL. Although you can build multiple production IODFs, only the one that is selected during IPL or activated during dynamic configuration is the *active* production IODF.

#### z/OS commands

z/OS provides several commands to assist in identifying the IODF that is in effect. Use the DISPLAY IOS,CONFIG command to display IOS-related configuration information.

As shown in Figure B-3, the second line indicates that IODF file SYS6.10DF06 is active on this system. If it is necessary to identify the volume upon which the IODF exists, issue DISPLAY IPLINFO.

```
IOS506I 15.35.17 I/O CONFIG DATA 762

ACTIVE IODF DATA SET = SYS6.IODF06

CONFIGURATION ID = L06RMVS1 EDT ID = 01

TOKEN: PROCESSOR DATE TIME DESCRIPTION

SOURCE: SCZP401 12-09-05 17:56:49 SYS6 IODF06

ACTIVE CSS: 0 SUBCHANNEL SETS CONFIGURED: 0, 1, 2

CHANNEL MEASUREMENT BLOCK FACILITY IS ACTIVE
```

Figure B-3 z/OS DISPLAY IOS, CONFIG command

As shown in Figure B-4, the next-to-last line indicates that the IODF resides on a device with a unit address of C730. Run the following command:

DISPLAY U,,,C730,1

```
IEE254I 15.37.54 IPLINFO DISPLAY 765

SYSTEM IPLED AT 15.24.36 ON 09/16/2012

RELEASE z/OS 01.13.00 LICENSE = z/OS

USED LOADO1 IN SYSO.IPLPARM ON 0C730

ARCHLVL = 2 MTLSHARE = N

IEASYM LIST = XX

IEASYS LIST = (00) (0P)

IODF DEVICE: ORIGINAL(0C730) CURRENT(0C730)

IPL DEVICE: ORIGINAL(09602) CURRENT(09602) VOLUME(Z1DRE1)
```



As shown in Figure B-5, and using the information from Figure B-3, it can be determined that IODF file SYS6.IODF06 resides on 3390 DASD with a volume serial of IODFPK.

IEE457I 15.40.03	UNIT STATUS 767	
UNIT TYPE STATUS	VOLSER	VOLSTATE
C730 3390 A	IODFPK	PRIV/RSDNT

Figure B-5 z/OS DISPLAY U,,,C730,1 command

**Note:** Each CPC can possibly be defined to separate IODFs (for example, this is plausible in a multisite CPC configuration). In that event, it may be necessary to repeat the z/OS commands on each CPC to ensure that the correct IODF information is gathered.

To obtain CPC-related information, issue the DISPLAY M=CPU command on each CEC that will participate in the CTN configuration.

As shown in Figure B-6, note that the CPC ND informational line identifies the processor type (2827), model (H43), and serial number (0000000B8D7).

IEE174I 15.42.10 DISPLAY M 769 PROCESSOR STATUS
ID CPU SERIAL
00 + 01B8D72827
01 + 01B8D72827
02 +A 01B8D72827
03 +A 01B8D72827
04 +I 01B8D72827
05 +I 01B8D72827
06 -
07 -
CPC ND = 002827.H43.IBM.02.0000000B8D7
CPC SI = 2827.719.IBM.02.0000000000B8D7
Model: H43
CPC ID = 00
CPC NAME = SCZP401
LP NAME = $A01$ LP ID = $1$
CSS ID = 0
MIF ID = 1

Figure B-6 z/OS DISPLAY M=CPU command

#### Step 3: HCD - Specifying IODF file

In the sample CTN configuration (Table B-1 on page 409), three CPCs are defined. This section describes the sequence of HCD panels to navigate for a single CPC, SCZP301, and for a single CHPID. To obtain the information for the other CPCs, repeat the steps once per CPC (and per IODF, if there is more than one IODF that must be explored).

1. With the IODF file information known, enter HCD, which displays the panel shown in Figure B-7.

z/OS V1.13 HCD Command ===>				
Hardware Configuration				
Select one of the following.				
<ul> <li>D. Edit profile options and policies</li> <li>Define, modify, or view configuration data</li> <li>Activate or process configuration data</li> <li>Print or compare configuration data</li> <li>Create or view graphical configuration report</li> <li>Migrate configuration data</li> <li>Maintain I/O definition files</li> <li>Query supported hardware and installed UIMs</li> <li>Getting started with this dialog</li> <li>What's new in this release</li> </ul>				
For options 1 to 5, specify the name of the IODF to be used.				
I/O definition file 'SYS6.IODF06' +				

Figure B-7 HCD: main screen

2. Specify the IODF file name in the I/O definition file field (as shown in Figure B-3 on page 410, this is SYS6.IODF06).

