z/OS

Common Information Model User's Guide

Version 1 Release 12

SC33-7998-07

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SC33-7998-07

Note

Before using this information and the product it supports, be sure to read the general information under "Notices" on page 305.

This edition applies to Version 1 Release 12 of z/OS (5694-A01) and to all subsequent releases and modifications until otherwise indicated in new editions.

This edition replaces SC33-7998–06.

Contents

Figures

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About this publication

This document describes the implementation of the Common Information Model (CIM) and Web Based Enterprise Management (WBEM) standards for z/OS. It explains how to set up and use the CIM server and CIM resource instrumentation provided together with the z/OS operating system. CIM is a standard data model for describing and accessing systems management data in heterogeneous environments. It allows system administrators and vendors to write applications that measure system resources in a network with different operating systems and hardware.

The focus of this document is on the z/OS-specific implementation of CIM. For more detailed information about the CIM and WBEM standards please review the information provided by the Distributed Management Task Force (DMTF), which is found in the internet on the DMTF website. (For explicit link addresses, see "Where to find more information.")

These are the major topics of this document:

- Chapter 4, "First-time CIM server set up," on page 25 describes how to set up the CIM server for z/OS.
- Chapter 5, "How to work with the CIM server," on page 43 describes how to customize and use the CIM server for z/OS.
- Chapter 8, "z/OS Management Instrumentation for CIM," on page 105 describes the z/OS system resources that are exposed through CIM and z/OS-specific extensions of the CIM Schema. The focus of this chapter are the z/OS-specific supplements and differences as well as how to use this information about z/OS.

Who should use this document

This document is intended for the system programmer and performance analyst responsible for measuring and improving system performance. The CIM data model described in this document can be used in writing applications that monitor system resources, for example to discover bottlenecks or to control thresholds and to provide information about which tuning actions should be applied.

Administrators of the z/OS CIM runtime environment should read Chapter 4, "First-time CIM server set up," on page 25, which contains information about how to set up security for the CIM server.

Developers of CIM providers for z/OS should read Chapter 12, "Developing CMPI providers for z/OS," on page 235.

Because the CIM data model provided for z/OS is used in applications that measure z/OS system performance, this document assumes that the reader has extensive knowledge of the z/OS system.

Where to find more information

OpenPegasus website
http://www.openpegasus.org

DMTF website
http://www.dmtf.org

WBEM standards
http://www.dmtf.org/standards/wbem

Common Information Model (CIM) Standards
http://www.dmtf.org/standards/cim

CIM Event Model White Paper
http://www.dmtf.org/standards/documents/CIM/DSP0107.pdf

Specification for CIM Operations over HTTP
http://www.dmtf.org/standards/published_documents/DSP0200_1.3.0.pdf

CIM Query Language Specification
http://www.dmtf.org/standards/documents/published_documents/DSP0202_1.0.0.pdf

eServer™ Common Information Model
http://publib.boulder.ibm.com/infocenter/eserver/v1r1/en_US/info/ciminfo/eicah.pdf

z/OS information updates on the web
http://publibz.boulder.ibm.com/cgi-bin/bookmgr_OS390/BOOKS/ZIDOCMST/CCONTENTS

LookAt website for online message explanations
http://www.ibm.com/systems/z/os/zos/bkserv/lookat/

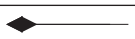
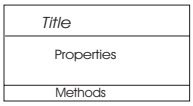
SNIA website
http://www.snia.org/

Storage Management Initiative Specification (SMI-S)
http://www.snia.org/tech_activities/standards/curr_standards/smi/

Legend for graphics showing class structures

The graphics in this book showing class structures illustrate the CIM object modeling using the UML syntax:

Table 1. UML syntax

Construct	Description	Syntax
association	A relationship between two or more classifiers that involves connections among their instances.	
aggregation	A special form of association that specifies a whole-part relationship between the aggregate (whole) and the component part.	
inheritance	A relationship among classes where one class shares the structure and/or behavior defined for one or more other classes. Inheritance is the mechanism that makes generalization, subclasses, and superclasses possible.	
class	Denotes the representation of a CIM class in UML notation with title, properties, and methods.	

How to read syntax diagrams

The following rules apply to the syntax diagrams used in this book:

Arrow symbols

Read the syntax diagrams from left to right, from top to bottom, following the path of the line.

The arrow symbols indicate the beginning and the end of a statement.

Conventions

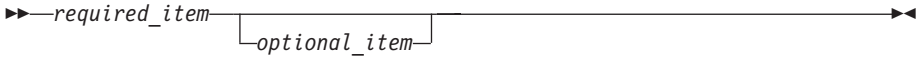
- Variables are shown in italics, for example, *column-name*. They represent user-defined parameters or suboptions.
- When entering commands, separate parameters and keywords by at least one blank if there is no intervening punctuation.
- Enter punctuation marks (slashes, commas, periods, parentheses, quotation marks, equal signs) and numbers exactly as given.

Required items

Required items are displayed on the horizontal line (the main path).

Optional items

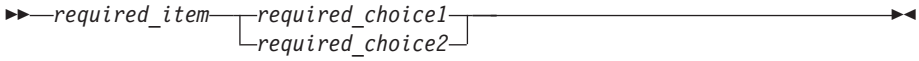
Optional items normally are shown below the main path.



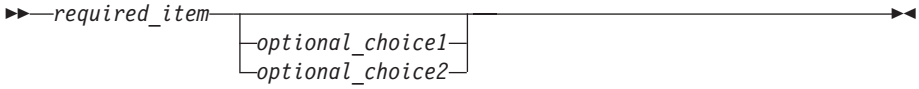
Multiple required or optional items

If you can choose from two or more items, they are displayed vertically in a stack.

If you *must* choose one of the items, one item of the stack is on the main path.

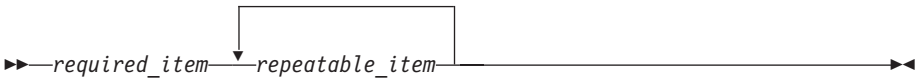


If choosing one of the items is optional, the entire stack is below the main path.



Repeatable items

An arrow returning to the left, above the main line, indicates that an item can be repeated.



A repeat arrow above a stack indicates that you can repeat the items in the stack.

Keywords

- Keywords are shown in uppercase (for example, `FROM`). They specify field names in the field table and must be substituted by the field ID when coded.
- Variables are shown in all lowercase letters (for example, *column name*). They represent user-supplied names or values. Variables enclosed in quotes must be coded as character strings.
- If punctuation marks, parentheses, arithmetic operators, or other such symbols are shown, you must enter them as part of the syntax.

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3. Mail the comments to the following address:
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   Department 3248
   Schönaicher Str. 220
   D-71032 Böblingen
   Federal Republic of Germany
4. Fax the comments to us as follows:
   From Germany: 07031-16-3456
   From all other countries: +(49)+7031-16-3456

Include the following information:

- Your name and address
- Your e-mail address
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- The publication title and order number:
  Common Information Model User's Guide
  SC33-7998–07
- The topic and page number related to your comment
- The text of your comment.

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- Contact your IBM service representative
- Call IBM technical support
- Visit the IBM zSeries support website at http://www.ibm.com/systems/z/support/

Summary of changes

This document contains terminology, maintenance, and editorial changes. Technical changes or additions to the text and illustrations in the present release are indicated by a vertical line to the left of the change.

The following sections list the changes that have been made to CIM with various operating system releases.

What's new in z/OS V1R12

The "Readers' Comments - We'd Like to Hear from You" section at the back of this publication has been replaced with a new section “How to send your comments to IBM” on page xv. The hardcopy mail-in form has been replaced with a page that provides information appropriate for submitting readers comments to IBM®.

SMI-S profiles

The Storage Management Initiative Specification (SMI-S) specifies standards-based profiles to manage storage networks. It builds on other standards such a CIM. The scope of SMI-S includes storage, storage virtualizers, fibre channel fabrics and IP connectivity, and host storage-specific CIM-based profiles. For more information, refer to the SNIA website (see page xii).

Starting with z/OS 1.12, CIM supports the SMI-S profiles "Host Discovered Resources (HDR)" and "Storage Host Bus Adapter (HBA)".

In order to implement these profiles, the following CIM classes for storage management are implemented by CIM for z/OS:

- IBMzOS_FCPort
- IBMzOS_FCPortStatistics
- IBMzOS_PortController
- IBMzOS_Product
- IBMzOS_SBProtocolEndpoint
- IBMzOS_SoftwareIdentity
- Association IBMzOS_ControlledBy
- Association IBMzOS_CSFCPort
- Association IBMzOS_CSFCPortController
- Association IBMzOS_ElementSoftwareIdentity
- Association IBMzOS_FCPortStatisticalData
- Association IBMzOS_InstalledSoftwareIdentity
- Association IBMzOS_ProductElementComponent
- Association IBMzOS_SBDeviceSAPImplementation
- Association IBMzOS_SBHostedAccessPoint
- Association IBMzOS_SBInitiatorTargetLogicalUnitPath

The following class is extended:

- IBMzOS_LogicalDisk

Improved Multi-Level Security (MLS)

Starting with z/OS 1.12 the MLS support activates the Out-Of-Process provider support and uses one address space per security label for full protection of classified documents and information.

Modified cimcli command

The cimcli command has been modified:

- The new function *modifyInstance* allows the modification of an instance residing in the repository.
- The new function *testInstance* allows value testing of an instance.
- The function *createInstance* now allows to specify array values.
- A new syntax for instance names for *enumerateInstances* allows the specification of array values.
- New options have been implemented:
  -ic sets the includeClassOrigin parameter to true
  –sort sorts the output
- The option -ip for the function *invokeMethod* has become obsolete.

New and changed z/OS-specific messages

The following z/OS-specific messages have been added or changed:

CEZ03000E CFZ05000E CFZ08101E CFZ17205W CFZ20400E

Part 1. CIM server

Chapter 1. Introduction and concepts

The Common Information Model (CIM) is a standard data model developed by a consortium of major hardware and software vendors (including IBM) called the Distributed Management Task Force (DMTF) as part of the Web Based Enterprise Management (WBEM) initiative. WBEM includes a set of standards and technologies that provide management solutions for a distributed network environment. Interoperability is a major focus of WBEM, and using WBEM technologies can help you develop a single set of management applications for a diverse set of resources.

Figure 1 shows a sample environment in which management applications can run that use the DMTF CIM standard data model.

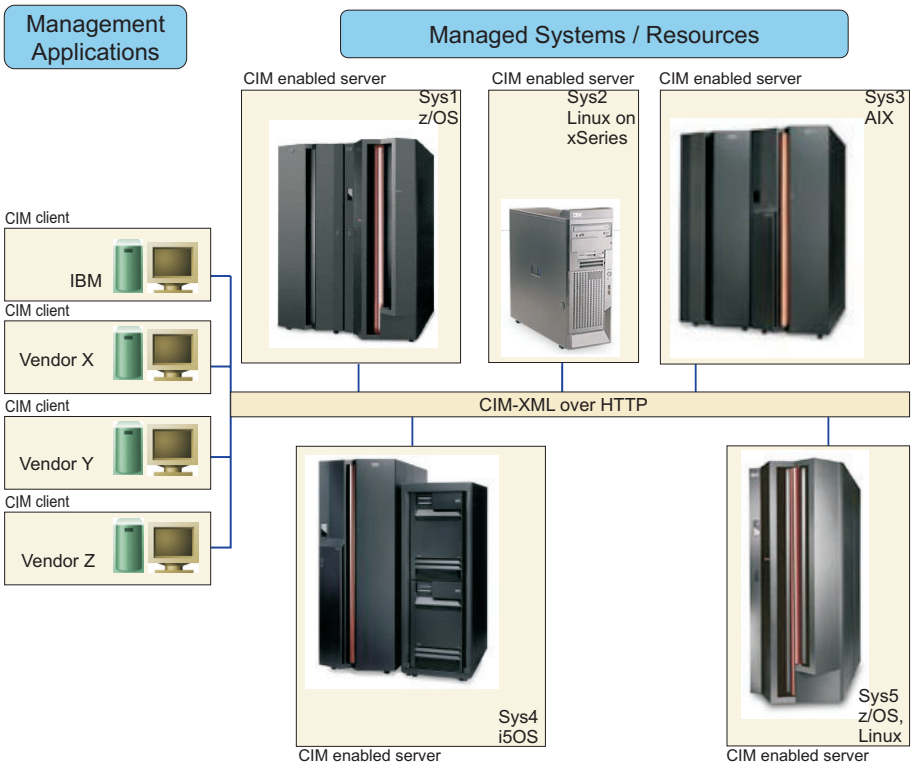


Figure 1. Sample network environment managed with CIM management applications

CIM is a major component of the WBEM initiative, providing a model for describing and accessing data across an enterprise. CIM consists of both a specification and a schema. The specification defines the details for integration with other management models, while the schema provides the actual model descriptions.

With support for the CIM server on systems running z/OS, users have the ability to access z/OS resources through an extendible industry standard model. The remainder of this document contains information about how to use the CIM server for z/OS for this purpose.

CIM for z/OS includes:

CIM server

An open source implementation of the CIM server manages communication between clients and providers. The CIM server also provides several management functions, including security, and a set of commands that provide configuration and management functions to administrators.

The CIM server implementation on z/OS is based on the **OpenPegasus CIM server** from **The OpenGroup**. See the OpenPegasus website for more information.

CIM-XML over HTTP protocol

The "CIM-XML over HTTP" protocol is an implementation of the standardized formats for communication between clients and the CIM server *Representation of CIM in XML* and *CIM Operations over HTTP*. For more information about these standards, see the WBEM website.

CIM operations over HTTP

The CIM server for z/OS supports most of the CIM operations defined in the *CIM Operations over HTTP* specification by the DMTF.

DMTF CIM Schema

A CIM Schema defines an information model for representing systems management functions. For z/OS 1.12, CIM Schema version 2.22 is supported by the CIM server.

Instrumentation for server resources

Instrumentation for server resources on the system are called **providers**. The providers, which are based on a subset of the standardized CIM classes, gather data on a system. CIM clients can work with these data by accessing the providers through the CIM server. For more information about what is supported in z/OS, refer to Chapter 8, "z/OS Management Instrumentation for CIM," on page 105.

CIM client for Java™

Since z/OS 1.9, the CIM client for Java library from the SBLIM project is included with z/OS CIM. With z/OS 1.12, version 2.1 of the CIM client for Java is included. The CIM client for Java is a programming API that enables z/OS® applications written in Java for local and remote access of CIM instrumentation through the CIM-XML over HTTP access protocol. It consists of a Java library and associated online Java documentation.

Note: Version 1 of the CIM client for Java (SBLIM CIM client) will be removed in a future release of z/OS.

Figure 2 on page 5 illustrates how the CIM server works in the z/OS environment: A CIM client application requests the CIM server to return information about z/OS resources, in this case about basic operating system (OS) data as well as RMF™ metrics. The CIM server invokes the according CIM providers which retrieve the requested data associated to z/OS system resources. The z/OS RMF monitoring provider invokes the RMF Distributed Data Server (DDS) which in turn collects RMF Monitor III performance data. The CIM server consolidates the data from the providers and returns them back to the calling client through the CIM-XML over HTTP protocol.

Figure 2 on page 5 shows two types of CIM providers: RMF monitoring providers that use the RMF DDS to access the z/OS system data, and z/OS OS management

providers that access the z/OS system data directly.

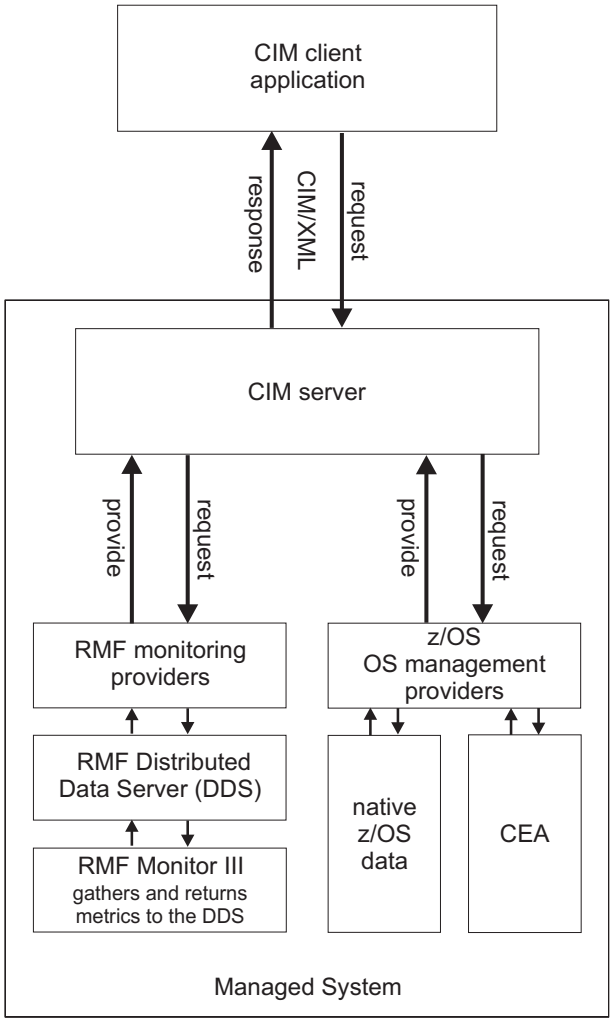


Figure 2. Exemplary tasks of the CIM server in a z/OS environment

For more information about the CIM standard, see the ***CIM Specification*** on the DMTF website.

Important Note:
Each IBM eServer operating system is supporting a specific open source implementation of a CIM server. The ***eServer Common Information Model*** document contains overall information about how to use CIM for systems management on IBM eServers. Users of CIM for z/OS need to know this information. The present z/OS Common Information Model User's Guide contains the z/OS-specific supplements and deviations from the common eServer CIM and from OpenPegasus.

CIM supports the concept of indications as described in the following chapter.

Support of CIM indications

Copyright attribution:
The introduction to CIM indications provided in this section is based on the information in the ***CIM Event Model White Paper, DSP0107***, Document Version 2.1 June 10,2003, provided by the Distributed Management Task Force (DMTF).

In CIM terminology, an indication is the representation of the occurrence of an event. For example, an event can be the unexpected termination of a program, or the modification of a property value of a CIM instance. There is not necessarily a one-to-one correspondence between events and indications. In particular, multiple indications can be generated for the same underlying event if multiple CIM client applications had subscribed for the event. An event can also occur without causing a related indication to be raised, for example if no subscription was made for the event.

Indications also may correlate. Two indications are correlated, if they do not represent the same underlying event, but there is a relationship between the events they represent.

z/OS supports additional indications for the CIM infrastructure. As an example, the RMF Monitoring CIM providers can generate indications for monitoring data, this way enabling CIM clients to support event-based monitoring, leaving the polling to the server. A CIM client can subscribe for conditions, for example whether a performance metric value is above a threshold. While the subscription is active, the RMF indication provider checks the condition independently and notifies the CIM client whenever the condition becomes true.

The CIM indication support comprises the following steps:

- define an indication filter condition: this describes the event that you might want to be notified about, that is, when to send an indication,
- define an indication listener: this describes how and where to send an indication
- activate the subscription by associating a filter with a listener,
- consume the indication once it is raised: the indication is sent to the indication listener, which decides how to react to the event.

The CIM Event Model defines the CIM classes used for indication support. It defines the CIM indication class hierarchy that is used to model various types of events, and the CIM subscription mechanism.

The CIM Event Model is described in the ***CIM Event Model White Paper, DSP0107***, Document Version 2.1 June 10,2003, provided by the Distributed Management Task Force (DMTF).

The *Specification for CIM Operations over HTTP* describes how the CIM server transmits CIM indications to the CIM listener.

How indications work

Indications are generated and processed as shown in Figure 3 on page 7 and described in the subsequent list:

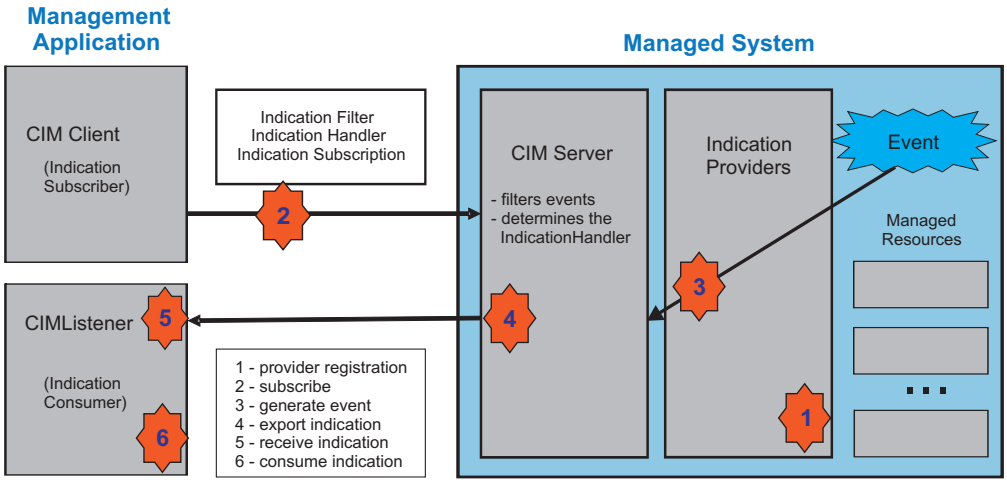


Figure 3. CIM indication flow and processing

1. Indication providers are registered:
   - An indication provider is registered with a CIM server just as any other provider is registered (using ***PG_ProviderCapabilities***). An indication provider is a CIM provider that recognizes when a particular type of event occurs on the managed system. The indication provider turns that event into a type of ***CIM_Indication*** and gives it to the CIM server.
2. A CIM client defines an indication filter condition in order to specify the event to be notified about.
   - The CIM client issues CIM operation requests to the CIM server to create an instance of the ***CIM_IndicationFilter class***.
   - The ***CIM_IndicationFilter*** instance defines the event to be notified about, in the form of a query string in a query language like CQL (CIM Query Language, see DMTF document DSP0202: *CIM Query Language Specification*) or deprecated WQL (WBEM query language).
3. A CIM client defines an indication listener in order to specify how to handle and where to send an indication.
   - The CIM client issues CIM operation requests to the CIM server to create an instance of the ***CIM_ListenerDestinationCIMXML*** class.
   - A ***CIM_ListenerDestinationCIMXML*** is an abstract superclass that specifies how to handle and where to send the indication. This may define a destination and protocol for delivering indications, or it may define a process to invoke. z/OS will support the subclass ***CIM_ListenerDestinationCIMXML*** as a vehicle to describe, via CIMXML, the destination for indications to be delivered. The destination is a URL.
4. A CIM client activates the subscription.
   - The CIM client issues CIM operation requests to the CIM server to create an instance of the ***CIM_IndicationSubscription*** class.
   - A ***CIM_IndicationSubscription*** is an association between a ***CIM_IndicationFilter*** and a ***CIM_ListenerDestinationCIMXML*** (see Figure 5 on page 10).
5. The three CIM instances mentioned above are created by the CIM client using the **createInstance** CIM operation. The instances must be created in the `root/PG_InterOp` namespace of the CIM server.
6. At some future time an event occurs on the managed system and is detected by the CIM indication provider.

- The CIM indication provider turns that event into a specific indication. At this stage, the indication is a local representation of an instance of a subclass of class ***CIM_Indication***. It delivers that indication to the CIM server for further processing and delivery.
- Typically the indication is an instance of a subclass of class ***CIM_ProcessIndication*** or class ***CIM_InstIndication***.

7. The CIM server filters the indications delivered by the indication provider according to the filter conditions of the active subscriptions.
8. The remaining indications are delivered to the CIM listeners specified in each of the ***CIM_ListenerDestinationCIMXML*** instances associated to the matching filter conditions via active subscriptions.
   - The CIM server generates a CIM export message to transmit the ***CIM_Indication*** instance to the CIM listener URL in the format and protocol specified in the ***CIM_ListenerDestinationCIMXML*** instance.
9. The ***CIM_Indication*** instance is received by the CIM listener.

   The CIM listener or CIM server coordinates the distribution of the indication to one or more registered indication consumers and sends CIM export responses.
10. The ***CIM_Indication*** is delivered to one or more indication consumers.

CIM indications

Indications in CIM are represented as instances of class **CIM_Indication**. This abstract class serves as the base class for all indication classes.

Indications are transient instances used to distribute information from an indication generator to an arbitrary number of indication consumers. Therefore, they are typically very short-living. Indications have a source namespace, this is the value of the **SourceNamespace** property of the **CIM_IndicationFilter** instance that produced the indication. Although indications are instances of CIM classes, they are unique in that they cannot be addressed, but can only be received by subscription. Hence, indication instances cannot be enumerated, created, deleted, retrieved or modified by client operations.

Note that z/OS does not ship generic providers, that is, an indication subscription is only processed if the required indication provider exists and is registered with the CIM server.

The CIM Schema version provided with z/OS supports three types of indications (representing different types of events) which are modeled as **CIM_Indication** subclasses. These subclasses include:

CIM_InstIndication
: used to report life cycle events for CIM instances. Types of events include: Instance creation, deletion, modification, method invocation and read access. For each of these types, a specific subclass of **CIM_InstIndication** is defined in the CIM Schema: **CIM_InstCreation**, **CIM_InstDeletion**, **CIM_InstModification**, **CIM_InstMethodCall** and **CIM_InstRead**.

CIM_ClassIndication
: used to report lifecycle events for CIM classes. Types of events include: Class creation, deletion, modification, and read access. This type of indication is not implemented by z/OS.

CIM_ProcessIndication
used to report the occurrence of any other event, typically alert type events. See "CIM_ProcessIndication."

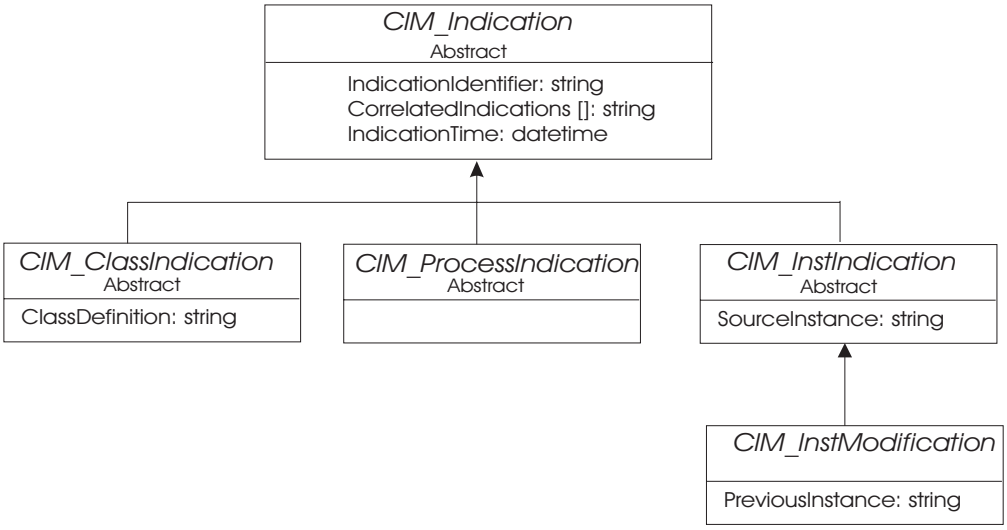


Figure 4. CIM indication hierarchy

CIM indication class hierarchy

The CIM indication class hierarchy models the types of events that can be detected. An instance of **CIM_Indication** represents the occurrence of an event in general. Indication instances cannot be addressed, but they have a source namespace. Although indications are modeled using CIM classes, indications are unique in that they cannot be manipulated or retrieved, but they can only be received by subscription. The **CIM_Indication** class is the base class for all other indication classes. It includes the following properties:

IndicationIdentifier
identifies indication instances uniquely within their source namespace.

IndicationTime
describes, to the extent possible, the time and date of the creation of the underlying event for the indication.

CorrelatedIndications
specifies a list of other indications, referenced by their **IndicationIdentifier** property values, that are related to this indication. These **IndicationIdentifier** property values are interpreted to have the same source namespace as this indication.

While the **CorrelatedIndications** property values are to be interpreted in the context of a single CIM namespace, any instances of other classes of the CIM Event Model do not need to be located in the same namespace.

CIM_ProcessIndication

CIM_ProcessIndication models any events other than lifecycle events. In the CIM Schema version supported for z/OS, the following two subclasses of **CIM_ProcessIndication** are defined:

- **CIM_AlertIndication** – signals the occurrence of an alert type of event. Properties of this subclass include **PerceivedSeverity**, **ProbableCause**, **RecommendedAction** and **Trending**, describing an alerting situation.
- **CIM_SNMPTrapIndication** – used to map SNMP traps to CIM indications. This is currently not supported by the z/OS CIM server.

CIM_InstIndication

An instance of ***CIM_InstIndication*** denotes the occurrence of a lifecycle event on a CIM instance. The possible lifecycle events are: creating an instance, deleting an instance, modifying an instance, reading an instance or invoking a CIM method on an instance. An instance of **CIM_InstIndication** includes an embedded copy (that is, a current snapshot) of the instance, **SourceInstance**, on which the lifecycle event occurred.

CIM_InstModification

Instances of **CIM_InstModification** include an embedded copy of the instance, **PreviousInstance**, before the modification occurred.

Lifecycle events on CIM instances include both, changes caused by a CIM client, and changes that happen spontaneous from a CIM client perspective due to volatile behavior of the CIM provider.

CIM subscription mechanism

The CIM Event Model defines how CIM clients subscribe to receive indications as shown in Figure 5 and Figure 6 on page 12. A **CIM_IndicationFilter** instance describes the set of conditions, a **CIM_ListenerDestinationCIMXML** instance defines the **CIM listener** and the communication protocol, that is, it describes the method and targets for distributing the indications. Finally, a **CIM_IndicationSubscription** association instance between the **CIM_IndicationFilter** instance and the **CIM_ListenerDestinationCIMXML** instance is used to subscribe for receiving these indications. The creation of this association instance activates the subscription.

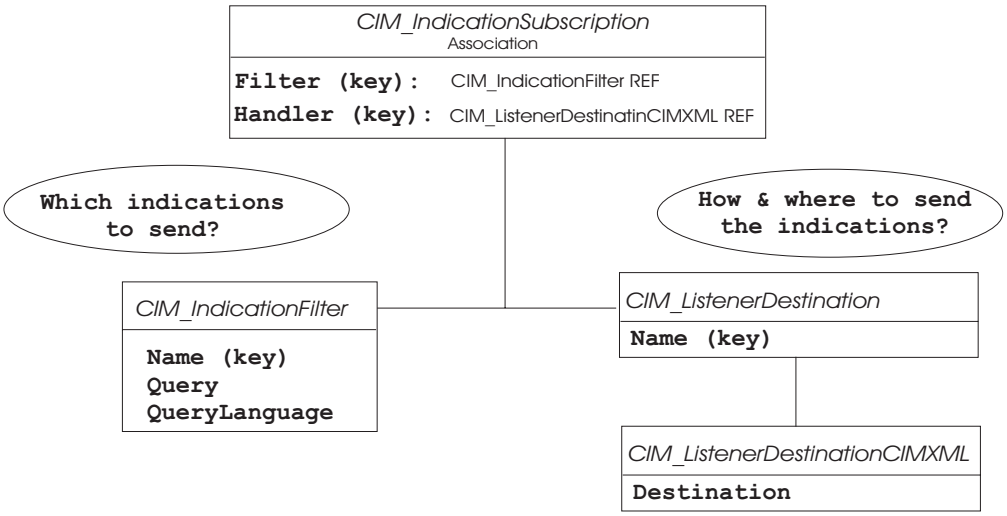


Figure 5. Indication subscription class diagram

CIM_IndicationFilter

An instance of **CIM_IndicationFilter** describes the set of indications of interest by means of a query expression. This is also called the desired indication stream. The most relevant properties of **CIM_IndicationFilter** are:

- **Name, CreationClassName, SystemName, SystemCreationClassName** – key properties.
- **SourceNamespace** – defines the source namespace for the indications resulting from this indication stream.
- **Query** – query string, like "select * from CIM_InstModification where ..."; defines the indication class, filter condition and property list of the indication stream.
- **QueryLanguage** – defines the query language used in the **Query** property. The z/OS CIM server supports the query languages "DMTF:CQL" (CIM Query Language) and "WQL" (WBEM Query Language). RMF providers only support query language "DMTF:CQL". For more information, see the *CIM Query Language Specification, DSP0202*, on *http://www.dmtf.org/standards/documents/WBEM/DSP0202.pdf*.

For information about the complete set of properties of a **CIM_IndicationFilter**, refer to the ***CIM Event Model White Paper*** or to the definition of this class in the CIM Schema. The white paper also contains an example of a **CIM_IndicationFilter** instance.

CIM_ListenerDestinationCIMXML

An instance of **CIM_ListenerDestinationCIMXML** defines "how and where" to send an indication. In particular, the **CIM_ListenerDestinationCIMXML** instance defines the desired indication destination, encoding and protocol for delivery of the indication stream. **CIM_ListenerDestinationCIMXML** specializes **CIM_ListenerDestination** and is used for indication consumers that support the CIM Operations over HTTP protocol (see Specification for CIM Operations over HTTP, DSP0200, on http://www.dmtf.org/standards/documents/WBEM/DSP200.html).

The **CIM_ListenerDestination** class hierarchy can be extended to allow the definition of additional indication handling mechanisms.

The most relevant properties of **CIM_ListenerDestinationCIMXML** are:

- **Name**, **CreationClassName**, **SystemName**, **SystemCreationClassNam** – key properties
- **Destination** – URL to which the indications are to be delivered

For information about the complete set of properties of **CIM_ListenerDestinationCIMXML**, refer to the ***CIM Event Model White Paper*** or to the definition of this class in the CIM Schema.

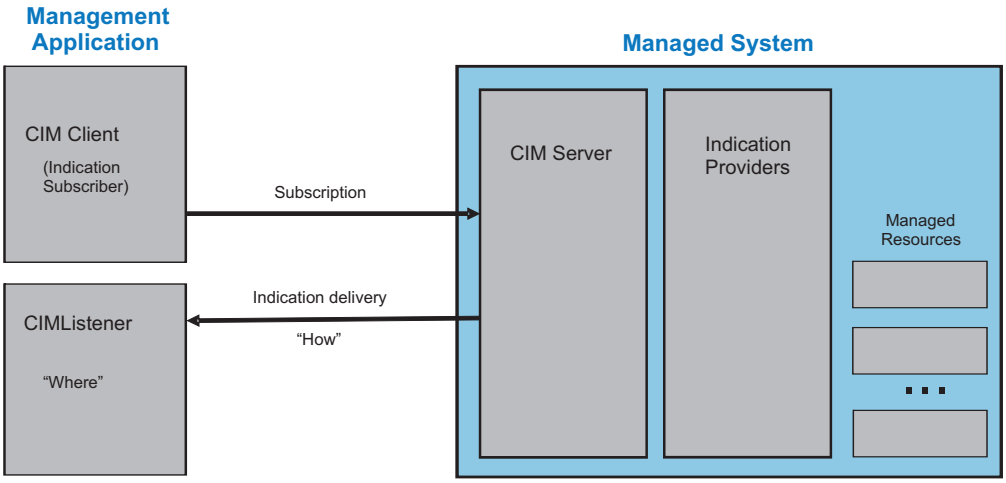


Figure 6. Indication Handler

CIM_IndicationSubscription

Primarily, an instance of **CIM_IndicationSubscription** defines the association between a **CIM_IndicationFilter** instance and a **CIM_ListenerDestinationCIMXML** instance. In addition, it includes a set of properties that further specify the behavior of a subscription. The most relevant properties of **CIM_IndicationSubscription** are:

- The **Repeat Notification** properties (those having "RepeatNotification" contained in their property name) define the behavior for handling indications that report the occurrence of the same underlying event (that is, the disk is still generating I/O errors and has not yet been repaired).
- The **Subscription State** properties (those having "SubscriptionState" contained in their property name) allow a CIM client to monitor and control the state of the subscription.
- The **Subscription Failure Handling** properties (OnFatalErrorPolicy, OtherOnFatalErrorPolicy, FailureTriggerTimeInterval) define the desired behavior when a fatal error occurs during subscription processing.
- The **Subscription Duration** properties (SubscriptionDuration, SubscriptionStartTime, SubscriptionTimeRemaining) allow to expire a subscription automatically, based upon elapsed time since its creation, and to monitor the elapsed times since creation and until expiration.

