Connect:Direct®
for UNIX

Administration Guide

Version 4.0

Sterling Commerce
An IBM Company

Connect:Direct for UNIX Administration Guide
Version 4.0

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Sterling Commerce, Inc.

4600 Lakehurst Court Dublin, OH 43016-2000 * 614/793-7000

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Chapter 1

About Connect:Direct for UNIX

Connect:Direct links technologies and moves all types of information between networked systems and computers. It manages high-performance transfers by providing such features as automation, reliability, efficient use of resources, application integration, and ease of use. Connect:Direct offers choices in communications protocols, hardware platforms, and operating systems. It provides the flexibility to move information among mainframe systems, midrange systems, desktop systems, and LAN-based workstations.

Connect:Direct is based on client-server architecture. The Connect:Direct server components interact with the user interfaces (API, CLI, Connect:Direct Browser User Interface, and Sterling Control Center) to enable you to submit, execute, and monitor Connect:Direct statements and commands.

Server Components

Connect:Direct has the following server components:

Process Manager

The Process Manager (PMGR) is the daemon that initializes the Connect:Direct server environment. The PMGR provides the following functions:

- Initializes Connect:Direct
- Accepts connection requests from Connect:Direct client APIs and remote nodes
- Creates Command Manager and Session Manager child Processes to communicate with APIs and remote nodes
- Accepts requests from Command Managers and Session Managers when centralized Connect:Direct functions are required
- Stops Connect:Direct

Note: Any application, including End User Applications (EUA), can run on any computer as long as it can connect to the PMGR.

Command Manager

A Command Manager (CMGR) is created for every API connection that is successfully established. The number of Command Managers that a PMGR can create is system-dependent and limited by the number of file descriptors available for each UNIX Process. The number of file descriptors set up by the UNIX operating system may affect Connect:Direct operation. You must define enough file descriptors to handle the number of concurrent Connect:Direct sessions allowed, which can be as many as 999.

The CMGR provides the following functions:

- Executes commands sent by the API and sends the results back to the API
- Carries out the Connect:Direct authentication procedure, in conjunction with the API, to determine access to Connect:Direct
- Interacts with the PMGR when executing commands

Session Manager

The Session Manager (SMGR) is created and invoked by the PMGR when resources are available and either a Process is ready to run or a remote node requests a connection with a local node. The SMGR provides the following functions:

- Performs the necessary Connect:Direct work
- Acts as a primary node (PNODE) and initiates Process execution
- Acts as a secondary node (SNODE) to participate in a Process initiated by the PNODE

When an SMGR is created to execute a Process submitted to a node, it creates the connection to the remote node. If the SMGR is started by the PMGR to execute local Processes, the SMGR runs each Process on this session until all Processes are completed.

If an SMGR is created because a remote node initiated a connection, the SMGR completes the connection. If the SMGR is started by the PMGR to execute remote Processes, the SMGR executes remote Process steps supplied by the remote SMGR until the remote SMGR completes all of its Processes.

The SMGR depends on the PMGR for Transmission Control Queue (TCQ) services and other centralized services. Refer to the *Transmission Control Queue* on page 13 for an overview of the TCQ.

File Agent

Connect:Direct File Agent is a feature of Connect:Direct, which provides unattended file management. File Agent monitors *watched* directories to detect new files. When File Agent detects a new file, it either submits a default Process or evaluates the file using rules to override the default Process and to determine which Process to submit. You create rules to submit different Processes based on the following properties:

- Specific or partial file names
- File size
- System events

You create the Processes used by File Agent on Connect:Direct; you cannot create them using File Agent.

To achieve optimum performance, configure File Agent to communicate with the Connect:Direct node where it is installed. File Agent can be installed on UNIX, Windows, and z/OS operating systems. For information to help you plan how to implement File Agent, see the *Managing Files with Connect:Direct File Agent* chapter in your Connect:Direct administration guide or getting started guide. The Connect:Direct File Agent Help contains instructions for configuring File Agent.

Connect:Direct Secure+ Option for UNIX

The Connect:Direct Secure+ Option application provides enhanced security for Connect:Direct and is available as a separate component. It uses cryptography to secure data during transmission. You select the security protocol to use with Secure+ Option.

To use Connect:Direct Secure+ Option for communications with remote nodes, you must have node records in the Secure+ Option parameters file that duplicate the adjacent node records in the Connect:Direct network map. You can populate the Secure+ Option parameters file from entries defined in an existing network map. For more information about creating the Connect:Direct Secure+ Option parameters file and configuring nodes for Secure+ Option, refer to the *Connect:Direct Secure+ Option for UNIX Implementation Guide*.

User Interfaces

Connect:Direct has the following user interfaces, which enable you to create, submit, and monitor Processes.

Applications Programming Interface

The UNIX Applications Programming Interface (API) enables you to write programs that work with Connect:Direct. Several API functions are provided to allow an End User Application (EUA) to perform the following tasks:

- Establish an API connection to the Connect:Direct server
- Terminate an API connection to the Connect:Direct server
- Send a command to Connect:Direct
- Receive responses from commands

Command Line Interface

The Command Line Interface (CLI) enables you to perform the following tasks:

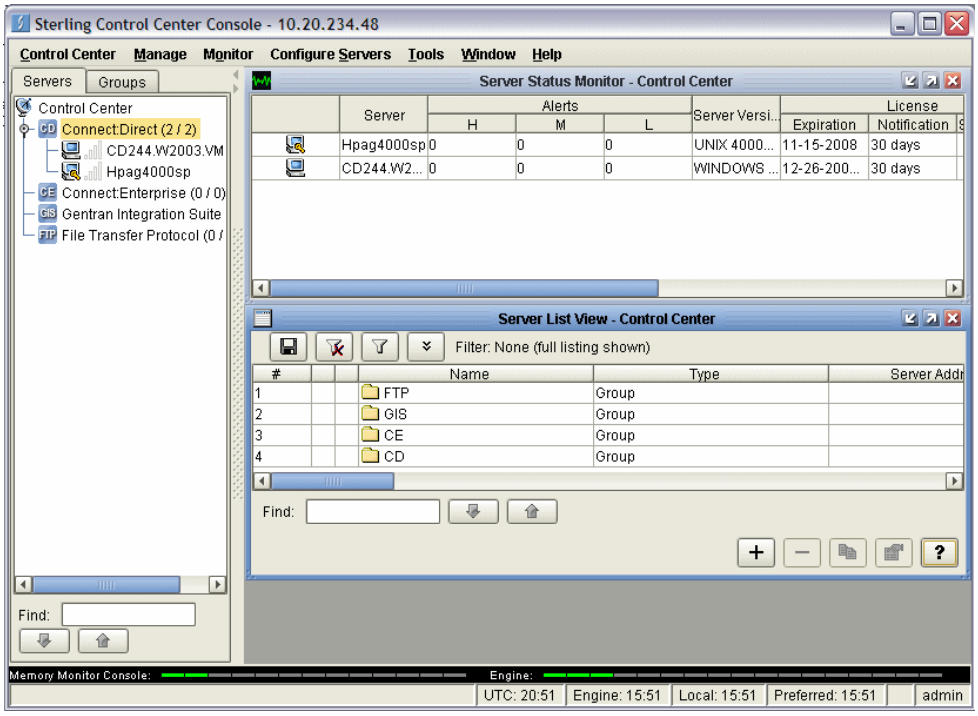
- Issue Connect:Direct commands
- Monitor Processes

The default CLI command prompt is **direct >**. Refer to the *Controlling and Monitoring Processes chapter* in the *Connect:Direct for UNIX User's Guide* for additional information about the CLI.

Sterling Control Center

Sterling Control Center is a centralized management system that provides operations personnel with continuous enterprise-wide business activity monitoring capabilities for Connect:Direct for z/OS, UNIX, Windows, HP NonStop, and i5OS servers; Connect:Direct Select; and Connect:Enterprise for UNIX and Connect:Enterprise for z/OS servers; and Gentran Integration Suite (GIS). Sterling Control Center enables you to:

- Manage multiple servers
  - Group individual servers into server groups for a single view of system-wide activity
  - View status and statistics on active or completed processing
  - Suspend, release, stop, and delete Connect:Direct Processes on z/OS, UNIX, Windows, Select, and HP NonStop platforms
  - Stop Connect:Direct servers on z/OS, Windows, HP NonStop,i5OS, and UNIX platforms.
- Monitor service levels
  - View active and completed processes across the servers within your network



  - Receive notification of data delivery events that occur or do not occur as scheduled
  - Define rules that, based on processing criteria, can generate an alert, send an e-mail notification, generate a Simple Network Management Protocol (SNMP) trap to an Enterprise Management System (EMS), run a system command, or issue a server command
  - Monitor for alerts, such as a server failure or a Process not starting on time

- Create service level criteria (SLCs) that define processing schedules, monitor Processes, files within Processes, and file transfers for compliance with these schedules, and generate alerts when the schedules are not met

- Analyze key operational metrics
- Create customized reports to document and analyze processing activity based on criteria you define
- Validate user authenticity for console-to-engine connections using one or more of four authentication methods, inclusing password validation, host name identification, Windows doman, and TCP/IP address (or three methods in the case of the Web console, which does not support domain authentication)
- Identify additional Connect:Direct servers that may need to be monitored based on communications with a currently monitored server

Sterling Control Center enhances operational productivity and improves the quality of service by:

- Ensuring that critical processing windows are met
- Reducing impact on downstream processing by verifying that expected processing occurs
- Providing proactive notification for at-risk business processes
- Consolidating information for throughput analysis, capacity planning, post-processing operational or security audits, and workload analysis
- Reducing the risk of errors associated with manual system administration, including eliminating individual server logon to view activity, and the need to separately configure each server for error and exception notifications

Sterling Control Center is available for purchase as a separate product. Contact your Sterling Commerce representative to learn more about Sterling Control Center.

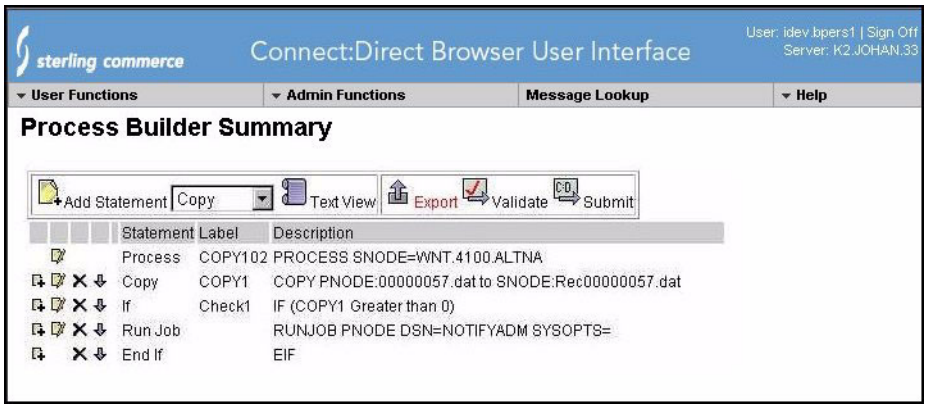
Connect:Direct Browser User Interface

Connect:Direct Browser User Interface allows you to build, submit, and monitor Connect:Direct Processes from an Internet browser, such as Microsoft Internet Explorer.

You can also perform Connect:Direct system administration tasks, such as viewing and changing the network map or initialization parameters, from Connect:Direct Browser. The specific administration tasks that you can perform depend on the Connect:Direct platform that your browser is signed on to and your security level.

Connect:Direct Browser is distributed on CD-ROM with Connect:Direct for z/OS, Connect:Direct for Windows, Connect:Direct for UNIX, and Connect:Direct for HP NonStop. It can also be downloaded from the Sterling Commerce Web site. Connect:Direct Browser is installed on a Web

server and can be accessed by administrators and users through a URL. The following example shows the page used to graphically build a Process:



To learn more about Connect:Direct Browser, see the documentation on the Connect:Direct Browser CD-ROM or available online from the Sterling Commerce Documentation Library.

Connect:Direct Concepts

This section introduces concepts and definitions to help you understand system operations.

Local and Remote Nodes

Each data transfer involves a local and a remote node. The two servers (local and remote) function together to perform the work. Either Connect:Direct node can initiate the work.

Local and remote node connections are set up in the network map file. Refer to the *Maintaining the Network Map File* chapter in the *Connect:Direct for UNIX Administration Guide* for a description of the network map file.

Connect:Direct must be installed on each node. When Connect:Direct establishes a session between the local node and remote node, the node that initiates the session has primary control (PNODE). The other serves as the partner and has a secondary function (SNODE). The node that initiates the session has primary control, regardless of the direction of information flow. The Process can specify work destined for either the local or remote node. When Connect:Direct establishes a session, the two nodes work together to transfer the information.

Processes

The Connect:Direct Process language provides instructions for transferring files, running programs, submitting jobs on the adjacent node, and altering the sequence of Process step execution. You can include one or more steps in a Process. A Process consists of a Process definition statement (Process statement) and one or more additional statements. Parameters further qualify Process instructions.

The following table lists Process statements and their functions:

Process Statement	Function
copy	Copies files from one node to another.
conditionals	Alters the sequence of Process execution based on the completion code of previous steps with the **if**, **then**, **else**, **eif** (end if), **goto**, and **exit** statements.
process	Defines general Process characteristics.
run job	Enables you to specify UNIX commands in a Process. The Process does not wait until the job has finished running before executing the next step in the Process.
run task	Enables you to specify UNIX commands in a Process. The Process waits until the job has finished running before executing the next step in the Process.
submit	Starts another Connect:Direct Process to either the local or remote node during execution of a Process.
pend	Marks the end of a Connect:Direct for UNIX Process.

Following is a sample Process:

```
ckpt01  process  snode=unix.node
step01 copy from (
              file=file1
              snode
              )
         ckpt=1M
         to   (
              file=file2
              disp=new
              pnode
              )
     pend;
```

Refer to the Connect:Direct Processes Web site at http://www.sterlingcommerce.com/documentation/processes/processhome.html for instructions on building a Process.

Transmission Control Queue

The Transmission Control Queue (TCQ) controls when Processes run. Connect:Direct stores submitted Processes in the TCQ. The TCQ is divided into four logical queues: Execution, Wait, Timer, and Hold. Processes are run from the Execution queue.

Connect:Direct places a Process in the appropriate queue based on Process statement parameters, such as the **hold**, **retain**, and **startt** parameters.

Connect:Direct runs Processes based on their priority and when the Process is placed in the Execution queue. Processes will run first based on their submitted date, and higher priority Processes are selected for execution ahead of Processes with a lower priority. You can access the queues and manage the Processes through Connect:Direct commands.

Refer to the *Connect:Direct for UNIX User's Guide* for more information on scheduling Processes in the TCQ.

Commands

You use Connect:Direct commands to submit Processes to the TCQ. You can also use Connect:Direct commands to perform the following tasks:

- Manage Processes in the queue
- Monitor and trace Process execution
- Produce reports on Process activities
- Stop Connect:Direct operation

The following table lists the commands and their functions:

Command	Function
change process	Changes the status and modifies specific characteristics of a nonexecuting Process in the TCQ.
delete process	Removes a nonexecuting Process from the TCQ.
flush process	Removes an executing Process from the TCQ.
trace	Runs Connect:Direct traces.
select process	Displays or prints information about a Process in the TCQ.
select statistics	Displays or prints statistics in the statistics log.
stop	Stops Connect:Direct operation.
submit	Submits a Process for execution.

For example, the following command submits the Process called **onestep** to the TCQ with a hold status of yes:

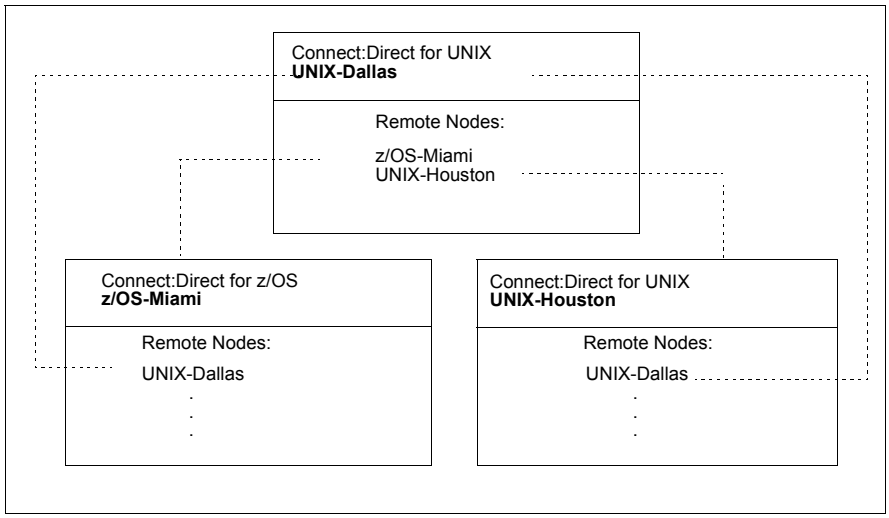
```
Direct> submit file=onestep hold=yes;
```

Network Map

During the transfer of data, the Connect:Direct server where the Process is submitted is the primary node and the secondary node is the remote node (partner). Connect:Direct identifies the remote nodes that the local node is able to communicate with through the use Connect:Direct network map (or netmap).