3. Select option 1 to define, view, or modify configuration data and press Enter to display another selection panel (Figure B-8).

```
z/OS V1.13 HCD
+----- Define, Modify, or View Configuration Data -----+
     Select type of objects to define, modify, or view data.
      3_ 1. Operating system configurations
             consoles
             system-defined generics
             EDTs
               esoterics
               user-modified generics
         2. Switches
             ports
             switch configurations
               port matrix
         3. Processors
             channel subsystems
               partitions
               channel paths
         4. Control units
         5. I/O devices
         6. Discovered new and changed control units and I/O devices
                   _____
```

Figure B-8 HCD - Define, modify, or view configuration data

#### Step 4: Selecting a processor

To do this task, take these steps:

1. As shown in Figure B-8, select 3 for Processors and press Enter to display the Processor List screen (Figure B-9).

Goto Fil	ter Backu	p Query	Help		
Command ==:	=>		Pro	ocessor List	t Row 1 of 6 More: > Scroll ===> PAGE
Select one or more processors, then press Enter. To add, use F11.					
/ Proc. ID	Type +	Model +	Mode+	Serial-# +	Description
_ ISGSYN	2064	1C7	LPAR		
_ ISGS11	2064	1C7	LPAR		
	2094	S18	LPAR	02991E2094	Danu
	2097	E26	LPAR	01DE502097	Eclipse
7 SCZP301	2817	432	LPAR	0B3BD52817	Gryphon
SCZP401	2827	H43		00B8D72827	•••
**************************************					

Figure B-9 HCD - Processor List view

2. As shown in Figure B-9 on page 414, type a slash (/) next to the SCZP301 processor and press Enter to display a panel that allows actions to be performed against a processor's configuration data.

**Note:** As shown in Figure B-10, HCD provides shortcut action codes (for example, a, r, c, and i) for experienced users. For the purposes of this appendix, the *long way* of selecting actions by number is used throughout this example.

	Backup Query Help
Command ===>	<pre>Backup Query Help  Actions on selected processors+ Select by number or action code and press Enter. 9_ 1. Add like (a) 2. Repeat (Copy) processor configurations (r) 3. Change (c) 4. *Prime serial number (d) 5. Delete</pre>
+-	++

Figure B-10 HCD - Actions on selected processors

#### Step 5: Selecting a channel subsystem

To do this task, take these steps:

- 1. As shown in Figure B-10 on page 415, select 9 to work with the currently attached channel paths and press Enter. A list of channel subsystems displays.
- 2. As shown in Figure B-11, type a slash (/) next to CSS 0 and press Enter to display a screen that allows actions to be performed against the selected channel subsystem.

Goto Backup Query Help									
Channel Subsystem List       Row 1 of 4 More:       >         Command ===>									
Select one or more channel subsystems, then press Enter. To add, use F11.									
Processor ID : SCZP301 Gryphon									
CSS Devices in SS0 Devices in SS1 / ID Maximum + Actual Maximum + Actual / 0 65280 8253 65535 13031 _ 1 65280 8573 65535 13031 _ 2 65280 7950 65535 13031 _ 3 65280 7907 65535 13031	65535       0         65535       0         65535       0         65535       0         65535       0								

Figure B-11 HCD - Channel Subsystem List

**Note:** This step may need to be repeated once for each channel subsystem (CSS) in the list (Figure B-11 on page 416) to ensure that all CHPID/PCHID has been gathered properly.

```
Goto Backup Query Help
          +----- Actions on selected channel subsystems -----+
Command ===>
           Select by number or action code and press Enter.
Select one or
           Repeat (Copy) channel subsystem . . . (r)
Processor ID
              2.
              3.
                 Copy to processor . . . . . . . . . . . (y)
 CSS Devices
              / ID Maximum
              / 0
              6. Work with partitions . . . . . . . . (p)
    65280
_ 1
              7. Work with attached channel paths . . . (s)
    65280
 2
    65280
              8. Work with attached devices . . . . . (u)
 3
    65280
*****
```

Figure B-12 HCD - Actions on selected Channel Subsystem (CSS)

#### Step 6: Displaying the master list of CHPIDs

To display the master list of CHPIDs (Figure B-12 on page 417), select 7 to work with the channel paths attached in CSS 0 and press Enter. A list of channel path IDs (CHPIDs) displays (Figure B-13).

```
Goto Filter Backup Query Help
                                             _____
                          Channel Path List
                                             Filter Mode. More:
                                                                  >
                                            _____ Scroll ===> PAGE
Command ===>
Select one or more channel paths, then press Enter. To add use F11.
Processor ID . . . : SCZP301
                               Gryphon
Configuration mode . : LPAR
Channel Subsystem ID : 0
       PCHID
                      Dyn Entry +
/ CHPID AID/P Type+ Mode+ Sw+ Sw Port Con Mng Description
/ A2
       210 CFP
                 SHR
                                Y
                                    No ISC-3 TESTPLEX to P201
_ A3
       198
            CFP
                                 Y
                                    No ISC-3 TESTPLEX to P201
                 SHR
 83
       18/2 CIB
                 SHR
                                Υ
                                    No 12x-3 TESTPLEX to P401
_
 88
       08/2 CIB
                 SHR
                                Y
                                    No 12x-3 TESTPLEX to P401
 8B
       1C/2 CIB
                 SHR
                                Υ
                                    No 12x (parked) to P201
_
 90
       08/1 CIB
                 SHR
                                Y
                                    No 12x-3 Trainer loop
```

Figure B-13 HCD: Channel path ID (CHPID) List

**Note:** It is possible to filter the CHPIDs that are displayed using the Filter menu, in the action bar, or using the **FILTER** command in the command line.