You can find more detailed information about these properties as well as the complete set of properties of **CIM_IndicationSubscriptionin** the ***CIM Event Model White Paper*** or in the definition of this class in the CIM Schema.

CIM server security

Although the CIM server on z/OS is based on the open source implementation, the security design has been considerably extended and adapted to meet the z/OS security strengths.

The CIM server security consists of two major areas. Protection of resources on the managed system through ***authentication*** and ***authorization***, and protection of communicated information through ***network security***.

The AT-TLS feature of z/OS is used to encrypt data using SSL for data security on the network. It is recommended to utilize this support.

To protect resources on the managed system from unauthorized access, first of all users have to be authenticated to ensure the CIM server is really communicating with a specific identity (user). Authentication of users can be done by either using a user identity (ID) and a password, a user identity and a PassTicket, or a user certificate. In all cases after successful authentication the user who wants to access the system is well known and now authorization checks against that specific user identity are executed.

Three types of authorization checks are being done by the CIM server:

1. General access to CIM is checked for a user. To get general access to CIM, a user needs at least `READ` access to profile CIMSERV in class WBEM.
2. The access to the provider is checked. Access to a provider can be explicitly restricted by defining a provider-specific profile in RACF® class WBEM and registering the provider with that security profile. This access restriction is optional and depends on whether a provider was registered with a security profile or not.
3. The last checks of authorization are performed based on the z/OS system resources a user tries to access, what effectively means that users can only access the resources for which they were entitled before.

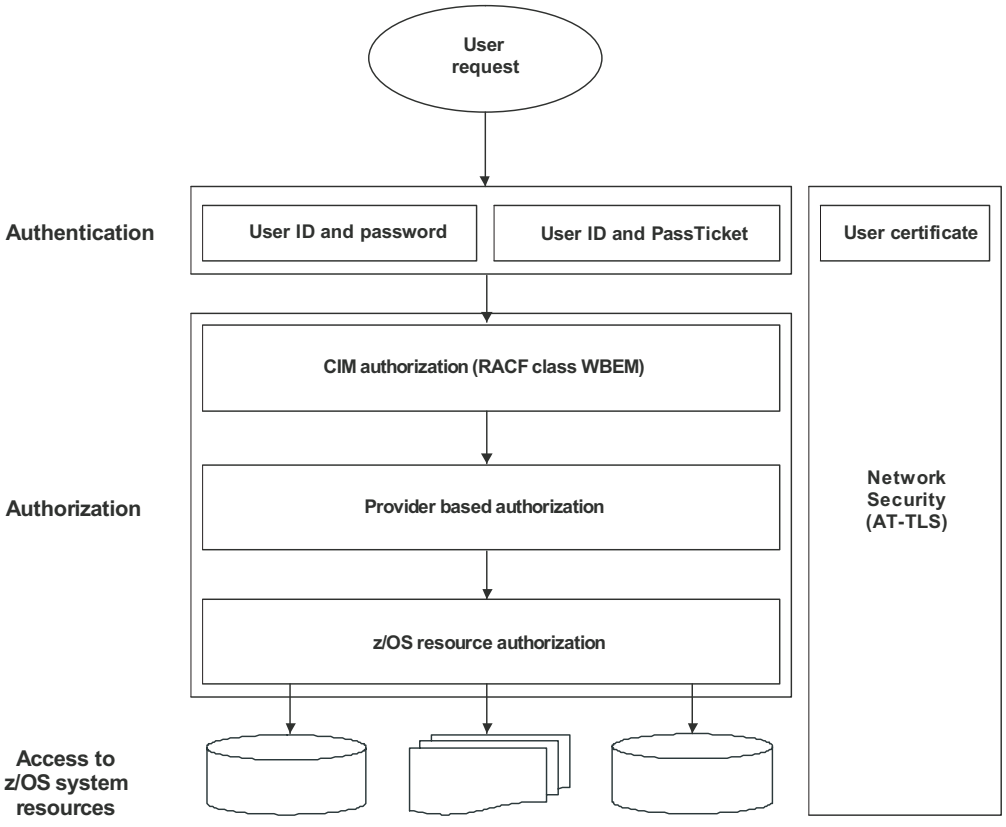


Figure 7. Security components

Figure 7 shows the CIM server runtime environment security.

Network security

AT-TLS provides network security. It is recommended to utilize this feature.

Authentication

Authentication is always enabled for the CIM server. The CIM server checks whether the requestor is entitled to use the CIM server. A requestor authenticates with a user ID and a password, with a user ID and a PassTicket, or with a user certificate.

Authorization

CIM authorization (RACF class WBEM)

The CIM server controls whether the user ID is authorized to access the CIM server using the RACF class WBEM. The profile CIMSERV restricts access to the CIM server.

Provider based authorization

Optionally, a provider can be registered with a specific security profile. In this case, the user ID has to be authorized before it can invoke the provider. A provider-specific profile in RACF class WBEM restricts the access to the provider.

These checks are strongly recommended for providers which use a designated user ID.

z/OS resource authorization

The z/OS system resource access authorization is verified against the requesting user ID.

For authorization purposes to specific z/OS system resources, the CIM server processes requests either under the user ID from which the request was generated or under a designated user ID which was registered for the provider. To do this, the CIM server uses thread-level security, which is provided by the UNIX® System Services.

For that reason certain providers require additional authorization to extra security profiles.

Additionally, the CIM server is enabled for the ***Enhanced Security model***. Under the Enhanced Security model, the CIM server does not load any dynamic load library that is not program controlled, in particular it does not load any such provider dynamic load library.

See "Customizing the security for the CIM server" on page 25 for setting up the security for the CIM server.

Chapter 2. CIM server quick setup and verification

This chapter describes the necessary steps for a quick setup of the CIM server on a z/OS system. It can be used to configure CIM without the need to understand the specifics of the CIM server's features and fine-grained authorization model.

Note: Please be aware that this security setup allows all users to perform all CIM system management functions. If you want to run the CIM server in a production environment, it is strongly recommended to modify this setup as described in Chapter 3, "Installation and migration," on page 19 and Chapter 4, "First-time CIM server set up," on page 25.

To learn more about the customization options for CIM, also refer to these chapters.

To set up the CIM server for the first time, perform the following steps which are described in more detail in the chapters below:

Step 1. Set up the security for the CIM server (once per security domain/sysplex)
→ Use job CFZSEC from the installation SAMPLIB

Step 2. Customize the file systems and directories used by the CIM server (once per z/OS system for which you want to configure CIM)
→ Use job CFZRCUST from the installation SAMPLIB

Step 3. Start the CIM server (once per z/OS system)
→ Copy the CFZCIM started task procedure from the installation PROCLIB
→ START CFZCIM

Step 4. Run the installation verification program (IVP) (once per CIM server)
→ Use job CFZIVP from the installation SAMPLIB

Quick step 1: Setting up the security for the CIM server

The security setup for the CIM server is done once per security domain and works for all systems that share this security domain, for example all systems that use the same shared RACF database. If you are using RACF as your security product, the easiest way to set up CIM server security is using the job CFZSEC provided in the installation SAMPLIB.

With little customization, this sample provides a working security setup for CIM, which allows you to start the CIM server and users or applications to connect to the CIM server.

Please note that the CFZSEC job is meant for a quick setup only. It is not recommended to use it as the final configuration without having reviewed the details of the CIM security setup described in "Customizing the security for the CIM server" on page 25.

__ 1. Review the CFZSEC job and customize the following steps:

Required updates:

__ a. If profile BPX.SERVER in the FACILITY class is active on your system, you should change the UID for CFZSRV to a value other than 0 in step CRUSR. In this case, the default for the

UID is 9500. If the profile is not already active on your system, it is recommended to define the CIM server user with a UID of 0 in the initial setup for simplicity reasons.

Note: Do not assign a password to the CFZSRV user ID.

__ b. If you are using the z/OS Resource Measurement Facility™ (RMF) optional element, replace `#rkeymask` with a 16-digit (0-9, A-F) keymask value to set up the connectivity between CIM and RMF via PassTickets. Otherwise, you may remove the step ENRMF from the job.

Note: The keymask value is a secret passkey. In a secure environment it is recommended to perform step ENRMF separately to avoid storing the passkey in the job log in readable format.

Customization updates:

__ a. Step ENCLCDS references the profile MVSADMIN.XCF.CFRM in the SERVAUTH class, but does not define it.

If this specific profile is not yet defined on your system, either define it or change the job to permit the CIM groups access to the generic profile MVSADMIN.** or MVSADMIN.XCF.*, if defined. To do this, replace "MVSADMIN.XCF.CFRM" by "MVSADMIN.**" or by "MVSADMIN.XCF.*".

__ b. Step ENWLM references the profile MVSADMIN.WLM.POLICY in the SERVAUTH class, but does not define it.

If this specific profile is not yet defined on your system, either define it or change the job to permit the CIM groups access to the generic profile MVSADMIN.** or MVSADMIN.WLM.*, if defined. To do this, replace "MVSADMIN.WLM.POLICY" by "MVSADMIN.**" or by "MVSADMIN.XCF.*".

__ c. Step PECEA defines the generic resource profile CEA.* and permits the CIM server default groups CFZADMGP and CFZUSRGP access to it. For the case that you have already defined the specific resource profiles (CEA.CONNECT, etc), this step also permits the CIM default groups to these specific resource profiles. Depending on what you have actually defined, you can customize this job step to match your environment by removing obsolete commands.

Optional changes:

__ Check that the GIDs (9501-9503) used in step CRUSR are not already in use on your system, otherwise change them.

For details on each step of the CFZSEC job see “Appendix A. Step-by-step explanation of the CFZSEC job” on page 287.

__ 2. Submit CFZSEC

Please note that, because this job provides a solution for each configuration, necessarily the job steps which do not apply to your system will fail. This does not affect the job's functionality.

__ 3. Authorize users to CIM by connecting them to group CFZUSRGP

Be sure to have at least one user authorized for CIM, to run the Installation Verification Procedure as described in “Quick step 4: Running the installation verification program (IVP)” on page 17.

Quick step 2: Customizing the file systems and directories

On each z/OS system where you want to start the CIM server, you need to set up the directories in the UNIX file system, where the CIM server stores its configuration and runtime data:

__ 1. Submit the CFZRCUST sample job from the SAMPLIB

CFZRCUST sets up the directories */etc/wbem* and */var/wbem* for the CIM server.

For details on the customization of the CFZRCUST job, please see "Customize CFZRCUST" on page 20.

__ 2. Change the owner of the */etc/wbem* and */var/wbem* directories to the CIM server user (default CFZSRV). For this, enter the following commands on the UNIX System Services command prompt from a user with superuser privileges:

```
chown -R CFZSRV:CFZSRVGP /etc/wbem
chown -R CFZSRV:CFZSRVGP /var/wbem
```

Quick step 3: Starting the CIM server

To start the CIM server,

__ 1. Copy the CFZCIM started task procedure from your installation PROCLIB to a data set that is part of your PROCLIB concatenation

__ 2. Start the CIM server from the z/OS system console via the START CFZCIM command

A successful start of the CIM server is indicated (among others) by the following console messages:

```
CFZ10025I: The CIM server is listening on HTTP port 5988.
CFZ10028I: The CIM server is listening on the local connection socket.
CFZ10030I: Started CIM Server version 2.10.0.
CFZ12533I: The CIM server failed to register with ARM using element name CFZ_SRV_SY1
     : return code 0x0C, reason code 0x0160.
```

Quick step 4: Running the installation verification program (IVP)

To verify that your CIM installation and customization was completed successfully, you can

__ Submit the job CFZIVP contained in your installation SAMPLIB

This job needs to run under a user that was previously authorized for CIM as described at the end of chapter "Quick step 1: Setting up the security for the CIM server" on page 15.

A successful CIM setup is indicated by a MAXCC=0 for the CFZIVP job along with a success message at the end of the job output like this:

```
cimivp - All tests completed successfully
```

Chapter 3. Installation and migration

This chapter lists the software and hardware prerequisites and describes how to install and how to migrate the CIM server to the current release.

Software and hardware prerequisites

z/OS CIM is delivered with the z/OS operating system and runs on any hardware that can exploit the current z/OS version as described in the *z/OS Program Directory*.

Installation

You install z/OS CIM using SMP/E as described in the *z/OS Program Directory*. For additional setup steps, refer to Chapter 4, "First-time CIM server set up," on page 25. Note that other z/OS components that provide CIM instrumentation, like for example RMF or DFSMSrmm, may require additional configuration steps which are described in the respective product documentation.

SMP/E installation directories

After a successful SMP/E installation, the components of z/OS CIM are located in the following hierarchical file system directory. It does not make any difference who owns the files.

Table 2. Default installation directories for z/OS CIM

Directory	Description
/usr/lpp/wbem	Base hierarchical file system directory
/usr/lpp/wbem/bin	CIM server executables
/usr/lpp/wbem/lib	CIM server libraries
/usr/lpp/wbem/install	Sample profile
/usr/lpp/wbem/provider	CIM provider libraries provided with z/OS
/usr/lpp/provider/schemas	IBM z/OS instrumentation MOF files
/usr/lpp/wbem/msg	CIM message files for NLS
/usr/lpp/wbem/schemas	DMTF CIM schema files (MOF)
/usr/lpp/wbem/repository	CIM schema master repository
/usr/lpp/wbem/jclient	CIM client for Java
/usr/lpp/wbem/IBM	SMP/E target library path

Other directories

Table 3. Other installation directories for z/OS CIM

Directory	Description	Owner	Access
/etc/wbem	This directory is system specific and used by the CIM server to store its configuration files and environment for the started task. It has to be owned and writable by the CIM server user (e.g. CFZSRV)	CIM server user	rwxr-xr-x

Table 3. Other installation directories for z/OS CIM (continued)

Directory	Description	Owner	Access
/var/wbem	This directory is system specific. The CIM server uses it to store its data repository for CIM classes and instances as well as for various files used at runtime, such as the special file required for connecting to the CIM server through UNIX Domain Sockets (cimxml.socket). This directory has to be owned by the CIM server user and only the CIM server user must have write access to it.	CIM server user	rwxr-xr-x
/var/wbem/logs	Used by the CIM server to log the stdout and stderr output when running as a started task. See"Customizing the started task procedure CFZCIM" on page 38 for details.	CIM server user	rwxr-xr-x

The configuration files and the repository are installed or migrated during separate steps. Refer to the appropriate migration information: "Migration from z/OS 1.10 or z/OS 1.11 to z/OS 1.12" on page 22.

For a better maintainability, it is recommended to mount a separate file system on */var/wbem* for the CIM server's data repository. The recommended size is 100MB. You can do so by adding a mount statement in your **BPXPRMxx PARMLIB** member:

Mount statement:

```
MOUNT FILESYSTEM(OMVS.VARWBEM.ZFS)
         TYPE(ZFS)
         MOUNTPOINT('/var/wbem')
         MODE(RDWR)
```

Customize CFZRCUST

The job **CFZRCUST** installs and migrates the z/OS CIM server configuration and repository on each target machine. A sample of **CFZRCUST** is shipped with the default SAMPLIB.

Prerequisites:

__ 1. The target system is running with configured UNIX System Services.
__ 2. The CIM server is stopped.
__ 3. The user running this job
   - must either have UNIX user ID 0
   - or must be able to copy files and set the program control bit on files.
__ 4. If you intend to mount the data set on a separate file system - which is recommended - this user must be entitled to allocate a 100 MB zFS data set (if not yet allocated), and must be authorized to mount file systems.

Now you have to adjust the sample job **CFZRCUST**, which is located in the SAMPLIB, to fit your environment. There are two options you can choose; it depends on whether you want to place the CIM server repository and the log files in a separate file system or not.

Option 1: Placing /var/wbem in a separate file system:

__ 1. Adjust the job card.

__ 2. Adjust STEP 1 of the JCL to create a file system data set. Choose this step to create a data set. You must provide the name in the JCL for further processing the selected sample job.

As an alternative, you can also create the file system outside of this JCL.

STEP 1 is a sample to allocate a zFS file system dataset:

JCL - sample STEP 1

```
//*****************************************************************/
//*  STEP 1 - Create zFS DataSet for /var/wbem                    */
//*****************************************************************/
//DEFZFS   EXEC PGM=IDCAMS
//SYSPRINT DD SYSOUT=*
//DASD0    DD DISP=(NEW,CATLG),UNIT=unit,VOL=SER=volser
//SYSIN    DD *
  DEFINE CLUSTER( -
    NAME(%CFZVARWBEMDS%) -
    VOLUMES(volser) -
    STORAGECLASS(OMVS) -
    LINEAR -
    CYLINDER(150 15) -
    SHAREOPTIONS(3) -
  )
//FRMZFS   EXEC   PGM=IOEAGFMT,REGION=0M,
//         PARM=(' -aggregate %CFZVARWBEMDS% -compat ')
//STEPLIB  DD DISP=SHR,DSN=SYS1.SIOELMOD
//SYSPRINT DD SYSOUT=*
//STDOUT   DD SYSOUT=*
//SYSPRINT DD SYSOUT=*
//SYSPRINT DD SYSOUT=*
```

__ 3. If you are using an extensible file system, you can suppress the check for enough free space by specifying the parameter `-noSpaceCheck` in the installation/migration utility at STEP 2 of the JCL. The system administrator is responsible to ensure that there is enough free space (60 MB) available for installation or migration, otherwise the job will fail. This would not suppress the check if a separate file system data set is used.

The beginning of STEP 2 will then look like:

JCL - sample STEP 2

```
//*****************************************************************/
//*  STEP 2 - Run customization/migration utility                 */
//*****************************************************************/
//CFZRCUST EXEC PGM=BPXBATCH,TIME=NOLIMIT,REGION=0M,
//       PARM='PGM /usr/lpp/wbem/install/CFZRCUST.sh -noSpaceCheck'
//*
```

__ 4. Replace the place holder %CFZVARWBEMDS% in the JCL with the name of the file system data set, for example: `OMVS.VARWBEM.ZFS`.

__ 5. Submit the job. The return code (MAXACC) is 0 or 4 and indicates a successful installation or migration. If the return code is 12, look at the job output, correct the error and submit the job again.

Option 2: Using an existing file system for /var/wbem:

__ 1. Adjust the job card.

__ 2. Omit STEP 1 of the sample job and specify the parameter `-noDS` in the installation/migration utility at STEP 2 of the JCL.`-noDS` disables the use of a separate file system dataset for /var/wbem.

JCL - sample STEP 2

```
//*************************************************************/
//*  STEP 2 - Run customization/migration utility             */
//*************************************************************/
//CFZRCUST EXEC PGM=BPXBATCH,TIME=NOLIMIT,REGION=0M,
//       PARM='PGM /usr/lpp/wbem/install/CFZRCUST.sh -noDS'
//*
```

__ 3. If you are using an extensible file system, you can suppress the check for enough free space by specifying the parameter `-noSpaceCheck` in the installation/migration utility at STEP 2 of the JCL. The system administrator is responsible to ensure that there is enough free space (60 MB) available for installation/migration, otherwise the job will fail. This would not suppress the check if a separate file system data set is used.

__ 4. Submit the job. A return code (MAXACC) 0 or 4 indicates a successful installation or migration. If the return code is 12, look at the job output, correct the error and submit the job again.

Running the installation verification program

After performing the actions described in Chapter 4, “First-time CIM server set up,” on page 25, you can run the sample application CIMIVP delivered with the product as an installation verification program (see “Verifying the installation and customization of CIM” on page 95).

Migration from z/OS 1.10 or z/OS 1.11 to z/OS 1.12

You can install z/OS 1.12 CIM as a replacement of a previous z/OS CIM version without affecting any external programs interfacing with the CIM server, such as management applications.

Installation

__ 1. It is recommended to replace the environment variable file `cimserver.env` located in */etc/wbem* with the new sample installed in directory:

/usr/lpp/wbem

__ 2. If you do not intend to replace the environment variable file `cimserver.env` with the new sample, make sure that the following directories are included in the LIBPATH defined in `cimserver.env`:

/usr/lpp/wbem/lib:/usr/lpp/wbem/provider:/usr/lib

The SMP/E installation of the z/OS 1.12 CIM server installs a new master repository in */usr/lpp/wbem/repository*. (Existing versions of the repository are located in */var/wbem/repository*.)

CIM server startup

During startup, the z/OS 1.12 CIM server automatically corrects eventually missing file tags. In addition, it detects if an existing repository is up to date.

If back-level, the CIM server automatically upgrades the repository in `/var/wbem` following these steps:

1. The CIM server backs up the current repository into

   `repository_old_`<*timestamp*> for all z/OS repositories
2. The CIM server copies the master repository from */usr/lpp/wbem/repository* to */var/wbem/repository*.
3. The CIM server migrates the previous repository content to the current repository.

The CIM server also checks for syntactical errors in the `cimserver.env` file located in directory */etc/wbem/*. Errors recognized by the CIM server are automatically corrected. The corrected version of `cimserver.env` replaces the old one, but the startup fails. Restart the CIM server.

Configuration

In z/OS 1.11 the default for the configuration property *slp* has been changed to `false`. This means that the CIM server will not automatically announce itself over the network using the SLP protocol.

When the *slp* property is set to `false`, the CIM server does not announce itself to the network, and other CIM-based Systems Management applications are not notified of its presence.

To notify the Systems Management applications in the network,

__ either set the configuration property *slp* to `true`

__ or configure the CIM-based Systems Management applications in the network to use this CIM server's IP-address or hostname.

For details how to change the configuration of the CIM server please see "CIM server configuration" on page 45.

Chapter 4. First-time CIM server set up

This chapter describes the subjects to be considered before the first invocation of the CIM server.

Ensure that you regard the following points:

__ 1. Make sure that the CIM server can make use of the configured HTTP port (usually, this is port number 5988). To look after your currently configured port for HTTP, see the configuration property *httpPort*.

   For more information, see "Basic configuration properties" on page 46.

__ 2. Customize the security for the CIM server.

   For more information, see "Customizing the security for the CIM server."

__ 3. Customize the CIM server startup.

   For more information, see "Customizing the CIM server startup" on page 38.

__ 4. Customize the environment variables.

   For more information, see "Customizing environment variables" on page 39.

__ 5. Select a WLM service class for z/OS CIM priority.

   For more information, see "Selecting a WLM service class for z/OS CIM priority" on page 40.

__ 6. Optionally choose a provider based authorization model.

   For more information, see "Provider based authorization model" on page 41.

__ 7. Optionally run providers in a designated user context.

   For more information, see "Running providers in a designated user context" on page 41.

Customizing the security for the CIM server

The z/OS implementation of the CIM server requires each requestor to have a real z/OS user ID. Only users who have been successfully authenticated with the z/OS security product and who have been granted access to the CIM server, will be able to execute requests against the CIM server. This chapter describes the details on how to set up these features.

Setting up security for the CIM server includes the following steps:

__ 1. Define a RACF class and profile for the CIM server (see "Defining a RACF class and profile for the CIM server" on page 26).

__ 2. Define a user ID for the CIM server and grant it access to the CIM server's RACF profile (see "Defining a CIM server user ID" on page 27).

__ 3. Configure the CIM server's resource authorization model (see "Configuring the CIM server's resource authorization model" on page 28.

__ 4. Grant client users and administrators access to the CIM server (see "Granting clients and administrators access to the CIM server" on page 30).

__ 5. Allow the CIM server to surrogate for a client ID (see "Switching identity (surrogate)" on page 31).

__ 6. Optionally configure secure connections (HTTPS) for the CIM server (see "Configuring the CIM server HTTPS connection using AT-TLS" on page 32).

__ 7. For PassTicket usage define an encryption key for the application ID CFZAPPL

(see "Defining an encryption key for PassTicket validation" on page 37)

__ 8. Specific providers need an additional setup:

- __ Some providers as the network, job, cluster, and monitoring providers have additional security and setup requirements. Refer to the description of these providers in Chapter 8, "z/OS Management Instrumentation for CIM," on page 105.
- __ For additional RACF setup, see Chapter 10, "Cluster, CoupleDataset, and JES2-JES3Jobs provider setup," on page 231 and Chapter 11, "Connecting the RMF CIM providers to the RMF Distributed Data Server (DDS)," on page 233.
- __ For the use of the SMI-S profiles, grant the requesting user ID `UPDATE` permission to the profile IOSCDR in the class FACILITY.

The following chapters describe how each step of security can be enabled and configured.

Note: This document describes how to set up security using Resource Access Control Facility (RACF) as security product. However, you can use any other suitable security product for this purpose.

Defining a RACF class and profile for the CIM server

Access to the CIM server is controlled through RACF class WBEM. Define a new class in RACF through the dynamic CDT feature of the ***z/OS Security Server*** as follows:

__ 1. To be able to build the dynamic class WBEM, you must first activate the class descriptor table (CDT) using the following RACF command:

Example:

```
SETROPTS CLASSACT(CDT)
```

__ 2. By adding a profile to the IBM class named CDT, you can create a new class definition. This profile then represents a dynamic class. The segment CDTINFO is used to define the class attributes. Definition of dynamic class WBEM can be done with the following RACF commands:

Example:

```
RDEFINE CDT WBEM UACC(NONE) CDTINFO(
 CASE(UPPER)
 FIRST(ALPHA)
 OTHER(ALPHA,NUMERIC)
 MAXLENGTH(246)
 MAXLENX(246)
 KEYQUALIFIERS(0)
 PROFILESALLOWED(YES)
 POSIT(200)
 DEFAULTRC(8)
 DEFAULTUACC(NONE)
 RACLIST(REQUIRED)
)
SETROPTS RACLIST(CDT) REFRESH
```

The default values shown above (except POSIT(200)) are expected by the CIM server; do not use different values as this can yield unpredictable results.

You can ignore the warning message which is issued when adding class WBEM.

For a more detailed description of how to create a new class within RACF dynamic CDT, see *z/OS Security Server RACF Security Administrator's Guide*.

__ 3. To activate the new class, issue:

Example:

```
SETROPTS CLASSACT(WBEM) RACLIST(WBEM)
```

__ 4. After creating and activating the WBEM class, you must create the CIMSERV profile within this class through which users then can be granted access to the CIM server.

The following example illustrates the flow of RACF commands that are required to define a profile named CIMSERV in this class:

Example:

```
RDEFINE WBEM CIMSERV
SETROPTS CLASSACT(WBEM) RACLIST(WBEM) REFRESH
```

Defining a CIM server user ID

To define a CIM server user ID:

__ 1. Either select an existing user ID or create a new CIM server user ID. We recommend to create a CIM server user ID named CFZSRV with UID 9500 and a CIM server group ID named CFZSRVGP with GID 9501.

Depending on the security model under which the CIM server runs, the user ID may need to be privileged (UID=0).

For more information to decide on the privileges for the CIM server user ID, see "Configuring the CIM server's resource authorization model" on page 28.

__ 2. Allow the CIM server's user ID `CONTROL` access to profile CIMSERV in class WBEM.

The following example shows the required RACF commands to achieve this, where the user ID CFZSRV was chosen for the CIM server:

Example:

```
PERMIT CIMSERV CL(WBEM) ACCESS(CONTROL) ID(CFZSRV)
SETROPTS CLASSACT(WBEM) RACLIST(WBEM) REFRESH
```

__ 3. If you run the CIM server as started task, it is recommended to define the CIM server user ID as *protected user ID*.

You can define a protected user ID by assigning the `NOPASSWORD`, `NOPHRASE`, and `NOOIDCARD` attributes through the ADDUSER or ALTUSER command.

Example:

```
ALTUSER CFZSRV NOPASSWORD NOOIDCARD NOPHRASE
```

Protected user IDs are protected from being used to log on to the system, and from being revoked through incorrect password attempts.

For more details about protected user IDs see *z/OS Security Server RACF Security Administrator's Guide*.

For running the CIM server started task, see "Customizing the started task procedure CFZCIM" on page 38 for how to associate the CIM server user ID with the started task.

Configuring the CIM server's resource authorization model

The CIM server can be run with two different authorization models, depending on whether the profile BPX.SERVER is defined in the FACILITY class or not. In any case, the CIM server follows a *resource-based authorization model*, which means that user requests are processed in separate threads, for which the security context is switched to the user ID of the requestor or to a designated user ID. So any z/OS system resource that is accessed directly through a CIM provider executing a user request in such a thread, will be accessed under the requestor's or a designated user ID and thus, authorization checks occur against this user ID.

These checks will occur in addition to the general access check for the CIM server through the CIMSERV profile in class WBEM.

To let the resource based authorization security work properly,
consider the following when setting up the CIM server user ID:

__ 1.

If the Enhanced Security model is *disabled*:
When the Enhanced Security model is disabled, no profile BPX.SERVER is active in the FACILITY class.

__ Set up the user ID running the CIM server as a privileged user (UID=0).

If the Enhanced Security model is *enabled*:
When the Enhanced Security model is enabled, profile BPX.SERVER exists in the FACILITY class.

Note:
The definition of BPX.SERVER is not specific for the CIM server, but has system wide implications for all programs running on the z/OS system. Refer to ***Setting up the BPX.* FACILITY class profiles*** in *z/OS UNIX System Services Planning* for additional information.

__ a. Set up the user ID running the CIM server with `UPDATE` access to BPX.SERVER.

The CIM server user ID's level of access for the BPX.SERVER profile (`READ` or `UPDATE`) defines against which user ID the RACF security checks are performed when executing CIM requests. When the

CIM server user ID has UPDATE access, only the client user ID is checked for access authorization.

__ b. Flag all CIM server libraries, as well as all installed providers, as "program controlled" (see “Setting up program control” on page 30).

__ c. If the CIM server user ID is not privileged (UID ≠ 0), ensure that the directories /etc/wbem and /var/wbem are owned by this user ID.

The following example shows how to change ownership:

Example:

```
chown -R <Server UserID>:<Server GroupID>
   /etc/wbem
chown -R <Server UserID>:<Server GroupID>
   /var/wbem
```

If any of these requirements is not met, the CIM server will not start, but issue an according error message in the logs.

__ 2. Consider to enable the *must-stay-clean feature* (see “Enabling the must-stay-clean feature”).

__ 3. If the Enhanced Security model or the must-stay-clean feature is enabled, make sure that the CIM server runs in a clean program controlled environment (see “Setting up program control” on page 30).

Enabling the must-stay-clean feature

To add additional system integrity to the CIM server, z/OS provides the optional *must-stay-clean* feature. To benefit from the feature, you must enable it explicitly.

Must-stay-clean provides additional system integrity:

- Provider libraries are loaded dynamically during runtime by the CIM server. The must-stay-clean feature prevents uncontrolled libraries to be loaded on behalf of a dynamic provider.
- Using the *Out-of-Process* feature, providers can be managed in separate address spaces rather than loading and calling provider libraries directly within the CIM server process. This converts the CIM server process into a daemon process that starts off several server processes (Provider Agent processes). Providers are then run in threads by the Provider Agent.

  Must-stay-clean secures the trust base between both address spaces.

To enable the must-stay-clean feature,

__ define the BPX.DAEMON FACILITY class in your security product

Defining BPX.DAEMON enforces program control. The following sample shows the according RACF commands:

Example:

```
RDEFINE FACILITY BPX.DAEMON UACC(NONE)
SETROPTS CLASSACT(FACILITY)
SETROPTS RACLIST (FACILITY)
SETROPTS RACLIST(FACILITY) REFRESH
```

Note: The definition of BPX.DAEMON is not specific for the CIM server, but has system wide implications for all programs running on the z/OS system. Refer to ***Setting up the BPX.* FACILITY class profiles*** and ***Setting up security procedures for daemons*** in *z/OS UNIX System Services Planning* for additional information.

Setting up program control

Program control means that all programs running in the address space have been loaded from a library that is controlled by a security product. A library identified to RACF program control is an example. Refer to *z/OS UNIX System Services Planning* for additional information about program control.

If the CIM server runs with authority to BPX.SERVER or with the must-stay-clean feature, the server must run in a clean program controlled environment.

To enable program control:

__ 1. Ensure that all libraries are flagged as *program controlled*.

By default, all libraries shipped with the CIM server are flagged as program controlled. If additional provider libraries are installed, it may be required to set the program control flag manually using the `extattr +p <libname>` command.

__ 2. In addition to the UNIX System Services files, mark several MVS™ libraries as program controlled. The following sample shows the according RACF commands.

Example:

```
RALT PROGRAM * ADDMEM('SYS1.SCEERUN'/'******'/NOPADCHK)
   UACC(READ)
RALT PROGRAM * ADDMEM('SYS1.SCEERUN2'/'******'/NOPADCHK)
   UACC(READ)
RALT PROGRAM * ADDMEM('SYS1.MIGLIB'/'******'/NOPADCHK)
   UACC(READ)
```

If you are using z/OS Resource Measurement Facility (RMF), then the library SYS1.SERBLINK should be program controlled.

__ 3. Ensure that the CIM server runtime environment runs in its own address space.

To run the CIM server runtime environment in its own address space, either start it using the provided started task procedure or set the environment variable `_BPX_SHAREAS=NO` in your z/OS UNIX System Services shell before starting it with the `cimserver` command.

Granting clients and administrators access to the CIM server

The CIM server authenticates users with the ***z/OS Security Server*** to determine which users can log into it. Authentication is performed for every new connection (local or remote) before a user is granted access to the CIM server.

For the CIM server for z/OS, users log on over HTTP or HTTPS using basic authentication or certificate authentication. When logging on, users are authenticated using their z/OS user ID and password as defined, for example, in RACF.

To access the CIM server, a user must be at least linked to a group with `READ` access to RACF profile CIMSERV. In order to use any of the administrative command-line tools of the CIM server, as described in “CIM server command-line utilities and commands” on page 59, a group instead requires `CONTROL` access to the CIMSERV profile.

For detailed information about the required access rights, see the following table.