The network map includes the names of all the remote nodes that the Connect:Direct local node can communicate with, the paths to contact those remote nodes, and characteristics of the sessions for communication.

The remote Connect:Direct nodes also have network maps for their remote nodes. The following sample displays the corresponding network map entries of UNIX-Dallas, z/OS-Miami, and UNIX-Houston:



User Authorization

Connect:Direct can authorize local and remote users to perform certain Connect:Direct tasks. In order to use Connect:Direct, each user must have a record defined in the user authorization file, called userfile.cfg. Each local user must have a record in the user authorization file, and remote users may be mapped to a local user ID in a proxy relationship.

To provide a method of preventing an ordinary user from gaining root access through Connect:Direct for UNIX, a second access file called the Strong Access Control (SACL) file is created when you install Connect:Direct for UNIX and is named sysacl.cfg. The **root:deny.access** parameter, which is specified in the sysacl.cfg file, allows, denies, or limits root access to Connect:Direct for UNIX. If the SACL file is deleted or corrupted, access to Connect:Direct is denied to all users.

For more information about specifying user authorizations in the userfile.cfg and the sysacl.cfg files, see *Maintaining Access Information Files* in the *Connect:Direct for UNIX Administration Guide*.

Process Restart

Several facilities are provided for Process recovery after a system malfunction. The purpose of Process recovery is to resume execution as quickly as possible and to minimize redundant data transmission after a system failure. The following Connect:Direct facilities are available to enable Process recovery:

- Process step restart—As a Process runs, the steps are recorded in the TCQ. If a Process is interrupted for any reason, the Process is held in the TCQ. When you release the Process to continue running, the Process automatically begins at the step where it halted.
- Automatic session retry—Two sets of connection retry parameters are defined in the remote node information record of the network map file: short-term and long-term. If you do not specify a value for these parameters in the remote node information record, default values are used from the local.node entry of the network map file. The short-term parameters allow immediate retry attempts. Long-term parameters are used after all short-term retries are attempted. Long-term attempts assume that the connection problem cannot be fixed quickly and retry attempts occur after a longer time period, thus saving the overhead of connection retry attempts.
- Checkpoint restart—This feature is available with the **copy** statement.

  Checkpoint restart can be explicitly configured within a **copy** step through the **ckpt** parameter. Refer to the Connect:Direct Processes Web site at http://www.sterlingcommerce.com/documentation/processes/processhome.html.

  If it is not configured in the **copy** step, it can be configured in the Initparms through the **ckpt.interval** parameter. (See *Maintaining the Initialization Parameters File* in the *Connect:Direct for UNIX Administration Guide* for more information on this parameter.)
- Run Task restart—If a Process is interrupted when a run task on an SNODE step is executing, Connect:Direct attempts to synchronize the previous run task step on the SNODE with the current run task step. Synchronization occurs in one of the following ways:
  - If the SNODE is executing the task when the Process is restarted, it waits for the task to complete, and then responds to the PNODE with the task completion status. Processing continues.
  - If the SNODE task completes before the Process is restarted, it saves the task results. When the Process is restarted, the SNODE reports the results, and processing continues.

  If synchronization fails, Connect:Direct reads the **restart** parameter in the **run task** step or the initialization parameters file to determine whether to perform the **run task step** again. The **restart** parameter on the **run task** step overrides the setting in the initialization parameter.

  For example, if the SNODE loses the run task step results due to a Connect:Direct cold restart, Connect:Direct checks the value defined in the **restart** parameter to determine whether to perform the **run task** again.

  Note: Run task restart works differently when Connect:Direct for UNIX runs behind a connection load balancer. For more information on the considerations you need to know when running Connect:Direct for UNIX in a load balancing environment, see the *Connect:Direct for UNIX for UNIX Release Notes*, *Connect:Direct for UNIX for UNIX Administration Guide*, and the *Connect:Direct for UNIX Getting Started Guide*.
- Interruption of Process activity when the SNODE is a Connect:Direct for UNIX node—When the SNODE is a Connect:Direct for UNIX node and the PNODE interrupts Process activity by issuing a command to suspend Process activity, deleting an executing Process, or when a link fails or an I/O error occurs during a transfer, the Process is placed in the Wait queue in WS status.

If Process activity does not continue, you must manually delete the Process from the TCQ. Refer to the *Connect:Direct for UNIX User's Guide* for command syntax and parameter descriptions for the **delete process** command.

Note: You cannot issue a **change process** command from the SNODE to continue Process activity; the Process can only be restarted by the PNODE, which is always in control of the session.

Archive Statistics Files

Connect:Direct for UNIX provides a utility to archive and purge statistics files. When you configure Connect:Direct for UNIX, you identify when to archive a statistics file by setting the parameter, **max.age**, in the stats record of the initialization parameters file. The **max.age** parameter defines how old a statistics file must be before you want to archive the file.

Once a day, the script called statarch.sh is started. This script identifies the statistics files that are equal to the **max.age**. It then runs the tar command and the compress command to create a compressed archived file of all the statistics records that match the **max.age** parameter. Once the statistics files are archived, these files are purged. For files archived on a Linux computer, the archived statistics files have the .gz suffix since these files are compressed with the gzip format. Archived files on all other UNIX platforms have the .Z suffix to indicate they are compressed using the compress format.

The archived files are stored in the directory where the statistics files and TCQ are stored. The shell script, statarch.sh, is located in the ndm/bin directory. If necessary, modify the script to customize it for your environment.

If you want to restore statistics files that have been archived, run the **statrestore.sh** script. It uses the **uncompress** and **tar** commands to restore all the statistics files in the archive. You supply two arguments to the **statrestore** command. The first argument is the directory path where the statistics files are located and the second argument identifies the archived file name followed by as many archived file names as you want to restore. Below is a sample **statrestore** command:

```
qa160sol: ./statrestore.sh /export/home/users/cd4000/ndm/bin archive1
```

After files are restored, the statistics records can be viewed using the select statistics command.

Sample Processes, Shell Scripts, and API Programs

Connect:Direct provides sample Processes and shell scripts in *d_dir*/ndm/src, where *d_dir* indicates the destination directory of the Connect:Direct software. You can create similar files with a text editor. In addition, instructions for creating sample Processes and shell scripts are in the README file in the same directory.

The following table displays the file names of sample Processes. Modify the Processes as required:

File Name	Type of Process
cpunx.cd	copy
rtunx.cd	run task
rjunx.cd	run job
sbunx.cd	submit

The following table displays the file names of sample shell scripts. Modify the shell scripts as required:

File Name	Type of Shell Script
selstat.sh	select statistics
send.sh	send
recv.sh	receive
wildcard	send multiple files to a PDS
statarch.sh	archive statistics files
statrestore.sh	restore statistics files that have been archived
lcu.sh	launch the Local Connection Utility tool
spadmin.sh	launch the Secure+ Option Admin Tool
spcli.sh	launch the Secure+ Option CLI (SPCLI)
spcust_sample1.sh	configure Secure+ Option for the STS protocol
spcust_sample2.sh	configure Secure+ Option for the STS protocol
spcust_sample3.sh	configure Secure+ Option to use the SSL or TLS protocol

The following table displays the names of sample programs:

Program Name	Description
apicheck.c	This program submits a Process to copy a file to a remote system. MAXDELAY is used in this example, which means that the program will not finish execution until the file has been transferred. A standard c compiler is used to compile this module.

Program Name	Description
apicheck.C	Same as apicheck.c, except that it is compiled with one of the C++ compilers listed in the *Connect:Direct for UNIX User's Guide*.
exit_skeleton.c	This program is a skeleton of a user exit program that works in conjunction with Connect:Direct for UNIX. It demonstrates usage of all three user exits.
exit_skeleton.C	Same as exit_skeleton_c, except that it is compiled with one of the C++ compilers listed in the *Connect:Direct for UNIX User's Guide*.
exit_sample.c	This is the same program as the skeleton user exit program, except that the security exit is demonstrated with code that approximates PassTicket functionality.
sdksample.C	This program exercises various commands using the SDK interface to Connect:Direct for UNIX.

Connect:Direct for UNIX Files

This section describes the configuration files, illustrates the directory structure of Connect:Direct for UNIX, and lists the individual files that are installed.

Connect:Direct for UNIX Configuration Files

Connect:Direct for UNIX creates the following configuration files during installation and customization. These files are required for the Connect:Direct server to operate correctly.

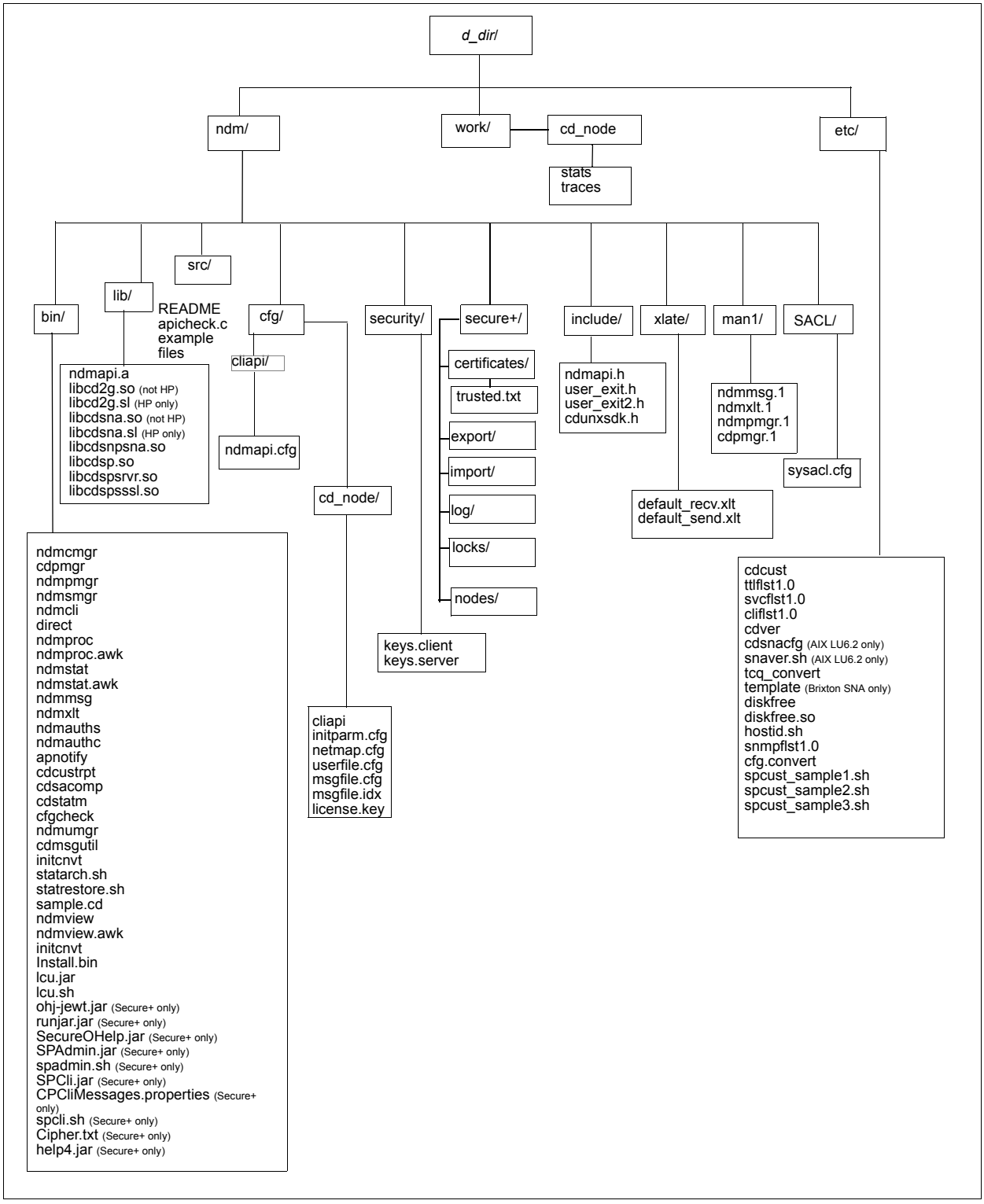
Configuration File	Description
Initialization parameters file	Provides information to the server to use at start up. During the installation, you identify the settings necessary for the initialization parameters file.
User authorization information file	Contains the local user information and remote user information record types. You customize this file during installation to map remote user IDs to local user IDs and create remote user information records in the user authorization information file.
Strong access control file	Improves the security of Connect:Direct for UNIX and allows, denies, or limits root access control. This file is created when you install Connect:Direct for UNIX. If the file is deleted or corrupted, access to Connect:Direct is denied to all users.
Network map file	Describes the local node and other Connect:Direct nodes in the network. You can define a remote node record for each node that Connect:Direct for UNIX communicates with.

Configuration File	Description
Server authentication key file	Verifies client API connection requests. Only verified clients are granted a connection.
Client configuration file	Identifies the port and host name used by a client to connect to Connect:Direct.
Client authentication key file	Identifies Connect:Direct servers that a Connect:Direct client connects to. You can have multiple entries for multiple servers.

Connect:Direct for UNIX Directory Structure

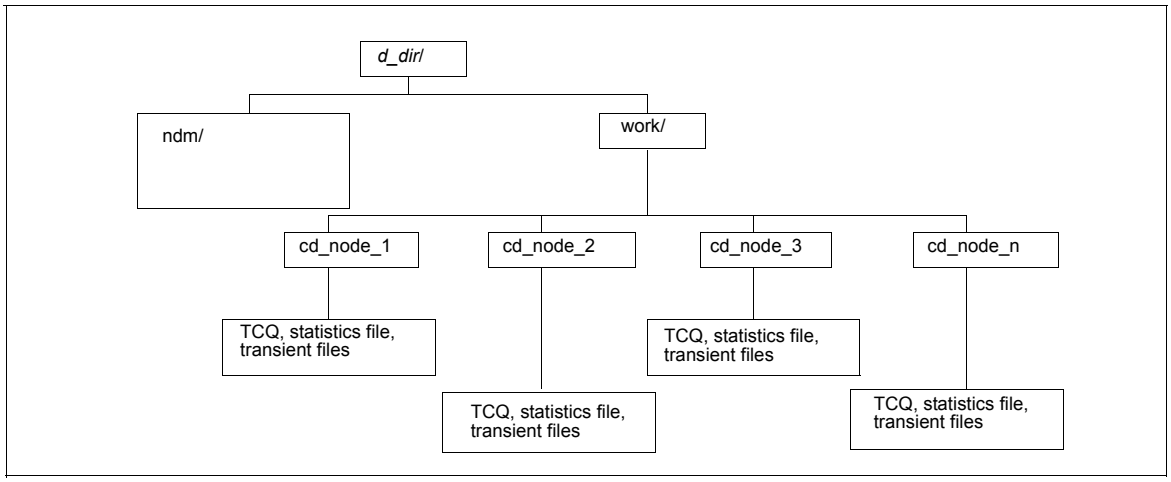
The following figure illustrates the Connect:Direct for UNIX directory structure. The directory tree starts at *d_dir/*, the destination directory where the software is installed. This directory structure provides for multiple nodes on the same network and possibly on the same computer. The directory structure organization enables you to share Connect:Direct programs, such as cdpmgr and ndmcmgr. If multiple nodes exist, each node must have its own *d_dir*/ndm/cfg/*cd_node*/ directory structure for configuration files, where *cd_node* is the Connect:Direct node name.

Note: The secure+ directory is available only when Secure+ Option is purchased and installed.



Note: See the following figure to view the work directory for a node.

A *d_dir*/work/*cd_node* directory is created for each node. The following figure displays the work directory for multiple nodes and illustrates the working files created for each node, such as TCQ files:



Connect:Direct for UNIX Documentation

See *Connect:Direct for UNIX Release Notes* for a complete list of the product documentation.

About This Guide

The *Connect:Direct for UNIX Administration Guide* is for programmers and network operations staff who maintain Connect:Direct for UNIX.

This guide assumes knowledge of the UNIX operating system, including its applications, network, and environment. For LU6.2 connectivity, a proficiency in configuring the SNA package to support independent LU6.2 connections is required.

Task Overview

The following table guides you to the information required to perform Connect:Direct for UNIX tasks:

Task	Reference
Understanding Connect:Direct for UNIX	Chapter 1, *About Connect:Direct for UNIX*
Using unattended file management for Connect:Direct	Chapter 2, *Managing Files with Connect:Direct File Agent*
Working with Connect:Direct configuration files	Chapter 2, *Maintaining Configuration Files*
Controlling system settings using initialization parameters	Chapter 3, *Maintaining the Initialization Parameters File*
Editing parameters that affect End User Applications (EUA)	Chapter 4, *Maintaining the Client Configuration File*
Specifying connectivity information for the local node and the remote nodes in the network	Chapter 5, *Maintaining the Network Map File*
Controlling access to Connect:Direct for UNIX	Chapter 6, *Maintaining Access Information Files*
Maintaining client/server security using authentication keys	Chapter 7, *Maintaining Client and Server Authentication Key Files*
Enabling a test mode for production instances of Connect:Direct for UNIX	Appendix C, *Using Connect:Direct for UNIX in a Test Mode*

Chapter 2

Maintaining Configuration Files

Configuration files define the operating environment for Connect:Direct. The following configuration files are created during the customization procedure:

- Initialization parameters file
- Client configuration parameters file
- Network map file
- Two access files: userfile.cfg and sysacl.cfg

After the initial customization, you can modify these files, if necessary. This chapter provides you with the information to modify the configuration files.