In this list it you can gather the CHPIDs, together with their PCHIDs (or HCA ID and Port for Infiniband) and Types. If you require more details, for example gather the LPARs that are in the access list of CHPID A2, do the following:

- 1. As shown in Figure B-13, type a slash (/) next to CHPID A2 and press Enter to display a panel that allows actions to be performed against the selected CHPID.
- 2. As shown in Figure B-14, select 7 to view the CHPID definition for CHPID A2 and press Enter. The definition for CHPID A2 displays.

	Backup Query Help + Actions on selected channel paths+
Command ===>	Select by number or action code and press Enter.
Select one or Processor ID	7_ 1. Add like (a)
Configuration Channel Subsy	<ol> <li>Connect CF channel paths (f)</li> <li>Aggregate channel paths (g)</li> </ol>
PCHID / CHPID AID/P	<pre>5. Delete (d) 6. Work with attached control units (s) 7. View channel path definition (v)</pre>
/ A2 210 _ A3 198	8. View connected switches (w) 9. View related CTC connections (k)
****	10. *View graphically       (h)         11. View unused resources       (u)
	* = requires GDDM
	++

Figure B-14 HCD - Actions on selected CHPIDs, view CHPID A2 definition

3. As shown in Figure B-15, further details are displayed for CHPID A2, to see LPARs in the access list press Enter.

```
Goto Filter Backup Query Help
- +------ View Channel Path Definition ------+
С
   Processor ID . . . : SCZP301
                                Gryphon
S
   Configuration mode . : LPAR
   Channel Subsystem ID : 0
Ρ
C |
   Channel path ID . . . . : A2
                             PCHID . . . . . : 210
   Channel path type . . . : CFP
CL
   Operation mode . . . . : SHR
   Managed . . . . . . . . No I/O Cluster . . :
/
  Description . . . . : ISC-3 TESTPLEX to P201
/ |
*
   Dynamic entry switch ID :
   Entry switch ID . . . . :
   Entry port . . . . . . :
   ENTER to continue.
 +------
```

Figure B-15 HCD - View CHPID definition of CHPID A2 to obtain details

4. The View Access List panel opens and displays the LPARs in the access list, as seen in Figure B-16.

```
Goto Filter Backup Query Help
- +------ View Access List -----++
                                          Row 1 of 2
                          _ Scroll ===> PAGE
C | Command ===>
S | The following partitions are in the access list.
P | Channel Subsystem ID : 0
  Channel path ID . . : A2 Channel path type . . : CFP
C
CL
  Operation mode . . . : SHR
  ENTER to continue.
/ 1
/ | CSS ID Partition Name Number Usage Description
 0
      AOD
                  D CF TESTPLEX CF7A
* | 0
       A05
                  5
                      0S
                           TESTPLEX SC74
  _____
```

Figure B-16 HCD - View LPARs in the access list

#### Step 7: Viewing CF CHPID connectivity information

To do this task, use these steps:

1. As shown in Figure B-17, type a slash (/) next to any CHPID and press Enter to display a panel that allows actions to be performed.

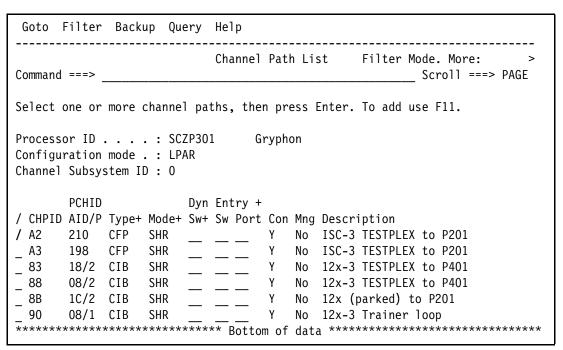


Figure B-17 HCD - CHPID List screen

2. As shown in Figure B-18, select 3 to view a screen that displays a list of coupling facility (CF) CHPID connections and press Enter. The CF connectivity list displays.

```
Goto Filter Backup Query Help
------ Actions on selected channel paths ------+
Command ===>
           Select by number or action code and press Enter.
Select one or
           Processor ID
               Configuration
               3. Connect CF channel paths . . . . . (f)
Channel Subsy
               4. Aggregate channel paths . . . . . (g)
               PCHID
               6. Work with attached control units . . (s)
/ CHPID AID/P
               7. View channel path definition . . . (v)
/ A2
               8. View connected switches . . . . . (w)
     210
     198
               9. View related CTC connections . . . . (k)
Α3
__
************
               10. *View graphically . . . . . . . . (h)
               11. View unused resources . . . . . . (u)
             = requires GDDM
```

Figure B-18 HCD - Actions on selected CHPIDs - Connect CF path option

 As shown in Figure B-19, it can be determined that CHPID A2 of CPC SCZP301 connects to CHPID A7 of CPC SCZP201 (CSS 2).

The PCHID that corresponds to CHPID A7 of CPC SCZP201 can be gathered later (Figure B-13 on page 417) when the configuration for SCZP201 is explored.