Table 4. Access types required for CIM operations

CIM operation type	CIM operations	RACF access
Basic read	GetClass, EnumerateClasses, EnumerateClassNames, GetInstance, EnumerateInstance, EnumerateInstanceNames, GetProperty, GetQualifier, EnumerateQualifier	READ
Basic write	SetProperty	UPDATE
"Method"	ExecuteMethod	UPDATE
Schema Manipulation	CreateClass, ModifyClass, DeleteClass	CONTROL
Instance Manipulation	CreateInstance, ModifyInstance, DeleteInstance	UPDATE
Indication Subscription	CreateInstance, ModifyInstance, DeleteInstance	UPDATE
Association Traversal	Associators, AssociatorNames, References,ReferenceNames	READ
Query	ExecQuery	READ
Qualifier Declaration	SetQualifier, DeleteQualifier	CONTROL

The following example shows how to define `UPDATE` access for a client group called CFZUSRGP:

Example:

```
PERMIT CIMSERV CL(WBEM) ACCESS(UPDATE) ID(CFZUSRGP)
SETROPTS CLASSACT(WBEM) RACLIST(WBEM) REFRESH
```

In addition, the CIM server's user ID must be defined as a surrogate of the client user ID (see “Switching identity (surrogate)”).

For a user to be able to use the command line tools, this UNIX System Services environment has to be set up as described in “Customizing the UNIX System Services shell for CIM server startup” on page 39

Switching identity (surrogate)

The CIM server uses services which can be run in client or server security context. Therefore, the CIM server’s user ID must be able to switch the user ID to the client’s user ID. To enable the CIM server’s user ID to switch user ID, BPX.SRV profiles for the SURROGAT class have to be defined within your System Authorization Facility (SAF).

The recommended way to do this is:

__ Specify a general profile to allow the CIM server user ID to switch to any other z/OS user ID with a UNIX System Services segment defined.

The following sample shows the required RACF commands to create the generic profile, where the CIM server's user ID is CFZSRV:

Example:

```
SETROPTS CLASSACT(SURROGAT) RACLIST(SURROGAT)
RDEFINE SURROGAT BPX.SRV.** UACC(NONE)
PERMIT BPX.SRV.** CLASS(SURROGAT) ACCESS(READ) ID(CFZSRV)
SETROPTS GENERIC(SURROGAT) RACLIST(SURROGAT) REFRESH
```

Configuring the CIM server HTTPS connection using AT-TLS

The CIM server runtime environment can profit from the Application Transparent Transport Layer Security (AT-TLS) functionality. The communication between the CIM client and the CIM server can be secured by encryption (SSL). Additionally the CIM client can be authenticated by a certificate and mapped to a local z/OS user ID.

The following task describes how to configure the CIM server HTTPS connection using AT-TLS.

__ 1. **Prerequisites**

__ Ensure that the basic setup for the Policy Agent is done

See *z/OS Communications Server: IP Configuration Guide* about policy-based networking and data protection.

__ Ensure that the basic certificates setup is done

For handling certificates for secure communications for RACF, see *z/OS Security Server RACF Security Administrator's Guide* about RACF and digital certificates.

__ 2. **Configuring the CIM server runtime**

__ a. Set the configuration property **enableHttpsConnection** to `true`.

__ b. Ensure that the configuration property **httpsPort** is set to 5989.

This default should not be changed.

__ c. Ensure that the https port 5989 can be used by the CIM server.

Based on this configuration, the CIM server opens a second listener for receiving client connections and ensures that these connections are secured by AT-TLS. The level of protection depends on the configuration of AT-TLS. If a connection on this port is not secured by AT-TLS, the connection is closed and an appropriate error message is issued on the operator console.

__ 3. **Configuring the Policy Agent to secure communication for the CIM server**

__ Enable the Policy Agent for AT-TLS. See *z/OS Communications Server: IP Configuration Guide* about Application Transparent Transport Layer Security data protection.

__ Configure the Policy Agent to secure the communication for the CIM server at the configured HTTPS port (configuration property **httpsPort**). For sample Policy Agent polices, see "Example: Configuring AT-TLS for secure communication" on page 33 to configure either an SSL protection or an SSL protection including a certificate based authentication.

__ Optionally you can protect the indication delivery on a specific port range with SSL.

Example: Configuring AT-TLS for secure communication

This sample shows the exemplary setup of the Policy Agent to secure communication for the CIM server.

- SSL protection only (see "Prerequisite" and "SSL protection only")
- SSL protection including certificate based authentication (see "Prerequisite" and "SSL protection including certificate based authentication" on page 34)
- SSL protected indication delivery (see "Prerequisite" and "SSL protected indication delivery" on page 36)

For a more detailed explanation about Policy Agent AT-TLS policy see *z/OS Communications Server: IP Configuration Reference* about Policy Agent and policy applications and Application Transparent Transport Layer Security (AT-TLS) policy statements.

Prerequisite: Common certificate setup

To enable AT-TLS to secure the communication, a valid server certificate, the associated server private key, and the certificate of trusted Certificate Authority's (CA) are needed. These examples are using a key ring named `CFZCIMServerRing` to store these credentials. This key ring must be accessible by the CIM server user ID (e.g. CFZSRV), and the server certificate must be the default certificate.

For a sample setup with RACF, see *z/OS Security Server RACF Security Administrator's Guide* about RACF and digital certificates, implementation scenario 1 or 2. For handling certificates and key rings, please refer to the documentation of your SAF product.

SSL protection only

Simple SSL protection means that the communication between the client and the server is encrypted without having established a trust relationship between the client and the server. So the client needs to send a user ID and a password for authentication.

To set up AT-TLS with simple SSL protection for the CIM server, a policy for the Communications Server Policy Agent has to be created that restricts AT-TLS to the CIM server port 5989 and to inbound TCP/IP communication.

Sample Policy Agent policy for a simple SSL protection:

Example

```
TTLSRule              CFZCIMServerRuleInbound
{
   Jobname                   CFZCIM*
   LocalPortRange            5989
   Direction                 Inbound
   TTLSGroupActionRef        grp_StartUp
   TTLSEnvironmentActionRef CFZCIMServerEnvActionInbound
}

TTLSEnvironmentAction CFZCIMServerEnvActionInbound
{
  HandshakeRole     Server
  TTLSEnvironmentAdvancedParms
  {
     ClientAuthType    PassThru
  }
  TTLSKeyRingParms
  {
     Keyring           CFZCIMServerRing
  }
}

# Common StartUp Group that new Rules may use
# Shows how each connection maps to policy
TTLSGroupAction grp_StartUp
{
 TTLSEnabled On
 Trace 0             # Log Errors and Info messages to syslogd
}
```

CIM server specific notes to the AT-TLS Policy parameters:

TTLSRule: Jobname
: **Jobname** identifies where this rule applies. In the example, it is the started task job name. If you set up the connection this way, the configuration does not influence other parts of the system.

TTLSRule: LocalPortRange
: This property must match the HTTPS port definition of the CIM server.

SSL protection including certificate based authentication

Since z/OS 1.9, you can use SSL secured communications and certificates based authentication between the CIM client and the CIM server, because the CIM server is aware of AT-TLS. The CIM server queries AT-TLS if the client is identified by a client certificate and mapped to a local user ID.

Authentication based on SSL certificates means:

- the communication between the client and the server is encrypted,
- the trust relationship is established, and
- the client certificate is matched to a local z/OS user ID.

No user ID and password have to be provided by the client. All subsequent authorization checking is done with the mapped user ID.

The CIM client sends an SSL certificate to AT-TLS, AT-TLS sends the certificate to RACF and RACF associates the certificate to the appropriate

user ID, which then can access the CIM server. Vice versa, the CIM server returns its responses to clients' requests using SSL certificates.

This method of authentication provides more security than sending user IDs and passwords between client and server. If you want to use this enhanced method based on certificates, you must create the inbound/outbound rules as follows:

To set up AT-TLS with authentication based on SSL certificates for the CIM server, a policy for the Communications Server Policy Agent has to be created that restricts AT-TLS to the CIM server port 5989 and to inbound TCP/IP communication. Also the SAF facility has to be set up to match certificate subjects to local z/OS user ID's.

For setting up the SAF facility to map certificates to local user IDs, see *z/OS Security Server RACF Security Administrator's Guide* about RACF and digital certificates, Certificate Name Filtering.

Sample Policy Agent policy for authentication based on SSL certificates:

Example

```
TTLSRule              CFZCIMServerRuleInbound
{
   Jobname                   CFZCIM*
   LocalPortRange            5989
   Direction                 Inbound
   TTLSGroupActionRef        grp_StartUp
   TTLSEnvironmentActionRef CFZCIMServerEnvActionInbound
}

TTLSEnvironmentAction CFZCIMServerEnvActionInbound
{
  HandshakeRole              ServerWithClientAuth
  TTLSEnvironmentAdvancedParms
  {
     ClientAuthType    SAFCheck
  }
  TTLSKeyRingParms
  {
     Keyring           CFZCIMServerRing
  }
}

# Common StartUp Group that new Rules may use
# Shows how each connection maps to policy
TTLSGroupAction grp_StartUp
{
 TTLSEnabled On
 Trace 0             # Log Errors and Info messages to syslogd
}
```

CIM server specific notes to the AT-TLS Policy parameters:

TTLSRule: Jobname

Jobname identifies where this rule applies. In this example it is the started task job name. If you set up the connection this way, the configuration does not influence other parts of the system.

TTLSRule: LocalPortRange

This property must match the HTTPS port definition of the CIM server.

SSL protected indication delivery

This sample shows an exemplary setup for the usage of RACF to deliver secured indications with AT-TLS.

To deliver secured indications from the CIM server to an indication end point means that the CIM server is establishing an encrypted connection to deliver indications. If a trusted relationship is established or not depends on the end point configuration.

In this case the CIM server is a client to the indication end point and therefore an outbound policy has to be specified with AT-TLS. To deliver secured indication the job name of the CIM server and the port specified in the indication handler destination property must match. An indication is defined by the application programmer so there must be an agreement between application programmer and the system programmer on which port secured indications are sent from the CIM server to the indication end points.

Sample Policy Agent policy for delivering of secured indications:

Example

```
TTLSRule              CFZCIMServerRuleOutbound
{
   Jobname                   CFZCIM*
   RemotePortGroupRef        CFZCIMServerRemotePortGroup
   Direction                 Outbound
   TTLSGroupActionRef        grp_StartUp
   TTLSEnvironmentActionRef CFZCIMServerEnvActionOutbound
}

TTLSEnvironmentAction CFZCIMServerEnvActionOutbound
{
  HandshakeRole        Client
  TTLSKeyRingParms
  {
    Keyring  CFZCIMServerRing
  }
}

PortGroup     CFZCIMServerRemotePortGroup
{
   PortRange
   {
     Port 5989
   }

   PortRange
   {
     Port 6000-7000
   }
}

# Common StartUp Group that new Rules may use
# Shows how each connection maps to policy
TTLSGroupAction grp_StartUp
{
 TTLSEnabled On
 Trace 0             # Log Errors and Info messages to syslogd
}
```

CIM server specific notes to the AT-TLS Policy parameters:

TTLSRule: Jobname

Jobname identifies where this rule applies. In this example it is the started task job name. If you set up the connection this way, the configuration does not influence other parts of the system.

PortGroup

All indications which do have a port specified within the indication handler destination property and do match to any PortRange defined within the PortGroup are delivered secure via AT-TLS. If the destination property protocol is specified as `https` and no other port is specified, port 5989 will be used by the CIM server. So please ensure that always port 5989 is within a PortRange. In this example, all indications with port 5989 and port 6000-7000 are delivered secured.

Defining the CFZAPPL profile for the APPL class

If the APPL class for the security product is active, the CFZAPPL profile can be defined to allow only certain users to log on to the CIM server. You can manage access to the CIM server application by a profile for CFZAPPL in the APPL class with an access list that contains only those users who are allowed to use the CIM server.

In general, you need not define a profile for CFZAPPL unless you have a generic profile (*) that prevents access to applications without a more specific profile.

For special purposes only, the CIM server can use the application ID OMVSAPPL, if the CIM server configuration property *enableCFZAPPLID* is set to `false` at server startup. In this case the system console message CFZ17204I indicates that the CIM server PassTicket validation is using application ID OMVSAPPL. For changing configuration properties, see “Changing current configuration properties” on page 45 and “Changing planned configuration properties” on page 45.

Defining an encryption key for PassTicket validation

The CIM server can alternatively validate a user ID and a ***PassTicket*** instead of a user ID and a password for authentication.

For more information about PassTickets, see *z/OS Security Server RACF Security Administrator's Guide*.

A PassTicket is validated against an application ID. The default application ID for the CIM server is CFZAPPL.

To enable CFZAPPL for the CIM server,

__ Define CFZAPPL profile in the PTKTDATA class in RACF.

Example:

```
SETROPTS CLASSACT (PTKTDATA)
SETROPTS RACLIST  (PTKTDATA)
RDEFINE  PTKTDATA CFZAPPL –
                  SSIGNON(KEYMASKED(<key>)
SETROPTS RACLIST(PTKTDATA) REFRESH
```

where <*key*> is the 16 digit encryption key.

For special purposes only, the CIM server can use the application ID OMVSAPPL, if the CIM server configuration property *enableCFZAPPLID* is set to `false` at server startup. In this case the system console message CFZ17204I indicates that the CIM server PassTicket validation is using application ID 'OMVSAPPL'. For changing configuration properties, see "Changing current configuration properties" on page 45 and "Changing planned configuration properties" on page 45.

Additional setup for specific providers

Some providers as the network, job and cluster providers have additional security and setup requirements. Please see Chapter 8, "z/OS Management Instrumentation for CIM," on page 105 for these providers. See also Chapter 10, "Cluster, CoupleDataset, and JES2-JES3Jobs provider setup," on page 231 for additional RACF setup.

Customizing the CIM server startup

There are two ways to start the CIM server: either from the started task procedure `CFZCIM` or from within a UNIX System Services shell. If you want to start the CIM server as started task, you must customize the JCL procedure `CFZCIM` and the according environment variable file */etc/wbem/cimserver.env*.

If you want to start the CIM server from a UNIX System Services shell or a remote UNIX session (telnet, SSH), the file *profile.add* contains the environment variables that you need to define. How to perform these tasks is described in the following subsections.

You should unambiguously decide on one of the possibilities and not mix them, because it is not possible to stop a CIM server started via UNIX System Services shell from the operator console.

Customizing the started task procedure CFZCIM

You can start the CIM server via started task procedure `CFZCIM` if you include `CFZCIM` in your PROCLIB concatenation. A sample of `CFZCIM` is shipped with the default PROCLIB.

The DDNAMEs `STDOUT` and `STDERR` in path */var/wbem/logs* are used to redirect the output from the console into the UNIX file system files *cimserver.out* and *cimserver.err*. If the started task is ended, the console output will be copied to the JCL job log in job steps two and three.

The DDNAME `STDENV` points to the hierarchical file system file containing environment variables required to run the CIM server. For running the CIM server as a started task, the environment variables are set in file *cimserver.env* located in the */etc/wbem* hierarchical file system directory. See "Customizing environment variables" on page 39 for details on how to set environment variables for the z/OS CIM server.

To run the CIM server with a user ID for which the security setup has been completed, either set up the STARTED class or use the started procedures table (ICHRIN03). For further details refer to *z/OS Security Server RACF Security Administrator's Guide*, chapter *Assigning RACF User IDs to Started Procedures*.

Example of the RACF commands required to set up the CIM server for the STARTED class:

Example:

```
SETROPTS RACLIST(STARTED)
RDEFINE STARTED CFZCIM.* STDATA(USER(CFZSRV) GROUP(CFZSRVGP))
SETROPTS RACLIST(STARTED) REFRESH
```

Customizing the UNIX System Services shell for CIM server startup

To start the CIM server from a UNIX System Services shell, you must set the required environment variables which are contained in file */usr/lpp/wbem/install/profile.add*. You can add the contents of the profile to */etc/profile* to enable the CIM server environment for all users of the UNIX System Services shell or to the individual ~/.profile of each user. The environment variable `PEGASUS_HOME` should reflect your environment, that is, point to the installation directory of the CIM Runtime environment (usually, this is `/usr/lpp/wbem`).

Customizing environment variables

Environment variables are set in file ***cimserver.env*** if the CIM server will run as started task, or, if you use the CIM server from the UNIX System Services command prompt, they are set in UNIX System Services ***.profile*** in the home path of the user ID from which the CIM server is started.

Setting the trace variables is not required for normal operation.

Note that changes to the environment variables become effective only after a restart of the CIM server.

The environment variable file ***cimserver.env*** can be found in the hierarchical file system at ***/etc/wbem/cimserver.env***. After installation, you can still find the originally shipped version in */usr/lpp/wbem/*. Set the following environment variables contained in this file to start the CIM server:

PEGASUS_HOME
Must be set to the hierarchical file system directory where the CIM server is installed. By default this is ***/usr/lpp/wbem***.

LIBPATH
Must include the CIM server's lib and provider hierarchical file system directory paths. By default this is set to

/usr/lpp/wbem/lib:/usr/lpp/wbem/provider:/usr/lib

OSBASE_TRACE
Defines the trace level for the z/OS OS management CIM instrumentation. Valid values range from 0 through 4, where 4 provides the most details.

OSBASE_TRACE_FILE
Defines the filename for the z/OS CIM instrumentation traces.

PATH Only for running the CIM server or any of the CIM server command-line utilities in UNIX System Services. Must include the CIM server's bin hierarchical file system directory path so that the CIM server's executable programs are automatically found when you enter the according command at the UNIX System Services command prompt. By default this is set to */usr/lpp/wbem/bin*.

The following variables starting with RMF_ only apply when RMF is installed and you use the RMF eServer monitoring providers:

RMF_CIM_HOST
defines the target TCP/IP address or hostname of the z/OS MVS image on which the DDS responsible for this system is running. Beginning with z/OS 1.11 the use of this environment variable is no longer required, but it will be used if defined. If omitted, the CIM monitoring providers can automatically locate an active RMF DDS in the sysplex, provided all systems in the sysplex run z/OS 1.10 or higher.

RMF_CIM_PORT
defines the TCP/IP port number of the DDS (default: 8803). Starting with z/OS 1.11 no longer required, but used when defined.

RMF_CIM_TRACE
defines the trace level of the RMF CIM provider. Valid values range from 0 through 4, with 0 providing no trace and 4 providing all information possible.

RMF_CIM_TRACE_FILE
defines the file name for storing the trace data for the z/OS RMF CIM instrumentation.

RMF_CIM_BENCH
used for performance benchmarks, for example, to identify the response time of the underlying RMF infrastructure. If this variable is set to 1, the RMF CIM provider will print some benchmarking information about various RMF operations, suitable for RMF development.

RMF_INDICATION_RESTTIME
specifies the time in seconds that a provider should sleep after checking an indication subscription and before checking the next one, in order to reduce system load. The default is one second.

RMF_INDICATION_POLLING_INTERVAL
specifies the time interval in which every single subscription is checked at most once. The default is 100 seconds.

The following variables starting with WLM_ only apply when Workload Manager (WLM) is installed and you use the WLM providers:

WLM_CIMPROVIDER_TRACE_FILE
defines the output file name for z/OS WLM provider traces. The default trace file is /var/wlmprovider.trc.

WLM_CIMPROVIDER_TRACE_LEVEL
defines the trace level for the z/OS WLM provider. Valid values range from 0 through 5, where 5 provides the most details. The default is 0, meaning that no trace is written.

Selecting a WLM service class for z/OS CIM priority

If you plan to use the z/OS CIM server as part of your monitoring or management infrastructure, it should run at a priority higher than the work to be managed. You should classify the CIM server into a single period service class with a velocity goal at an appropriate importance level.

Provider based authorization model

The CIM server offers an optional authorization check. This check is optionally performed on a per provider basis, meaning that a RACF profile in class WBEM can be related to a single provider library. Correlation between a provider and a RACF profile occurs during provider registration by the addition of a property in the **PG_Provider** class.

The provider based authorization is defined by the vendor of a provider rather than by the CIM server administrator. Therefore, specific RACF requirements will need to be documented on a per provider base.

In addition, this check is done depending on the type of CIM request that is performed. For example, in order to access CIM operations that change the states of objects, `WRITE` access to the RACF profile defined for a provider is required. Schema manipulation is only available to users with `CONTROL` access to SAF profile CIMSERV in class WBEM.

Table 4 on page 31 lists the type of access required for the different types of CIM operations.

The OpenPegasus CIM class ***PG_Provider*** contains a string type attribute named *SecurityAccessProfile*. Providers that register with an instance of class ***PG_Provider*** containing the *SecurityAccessProfile* property, must specify their RACF profile with this property in order to define it to the system. In addition, requesting users must have the according level of authorization for the named profile.

Class ***PG_Provider*** contains the z/OS-specific property *SecurityAccessProfile*. This property defines the name of a z/OS Security Server's profile in the CIM server's WBEM class that will be checked for a requestor's access before a request is routed to this provider. Depending on the type of the CIM operation, a different level of access for the security profile is required as listed in Table 4 on page 31.

If you want to let existing providers exploit this new feature,

__ 1. remove (unregister) them using the `cimprovider` utility, then

__ 2. re-register them with the added security profile name in property *SecurityAccessProfile* in their provider registration MOF file

The existence of a specified security profile will not be checked during provider registration. Instead, this check is done during runtime, when a request is received for the according provider.

Running providers in a designated user context

When an invocation is caused by an external CIM operation, by default the provider is processed in the context of the **requestor's user ID**. As the provider runs under the identity of the requestor's user ID, all resource access authorization occurs against this user ID. So the requestor must be authorized for all resources that a provider accesses during a request.

To avoid that a CIM client user ID has global access to all the resources that a provider uses for gathering data, starting with z/OS 1.10, a provider can be registered with a **designated user ID**. The designated user ID specifies a separate security context which is used to process the provider. The designated user ID must be authorized to access all the resources accessed by the provider. Instead of directly using a requestor's user ID when accessing the resource, the provider code

now has to perform custom authorization checks based on the requestor's user ID, to prevent unauthorized access to resources. The security definitions for the designated user ID should be similar to those of regular client users, as described in "Switching identity (surrogate)" on page 31.

The properties *UserContext* and *DesignatedUserContext* of CIM class ***PG_ProviderModule*** specify the provider's processing context. You can specify the values for these properties in the provider registration MOF file for each provider module. By default, it is installed at `/usr/lpp/wbem/provider/schemas/...`. For further details, see "PG_ProviderModule" on page 243.

Generally, the vendor of a provider (implementing a certain CIM class) defines if a provider should run under a designated user context and also supplies the according documentation describing the specific setup steps.

Chapter 5. How to work with the CIM server

The CIM server is used to receive the clients' requests, collect the requested metrics/data from the managed system and return the results to the client. This chapter contains all information required for working with the CIM server on z/OS. It describes the following topics:

- "Controlling the CIM server"
- "CIM server command-line utilities and commands" on page 59
- "Backing up the CIM server repository" on page 95
- "Verifying the installation and customization of CIM" on page 95
- Chapter 16, "Troubleshooting," on page 281

While you must set up the CIM server only once to make it ready to use, you can configure your CIM server environment as often as you want during operation to best meet your requirements. To configure the CIM server you can use the commands described in "CIM server command-line utilities and commands" on page 59. If you run into problems while setting up or using the CIM server you can find information for problem solving in Chapter 16, "Troubleshooting," on page 281.

Controlling the CIM server

The CIM server provides the ability to set a number of configuration options.

Many tasks and operations for the CIM server are performed under z/OS UNIX System Services, ideally within a telnet session.

To use the command line tools, set up the UNIX System Services environment as described in "Customizing the UNIX System Services shell for CIM server startup" on page 39.

Starting and stopping the CIM server

Start the CIM server from either the UNIX System Services command prompt or as a started task, as described in the following sections.

Running the CIM server from the UNIX System Services command prompt

To start the CIM server from the UNIX System Services shell, type the `cimserver` command at the command prompt of a z/OS UNIX System Services shell. To run the CIM server runtime environment in its own address space, set the environment variable `_BPX_SHAREAS=NO` in your z/OS UNIX System Services shell beforehand.

Stop the CIM server by entering `cimserver -s` at the command line.

To let the `cimserver` command work from a UNIX System Services shell, make sure you have completed the configuration steps described in "Customizing the UNIX System Services shell for CIM server startup" on page 39.

Running the CIM server as started task

The standard way to start the CIM server on z/OS is through the started task `CFZCIM`.

Before the first start

Before starting the CIM server for the first time through `CFZCIM`, customize the procedure to match the correct installation paths in the DD statements and also update the *cimserver.env* file installed in */etc/wbem* to match the correct installation paths for the CIM server. When using the default installation directory */usr/lpp/wbem*, you need not modify `CFZCIM` or *cimserver.env*. For information about how to customize `CFZCIM` and *cimserver.env* refer to "Customizing the CIM server startup" on page 38.

Starting the CIM server

Start the CIM server from the z/OS console by entering

```
S(TART) CFZCIM
```

Verifying a successful start

After a successful start of the CIM server, the following message is shown on the console and issued to the syslog:

```
CFZ10030I: Started CIM server version 2.10.0 for z/OS.
```

Stopping the CIM server

When the CIM server was started through `CFZCIM`, it can also be stopped from the console by entering

```
(STO)P CFZCIM
```

Running providers in their own address space

The z/OS CIM server supports an enhanced version of the OpenPegasus *Out-of-Process* provider feature. The Out-of-Process feature manages providers in separate address spaces rather than loading and calling provider libraries directly within the CIM server process.

The configuration property *forceProviderProcesses* (see "Advanced configuration properties" on page 47) is used to enable/disable the *Out-of-Process* support for all active providers. By default, *forceProviderProcesses* is set to 'false', so that the existing in-process provider implementation is not affected. When *forceProviderProcesses* is set to 'true', providers will be executed within a newly created Provider Agent process.

On multi level secure (MLS) systems the option *forceProviderProcesses* is ignored and Out-of-Process support is enabled. Providers are executed in several Provider Agent processes ordered by the security classification of users and the port of entry.

In addition to the support provided in OpenPegasus for *Out-of-Process* providers, for z/OS a number of options are introduced for the provider registration that help to control the security model of the Provider Agent in which a provider will be executed. Depending on which options are set during provider registration, providers will execute in different types or instances of Provider Agents.

There is no limit to the number of provider modules that may register with a CIM server which supports *Out-of-Process* providers. There is also no limit to the number of providers in a provider module. However, one *Out-of-Process* Provider Agent can correspond to one or more provider modules, depending on the setting of the *ShareAS* property. When *ShareAS* is set to 'true' in the provider module definition, the according provider code runs in one of the pthreads within an *Out-of-Process* address space. There will be other CIM providers running on different pthreads within this address space, too. If *ShareAS* is set to 'false', the designated CIM provider code runs in its own dedicated Provider Agent address

space. No other CIM providers (that is, a different CIM provider other than the designated CIM provider) will be allowed to run in this address space.

CIM server configuration

The default configuration setting for the CIM server works for the majority of environments. However, the CIM server provides command-line utilities to change the default configuration settings (see "CIM server command-line utilities and commands" on page 59).

Changing current configuration properties

Use the `cimconfig` UNIX System Services shell command (see "cimconfig" on page 62) or the `MODIFY` console command (see "MODIFY console command" on page 93) to dynamically change the current configuration properties of the CIM server.

You can update the current configuration while the CIM server is running when a property is shown as dynamic in "Basic configuration properties" on page 46 or in "Advanced configuration properties" on page 47.

Using the `cimconfig` command without the `-p` option or the `MODIFY` console command without the `PLANNED` option results in a non-permanent change. After a restart of the CIM server, these changes will be reset to the planned configuration values. For making permanent changes, you must change the planned configuration values.

Changing planned configuration properties

To change values for the planned configuration properties, use the `cimconfig` UNIX System Services shell command with the `-p` option or the `MODIFY` console command with the `PLANNED` option.

`cimconfig`
The use the `cimconfig` command is independent of whether the CIM server is running or stopped. If you change the planned configuration properties while the CIM server is running, those changes do not take effect until the CIM server is restarted. Then the planned configuration properties become the current configuration properties.

`MODIFY` The CIM server must be running to use the `MODIFY` console command. When you use the `MODIFY` console command with the `PLANNED` option, those changes do not take effect until the CIM server is restarted. Then the planned configuration properties become the current configuration properties.

If during the CIM server startup a deprecated configuration property is detected in file ***/etc/wbem/cimserver_planned.conf***, then the CIM server issues warning message CFZ02300I and continues to start. The properties *logdir*, *enableNamespaceAuthorization* and *httpAuthType* are deprecated and should be removed from the property file to avoid this message.

CIM server configuration properties

Using the `cimconfig` command, you can change configuration properties from the following categories:

- "Basic configuration properties" on page 46
- "Advanced configuration properties" on page 47

Column ***dynamic Y/N*** in the tables in these sections tells you whether you can dynamically change the property.

For those properties which you cannot dynamically change, you must use

- either the -p parameter of the `cimconfig` command to indicate your change, and then you must stop and restart the CIM server (see "cimconfig" on page 62),
- or the `PLANNED` option of the `MODIFY` console command (see "MODIFY console command" on page 93).

Basic configuration properties

Table 5. CIM server basic configuration properties

Property name	Description	Default value	dynamic Y/N
daemon	The foreground/background process property. Set Daemon to 'false' to run the CIM server as foreground process or as a started task.	true For running the CIM server as a started task, this option is set to 'false'.	N
enableHttpConnection	The HTTP connection to the CIM server. Enables and disables connections to the CIM server over HTTP. When turned off only local connections are accepted.	true	N
enableHttpsConnection	The HTTPS connection to the CIM server. Enables and disables secure connections to the CIM server via HTTPS. Note that it is not sufficient to turn on this option, but you must also enable an SSL connection through the AT-TLS feature at the z/OS Communications Server as described in "Configuring the CIM server HTTPS connection using AT-TLS" on page 32. **Note:** When set to true, ensure that the configured *httpsPort* can be used by the CIM server.	false	N
httpPort	The port to listen for HTTP requests. It is recommended not to change this value. **Note:** Make sure that the configured *httpPort* can be used by the CIM server.	5988	N
httpsPort	The port to listen for HTTPS requests. AT-TLS should be configured to use this port. It is not recommended to change this value. This value is only active if *enableHttpsConnection* is set to `true`. **Note:** Make sure that the configured *httpsPort* can be used by the CIM server.	5989	N

Advanced configuration properties

Table 6. CIM server advanced configuration properties

Property name	Description	Default value	dynamic Y/N
enableAuditLog	When this option is set to `true`, the CIM server is writing SMF records 86. For details see “Audit logging with SMF record 86” on page 54.	false	Y
enableCFZAPPLID	If the property is set to true, the application ID (APPLID) is ‘CFZAPPL’. Otherwise the used application ID is ‘OMVSAPPL’ and the message CFZ17204I is issued at CIM server startup.	true	N
enableIndicationService	'true' means the indication service is enabled. 'false' will disable the indication service.	true	N
enableRemotePrivileged UserAccess	The remote privilege for users. Enables and disables remote access for users with UID 0.	false	N
forceProviderProcesses	When this option is set to 'true', providers will run in one or more separate address spaces. For details see “Running providers in their own address space” on page 44. This option is ignored when MLS support is activated. The Out-of-Process provider support uses then one address space per security label for full protection of classified documents and information.	false	N
idleConnectionTimeout	The timeout value in seconds that the CIM server uses to wait for idle client connections to close. A client connection is considered as idle when it is not in the process of sending a request and when the CIM server is not processing a request from that connection. If the value is set to 0, no timeout is used.	0	Y
logLevel	The detail level for logging. Possible values are `INFORMATION`, `WARNING`, `SEVERE`, `FATAL`, or `TRACE` (see also “Configuring logging” on page 52).	INFORMATION	Y
maxProviderProcesses	The maximum number of separate address spaces for running providers. Only in effect if *forceProviderProcesses* is set to `TRUE`. If the value is set to 0, the number is unlimited.	0	Y
messageDir	The message bundle directory. Do not change the default.	msg	N

Table 6. CIM server advanced configuration properties (continued)

Property name	Description	Default value	dynamic Y/N
providerDir	The name of the directory where the provider libraries reside. You can specify multiple directories here, separated by a colon (':'). Since the CIM server has its own set of providers, its lib directory always needs to be present in the list of provider directories. When adding new provider directories, it is also recommended to update the LIBPATH environment variable according to the new values of providerDir. This is required, because a provider may need other supplemental dynamic load libraries, which the CIM server is not aware of and therefore would otherwise fail to load. **Note:** You must provide the full path for all directories when changing the default.	lib:provider	Y
repositoryDir	The name of the directory for the repository.	/var/wbem/ repository	N
repositoryIs DefaultInstanceProvider	The CIM server repository serves as the default provider for CIM instances when no dynamic provider has been registered for a CIM class.	true	N
shutdownTimeout	The timeout value in seconds that the CIM server uses to wait for the shutdown process to complete. This value includes terminating active providers.	30	Y
slp	The CIM server uses the SLP Protocol to announce itself over the network.	false	N
socketWriteTimeout	The timeout value in seconds that the CIM server uses to wait for a client to receive data from the socket. After the timeout the CIM server will close the socket.	20	Y
traceComponents	This option specifies the component(s) that you want to trace. The value `ALL` enables tracing for all components. For more information refer to section "Configuring tracing" on page 50, which also lists the valid components.	`ALL`	Y

Table 6. CIM server advanced configuration properties (continued)

Property name	Description	Default value	dynamic Y/N
traceFacility	This option specifies the trace destination. **FILE** saves the tracing messages to the file specified in *traceFilePath* **LOG** saves the tracing messages to the logging facility, if *logLevel* is set to TRACE (see "Configuring logging" on page 52). This alternative combines the tracing message stream with the log messages. **MEMORY** saves tracing messages in a wrap around memory buffer. This buffer is included in memory dumps. Specify the size of the allocated memory with the *traceMemoryBufferKbytes* property.	MEMORY	Y
traceFilePath	This property specifies the fully qualified file which saves the trace data.	/tmp/cimserver.trc	Y
traceLevel	Switches tracing on or off, and sets the trace level of detail. Choose one of the following trace levels: **0** Tracing is off **1** Severe errors **2** Warning level error messages **3** Inter-function logic flow, medium data detail **4** High data detail **5** High data detail, method enter and exit **Note:** This does not include tracing for the providers. See also "Configuring tracing" on page 50.	2	Y
traceMemoryBufferKbytes	Specifies the size of the memory area which is reserved for tracing messages in kB (1kB=1024B). The value must be at least 16. This value only becomes valid when *traceFacility*=MEMORY.	10240	N

Configuring tracing

To enable or to modify tracing

use the `cimconfig` command or the `MODIFY` console command. You can modify the tracing configuration properties while the CIM server is running.

See also "cimconfig" on page 62 and "MODIFY console command" on page 93.

You can modify the following tracing configuration properties:

traceLevel

turns tracing on and off and specifies the trace level. You can choose among the following trace levels:

0	Tracing is off
1	Severe errors
2	Warning level error messages (default)
3	Inter-function logic flow, medium data detail
4	High data detail
5	High data detail, method enter and exit

traceComponents

specifies the components that you want to trace.

You can choose one or more of the following components, separated by comma:

```
All                              Authentication
Authorization                    BinaryMessageHandler
CIMExportRequestDispatcher       CIMOMHandle
CMPIProvider                     CMPIProviderInterface
Config                           ControlProvider
CQL                              DiscardedData
Dispatcher                       ExportClient
Http                             IndicationFormatter
IndicationGeneration             IndicationHandler
IndicationReceipt                IndicationService
IPC                              L10N
Listener                         LogMessages
MessageQueueService              ObjectResolution
OsAbstraction                    ProviderAgent
ProviderManager                  Repository
Server                           Shutdown
SSL                              StatisticalData
Thread                           UserManager
WQL                              Xml
XmlIO
```

The following components have a special purpose:

Special purpose trace components	Description
`All`	Traces all available components

Special purpose trace components	Description
DiscardedData	Issues a trace message when information is discarded or an operation is cancelled
LogMessages	Traces all messages written to the logging facility
StatisticalData	Prints statistical data to the trace at level 4
XmlIO	Prints the complete CIM-XML messages

traceFacility
specifies the destination of the trace messages.