About the Configuration Files

A configuration file is a text file composed of records. A record is a single logical line. A logical line is one or more physical lines that can be continued with the backslash (\) character. In the table on page 26, physical lines 4 and 5 illustrate a logical line. Line 4 ends with a backslash (\) character, to indicate that the line is continued on the next physical line. Line 1 of the sample begins with a pound (#) sign. The pound sign indicates this line contains a comment.

A record consists of a record name and one or more parameter pairs. A parameter pair is a parameter name and parameter value. Line 2 contains the record name, ndm.path. Line 2 also contains the parameter pair, path and /ndm/users/c, where the parameter name is path and the parameter value is /ndm/users/c. The parameter pair is bound by colons (:) and separated by an equal sign (=) in the following format. The following example displays a complete record, where ndm.path is the record name, path is the parameter name, and /ndm/users/c is the parameter value:

```
ndm.path:path=/ndm/users/c:
```

Record names and parameter names are not case sensitive. Parameter values are case sensitive.

Lines 7 through 23 illustrate a longer logical record. Line 7 contains the record name local.node followed by an optional colon (:) and a backslash (\) character. All lines between 7 and 23 end with

a backslash (\) character. Line 23 does not contain a backslash (\) character, to indicate the end of the record.

The following table displays a portion of the initialization parameters file to illustrate the format of Connect:Direct configuration files:

Line	Contents	Notes
1	#Miscellaneous Parameters	# indicates a comment
2	ndm.path**:**path=/ndm/users/c:	record name=ndm.path, parameter=path value= /ndm/users/c
3	proc.prio:default=8:	record name=proc.prio, parameter=default value= 8
4 5	asset.protection:\ keyfile=${CDUNIX_PATH}/ndm/cfg/main_node/license.key:	License keyfile
6	#Local Connect:Direct connection information	# indicates a comment
7	local.node:\	record name=local.node
13	.	
. . .	.	
21	.	
22	:tcp.api=rusty;3191:\	parameter= tcp.api, value= rusty;3191
23	:tcp.api.bufsize=**32768**:	parameter= tcp.api.bufsize value= 32768

Configuration files allow duplicate but not identical records, in some cases. For example, you can define more than one remote node information (**rnode.listen**) record in the initialization parameters file.

Modifying Configuration Files

You can modify Connect:Direct configuration files using any text editor or create a new configuration file using the **cdcust** command provided with Connect:Direct for UNIX.

- Modifying Configuration Files with a Text Editor—You can modify Connect:Direct configuration files with any text editor, such as vi editor.
- Creating Configuration Files with cdcust—Type the following command to start the customization procedure, where *d_dir* is the Connect:Direct for UNIX path name:

```
$ d_dir/etc/cdcust
```

Chapter 3

Maintaining the Initialization Parameters File

Initialization parameters determine various Connect:Direct settings that control system operation. The initialization parameters file is created when you install Connect:Direct for UNIX and can be updated as needed.

You can modify Connect:Direct initialization parameters file using any text editor. Before changing a value in the file, first shut down the Connect:Direct server. After you change a value and save the file, restart the server. Restarting the server validates the new values and generates an error message if a value is invalid. All available parameters are described in this chapter.

If you use Connect:Direct Browser User Interface to update parameters in the Local Node Connection Record, you do not have to stop and restart the server.

Note: You can also use the Connect:Direct Browser to perform some of the procedures in this chapter. To learn more about the Connect:Direct Browser, see the documentation on the Connect:Direct Browser CD-ROM or available online from the Sterling Commerce Documentation Library.

About the Initialization Parameters File

The initialization parameters file resides in *d_dir*/ndm/cfg/*cd_node*/initparm.cfg, where *d_dir* is the destination directory where Connect:Direct for UNIX is installed and *cd_node* is the node name.

The initialization parameters file contains records. Each record includes parameters to define the attributes of the record. The records are summarized as follows:

- Miscellaneous parameters—Provide miscellaneous information including the name of the Connect:Direct for UNIX node; the location of Connect:Direct for UNIX, the Pluggable Authentication Modules (PAM) service configuration file, the shared work area for SNODE work files, and the license management key file; the default Process priority; and whether commands with special characters are restricted in the run directory.
- Remote node connection information—The rnode.listen record includes parameters to monitor inbound connections.
- Transmission Control Queue (TCQ) information—The tcq record defines how long a Process is held in error before being deleted.

- Global copy parameters—The **copy.parms** record defines default parameters used by the Copy operation including checkpoint parameters, file size limitations, translation table information, exception handling, CRC checking, file allocation retry parameters, and compression options.
- Global run task parameters—The **runtask.parms** record defines a parameter to define the restart option.
- Statistics file information—The **stats** record includes parameters to define default statistics file information including file size limitations, the type of information to write to the statistics file, and how long to maintain statistics files before archiving them.
- Server authentication information—The **authentication** record parameters to authenticate the server.
- User exit parameters—The **user.exits** record defines the programs used during a user exit procedure.
- Firewall navigation information—The **firewall.parms** record defines the ports or range of ports to use for outbound sessions when a server operates behind a firewall.

The following sample initialization parameters file shows how some of these parameters are specified:

```
# Miscellaneous Parameters
ndm.path:path=/sci/users/mscarbro/cd4000:\
        :snode.work.path=/sci/users/mscarbro/cd4000/shared:

ndm.node:name=mws_joshua_4000:
ndm.pam:service=cdlogin:
ndm.quiesce:quiesce.resume=n

proc.prio:default=10:

asset.protection:keyfile=/sci/users/mscarbro/cd3800/ndm/cfg/mws_joshua_4000/license
.key:

restrict:cmd=y

# TCQ information
tcq:\
 :max.age=8:

# Global copy parameters.
copy.parms:\
 :ckpt.interval=2M:\
 :ulimit=N:\
 :xlate.dir=/sci/users/mscarbro/cd4000/ndm/xlate:\
 :xlate.send=def_send.xlt:\
 :xlate.recv=def_recv.xlt:\
 :continue.on.exception=y:
```

```
# Global runtask parameters.
runtask.parms:\
 :restart=y:

# Stat file info.
stats:\
 :file.size=1048576:\
 :log.commands=n:\
 :log.select=n:\
 :snmp.agent.port=1365:\
 :snmp.agent.activated=n:\
 :syslog.logd=daemon:

# Authenticator
authentication:\
 :server.program=/sci/users/mscarbro/cd4000/ndm/bin/ndmauths:\
 :server.keyfile=/sci/users/mscarbro/cd4000/ndm/security/keys.server:

# user exit information
user.exits:\
 :security.exit.program=:\
 :file.open.exit.program=:\
 :stats.exit.program=:

# Remote CDU nodes
rnode.listen:\
 :recid=rt.sles96440:\
 :comm.info=0.0.0.0;9974:\
 :comm.transport=udt33:

# Secure+ parameters
secure+:\
 :certificate.directory=/home/nis02/jlyon/certs: \
 :s+cmd.enforce.secure.connection=n:
```

Updating Miscellaneous Parameters

This section identifies the miscellaneous records and defines available parameters. Required parameters are displayed in bold.

Updating the Path Record

The **ndm.path** record identifies the path to Connect:Direct files. The following table describes the parameter available for this record:

Parameter	Description	Value
path	The path to all Connect:Direct subdirectories and files.	path specification

Updating the SNODE Work Path

The **snode.work.path** parameter is part of the **ndm.path** record and identifies the path to the shared work area for SNODE work files on a cluster file system (not an NFS). This optional parameter provides a means to share SNODE work files among nodes in a load balancing environment. SNODE return code files (steprc files) and **copy** checkpoint information are created in this area when the **snode.work.path** parameter is specified. The following table describes the **snode.work.path** parameter:

Parameter	Description	Value
snode.work.path	The path to the shared work area for SNODE work files. **Note:** Specify the same path for all nodes in a cluster.	path specification

Updating the Node Name Record

The **ndm.node** record identifies the name of the Connect:Direct node. The following table describes the parameter available for this record:

Parameter	Description	Value
name	The name of the node.	The maximum length is 16 bytes. If a node name is longer, the name will be truncated.

Updating the PAM Service Record

The **ndm.pam** record identifies the PAM service configuration file used to authenticate the user authority for Connect:Direct Processes. If the service initialization parameter is defined and if PAM is installed on the Connect:Direct for UNIX server, PAM is used to authenticate users for service-providing applications. The following table describes the parameter available for this record:

Parameter	Description	Value
service	PAM service configuration file name.	File name

Updating the Quiesce/Resume Record

The **ndm.quiesce** record specifies whether Connect:Direct for UNIX is operating in a "test" mode. Use this record in conjunction with the NDMPXTBL table to enable the test mode. If you enable the **quiesce.resume** parameter, you must have an NDMPXTBL parameter table updated for your environment in the installation ndm/cfg/<*nodename*> directory. For more information on the test mode and the NDMPXTBL table, see Appendix C, *Using Connect:Direct for UNIX in a Test Mode*.

The following table describes the parameter available for this record:

Parameter	Description	Value
quiesce.resume	Enables/disables the test mode for Connect:Direct for UNIX.	y | n y—Enables the test mode. n—Disables the test mode. The default is **n**.

Updating the Priority Record

The **proc.prio** record identifies the default value of the Process priority. The following table describes the parameter available for this record:

Parameter	Description	Value
default	The default value of the Process priority.	1–15. The default value is **10**. 15 is the highest priority.

Updating the License Management Key Record

The **asset.protection** record identifies the name and location of the license management key file. The following table describes the parameter available for this record:

Parameter	Description	Value
keyfile	The license management key file.	name and location of the key

Restricting the Use of Special Characters in the Run Directory

If a run directory restriction is defined in the user configuration file (userfile.cfg), the **restrict** record determines if commands containing certain special characters are allowed. For more information on the userfile.cfg file, see *Updating the Local User Information Record Format* on page 63 and

Updating the Remote User Information Record on page 67. The following parameter is available for this record:

Parameter	Description	Values
cmd	Determines if commands with certain special characters are allowed.	y | n y—Restricts the ability to use commands with any of the following special characters: ; & ‘ | n—Does not restrict allowed commands.

Updating the Remote Node Connection Record

The **rnode.listen** record contains parameters used by the local node to monitor inbound connection requests. You can modify the IP address and port number in the **rnode.listen** record while the server is running. However, you must recycle the server before the change is active. The following table describes the remote node connection parameters:

Parameter	Description	Values
recid	A unique identifier of an **rnode.listen** record.	A text string
comm.info	The information needed to monitor connection requests from remote nodes using TCP/IP or LU6.2. This parameter is required. ◆ For TCP/IP connections, specify the host name or the IP address and port number. If specifying an IP address and port, separate parameters with a semicolon (;). Separate multiple addresses/host names with a comma, for example: 10.23.107.5;1364, fe00:0:0:2014::7;1364, msdallas-dt;1364 For more information on specifying IP addresses and host names, see Appendix B, *Specifying IP Addresses, Host Names, and Ports*. ◆ For LU6.2 connections, identify the profile name to identify the name of an SNA configuration profile for the remote connection. Connect:Direct generates the default name, hostl1, during the customization procedure. For AIX SNA, hostl1 refers to the side information profile name. For HP SNA, SunLink SNA, and Brixton SNA, hostl1 refers to the SNA profile file located in the same directory as the configuration files.	For TCP/IP connections, specify the host name or the IP address and port number: 10.23.107.5;1364 Separate multiple IP/host addresses with a comma (,): fe00:0:0:2014::7;1364, msdallas-dt;1364 A space can be added after the comma for readability. Set the IP address to monitor a specific adapter or to **0.0.0.0**, to monitor all adapters. The default port is **1364**. For LU6.2 connections, specify a profile name, up to 8 characters.

Parameter	Description	Values
comm.transport	The transport protocol for the remote node.	tcp | lu62 | blklu62 | udt33 tcp—For TCP/IP connections lu62—For AIX SNA LU6.2 connections blklu62—For other LU6.2 connections udt33—For UDT connections

Updating the TCQ Record

The **tcq** record provides information pertaining to the Transmission Control Queue. The following parameter is available for this record:

Parameter	Description	Value
max.age	The maximum number of days a Process with Held-in-Error status remains in the TCQ before it is automatically deleted.	A 3-digit decimal number. Connect:Direct does not automatically delete Processes when max.age=0. The default is **8** days.

Adding and Updating the Secure+ Record

The **secure+** record provides information pertaining to remote configuration of Secure+ Option from the Connect:Direct client API. This record is not included in the initparm.cfg file by default. You must manually add the secure+ record to the initparm.cfg file. The following parameters are available for this record:

Parameter	Description	Value
certificate.directory	Specifies a default certificate directory for Secure+ Option commands issued from the Connect:Direct client API. If the certificate directory is not configured, the default directory created during installation is used.	Directory path name

Parameter	Description	Value
s+cmd.enforce.secure.connection	Specifies whether Secure+ Option commands are accepted from the Connect:Direct client API on unsecure connections.	y | n y—Commands from unsecure connections are not accepted. The default is **y**. n—Commands from unsecure connections are accepted

Updating the Global Copy Record

The Global Copy record called **copy.parms** provides default information for the Connect:Direct copy operation. The ecz parameters are only used when extended compression is defined in a Process. The following parameters are available for this record:

Record	Description	Value
ckpt.interval	The default number of bytes transmitted in a copy operation before a checkpoint is taken. Following is a list of the maximum number of digits for each byte interval: no—No checkpointing nnnnnnnn—Up to an 8-digit decimal *nnnnnnnn*K—Up to an 8-digit decimal, where K denotes 1024 bytes *nnnnnnnn*M—Up to an 7-digit decimal, where M denotes 1048576 bytes *nnnn*G—Up to an 4-digit decimal, where G denotes 1073741824 bytes	The maximum possible value is 1 terabyte (TB). The normal value is 64KB.
ulimit	The action taken when the limit on a user output file size is exceeded during a copy operation.	**n**—Ignores the limit. **n** is the default value. **y**—Recognizes the user file size limit. If this limit is exceeded during a copy operation, the operation fails.
xlate.dir	The name of the directory containing the translation tables.	Any valid directory. The default path is ***d_dir*/ndm/xlate**.
xlate.send	The default translation table used when sending data to a remote node.	Any valid directory. The default file name is **def_send.xlt**.

Record	Description	Value
xlate.recv	The name of the default translation table used when copying data from a remote node.	The default file name is **def_recv.xlt** in the directory defined in the **xlate.dir** parameter.
continue.on.exception	The method to use to handle an exception condition in a Process. If a step fails due to a STOP IMMEDIATE or FLUSH exception issued on the remote node, the Process is placed in the Hold HE queue, regardless of the value of this parameter.	**y**—Continues Processing with the next step. **n**—Places a Process in the Hold queue with a value of HE. The default is **n**.
ecz.compression.level	Sets the compression level.	1–9. The default is **1**. 1—The fastest but offers the least degree of compression. 9—Provides the greatest degree of compression but is the slowest.
ecz.memory.level	How much virtual memory to allocate to maintaining the internal compression state.	1–9. The default is **4**. 1—Uses the least memory and 9 uses the most memory.
ecz.windowsize	The size of the compression window and history buffer. The larger the window, the greater the compression. However, increasing the window uses more virtual memory.	Valid values are 9–15. The default is **13**.
retry.codes	The codes to recognize as a file allocation retry attempt. File allocation retry enables a Process with a file allocation or open error on either the local or remote node to run the Process again, beginning at the copy step where the error occurred. This feature supports the ability to retry a Process that failed when a file is already in use. When a file allocation or open error occurs on either the local or remote node, the PNODE searches for the error or message ID in the retry.codes and retry.msgids parameters. If the error code or message ID is found, the Process is retried. Since error codes can vary from one operating system to another and the same error code can have different meanings, use message IDs to identify retry conditions when communicating between two different platforms. You can perform retry attempts based on codes only, IDs only, or a combination of the two. When a retry condition is detected, the session is terminated cleanly and the Process is placed in the Timer queue.	Any valid error code

Record	Description	Value
retry.msgids	Identifies the message IDs to use to support a file allocation retry attempt. Since error codes can vary from one operating system to another and the same error code can have different meanings, use message IDs to identify retry conditions when communicating between two different platforms. When a file allocation or open error occurs on either the local or remote node, the PNODE searches for the message ID in the retry.msgids parameters. If the message ID is found, the Process is retried. You can perform retry attempts based on codes only, message IDs only, or a combination of the two. When a retry condition is detected, the session is terminated cleanly and the Process is placed in the Timer queue.	Any of the valid file allocation retry messages.
tcp.crc	Globally turn on or off the CRC function for TCP/IP Processes.	y | n y—Turns on the CRC function globally. n—Turns off the CRC function globally. The default is **n**.
tcp.crc.override	Determines whether netmap remote node and Process statement overrides for CRC checking are allowed. If this value is set to n, setting overrides for CRC checking will be ignored.	y | n y—Allows netmap remote node and Process statement overrides for CRC checking. n—Prevents netmap remote node and Process statement overrides for CRC checking. The default is **n**.
strip.blanks	Determines whether trailing blank characters are stripped from the end of a record. If strip.blanks is not defined in the initialization parameter, the default value of i is used.	y | n | i **y**—Strips blanks from the end of a record **n**—Does not strip blanks from the end of a record **i**—Ignores the setting defined in the .Local node record and uses the settings for strip.blanks as determined by the default value of the remote node type as follows: ◆ z/OS, VM, VSE, and i5OS—y ◆ All other platforms—n

Updating the Global Run Task Record

The Global Run Task record called **runtask.parms** is used if the PNODE and SNODE cannot resynchronize during a restart. If a Process is interrupted when a run task on an SNODE step is executing, Connect:Direct attempts to synchronize the previous run task step on the SNODE with the current run task step. If synchronization fails, Connect:Direct reads the **restart** parameter to determine whether to perform the **run task** step again. The following parameter is available for this record:

Parameter	Description	Value
restart	If processing is interrupted when a **run task** on an SNODE step is executing and if synchronization fails after a restart, Connect:Direct reads the **restart** parameter to determine whether to perform the **run task** step again. Set this parameter in the initialization parameters file of the SNODE. **Note:** When a load balancing cluster is used and the snode.work.path *is* specified, the **restart** parameter takes effect only when resynchronization fails.	y | n **y**—The run task program runs again. The default is **y**. **n**—The Process skips the **run task** step.