Goto Filter Backup Query Help CF Channel Path Connectivity List Row 1 of 18 \_\_\_\_\_ Scroll ===> PAGE Command ===> Select one or more channel paths, then press Enter. Source processor ID . . . . : SCZP301 Gryphon Source channel subsystem ID . : 0 Source partition name . . . . : \* -----Destination------CU- -#-/ CHPID CF Type Mode Occ Proc.CSSID CHPID CF Type Mode Type Dev Y CIB SHR N SCZP401.0 B2 Y CIB SHR CFP 7 83 Y CIB SHR N N CIB SHR N SCZP401.0 B6 Y CIB CFP 88 SHR 7 \_ 8B SCZP201.0 9C Y CIB SHR CFP 7 \_ 90 N CIB SHR N SCZP301.1 94 Y CIB SHR CFP 7 Y CFP SHR N Y CFP SHR N Y ICP SHR N A2 SCZP201.2 A7 Y CFP SHR CFP 7 Y CFP Α3 SCZP201.2 AC SHR CFP 7 C0 SCZP301.0 C1 Y ICP SHR CFP 7 C1 Y ICP SHR N Y ICP SHR CFP SCZP301.0 CO 7 Y ICP SHR N Y ICP SHR N Y ICP C2 SCZP301.0 C3 SHR CFP 7 С3 SCZP301.0 C2 Y ICP SHR CFP 7 C4 N ICP SHR N SCZP301.0 C5 Y ICP SHR CFP 7 N ICP C5 Y ICP SHR N SCZP301.0 C4 SHR CFP 7 N ICP SHR N Y ICP SCZP301.0 C7 CFP C6 SHR 7 \_ С7 Y ICP SHR N SCZP301.0 C6 N ICP SHR CFP 7 \_ 63 Y ICP SPAN N SCZP301.0 CA Y ICP SPAN CFP 7 Y ICP SPAN N Y ICP SPAN С9 SCZP301.0 CB CFP 7 Y ICP SPAN N СА SCZP301.0 C8 Y ICP SPAN CFP 7 СВ Y ICP SPAN N SCZP301.0 C9 Y ICP SPAN CFP 7 

Figure B-19 HCD - View CF CHPID Connectivity List

- 4. Use the screen inFigure B-19 to identify CHPIDs of interest, by looking at which CPCs they connect to (remember we are interested in the CPCs listed in Table B-1 on page 409). Gather their connectivity information, their PCHID, and any other details you may want, as described in "Step 6: Displaying the master list of CHPIDs" on page 417. In our case we are interested in the CHPIDs 83, 88, 8B, A2 and A3. All the other CHPIDs are either virtual paths (ICP) or are connected to SCZP301 itself.
- 5. When all CHPID information within this particular channel subsystem has been gathered (in this example, SCZP301 CSS ID 0), return to "Step 5: Selecting a channel subsystem" on page 416, to examine the next channel subsystem of interest and repeat all steps through "Step 7: Viewing CF CHPID connectivity information" on page 420. For example, one might next explore CSS ID 1.
- After exploring all channel subsystems defined within this particular processor, return to "Step 4: Selecting a processor" on page 414 and select another processor of interest. As shown in Table B-1 on page 409, the next processor of interest might be SCZP401.

Repeat all steps between this step and "Step 7: Viewing CF CHPID connectivity information" on page 420 as before.

Upon completion of this compilation process, all information necessary to draw the CTN diagram shown in Figure B-2 on page 409 should have been obtained, as shown in Table B-2. If not, repeat "Step 4: Selecting a processor" on page 414 through Step 8, "Step 7: Viewing CF CHPID connectivity information" on page 420, as necessary, or see the logic flow diagram in Figure B-1 on page 408.

Source				Destination			
Proc.CSSID	PCHID	CHPID	Туре	Proc.CSSID	PCHID	CHPID	Туре
SCZP401.0	09/1	80	CIB	SCZP201.0	09/1	90	CIB
SCZP401.0	09/1	91	CIB	SCZP201.2	09/1	92	CIB
SCZP401.1	09/1	90	CIB	SCZP201.0	09/1	91	CIB
SCZP401.0	0A/2	A1	CIB	SCZP301.3	18/2	81	CIB
SCZP401.0	0A/2	B2	CIB	SCZP301.0	18/2	83	CIB
SCZP401.1	0A/2	B1	CIB	SCZP301.2	18/2	82	CIB
SCZP401.0	19/1	84	CIB	SCZP201.0	0B/1	98	CIB
SCZP401.0	19/1	95	CIB	SCZP201.2	0B/1	9A	CIB
SCZP401.1	19/1	94	CIB	SCZP201.0	0B/1	99	CIB
SCZP401.0	1A/2	A5	CIB	SCZP301.3	08/2	86	CIB
SCZP401.0	1A/2	B6	CIB	SCZP301.0	08/2	88	CIB
SCZP401.1	1A/2	B5	CIB	SCZP301.2	08/2	87	CIB
SCZP301.2	0A/1	85	CIB	SCZP201.0	09/2	93	CIB
SCZP301.2	0B/1	83	CIB	SCZP201.0	0B/2	BA	CIB
SCZP301.3	119	AA	CFP	SCZP201.0	110	A0	CFP
SCZP301.0	198	A3	CFP	SCZP201.2	590	AC	CFP
SCZP301.2	1C/1	86	CIB	SCZP201.0	1B/2	BB	CIB
SCZP301.0	1C/2	8B	CIB	SCZP201.0	1B/1	9C	CIB
SCZP301.0	210	A2	CFP	SCZP201.2	309	A7	CFP
SCZP301.3	219	AB	CFP	SCZP201.0	300	A4	CFP

Table B-2 CHPID mapping

# Sketching the diagram

Use any graphics tool, such as Microsoft Visio, to draw the final CTN diagram using the CHPID/PCHID connectivity information gathered. Figure B-2 on page 409 shows an example of a final CTN diagram.