FILE saves the trace messages to the file specified in *traceFilePath*.

This file is continuously growing. You can remove it while the CIM server is running. It will be recreated automatically.

LOG saves the trace messages to the logging facility, if the *logLevel* is set to TRACE (see "Configuring logging" on page 52). This alternative combines the log messages and the trace messages to one message stream.

MEMORY saves trace messages in a wrap around memory buffer. This buffer is included in memory dumps. (default).

To find the trace in a memory dump, the top of the allocated memory block is flagged with "PEGASUSMEMTRACE". The last trace message is flagged with the suffix "EOTRACE". The flags are encoded in ASCII.

Specify the size of the memory buffer with the static *traceMemoryBufferKbytes* property.

traceFilePath
if *traceFacility*=FILE, this property specifies the file which saves the trace data. The default is /tmp/cimserver.trc.

traceMemoryBufferKbytes
specifies the size of the memory area which is reserved for trace messages in kB (1kB=1024B). The default is 10240. The value must be at least 16. *traceMemoryBufferKbytes* is a planned configuration property (see "Changing planned configuration properties" on page 45).

This area is allocated when *traceFacility*=MEMORY.

Examples:

To set the trace level to trace all information with high data detail in the *Thread* and *ProviderManager* components,
type the following commands into the UNIX System Services shell:

```
cimconfig -s traceLevel=4
cimconfig -s traceComponents=Thread,ProviderManager
```

or

```
F CFZCIM,APPL=CONFIG,traceLevel=4
F CFZCIM,APPL=CONFIG,traceComponents='Thread,ProviderManager'
```

on the console.

To disable all tracing,

type the following command into the UNIX System Services shell:

```
cimconfig -s traceLevel=0
```

To route both trace and log messages to a file:

type the following commands into the UNIX System Services shell:

```
cimconfig -s traceLevel=1
cimconfig -s traceComponents=Thread,ProviderManager,LogMessages
cimconfig -s traceFacility=FILE
cimconfig -s traceFilePath=/tmp/cimservr1.trc
```

The CIM server now saves severe trace messages in the ***Thread*** and ***ProviderManager*** components and all log messages to the file `/tmp/cimservr1.trc`.

To route both trace and log messages to memory:

type the following commands into the UNIX System Services shell:

```
cimconfig -s traceLevel=1
cimconfig -s traceComponents=Thread,ProviderManager,LogMessages
cimconfig -s traceFacility=MEMORY
```

The CIM server now saves severe trace messages in the ***Thread*** and ***ProviderManager*** components and all log messages to the default memory space of 10240kB.

To route both trace and log messages to the z/OS Communications Server's system logger (syslog) daemon:

1. configure the syslog daemon as described in *z/OS Communications Server: IP Configuration Reference*and *z/OS Communications Server: IP Configuration Guide*
2. type the following commands into the UNIX System Services shell:

   ```
   cimconfig -s logLevel=TRACE
   cimconfig -s traceLevel=1
   cimconfig -s traceComponents=Thread,ProviderManager
   cimconfig -s traceFacility=LOG
   ```

   The CIM server now writes severe trace messages in the ***Thread*** and ***ProviderManager*** components and all log messages to the syslog daemon.

See also “Configuring logging.”

Configuring logging

The CIM server sends log messages

- to the *z/OS system console*,
- and to the *z/OS Communications Server's system logger (syslog) daemon*,

  if the syslog daemon is configured as described in *z/OS Communications Server: IP Configuration Reference*and *z/OS Communications Server: IP Configuration Guide*,
- and to the *trace facility*,

  if *traceComponents* includes the element `LogMessages`, (see also “Configuring tracing” on page 50).

Generally logging for the CIM server is enabled and cannot be turned off. However, you can configure the level of logging.

To modify the log level

use the `cimconfig` command or the `MODIFY` console command to change the *logLevel* configuration property.

Examples

- type the following command into the UNIX System Services shell while the CIM server is running:

  ```
  cimconfig -s logLevel=INFORMATION
  ```

- or type the following command into the z/OS system console:

  ```
  F CFZCIM,APPL=CONFIG,logLevel=INFORMATION
  ```

See also "cimconfig" on page 62 and "MODIFY console command" on page 93.

Log levels

You can choose between five different log levels:

`INFORMATION` (default)
The default setting for *logLevel* is `INFORMATION`. This setting should not be changed unless there is a specific need for a more or less detailed logging.

`WARNING`
returns log messages for warnings, severe and fatal errors

`SEVERE` returns log messages for severe and fatal errors

`FATAL` returns log messages only for fatal errors

`TRACE` returns all log messages and all trace messages

trace messages are only routed to the z/OS Communications Server's system logger (syslog) daemon - never to the system console. Remember to set *traceFacility* to `LOG`, otherwise no trace message is displayed in the syslog daemon (see "Configuring tracing" on page 50).

Using the syslog daemon for CIM server logging

The z/OS CIM server will connect to the syslog daemon and send all of its log messages to it, where the filtering according to the *logLevel* configuration property applies as described above. Therefore no messages will be submitted to the syslog daemon which have a higher log level than what's specified in the current value of the *logLevel* configuration property.

Messages that go to the syslog daemon are prepended with an according z/OS message number, which is either one of the generic CFZ00001E, CFZ00002W or CFZ00004I messages followed by a PGSxxxxx message number, or one of the directly mapped z/OS specific CFZxxxxx message numbers.

Syslog messages from the z/OS CIM server will have an identifier of "CFZCIM" and also contain the CIM server's process ID.

The log levels of the z/OS CIM server are mapped to the following syslog levels:

Table 7. Log and syslog levels

INFORMATION	-->	LOG_INFO
WARNING	-->	LOG_ERR

Table 7. Log and syslog levels (continued)

SEVERE	-->	LOG_WARNING
FATAL	-->	LOG_ERR
TRACE	-->	LOG_DEBUG

The syslog service must be properly configured for CIM, and the syslog daemon must be started as described in *z/OS Communications Server: IP Configuration Reference* and *z/OS Communications Server: IP Configuration Guide*.

Following is a sample syslog configuration file (*/etc/syslog.conf*) entry for the CIM server, which tells the syslog daemon to create log files:

Example:

```
...
*.CFZ*.*.debug  /var/wbem/logs/cimserver_%Y.%m.%d.syslog
...
```

When configured like this, the CIM server log messages will be displayed in the format shown by the following example:

Example:

```
Nov  7 12:48:38 BOECFZ1 CFZCIM[33557318]:
CFZ10025I: The CIM server is listening on HTTP port 5,988.
Nov  7 12:48:38 BOECFZ1 CFZCIM[33557318]:
CFZ10028I: The CIM server is listening on the local connection socket.
Nov  7 12:48:38 BOECFZ1 CFZCIM[33557318]:
CFZ10030I: Started CIM Server version 2.10.0
Nov  7 12:48:38 BOECFZ1 CFZCIM[33557318]:
CFZ12533I: The CIM server failed to register with ARM using
element name CFZ_SRV_PEG2: return code 0x0C, reason code 0x0168.
Nov  7 12:49:01 BOECFZ1 CFZCIM[33557318]: CFZ10031I: CIM Server stopped.
```

Except for the CIM server's *logLevel* property, all configuration now occurs through the syslog service as described in *z/OS Communications Server: IP Configuration Reference*and *z/OS Communications Server: IP Configuration Guide*.

Note: Configuration of the syslog daemon for specific processes/daemons is done based on the job name of the process writing the logs. While this is always CFZCIM when running the CIM server as started task, it is also possible to have the CIM server started from the UNIX System Services command prompt. In that case the job name of the CIM server will be that of the user ID that is was started from, rather than CFZCIM. In order to set the job name of the CIM server correctly to CFZCIM when started from the command prompt, environment variable _BPX_JOBNAME should be set to “CFZCIM”. Otherwise it will be difficult to create a syslog configuration for the CIM server.

Audit logging with SMF record 86

The CIM server can file audit log records to SMF record 86. These records contain information about authentication, configuration, provider status, and CIM operations. For details of SMF record 86, see *z/OS MVS System Management Facilities (SMF)*.

To enable writing audit SMF record 86, modify the SMF, the CIM server, and the security configuration:

SMF configuration:

__ Ensure that record 86 is part of your active SMF configuration SMFPRMXX parmlib member.

CIM server configuration:

__ To enable the CIM server to write audit records, set the configuration property **enableAuditLog** to `true`.

When recording is switched on, the current CIM server configuration and the status of the currently loaded providers is recorded. To disable recording, set the configuration property to `false`. This property can be changed dynamically during CIM server runtime.

Security configuration:

__ In order to write SMF records, the CIM server needs at least `READ` access to the BPX.SMF profile of the FACILITY class at your SAF product.

Example for RACF:

```
RDEFINE FACILITY BPX.SMF UACC(NONE)
PERMIT BPX.SMF CL(FACILITY) ACCESS(READ) ID(CFZSRV)
SETROPTS RACLIST(FACILITY) REFRESH
```

If the CIM server audit logging is enabled, but SMF does not collect SMF record 86 or subtypes, or SMF is not enabled at all, no records are written.

Backing up the CIM server configuration

After you have set up and configured the z/OS CIM server properly as described in the subsections of Chapter 4, "First-time CIM server set up," on page 25 and "Controlling the CIM server" on page 43, you should backup the following CIM server property configuration files located in */etc/wbem*:

- **cimserver_planned.conf** contains planned values, not yet in effect and that are not defaulted. They will be picked up at the next CIM server restart.
- **cimserver.env** contains the environment variables for the started task CFZCIM.

Note: Do not edit configuration files directly. Use the `cimconfig` command to change the property values in the files.

How to backup the CIM server repository is described in "Backing up the CIM server repository" on page 95.

Automatic restart of the CIM server

Since the CIM server serves as a primary system management interface for a system, it should be continuously available.

To support the CIM server availability, startup and shutdown messages are logged to the z/OS console to be used with a systems management program such as IBM Tivoli® System Automation.

Starting with z/OS 1.9, the z/OS CIM server is also enabled for the Automatic Restart Manager (ARM). This section only documents the information that is relevant for ARM with the CIM server. For details on ARM refer to *z/OS MVS Setting Up a Sysplex*.

The CIM server needs no additional configuration to use ARM. It will always try to register itself to ARM. When ARM is active and the CIM server is authorized to register with ARM, then success message CFZ12532I will be displayed in the system log (see "z/OS-specific messages" on page 252). Otherwise, information message CFZ12533I will be displayed in the system log to inform you that the CIM server is not registered to ARM.

You can use ARM only for started task procedures or batch jobs. So if you start the CIM server from the UNIX System Services shell, you also get the message CFZ12533I. If you do not plan to use ARM, you can ignore this message, which is issued every time when the CIM server is started.

The CIM server issues the registration and the ready request after a successful bind to the communication socket/s (HTTP, HTTPS, and/or Local). It will be de-registered from ARM during its normal shutdown procedure. In all other cases, the CIM server remains registered and is restarted based on the active ARM policy.

In a sysplex, you can start only one CIM server per OS image. Therefore ARM can only be used to restart after an application ABEND and not for cross-system restarts. You must use other facilities to start the CIM server during an IPL.

ARM security considerations

If the CIM server is configured to use ARM in a sysplex, you must ensure that the XCF address space has the proper authorization to perform a restart. ARM must be able to issue operator commands from the XCF address space (XCFAS) to start the CIM server.

The CIM server is not running in supervisor mode. Therefore, the user ID running the CIM server must have proper SAF authorization to be allowed to register to ARM. Therefore the user ID running the CIM server also needs the SAF authorization for `UPDATE` access to the following FACILITY class resource:

Example:

```
IXCARM.DEFAULT.CFZ_SRV_<system_name>
```

Here is an example for entitling the CIM server user ID CFZSRV to register the CIM server for all machines within a sysplex using RACF:

Example:

```
SETROPTS CLASSACT(FACILITY)
SETROPTS RACLIST (FACILITY)

RDEFINE FACILITY IXCARM.DEFAULT.CFZ_SRV_* UACC(NONE)

PERMIT IXCARM.DEFAULT.CFZ_SRV_* CLASS(FACILITY) +
       ID(CFZSRV) ACCESS(UPDATE)

SETROPTS RACLIST(FACILITY) REFRESH
```

ARM policy considerations

The CIM server has the following requirements for exploiting the ARM restart policy:

- The ARM element name used for the CIM server is CFZ_SRV_<*system_name*>, where <*system_name*> is substituted by the value of the system symbol `SYSNAME`.
- The CIM server can only be restarted on the system where it failed. A cross-system restart within a sysplex is not possible. Therefore the termination type has to be `ELEMTERM`.
- The restart occurs through starting the CIM server started task procedure CFZCIM.

The sample JCL `CFZARMP` is installed to the SYS1.SAMPLIB during SMP/E z/OS installation of the CIM component.

```
//CFZARMP  JOB MSGCLASS=C,MSGLEVEL=(1,1),USER=XXXXXXX,NOTIFY=XXXXXXX
//*******************************************************************
//*                                                                 *
//* PROPRIETARY STATEMENT:                                          *
//*    Licensed Materials - Property of IBM                         *
//*    5694-A01 Copyright IBM Corp. 2005,  2009                     *
//*                                                                 *
//*    STATUS=HPG7760                                               *
//*                                                                 *
//* DESCRIPTIVE NAME:                                               *
//*                                                                 *
//* SAMPLE JCL TO UPDATE THE ADMINISTRATIVE POLICY DATA FOR CIM      *
//* SERVER IN THE COUPLE DATA SET FOR ARM (AUTOMATIC RESTART MANAGER)*
//*                                                                 *
//* NOTES:                                                          *
//*                                                                 *
//*   1. SYSPRINT DD IS A REQUIRED DD STATEMENT FOR THE UTILITY     *
//*      OUTPUT.                                                    *
//*   2. SYSIN DD IS A REQUIRED DD STATEMENT FOR THE UTILITY        *
//*      CONTROL STATEMENTS.                                        *
//*   3. DATA TYPE(ARM) STATEMENT IS REQUIRED TO SPECIFY WHAT TYPE  *
//*      OF COUPLE DATA SET IS TO BE UPDATED.                       *
//*   4. REPORT KEYWORD IS OPTIONAL.  WHEN REPORT(YES) IS SPECIFIED, *
//*      AN ARM ADMINISTRATIVE POLICY REPORT WILL BE GENERATED IN   *
//*      THE OUTPUT.  THE DEFAULT VALUE FOR REPORT IS YES.          *
//*   5. REPLACE KEYWORD IS OPTIONAL. WHEN REPLACE(YES) IS SPECIFIED *
//*      FOR A POLICY, THE POLICY WILL BE REPLACED IF IT ALREADY    *
//*      EXISTED IN THE COUPLE DATA SET.                            *
//*      IF REPLACE(NO) IS SPECIFIED FOR AN EXISTING POLICY,        *
//*      THE UPDATE JOB WILL BE FAILED AND NO CHANGES WILL BE MADE  *
//*      TO THE COUPLE DATA SET.                                    *
//*   6. TO DELETE AN EXISTING POLICY IN A COUPLE DATA SET,         *
//*      INCLUDE THE FOLLOWING LINE IN THE SYSIN DD CARD:           *
//*            DELETE POLICY NAME(CFZARMPO)                         *
//*      WHERE POLNAME IS THE NAME OF THE POLICY TO BE DELETED.     *
//*                                                                 *
//*******************************************************************
//STEP1    EXEC PGM=IXCMIAPU
//STEPLIB  DD   DSN=SYS1.MIGLIB,DISP=SHR
//SYSPRINT DD   SYSOUT=A
//SYSABEND DD   SYSOUT=A
//SYSIN    DD   *

     DATA TYPE(ARM)
     REPORT(YES)

     DEFINE POLICY NAME(CFZARMPO) REPLACE(YES)

         RESTART_GROUP(CFZCIMRESGRP)
         /* List all systems where the CIM Server can be started  */
         TARGET_SYSTEM(SYS1)
         /* Wait 10 sec before restarting to free resources       */
         RESTART_PACING(10)

         ELEMENT(CFZ_SRV_*)
           RESTART_ATTEMPTS(3,300)
           RESTART_TIMEOUT(300)
           READY_TIMEOUT(300)
           /* coss-system restart is not allowed.                */
           /* No restart after system failure                    */

           TERMTYPE(ELEMTERM)
           RESTART_METHOD(ELEMTERM,STC,'S CFZCIM')

/*
```

CIM server command-line utilities and commands

The CIM server includes a set of command-line utilities that you can use to control or change the CIM server environment. During normal use, you should rarely need to use these commands.

You must run all of the command-line utilities from a z/OS UNIX System Services shell. The command-line utilities need the same environment setup as described in "Controlling the CIM server" on page 43. Users of these command-line utilities must have `CONTROL` access to profile CIMSERV in class WBEM.

Note: All of these utilities generate ASCII output. Without proper setup of your shell these utilities will show unreadable output. If you have problems with viewing this output, see "ASCII-EBCDIC conversion" on page 281.

The commands include:

`cimmof/cimmofl`
: These commands are used to compile provider registrations and to compile Common Information Model (CIM) class descriptions written in the managed object format (MOF) language. The compiled information is put into the class schema stored in the repository.

  `cimmofl` is a version of `cimmof` that does not use the CIM server. The CIM server must be stopped before using this command. The usage of `cimmofl` is not recommended, since it bypasses the CIM server and directly manipulates files in the file system (see "cimmof/cimmofl" on page 60).

`cimconfig`
: This command configures the options for the CIM server. Depending on the property being configured, the CIM server may need to be restarted after using this command (see "cimconfig" on page 62).

`cimprovider`
: This command enables or disables a registered provider, primarily during testing. The CIM server must be running to use this command (see "cimprovider" on page 64).

`cimcli` This command lets you perform CIM client requests/operations. It implements most of the DMTF CIM operations.

  Each execution of `cimcli` invokes a CIM operation with the corresponding parameters equivalent to the CIM operations defined in the *CIM Operations over HTTP* specification. Additionally, the `cimcli` command-line interface implements a number of other specific operations that support testing and querying CIM servers, including operations to query for namespaces and to get all instances in a namespace (see "cimcli" on page 66).

`cimsub` This command lets you manage CIM indications on the local CIM server. The command can list, enable, disable and remove indication subscriptions, filters and handlers (see "cimsub" on page 91).

`MODIFY` console command
: Like the `cimconfig` command, the `MODIFY` console command configures the options for the CIM server while the CIM server is running. Depending on the property being configured, the CIM server may need to be restarted after using this command (see "MODIFY console command" on page 93).

Note: The **wbemexec** utility is also included with CIM. It is used to directly send CIM-XML requests to a CIM server. However, this tool is not supported, but just supplied on an 'as-is-base'.

You can specify most options provided by the utilities in two ways:

- a short form introduced by a single dash, for example -f<file>
- a long form introduced by a double dash, for example --file=<file>

To understand the syntax of the description of the command-line utilities, see "How to read syntax diagrams" on page xiii.

cimmof/cimmofl

Description

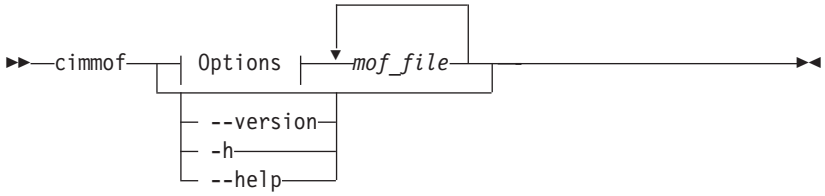
These commands are used to compile provider registrations and to compile CIM class descriptions written in the MOF language and store the information in the repository. For `cimmof`, the CIM server must be started before using this command. `cimmofl` runs without using the CIM server. This version of the MOF compiler does only limited error checking, may handle instance operations incorrectly, and does not protect against concurrent access to the CIM repository. Therefore, `cimmof` is the recommended MOF compiler.

The CIM server MOF compiler is a command-line utility that compiles MOF files (using the MOF format defined by the DMTF CIM Specification) into a CIM server repository. It allows compiling from structures of MOF files using the `include #pragma` and can either compile into a CIM server repository or check the syntax of the MOF files. The compiler requires that the input MOF files are in the current directory or that a fully qualified path is given. MOF files that are included using the `include #pragma` must be in the current directory or in a directory specified by a `-I` command-line switch. For using `cimmofl` the binary option has to be specified.

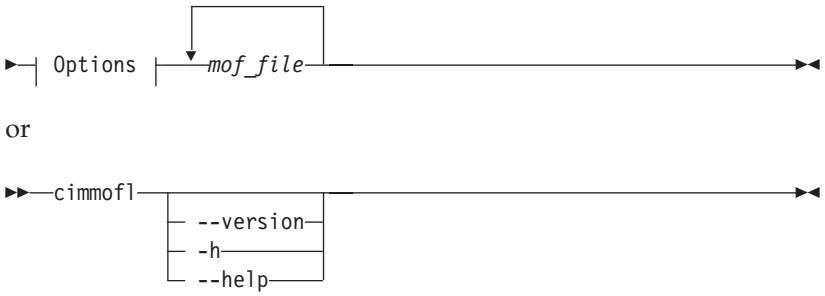
For using the `cimmof/cimmofl` commands against the CIM server namespaces (root/PG_Internal, root/PG_InterOp), a user needs to have `CONTROL` access to profile CIMSERV in class WBEM.

Syntax

cimmof

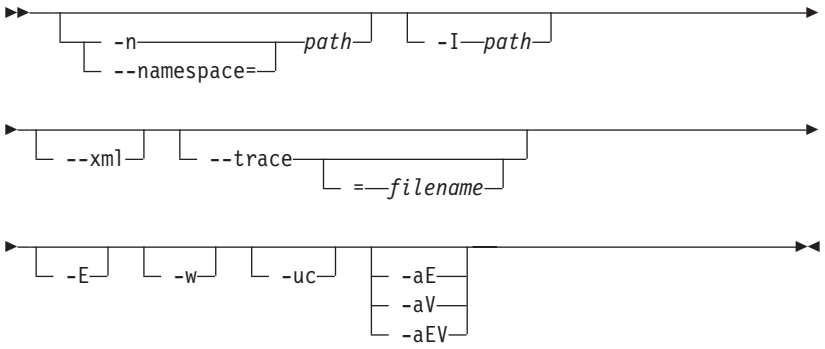


cimmofl



or

Options:



Options

mof_file
Specifies the MOF file or MOF files to compile.

--version
Displays the CIM server version.

-h, –help, *or no specified option*
Prints out a usage message with command definitions.

-binary
Binary repository load. (`cimmofl` only)

-R *path*, **--CIMRepository=***path*
If specified, this overrides the current repository path used by the CIM server. Specify an absolute or relative path. (`cimmofl` only)

-I *path* Specifies a path to the included MOF files.

-n *path*, **--namespace=***path*
Overrides the default CIM repository namespace path. The default is `root/cimv2`.

--xml Generates XML to standard output. This option does not update the repository.

--trace, --trace=*filename*
Writes trace information to a file. If *filename* is omitted, the output destination is standard output. Those files are written with ASCII encoding.

-E Performs a syntax check on the input. This option does not update the repository.

-w Suppresses warning messages.

-uc Allows the update of an existing class definition. This option lets you update a leaf class. It does not allow updates of superclasses or classes that have subclasses.

-aE Allows the addition or modification of classes with the experimental qualifier.

-aV Updates a class that results in a version change. The version must be specified in a valid format. The format is `m.n.u` where `m` is major version, `n` is minor release and `u` is update. For example, 2.7.0 is a valid format for CIM Schema 2.7.0. If the input class has the same version as the class in the repository, the class is not updated.

-aEV Allows both Experimental and Version Schema changes.

Example

`cimmof -w -I./myDir myDir/CIM_Schema211.mof`
In this example, the managed object format (MOF) file that is located in directory `myDir` with the name `CIM_Schema211.mof` is compiled into the default namespace `root/cimv2`. `CIM_Schema211.mof` includes #pragmas for other MOF files that are also in the `myDir` directory. Therefore an include (-I) option is required for the `myDir` directory. The `-w` option suppresses warning messages.

cimconfig

Description

Use the `cimconfig` command to manage CIM server configuration properties. You can get, set, unset, or list these properties. See "Controlling the CIM server" on page 43 for more information.

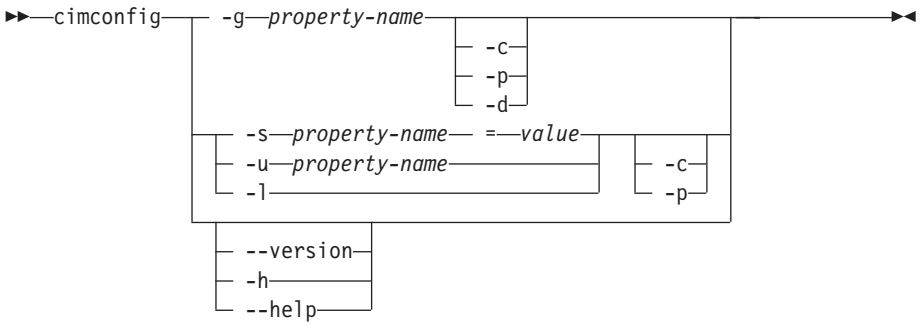
You can use the `cimconfig` command to set the current or planned configuration properties of the CIM server.

Current configuration properties:
You can update the current configuration properties only while the CIM server is running. After a restart of the CIM server, these changes will be reset to the planned configuration values. For making permanent changes, you must change the planned configuration values.

Planned configuration properties:
Planned configuration properties can be modified even if the CIM server is stopped. If the planned configuration properties are changed when the CIM server is running, those changes do not take effect until the CIM server is restarted.

For using the `cimconfig` command, a user needs to have `CONTROL` access to profile CIMSERV in class WBEM.

Syntax



Options

The `cimconfig` command recognizes the following options:

-g *property-name*, **-g** *property-name* **-c**
: Gets the current value of the configuration property *property-name*. Returns an error when the CIM server is not running.

-g *property-name* **-p**
: Gets the planned value of the configuration property *property-name*.

-g *property-name* **-d**
: Gets the default value of the configuration property *property-name*. Returns an error when the CIM server is not running.

-s *property-name*=*value*, **-s** *property-name*=*value* **-c**
: Sets the current configuration property *property-name* to the value *value*. Returns an error when the CIM server is not running or the specified property cannot be updated dynamically.

-s *property-name*=*value* **-p**
: Sets the planned configuration property *property-name* to the value *value*.

-u *property-name*, **-u** *property-name* **-c**
: Unsets the value of the current configuration property *property-name* to its default value. Returns an error when the CIM server is not running or the specified property cannot be updated dynamically.

-u *property-name* **-p**
: Unsets the value of the planned configuration property *property-name* to its default value.

-l
: Lists the names of all configuration properties. Returns an error when the CIM server is not running.

-l -c
: Lists the name and value pairs of all current configuration properties. Returns an error when the CIM server is not running.

-l -p
: Lists the name and value pairs of all planned configuration properties.

--version
: Displays the CIM server version.

-h, --help, ***no options specified***
: Displays the command help information.

Examples

```
cimconfig -s traceLevel=4
```

cimconfig -s traceComponents=XmlIO,Http
Sets the trace level to trace all information with high data detail in the ***XmlIO*** and ***Http*** components.

cimconfig -s logLevel=WARNING -p
Sets the *logLevel* configuration property to the value `WARNING` in the *cimserver_planned.conf* file.

cimprovider

Description

The `cimprovider` command lets you disable, enable, remove, and list registered CIM providers or CIM provider modules and the according module status.

disable
When a CIM provider is disabled, the CIM server rejects any requests to the provider. When a provider module is disabled, any new requests to the providers that are contained in the specified provider module are rejected.

enable
When a CIM provider is enabled, the CIM server forwards requests to the provider. When a provider module is enabled, the providers that are contained in the provider module are ready to accept a new request.

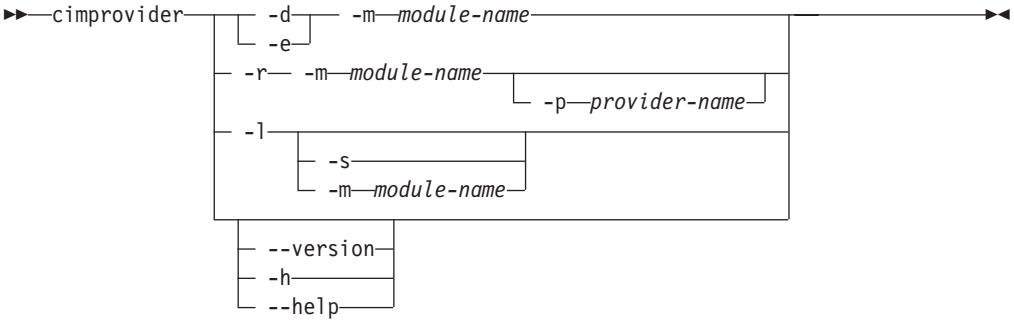
remove
When a CIM provider is removed (unregistered), the CIM server will no longer have any information about the provider. When a CIM provider module is removed (unregistered), the CIM server will no longer have any information about any provider contained in the module. If you want to address requests to a provider after removal, the provider or provider module must be registered again (typically by loading its registration schema using the `cimmofl` command).

list

You can list all registered provider modules and the according module status or all providers in the specified provider module.

For using the `cimprovider` command, the CIM server must be running, and the user needs to have `CONTROL` access to profile CIMSERV in class WBEM.

Syntax



Options

The `cimprovider` command recognizes the following options:

-d -m *module-name*
: Disables the CIM provider module *module-name*. If the module is already disabled, an error message is returned.

-e -m *module-name*
: Enables the CIM provider module *module-name*. If the module is already enabled or is currently being disabled, an error message is returned.

-r -m *module-name*
: Removes the provider module *module-name* and all of its contained providers.

-r -m *module-name* **-p** *provider-name*
: Removes the provider *provider-name* in the provider module *module-name* without affecting any other providers in that module.

-l
: Displays all registered provider modules.

  To list all providers in all modules, type a `cimprovider -l` command, followed by `cimprovider -l -m` for each listed module.

-l -s
: Lists the status of all registered provider modules.

-l -m *module-name*
: Lists all registered providers in module *module-name*.

--version
: Displays the CIM server version.

-h, --help, ***no option specified***
: Displays the command help information.

Limitations

This command disables, enables, or removes one CIM provider module or CIM provider at a time.

Examples

`cimprovider -d -m myProviderModule`
: Disables provider module `myProviderModule` and all of its contained providers (placing them in a stopped state).

`cimprovider -e -m myProviderModule`
: Enables provider module `myProviderModule` and all of its contained providers (placing them in an OK state).

`cimprovider -r -m myProviderModule`
: Removes (unregisters) the `myProviderModule` provider module and all of its contained providers.

`cimprovider -r -m myProviderModule -p MyProvider`
: Removes (unregisters) the `MyProvider` provider contained in the `myProviderModule` provider module.

`cimprovider -l`
: Lists the registered provider modules.

`cimprovider -l -s`
: Lists the registered provider modules and their status (such as OK, Stopping, Stopped).

`cimprovider -l -m myProvider`
: Lists the registered providers, which are in the `myProviderModule` provider module.

cimcli

Description

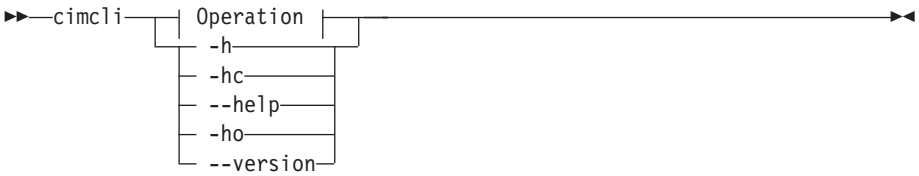
z/OS provides a command-line interface called `cimcli` through which you can perform CIM client requests/operations. It implements most of the DMTF CIM operations except for the *modifyClass*, *modifyInstance* and *createClass* operations.

Each execution of `cimcli` invokes a CIM operation with the corresponding parameters equivalent to the CIM operations defined in the *CIM Operations over HTTP* specification.

In addition to the basic CIM operations defined in this specification, the `cimcli` command-line interface implements a number of other specific operations that support testing and querying CIM servers, including operations to query for namespaces and to get all instances in a namespace.

The command-line client is invoked from the UNIX System Services shell.

Syntax



Operation:

Defines the operation to be performed. `cimcli` performs all of the DMTF CIM operations (for example, `getclass`) and a set of compound operations (for example, `enumerateNamespaces`).

There are two forms for each operation: a long form which is the full name of the operation (for example, `getClass`), and a short form, typically two characters (for example, `gc` for `getClass`).

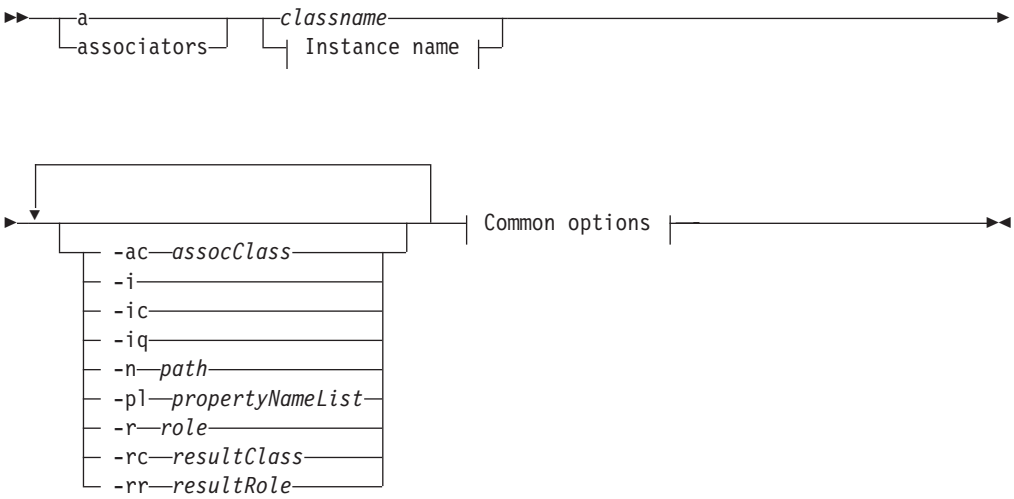
Options:

-h	Prints help usage message.
-hc	Prints CIM Operation command list.
--help	Prints full help message with commands, options, and examples.
-ho	Prints list of options.
--version	Displays the software version.

a, associators

Purpose: Enumerates the classes or instances linked (associated) to a CIM class or a CIM instance.

Operation:



For "Instance name", see "***Instance name***" on page 90.

Options: For special options and "Common options", see "***Options***" on page 88.

Examples:

```
cimcli a IBMzOS_Process
```

Results:

0 Successful execution of the operation

all values other than 0
The execution on the operation returned an error.