Updating the Statistics File Information Record

The statistics file information record called **stats** define the statistics facility. The following parameters are available for this record:

Parameter	Description	Value
file.size	The maximum size in bytes of an individual statistics data file. The statistics file name is written in the format of **Syyyymmdd.ext**, where **yyyy** indicates year, **mm** indicates month, and **dd** indicates day. The extension (**ext**) begins as 001. When a statistics file reaches the defined size within a 24-hour period, a new file is created with the same file name. The extension value is incremented by one.	nnnnnnnn, nnnnnnnnK, nnnnnnnM, or nnnnG—Establishes a default output file size limit for the statistics files. K denotes 1024 bytes. M denotes 1048576 bytes. G denotes 1073741824 bytes. The maximum value you can specify is 1 TB.
log.commands	Determines whether commands are written to the statistics file. If you want to log all commands except the select statistics and select process commands, set this parameter to y and the log.select parameter to n.	y | n y—Commands are written to the statistics file. n—Commands are not written to the statistics file. The default is **n**.

Parameter	Description	Value
log.select	Specifies whether Connect:Direct creates a statistics record when a select process or select statistics command is executed.	y | n y—A statistics record is created. n—A statistics record is not created. The default is **n**.
snmp.agent.port	The SNMP agent monitoring port number. This number must match the port number listed in the SNMP agent initialization file.	The default is **1365**.
snmp.agent.activated	Notifies the server if an SNMP agent is active.	y | n y—Notifies the server. n—Does not notify the server. The default is **n**.
syslog.logd	Enables Connect:Direct to send license management failure messages to the UNIX syslogd daemon. Refer to manual pages for instructions on configuring syslog.	Available values are: kern—Kernel user—User level mail—Mail subsystems daemon—System daemons auth—Security or authorization syslog—syslogd daemon lpr—Line-printer subsystem news—News subsystem uucp—uucp subsystem The default value is **daemon.**
max.age	Specifies how old a statistics file must be before it is archived. Once a day, a shell script is executed that identifies the statistics files that are as old as the max.age, runs the tar command and the compress command to create a compressed archive, and then deletes the statistics files that have been archived.	A 3-digit decimal number. The default is **8** days. 0—no archiving.

Running a Process generates multiple statistics records. To accommodate the large number of statistics records generated, Connect:Direct closes the current statistics file and creates a new statistics file at midnight every day. It can also close the current file before midnight if the file size exceeds the value set for the **file.size** initialization parameter. The default file size is **1** megabyte.

Statistics files are stored in the *d_dir*/work/cd_node directory. Names of the statistics files are in the format **Syyyymmdd.ext**, where **yyyy** indicates year, **mm** indicates month, and **dd** indicates day. The extension (**ext**) begins as 001. The extension is incremented by one each time a new statistics file is created in a single day.

Connect:Direct for UNIX provides a utility to archive and purge statistics files. You identify when to archive a statistics file by setting the parameter, max.age. The max.age parameter defines how old a statistics file must be before you want to archive the file. Once a day, the script called

statarch.sh is started. This script identifies the statistics files that are greater than or equal to the max.age. It then runs the tar command and the compress command to create a compressed archived file of all the statistics records that match the max.age parameter. Once the statistics files are archived, these files are purged.

The archived files are stored in the directory where the statistics files and TCQ are stored. The shell script, statarch.sh, is located in the ndm/bin directory. If necessary, modify the script to customize it for your environment.

If you want to restore statistics files that have been archived, run the statrestore.sh script. It uses the tar command to restore all the statistics files in the archive. Once files are restored, the statistics records can be viewed using the select statistics command.

Updating the Server Authentication Record

The server authentication record called **authentication** is used during the authentication procedure. The following parameters are available for this record:

Parameter	Description	Value
server.program	The name and location of the server program used during the authentication procedure.	The default is **ndmauths**.
server.keyfile	The name and location of the key file used during the authentication procedure.	The default is **keys.server**.

Updating the User Exit Record

The user exit record called **user.exits** provides interfaces to specified programs. The available user exits include Statistics Exit, File Open Exit, and Security Exit. The following parameters are available for this record:

Parameter	Description	Value
stats.exit.program	The gateway control program used during the user exit procedure. This exit is given control for each statistics record that is written.	Name of the gateway control program.

Parameter	Description	Value
file.open.exit.program	The file open exit program used during the user exit procedure. It enables you to control file names on both the sending and receiving node. The exit is located so that it takes control on the receiving (remote) node before the file is opened. This exit applies only to the **copy** statement and provides access to all file control parameters (including the data set name file name, sysopt parameters, and disposition).	Name of the file open exit program.
security.exit.program	The security exit program used during the user exit procedure. This exit generates and verifies passtickets, and it also supports other password support programs, such as PASSTICKET, part of the RACF security system available on MVS hosts and also supported by IBM on UNIX AIX and OS/2 computers using the NETSP product.	Name of the security exit program.
security.exit.flag	Modifies the default behavior of security.exit.program. This is an optional parameter.	snode_sec_exit_only | sec_exit_only snode_sec_exit_only—Causes Connect:Direct to use the security exit, when it is acting in the role of the SNODE. After Connect:Direct receives a valid message, it evaluates the proxy and the secure point-of-entry to establish the local user. The security exit is not used when Connect:Direct is the PNODE. sec_exit_only—Causes Connect:Direct to always use the security exit. After Connect:Direct receives a valid message, it evaluates the proxy and the secure point-of-entry to establish the local user.

Updating the Firewall Navigation Record

The firewall navigation record, called firewall.parms, enables you to assign a specific TCP/IP and UDT source port number or a range of port numbers with a particular TCP/IP and UDT address for outbound Connect:Direct sessions. These ports also need to be open on the firewall of the trading partner to allow the inbound Connect:Direct sessions. This feature enables controlled access to a Connect:Direct server if it is behind a packet-filtering firewall without compromising security policies.

Note: Before you configure firewalls for use with UDT, refer to Appendix A, *Configuring Firewall Navigation*, for information on the differences between UDT and TCP session establishment and firewall navigation.

The following parameters are available for this record:

Parameter	Description	Value
tcp.src.ports	For TCP/IP connections, remote IP addresses and the ports permitted for the addresses when using a packet-filtering firewall. This parameter is required only if the local node acts as a PNODE. Place all values for an address inside parentheses and separate each value for an address with a comma.	Valid IP address with an optional mask for the upper boundary of the IP address range and the associated outgoing port number or range of port numbers for the specified IP address, for example: (199.2.4.*, 1000), (fd00:0:0:2015:*::*, 2000-3000), (199.2.4.0/255.255.255.0, 4000-5000),(fd00:0:0:2015::0/48, 6000, 7000) A wildcard character (*) is supported to define an IP address pattern. If the wildcard character is used, the optional mask is not valid. For more information on IP addresses, masks, and ports, see Appendix B, *Specifying IP Addresses, Host Names, and Ports*.
tcp.src.ports.list.iterations	The number of times that Connect:Direct scans the list of available ports to attempt a connection before going into a retry state.	Any numeric value from 1–255. The default value is **2**. .
udp.src.ports	For UDT connections, remote IP addresses and the ports permitted for the addresses when using a packet-filtering firewall. This parameter is recommended if a firewall is used whether the local node acts as a PNODE or an SNODE. Place all values for an address inside parentheses and separate each value for an address with a comma.	Valid IP address with an optional mask for the upper boundary of the IP address range and the associated outgoing port number or range of port numbers for the specified IP address, for example: (199.2.4.*, 1000), (fd00:0:0:2015:*::*, 2000-3000), (199.2.4.0/255.255.255.0, 4000-5000),(fd00:0:0:2015::0/48, 6000, 7000) A wildcard character (*) is supported to define an IP address pattern. If the wildcard character is used, the optional mask is not valid. For more information on IP addresses, masks, and ports, see Appendix B, *Specifying IP Addresses, Host Names, and Ports*.

Parameter	Description	Value
udp.src.ports.list.iterations	The number of times that Connect:Direct scans the list of available ports to attempt a connection before going into a retry state.	Any numeric value from 1–255. The default value is **2**. .

Chapter 4

Maintaining the Client Configuration File

The client configuration file consists of parameter records that interface with End User Applications (EUA). The client file includes the following parameters:

- Connect:Direct API configuration parameters
- Connect:Direct CLI configuration parameters
- Client authentication parameters

You can modify Connect:Direct configuration files using any text editor. If you want to create a new configuration file, use the **cdcust** command.

About the Client Configuration File

The client configuration file is created during the customization procedure and resides in *d_dir*/ndm/cfg/cliapi/ndmapi.cfg, where *d_dir* is the directory where Connect:Direct is installed.

A sample client configuration file is displayed in the following example:

```
# Connect:Direct for UNIX Client configuration file

cli.parms:\
  :script.dir=/home/qatest/jsmith/cdunix/hp/ndm/bin/:\
  :prompt.string=”Test CD on Medea”:

api.parms:\
  :tcp.hostname=alicia:\
  :tcp.port=1393:\
  :wait.time=50:

# Authenticator
authentication:\
  :client.program=/home/qatest/jsmith/cdunix/hp/ndm/bin/ndmauthc:\
  :client.keyfile=/home/qatest/jsmith/cdunix/hp/ndm/sc/keys.client:
```

Updating the API Configuration Record

The Connect:Direct API Configuration record, **api.parms**, is used by the API to communicate. The parameters for the API configuration record are described in the following table:

Parameter	Description	Value
tcp.hostname	The host name or IP address to which the API usually connects.	Host name or IP address. For more information on specifying IP addresses and host names, see Appendix B, *Specifying IP Addresses, Host Names, and Ports*.
tcp.port	The TCP/IP port number to which the API usually connects.	Port number. The default is **1363**.
wait.time	The number of seconds to wait for responses from the server. If this limit is exceeded, the message ID XCMG000I is displayed.	Seconds to wait. The default is **50** seconds.

Updating the CLI Configuration Record

The CLI configuration record, **cli.parms**, identifies the location of the script files to format the output of the **select statistics** and **select process** commands and allows you to customize the CLI prompt. If you customize the script to format the output of the **select statistics** and **select process** command, update the **script.dir** parameter to identify the location of the scripts. If you want to display a customized prompt at the CLI command line, in place of the default "Direct" prompt, identify the prompt to use in the **prompt.string** parameter. The **cli.parms** parameters are described in the following table:

Parameter	Description	Value
script.dir	The directory where customized script files are stored. Specify this parameter if you have created a custom script to format the output of the **select statistics** and **select process** commands. The file names must be ndmstat and ndmproc.	Directory name. The default directory is **ndm/bin/**.
prompt.string	Identifies the CLI prompt to display on the command line when the client is started. If the prompt string includes spaces or special characters, enclose it in single or double quotation marks. You can set the customized prompt in this parameter and at the command line (using the -P parameter). If the prompt string is specified in both places, the -P parameter at the command line takes precedence. When the default prompt is overridden, the new prompt string is displayed in the Welcome banner and at the command prompt.	Prompt string up to 32 characters. The default is "**Direct**".

Updating the Client Authentication Record

The client authentication record, **authentication**, is used during the authentication procedure. The client authentication parameters are described in the following table:

Parameter	Description	Value
client.program	The client program to use during authentication.	Client program name. The default is **ndmauthc**.
client.keyfile	The key file to use during authentication.	Client key file. The default is **keys.client**.

Chapter 5

Maintaining the Network Map File

This chapter describes the parameters in the network map file. This file is created when you install Connect:Direct for UNIX. If necessary, use a text editor to add or modify remote node records in the network map file. You can modify the network map file dynamically while the server is running.

Note: You can also use the Connect:Direct Browser to perform some of the procedures in this chapter. To learn more about the Connect:Direct Browser, see the documentation on the Connect:Direct Browser CD-ROM or available online from the Sterling Commerce Documentation Library.

About the Network Map File

The network map contains connectivity information that describes the local node and the remote nodes in the network. One remote node information record is created for each node with which the local node communicates.

The network map file resides in *d_dir*/ndm/cfg/*cd_node*/netmap.cfg where *d_dir* is the location where Connect:Direct is installed and *cd_node* is the node name.

Note: If you are using TCP/IP, the local node can communicate with a remote node without a remote node information record. Specify the required connection information in the submit command or the Process statement.

Sample Network Map Entry for Remote Node

The following sample shows network map remote node entries for a TCP/IP connection and a Sun LU6.2 connection to remote nodes.

```
# Sample Network Map remote node entry for a TCP/IP connection
remote.customer.node:\
  :conn.retry.stwait=00.00.30:\
  :conn.retry.stattempts=3:\
  :conn.retry.ltwait=00.10.00:\
  :conn.retry.ltattempts=6:\
  :tcp.max.time.to.wait=180;\
  :runstep.max.time.to.wait=0:\
  :contact.name=:\
  :contact.phone=:\
  :descrip=:\
  :sess.total=255:\
  :sess.pnode.max=255:\
  :sess.snode.max=255:\
  :sess.default=1:\
  :comm.info=10.20.246.49;9974:\
  :comm.transport=tcp:\
  :comm.bufsize=65536:\
  :pacing.send.delay=0:\
  :pacing.send.count=0:
# Sample Network Map remote node entry for a Sun LU6.2 connection
# hostl1 is the profile name
MVS.SAM1.NODE:\
  :conn.retry.stwait=00.00.30:\
  :conn.retry.stattempts=3:\
  :conn.retry.ltwait=00.10.00:\
  :conn.retry.ltattempts=6:\
  :contact.name=:\
  :contact.phone=:\
  :descrip=:\
  :sess.total=255:\
  :sess.pnode.max=128:\
  :sess.snode.max=127:\
  :sess.default=1:\
  :comm.info=hostl1:\
  :comm.transport=blklu62:\
  :comm.bufsize=16000:
```

Note: To insert comments about fields in the network map, be sure to place a # in the first column. If the # is not in the first column, the comment is not ignored and the field is read.

Updating the Local Node Connection Record

The local.node record serves two separate purposes. It configures settings for the local node, and it also provides default configuration values that can be overridden in the remote node entries. Two sets of connection retry parameters are created: short-term and long-term. Short-term parameters define retry attempts in the event of a short-term connection failure. Connect:Direct uses long-term

parameters after exhausting short-term attempts. Long-term attempts are set for less frequent retries, because long-term attempts assume that the connection problem cannot be fixed quickly.

Following are the local.node parameters. The parameters in bold are required.

Parameter	Description	Value
api.max.connects	The maximum number of concurrent API connections permitted for the local node. The value of api.max.connects and sess.total cannot exceed the number of file descriptors available. This value is system dependent. A Command Manager (CMGR) is created for every API connection that is successfully established. The number of Command Managers that a PMGR can create is system-dependent and limited by the number of file descriptors available for each UNIX Process. The number of file descriptors set up by the UNIX operating system may affect Connect:Direct operation.	1–256 The default is **16**.
comm.bufsize	The buffer size for transmitting data to and from a remote node for TCP/IP connections.	The value for TCP/IP has no limit (up to 2,147,483,623). For LU6.2, the maximum is 32000. The default is **65536** bytes.
conn.retry.stwait	The time to wait between retries immediately after a connection failure occurs. The format is **hh.mm.ss**, where **hh** specifies hours, **mm** specifies minutes, and **ss** specifies seconds.	The maximum value is limited to the highest value in the clock format, 23.59.59. The default is **00.00.30**, which is 30 seconds.
conn.retry.stattempts	The number of times to attempt connection after a connection failure occurs.	0–9999 The default is **6**.
conn.retry.ltwait	The time to wait between long-term retry attempts after all short-term retry attempts are used. The format is **hh.mm.ss**, where **hh** specifies hours, **mm** specifies minutes, and **ss** specifies seconds.	00.00.00–23.59.59 The default is **00.10.00**, or 10 minutes.
conn.retry.ltattempts	The number of times to attempt a connection after all short-term retry attempts are used.	0–9999 The default is **6**.