# **Related publications**

The publications listed in this section are considered particularly suitable for a more detailed discussion of the topics covered in this book.

# **IBM Redbooks publications**

For information about ordering these publications, see "How to get Redbooks publications" on page 427. Note that certain documents referenced here may be available in softcopy only.

- Server Time Protocol Implementation Guide, SG24-7281
- Server Time Protocol Recovery Guide, SG25-7380
- ► IBM zEnterprise EC12 Technical Guide, SG24-8049
- IBM zEnterprise EC12 Technical Introduction, SG24-8050
- IBM zEnterprise 196 Configuration Setup, SG24-7834
- IBM zEnterprise EC12 Configuration Setup, SG24-8034
- IBM zEnterprise 196 Technical Guide, SG24-7833
- IBM System z9 Enterprise Class Technical Guide, SG24-7124
- Getting Started with InfiniBand on System z10 and System z9, SG24-7539
- IBM System z9 Business Class Technical Introduction, SG24-7241
- IBM System z10 Enterprise Class Configuration Setup, SG24-7571
- IBM System z10 Enterprise Class Technical Guide, SG24-7516
- IBM System z10 Enterprise Class Technical Introduction, SG24-7515
- IBM System z10 Business Class Technical Overview, SG24-7632
- IBM System z Connectivity Handbook, SG24-5444
- S/390 Time Management and IBM 9037 Sysplex Timer, SG24-2070

## Other publications

These publications are also relevant as further information sources:

- z/Architecture Principles of Operation, SA22-7832
- zEnterprise EC12 Installation Manual for Physical Planning, GC28-6914
- zEnterprise 196 Installation Manual for Physical Planning, GC28-6897
- zEnterprise 114 Installation Manual for Physical Planning, GC28-6907
- IBM System z10 Business Class Installation Manual for Physical Planning, GC28-6875
- System z10 Enterprise Class Installation Manual for Physical Planning, GC28-6864
- System z10 Processor Resource/Systems Manager Planning Guide, SB10-7153
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- ▶ IBM System z10 Enterprise Class Service Guide, GC28-6866
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- zSeries 890 and 990 Processor Resource/Systems Manager Planning Guide, SB10-7036
- z890 and z990 Support Element Operations Guide Version 1.8.2, SC28-6831
- Hardware Management Console Operations Guide Version 2.12.0, SC28-6919
- zEnterprise System Support Element Operations Guide Version 2.12.0, SC28-6920
- System z CHPID Mapping Tool User's Guide, GC28-6900
- ► Hardware Management Console Operations Guide Version 2.10.1, SC28-6873
- ► Hardware Management Console Operations Guide Version 2.10.0, SC28-6867
- Support Element Operations Guide V2.10.1, SC28-6879
- ► Support Element Operations Guide V2.10.0, SC28-6868
- Planning for the 9037 Model 2, SA22-7233
- ▶ Model 5900 and 4900 ESCON Server Installation and User's Guide, GA22-1082
- ► z/OS MVS Setting Up a Sysplex, SA22-7625
- ► IOCP User's Guide, SB10-7037
- ► Stand-Alone Input/Output Configuration Program User's Guide, SB10-7152
- ▶ Planning for Fiber Optic Links, GA23-0367
- ► Common Information Model (CIM) Management Interfaces, SB10-7154

#### **Online resources**

These websites and URLs are also relevant as further information sources:

- IBM Resource Link http://www.ibm.com/servers/resourcelink/
- Server Time protocol web page

http://www-03.ibm.com/servers/eserver/zseries/pso/stp.html

► GDPS

http://www.ibm.com/systems/z/gdps/

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# Index

# Α

activate 244 Activating an STP-only CTN 1 active IODF 409 ACTS 21 Adjust Leap Second 156, 232 Time 151, 156, 218, 222, 240 time-zone offset 234, 238 Adjust Leap Second offset 232 Adjust Leap Seconds 156 Adjustment steering 156–157, 218–221, 224 alternate SE 244 Arbiter 72, 88, 260, 269 Assigning the CTN roles 79, 260 Automated Computer Time Service (ACTS) 36

#### В

Backup Time Server 18, 269, 277 Backup Time Server (BTS) 72, 88 Base steering 218 bounded CTN 95–96 BTS 4, 257, 260