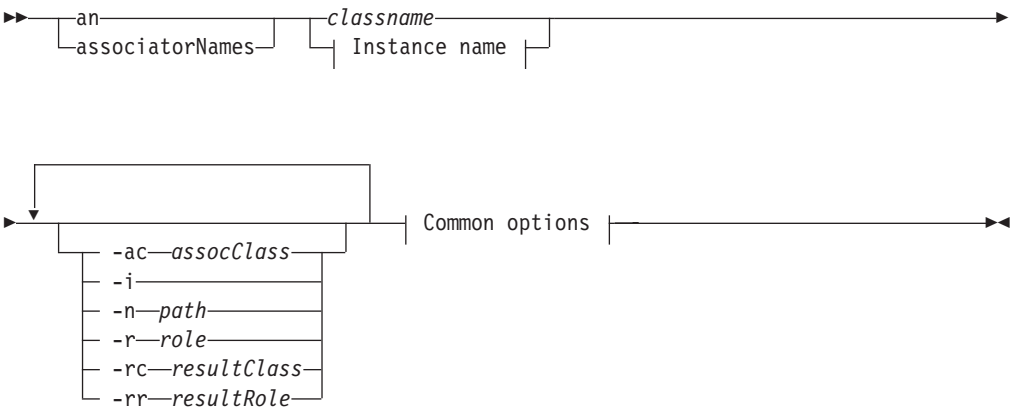
For a given class, the list of associated classes is returned.

For a given instance name, the list of associated instances is returned.

an, associatorNames

Purpose: Enumerates the class or instance names linked (associated) to a CIM class or a CIM instance.

Operation:



For "Instance name", see "***Instance name***" on page 90.

Options: For special options and "Common options", see "***Options***" on page 88.

Examples:

```
cimcli an IBMzOS_Process
```

Results:

0 Successful execution of the operation

all values other than 0
The execution on the operation returned an error.

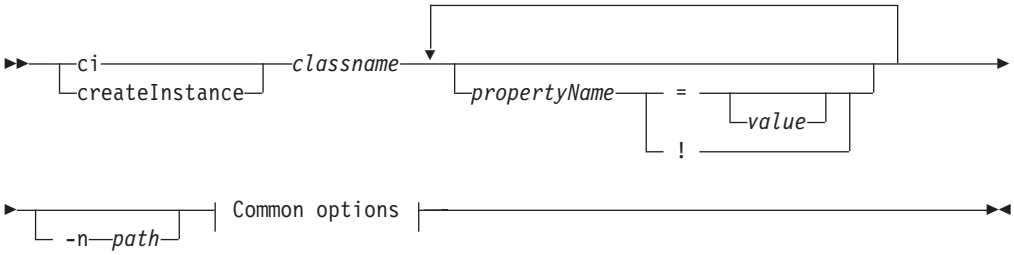
For a given class, the list of associated class names is returned.

For a given instance name, the list of associated instance names is returned.

ci, createInstance

Purpose: Creates one instance of the specified class with the provided properties in the repository.

Operation:



Usage: The *classname* parameter defines the class for which the instance is to be created. The optional set of parameters defines the properties to be provided (see also "***Instance name***" on page 90). The command reads the specified class and inserts the properties. The command will be rejected if the class does not exist in the namespace.

Specify a *value* for a property name according to its type. Follow the syntax rules as specified in *Common Information Model Specification, DSP0004, Version 2.3* by the DMTF. Note special syntax rules to define

- the current date and time with the keyword `now` for values of the type `Datetime`
- an empty string with the property name followed by a `!` for values of the type `string`
- an `NULL` string with the property name followed by a `=` for values of the type `string`

Options: For special options and "Common options", see "***Options***" on page 88.

Examples:

```
cimcli ci CIM_Person Name=Michael Title=Engineer
```

Creates an instance of the class CIM_Person.

Results: The command returns the object path of the created instance if the call to the CIM server was performed. Otherwise it returns the exception received.

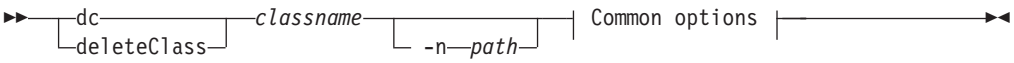
0 Successful execution of the operation

all values other than 0
The execution on the operation returned an error.

dc, deleteClass

Purpose: Deletes the CIM class specified by *classname*.

Operation:



Options: For special options and "Common options", see "***Options***" on page 88.

Examples:

```
cimcli dc CIM_Person
```

Deletes the class CIM_Person and all sub-classes when there are no instances.

Results:

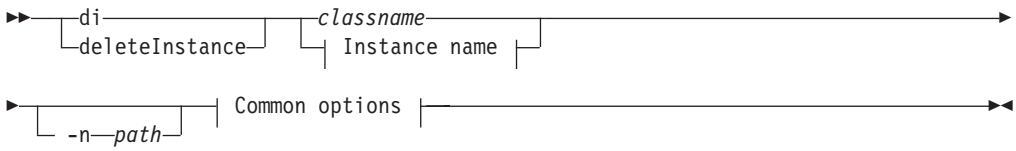
0 Successful execution of the operation

all values other than 0
The execution on the operation returned an error.

di, deleteInstance

Purpose: Deletes the specified instance or interactively one instance from the specified class.

Operation:



For "Instance name", see "***Instance name***" on page 90.

Usage: If the instance is specified,, the operation is performed directly. If class is specified, the `enumerateInstances` command is performed and the list of returned instances presented for the user to select one to delete. `cimcli` then performs `deleteInstance` with the selected instance name.

Options: For special options and "Common options", see "***Options***" on page 88.

Examples:

```
cimcli di CIM_Person
```

Interactively deletes an instance of class CIM_Person.

Results:

0 Successful execution of the operation

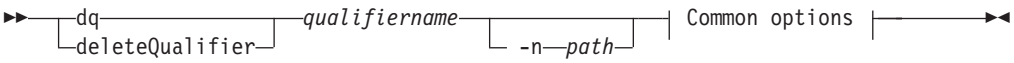
all values other than 0
The execution on the operation returned an error.

There is no response if the instance was successfully deleted, or an exception returned if there were any errors.

dq, deleteQualifier

Purpose: Deletes the CIM qualifier specified by *qualifiername*.

Operation:



Options: For special options and "Common options", see "***Options***" on page 88.

Examples:

```
cimcli dq ASSOCIATION
```

Deletes the qualifier Association (generally not recommended).

Results:

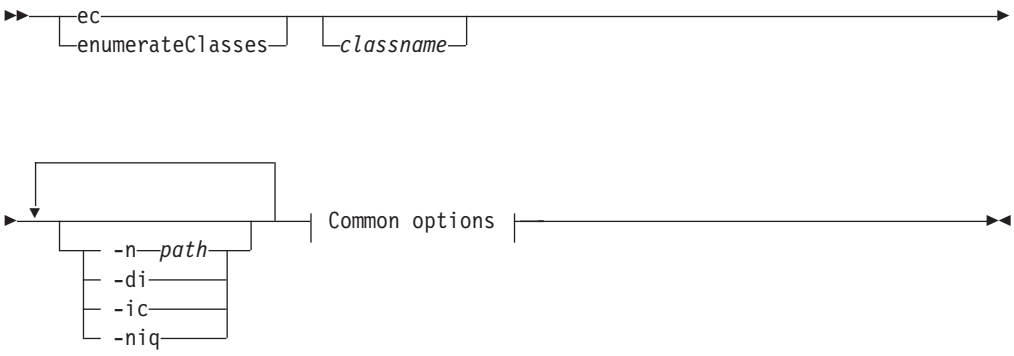
0 Successful execution of the operation

all values other than 0
The execution on the operation returned an error.

ec, enumerateClasses

Purpose: Enumerates the classes starting at the level defined by *classname*.

Operation:



Usage: If the class name is omitted, `cimcli` inserts an empty class name.

Options:

-di enumerates all inherited classes

If you do not specify this parameter, only the child classes are enumerated.

For all other special options and "Common options", see "***Options***" on page 88.

Examples:

```
cimcli ec -n root/cimv2 -niq
```

Enumerates classes from the root of the root/cimv2 namespace.

Results:

0 Successful execution of the operation

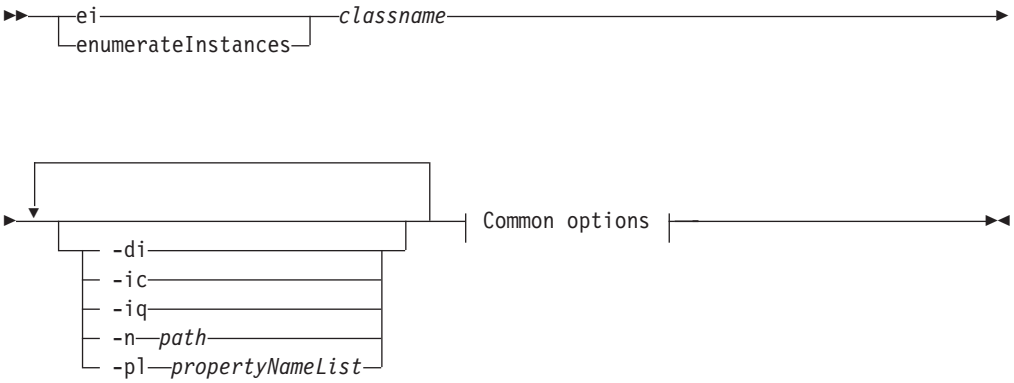
all values other than 0

The execution on the operation returned an error.

ei, enumerateInstances

Purpose: Enumerates the instances of the specified CIM class.

Operation:



Options: For special options and "Common options", see "***Options***" on page 88.

Examples:

```
cimcli ei CIM_ComputerSystem -di
```

Enumerates the instances of class CIM_Computersystem, listing properties of inherited classes (-di).

Results:

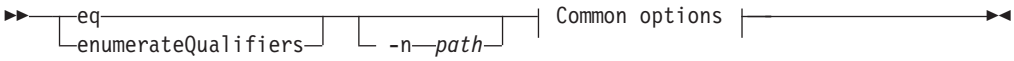
0 Successful execution of the operation

all values other than 0
The execution on the operation returned an error.

eq, enumerateQualifiers

Purpose: Enumerates all qualifiers in the specified or default namespace.

Operation:



Options: For special options and "Common options", see "***Options***" on page 88.

Examples:

```
cimcli eq
```

Enumerates qualifiers in the default root/cimv2 namespace.

Results:

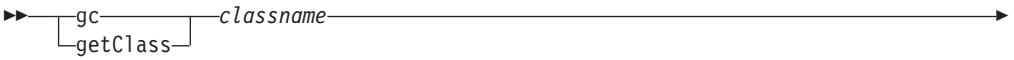
0 Successful execution of the operation

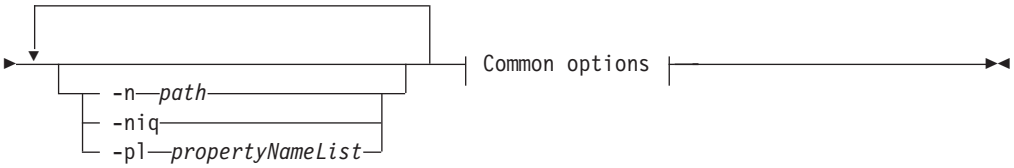
all values other than 0
The execution on the operation returned an error.

gc, getClass

Purpose: Gets the class of *classname*.

Operation:





Options: For special options and "Common options", see *"Options"* on page 88.

Examples:

```
cimcli gc IBMzOS_Process
```

Gets the definition for class IBMzOS_Process.

Results:

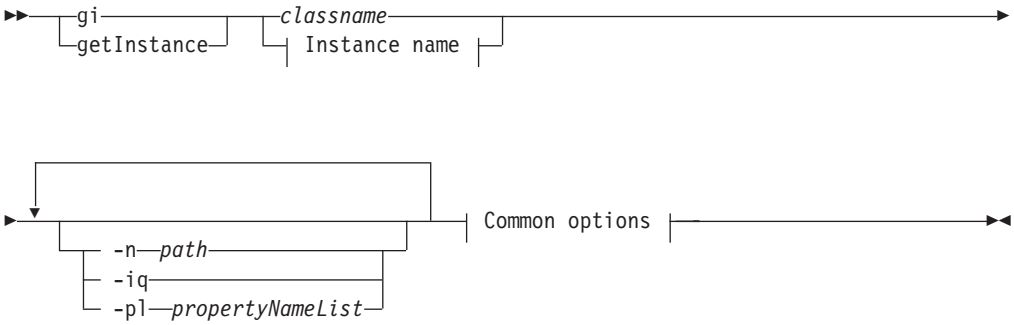
0 Successful execution of the operation

all values other than 0
The execution on the operation returned an error.

gi, getInstance

Purpose: Displays the specified instance.

Operation:



For "Instance name", see "***Instance name***" on page 90.

Options: For special options and "Common options", see "***Options***" on page 88.

Examples:

```
cimcli gi IBMzOS_UnixLocalFileSystem
```

Interactively returns a list of instances from class IBMzOS_UnixLocalFileSystem. The user can select one instance to be displayed.

Results:

0 Successful execution of the operation

all values other than 0
The execution on the operation returned an error.

If an instance is specified, the operation displays the result from the CIM server.

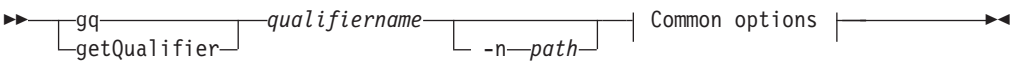
If a class is specified, an `enumerateinstanceNames` CIM operation is performed, and if any instance names are returned, the result is presented for the user to select one of the instances to be displayed.

If there are no instances, the command returns an empty response.

gq, getQualifier

Purpose: Gets the CIM qualifier specified by *qualifiername*.

Operation:



Options: For special options and "Common options", see "***Options***" on page 88.

Examples:

```
cimcli gq Association
```

Gets the qualifiers in mof output format

Results:

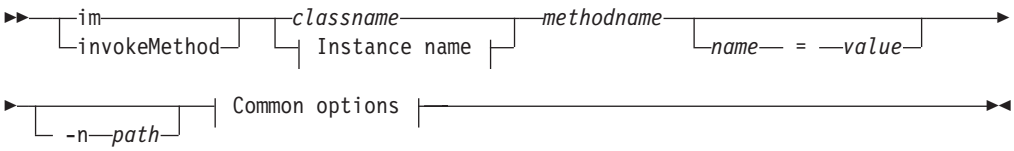
0 Successful execution of the operation

all values other than 0
The execution on the operation returned an error.

im, invokeMethod

Purpose: Performs the extrinsic method *methodname* on the specified class or instance.

Operation:



For "Instance name", see "***Instance name***" on page 90.

Usage: The parameters are supplied as *name=value* pairs. In the current version, all parameters are treated as strings.

Options: For special options and "Common options", see "***Options***" on page 88.

Examples:

```
cimcli im 'IBMzOS_Test.handle="1"' TriggerIndication NumberOfIndications=3
```

Results:

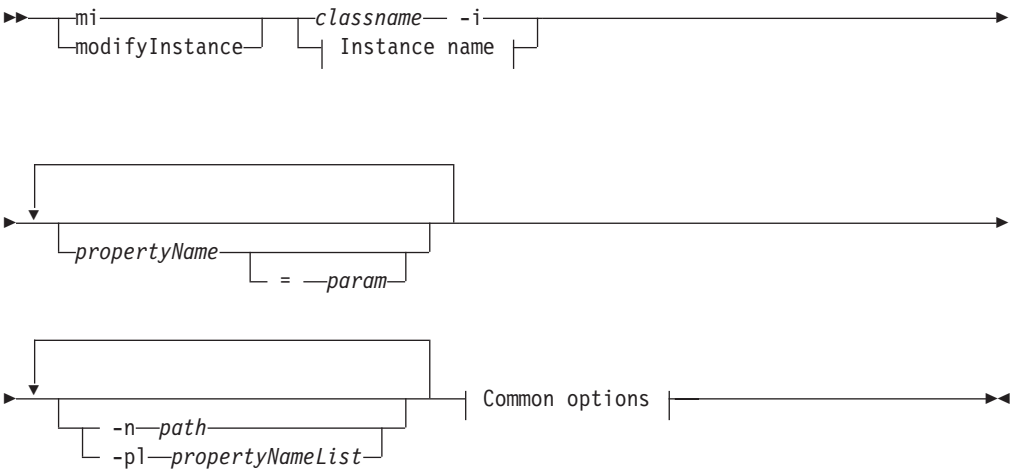
0 Successful execution of the operation

all values other than 0
The execution on the operation returned an error.

mi, modifyInstance

Purpose: Modifies the specified instance or creates a modified instance of the specified class by building the properties from a combination of the target class and the provided properties.

Operation:



For "Instance name", see "***Instance name***" on page 90.

Options: For special options and "Common options", see "***Options***" on page 88.

Examples:

```
cimcli mi CIM_xxxx name=abc size=zyx
```

Results:

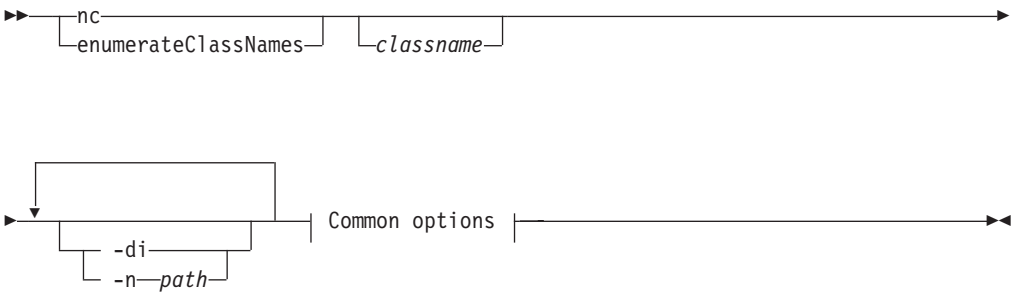
0 Successful execution of the operation

all values other than 0
The execution on the operation returned an error.

nc, enumerateClassNames

Purpose: Enumerates sub class names of *classname* or all top level class names of a given namespace.

Operation:



Usage: Note that on z/OS all class names are returned in lowercase due to a z/OS specific performance optimization. Use the `getclass` operation to receive the exact case of the class name.

Options: For special options and "Common options", see "***Options***" on page 88.

Examples:

```
cimcli nc -di
```

Enumerates all class names from the root/cimv2 namespace, including subclasses (-di).

Results:

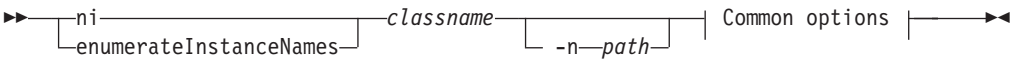
0 Successful execution of the operation

all values other than 0
The execution on the operation returned an error.

ni, enumerateInstanceNames

Purpose: Enumerates all instances of the specified class.

Operation:



Options: For special options and "Common options", see "***Options***" on page 88.

Examples:

```
cimcli ni CIM_Processor -n root/cimv2
```

Results:

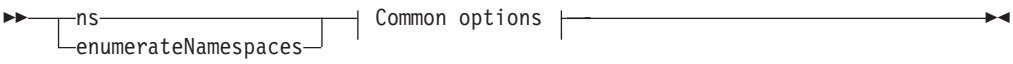
0 Successful execution of the operation

all values other than 0
The execution on the operation returned an error.

ns, enumerateNamespaces

Purpose: Requests an enumeration of all the namespaces in the target CIM server. This command uses both the CIM_Namespace class and if that fails, the __Namespace class to determine the list of namespaces.

Operation:



Options: For "Common options", see "***Options***" on page 88.

Examples:

```
cimcli ns
```

Results:

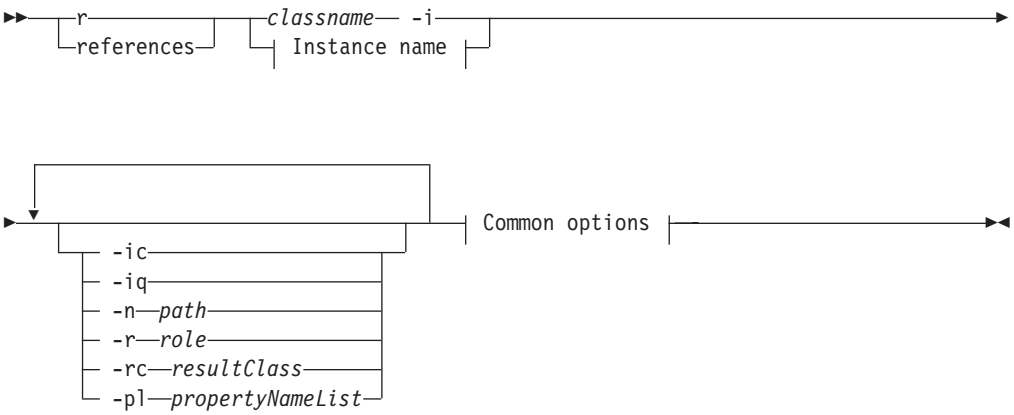
0 Successful execution of the operation

all values other than 0
The execution on the operation returned an error.

r, references

Purpose: Enumerates the association classes or association instances linked to the specified CIM class or CIM instance.

Operation:



For "Instance name", see "***Instance name***" on page 90.

Options: For special options and "Common options", see "***Options***" on page 88.

Examples:

```
cimcli r 'IBMzOS_ComputerSystem.
              CreationClassName="IBMzOS_ComputerSystem",
              Name="sys1"'
cimcli r IBMzOS_OperatingSystem -rc CIM_OSProcess
```

Results:

0 Successful execution of the operation

all values other than 0
The execution on the operation returned an error.

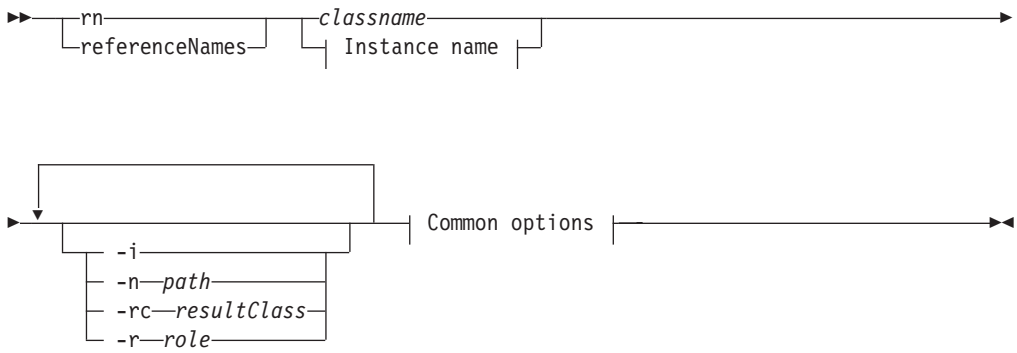
For a given class, the list of linked association classes is returned.

For a given instance name, the list of linked association class instances is returned.

rn, referenceNames

Purpose: Enumerates the association class or instance names linked to the specified CIM class or CIM instance.

Operation:



For "Instance name", see "***Instance name***" on page 90.

Options: For special options and "Common options", see "***Options***" on page 88.

Examples:

```
cimcli rn 'IBMzOS_ComputerSystem.
               CreationClassName="IBMzOS_ComputerSystem",
               Name="sys1"'
cimcli rn IBMzOS_OperatingSystem -rc CIM_OSProcess
```

Results:

0 Successful execution of the operation

all values other than 0
The execution on the operation returned an error.

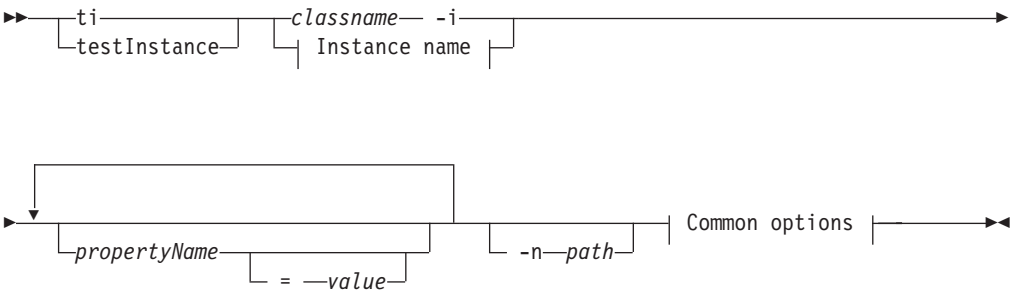
For a given class, the list of linked association class names is returned.

For a given instance name, the list of linked association instance names is returned.

ti, testInstance

Purpose: Tests an instance or a class for the equality of the specified properties.

Operation:



For "Instance name", see *"Instance name"* on page 90.

Options: For special options and "Common options", see *"Options"* on page 88.

Examples:

```
cimcli ti TST_Person Name=Mike SSN=333 -n test/TestProvider
```

Results:

0 Successful execution of the operation

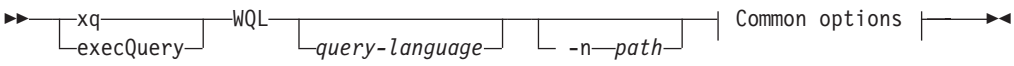
all values other than 0
The execution on the operation returned an error.

Returns an error code if the given properties and values do not match.

xq, execQuery

Purpose: Performs the `execQuery` CIM operation with the specified *query-expression*. Note that the use of the `execQuery` operation has been deprecated by the DMTF and it may be removed in a future version of the "Specification for CIM Operations over HTTP".

Operation:



Options: For special options and "Common options", see "***Options***" on page 88.

Examples:

```
cimcli xq "select handle,name from CIM_process
               where handle = \"1\"" WQL
```

Results:

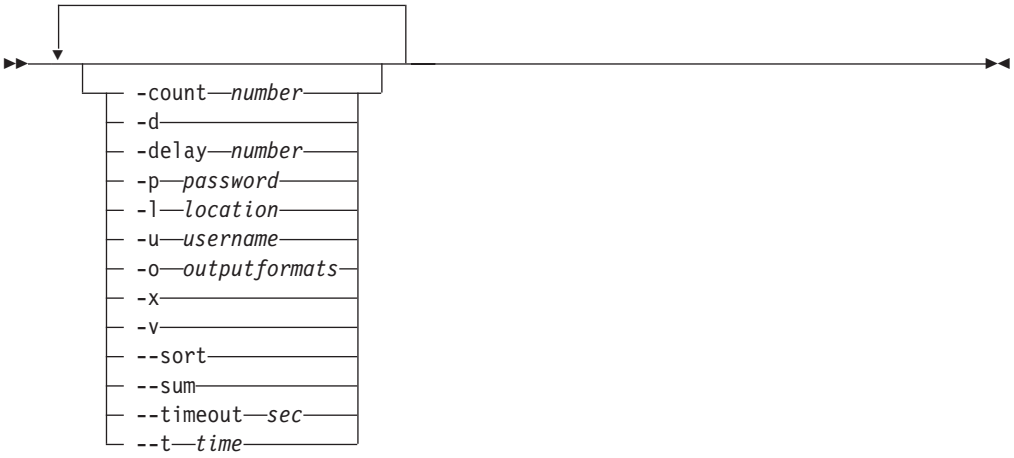
0 Successful execution of the operation

all values other than 0
The execution on the operation returned an error.

Options

Purpose: Options are identified on the command line with the '-' or '--' notation. An option that is not used by a particular operation is ignored.

Operation: Common options:



Usage: The `cimcli` command recognizes the following common options:

-count *number* Expected number of objects returned, if the **–sum** option is set. Tests this number and displays the difference. Term nonzero is returned if test fails.

-d Displays more detailed debug messages.

-delay *number* Delay in seconds between connection and request. Default is 0.

-l *location* Allows input of the host name for the CIM server and optionally the port (HostName:port). The default is localhost:5988. The port component is optional. The default is 5988.

-n *path* Specifies the namespace for the operation. The default is `root/cimv2`.

-o *outputformats*
Specifies the output format. Valid values are: xml, mof, and table. Default is mof.

-p *password* Allows the input of a password for the command's server authentication. The default is empty.

- -r *repeat* Sets the number of times to repeat the function. Zero means one time. Repeats the operation without disconnecting. Default is 0.

- -sort Sorts the output objects before they are displayed.

- -sum Presents only summary information, not the complete output. Generally this option presents counts of objects returned instead of the names or objects themselves.

- -t *time* Measures the time for operation and presentation of the results upon command completion.

- -timeout *sec* Sets the connection timeout in seconds. Default is 0.

-trace *traceLevel*
Sets the common components trace. Sets the trace level. 0 is off. Default is 0. Valid values are 0 to 5.

-u *username* Allows the input of a user name for authentication. The default is empty.

-v Displays verbose data (including operation parameters).

-x Output objects in xml instead of mof format.

The `cimcli` command recognizes the following special options:

-ac *assocClass* Passes the assocClass parameter to applicable association operations. Default is to pass no assocClass parameter.

-ar *associationRoleName*
Defines an association role for associator operations.

-di Specifies the *deepInheritance* parameter for selected commands. The default is '`false`'. This option has different meanings for different commands and is used only with the enumerate commands. For further information, refer to the *CIM Operations over HTTP* published by the DMTF.

-i Interactively asks the user to select instances. Used with associator and reference operations.

-ic Sets the CIM operation parameter classOrigin in the operation request to true. Only useful with option `-o xml`.

-iq Sets includeQualifiers = `true`.

-lo Passes localOnly=`true` to applicable operations.

-nlo When set, sets localOnly = 'false' on operations. Default is '`false`'.

Note that option *localOnly* has been deprecated by the DMTF for some operations and will completely be removed with the next major version of CIM.

-niq Sets includeQualifiers = 'false' on operations. Default is '`false`'.

Note that option *includeQualifiers* has been deprecated by the DMTF for some operations and will completely be removed with the next major version of CIM.

-pl *propertyNameList*
Passes the propertyNameList parameter to applicable operations. Format is p1,p2,p3 (without spaces) or "" for an empty list. The default is to pass no propertyList parameter.

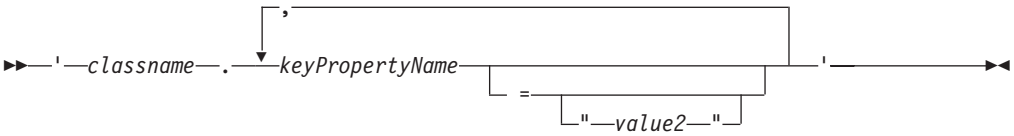
-r *role* Passes the role parameter to applicable association operations. Default is to pass no role parameter.

-rc *resultClass* Passes the resultClass parameter to applicable association operations. Default is to pass no resultClass parameter.

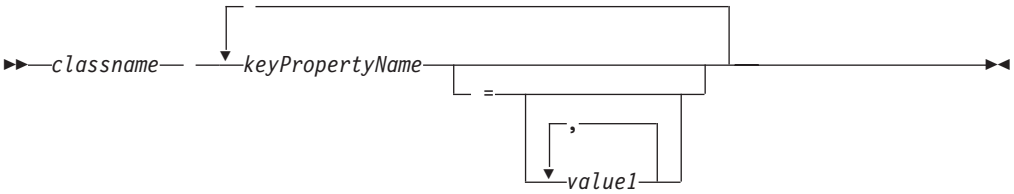
-rr *resultRole* Passes the resultRole parameter to applicable association operations. Default is to pass no resultRole parameter.

Instance name

Operation:



For the getInstance operation, there is also an alternate way to specify an instance name:



Usage:

keyPropertyName
to specify an instance, all key properties of the class have to be listed

Specifying a key property with a "=", but without a value assigns the NULL value to it.

Specifying a key property without a "=", and without a value assigns the default value to it.

value1 "" indicating a string value has to be escaped by '\'.

value2 No escape sequence is needed.

The new syntax listing the key properties separated by spaces now allows to specify array values.

cimsub

Description

The `cimsub` command lets you manage CIM indications on the local CIM server. The command can list, enable, disable and remove indication subscriptions, filters and handlers. However, you cannot modify or create a handler or a filter. The CIM indication must be created or modified by a CIM client program.

list Lists all or selected indication subscriptions, filters, and handlers, and displays the requested information about the instance(s).

enable

Enables a specific subscription. Sets a subscription into the enabled state, and the CIM server starts to process it.

disable

Disables a specific subscription. Sets a subscription into the disabled state, and it is no longer processed by the CIM server.

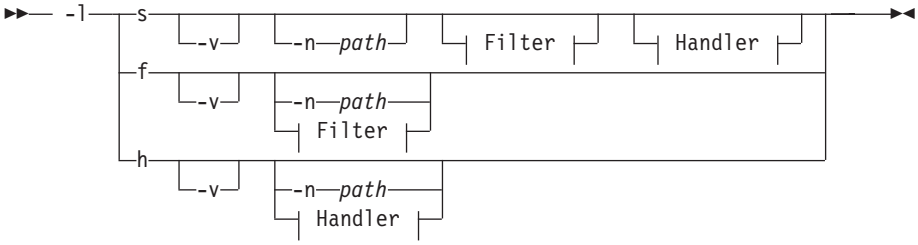
remove

Removes a specific indication subscription, filter, and/or handler form the CIM server. The information is removed within the CIM server and can only be recreated by a client application. The administrator must take care that a filter or handler is not referenced by any other subscription. If this is the case, but the filter or handler is deleted anyway, this subscription will no longer work.

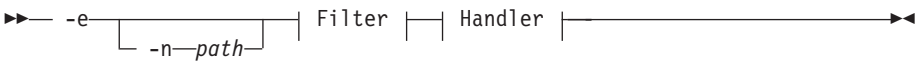
In order to use the `cimsub` command, the CIM server must be running on the local system and a user needs to have `CONTROL` access to profile CIMSERV in class WBEM.

Syntax

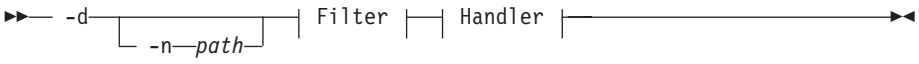
list:



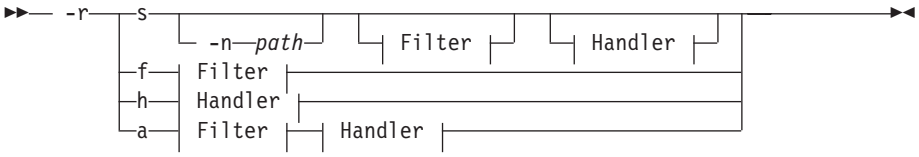
enable:



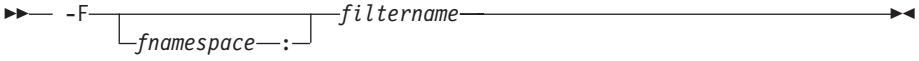
disable:



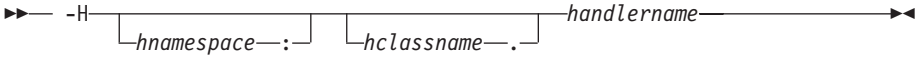
remove:



Filter:



Handler:



Options

The `cimsub` command recognizes the following options:

-l Lists all or selected

indication subscriptions (-ls)

filters (-lf)

handlers (-lh)

Options -F and -H are superseding the -n namespace option, if -n is set together with either -F or -H.

-e Sets the subscription state to `enabled`.

-d Sets the subscription state to `disabled`.

-r Removes a specific

indication subscription (-rs)

filter (-rf)

handler (-rh)

or all three together (-ra)

Options -F and -H are superseding the -n namespace option, if -n is set together with either -F or -H.

-v Displays verbose information (for example, subscription state, filter query, handler destination) for each listed instance.