Parameter	Description	Value
conn.retry.exhaust.action	Action to take after the specified short and long-term retries have been used.	hold | delete hold—Places Processes in the hold queue in "Held in Error" status, after all retry attempts are used. This is the default value. delete—Causes the Processes to be deleted from the TCQ.
contact.name	The name of the Connect:Direct administrator or operator.	Name
contact.phone	The phone number of the Connect:Direct administrator or operator.	Phone number
descrip	Comments to include as part of the record.	An unlimited text string
lu62.writex.wait	If you are using SNA on an IBM AIX operating system, use this parameter to identify how long to wait before retrying the connection.	0:00:00–59:59:59 The value is in hh:mm:ss format. The default value is **1**.
lu62.writex.retry.attempts	If you are using SNA on an IBM AIX operating system, use this parameter to identify how many times to attempt a connection.	0–2,147,483,647 The default value is **0**.
netmap.check	Enhanced security testing performed on the SNODE. For TCP/IP connections, the remote IP address of the incoming socket connection is compared to the comm.info record of the netmap.cfg file. These values must match for a Connect:Direct session to be established. The comm.info record can be the official network name, an alias name listed in the appropriate file (for example, /etc/hosts, if the system is not running NIS or DNS), or the IP address. For all connections, the remote node name must be in the netmap.cfg.	y | n y—Specifies that the security checks are made to verify that the remote node name is in the netmap.cfg file. n—Specifies that none of these security checks are made. The default value is **n**.
outgoing.address	If running in a high availability environment, this parameter enables you to specify the virtual IP address for the remote node to use for network map checking and prevents the Process from failing when initiated from within a high availability environment. Specify the IP address for this value and network map checking verifies the address instead of the value set in **comm.info** in the SNODE network map record.	nnn.nnn.nnn.nnn (IPv4) or nnnn:nnnn:nnnn:nnnn:nnnn:nnnn:nnnn:nnnn (IPv6) For more information on specifying IP addresses, see Appendix B, *Specifying IP Addresses, Host Names, and Ports*.

Parameter	Description	Value
pacing.send.delay	The time to wait between send operations to the remote node. The decimal number is the number of milliseconds between the end of one packet and the beginning of the next packet. Time-based pacing does not contribute to network traffic. The value for this parameter has no effect on LU6.2 connections.	The format is *nnn*. No limit exists for the size of this value. The default is **0**, which indicates no pacing of this type.
pacing.send.count	The number of send operations to perform before automatically waiting for a pacing response from the remote node. The value for this parameter has no effect on LU6.2 connections.	No limit exists for the size of this value. The default is **0**, which indicates no pacing of this type.

proxy.attempt	Enables the ID subparameter of snodeid to contain a proxy, or dummy user ID to be used for translation to a local user ID on the remote system. Using a dummy user ID improves security because neither the local system nor the remote system requires a valid user ID from the other side.
	The following code illustrates the logic used to perform a security check for the user ID:
	`if proxy.attempt = yes`
	`  if snodeid (ID only or ID & password) is specified`
	`  if ID@PNODE found in userfile.cfg`
	`  security checking OK`
	`  else`
	`  if (ID, PSWD) is valid UNIX ID & password`
	`  security OK`
	`  else`
	`  security checking failed`
	`  else /*snodeid is NOT specified */`
	`  if submitter@PNODE found in userfile.cfg`
	`  security OK`
	`  else`
	`  security checking failed`
	`  else /*i.e. proxy.attempt = no, the default value */`
	`  if snodeid (ID & password) is specified`
	`  if (ID, PSWD) is valid UNIX ID & password`
	`  security OK`
	`  else`
	`  security checking failed`
	`  else /*snodeid is NOT specified */`
	`  if submitter@PNODE found in userfile.cfg`
	`  security OK`
	`  else`
	`  security checking failed`
		y | n
		y—Specifies that the remote users can specify a dummy user ID in snodeid parameter.
		n—Specifies that the remote users cannot specify dummy user ID in snodeid parameter.
		The default is **n**.

Parameter	Description	Value
runstep.max.time.to.wait	The maximum time to wait for remote run steps to complete. Remote run steps include remote run task, run job, or submit statements. This wait time is different from the wait time specified by the tcp.max.time.to.wait parameter. Using runstep.max.time.to.wait prevents a Process from failing when a remote step takes longer to complete than specified in tcp.max.time.to.wait.	0–10000 The value is in seconds. The default value is **0**.
sess.total	The maximum number of concurrent connections between all nodes and the local node. The sum of api.max.connects and sess.total cannot exceed the number of file descriptors available. This value is system dependent. You must define enough file descriptors to handle the number of concurrent Connect:Direct sessions allowed, which can be as many as 999. If sess.total exceeds the number of sessions in the APS license key file, the license key file silently overrides this value.	0–999 A 1–3 digit number. The default is **255**.
sess.pnode.max	The maximum concurrent connections, where the local node is the initiator of the session. Number of PNODE sessions cannot exceed the total number of sessions. If sess.pnode.max is larger than sess.total, the value of sess.pnode.max is silently rounded down to the value of sess.total.	0–999 The default is **255**.
sess.snode.max	The maximum concurrent connections, where the local node is the secondary node in a session. Number of SNODE sessions cannot exceed the total number of sessions. If sess.snode.max is larger than sess.total, then it is silently changed to the value of sess.total.0	0–999 The default is **255**.
sess.default	The default session class for starting session managers. A Process executes on the specified class or any higher session class.	1–50 The default is **1**.
tcp.api.bufsize	The buffer size for transmitting data to and from a Connect:Direct CLI/API.	This value has no limit. The default is **32768** bytes.

Parameter	Description	Value
tcp.api	The information needed to monitor connection requests from the CLI or API using TCP/IP. The host is the host name or IP address where Connect:Direct is running. The port identifies the communications port for Connect:Direct for UNIX. Multiple host name/IP addresses and port combinations can be specified when they are separated by a comma. This parameter is required.	*host name/IP address*;*nnnn* host name—is the name of the Connect:Direct host computer. IP address—is the IP address of a machine running Connect:Direct: nnn.nnn.nnn.nnn (IPv4) or nnnn:nnnn:nnnn:nnnn:nnnn:nnnn:nnnn:nnnn (IPv6) port—identifies the communications port for Connect:Direct for UNIX. The format is *nnnn*, where *nnnn* is a decimal number. A semi-colon separates the host name/IP address from the port: msdallas-dt;1364 You can specify multiple address/host name and port combinations (separated with a comma): 10.23.107.5;1364, fe00:0:0:2014::7;1364, msdallas-dt;1364 For more information on specifying IP addresses and host names, see Appendix B, *Specifying IP Addresses, Host Names, and Ports*.
tcp.api.inactivity.timeout	This is the maximum time a CMGR waits before exiting when it has not received a command from a client program.	0–86399 (23 hours, 59 minutes, and 59 seconds) The value is in seconds. The default is **0**, which indicates no timeout occurs.
tcp.max.time.to.wait	The maximum time the local node waits for a message from the remote node when using TCP/IP. When the time expires, the Process is moved to the Timer queue and Connect:Direct attempts to re-establish a session with the remote node. When set to 0, wait time is unlimited unless limited by the operating system.	0–10000 The value is in seconds. The default value is **180**.

Updating TCP/IP Settings for a Local Node

The **tcp.ip.default** record defines default information to use when the remote node is specified by IP address. The **tcp.ip.default** record parameters are described in the following table:

Parameter	Description	Value
conn.retry.stwait	The time to wait between retries immediately after a connection failure occurs. The format is **hh.mm.ss**, where **hh** specifies hours, **mm** specifies minutes, and **ss** specifies seconds.	The maximum value is limited to the highest value in the clock format, 23.59.59. The default is **00.00.30**, which is 30 seconds.
conn.retry.stattempts	The number of times to attempt connection after a connection failure occurs.	0–9999 The default is **6**.
conn.retry.ltwait	The time to wait between long-term retry attempts after all short-term retry attempts are used. The format is **hh.mm.ss**, where **hh** specifies hours, **mm** specifies minutes, and **ss** specifies seconds.	0–23.59.59 The default is **00.10.00**, or 10 minutes.
conn.retry.ltattempts	The number of times to attempt a connection after all short-term retry attempts are used.	0–9999 The default is **6**.
comm.bufsize	The buffer size for transmitting data to and from a remote node.	The value for TCP/IP has no limit (up to 2,147,483,623). For LU6.2, the maximum is 32000. The default is **16000** bytes.
conn.retry.exhaust.action	Action to take after the specified short and long-term retries have been used.	hold | delete hold—Places Processes in the Hold queue in Held in Error status, after all retry attempts are used. This is the default value. delete—Causes the Processes to be deleted from the TCQ.
tcp.max.time.to.wait	The maximum time the local node waits for a message from the remote node when using TCP/IP. When the timer expires, the Process is moved to the Timer queue and Connect:Direct attempts to re-establish a session with the remote node.	0–10,000 The value in seconds. The default value is **180**. When set to 0, wait time is unlimited unless limited by the operating system.

Parameter	Description	Value
runstep.max.time.to.wait	The maximum time to wait for remote run steps to complete. Remote run steps include remote run task, run job, or submit statements. This wait time is different from the wait time specified by the tcp.max.time.to.wait parameter. Using runstep.max.time.to.wait prevents a Process from failing when a remote step takes longer to complete than specified in tcp.max.time.to.wait.	0–10000 The value in seconds. The default value is **0**.
contact.name	The name of the administrator or operator.	Name
contact.phone	The phone number of the Connect:Direct administrator or operator.	Phone number
descrip	Comments to include as part of the record.	An unlimited string
sess.total	The maximum number of concurrent connections between all nodes and the local node. The sum of api.max.connects and sess.total cannot exceed the number of file descriptors available. This value is system dependent.	0–999 A 1–3 digit number. The default is **255**.
sess.pnode.max	The maximum concurrent connections, where the local node is the initiator of the session.	0–999 The default is **255**.
sess.snode.max	The maximum concurrent connections, where the local node is the secondary node in a session.	0–999 The default is **255**.
sess.default	The default session class for starting session managers. A Process executes on the specified class or any higher session class. The value for this parameter overrides the equivalent value in the local.node record.	1–50 The default is **1**.
pacing.send.delay	How long to wait between send operations to the remote node. The decimal number is the number of milliseconds between the end of one packet and the beginning of the next packet. Time-based pacing does not contribute to network traffic. The value for this parameter has no effect on LU6.2 connections.	*nnn* The size of this number has no limit. The default is **0**, which indicates no pacing of this type.

Parameter	Description	Value
pacing.send.count	The number of send operations to perform before automatically waiting for a pacing response from the remote node. The value for this parameter has no effect on LU6.2 connections.	No limit exists for the size of this value. The default is **0**, which indicates no pacing of this type.

Updating Remote Node Connection Information

The remote node connection information record includes remote node information. Update these parameters as necessary to define default values to use for a remote node connection or add a new set of parameters for each new remote node you define. Following are the remote node connection parameters

Parameter	Description	Value
alternate.comminfo	Provides support for establishing netmap-checked sessions with systems with multiple IP addresses, such as Connect:Direct/Plex z/OS. Use this parameter to list all IP addresses or host names that are part of the multiple IP address environment. For Connect:Direct/Plex, this list should include the address of each Connect:Direct/Server with a different IP address from the Connect:Direct/Plex Manager.If the IP address of the initiating node does not match the IP address specified on the **comm.info** parameter, the **alternate.comminfo** parameter is checked for other valid IP addresses. For more information on specifying IP addresses and host names, see Appendix B, *Specifying IP Addresses, Host Names, and Ports*.	*host name/IP address* or * host name—Host name associated with the IP address, for example: :alternate.comminfo=hops (where hops is a machine on the local domain) :alternate.comminfo=hops.csg.stercomm.com (fully-qualified host name) IP address——the IP address of a machine running Connect:Direct in IPv4 or IPv6 format: nnn.nnn.nnn.nnn (IPv4) or nnnn:nnnn:nnnn:nnnn:nnnn:nnnn:nnnn:nnnn (IPv6) For example: :alternate.comminfo=10.23.107.5 :alternate.comminfo=fe00:0:0:2014::7 Specify multiple addresses/host names by separating them with a comma (,). A space can be added after the comma for readability. For example: 10.23.107.5, fe00:0:0:2014::7, msdallas-dt *—Accepts any IP address. This turns off IP address validation. **Note:** Partial pattern matches are not supported, such as: *.mydomain.com, myplex??.mydomain.com.

Parameter	Description	Value
alt.comm.outbound	Alternate communication address (communication path) used for outbound Processes. This parameter provides the alternate addresses for a remote node that has multiple NIC cards. When the local node is the PNODE, the alternate addresses are tried if an initial attempt to the primary address (specified in the comm.info parameter) fails. After a connection has been established, if the connection is subsequently lost, attempts to reestablish the connection through the retry mechanism use the same address as the initial connection. When the local node is the SNODE, the alternate addresses are used in the Netmap check.	*Fully-qualified host name/IP address*;*nnnn* The host name/IP address and port are separated by a semi-colon (;). A comma separates the list of alternate communication paths, and the list is processed from the top down. For example: salmon;9400, 10.20.40.65;9500 For more information on specifying IP addresses and host names, see Appendix B, *Specifying IP Addresses, Host Names, and Ports*.
comm.bufsize	The buffer size for transmitting data to and from a remote node on TCP/IP connections.	The value for TCP/IP has no limit (up to 2,147,483,623). For LU6.2, the maximum is 32000. The default is **65536** bytes.

Parameter	Description	Value
comm.info	The information needed to initiate connection requests to remote nodes using TCP/IP or LU6.2. This information refers to the network card that the local Connect:Direct node uses to initiate outbound requests. This value is required. ◆ For TCP/IP connections, specify the host name or the IP address and port number. If specifying IP address and port, separate parameters with a semicolon (;). ◆ For LU6.2 connections, identify the profile name to identify the name of an SNA configuration profile for the remote connection. Connect:Direct generates the default name, hostl1, during the customization procedure. For AIX SNA, hostl1 refers to the side information profile name. For HP SNA, SunLink SNA, and Brixton SNA, hostl1 refers to the SNA profile file located in the same directory as the configuration files.	For TCP/IP connections, specify the host name or the IP address and port number. The default port is **1364**. For LU6.2 connections, specify a profile name, up to 8 characters. For more information on specifying IP addresses and host names, see Appendix B, *Specifying IP Addresses, Host Names, and Ports*.
comm.transport	The transport protocol for the remote node.	tcp | lu62 |blklu62 | udt33 tcp—TCP/IP connections lu62—AIX SNA LU6.2 connections blklu62—Other LU6.2 connections udt33—UDT connections
conn.retry.stwait	Time to wait between retries immediately after a connection failure occurs. The format is **hh.mm.ss**, where **hh** specifies hours, **mm** specifies minutes, and **ss** specifies seconds.	The maximum value is limited to the highest value in the clock format, 23.59.59. The default is **00.00.30**, which is 30 seconds.
conn.retry.stattempts	Number of times to attempt connection after a connection failure occurs.	0–9999 The default is **6**.

Parameter	Description	Value
conn.retry.ltwait	Time to wait between long-term retry attempts after all short-term retry attempts are used. The format is **hh.mm.ss**, where **hh** specifies hours, **mm** specifies minutes, and **ss** specifies seconds.	0–23.59.59 The default is **00.10.00**, or 10 minutes.
conn.retry.ltattempts	Number of times to attempt a connection after all short-term retry attempts are used.	0–9999 The default is **6**.
conn.retry.exhaust.action	Action to take after the specified short and long-term retries have been used.	hold | delete hold—Places Processes in the Hold queue in Held in Error status, after all retry attempts are used. This is the default value. delete—Causes the Processes to be deleted from the TCQ.
contact.name	The name of the Connect:Direct administrator or operator.	Name
contact.phone	The phone number of the Connect:Direct administrator or operator.	Phone number
descrip	Comments to include as part of the record.	An unlimited string
pacing.send.count	The number of send operations to perform before automatically waiting for a pacing response from the remote node. The value for this parameter has no effect on LU6.2 connections.	No limit exists for the size of this value. The default is **0**, which indicates no pacing of this type.
pacing.send.delay	The time to wait between send operations to the remote node. The decimal number is the number of milliseconds between the end of one packet and the beginning of the next packet. Time-based pacing does not contribute to network traffic. The value for this parameter has no effect on LU6.2 connections.	*nnn* The size of this number has no limit. The default is **0**, which indicates no pacing of this type.