## С

Calibrated Cesium clock 21 Calibrated Rubidium clock 22 call-home server 5 Canadian Time Service (CTS) 36 Cancel Migration to Mixed CTN 161 CF 62 CF Request Time Ordering 142-143, 172, 175, 213 CFCC Coupling Facility Control Code 144, 175 **DISPLAY TIMEZONE 144** TIMEZ offset 144 TIMEZONE command 144 Channel Path Identifier (CHPID) 137 channel subsystem 416 CHPID 248 access list 248 CHPIDs 248, 417 **Clock Adjustment** Daylight Saving Time 75, 185, 235 clock source 129 CLOCKxx 150-152, 228, 239-241, 264 ETRMODE 229 ETRZONE 150, 229 STPMODE 229 STPZONE 150, 229 CLOCKxx member 2, 264 command SETETR 142, 172

commands DISPLAY ETR 61, 63, 76, 94 DISPLAY XCF,S,ALL 76 DISPLAY XCF, SYSPLEX, ALL 95 Configure NTP 7 console log 40 Coordinated Server Time 4, 85-86 Coordinated Server Time (CST) 5, 18, 259 Coordinated Timing Network (CTN) 129 Coupling Facilitiy (CF) 1 coupling facility 282 Coupling facility commands 143 Coupling link 61 coupling link connectivity 261 CPC 19, 89, 103, 139 Cross System Coupling Facility (XCF) 147 CST 140 CTN ID 56-57, 80, 101, 145, 287 CTN roles 71,80 CTN time source 92, 157, 197 CTS 18, 81, 89 CTS candidate 139 current local time 129 Current Time Server 4, 18, 72, 277 Customize Network Settings 12, 19, 28

# D

Daylight saving date and time end 83 Daylight saving date and time start 83 Daylight saving offset 83 daylight saving time adjustment 75 Daylight Saving Time offset 185, 228 daylight saving time offset 129 deactivate 244 Deconfigure 130, 158, 162, 213 dial out as External Time Source 37 dial out schedule 38 Dial out to a telephone time service 5 dial-out function 80 Directly Attached Systems 111, 121, 279, 293, 307, 320, 325, 340, 352, 361, 373, 382 DISPLAY TIMEZONE 144, 175 DISPLAY CF 142 DISPLAY XCF,S,ALL 95 disruptive action CTS - DEACTIVATE 244 disruptive tasks 244 Domain Name Services 12, 19, 28 drift 74 DST offset 146

#### Ε

EAF stepping port number 133-134

encryption 5 ESCON® 248 ETR 126-127, 134, 233 Data Word 133-134 Expanded Availability 266 LIC 263 port 140, 170 port number 133, 135 Port state 133 Reset Link Error Threshold 132 Status Word 133-134 ETR Attachment Facility 132–133 ETR Attachment Facility (EAF) ports 131 ETR Attachment Facility port Port 0 131 Port 1 131 ETR card 27 ETR Card Status 133 ETR Configuration 69, 268-270, 278, 284, 286, 292, 298-299, 301, 306, 313, 315, 318, 326, 332, 339, 350, 359, 371, 381, 388-389, 394 ETR ID change 246 ETR links 74 ETR Network 269 ETR network 1, 128 ETR Network ID 56–57, 69–70, 76, 81, 133, 270, 272, 290, 298, 332, 350, 372, 383 ETR Network to Mixed CTN (ETR timing mode) 263 ETR port 69, 74, 283 ETR ports 65 ETR Status 58, 126-127, 268, 270-271, 277, 285, 292, 299, 306, 313, 319, 325, 331, 339, 350, 360, 372, 381-382, 388, 395 ETR Stepping Mode 135 ETR timing mode 55, 64, 131, 229, 265, 271, 275, 296, 301, 303, 315, 317-318, 345, 367, 390 ETRMODE YES 264 ETRZONE YES 264 ETS 4, 80, 85 ETS Configuration 127, 268 ETS dial out capability 37 Expanded Availability configuration 126 External Time Source 1, 34, 150, 218, 222, 224 external time source 4, 138 External Time Source (ETS) 5

#### F

FICON® 248 Force configuration 87, 89, 104, 161, 204

# G

Global Timing Network ID 72 GMT 83 GPS 12

#### Η

Hardware Configuration Dialog (HCD) 266 Hardware Management Console 12, 34 HMC as an NTP server 14 HMC message ACT20042 250, 255 ACT37301 303, 316, 327-328 ACT37308 132 ACT37315 115, 147, 180, 273-274, 288, 329 ACT37322 183 ACT37324 147 ACT37326 220, 223 ACT37328 186 ACT37330 237-238 ACT37332 208 ACT37333 211 ACT37336 202, 211 ACT37338 208 ACT37341 190, 261, 344, 365 ACT37348 189, 261 ACT37354 385 ACT37355 343, 364 ACT37359 327 ACT37360 288 ACT37361 273, 328 ACT37363 114, 180 ACT37364 147 ACT37382 187 ACT37384 213 ACT37388 302 ACT39128 385 ACT39136 386 ACT39139 238 ACT39161 247 ACTB1TC1 228 ACTB1TI3 227 ACTZ01C7 246

## 

ICB-4 154 IEA386I 171 IEN (Instituto Elettrotecnico Nazionale) 36 Initialize Time 130, 181, 188, 259 Initializing the time 79, 259 Input Output Configuration Data Set (IOCDS) 137 Installation Manual for Physical Planning (IMPP) 29 IOCDS 111, 271, 326 IODF 410 ISC-3 Peer 154