-F [*fnamespace***:]***filtername*

Specifies the name of the filter instance used for the subscription

operation. If the filter namespace [*fnamespace*:] is not specified, the operation is using the namespace of the subscription.

-H [*hnamespace***:][***hclassname***.]***handlername*
Specifies the name of the handler instance used for the subscription operation. If the handler namespace [*hnamespace*:] is not specified, the operation is using the namespace of the subscription. If the handler class name [*hclassname*.] is not specified, the operation is using the ***CIM_ListenerDestinationCIMXML*** handler class name.

Note: Currently the only supported handler is an instance of the ***CIM_ListenerDestinationCIMXML*** class or subclass.

-n *path*
Specifies the namespace for the operation. For the -l option, if no namespace is specified, instances in all namespaces are listed. For all other operations, if no namespace is specified, the `cimsub` command operates on instances of the *root/PG_InterOp* namespace.

Note: It is recommended not to use any other namespace for indications than *root/PG_InterOp*.

--help Displays the command help information.

--version
Displays the CIM server version.

Examples
The following example lists all subscriptions in the namespace *root/PG_InterOP* in verbose mode:

`cimsub -ls -v`
Output:

```
Namespace:         root/PG_InterOp
Filter:            root/PG_InterOp:IndicationTest_indicationFilter
Handler:           root/PG_InterOp:CIM_ListenerDestinationCIMXML.IndicationTest
Query:             "SELECT * FROM TestIndication"
Destination:       http://test.server.com/
SubscriptionState: Enabled
```

`cimsub -d -F IndicationTest_indicationFilter -H IndicationTest`
Disables the subscription specified by -F and -H, and displays the result in verbose mode.

`cimsub -ls -v`
Output:

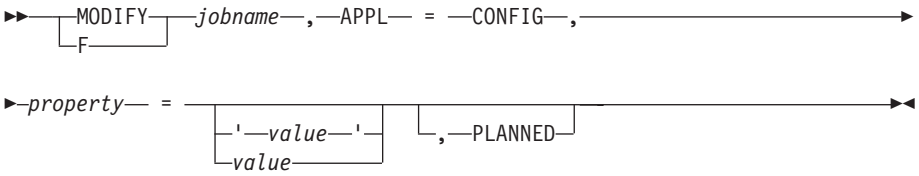
```
Namespace:         root/PG_InterOp
Filter:            root/PG_InterOp:IndicationTest_indicationFilter
Handler:           root/PG_InterOp:CIM_ListenerDestinationCIMXML.IndicationTest
Query:             "SELECT * FROM TestIndication"
Destination:       http://test.server.com/
SubscriptionState: Disabled
```

MODIFY console command

In addition to the `cimconfig` command-line utility (see "cimconfig" on page 62), starting with z/OS 1.10 the CIM server configuration can be changed from the z/OS system console using the `MODIFY` command. The general syntax for using the `MODIFY` command to pass information to a Unix System Services Application is described in *z/OS MVS System Commands*.

Syntax

Following is the specific syntax for using the `MODIFY` command to pass configuration changes to the CIM server. Between the options, no spaces are allowed:



Options

Basically the CIM server accepts the same options for the `MODIFY` command as for the `cimconfig` utility.

jobname
: The name of the job that runs the CIM server. When the CIM server is run as a started task, this will usually be CFZCIM.

APPL=CONFIG
: This is the indicator for the CIM server that a configuration change was requested through the z/OS system console.

property
: The name of the configuration property to be changed. For a complete list of CIM server configuration properties see "CIM server configuration properties" on page 45. Typically, the only current configuration properties that you can change dynamically are the *shutdownTimeout* property and the logging and tracing properties. Permanent changes require a CIM server restart. They are indicated using the PLANNED keyword at the end of the `MODIFY` command string.

value
: The new value for the configuration property to be changed. For values that contain a comma or for case sensitive property values such as path names the value needs to be enclosed in single quotes ('). To reset a property to its default value, omit the *value* parameter.

PLANNED
: Indicates that the configuration change should be made permanently. This means that the change will only become effective after a CIM server restart, and that the change will also persist further restarts until it is changed again. If PLANNED was not specified at the end of the command, the changes will only stay in effect until the next restart of the CIM server.

Examples

`F CFZCIM,APPL=CONFIG,traceComponents=xmlio`

`F CFZCIM,APPL=CONFIG,traceLevel=4`
: Turns on tracing of the CIM server's XML traffic.

`F CFZCIM,APPL=CONFIG,enableRemotePrivilegedUserAccess=true,PLANNED`
: Permanently enables superusers (UID=0) to issue requests against the CIM server from a remote system.

Backing up the CIM server repository

The CIM server keeps definitions of the data about managed objects and their providers in its repository. Four namespaces install with the CIM server. Others may be added by CIM clients and providers. The four that are automatically installed are:

root The root namespace exists to conform to the DMTF specifications.

root/cimv2
The standard CIM Schemas as well as the schemas for the shipped providers are located here.

root/PG_Interop
Among other purposes, this namespace is used for provider registration. All providers must register here (see "cimprovider" on page 64).

root/PG_Internal
This space is reserved for use by the OpenPegasus CIM server only.

It is important to schedule backups of the repository directories and files. If the repository is deleted or corrupted, backups of the repository files need to be restored. If the repository files cannot be restored from a backup, refer to section "Migration from z/OS 1.10 or z/OS 1.11 to z/OS 1.12" on page 22 for information about how to recover the repository.

As recommended in the *z/OS Program Directory*, the path */var/wbem* should be mounted as a separate data set to simplify backing up. It is also recommended to stop the CIM server during backup to avoid data corruption.

Note: If the repository was backed up from a prior z/OS release, it should not be restored onto a system that runs a later version of the OS. Once a new version of z/OS was installed and the CIM server has been initially started, you should immediately back up the upgraded repository and discard old repository backups.

Verifying the installation and customization of CIM

The client application CIMIVP is delivered as executable with the product in file ***/usr/lpp/wbem/bin/cimivp***. You can use it as an installation verification program. It displays information about the z/OS system which is available through CIM.

You invoke this program as job CFZIVP contained in SYS1.SAMPLIB or from the UNIX System Services command line as `cimivp`.

On successful completion, it generates an output similar to the one shown hereafter. If the program produces unreadable output, check whether you forgot to tag the output files as EBCDIC. See also "ASCII-EBCDIC conversion" on page 281.

```
cimivp Main started ...
Connecting to local CIM Server ...
 ... success
> Found Computer System  : BOEPEG4.boeblingen.de.ibm.com
  (CPUID: 0C0B822097, VMGuestID: PEG4)
> Found Operating System : PEG4 (Version: 01.12.00,
  Sysplex: PEG4PLEX, FreeMem: 1303824)
> Number of active UNIX System Services processes: 17
> Number of active address spaces: 110
> Number of FC ports: 20
```

```
|                       > Number of online processors: CP(3) zAAP(0) zIIP(1)
|                       > Number of online disk volumes: 80
|                       cimivp - All tests completed successfully.
```

Chapter 6. Impacts of the Out-of-Process support for providers

This chapter discusses several aspects that administrators or system programmers need to consider when using the *Out-of-Process* support for providers. The following topics are addressed:

- "Provider management and registration"
- "Provider based authorization model" on page 41
- "Tracing providers running Out-of-Process"
- "Performance implications" on page 98

Provider management and registration

To manage and register your providers, use classes ***PG_Provider*** and ***PG_ProviderModule*** from The OpenGroup. In addition, there is the following z/OS-specific extension for class ***PG_ProviderModule*** that you can specify in a provider's registration MOF file:

boolean ShareAS

When the ***ShareAS*** property is set to 'false', the provider module will run in its own copy of a Provider Agent process. No other provider module will be loaded into this process. Setting the *ShareAS* property to 'false' has a major impact on the performance, so it should be set to true unless there is an urgent need for a provider module to be protected from other provider modules running in the same process. Therefore the default of this property is 'true'.

Setting *ShareAS* to 'false' is only honored by the CIM server, if it is running with the configuration property for *forceProviderProcesses* set to 'true'.

Example of a provider registration MOF file with properties specified for the *Out-of-Process* support:

```
instance of PG_ProviderModule
{
   Name = "OSBase_TestClassProviderModule";
   //The library name on disk
   Location = "cmpiOSBase_TestClassProvider";
   Vendor = "IBM";
   Version = "2.0.0";
   InterfaceType = "CMPI";
   InterfaceVersion = "2.0.0";
   ShareAS = false;
};
```

Tracing providers running Out-of-Process

When tracing is enabled in the CIM server, it is also enabled in the Provider Agent processes. For reasons of trace data integrity and regarding performance aspects, a separate trace file is used for each Provider Agent process.

Each Provider Agent is uniquely identified by the name of the shared Provider Agent executable. Each non-shared instance of a Provider Agent corresponds with a single provider module, the module/executable name uniquely identifies the

process. The tracer is updated to allow an extra name to be specified, and this name is used as an extension to the trace file name specified by the *traceFilePath* configuration property. For example, if the *traceFilePath* is defined as */tmp/cimserver.trc*, the non-shared Provider Agent for the ***OperatingSystemModule*** would direct its trace output to the file */tmp/cimserver.trc.OperatingSystemModule*.

Performance implications

Exploitation of the *Out-of-Process* provider support has some impact on the path length executed for each single CIM request. Most of this path length increase occurs because of the serialization/de-serialization of request and response messages flowing between the CIM server and the Provider Agent address spaces. Also, the path length for provider up-calls back into the CIM server through the CIMOMHandle will increase significantly. Therefore, provider developers should use up-calls with care.

Part 2. CIM instrumentation

Chapter 7. Profiles

A profile defines the CIM model and its behavior that represents a particular domain to be managed. The CIM model comprises CIM classes, associations, indications, properties, methods, and values to describe the domain and its characteristics.

SMI-S profiles

The Storage Management Initiative Specification (SMI-S) was developed by members of the Storage Networking Industry Association (SNIA) and defines an interface for the secure, extensible, and interoperable management of a distributed and heterogeneous storage system. The specification describes the information available to a WBEM Client from an SMI-S compliant CIM WBEM Server.

The SMI-S specifies standards-based profiles to manage storage networks. It builds on other standards such a CIM. The scope of SMI-S includes storage, storage virtualizers, fibre channel fabrics and IP connectivity, and host storage-specific CIM-based profiles.

The host storage portion of the specification defines profiles for the management of host-based storage devices.

CIM for z/OS supports the host-based storage profiles:

Host Discovered Resources Profile
The Host Discovered Resources (HDR) profile defines the model for the storage devices presented to z/OS.

Storage HBA profile
The Storage Host-Bus-Adapter (HBA) profile represents the manageable elements of an HBA and optionally, the storage connected to it.

For more information, refer to the SNIA, Storage Management Initiative Specification (SMI-S) website, *Storage Management Technical Specification, Part 6 Host Elements.*

Host Discovered Resources profile

The Host Discovered Resources profile allows a client application to discover

- the storage hardware resources (such as host adapters and storage devices, and including the connectivity and correlatable names) attached to a host system,
- the logical storage resources (such as special files that represent storage devices) available through the operating system, and
- the relationship between these hardware and logical resources.

Figure 8 on page 102 shows a Host Discovered Resources instance diagram with the host portion consisting of a ComputerSystem and an Initiator SBProtocolEndpoint and the storage controller portion consisting of a Target SBProtocolEndpoint and a LogicalDisk.

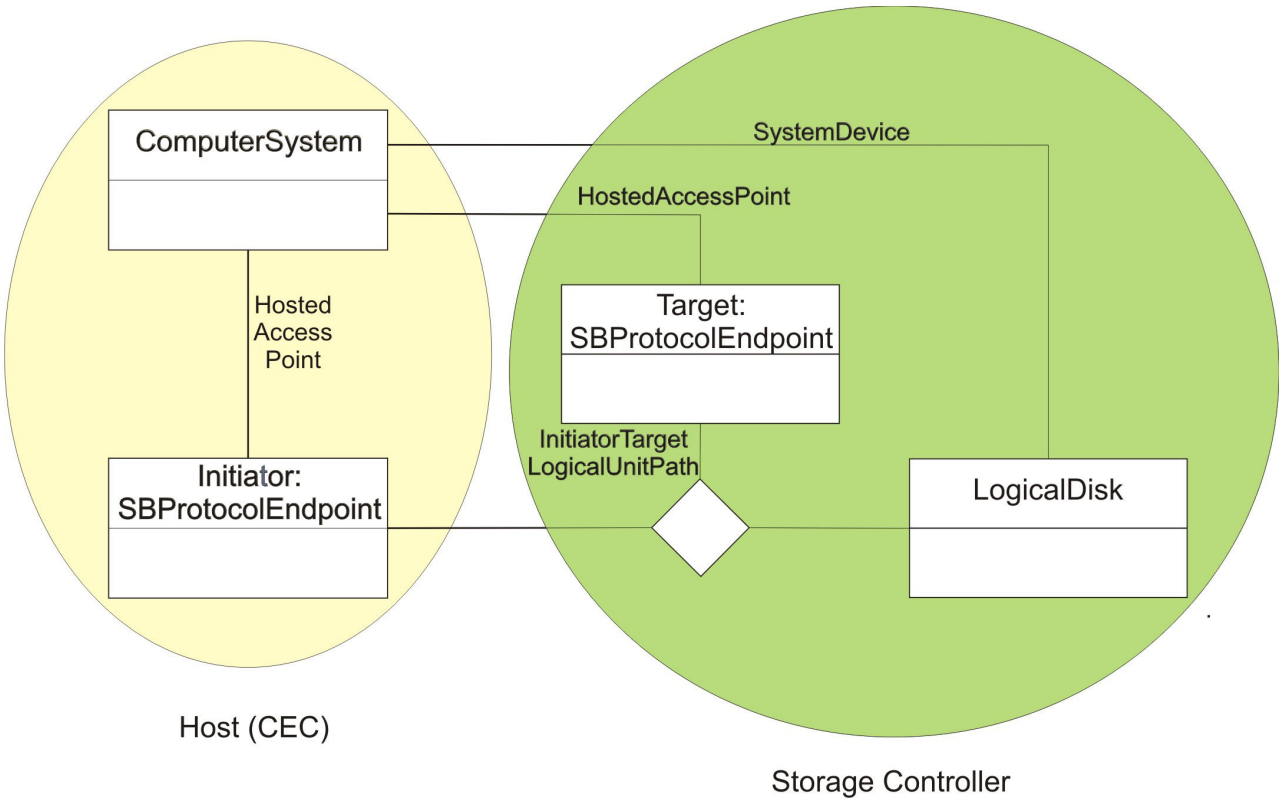


Figure 8. Host Discovered Resources Instance Diagram

Used CIM elements

Element name	implementing z/OS class	Reference
CIM_ComputerSystem	IBMzOS_ComputerSystem	see page 113
CIM_LogicalDisk	IBMzOS_LogicalDisk	see page 131
CIM_StorageExtent	IBMzOS_LogicalDisk	see page 131
CIM_SystemDevice	IBMzOS_CSFCPortController	see page 222
CIM_ProtocolEndpoint	IBMzOS_SBProtocolEndpoint	see page 218
Association CIM_HostedAccessPoint	Association IBMzOS_SBHostedAccessPoint	see page 224
Association CIM_Initiator TargetLogicalUnitPath	Association IBMzOS_SBInitiator TargetLogicalUnitPath	see page 225

Storage HBA profile

The storage Host-Bus-Adapter (HBA) profile represents the manageable elements of an HBA and optionally, the storage connected to it. An HBA can be connected to disks contained within a server's internal drive cage or an external drive enclosure or array.

Figure 9 on page 103 shows an HBA instance diagram with the FC Initiator Port Subprofile consisting of an SBProtocolEndpoint and FCPortStatistics, providing data and implementation for FCPort.

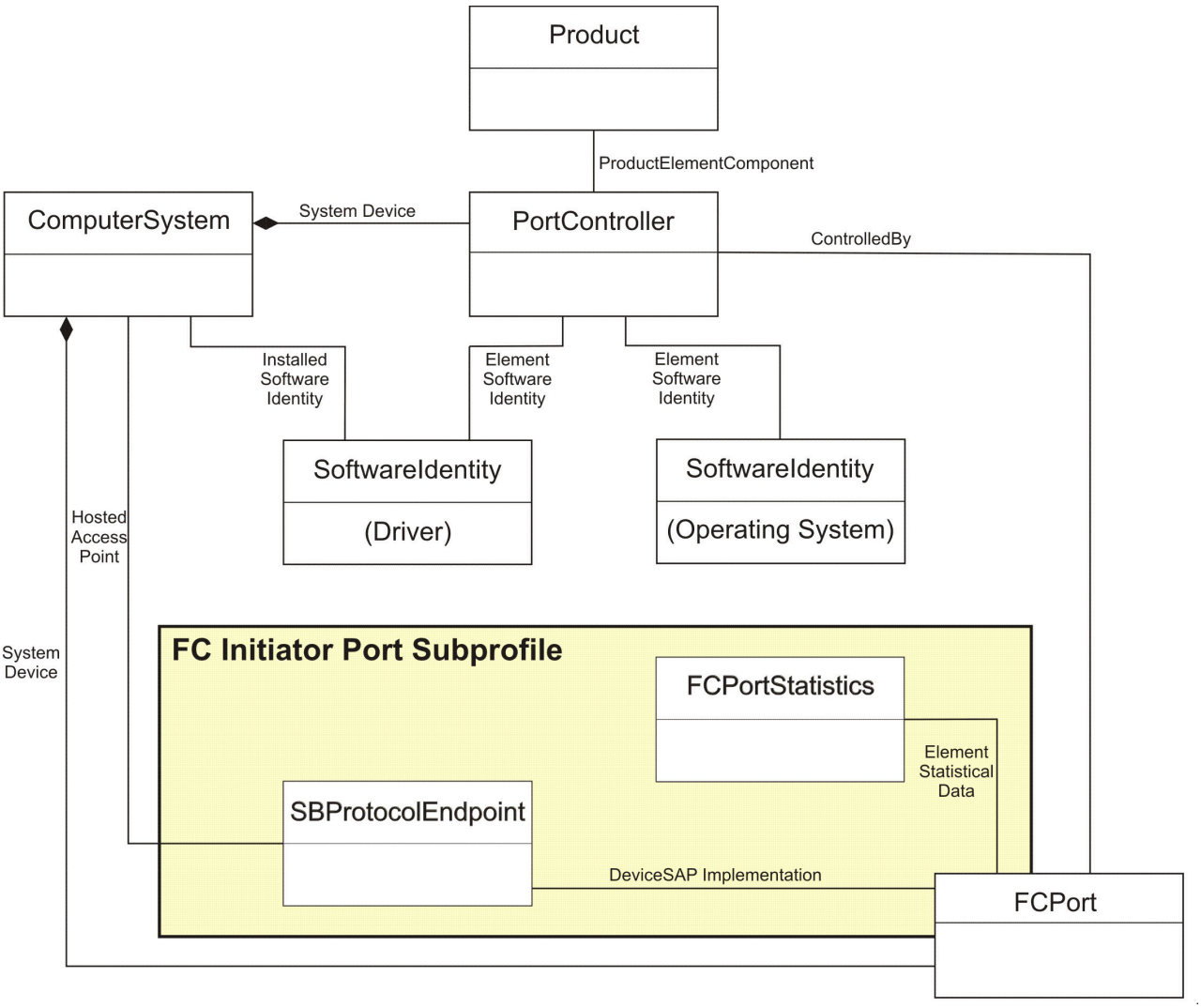


Figure 9. HBA Instance Diagram

Used CIM elements

Element name	implementing z/OS class	Reference
CIM_FCPort	IBMzOS_FCPort	see page 211
CIM_FCPortStatistics	IBMzOS_FCPortStatistics	see page 214
CIM_PortController	IBMzOS_PortController	see page 215
CIM_Product	IBMzOS_Product	see page 217
CIM_SoftwareIdentity	IBMzOS_SoftwareIdentity	see page 220
CIM_SystemDevice	IBMzOS_CSFCPortController	see page 222
CIM_ProtocolEndpoint	IBMzOS_SBProtocolEndpoint	see page 218
Association CIM_ControlledBy	Association IBMzOS_ControlledBy	see page 222
Association CIM_DeviceSAP Implementation	Association IBMzOS_SBDeviceSAP Implementation	see page 224

Element name	implementing z/OS class	Reference
Association CIM_ElementSoftwareIdentity	Association IBMzOS _ElementSoftwareIdentity	see page 222
Association CIM_ElementStatisticalData	Association IBMzOS_FCPortStatisticalData	see page 223
Association CIM_HostedAccessPoint	Association IBMzOS_SBHostedAccessPoint	see page 224
Association CIM_InstalledSoftwareIdentity	Association IBMzOS _InstalledSoftwareIdentity	see page 223
Association CIM_Product ElementComponent	Association IBMzOS_Product ElementComponent	see page 223
Association CIM_Initiator TargetLogicalUnitPath	Association IBMzOS_SBInitiator TargetLogicalUnitPath	see page 225

Chapter 8. z/OS Management Instrumentation for CIM

The CIM standard provides the ability to develop management applications that work with systems management data. To work with CIM, developers should have a thorough understanding of the CIM standard defined by the DMTF. For more information about the CIM standard, see ***Common Information Model (CIM) Standards*** on the DMTF website.

IBM has developed providers for z/OS that support basic operating system information and some performance metrics. A CIM provider is the link between the CIM server and the system (see Figure 2 on page 5). This interface allows CIM to access and manage the resources. Each CIM provider makes accessible the resources it represents in a standard way.

Notes:

1. **IBM only supports the classes and properties listed in the present document or in other z/OS documentation provided by IBM. All other classes or properties which are not documented by IBM, IBM does not support, and bears no responsibility for their use.**
2. Not all properties of the supported CIM classes described in this document are implemented by z/OS. Those properties implemented by z/OS are documented in each of the following subchapters. For all CIM properties not implemented by z/OS, the CIM server returns no values.

The following CIM classes and associations are implemented as IBM-supplied providers to provide basic operating system information:

Base classes
(See page 110)

- IBMzOS_ComputerSystem: subclass of CIM_ComputerSystem
- IBMzOS_OperatingSystem: subclass of CIM_OperatingSystem
- IBMzOS_OSProcess: subclass of association CIM_OSProcess
- IBMzOS_Process: subclass of CIM_Process
- IBMzOS_RunningOS: subclass of association CIM_RunningOS
- IBMzOS_UnixProcess: subclass of CIM_UnixProcess
- IBMzOS_LogicalDisk: subclass of CIM_LogicalDisk
- IBMzOS_LogicalDiskDevice: subclass of association CIM_SystemDevice

BaseBoard classes
(See page 121)

- IBM_BaseBoard: subclass of CIM_Card
- IBMzOS_BaseBoard: subclass of IBM_BaseBoard

Processor classes
(See page 125)

- IBMzOS_CSProcessor: subclass of association CIM_SystemDevice
- IBMzOS_Processor: subclass of CIM_Processor

File System classes
(See page 133)

- IBMzOS_HostedFileSystem: subclass of association CIM_HostedFileSystem

- IBMzOS_NFS: subclass of CIM_NFS
- IBMzOS_UnixLocalFileSystem: subclass of CIM_UnixLocalFileSystem

Network classes

(See page 137)

- IBMzOS_EthernetPort: subclass of CIM_EthernetPort
- IBMzOS_CSNetworkPort: subclass of association CIM_SystemDevice
- IBMzOS_IPProtocolEndpoint: subclass of CIM_IPProtocolEndpoint
- IBMzOS_NetworkPortImplementsIPEndpoint: subclass of association CIM_PortImplementsEndpoint

Job classes

(See page 142)

- IBMzOS_Job: subclass of CIM_Job
- IBMzOS_JES2Job: subclass of IBMzOS_Job
- IBMzOS_JES3Job: subclass of IBMzOS_Job
- IBMzOS_SysoutDataset: subclass of CIM_LogicalFile
- IBMzOS_JES2SysoutDataset: subclass of IBMzOS_SysoutDataset
- IBMzOS_JES3SysoutDataset: subclass of IBMzOS_SysoutDataset
- IBMzOS_Subsystem: subclass of CIM_Service
- IBMzOS_JobsManagementSettings: subclass of CIM_SettingData
- association IBMzOS_SubsystemJES2Jobs (between IBMzOS_Subsystem and IBMzOS_JES2Job)
- association IBMzOS_SubsystemJES3Jobs (between IBMzOS_Subsystem and IBMzOS_JES3Job)
- association IBMzOS_UsesJES3SysoutDatasets (between IBMzOS_JES3Job and IBMzOS_JES3SysoutDataset)
- association IBMzOS_UsesJES2SysoutDatasets (between IBMzOS_JES2Job and IBMzOS_JES2SysoutDataset)

Cluster classes

(See page 171)

- IBMzOS_Sysplex: subclass of IBMzOS_Cluster
- IBMzOS_SysplexNode: subclass of IBMzOS_ClusterNode
- IBMzOS_CouplingFacility: subclass of IBMzOS_ClusterAggregatedResource
- IBMzOS_CFStructure: subclass of IBMzOS_ClusterAggregatedResource
- IBMzOS_CFStructureConnector: subclass of IBMzOS_ClusterResource
- IBMzOS_ClusterResource
- IBMzOS_ClusterGlobalResource
- IBMzOS_ClusterAggregatedResource
- IBMzOS_Cluster
- IBMzOS_ClusterNode
- association IBMzOS_CollectionOfSysplexNodes
- association IBMzOS_CollectionOfCFs
- association IBMzOS_HostedCFStructure
- association IBMzOS_HostedCFStrConnector
- association IBMzOS_CFStructureDependsOn
- association IBMzOS_UsesCFs

- association IBMzOS_UsesCouplingFunctions
- association IBMzOS_UsesSysplexCoupleDatasets
- association IBMzOS_UsesCFRMCoupleDatasets
- association IBMzOS_UsesCFRMPolicies

Cluster indications

(See also "Support of CIM indications" on page 6)

- IBMzOS_SysplexInstCreation
- IBMzOS_SysplexInstModification
- IBMzOS_Sysplex_ReallocateInitiated
- IBMzOS_Sysplex_ReallocateCompleted
- IBMzOS_Sysplex_CFRM_CDS_Initialized
- IBMzOS_SysplexNodeInstCreation
- IBMzOS_SysplexNodeInstDeletion
- IBMzOS_SysplexNodeInstModification
- IBMzOS_CouplingFacilityInstCreation
- IBMzOS_CouplingFacilityInstDeletion
- IBMzOS_CouplingFacilityInstModification
- IBMzOS_CFStructureInstCreation
- IBMzOS_CFStructureInstDeletion
- IBMzOS_CFStructureInstModification
- IBMzOS_CFStrConnectorInstCreation
- IBMzOS_CFStrConnectorInstDeletion
- IBMzOS_CFStrConnectorInstModification
- IBMzOS_CollectionOfSysplexNodesInstCreation
- IBMzOS_CollectionOfSysplexNodesInstDeletion
- IBMzOS_CollectionOfCFsInstCreation
- IBMzOS_CollectionOfCFsInstDeletion
- IBMzOS_HostedCFStructureInstCreation
- IBMzOS_HostedCFStructureInstDeletion
- IBMzOS_HostedCFStrConnectorInstCreation
- IBMzOS_HostedCFStrConnectorInstDeletion

Storage management classes

(See page 208)

- CIM_StorageExtent
- IBMzOS_FCPort
- IBMzOS_FCPortStatistics
- IBMzOS_PortController
- IBMzOS_Product
- IBMzOS_SBProtocolEndpoint
- IBMzOS_SoftwareIdentity
- association IBMzOS_ControlledBy
- association IBMzOS_CSFCPort
- association IBMzOS_CSFCPortController
- association IBMzOS_ElementSoftwareIdentity
- association IBMzOS_FCPortStatisticalData

- association IBMzOS_InstalledSoftwareIdentity
- association IBMzOS_ProductElementComponent
- association IBMzOS_SBDeviceSAPImplementation
- association IBMzOS_SBHostedAccessPoint
- association IBMzOS_SBInitiatorTargetLogicalUnitPath

WLM classes

(See page 227)

- IBMzOS_WLM
- association IBMzOS_WLMOS (between IBMzOS_WLM and IBMzOS_ComputerSystem)

WLM indications

(See page 227)

- IBMzOS_WLMPolicyActivationIndication

CIM classes implemented by RMF

Please note that for using the CIM providers implemented by RMF you need to have RMF installed and additional configuration is required (see Chapter 11, "Connecting the RMF CIM providers to the RMF Distributed Data Server (DDS)," on page 233). For more information, see *z/OS RMF Programmer's Guide* and *z/OS RMF User's Guide*.

- IBMzOS_BaseMetricValue
- IBMzOS_BaseMetricDefinition
- IBMzOS_MetricForME
- IBMzOS_MetricDefForME
- IBMzOS_MetricInstance
- IBMzOS_Channel
- IBMz_CEC
- IBMz_ComputerSystem
- IBMzOS_WLMServiceDefinition
- IBMzOS_WLMServiceClassPeriod

To exploit this functionality, RMF must be installed and running.

Notes:

1. The z/OS Communications Server provides documentation of these CIM classes. For details refer to ***Considerations for Common Information Model (CIM) providers*** in *z/OS Communications Server: IP Configuration Guide*.
2. For all classes, the properties that are common for eServer and the z/OS specific properties are documented in separate tables.
3. Starting with z/OS 1.9, the CIM server exploits the functionality of Common event adapter (CEA). CEA is a z/OS component that provides the ability to deliver z/OS events to C-language clients. A CEA address space is started automatically during initialization of every z/OS system. In order for the address space to start successfully, you must configure CEA to work with z/OS. Failure to do so will cause CEA to run in a minimum function mode. For details refer to *z/OS Planning for Installation*.
4. An extra security setup is needed for the Job and Cluster classes.

To understand the syntax of the graphics showing class structures, see "Legend for graphics showing class structures" on page xii.

Supported CIM operations

While the z/OS CIM server supports all of the CIM operations from the DMTF's ***CIM Operations over HTTP*** specification, only a specific subset of operations is supported by the OS management CIM providers delivered with this release of z/OS.

The following operations are available for all OS management classes or for association classes.

Available for all OS management classes:

- EnumerateInstanceNames
- EnumerateInstances
- GetInstance

Additionally available for all association classes:

- Associators
- AssociatorNames
- References
- ReferenceNames

OS management Base classes

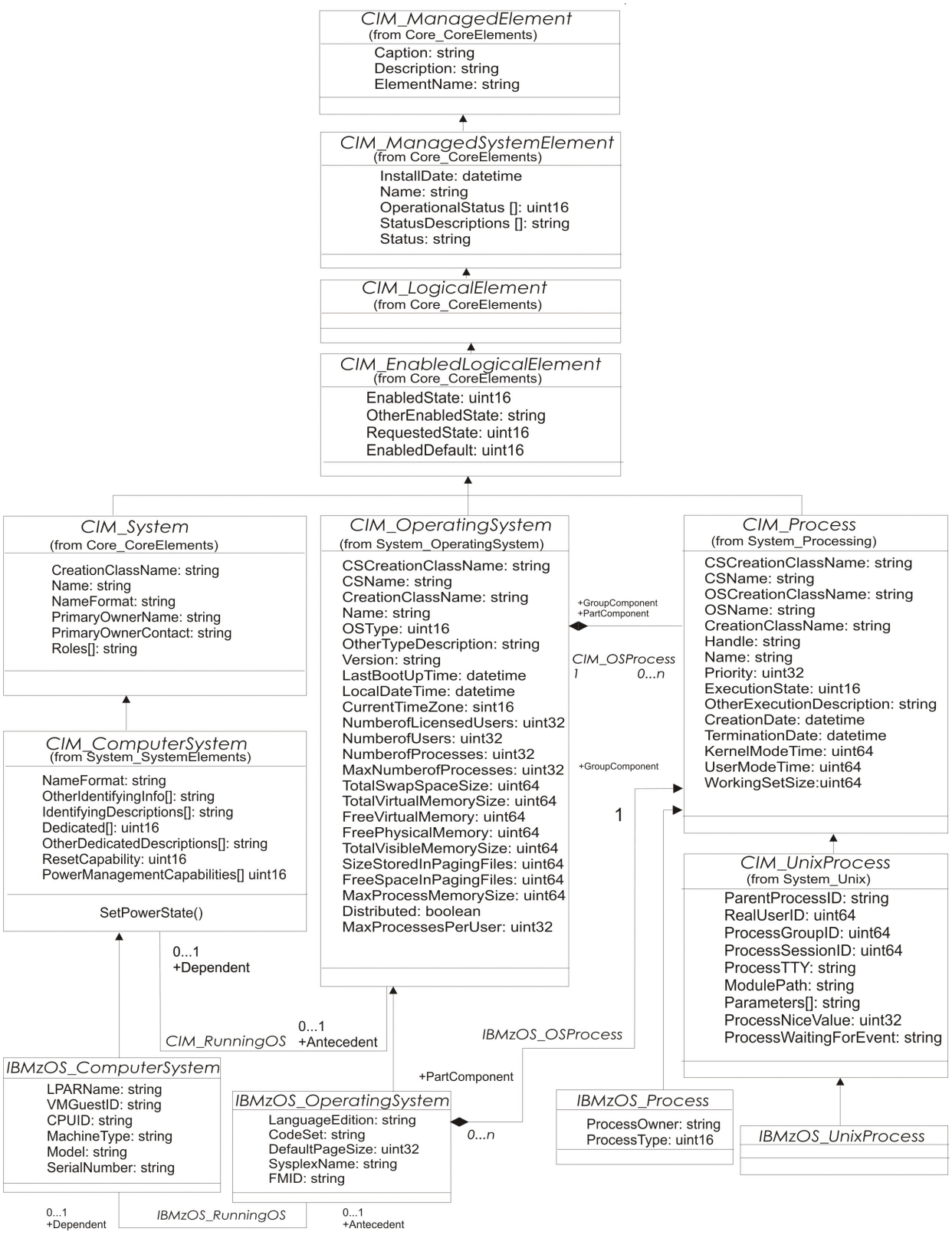


Figure 10. CIM Base classes extended by z/OS-specific classes (1)

Figure 10 on page 110 illustrates the relationship between the IBM extension classes, and the CIM Base classes that they extend. The packages, in which the classes are defined in the CIM Schema, are indicated in parenthesis. The DMTF website provides a detailed description of the CIM base classes. The z/OS-specific classes are described in detail in the following chapters.

The MOF files that define these classes can be found in directory *schemas/os_management* relative to where the providers for z/OS have been installed. The default is */usr/lpp/wbem/provider*.

CIM_ComputerSystem

Purpose

This class represents either virtual or physical computer systems in the sense of a container inside which an operating system may run. This is the central class of the OS Management data model and aggregates all other resource classes.

Inheritance

The z/OS specific subclass is IBMzOS_ComputerSystem (see "IBMzOS_ComputerSystem" on page 113).

CIM_OperatingSystem

Purpose

This class represents a running operating system with its basic properties.

Inheritance

The z/OS specific subclass is IBMzOS_OperatingSystem (see "IBMzOS_OperatingSystem" on page 115).

CIM_OSProcess

Purpose

This class associates an operating system with the set of currently active address spaces and UNIX System Services processes.

Inheritance

The z/OS specific subclass is IBMzOS_OSProcess (see "IBMzOS_OSProcess" on page 117).