Parameter	Description	Value
runstep.max.time.to.wait	The maximum time to wait for remote run steps to complete. Remote run steps include remote run task, run job, or submit statements. This wait time is different from the wait time specified by the tcp.max.time.to.wait parameter. Using runstep.max.time.to.wait prevents a Process from failing when a remote step takes longer to complete than specified in tcp.max.time.to.wait. The value is in seconds.	0–10000 The default value is **0**.
sess.total	The maximum number of concurrent connections between all nodes and the local node. The sum of api.max.connects and sess.total cannot exceed the number of file descriptors available. This value is system dependent. If sess.total exceeds the number of sessions in the APS license key file, the license key file silently overrides this value.	0–999 A 1–3 digit number. The default is **255**.
sess.pnode.max	The maximum concurrent connections, where the local node is the initiator of the session. Number of PNODE sessions cannot exceed the total number of sessions. If sess.pnode.max is larger than sess.total, the value of sess.pnode.max is silently rounded down to the value of sess.total.	0–999 The default is **255**.
sess.snode.max	The maximum concurrent connections, where the local node is the secondary node in a session. Number of SNODE sessions cannot exceed the total number of sessions. If sess.snode.max is larger than sess.total, then it is silently changed to the value of sess.total.	0–999 The default is **255**.
tcp.crc	Turn on or off the CRC function for TCP/IP Processes on the remote node.	y | n The default is **n**.

Chapter 6

Maintaining Access Information Files

You can control access to Connect:Direct for UNIX through the following: the user authorization information file, strong access control file, program directory, local and remote user information records, and security exit.

User Authorization Information File

In order for users to have access to Connect:Direct for UNIX and use Connect:Direct commands and statements, you need to define a record for each user ID in the user authorization information file, called **userfile.cfg**. The user ID is the key to the local user information record. It must be a valid user ID on the local system and must be unique.

Note: To disable access to the software for a local user, delete or comment out the local user information record.

You can create a generic user ID by specifying an asterisk (*) as the user ID. If a user does not have a specific local user information record, the user authorizations will default to those specified in this generic record. If no generic local user information record is defined and no specific local user information record is defined for the user, the user cannot use Connect:Direct.

Connect:Direct may optionally use remote user information records to translate remote user IDs to valid local user IDs where Connect:Direct for UNIX is installed. If an snodeid parameter is not coded on the incoming Process, Connect:Direct for UNIX uses this proxy relationship to determine the rights of remote users to issue Connect:Direct commands and statements.

Connect:Direct for UNIX uses the asterisk (*) character to establish generic mappings that facilitate mapping remote user IDs to local user IDs. The asterisk matches the node name or the host name. For example, you can specify *@node name to map the remote user ID to all user IDs at one node name, specify id@* to map to a specific user ID at all node names, or specify *@* to match all users at all node names.

The following table displays sample remote user ID mappings to local user IDs using the special characters:

Remote User ID	at	Remote Node Name	is mapped to	Local User ID	Result of Mapping
user	@	*	=	test02	Remote user ID “user” on all remote nodes is mapped to local user ID test02.
*	@	mvs.node3	=	labs3	All remote user IDs on remote node mvs.node3 are mapped to local user ID labs3.
*	@	*	=	vip01	All remote user IDs on all remote nodes are mapped to local user ID vip01.

You can generate all the records through the script-based customization procedure or generate only one or two records and use a text editor to generate additional records. After customization, you may want to modify some of the parameters. Use **cdcust** to create a new user file or a text editor to modify the file as necessary.

Sample User Authorization File

The following sample displays a user authorization file. In the sample, SAM1 is the remote user ID, MVS.SAM1.NODE is the remote node name, and sam is the local UNIX user ID.

```
SAM1@MVS.SAM1.NODE:\
  :local.id=sam:\
  :pstmt.upload=y:\
  :pstmt.upload_dir=/home/qatest/username/ndm/uploaddir:\
  :pstmt.download=y:\
  :pstmt.download_dir=/home/qatest/username/ndm/downloaddir:\
  :pstmt.run_dir=/home/qatest/username/ndm/rundir:\
  :pstmt.submit_dir=/home/qatest/username/ndm/submitdir:\
  :descrip=:
sam:\
  :admin.auth=y:\
  :pstmt.copy.ulimit=y:\
  :pstmt.upload=y:\
  :pstmt.upload_dir=/home/qatest/username/ndm/uploaddir:\
  :pstmt.download=y:\
  :pstmt.download_dir=/home/qatest/username/ndm/downloaddir:\
  :pstmt.run_dir=/home/qatest/username/ndm/rundir:\
  :pstmt.submit_dir=/home/qatest/username/ndm/submitdir:\
  :name=:\
  :phone=:\
  :descrip=:
  :cmd.s+conf=n:
```

Updating the Local User Information Record Format

The local user record, userid, defines the default values for each user ID. Most of the parameters in the local user information record can take the following values:

- y—Indicates that a user can perform the function. In the case of process and select statistics commands, the user can affect Processes and view statistics owned by this user ID
- n—Indicates that a user cannot perform the function.
- a—Indicates that a user can issue commands for Processes owned by all users and generate statistics records for all users.

The following table defines the local user information parameters. The default values are underlined.

Parameter	Description	Value
admin.auth	Determines if the user has administrative authority. If set to y, the user can perform all of the commands by default, but the specific command parameters override the default. If set to n, the specific command parameters must be granted individually.	y | n y—User has administrative authority. n—User does not have administrative authority. The default is **n**.
cmd.chgproc	Determines if the user can issue the **change process** command. A “y” value enables a user to issue the command to targets owned by that user. Whereas, “a” allows a user to issue the command to targets owned by all users.	y | n | a y—Allows the user to issue the command. n—Prevents the user from issuing the command. The default is **n**. a—Allows the user to issue the command against targets owned by all users.
cmd.delproc	Determines if the user can issue the **delete process** command. A “y” value enables a user to issue the command to targets owned by that user. Whereas, “a” allows a user to issue the command to targets owned by all users.	y | n | a y—Allows the user to issue the command. n—Prevents the user from issuing the command. The default is **n**. a—Allows the user to issue the command against targets owned by all users.

Parameter	Description	Value
cmd.flsproc	Determines if the user can issue the **flush process** command. A “y” value enables a user to issue the command to targets owned by that user. Whereas, “a” allows a user to issue the command to targets owned by all users.	y | n | a y—Allows the user to issue the command. n—Prevents the user from issuing the command. The default is **n**. a—Allows the user to issue the command against targets owned by all users.
cmd.selproc	Determines if the user can issue the **select process** command. A “y” value enables a user to issue the command to targets owned by that user. Whereas, “a” allows a user to issue the command to targets owned by all users.	y | n | a y—Allows the user to issue the command. n—Prevents the user from issuing the command. The default is **n**. a—Allows the user to issue the command against targets owned by all users.
cmd.viewproc	Determines if the user can issue the **view process** command. A “y” value enables a user to issue the command to targets owned by that user. Whereas, “a” allows a user to issue the command to targets owned by all users.	y | n | a y—Allows the user to issue the command. n—Prevents the user from issuing the command. The default is **n**. a—Allows the user to issue the command against targets owned by all users.
cmd.selstats	Determines if the user can issue the **select statistics** command. A “y” value enables a user to issue the command to targets owned by that user. Whereas, “a” allows a user to issue the command to targets owned by all users.	y | n | a y—Allows the user to issue the command. n—Prevents the user from issuing the command. The default is **n**. a—Allows the user to issue the command against targets owned by all users.
cmd.stopndm	Determines if the user can issue the **stop** command.	y | n y—Allows the user to issue the command. n—Prevents the user from issuing the command. The default is **n**.
cmd.s+conf	Determines if the user can issue commands from network clients, such as Sterling Control Center or Java API, to configure Secure+ Option. **Note:** This parameter has no effect on local tools, such as spadmin.sh and spcli.sh.	y | n y—Allows the user to issue commands. The default is **y**. n—Prevents the user from issuing commands.

Parameter	Description	Value
cmd.submit	Determines if the user can issue the **submit process** command.	y | n y—Allows the user to issue the command. n—Prevents the user from issuing the command. The default is **n**.
cmd.trace	Determines if the user can issue the **trace** command.	y | n y—Allows the user to issue the command. n—Prevents the user from issuing the command. The default is **n**.
pstmt.crc	Enables the user to override the initial settings to use the keyword CRC in a Process statement.	y | n y—Allows the user to issue the command. n—Prevents the user from issuing the command. The default is **n**.
descrip	Permits the administrator to add descriptive notes to the record.	Unlimited text string
name	The name of the user.	User name
phone	The phone number of the user.	user phone number
pstmt.copy	Determines if the user can issue the **copy** statement.	y | n y—Allows the user to issue the command. n—Prevents the user from issuing the command. The default is **n**.
pstmt.copy.ulimit	The action taken when the limit on a user output file size is exceeded during a copy operation. The value for this parameter overrides the equivalent value for the ulimit parameter in the initialization parameters file.	y | n | nnnnnnnn | nnnnnnnnK | nnnnnnnM | nnnnG y—Honors the user file size limit. If this limit is exceeded during a copy operation, the operation fails. n—Ignores the limit. The default is **n**. nnnnnnnn, nnnnnnnnK, nnnnnnnM, or nnnnG—Establishes a default output file size limit for all copy operations. K denotes 1024 bytes. M denotes 1048576 bytes. G denotes 1073741824 bytes. The maximum value you can specify is 1 TB.

Parameter	Description	Value
pstmt.upload	Determines if the user can send files from this local node. If a file open exit is in use, this parameter is passed to the exit, but it is not enforced.	y | n y—Allows the user to send files. The default is **y**. n—Prevents the user from sending files.
pstmt.upload_dir	The directory from which the user can send files. If a value is set for this parameter, then files can only be sent from this directory or subdirectories. If a file open exit is in use, this parameter is passed to the exit, but it is not enforced. If this parameter is defined, file names in Copy statements must be relative to this directory. Absolute path names can be used, but the path must coincide with this specification.	Directory path name
pstmt.download	Determines if the user can receive files to this local node. If a file open exit is in use, this parameter is passed to the exit, but it is not enforced.	y | n y—Allows the user to receive files. The default is **y**. n—Prevents the user from receiving files.
pstmt.download_dir	The directory to which the user can receive files. If a value is set for this parameter, then files can only be received to this directory or subdirectories. Otherwise, they can be received to any directory. If a file open exit is in use, this parameter is passed to the exit, but it is not enforced.	Directory path name
pstmt.run_dir	The directory where Connect:Direct for UNIX is installed that contains the programs and scripts the user executes with **run job** and **run task** statements. Any attempt to execute a program or script outside the specified directory fails. The UNIX Restricted Shell provides enhanced security by restricting the user to the commands contained in the pstmt.run_dir. If the user does not specify pstmt.run_dir, the commands are started with the Bourne shell. To restrict the use of special characters in the run directory, be sure to configure Y for the **restrict:cmd** initialization parameter. For more information on specifying the **restrict:cmd** initialization parameter, see *Restricting the Use of Special Characters in the Run Directory* on page 31.	Directory path name

Parameter	Description	Value
pstmt.runjob	Specifies whether the user can issue the **run job** statement.	y | n y—Allows the user to issue the statement. n—Prevents the user from issuing the statement. The default is **n**.
pstmt.runtask	Specifies whether the user can issue the **run task** statement.	y | n y—Allows the user to issue the statement. n—Prevents the user from issuing the statement. The default is **n**.
pstmt.submit	Specifies whether the user can issue the **submit** statement.	y | n y—Allows the user to issue the statement. n—Prevents the user from issuing the statement. The default is **n**.
pstmt.submit_dir	The directory from which the user can submit Processes. This is for **submit**s within a Process.	Directory path name
snode.ovrd	Specifies whether the user can code the **snodeid** parameter on the **submit** command and **process** and **submit statements.**	y | n y—Allows the user to code the **snodeid** parameter n—Prevents the user from coding the **snodeid** parameter. The default is **n**.
pstmt.crc	Gives the user the authority to specify the use of CRC checking in a Process statement. Setting this parameter to y enables the user to override the initial settings in the initialization parameters or network map settings files.	y | n y—Allows a user to specify CRC checking on a Process statement. n—Prevents a user from specifying CRCchecking on a Process statement. The default is **n**.

If the same parameter is specified in the remote user information record and the local user information record, the parameter in remote user information record takes precedence unless it is a null value. When a null value is specified in the remote record, the local user record takes precedence.

Updating the Remote User Information Record

The remote user information record contains a remote user ID and a remote node name that become the key to the record. The local.id parameter identifies a local user information record for this user. You must create a local user information record for the remote user.

Note: To prevent the remote user from using Connect:Direct, delete or comment out the remote user information, unless the remote user specifies an SNODEID parameter in the Process.

The remote user information record is remote userid@remote node name. It specifies the user and remote node name pair defined as a remote user. This value becomes the key to the record and must be unique. Create a remote user information record for each user on a remote node that will communicate with this local node.

Following are the parameters for the remote user information record:

Parameter	Description	Value
local.id	The local user ID to use for security checking on behalf of the remote user. The **local.id** parameter must identify a local user information record.	Local user ID
pstmt.copy	Determines if the user can issue the **copy** statement.	y | n y—Allows a user to issue the statement. n—Prevents a user from issuing the statement. The default is **n**.
pstmt.upload	Determines if the user can send files from this local node. If a file open exit is in use, this parameter is passed to the exit, but it is not enforced.	y | n y—Allows a user to send files. The default is **y**. n—Prevents a user from sending files.
pstmt.upload_dir	The directory from which the user can send files. If a value is set for this parameter, then files can only be sent from this directory or subdirectories. If a file open exit is in use, this parameter is passed to the exit, but it is not enforced. If this parameter is defined, file names in Copy statements must be relative to this directory. Absolute path names can be used, but the path must coincide with this specification.	Directory path name
pstmt.download	Determines if the user can receive files to this local node. If a file open exit is in use, this parameter is passed to the exit, but it is not enforced.	y | n y—Allows a user to receive files. The default is **y**. n—Prevents a user from receiving files.

Parameter	Description	Value
pstmt.download_dir	The directory to which the user can receive files. If a value is set for this parameter, then files can only be received to that directory or subdirectories. Otherwise, they can be received to any directory. If a file open exit is in use, this parameter is passed to the exit, but it is not enforced.	Directory path name
pstmt.run_dir	The directory that contains the programs and scripts the user can execute with **run job** and **run task** statements. Any attempt to execute a program or script outside the specified directory fails. To restrict the use of special characters in the run directory, be sure to configure Y for the **restrict:cmd** initialization parameter. For more information on specifying the **restrict:cmd** initialization parameter, see *Restricting the Use of Special Characters in the Run Directory* on page 31.	Directory path name
pstmt.submit_dir	The directory from which the user can submit Processes. This is for **submit**s within a Process.	Directory path name
pstmt.runjob	Specifies whether the user can issue the **run job** statement.	y | n y—Allows a user to issue the statement. n—Prevents a user from issuing the statement. The default is **n**.
pstmt.runtask	Specifies whether the user can issue the **run task** statement.	y | n y—Allows a user to issue the statement. n—Prevents a user from issuing the statement. The default is **n**.
pstmt.submit	Specifies whether the user can issue the **submit** statement.	y | n y—Allows a user to issue the statement. n—Prevents a user from issuing the statement. The default is **n**.
descrip	Permits you to add descriptive notes to the record.	Text string

Updating the Strong Access Control File

To provide a method of preventing an ordinary user from gaining root access through Connect:Direct for UNIX, a strong access control file called **sysacl.cfg** is created at installation in the *d_dir*/ndm/SACL/ directory. By default, an ordinary user cannot access the root through Connect:Direct for UNIX. If you want to give an ordinary root user access through Connect:Direct for UNIX, you must access and update the **sysacl.cfg** file.

Note: Even if you do not want to limit root access through Connect:Direct for UNIX, the sysacl.cfg file must exist. If the file is deleted or corrupted, all users are denied access to Connect:Direct for UNIX.

The file layout of the sysacl.cfg file is identical to the user portion of the userfile.cfg file. Setting a value in the sysacl.cfg file for a user overrides the value for that user in the userfile.cfg file.

The **root:deny.access** parameter, which is specified in the sysacl.cfg file, allows, denies, or limits root access to Connect:Direct for UNIX. this parameter is required. The following values can be specified for the **root:deny.access** parameter:

Parameter	Description	Value
deny.access	Allows, denies, or limits root access to Connect:Direct for UNIX	y | n | d y—No Processes can acquire root authority n—PNODE Processes can acquire root authority, but SNODE Processes can not. This is the default value. d—Any Process can acquire root authority

If a user is denied access because the **root:deny.access** parameter is defined in the sysacl.cfg file for that user, a message is logged, and the session is terminated. If a user is running a limited ID, an informational message is logged.

Automatic Detection of Shadow Passwords

Because shadow password files are available on some versions of the UNIX operating system, Connect:Direct for UNIX detects the use of shadow passwords automatically, if available.