## L

last path 248 last timing link 243, 249 leap (bisect) year 151 Leap second 129, 259 Leap second offset 146, 228, 232 leap second offset 268 Leap Seconds 83 leap seconds 258 Light detected 134 Local STP Link Identifier(s) 248 Local time 229 Local time changes 125 Local Uninitialized STP link 137 Local-stepping mode 133 Loss of light 134 loss of timing synchronization 243

#### Μ

Maximum STP version 136 Maximum timing stratum level 136 MCL 213 message ACT37301 66 ACT37309 133 ACT37315 62, 147 ACT37324 147 ACT37341 73, 90, 92, 105 ACT37346 89 ACT37348 90, 104 ACT37355 72 ACT37357 91-92, 196 ACT37361 62, 145 ACT37382 85, 187 ACT37388 66 ACT39142 20, 29 ACT39145 22, 30-31, 34, 140 ACT39196 31 ACT39197 33 ACT39206 23 IEA282I 77 IEA282I (ETR) 67 IEA386I 77 IEA386I (STP) 67 IEE148I 249 IXC439E 73 Message Time Ordering Facility 142-143, 172-173, 175 migration ETR to STP timing mode 65 ETR to STP-only CTN 55 Mixed CTN to STP-only CTN 71 Migration from an existing ETR network 1 Mixed CTN 1, 4, 55-56, 59, 68, 71, 76, 123, 126, 146, 286 Mixed CTN (ETR timing mode) to ETR Network 263 Modem Configuration 36 MTOF 142-143, 172-173, 175

## Ν

Network Configuration 110, 120, 127, 268–269, 277, 284, 287, 292, 298, 312, 324, 331, 338, 341–342, 349, 351, 359, 363–364, 370, 373, 380–381, 383–384, 387, 394 Initialize Time 130, 181, 188, 259 NIST WWV (radio station) 21 NIST (National Institute of Standards and Technology) 36 NIST telephone modem service 21 NRC (National Research Council) 36 NTP protocol version 11 Stratum 1 11 NTP access 4 NTP server 4–5, 80, 138, 213, 215 NTP server IP address 29 NTP server redundancy 6 NTP server with PPS 80 NTP server with pulse per second 4, 27 NTP source ID 157, 197 NTP stratum level 157, 197 NUMBER OF USABLE TIMING LINKS 256

## 0

operational safeguards 243 Outbound Connectivity Setting 35

#### Ρ

Parallel Sysplex 143, 172, 243 PCHIDs 248 Physical Channel ID (PCHID) 137 Port state (0, 1) 133 power off 244 power-on reset 244 PPS 4 preferred NTP server 19 Preferred Time Server 269 Preferred Time Server (PTS) 72, 88, 139 Primary Time Server 18 PTB (Germany) telephone modem service 22 PTS 4, 18, 81, 103, 257, 260

# R

Reason Code 137 Link Failure 137 Offline 137 Redbooks Web site 427 Contact us xii Repeat tab 227 Reset ETR 132 Reset Link Error Threshold 132 Restarting CTN after POR 257 reverse migration 101

#### S

Save STP Debug Data 136 saving STP configuration across PORs 99 Saving the CTN configuration 98 Scheduled Operation 39 scheduled operations 228 Scheduled Time Adjustment 225 SE LAN 5 server role 101, 112, 170, 188–189, 200, 208, 272, 287, 301, 315, 326, 342, 363, 383 Service Element (SE) 5 SET CLOCK 152, 241 DATE 151

RESET 152 TIMEZONE 152, 241 Set Date and Time 186, 259 date and time 82, 85 Daylight Saving Time 185 leap second 186 leap seconds 82 Standard Time 185 time zone 82-83, 186 SETETR 142, 172 setup a Coordinated Timing Network (CTN) 1 SIMETRID 2 Simple Network Time Protocol (SNTP) 6 Simple Network Time Protocol client 18 single point of failure 126 single point of failure (SPOF) 255 Single server CTN 97 single server CTN 101 Source field 21, 30 STCK 150, 229 steering the CST 5, 18 stepping mode 133 STP capable 263, 266-267, 305 STP Configuration 69–70, 95, 110, 114, 116, 121, 127, 268, 270, 272-273, 278, 285, 287, 292, 299, 307, 314, 319, 325-326, 328, 332, 340, 351, 360, 372-373, 382, 389.395 STP configured 110-111, 121, 275, 282, 286-287, 290, 293, 296, 300, 305, 331, 338, 358 STP connectivity 277 STP enabled 1, 263, 266-267, 275, 287, 290, 305 STP feature 263 STP feature FC1021 2 STP feature installation 263 STP ID 69-70, 80, 112, 272, 287, 301, 315, 326, 342, 363, 383 STP ID xxxxx 159, 260 STP ID change 246 STP Link Identifiers 137, 279, 305, 340, 352, 361, 373, 382, 396 STP message 68, 248 STP Network ID 59, 81, 112, 147, 272, 287, 301, 315, 326, 342, 363, 383 STP Status 63, 127, 248, 268, 271, 278-279, 352, 373 Directly Attached Systems 111, 121, 279, 293, 307, 320, 325, 340, 352, 361, 373, 382 STP Link Identifiers 137, 279, 305, 340, 352, 361, 373, 382, 396 STP timing 93 STP timing mode 55, 64, 68, 94, 108–109, 117–118, 147, 265, 277, 281, 301, 303-305, 307, 310-311, 314-316, 318, 321, 326, 329-330, 339, 345-346, 348, 356-357, 359, 367, 369, 375, 378, 384, 390 STP-capable servers 88 STP-configured server 126 STP-enabled server 62 STPMODE YES 264 STP-only CTN 1, 4, 71, 79, 91, 143, 173 STP-only to Mixed CTN 263