CIM_Process

Purpose

This class represents currently active processes on an operating system. For z/OS this is mapped to address spaces and UNIX System Services processes.

Inheritance

The z/OS specific subclasses are:

- IBMzOS_Process (for address spaces) (see "IBMzOS_Process" on page 118)
- IBMzOS_UnixProcess (for UNIX System Services processes) (see "IBMzOS_UnixProcess" on page 120)

CIM_RunningOS

Purpose

This class associates a computer system with the currently running operating system (see Figure 10 on page 110).

Inheritance

The z/OS specific subclass is IBMzOS_RunningOS (see "IBMzOS_RunningOS" on page 119).

IBMzOS_ComputerSystem

Purpose

This class provides basic computer system information such as computer name, and status information. A provider instruments this class so that it can be used by client applications to identify the managed system on which the provider is running (typically a server or an application).

Inheritance

CIM_ManagedElement
- ← CIM_ManagedSystemElement
- ← CIM_LogicalElement
- ← CIM_EnabledLogicalElement
- ← CIM_System
- ← CIM_ComputerSystem
- ← IBMzOS_ComputerSystem

Used by the following CIM profiles

- Host Discovered Resources Profile
- IBM OS management

Properties

The following properties are common for eServer:

string Caption — Always set to `IBM z/OS Computer System`.

string Description — Always set to `This is an IBMzOS_ComputerSystem`.

string ElementName — Returns `IBM:`*`model`*

string Name [key] — The fully qualified IP host name.

string CreationClassName [key] — Always set to `IBMzOS_ComputerSystem`

string NameFormat — Describes the format used to build the Name property. Always set to `IP`.

uint16 Dedicated[] — Indicates whether this is a special purpose system. Always set to 0 (not dedicated).

string UUID — The universally unique identifier of the server. For z/OS, no value is supplied for this property, but it is maintained for compatibility with the other IBM eServer platforms.

string HostingSystemName — A name that identifies the underlying hosting system in a virtualized environment. Returns *`Elementname + serialnumber`*.

string HostingSystemNameFormat — The name format used for HostingSystemName. Always returns `Other`.

The following properties have data that may be specific to z/OS, or may map to z/OS specific attributes.

string LPARName — Name of the zSeries® logical partition that makes up the computer system. If not running in LPAR mode, a blank string is returned here.

string VMGuestID	z/VM® user ID of the virtual machine, of which the current z/OS image is a guest. If z/OS is not running as a guest under z/VM, a blank string is returned here.
string CPUID	String containing the readable part of the serial number concatenated with the model number.
string SerialNumber	IBM allocated number used to identify the server on which this computer system is running.
string MachineType	Processor family of this z/OS server.
string Model	Model number of the server.
string Manufacturer	The name of the company that produced the server.
uint16 LPARid	Logical partition number. This number distinguishes the configuration from all other level-2 configurations provided by the same LPAR hypervisor.
string Plant	Plant of manufacturer for the CPU.

IBMzOS_OperatingSystem

Purpose

This class is for use by client applications to obtain basic properties of a running z/OS operating system.

Inheritance

CIM_OperatingSystem

↖ IBMzOS_OperatingSystem

Properties

The following properties are common for eServer:

string Name [key] The name of the z/OS operating system.

uint16 OperationalStatus[] Overall system status.

uint16 OSType Always 68 (*'z/OS'*).

string Version Version, release and modification of the operating system in the format of "VV.RR.MM". For example, for z/OS V1.7.0, this will return "01.07.00".

datetime LastBootUpTime Time when the operating system was IPLed.

datetime LocalDateTime Local time of the operating system

sint16 CurrentTimeZone Time zone for the operating system, offset in minutes from GMT.

uint32 NumberOfUsers The number of currently logged on TSO and Unix System Services users.

uint32 NumberOfProcesses Total number of UNIX processes and active address spaces.

uint32 MaxNumberOfProcesses
The maximum number of processes configured in MaxProcSys.

uint64 MaxProcessMemorySize
The maximum number of KBytes of memory that can be allocated to a process (RLIMIT_AS).

uint64 TotalVirtualMemorySize
Total number of KBytes of virtual memory available to the operating system.

uint64 FreeVirtualMemory Number of KBytes of virtual memory currently unused and available.

uint64 FreePhysicalMemory Number of KBytes of physical memory currently unused and available.

uint64 TotalVisibleMemorySize
The total amount of physical memory (in KBytes) available to the operating system.

uint64 SizeStoredInPagingFiles
The total number of KBytes that can be stored in the operating system's page data sets.

uint64 FreeSpaceInPagingFiles
The total number of KBytes currently free in the operating system's page data sets.

The following properties have data that may be specific to z/OS, or may map to z/OS specific attributes.

string LanguageEdition eServer specific extension for the language version of the OS. For z/OS always returns *'en-US'*.

string CodeSet eServer specific extension for the default OS code page. For z/OS this returns the code page for the CIM server process.

uint32 DefaultPageSize eServer specific extension. The default size of pages used by the virtual memory management in units of bytes. Always 4096 for z/OS.

string SysplexName The name of the z/OS Sysplex to which this operating system belongs.

string FMID Function modification identifier of the z/OS operating system.

uint32 LastBootUpDuration Indicates the time in seconds used to complete the IPL.

string IPLProfile[] HMC profile from which the operating system was IPLed. `IPLProfile` contains 4 elements:

ipaiodfu	IODF unit address
ipaloads	LOADxx suffix
ipapromt	Operator prompt flag
ipanucid	Nucleus ID

string sequentialReleaseNumber
Release number of the operating system as an ever increasing number, e.g. `21.00` for z/OS 1.11.

IBMzOS_OSProcess

Purpose

This class provides a link between the operating system and process(es) running in the context of this operating system. Client applications can use this provider to give clients an understanding of the processes (jobs) running on the managed system within the context of its operating system.

Inheritance

CIM_OSProcess

↖ IBMzOS_OSProcess

IBMzOS_Process

Purpose

This class provides basic process information such as process name, priority, and run-time state. Instances of class IBMzOS_Process are mapped to z/OS address spaces. Client applications can use this class to give clients an understanding of the processes (address spaces) running on the managed system within the context of their operating system.

Note: z/OS also provides the notion of a UNIX process through the UNIX System Services. In addition, those processes running under UNIX System Services are supported by the extra IBMzOS_UnixProcess class which is derived from class CIM_UnixProcess. When a client enumerates all instances of class CIM_Process, it gets the complete list of z/OS address spaces, as well as all processes running under UNIX System Services. However, if the client enumerates the instances of class IBMzOS_Process directly, it only gets the list of address spaces since class IBMzOS_UnixProcess is not derived from IBMzOS_Process but only from CIM_UnixProcess. Ideally, IBMzOS_UnixProcess should inherit from IBMzOS_Process, besides inheriting from CIM_UnixProcess, however, multiple inheritance is not the current standard in CIM version 2. For inheritance information of the mentioned classes refer to Figure 10 on page 110.

Inheritance

CIM_Process

↖ IBMzOS_Process

Properties

The following properties are common for eServer:

string Name	The name of the z/OS address space.
string Handle [key]	The decimal representation of the address space ID(ASID).
uint32 Priority	The address space's dispatching priority.
datetime CreationDate	The time when the address space was created.
uint64 KernelModeTime	Not supported for z/OS.
uint64 UserModeTime	Not supported for z/OS.

The following properties have data that may be specific to z/OS, or may map to z/OS specific attributes:

string ProcessOwner	The primary z/OS user ID under which an address space was started.
uint16 ProcessType	The type of address space. Possible values are: 0 (Other), 1 (TSO User), 2 (Started Task), 3 (Job), 4 (System Address Space), 5 (Initiator).

IBMzOS_RunningOS

Purpose

This class is for use by clients to find associations between a computer system and the operating system that is currently running on the computer system.

Inheritance

CIM_OperatingSystem

← IBMzOS_OperatingSystem

IBMzOS_UnixProcess

Purpose

This class provides basic information about z/OS processes running in the Unix System Services subsystem. It supports all properties from CIM_Process plus a set of properties typical for Unix processes.

Inheritance

Class IBMzOS_UnixProcess is not derived from IBMzOS_Process, and therefore no instances of IBMzOS_UnixProcess are returned when a client enumerates the instances of class IBMzOS_Process, rather than class CIM_Process.

CIM_Process

↖ IBMzOS_UnixProcess

Properties

The following properties are common for eServer:

string Name	The name of the z/OS Unix process. This is usually the name of the executable that started the process.
string Handle [key]	The z/OS Unix process ID.
uint32 Priority	The process priority.
uint16 ExecutionState	The process state (ready, blocked, suspended, stopped, and so on).
datetime CreationDate	The time when the process was started.
uint64 KernelModeTime	Not supported on z/OS.
uint64 UserModeTime	Not supported on z/OS.
string ParentProcessID	The parent process ID.
uint64 RealUserID	The real user ID.
uint64 ProcessGroupID	The process group ID.
uint64 ProcessSessionID	The process session ID.
string ProcessTTY	The TTY currently associated with this process.
string ModulePath	The executing process's command path.
string Parameters[]	The operating system parameters provided to the executing process. These are the argv[] values.

Class IBMzOS_UnixProcess has no z/OS specific properties.

OS management BaseBoard classes

Figure 11 illustrates the relationship between the IBM extension classes, and the CIM BaseBoard classes that they extend. The packages, in which the classes are defined in the CIM Schema, are indicated in parenthesis. The DMTF website provides a detailed description of the CIM BaseBoard classes. The z/OS-specific classes are described in detail in the following chapters.

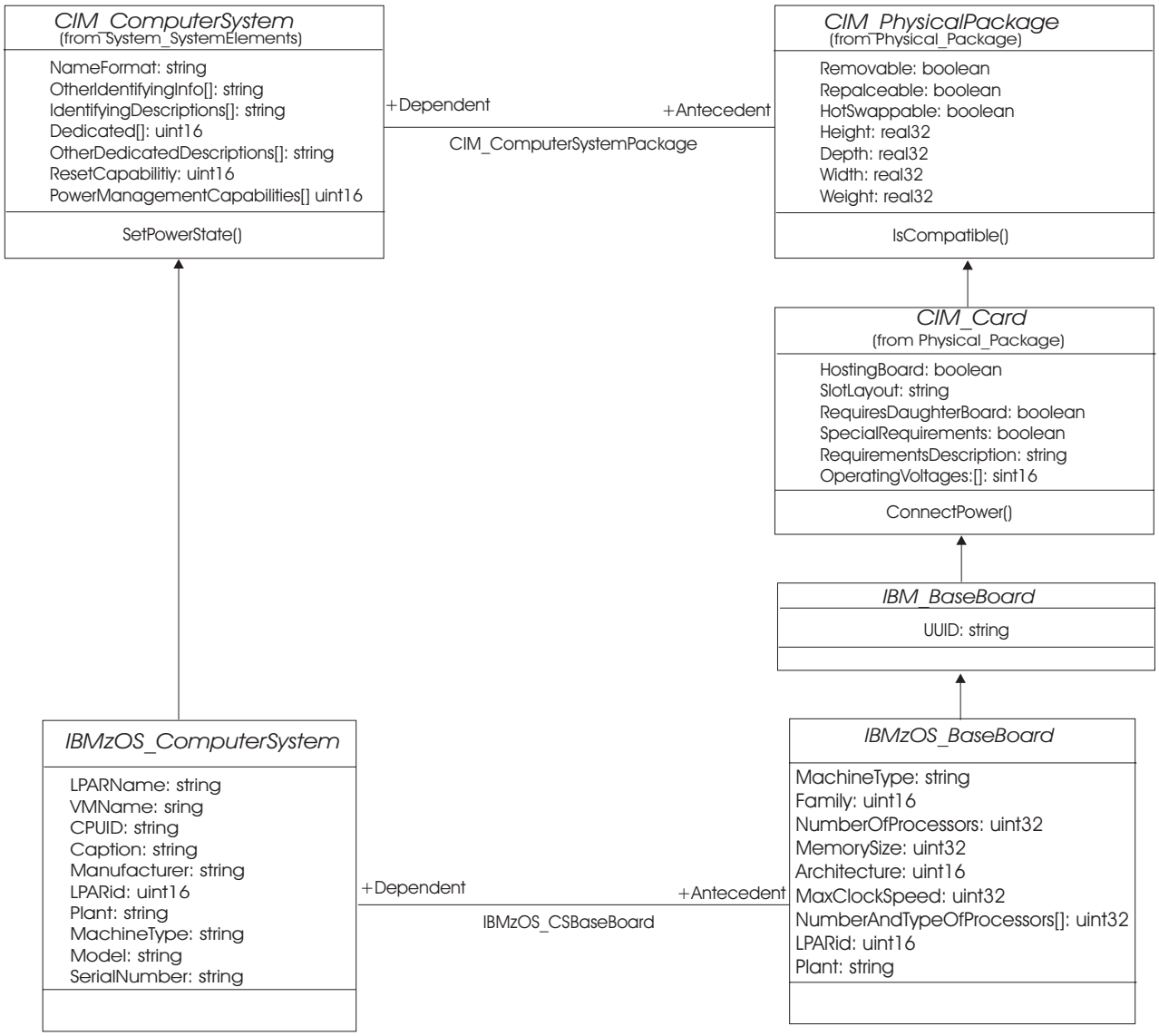


Figure 11. OS management BaseBoard Class

IBM_BaseBoard

Purpose

This class represents the unique characteristics of the physical hardware as recognized by the z/OS operating system running on that hardware (the inband view). On most platforms these are the characteristics of the main board, and therefore, the name IBM_BaseBoard was chosen for this class. Instances of this class are either identified by a unique ID that was assigned to the main board (property ***UUID***) or by the combination of manufacturer, model and serial number. The major purpose of this class is to provide the ability to determine which instances of computer systems are running on the same physical hardware.

Inheritance

The z/OS specific subclass is IBMzOS_BaseBoard (see "IBMzOS_BaseBoard" on page 123).

Properties

The following properties are common for eServer:

string Caption — Always returns *'Base Board'*.

string Description — Always returns *'A class derived from Card to deliver the systems base board hardware information.'*

string ElementName — Same as property ***Tag***.

string Tag [key] — A combination of manufacturer, model and serial number in the following format: `manufacturer:model:serialnumber`.

string CreationClassName [key] — Always returns *'IBMzOS_BaseBoard'*.

string SerialNumber — IBM allocated number used to identify the CEC.

string Model — The model number of the CEC, for example *'314'*.

string Manufacturer — The name of the company that produced the CEC.

string PartNumber — Not supported for z/OS.

boolean HostingBoard — Always returns `TRUE`, indicating that this card is a main board.

string UUID — The unique ID assigned to the main board. For z/OS, no value is supplied for this property, but it is maintained for compatibility with the other IBM eServer platforms.

IBMzOS_BaseBoard

Inheritance

IBM_BaseBoard

← IBMzOS_BaseBoard

Properties

The following properties have data that may be specific to z/OS, or may map to z/OS specific attributes.

string MachineType Processor type for the class of this z/OS server, for example: `2084`

uint16 Family The processor family. For z/OS, a value of 204 (z/Architecture® base) is returned.

uint32 NumberOfProcessors The number of general purpose processors installed on the system board.

uint32 MemorySize The total amount of physical memory (in Kbytes) available to the operating system through which this data was provided. Note that this is not the total amount of installed memory for the zSeries CEC. This is the inband view of z/OS.

uint16 Architecture The processor architecture.

uint32 NumberAndTypeOfProcessors[] An array of uint32 where the first element is the number of general purpose processors, the second element is the number of zAAPs, the third element is the number of zIIPs, if supported.

uint16 LPARid Logical partition number. This number distinguishes the configuration from all other level-2 configurations provided by the same LPAR hypervisor.

string Plant Plant of manufacturer for the CPU.

Association CIM_ComputerSystemPackage

Purpose

This class associates a ComputerSystem with the physical main board of the system on which it runs.

Inheritance

The z/OS specific subclass is IBMzOS_CSBaseBoard (see "Association IBMzOS_CSBaseBoard").

Association IBMzOS_CSBaseBoard

Purpose

This class associates a z/OS computer system with the physical zSeries CEC on which it runs (see Figure 11 on page 121). It has no properties.

Inheritance

CIM_ComputerSystemPackage

← IBMzOS_CSBaseBoard

OS management Processor classes

Figure 12 illustrates the relationship between the IBM extension classes, and the CIM Processor classes that they extend. The packages, in which the classes are defined in the CIM Schema, are indicated in parenthesis. The DMTF website provides a detailed description of the CIM Processor classes. The z/OS-specific classes are described in detail in the following chapters.

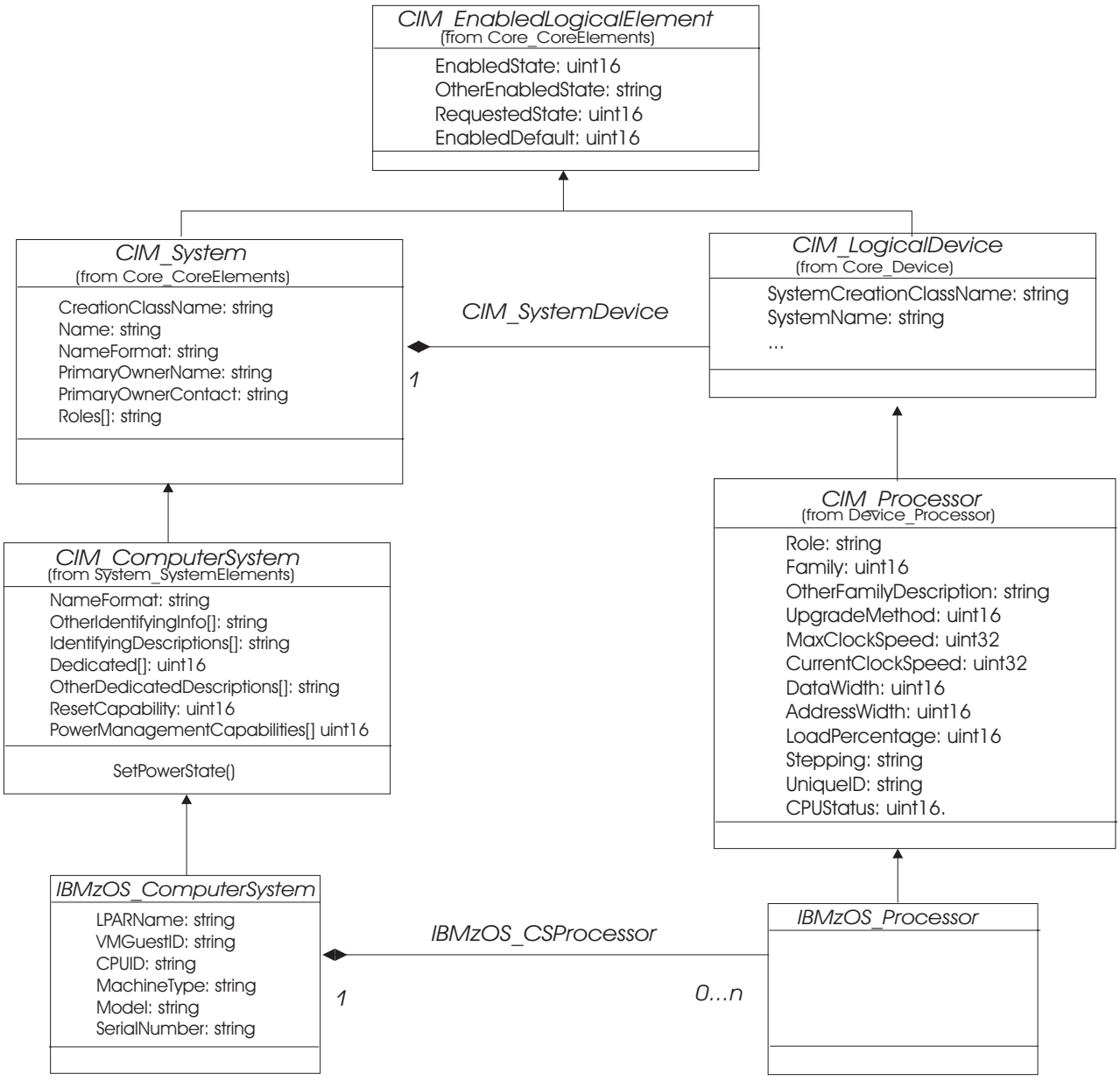


Figure 12. OS management Processor classes

CIM_Processor

Purpose

This class represents the physical processors that are available to the operating system.

Inheritance

The z/OS specific subclass is IBMzOS_Processor (see “IBMzOS_Processor” on page 127).

Association CIM_SystemDevice

Purpose

This class associates a **ComputerSystem** with the instrumented processors.

Properties

The z/OS specific subclass is IBMzOS_CSProcessor.

IBMzOS_Processor

Inheritance

CIM_Processor

← IBMzOS_Processor

Properties

The following properties are common for eServer:

string Caption
Always set to *'zSeries logical processor'*.

string Description
Always set to *'This class represents instances of processors currently available to the z/OS operating system'*.

string ElementName
Same as DeviceID.

string DeviceID [key]
Concatenation of the CPUID of the physical processor (PCCACPID) + colon (':') + CPU address. CBA987654321:2 is an example for a valid DeviceID.

If a CPU is in `Reserved` or `Offline` state, the CPUID is FFFFFFFFFFFF.

unit16 EnabledState

2 Online
3 Reserved
6 Offline
9 Offline by WLM

string Role

CP Central Processor (including zEAP Processors)
ZIIP zIIP processor
ZAAP zAAP processor
UNKNOWN no assigned role

uint16 Family
200 (=*'S/390® and zSeries Family'*).

string OtherFamilyDescription
'S/390 and zSeries Family' or specific model like *'z990'*.

uint32 MaxClockSpeed
Not supported for z/OS.

uint32 CurrentClockSpeed
Not supported for z/OS.

uint16 LoadPercentage
For z/OS provided through RMF metrics provider only.

string Stepping
Not supported for z/OS.

string UniqueID
CPUID of the physical processor (PCCACPID).

uint16 CPUStatus
Not supported for z/OS.

Class IBMzOS_Processor has no z/OS specific properties.

Methods

unit32 RequestStateChange()

Issues messages for the operator or automation to change the state of the processor.

Parameters:

[IN] uint16 RequestedState
Must be one of "Enabled" (2) or "Offline" (6).

[OUT] CIM_ConcreteJob REFJob
Always returns NULL.

[IN] datetime TimeoutPeriod
Must be either not defined or a CIM NULL value.

Return values

0 Completed without Error

4 Due to a system error the state change cannot take place. Check target system log.

5 Parameter *RequestedState* has not the value "Enabled" (2) or "Offline" (6).

4097 If the state change is different than from "Reserved" (3), "Offline" (6) to "Online" (2) or from "Online" (2) to "Offline" (6).

4098 If TimeoutPeriod is not 0 or NULL.

OS management Logical Disk classes

Figure 13 on page 130 illustrates the relationship between the IBM extension classes, and the CIM Base classes that they extend. This figure focuses on class ***IBMzOS_LogicalDisk*** which was provided in z/OS 1.9 CIM server to support the management of logical disks.

The packages, in which the classes are defined in the CIM Schema, are indicated in parenthesis.

The DMTF website provides a detailed description of the CIM Base classes. The z/OS-specific classes are described in detail in the following chapters.

Note: The described metrics are only available for active disks, but not for inactive or offline disks.

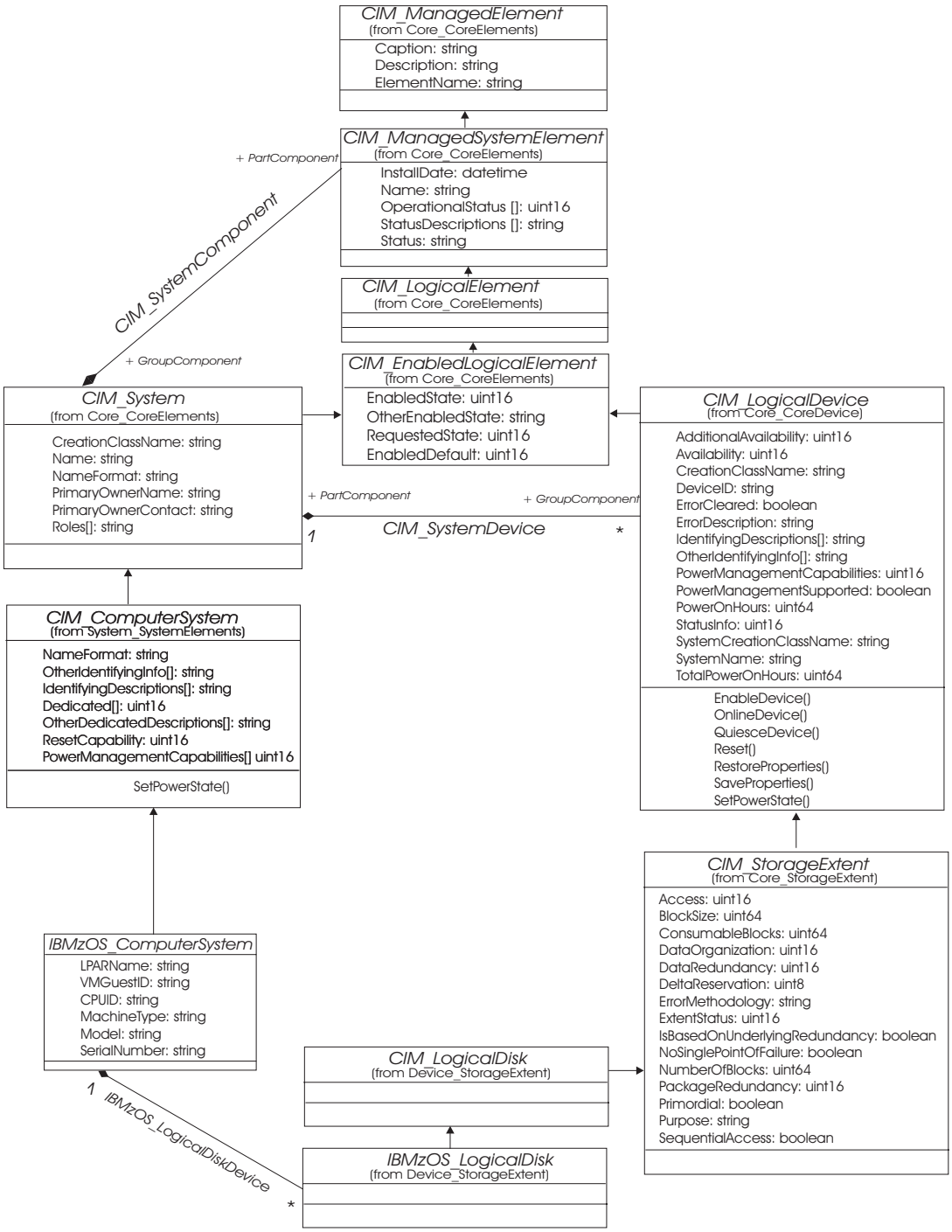


Figure 13. CIM Base classes extended by z/OS-specific classes (2)

CIM_LogicalDisk

Purpose

This class represents logical disks attached to an operating system.

Inheritance

The z/OS specific subclass is IBMzOS_LogicalDisk (see "IBMzOS_LogicalDisk" on page 131).

IBMzOS_LogicalDisk

Purpose

This class provides basic information about disk devices known to the z/OS operating system based on the logical view.

Inheritance

CIM_ManagedElement
← CIM_ManagedSystemElement
← CIM_LogicalElement
← CIM_EnabledLogicalElement
← CIM_LogicalDevice
← CIM_StorageExtent
← CIM_LogicalDisk
← IBMzOS_LogicalDisk

Used by the following CIM profiles

- Host Discovered Resources profile

Properties

string Caption — Always returns `z/OS Storage Volume`.

string Description — Always returns `Represents a storage volume as seen by z/OS`.

string ElementName — Same as Name (Volume Serial Number)

string Name — Unique identifier for the extent in the form *CC:SS:DDDD*, where
CC is the channel subsystem ID
SS is the SubchannelSetID
DDDD is the DeviceNumber

uint16 NameFormat — Returns
12 OS device name format

uint16 NameNamespace — Returns
8 OS device namespace

uint16 EnabledState — Mapped from the UCBONLI and UCBBOX values retrieved through UCBSCAN.

See Table 8 on page 132 for mapping values of ***EnabledState*** to system data.

string CreationClassName — Always returns `IBMzOS_LogicalDisk`.

string DeviceID — Channel Device ID obtained from UCBCHAN through UCBSCAN

string[] IdentifyingDescriptions — [0]=Device Node Element Description obtained from the NEDID field of the matching IHACDR control block.

string[] OtherIdentifyingInfo — [0]="Device Node Element Descriptor"

string SystemCreationClassName — Always returns `IBMzOS_ComputerSystem`.

string SystemName The systems fully qualified hostname (see ***IBMzOS_ComputerSystem:colon;Name***). Obtained through the ***OSBase_Common.get_system_name()*** function.

uint16 OperationalStatus[] Returns

0	Unknown
2	OK
9	Stopping
10	Stopped

The property ***enabledState*** is set based on the UCB control block information as shown in the following table:

Table 8. UCB control block information

UCBONLI	**UCBBOX**	
	Boxed	**Not boxed**
Online	Quiesce (9)	Enabled (2)
Offline	Disabled (3)	Disabled (3)
Pending Offline	Shutting down (4)	

Associations

IBMzOS_SBInitiatorTargetLogicalUnitPath

Source	IBMzOS_LogicalDisk
Target	CIM_ProtocolEndpoint
see	page 225

IBMzOS_LogicalDiskDevice

Source	IBMzOS_ComputerSystem
Target	IBMzOS_LogicalDisk

OS management File System classes

Figure 14 illustrates the relationship between the IBM extension classes, and the CIM FileSystem classes that they extend. The packages, in which the classes are defined in the CIM Schema, are indicated in parenthesis. The DMTF website provides a detailed description of the CIM FileSystem classes. The z/OS-specific classes are described in detail in the following chapters.

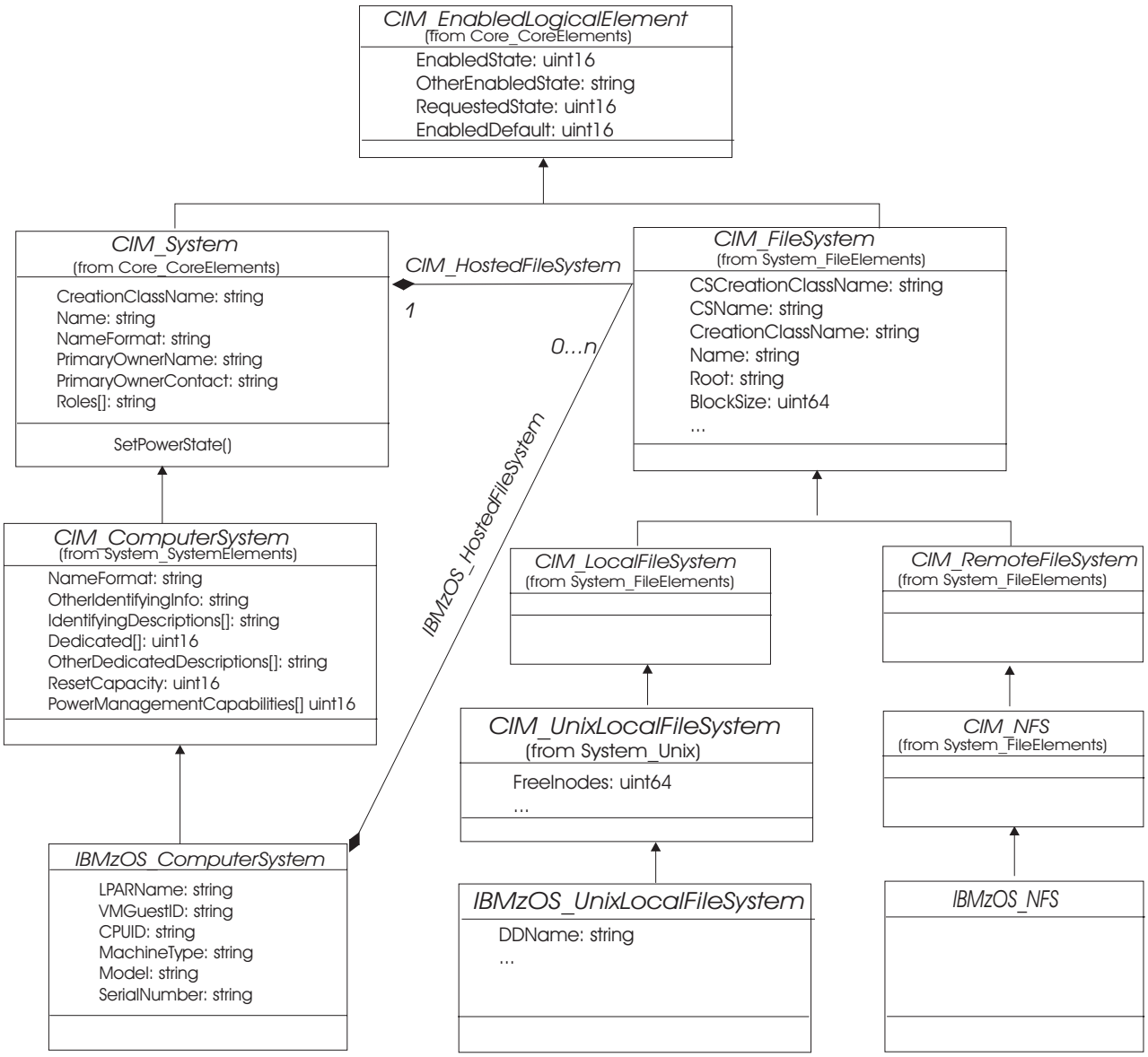


Figure 14. OS management FileSystem classes

CIM_LocalFileSystem

Purpose

This class represents file systems that are locally attached to a computer system. On z/OS, hierarchical file systems HFS and zFS are supported.

Inheritance

The z/OS specific subclass is IBMzOS_UnixLocalFileSystem (see "IBMzOS_UnixLocalFileSystem" on page 135).

CIM_RemoteFileSystem

Purpose

This class represents file systems that are accessed remotely by a computer system. On z/OS, only NFS is supported.

Inheritance

The z/OS specific subclass is IBMzOS_NFS (see "IBMzOS_NFS" on page 136).

Association CIM_HostedFileSystem

Purpose

The CIM_HostedFileSystem association associates a ComputerSystem with the set of currently mounted UNIX System Services file systems.

Inheritance

The z/OS specific subclass is IBMzOS_HostedFileSystem.

IBMzOS_UnixLocalFileSystem

Inheritance

CIM_LocalFileSystem

← IBMzOS_UnixLocalFileSystem

Properties

The following properties are common for eServer:

string Caption	Always set to *'z/OS hierarchical local file system'*.
string Description	Always set to *'This class represents instances of currently mounted local hierarchical file systems'*.
string ElementName	Same as Name.
string Name [key]	File system name (z/OS data set name).
string Root	Name of the directory where the file system is mounted.
uint64 FileSystemSize.	File system size in bytes.
uint64 AvailableSpace	Space available on the file system in bytes.
boolean ReadOnly	Indicates whether the file system is mounted read only.
string FileSystemType	File system type, for example *'NFS'*.

The following properties have data that may be specific to z/OS, or may map to z/OS specific attributes.