Limiting Access to the Program Directory

The program directory provides enhanced security for the run task and run job process statements by limiting access to specified scripts and commands. Any attempt to execute a program or script

outside the specified directory fails. The program directory is identified with the **pstmt.run_dir** parameter. If the program directory is specified, the UNIX restricted shell is invoked, providing enhanced security. If the program directory is not specified, the regular (Bourne) shell is invoked for executing commands with no restrictions.

The restricted shell is very similar to the regular (Bourne) shell, but it restricts the user from performing the following functions:

- Changing the directory (cd)
- Changing PATH or SHELL environment variables
- Using command names containing a slash (/) character
- Redirecting output (> and >>)

Additional information about the restricted shell can be found in the appropriate UNIX manual pages or UNIX security text books.

The restricted shell is started using only the environment variables HOME, IFS, PATH, and LOGNAME, which are defined as follows:

HOME=*run_dir*
IFS=*whitespace characters* (tab, space, and newline)
PATH=/usr/rbin and *run_dir*
LOGNAME=*user's UNIX ID*

Because environment variables are not inherited from the parent Process, no data can be passed to the script or command through shell environment variables. The restricted shell restricts access to specified scripts and commands, but it does not restrict what the scripts and commands can do. For example, a shell script being executed within the *run_dir* directory can change the value of PATH and execute command names containing a slash (/) character. For this reason, it is important that the system administrator controls which scripts and commands the user has access to and does not give the user write privileges to the *run_dir* directory or any of the files in the *run_dir* directory.

Security Exit

The Security Exit in the initialization parameters file, **initparm.cfg**, provides an interface to password support programs.

This exit generates and verifies passtickets and it also supports other password support programs. An example of other programs is PASSTICKET, part of the RACF security system available on MVS hosts and also supported by IBM on UNIX AIX and OS/2 computers using the NETSP product.

Refer to Chapter 3, *Maintaining the Initialization Parameters File*, for information on the Security Exit.

Chapter 7

Maintaining Client and Server Authentication Key Files

This chapter contains information about client and server authentication key files. You can edit both key files with any text editor installed on your system.

About Client and Server Authentication Key Files

Connect:Direct client/server security depends on a key, similar to a password, in a Connect:Direct server and an identical key in each API that communicates with that server. The keys are defined and coordinated by the system administrator.

The client key file is called keys.client on the node on which the API resides. The server key file is keys.server on the node on which the server resides. The key files are located in the directory *d_dir*/security.

Key File Format

A record in a key file can contain up to four keys that match entries in another API or server key file. The key file can contain as many key file records as necessary. The format of a key file entry is illustrated in the following sample:

```
hostname    MRLN SIMP key [key [key [key] ] ]
```

Updating Key File Parameters

The following table describes the available key file parameters:

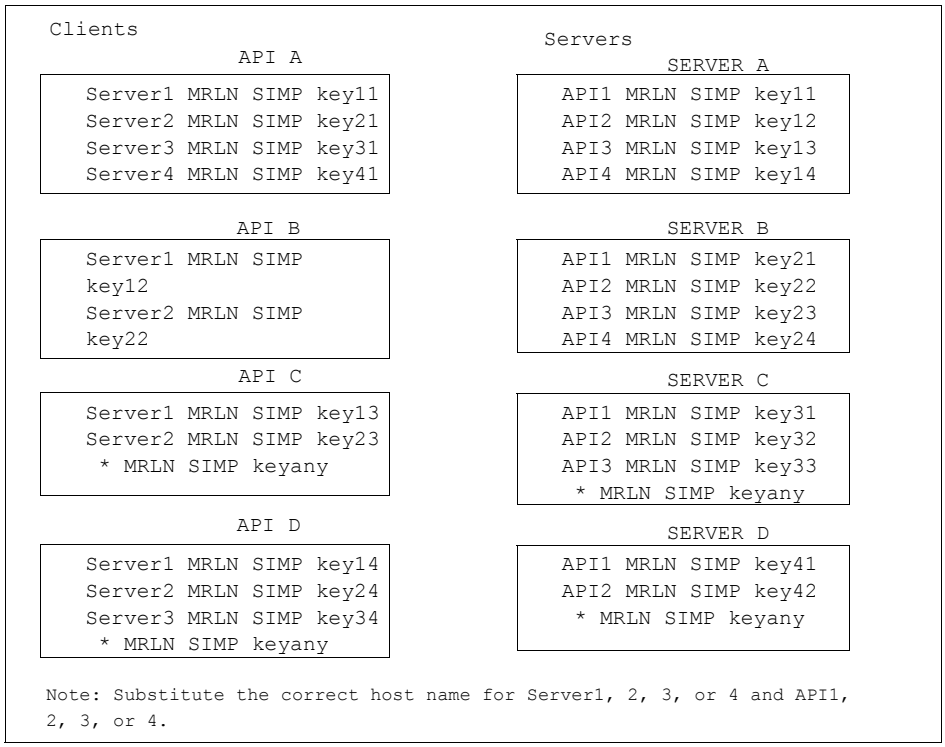
Parameter	Description	Value
hostname	The host name of the server with which you want to communicate or the host name of the API you will allow to communicate with your server. The hostname is followed by one or more space characters. If you replace the host name with an asterisk (*) character in the server configuration file, the server accepts a connection from any API with a matching key. You can use only one asterisk per file. Always place the entry with the asterisk after entries with specific host names.	1—16 characters and must be unique within its key file.
MRLN SIMP	A required character string, separated from the other fields by one or more spaces.	Character string
key	The security key. Separate the key from SIMP by one or more spaces.	Up to 22 characters long including A to Z, a to z, 0 to 9, period (.), and slash (/).

Sample Client Authentication Key File

The following figure illustrates API key lists in the Clients column and server key lists in the Servers column.

- API A contains key11, key21, key31, and key41. Key11 enables API A to communicate with Server A because Server A also contains the key11 entry. You must ensure that API1 is the host name on which API A resides and that Server1 is the host name on which Server A resides.
- API D contains key14, key24, and key34. Key14 enables API D to communicate with Server A because Server A also contains the key14 entry. You must ensure that API4 is the host name on which API D resides and that Server1 is the host name on which Server A resides.

- API C can communicate with Server A and Server B through matching keys. API C also can communicate with Server C and Server D only through the *** MRLN SIMP keyany** line.

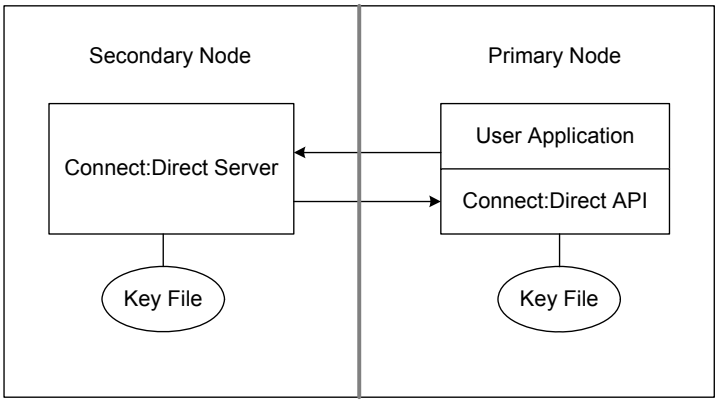


About the Authentication Procedure

The Connect:Direct authentication procedure determines if the user is authorized to access the system.

The goal of Connect:Direct security is to reliably determine the identity of each user without requiring logon repetition. In addition, the security design ensures that all requests originate from

the Connect:Direct API, to ensure that the authentication procedure is not bypassed by an unauthorized user. The following figure displays the components that perform authentication:



Server Authentication Parameters

The server authentication parameters are specified in **initparm.cfg.** You must have ownership and permissions to modify these files. Ownership is established during the installation procedure.

Additionally, the directory containing the keys.server file must have UNIX permission 0700, and keys.server must have UNIX permission 0600. These files cannot be owned by root.

The following server authentication parameters are used by the CMGR during the authentication procedure:

Parameter	Description
server.program	The server program to use during the authentication procedure.
server.keyfile	The key file to use during the authentication procedure.

Client Authentication Parameters

The client authentication parameters are specified in **ndmapi.cfg**. You must have ownership and permissions to modify these files. Ownership is established during the installation procedure.

Additionally, the directory containing the keys.client file must have UNIX permission 0700, and keys.client must have UNIX permission 0600.

The following client authentication parameters are used by the CLI/API during the authentication procedure:

Parameter	Description
client.program	The client program to use during the authentication procedure.
client.keyfile	The key file to use during the authentication procedure.

Appendix A

Configuring Firewall Navigation

Firewall navigation enables controlled access to a Connect:Direct system running behind a packet-filtering firewall without compromising your security policies or those of your trading partners. You control this access by assigning a specific TCP or UDT source port number or a range of source port numbers with a specific destination address (or addresses) for Connect:Direct sessions.

Before you configure source ports in the Connect:Direct initialization parameters, you need to review the information in this chapter, especially if you are implementing firewalls for UDT.

Implementing Firewall Navigation

To implement firewall navigation in Connect:Direct for UNIX:

1. Coordinate IP address and associated source port assignment with your local firewall administrator before updating the firewall navigation record in the initialization parameters file.
2. Add the following parameters to the Connect:Direct for UNIX initialization parameters file as needed, based on whether you are using TCP or UDT:
   - tcp.src.ports
   - tcp.src.ports.list.iterations
   - udp.src.ports
   - udp.src.ports.list.iterations
3. Coordinate the specified port numbers with the firewall administrator at the remote site.

Firewall Navigation

Firewall rules need to be created on the local firewall to allow the local Connect:Direct node to communicate with the remote Connect:Direct node. A typical packet-filtering firewall rule specifies that the local firewall is open in one direction (inbound or outbound) to packets from a particular protocol with particular local addresses, local ports, remote addresses, and remote ports. Firewall

Navigation differs between TCP and UDT; as a result, firewall rules for TCP and UDT should be configured differently.

TCP Firewall Navigation Rules

In the following table, the TCP rules are presented in two sections: the first section applies to rules that are required when the local node is acting as a PNODE; the second section applies to rules that are required when the local node is acting as an SNODE. A typical node acts as a PNODE on some occasions and an SNODE on other occasions; therefore, its firewall will require both sets of rules.

TCP PNODE Rules			
Rule Name	**Rule Direction**	**Local Ports**	**Remote Ports**
PNODE session	Outbound	Local C:D's source ports	Remote C:D's listening port
TCP SNODE Rules			
Rule Name	**Rule Direction**	**Local Ports**	**Remote Ports**
SNODE session	Inbound	Local C:D's listening port	Remote C:D's source ports

UDT Firewall Navigation Rules

UDT firewall rules are applied to the UDP protocol. The recommended default firewall rule for UDP packets is to block packets inbound to the local system *and* outbound from the local system to prevent the confusion that could occur due to the callback feature of UDT session establishment.

In the following table, the UDT rules are presented in two sections: the first section applies to rules that are required when the local node is acting as a PNODE; the second section applies to rules that are required when the local node is acting as an SNODE. A typical node acts as a PNODE on some occasions and an SNODE on other occasions; therefore, its firewall will require both sets of rules.

UDT PNODE Rules			
Rule Name	**Rule Direction**	**Local Ports**	**Remote Ports**
PNODE Session Request	Outbound	Local C:D's source ports	Remote C:D's listening port
PNODE Session	Outbound	Local C:D's source ports	Remote C:D's source ports
UDT SNODE Rules			
Rule Name	**Rule Direction**	**Local Ports**	**Remote Ports**
SNODE listen	Inbound	Local C:D's listening port	Remote C:D's source ports
SNODE session	Inbound	Local C:D's source ports	Remote C:D's source ports

Firewall Configuration Examples

In the firewall configuration examples for TCP and UDT, the following IP addresses and source ports will be used:

Note: The IP addresses in the examples have been chosen to be distinctive and are not intended to be valid IP addresses.

- The **local node** has IP address 222.222.222.222 and listening port 2264. Its source ports for communicating with the remote node are 2000–2200.
- The **remote node** has IP address 333.333.333.333 and listening port 3364. Its source ports for communicating with the local node are 3000–3300.

Note: See *Session Establishment* on page 80 for a discussion of the differences between UDT and TCP session establishment.

TCP Firewall Configuration Example

The Connect:Direct administrator configures the **local node** to listen on port 2264, and the following initialization parameter settings are used to configure the local node's source ports:

- tcp.src.ports = (333.333.333.333, 2000–2200)
- tcp.src.ports.list.iterations = 1

This configuration specifies to use a source port in the range 2000–2200 when communicating with the remote node's address 333.333.333.333 and to search the port range one time for an available port. The local node will act as both a PNODE and an SNODE when communicating with the remote node.

Based on this scenario, the firewall rules for the local node are the following:

Rule Name	Rule Direction	Local Ports	Remote Ports
PNODE session request	Outbound	2000–2200	3364
SNODE session	Inbound	2264	3000–3300

UDT Firewall Configuration Example

The Connect:Direct administrator configures the **local node** to listen on port 2264, and the following initialization parameter settings are used to configure the local node's source ports:

- udp.src.ports = (333.333.333.333, 2000-2200)
- udp.src.ports.list.iterations = 1

This configuration specifies to use a source port in the range 2000–2200 when communicating with the remote node's address 333.333.333.333 and to search the port range one time for an available port. The local node will act as both a PNODE and an SNODE when communicating with the remote node.

Based on this scenario, the firewall rules for the local node are the following:

Rule Name	Rule Direction	Local Ports	Remote Ports
PNODE session request	Outbound	2000–2200	3364
PNODE session	Outbound	2000–2200	3000–3300
SNODE listen	Inbound	2264	3000–3300
SNODE session	Inbound	2000–2200	3000–3300

Blocking Outbound Packets

The recommended default rule for outbound UDP packets from the local system is to block the packets. If you do not follow this recommendation, port usage may, at first sight, appear to violate the firewall's inbound rules.

An example will help illustrate this situation. Suppose that in the example in the previous section:

- The local node is the SNODE.
- The default outbound rule allows all outbound UDP packets from the local system.
- The “SNODE session” rule is accidently omitted.

Because of the callback feature of UDT session establishment, SNODE sessions are still likely to succeed on ports 2000–2200. This may cause confusion because ports 2000–2200 are blocked to inbound UDP packets.

If you use the recommended default outbound rule and apply the PNODE and SNODE rules described in the previous section, there will be no confusion about which port to use, and the UDT callback feature will function as designed, thus supporting reliability.

Session Establishment

Session establishment differs between TCP and UDT; these differences affect how you set up firewall rules and configure the firewall navigation initialization parameters in Connect:Direct.

TCP Session Establishment

A Connect:Direct TCP client contacts a Connect:Direct TCP server on its listening port. The Connect:Direct client scans the list of ports (specified using the **tcp.src.ports** initialization parameter) and looks for a port to bind to. The number of times Connect:Direct scans the list is specified using the **tcp.src.ports.list.iterations** initialization parameter. If Connect:Direct finds an available port, communication with the remote node proceeds.

UDT Session Establishment

When a Connect:Direct UDT client contacts a Connect:Direct UDT server on its listening port to request a session, the UDT server responds with a different server port to use for the session. The

client attempts to contact the server on the session port. The Connect:Direct client scans the list of ports (specified in the **udp.src.ports** initialization parameter) and looks for an available port to bind to. The number of times Connect:Direct scans the list is specified using the **udp.src.ports.list.iterations** initialization parameter. If the Connect:Direct client finds an available port, communication with the remote Connect:Direct server proceeds. If a session cannot be established after a certain time interval, the server atempts to contact the client.

Appendix B

Specifying IP Addresses, Host Names, and Ports

Connect:Direct for UNIX accepts both Internet Protocol version 4 (IPv4) and Internet Protocol version 6 (IPv6) versions of the Internet Protocol as well as host names. You can enter IP addresses/host names and ports in several ways, depending on the field you are specifying:

- Address or host name only
- Port number only
- Address/host name with a port number
- Multiple address/host name and port combinations

When specifying IP addresses/host names and ports for Connect:Direct for UNIX, use the following guidelines.

IP Addresses

Connect:Direct for UNIX accepts both IPv4 and IPv6 addresses. Wherever an IP address is specified in Connect:Direct for UNIX, you can use either IPv4 or an IPv6 addresses.

IPv4 Addresses

IPv4 supports 2^{32} addresses written as 4 groups of dot-separated 3 decimal numbers (0 through 9), for example, 10.23.107.5.

IPv6 Addresses

IPv6 supports 2^{128} addresses written as 8 groups of colon-separated 4 hexadecimal digits, for example, 1001:0dc8:0:0:0:ff10:143e:57ab. The following guidelines apply to IPv6 addresses:

- If a four-digit group contains zeros (0000), the zeros may be omitted and replaced with two colons (::), for example:

```
2001:0db8:85a3:0000:1319:8a2e:0370:1337
can be shortened as
2001:0db8:85a3::1319:8a2e:0370:1337
```

- Any number of successive 0000 groups may be replaced with two colons (::), but only one set of double colons (::) can be used in an address, for example:

```
001:0db8:0000:0000:0000:0000:1319:58ab
Can be shortened as:
2001:0db8:0000:0000::1319:58ab
```

- Leading zeros in a four-zero group can be left out (0000 can be shortened to 0), for example:

```
2001:0db8:0000:0000:0000:0000:1319:58ab
Can be shortened as:
2001:0db8:0:0:0:0:1319:58ab
```

- You can write a sequence of 4 bytes that occur at the end of an IPv6 address in decimal format using dots as separators, for example:

```
::ffff:102:304
Can be written as:
::ffff:1.2.3.4
```

This notation is useful for compatibility addresses.