STPZONE YES 264 Stratum 0 (STP) 258 Stratum 1 (STP) 67, 93, 96, 145 Stratum 2 (STP) 67, 93, 149 Stratum 3 (STP) 246, 255 Stratum Level 149 Stratum level 20, 112, 136, 272, 287, 301, 315, 326, 342, 363, 383 stratum level 157 Support Element 2, 85 Support Element Console Events 25 Synchronization Mode 141 SYS1.PARMLIB 2 SYSLOG 289 Syslog message 73 sysplex members 95 Sysplex Timer 2, 4, 58, 64, 126, 263, 266-268, 270, 274-276, 278-279, 283, 287, 289, 297, 301, 303, 312, 350, 372, 376, 382, 387 System (Sysplex) Timer task ETR Configuration 69, 269-270, 278, 284, 286, 292, 298-299, 301, 306, 313, 315, 318, 326, 332, 339, 350, 359, 371, 381, 388-389, 394 ETR Status 270-271, 277, 285, 292, 299, 306, 313, 319, 325, 331, 339, 350, 360, 372, 381-382, 388, 395 Network Configuration 110, 120, 259, 269, 277, 284, 287, 292, 298, 312, 324, 331, 338, 341-342, 349, 351, 359, 363-364, 370, 373, 380-381, 383-384, 387, 394 STP Configuration 69-70, 95, 110, 114, 116, 121, 270, 272-273, 278, 285, 287, 292, 299, 307, 314, 319, 325-326, 328, 332, 340, 351, 360, 372-373, 382, 389, 395 STP Status 271, 278-279, 352, 373 Timing Network 109, 119, 268, 276, 283, 291, 297, 312, 324, 331, 338, 348, 358, 369, 379, 386, 393

#### Т

Telephone Date Code (CTD) 36 time accuracy 33 TIME macro 229 Time of Day (TOD) 136 time source Uninitialized 129 time steering 18 Time Zone 75, 144, 175, 185, 230, 235 Offset 144, 152, 175, 228-231, 234, 241, 349, 370 time zone 76, 83, 129 Offset 74 time zone algorithm 75 time zone offset 146, 258 TIMEDELTA 10 264 timekeeping information 126 Timing mode 112, 136, 266, 272, 287, 301, 315, 326, 342, 363, 383 Timing Network 109, 119, 127, 268, 276, 283, 291, 297, 312, 324, 331, 338, 348, 358, 369, 379, 386, 393 Timing network 129 Timing Network ID 288 Timing state 136 timing state

Stopped 136 Synchronized 136 Unsynchronized 136 TM=ETR 142 TM=STP 142, 172 TOD 259, 270 TOD clock 86 Two server bounded CTN 99

#### U

Uninitialized Reason Code 137 Usable clock source 136 usable timing links 256 USNO telephone modem service 22 UTC 129, 150, 152, 187, 218, 222, 224, 229, 234, 239 UTC time scale 82

#### Χ

XCF 289

# Ζ

z/OS command CONFIG CHP(xx),OFF 249 DISPLAY ETR 140, 170, 208-209, 256, 267, 270, 275, 330 DISPLAY XCF 109, 118, 142, 172, 267, 283, 291, 297, 305, 378 z/OS commands 140 z/OS images 274 z/OS message IEA260 390 IEA267I 316, 390 IEA2711 231 IEA273I 390 IEA279I 151, 240 IEA382I 255 IEA384I 142, 172 IEA386I 207-209, 212 IEA389I 206, 211 IEA392I 232 IEE136I 151 IEE148I 249 IXC335I TM=ETR 142 TM=STP 142, 172 IXC435I 345, 367, 390 IXC438I 274, 289, 345, 367, 390 IXC439E 345, 367, 390



**Server Time Protocol Implementation Guide** 

# Server Time Protocol Implementation Guide



#### Coordinated Timing Network configuration

Administration and operations tasks

How to implement Server Time Protocol examples Server Time Protocol (STP) is a server-wide facility that is implemented in the Licensed Internal Code (LIC) of IBM zEnterprise EC12 (zEC12), IBM zEnterprise 196 (z196), IBM zEnterprise 114 (z114), IBM System z10, and IBM System z9. It provides improved time synchronization in both a sysplex or non-sysplex configuration.

This IBM Redbooks publication will help you configure a Mixed or STP-only Coordinated Timing Network. It is intended for technical support personnel requiring information about:

- Installing and configuring a Coordinated Timing Network
- Using STP functions and operations
- Migrating to a Coordinated Timing Network from various timing environments

Readers are expected to be familiar with IBM System z technology and terminology. For planning, see our companion book, *Server Time Protocol Planning Guide*, SG24-7280. For information about how to recover your STP environment functionality, see *Server Time Protocol Recovery Guide*, SG24-7380.

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