Host Names

When you specify a host name, rather than an IP address, Connect:Direct for UNIX gets the IP address from the operating system. The first IP address returned by the operating system is used regardless of whether it is in IPv4 or IPv6 format.

A host name (net, host, gateway, or domain name) is a text string of up to 24 characters comprised of the alphabet (A–Z), digits (0–9), minus sign (-), and period (.), for example, msdallas-dt.

The following guidelines also apply:

- No blank or space characters are permitted as part of the name.
- Periods are allowed only when they are used to delimit components of domain-style names.
- Host names are not case sensitive.
- The first and last character must be a letter or digit.
- Single-character names or nicknames are not allowed.

Port Numbers

Port numbers can be appended to the end of IP/host addresses when they are preceded by a semi-colon (;), for example, 10.23.107.5;1364. This convention is specific to Connect:Direct for UNIX and is not an industry standard.

A port number must be in the range of 0 through 65535. Port numbers lower than 1024 are designated as reserved and should not be used. The following examples show port numbers appended to IP/host addresses using these conventions:

```
10.23.107.5;1364
fe00:0:0:2014::7;1364
msdallas-dt;1364
```

Multiple Addresses, Host Names, and Ports

You can specify multiple IPv4 and IPv6 addresses and host names by separating them with a comma (,). A space can be added after the comma for readability, for example:

```
10.23.107.5, fe00:0:0:2014::7, msdallas-dt
```

You can also specify a port number for each address or host name. The port is separated from its corresponding address/host name with a semi-colon (;), and each address/host name and port combination is separated by a comma (,). A space may be added after the comma for readability. The following example shows multiple address/host name and port combinations:

```
10.23.107.5;1364, fe00:0:0:2014::7;1364, msdallas-dt;1364
```

Multiple address/host names (and combinations with port numbers) are limited to 1024 characters.

Using Masks for IP Address Ranges

When you specify a value for the **tcp.src.ports** parameter in the initialization parameters file, you can use masks to specify the upper boundary of a range of IP addresses that will use a specific port, multiple ports, or a range of ports. Connect:Direct for UNIX supports masks for both IPv4 and IPv6 addresses as shown in the following sample entry from the **initparms.cfg** file:

```
tcp.src.ports=(199.2.4.*, 1000), (fd00:0:0:2015:*::*, 2000-3000), (199.2.4.0/255.255.255.0, 4000-5000),
(fd00:0:0:2015::0/48, 6000, 7000)
```

These sample addresses specify the following information:

(199.2.4.*, 1000)—Any IPv4 address that falls in the range from 199.2.4.0 through 199.2.4.255 will use only port 1000.

(fd00:0:0:2015:*::*, 2000-3000)—Any IPv6 address that falls in the range from fd00:0:0:2015:0:0:0:0 through fd00:0:0:2015:ffff:ffff:ffff:ffff will use a port in the range of 2000 through 3000.

(199.2.4.0/255.255.255.0, 4000-5000)—Any IPv4 address that falls in the range from 199.2.4.0 through 199.2.255.255 will use a port in the range of 4000 through 5000.

(fd00:0:0:2015::0/48, 6000, 7000)—Any IPv6 address that falls in the range from fd00:0:0:2015:0:0:0:0 through fd00:0:0:ffff:ffff:ffff:ffff:ffff will use port 6000 or port 7000.

As shown in the sample entry above, the wildcard character (*) is supported to define an IP address pattern. You can specify up to 255 unique IP address patterns or up to 1024 characters in length, each with its own list of valid source ports. If the wildcard character is used, the optional mask is not valid.

Appendix C

Using Connect:Direct for UNIX in a Test Mode

You can enable a test mode for production instances of Connect:Direct for UNIX to perform the following functions:

- Test new applications and customer connections
- Prevent future production work from executing until testing is complete after you have terminated all active production work using the Flush Process command
- Resume regular production work after testing
- Control individual file transfers by application
- Enable and disable individual nodes and applications

While testing is being conducted, only Processes, particularly file transfers, involved with the testing activity are executed. No production data is transferred to applications being tested while at the same time no test data is transferred to production applications.

Processing Flow of the Test Mode

You enable the testing mode using the **quiesce.resume** initialization parameter and specify which Connect:Direct Processes to run and not run by storing your preferences as text records in a parameter table named NDMPXTBL. A sample parameters file, NDMPXTBL.sample, is located in the /ndm/src directory. After you have updated the file for your testing environment, place it in the installation ndm/cfg/<*nodename*> directory. If you enable the quiesce.resume parameter, you must have an NDMPXTBL table to operate Connect:Direct in a test mode.

You can specify the following criteria that are used to find matches for one or more Processes to include (using the "I" command code) or exclude ("X" command code) from execution:

- A partial or full Process name
- A partial or full remote node name
- A partial or full Connect:Direct submitter ID and submitter node combination

In addition to telling Connect:Direct which Processes to run, you tell the system what to do with the Processes which do not get executed. You can specify the following dispositions for Processes not permitted to run:

- Place the Process in the Hold queue
- Place the Process in the Timer queue for session retry
- Flush the Process from the queue

For more information on how the testing mode can be used, see *Sample Test Scenarios* on page 90.

When the testing mode is enabled, Connect:Direct for UNIX performs a syntax check on the parameter table and fails initialization if the table is invalid. If the table is valid, Connect:Direct for UNIX scans it looking for a pattern that matches the Process that is about to execute. If a match is found, the Process is permitted to execute if the "I" (Include) command code is in effect. If command code "X" (Exclude) is in effect, the process is not permitted to execute. If a match is not found in the table, the opposite processing occurs from the case where a match is found, that is, if no match is found and command code "I" is in effect, the Process is not permitted to execute, whereas if command code "X" is in effect, the Process is permitted to execute.

If a Process is not permitted to execute, the disposition specified in the NDMPXTBL parameter table to either hold, retry, or flush the Process is implemented and a non-zero return code is returned. When a Process is prevented from executing in testing mode, appropriate messages are issued and can be viewed in the statistics log.

Note: For Processes initiated on remote nodes, the testing mode functions in the same manner as it does for Processes submitted on the local Connect:Direct node except that the remote node is the PNODE (Process owner) for that Process, and the local node is the SNODE (secondary node). The NDMPXTBL Parameter Table is searched for a matching entry, and the remotely-initiated Process is either permitted to execute or is excluded from execution. Because the local node is the SNODE for this type of transfer, it cannot enforce the Process disposition setting in the NDMPXTBL parameter table. The remote PNODE determines how the Process is handled. Typically, the remote node places the Process in the Hold queue with a status of "HE" (Held in Error).

Preparing the NDMPXTBL Parameter Table

You can use any text editor to modify the sample NDMPXTBL parameter table supplied with Connect:Direct for UNIX. When you update the parameter table, name it NDMPXTBL and save it to the Server directory of the installation. The parameter table file can be created or updated while the server is active, and any changes made to the file take effect for sessions that begin after the changes are made. Similarly, the **quiesce.resume** initialization parameter can be modified while the server is active. For more information on the **quiesce.resume** initialization parameter, see *Updating the Quiesce/Resume Record* on page 31.

Note: If you enable the quiesce.resume initialization parameter, you must have an NDMPXTBL parameter table.

Each table entry or record consists of a single-character command code in column one. Most command codes have a parameter which begins in column two and varies according to the command code function.

Command Code	Description	Subparameters/ Examples
*	Comment line.	* Only run the following Processes.
E	Enables execution of Processes based on table entries. Either “E” or “D” must be the first non-comment entry in the table.	The second column in this entry must contain one of the following values which indicates the disposition of a PNODE Process if it is not allowed to run. H—Places the Process in the Hold queue R—Places the Process in the Timer queue in session retry F—Flushes the Process from the queue
D	Disables the execution of all Processes regardless of the contents of the parameter table and fails Process execution with a non-zero (error) return code and message LPRX003E. Either “E” or “D” must be the first non-comment entry in the table	The parameter for command code “E” can also be specified in column two. This is a convenience to make it easier to change from “E” to “D” and vice versa without having to change column two to a blank for command code “D.”
P	Matches Processes based on a full or partial Process name. Supports the wild card trailing asterisk (*). Can be used to enable or disable Process execution for a particular application by using naming conventions to match an application.	PCOPY—Matches a single Process PACH*—Matches all Processes beginning with “ACH” P*—Matches all Processes
N	Matches Processes based on a full or partial remote node name. Supports the wild card trailing asterisk (*).	NCD.NODE1—Matches a single remote node name NCD.NODEA*—Matches all remote node names beginning with “CD.NODEA” N*—Matches all remote node names
S	Matches Processes based on a full or wild card Connect:Direct submitter ID and submitter node combination. The format is <id>@<node>.	SACTQ0ACD@TPM002—Matches a specific ID and node combination. S*@TPM002—Matches all IDs from node TPM002 SACTQ0ACD@*—Matches ID ACTQ0ACD from all nodes S*@*—Matches all IDs from any node. This is another way to match all Processes.

Command Code	Description	Subparameters/ Examples
I	Includes Processes for execution that match the patterns in the table which follow this command code. Either “I” or “X” must be the second non-comment entry in the table. Processes which do not match a pattern in the table **are not** executed. **Note:** To choose which command code to use to select Processes, determine which group is smaller and use the corresponding command Code. For example, if the number of Processes to be executed is smaller than the number of Processes to exclude from execution, specify “I” as the command code and add patterns to match that group of Processes.	ER I NCD.BOSTON Includes Processes for execution on the CD.BOSTON node only. Processes destined for all other remote nodes are placed in the Timer queue in session retry
X	Excludes from execution those Processes that match the patterns in the table which follow this command code. Either “X” or “I” must be the second non-comment entry in the table. Processes which do not match a pattern in the table ***are*** executed.	EH X SDALLASOPS@* Excludes Processes for execution submitted by the ID DALLASOPS from any node
L	Last entry in table.	

Sample Test Scenarios

The following examples show different applications of the test mode using the NDMPXTBL parameter table to define which Connect:Direct Processes to run and not run.

Specifying Which Processes Run

In this example, Connect:Direct executes all Processes that start with ACH or are named DITEST01 or DITEST02. All other Processes are placed in the Hold queue.

```
* Enable processing. Only permit processes matching one of the patterns
* to execute. Hold processes that don't execute.
EH
I
PACH*
PDITEST01
PDITEST02
L
```

Specifying Which Processes to Exclude

In this example, Connect:Direct does not execute any Process that starts with ACH or is named DITEST01 or DITEST02. All other Processes are executed.

```
* Exclude matching processes.  Permit all others to execute.
EH
X
PACH*
PDITEST01
PDITEST02
L
```

Permitting Process Execution by Secondary Node and Submitter User ID/Node

In this example, Connect:Direct executes all Processes that match one of the following criteria:

- The specific secondary node (SNODE) name is DI.NODE1
- An SNODE whose name starts with DI0017
- Any Connect:Direct submitter ID from node DI0049
- The specific Connect:Direct submitter ID ACHAPP from any node

All Processes not matching one of the above criteria are flushed from the queue.

```
* Only permit matching processes to execute.  Flush those that do not.
EF
I
NDI.NODE1
NDI0017*
S*@DI0049
SACHAPP@*
L
```

Stopping the Test Mode

In this example, no Processes will be executed, and a non-zero return code will be displayed, which signifies an error along with message ID LPRX003E. The remainder of the table is ignored (including the “F” code to flush Processes from the queue), and all Processes are placed in the Hold queue.

To resume testing, change the “D” command code to an “E.”

```
* Execute no processes at all.  Put them in the hold queue and return.
DF
I
PACH*
PDITEST01
PDITEST02
L
```

Glossary

A

Application Programming Interface (API)

A library of function calls that enables End User Applications (EUAs) to interact with the Connect:Direct software.

C

Client

A program that makes requests of the Connect:Direct server and accepts the server's responses.

Command Line Interface (CLI)

A program available to submit Connect:Direct Processes and commands from a command line environment.

Command Manager (CMGR)

The program that executes commands sent by the API and sends the results back to the API. In conjunction with the API, the CMGR carries out the Connect:Direct authentication procedure, which determines if the user name and password are authorized to access the system. CMGR interacts with the PMGR when required by command execution.

Connect:Direct

The family of data transfer software products that distributes information and manages production activities among multiple data centers.

Connect:Direct Browser User Interface

As an alternative to submitting Connect:Direct commands through the command line interface, you can use the Connect:Direct Browser User Interface to create, submit, and monitor Processes from an Internet browser, such as Microsoft Internet Explorer or Netscape Navigator. You can also use

the Connect:Direct Browser to perform Connect:Direct system administration tasks, such as viewing and changing the network map or initialization parameters, if you have the appropriate Connect:Direct authority.

Connect:Direct for UNIX

The UNIX implementation of the Connect:Direct product.

Connect:Direct Node

Any computer/workstation running Connect:Direct.

Connect:Direct Process

A series of statements, which can be predefined and stored in a directory, submitted through the API to initiate Connect:Direct for UNIX activity. Examples of Process functions are copying files and running jobs.

D

daemon

The long-running process that provides a service to a client. The PMGR is the Connect:Direct for UNIX daemon.

Diagnostic Commands

Connect:Direct commands that assist in the diagnosis of Connect:Direct software problems.

E

End User Application (EUA)

An application program developed by an end user to accomplish a particular task.

Execution Queue

A logical queue in the TCQ. A Process in the Execution Queue can be transferring data to or from a remote Connect:Direct node or it can be waiting for a connection to the remote Connect:Direct node before it can perform its tasks.

F

File Agent

An application program and component of Connect:Direct. It scans specified directories searching for the presence of a file. When a file appears in a watched directory, Connect:Direct either submits a Process or performs the action specified by the rules for the file.

H

Hold Queue

A logical queue in the TCQ. Processes in the Hold Queue are waiting for operator intervention before they move to the Wait Queue for scheduling.

M

Monitoring Commands

Connect:Direct commands that allow you to display information from the statistics file and the TCQ about Connect:Direct Process execution results.

O

Operational Control Commands

Connect:Direct commands that allow you to submit a Process, change specific characteristics of a Process in the TCQ, remove executing and nonexecuting Processes from the TCQ, and stop Connect:Direct.

P

Process Manager (PMGR)

The long-running Connect:Direct server that initializes the Connect:Direct software, accepts connection requests from Connect:Direct APIs and remote Connect:Direct nodes, creates Command Managers and Session Managers, accepts requests from Command Managers and Session Managers where centralized Connect:Direct functions are required, and terminates Connect:Direct software execution.

PNODE (Primary Node)

The Connect:Direct node on which the Process is being executed. The primary node is also called the controlling or source node, but is not always the sending node because PNODE can be the receiver. Every Process has one PNODE and one SNODE. The submitter of a Process is always the PNODE. The PNODE name can be 1–16 characters long.

S

Session

A connection between two Connect:Direct nodes.

Session Manager (SMGR)

The server component responsible for creating or completing a connection with a remote Connect:Direct node and carrying out the Connect:Direct work to be performed.

SNODE (Secondary Node)

The Connect:Direct node that interacts with the Primary node (PNODE) during Process execution. The Secondary node (SNODE) also can be referred to as the participating, target, or destination node. Every Process has one PNODE and one SNODE. The secondary node is the node participating in Process execution initiated by another node (PNODE). The SNODE name can be 1–16 characters long.

Sterling Control Center

A centralized management system that provides operations personnel with continuous enterprise-wide business activity monitoring capabilities for Connect:Direct z/OS, UNIX, and Windows servers. It manages multiple Connect:Direct servers to suspend, release, and delete Processes, stops Connect:Direct servers, and views detailed statistics on running or completed Processes. It monitors service levels to view Connect:Direct processing across Connect:Direct z/OS, UNIX, and Windows servers within your network and retrieve information about active and completed Processes. It receives notification of data delivery events that occur or do not occur as scheduled and defines rules that, based on processing criteria, can generate an alert, send an e-mail notification, generate a Simple Network Management Protocol (SNMP) trap to an Enterprise Management System (EMS), or run a system command. It monitors for alerts, such as a server failure or a Process not starting on time.

T

TCQ Status Value

A two-letter code assigned to a Process by Connect:Direct when the Process is placed on the TCQ. The status of a Process can be examined with a **select process** command.

TCQ (Transmission Control Queue)

A queue that holds all Processes that are submitted to Connect:Direct for UNIX. TCQ contains the following four logical queues:

- EXECUTION
- WAIT
- TIMER
- HOLD

Timer Queue

A logical queue in the TCQ. Processes on the Timer Queue are waiting for a start time before they move to the Wait Queue for scheduling.

W

Wait Queue

A logical queue in the TCQ. Processes on the Wait Queue are waiting on a connection to or from the remote Connect:Direct node.

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