DDName	DD name that was specified on mount.
FSParentDeviceID	Device ID of the parent file system.
FSDeviceID	Device number which the `STAT` command will return for all files in this file system.
MountParameters	The parameters that were specified for the mount command.
FSOwner	MVS Owner ID of the file system.
FSTypeName	The file system type name from the PARMLIB statement.

IBMzOS_NFS

Inheritance

CIM_RemoteFileSystem

↖ IBMzOS_NFS

Properties

The following properties are common for eServer:

string Caption	Always set to *'z/OS mounted network file system'*.
string Description	Always set to *'This class represents instances of currently mounted network file systems'*.
string ElementName	Same as Name.
string Name [key]	File system name (corresponds to the *file system argument of the **mount** command)*.
string Root	Name of the directory where the file system is mounted.
uint64 FileSystemSize	File system size in bytes.
uint64 AvailableSpace	Space available the on file system in bytes.
boolean ReadOnly	Indicates whether the file system is mounted read only.
string FileSystemType	File system type, for example *'NFS'*.

Class IBMzOS_NFS has no z/OS specific properties.

OS management Network classes

The classes described in this section are implemented by the z/OS Communication Server. For details on these CIM classes, refer to *z/OS Communications Server: IP Configuration Guide*.

Access to TCP/IP stack data is controlled by a security resource. Such a security resource is required if a user ID, associated with the client of the CIM server, is not defined as a z/OS UNIX superuser. The resource name is **EZB.CIMPROV.sysname.tcpname**. It is defined in the `SERVAUTH` class. Access is granted if the user ID associated with the client of the CIM server is permitted for `READ` access to the resource.

The providers are installed in the `/usr/lpp/tcpip/lib` hierarchical file system directory and linked to the CIM server's provider directory.

The z/OS CS CIM class definition and provider registration files are installed in the `/usr/lpp/tcpip/mof` hierarchical file system directory and are already integrated into the CIM server.

Figure 15 on page 138 illustrates the relationship between the IBM extension classes, and the CIM Network classes that they extend. The packages, in which the classes are defined in the CIM Schema, are indicated in parenthesis. The DMTF website provides a detailed description of the CIM BaseBoard classes. The z/OS-specific classes are described in detail in the following chapters.

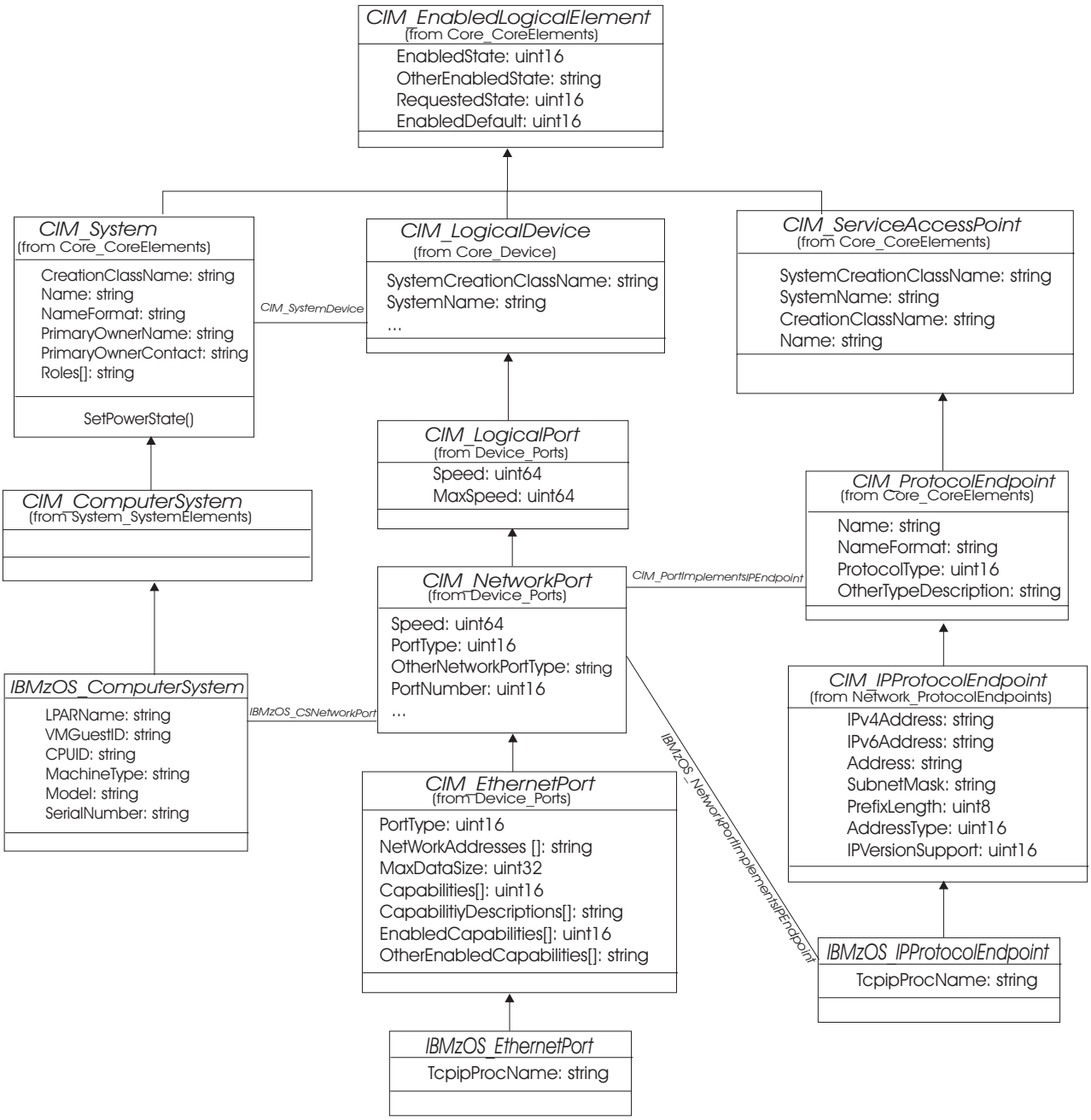


Figure 15. OS management Network classes

CIM_EthernetPort

Purpose
This class represents network ports (interfaces) of type ethernet. For z/OS, all the ethernet interfaces configured to the TCP/IP stacks on the MVS image are supported.

Inheritance
The z/OS specific subclass is IBMzOS_EthernetPort (see "IBMzOS_EthernetPort" on page 140).

CIM_IPProtocolEndpoint

Purpose
This class represents the installed IP protocols. For z/OS, all IPv4 addresses configured to the TCP/IP stacks on the MVS image are supported.

Inheritance
The z/OS specific subclass is IBMzOS_IPProtocolEndPoint (see "IBMzOS_IPProtocolEndpoint" on page 141).

CIM_PortImplementsEndpoint

Purpose
This class associates a network port with its installed network protocols. Currently, only IP protocols defined for Ethernet ports are returned.

Inheritance
The z/OS specific subclass is IBMzOS_NetworkPortImplementsIPEndpoint.

Association CIM_SystemDevice

Purpose
This class associates a ComputerSystem with the instrumented network ethernet ports.

Inheritance
The z/OS specific subclass is IBMzOS_CSNetworkPort.

IBMzOS_EthernetPort

Inheritance

CIM_EthernetPort

↖ IBMzOS_EthernetPort

Properties

The following properties are common for eServer:

string Caption Always set to *'IBMzOS EthernetPort'*.

string Description Variable, depending on the type of interface, for example, *'IP Assist Queued Direct I/O Ethernet protocol port'*.

string ElementName Same as Name.

string Name The label by which the NetworkPort is known to the operating system (*'tcpprocname_intfname'*).

uint16 EnabledState Indicates whether the protocol endpoint is active or not.

string DeviceID [key] Identifying information to uniquely name the ethernet port. (*'tcpprocname_intfname'*).

uint64 Speed The current bandwidth of the port in bits per second.

uint64 MaxSpeed The maximum bandwidth of the port in bits per second. For z/OS, this is always the same value as ***Speed***.

uint16 LinkTechnology Always 2 (=Ethernet).

string OtherLinkTechnology Not set for z/OS.

The following properties have data that may be specific to z/OS, or may map to z/OS specific attributes.

TcpipProcName z/OS TCP/IP stack name.

IBMzOS_IPProtocolEndpoint

Inheritance

CIM_IPProtocolEndpoint

↖ IBMzOS_IPProtocolEndpoint

Properties

The following properties are common for eServer:

string Caption — Always set to *'IBMzOS Protocol Endpoint for IP'*.

string Description — Always set to *'A communication point to send and receive data. This class is dedicated to relate IP interfaces to Logical Networks'*.

string ElementName — Same as Name.

string Name [key] — The unique name of the protocol endpoint, constructed according to the template in NameFormat.

uint16 EnabledState — Returns whether the protocol endpoint is active or not.

string NameFormat — Describes the format of the name property. For z/OS, this is always set to *'TCPIPPROCNAME_TYPE_DEVICE_IPADDR*(_ETH)'.

string IPv4Address — The IPv4 IP address.

string IPv6Address — Not yet supported for z/OS instrumentation.

string SubnetMask — The IPv4 IP subnet mask.

uint16 IPVersionSupport — Always returns 1 (=IPv4 only).

The following properties have data that may be specific to z/OS, or may map to z/OS specific attributes.

TcpipProcName — z/OS TCP/IP stack name.

OS management Job classes

The classes described in this section are implemented by z/OS to instrument the z/OS jobs subsystems, JES2 and JES3.

For using these providers you need an extra security setup as described in Chapter 10, “Cluster, CoupleDataset, and JES2-JES3Jobs provider setup,” on page 231.

For a list of the Jobs providers' reason codes, see Chapter 15, “Reason codes,” on page 277.

IBMzOS_JES2Job

Purpose

This class is a subclass of IBMzOS_Job and contains those properties that are unique to a job that has run, or will run, under JES2.

Inheritance

IBMzOS_Job

↖ IBMzOS_JES2Job

Properties

The following properties have been implemented for z/OS:

string Caption

A short description of the class. Returns *'IBM z/OS JES2 Job'*.

string Description

A description of the class. Returns *'This is an IBMzOS_JES2Job'*.

string ElementName

Name given to this instance of the class (same as Name)

datetime InstallDate

Not supported for z/OS.

string Name [key]

The property is overridden by ***IBMzOS_Job***. It contains a unique identifier for this job.

uint16 OperationalStatus[]

The current status of the JES2 job.

- **1** No subchain exists
- **2** Active in CI in FSS address space
- **3** Awaiting postscan (batch)
- **4** Awaiting postscan (damsel)
- **5** Awaiting volume fetch
- **6** Awaiting start setup (JES3), Awaiting setup (JES2)
- **7** Awaiting/active in MDS system select processing
- **8** Awaiting resource allocation
- **9** Awaiting unavailable volumes
- **10** Awaiting volume mounts
- **11** Awaiting/active in MDS system verify processing
- **12** Error during MDS processing
- **13** Awaiting selection on main (JES3), Awaiting execution (JES2)
- **14** Scheduled on main (JES3), Active executing (JES2)
- **17** Awaiting breakdown (JES3), Active in output (JES2)
- **18** Awaiting MDS restart processing
- **19** Main MDS processing complete
- **20** Awaiting output service (JES3), Awaiting hardcopy (JES2)
- **21** Awaiting output service writer
- **22** Awaiting reserved services
- **23** Output service complete

24 Awaiting selection on main (demand select job)
25 Ending function rq waiting or I/O completion
26 Ending function rq not processed
27 Maximum rq index value
128 Active in input processing
129 Awaiting conversion
130 Active in conversion
131 Active in setup
132 Active in spin
133 Awaiting output
134 Awaiting purge
135 Active in purge
136 Active on NJE sysout received
137 Awaiting NJE transmission
138 Active on NJE job transmitter

string StatusDescriptions[] Strings describing the various ***OperationalStatus*** values. Returns NULL.

string Status

Not supported for z/OS.

string JobStatus A free form string containing information about the job.

The primary job status is reflected in ***OperationalStatus***. ***JobStatus*** provides additional implementation-specific details.

datetime TimeSubmitted The time that the Job was submitted to execute.

A value of all zeros indicates that the owning element is not capable of reporting a date and time. Therefore, the ***ScheduledStartTime*** and ***StartTime*** are reported as intervals relative to the time their values are required.

datetime ScheduledStartTime Not supported for z/OS.

datetime StartTime The time that the Job was actually started.

This may be represented by an actual date and time, or by an interval relative to the time that this property is requested.

Note that this property is also present in the ***JobProcessingStatistics*** class. This is necessary to capture the processing information for recurring Jobs, since only the 'last' run time can be stored in this single-valued property.

datetime ElapsedTime The time interval that the Job has been executing or the total execution time if the Job is complete.

Note that this property is also present in the ***JobProcessingStatistics*** class. This is necessary to capture the processing information for recurring Jobs, since only the 'last' run time can be stored in this single-valued property.

uint32 JobRunTimes

Number of times that the Job should be run.

A value of 1 indicates that the Job is NOT recurring, while any non-zero value indicates a limit to the number of time that the Job will recur.

Zero indicates that there is no limit to the number of times that the Job can be processed, but that it is terminated either AFTER the ***UntilTime***, or by manual intervention.

By default, a job is processed once.

This property is not modifiable.

uint8 RunMonth

Not supported for z/OS.

sint8 RunDay

Not supported for z/OS.

sint8 RunDayOfWeek

Not supported for z/OS.

datetime RunStartInterval

The time interval after midnight when the Job should be processed.

For example, 00000000020000.000000:000 indicates that the Job should be run on or after two o'clock, local time of UTC time (distinguished using the ***LocalOrUtcTime*** property).

This property is not modifiable.

uint16 LocalOrUtcTime

This property indicates whether the time represented in the ***RunStartInterval*** and ***UntilTime*** properties represent local or UTC times.

Time values are synchronized worldwide by using the enumeration value 2, "UTC Time". Permitted values are:

1 Local time
2 UTC time

This property is not modifiable.

datetime UntilTime

The time after which the Job is invalid or should be stopped.

This may be represented by an actual date and time, or by an interval relative to the time that this property is requested.

A value of all nines indicates that the Job can run indefinitely.

This property is not modifiable.

string Notify

User to be notified upon the Job completion or failure.

This property can be modified using the ***RequestPropertyChange()*** method.

string Owner

The User that submitted the Job or the Service/method name/etc. that caused the job to be created.

uint32 Priority

Indicates the urgency or importance of execution of the Job.

The lower the number, the higher the priority.

Note that this property is also present in the ***JobProcessingStatistics*** class. This is necessary to capture the setting information that would influence a Job's results.

This property can be modified using the ***RequestPropertyChange()*** method.

uint16 PercentComplete

Not supported for z/OS.

boolean DeleteOnCompletion

Indicates whether or not the Job should be automatically deleted upon completion.

Note that the 'completion' of a recurring Job is defined by its ***JobRunTimes*** or ***UntilTime*** properties, OR when the Job is terminated by manual intervention.

If this property is set to `false` and the Job completes, then the extrinsic method ***DeleteInstance*** MUST be used to delete the Job versus updating this property.

This property is not modifiable.

uint16 ErrorCode

Not supported for z/OS.

string ErrorDescription

Not supported for z/OS.

uint16 RecoveryAction

Not supported for z/OS.

string OtherRecoveryAction

Not supported for z/OS.

string AbendCode

Job completed with abend code.

string AccountNumber

Account number from job card.

boolean ARMRegistered

Job is ARM registered indicator.

string AvailableSchedEnvSystem []

System names onwhich the scheduling environment required by job is available. Only valid if job requires a scheduling environment and that environment is available on at least one system.

string AvailableSeclabelSystems []

System names on which the seclabel associated with the job is available. Only valid if seclabel by system is active in the security product and the seclabel is available on at least on system.

boolean AwaitingARMRestart

Job awaiting ARM restart indicator.

string Building

NJE building.

This property is "Expensive".

uint32 CardCount

Card (output) count.

string Class
Job class.

This property can be modified using the ***RequestPropertyChange()*** method.

uint32 CompletionCode
Completion code (set for conditions marked with + in job completion indicator).

uint8 CompletionType
Specific completion type:
0 No completion info
1 Job ended normally
2 Job ended by CC
3 JCL error
4 Canceled
5 Abended
6 Converter abended
7 Security error
8 Job failed in EOM

uint16 CopyCount
Job copy count.

This property is "Expensive".

string CSName
The scoping Computer System.

string DefaultPrintDest
Default print destination.

This property can be modified using the ***RequestPropertyChange()*** method.

string DefaultPunchDest
Default punch destination.

This property can be modified using the ***RequestPropertyChange()*** method.

string Department
NJE department.

This property is "Expensive".

string Device
Name of device job is active on.

uint32 EstimatedTimeToExecution
Estimated time to execution in seconds.

This field is only available if the job is awaiting execution, job is scheduled to run to a WLM managed class, job is not held (duplicate job name, operator hold, etc.), member it has affinity to is available, and the scheduling environment is available.

datetime ExecutionEndTime
Execution end time and date.

This property is "Expensive".

string ExecutionMember
Execution JES2 member name.

This property is "Expensive".

string ExecutionNode
Execution node.

This property can be modified using the ***RequestPropertyChange()*** method.

datetime ExecutionStartTime
Execution start time and date.

This property is "Expensive".

string ExecutionSystem
Execution MVS system name.

This property is "Expensive".

uint8 HoldIndicator
Job hold indicator:
1 Not held
2 Held
3 Held for duplicate job name

uint32 InputCount
Job input count.

This property is "Expensive".

string InputDevice
Input device name.

This property is "Expensive".

datetime InputStartTime
Input start time and date.

This property is "Expensive".

string InputSystem
Input system or member.

boolean JesLogSpinnable
Jeslog spinnable indicator.

boolean JobClassModeWLM
Job class mode for job. If `true`, mode is WLM, otherwise mode is JES.

string JobID
Job identifier.

boolean JobIsActive
Indicate job is executing.

string JobName
Job name.

uint8 JobType
Job type:
1 Started task (STC)
2 Time sharing user (TSU)
3 Batch job (JOB)
4 APPC indicator

uint32 LineCount
Line count.

This property is "Expensive".

string MemberName
JES2 member on which the job is active.

string MessageClass
Message class from job card.

string NotifyNode
Notify node.

This property is "Expensive".

string OriginalJobID
Original job identifier.

string OriginNode
Original node (node of submittal).

string OSName
The scoping Operating System's name.

uint32 PageCount
Job page count.

This property is "Expensive".

uint8 Phase
Phase job is in:
1 No subchain exists
2 Active in CI in FSS address space
3 Awaiting postscan (batch)
4 Awaiting postscan (damsel)
5 Awaiting volume fetch

6 Awaiting start setup (JES3), Awaiting setup (JES2)
7 Awaiting/active in MDS system select processing
8 Awaiting resource allocation
9 Awaiting unavailable volumes
10 Awaiting volume mounts
11 Awaiting/active in MDS system verify processing
12 Error during MDS processing
13 Awaiting selection on main (JES3), Awaiting execution (JES2)
14 Scheduled on main (JES3), Active executing (JES2)
17 Awaiting breakdown (JES3), Active in output (JES2)
18 Awaiting MDS restart processing
19 Main MDS processing complete
20 Awaiting output service (JES3), Awaiting hardcopy (JES2)
21 Awaiting output service writer
22 Awaiting reserved services
23 Output service complete
24 Awaiting selection on main (demand select job)
25 Ending function rq waiting or I/O completion
26 Ending function rq not processed
27 Maximum rq index value
128 Active in input processing
129 Awaiting conversion
130 Active in conversion
131 Active in setup
132 Active in spin
133 Awaiting output
134 Awaiting purge
135 Active in purge
136 Active on NJE sysout received
137 Awaiting NJE transmission
138 Active on NJE job transmitter

string ProgrammerName Programmer name from job card.

string RoomNumber Job card room number.

string Seclabel Seclabel from job.

boolean Spin Indicator of whether jobs in the job class can be spun.

string Subsystem Subsystem name.

string SystemName MVS system name on which the job is active.

uint32 WLMActiveJobCount Number of active jobs in this WLM service class.

uint32 WLMJobsOnQueueCount
Number of jobs on WLM service class queue.

uint32 WLMPosition Position of this job on WLM service class queue.

uint32 WLMSchedulingEnvironment
WLM scheduling environment.

This property can be modified using the ***RequestPropertyChange()*** method.

string WLMServiceClass WLM service class.

This property can be modified using the ***RequestPropertyChange()*** method.

string PercentSpoolUtilization
Percent of spool Used by the following CIM profiles the job.

boolean ConverterWait Job can be converted only by CNVT PCEs that can wait for OS

boolean Independent Job is set to independent mode.

uint32 JobKey Job key

boolean JobNotRunReasonJobBusyOnDevice
Job not running because job busy on device

boolean JobNotRunReasonJobClassHeld
Job not running because job class held

boolean JobNotRunReasonJobClassLimitReached
Job not running because job class limit reached

boolean JobNotRunReasonNoSystem
Job not running because no system with right combination of resources

boolean JobNotRunReasonSchedulingEnvironment
Job not running due to unavailable scheduling environment

boolean JobNotRunReasonSeclabelAffinity
Job not running because of seclabel affinity

boolean JobNotRunReasonSpoolNotAvailable
Job not running because spools not available

boolean JobNotRunReasonSystemAffinity
Job not running due to system affinity

boolean Protected Job is protected

uint32 SpoolDataToken Spool data token

string SystemAffinity [] System affinity for job

boolean SystemDataSet Job represents a system data set

uint32 TrackGroupCount Number of track groups of spool space used by this job

Methods

Method	Description	
sint32 Hold()	Holds a job.	
	Parameters	**Description**
	[IN] datetime TimeoutPeriod	Specifies the maximum amount of time that the client expects the transition to the new state to take.
	[OUT] ResponseText[]	Command response messages.
	[OUT] sint32 ReasonCode	Reason code referencing CEA errors.
sint32 Release()	Releases a job.	
	Parameters	**Description**
	[IN] datetime TimeoutPeriod	Specifies the maximum amount of time that the client expects the transition to the new state to take.
	[OUT] string ResponseText[]	Command response messages.
	[OUT] sint32 ReasonCode	Reason code referencing CEA errors.
sint32 ReleaseOutput()	Releases output for a job.	
	Parameters	**Description**
	[IN] datetime TimeoutPeriod	Specifies the maximum amount of time that the client expects the transition to the new state to take.
	[OUT] string ResponseText[]	Command response messages.
	[OUT] sint32 ReasonCode	Reason code referencing CEA errors.
sint32 RequestPropertyChange()	Changes a property and returns response messages from the generated command.	
	Parameters	**Description**
	[IN] string PropertyName	The property to be changed.
	[IN] string PropertyValue	The new value for the property.
	[IN] datetime TimeoutPeriod	Specifies the maximum amount of time that the client expects the transition to the new state to take.
	[OUT] string ResponseText[]	Command response messages.
	[OUT] sint32 ReasonCode	Reason code referencing CEA errors.

Method	Description	
sint32 Restart()	Restarts a job.	
	Parameters	**Description**
	[IN] boolean Hold	Indicates if the job should be held prior to its execution.
	[IN] datetime TimeoutPeriod	Specifies the maximum amount of time that the client expects the transition to the new state to take.
	[OUT] string ResponseText[]	Command response messages.
	[OUT] sint32 ReasonCode	Reason code referencing CEA errors.
sint32 Cancel()	Cancels a job.	
	Parameters	**Description**
	[IN] boolean PurgeOutput	Indicates if any output associated with the job is to be cancelled.
	[IN] boolean TakeDump	Indicates if a dump should be taken when the job is canceled.
	[IN] datetime TimeoutPeriod	Specifies the maximum amount of time that the client expects the transition to the new state to take.
	[OUT] string ResponseText[]	Command response messages.
	[OUT] sint32 ReasonCode	Reason code referencing CEA errors.

IBMzOS_JES3Job

Purpose

This class is a subclass of IBMzOS_Job and contains those properties that are unique to a job that has run, or will run, under JES3.

Inheritance

IBMzOS_Job

↖ IBMzOS_JES3Job

Properties

The following properties have been implemented for z/OS:

string Caption
A short description of the class

string Description
A description of the class

string ElementName
Name of given to this instance of the class

datetime InstallDate
Not supported for z/OS.

string Name
The property is overridden by ***IBMzOS_Job***. It contains a unique identifier for this Job.

uint16 OperationalStatus [ ]
The current status of the JES3 Job:

- **1** No subchain exists
- **2** Active in CI in FSS address space
- **3** Awaiting postscan (batch)
- **4** Awaiting postscan (damsel)
- **5** Awaiting volume fetch
- **6** Awaiting start setup (JES3), Awaiting setup (JES2)
- **7** Awaiting/active in MDS system select processing
- **8** Awaiting resource allocation
- **9** Awaiting unavailable volumes
- **10** Awaiting volume mounts
- **11** Awaiting/active in MDS system verify processing
- **12** Error during MDS processing
- **13** Awaiting selection on main (JES3), Awaiting execution (JES2)
- **14** Scheduled on main (JES3), Active executing (JES2)
- **17** Awaiting breakdown (JES3), Active in output (JES2)
- **18** Awaiting MDS restart processing
- **19** Main MDS processing complete
- **20** Awaiting output service (JES3), Awaiting hardcopy (JES2)
- **21** Awaiting output service writer
- **22** Awaiting reserved services
- **23** Output service complete
- **24** Awaiting selection on main (demand select job)
- **25** Ending function rq waiting or I/O completion
- **26** Ending function rq not processed
- **27** Maximum rq index value

128 Active in input processing
129 Awaiting conversion
130 Active in conversion
131 Active in setup
132 Active in spin
133 Awaiting output
134 Awaiting purge
135 Active in purge
136 Active on NJE sysout received
137 Awaiting NJE transmission
138 Active on NJE job transmitter

string StatusDescriptions [ ] Strings describing the various Operational Status values.

string Status Not supported for z/OS.

string JobStatus A free form string representing the Job's status.

The primary status is reflected in the inherited ***OperationStatus*** property.

JobStatus provides additional implementation-specific details.

datetime TimeSubmitted The time that the Job was submitted to execute.

A value of all zeros indicates that the owning element is not capable of reporting a date and time. Therefore, the ***ScheduledStartTime*** and ***StartTime*** are reported as intervals relative to the time their values are required.

datetime ScheduledStartTime Not supported for z/OS.

datetime StartTime The time that the Job was actually started.

This may be represented by an actual date and time, or by an interval relative to the time that this property is requested.

Note that this property is also present in the ***JobProcessingStatistics*** class. This is necessary to capture the processing information for recurring Jobs, since only the 'last' run time can be stored in this single-valued property.

datetime ElapsedTime The time interval that the Job has been executing or the total execution time if the Job is complete.

Note that this property is also present in the ***JobProcessingStatistics*** class. This is necessary to capture the processing information for recurring Jobs, since only the 'last' run time can be stored in this single-valued property.

uint32 JobRunTimes Number of times that the Job should be run.

A value of 1 indicates that the Job is NOT recurring, while any non-zero value indicates a limit to the number of time that the Job will recur.

	Zero indicates that there is no limit to the number of times that the Job can be processed, but that it is terminated either AFTER the ***UntilTime***, or by manual intervention. By default, a Job is processed once. This property is not modifiable.
uint8 RunMonth	Not supported for z/OS.
sint8 RunDay	Not supported for z/OS.
sint8 RunDayOfWeek	Not supported for z/OS.
datetime RunStartInterval	The time interval after midnight when the Job should be processed. For example, `00000000020000.000000:000` indicates that the Job should be run on of after two o'clock, local time of UTC time (distinguished using the ***LocalOrUtcTime*** property). This property is not modifiable.
uint16 LocalOrUtcTime	This property indicates whether the time represented in the ***RunStartInterval*** and ***UntilTime*** properties represent local or UTC times. Time values are synchronized worldwide by using the enumeration value 2, "UTC Time". Permitted values are: **1** Local time **2** UTC time This property is not modifiable.
datetime UntilTime	The time after which the Job is invalid or should be stopped. This may be represented by an actual date and time, or by an interval relative to the time that this property is requested. A value of all nines indicates that the Job can run indefinitely. This property is not modifiable.
string Notify	User to be notified upon the Job completion or failure. This property can be modified using the ***RequestPropertyChange()*** method.
string Owner	The User that submitted the Job or the Service/method name/etc. that caused the job to be created.
uint32 Priority	Indicates the urgency or importance of execution of the Job. The lower the number, the higher the priority. Note that this property is also present in the ***JobProcessingStatistics*** class. This is necessary to capture the setting information that would influence a Job's results. This property can be modified using the ***RequestPropertyChange()*** method.

uint16 PercentComplete Not supported for z/OS.

boolean DeleteOnCompletion

Indicates whether or not the Job should be automatically deleted upon completion.

Note that the 'completion' of a recurring Job is defined by its ***JobRunTimes*** or ***UntilTime*** properties, OR when the Job is terminated by manual intervention.

If this property is set to `false` and the Job completes, then the extrinsic method ***DeleteInstance*** MUST be used to delete the Job versus updating this property.

This property is not modifiable.

uint16 ErrorCode Not supported for z/OS.

string ErrorDescription Not supported for z/OS.

uint16 RecoveryAction Not supported for z/OS.

string OtherRecoveryAction Not supported for z/OS.

string AbendCode Job completed with abend code.

string AccountNumber Account number from job card.

boolean ARMRegistered Job is ARM registered indicator.

string AvailableSchedEnvSystems [ ]

System names on which the scheduling environment required by job is available. Only valid if job requires a scheduling environment and that environment is available on at least one system.

string AvailableSeclabelSystems [ ]

System names on which the seclabel associated with the job is available. Only valid if seclabel by system is active in the security product and the seclabel is available on at least on system.

boolean AwaitingARMRestart

Job awaiting ARM restart indicator.

string Building NJE building.

This property is "Expensive".

uint32 CardCount Card (output) count.

string Class Job class.

This property can be modified using the ***RequestPropertyChange()*** method.

uint32 CompletionCode Completion code (set for conditions marked with + in job completion indicator.

uint8 CompletionType Specific completion type:
0 No completion info
1 Job ended normally
2 Job ended by CC

3 JCL error
4 Canceled
5 Abended
6 Converter abended
7 Security error
8 Job failed in EOM

uint16 CopyCount Job copy count.

This property is "Expensive".

string CSName The scoping Computer System.

string DefaultPrintDest Default print destination.

This property can be modified using the ***RequestPropertyChange()*** method.

string DefaultPunchDest Default punch destination.

This property can be modified using the ***RequestPropertyChange()*** method.

string Department NJE department.

This property is "Expensive".

string Device Name of device job is active on.

uint32 EstimatedTimeToExecution
Estimated time to execution in seconds. This field is only available if the job is awaiting execution, job is scheduled to run to a WLM managed class, job is not held (duplicate job name, operator hold, etc.), member it has affinity to is available, and the scheduling environment is available.

datetime ExecutionEndTime Execution end time and date.

This property is "Expensive".

string ExecutionMember Execution JES2 member name.

This property is "Expensive".

string ExecutionNode Execution node.

This property can be modified using the ***RequestPropertyChange()*** method.

datetime ExecutionStartTime Execution start time and date.

This property is "Expensive".

string ExecutionSystem Execution MVS system name.

This property is "Expensive".

uint8 HoldIndicator Job hold indicator:
1 Not held
2 Held
3 Held for duplicate job name

uint32 InputCount Job input count.

This property is "Expensive".

string InputDevice Input device name.

This property is "Expensive".

datetime InputStartTime Input start time and date.

This property is "Expensive".

string InputSystem Input system or member.

boolean JesLogSpinnable Jeslog spinnable indicator.

boolean JobClassModeWLM Job class mode for job. If `true`, mode is WLM, otherwise mode is JES.

string JobID Job identifier.

boolean JobIsActive Indicate job is executing.

string JobName Job name.

uint8 JobType Job type:
1 Started task (STC)
2 Time sharing user (TSU)
3 Batch job (JOB)
4 APPC indicator"

uint32 LineCount Line count.

This property is "Expensive".

string MemberName JES2 member on which the job is active.

string MessageClass Message class from job card.

string NotifyUserid Notify user ID.

string OriginalJobID Original job identifier.

string OriginNode Original node (node of submittal).

string OSName The scoping Operating System's name.

uint32 PageCount Job page count.

This property is "Expensive".

uint8 Phase Phase, the job is in. For the values and their meanings, see property ***OperationalStatus***.

string ProgrammerName Programmer name from job card.

string RoomNumber Job card room number.

string Seclabel Seclabel from job.

boolean Spin Indicator of whether jobs in the job class can be spun.

string Subsystem Subsystem name.

string SystemName MVS system name on which the job is active.

uint32 WLMActiveJobCount Number of active jobs in this WLM service class.

uint32 WLMJobsOnQueueCount
Number of jobs on WLM service class queue.

uint32 WLMPosition Position of this job on WLM service class queue.

uint32 WLMSchedulingEnvironment
WLM scheduling environment.

This property can be modified using the *RequestPropertyChange()* method.

string WLMServiceClass WLM service class.

This property can be modified using the *RequestPropertyChange()* method.

string PercentSpoolUtilization

Percent of spool used by the job.

uint8 JobNotRunReasonCodes [ ]

List or reasons by system for why job is waiting to run

string JobNotRunSystems [ ] List of system names corresponding to JobNotRunReasonCodes

Methods

Method	**Description**	
sint32 Hold()[OUT]	Holds a job.	
	Parameters	**Description**
	[IN] datetime TimeoutPeriod	Specifies the maximum amount of time that the client expects the transition to the new state to take.
	[OUT] ResponseText[]	Command response messages.
	[OUT] sint32 ReasonCode	Reason code referencing CEA errors.
sint32 Release()	Releases a job.	
	Parameters	**Description**
	[IN] datetime TimeoutPeriod	Specifies the maximum amount of time that the client expects the transition to the new state to take.
	[OUT] string ResponseText[]	Command response messages.
	[OUT] sint32 ReasonCode	Reason code referencing CEA errors.
sint32 ReleaseOutput()	Releases output for a job.	
	Parameters	**Description**
	[IN] datetime TimeoutPeriod	Specifies the maximum amount of time that the client expects the transition to the new state to take.
	[OUT] string ResponseText[]	Command response messages.
	[OUT] sint32 ReasonCode	Reason code referencing CEA errors.

Method	Description	
sint32 RequestPropertyChange()	Changes a property and returns response messages from the generated command.	
	Parameters	**Description**
	[IN] string PropertyName	The property to be changed.
	[IN] string PropertyValue	The new value for the property.
	[IN] datetime TimeoutPeriod	Specifies the maximum amount of time that the client expects the transition to the new state to take.
	[OUT] string ResponseText[]	Command response messages.
	[OUT] sint32 ReasonCode	Reason code referencing CEA errors.
sint32 Restart()	Restarts a job.	
	Parameters	**Description**
	[IN] boolean Hold	Indicates if the job should be held prior to its execution.
	[IN] datetime TimeoutPeriod	Specifies the maximum amount of time that the client expects the transition to the new state to take.
	[OUT] string ResponseText[]	Command response messages.
	[OUT] sint32 ReasonCode	Reason code referencing CEA errors.
sint32 Cancel()	Cancels a job.	
	Parameters	**Description**
	[IN] boolean PurgeOutput	Indicates if any output associated with the job is to be cancelled.
	[IN] boolean TakeDump	Indicates if a dump should be taken when the job is canceled.
	[IN] datetime TimeoutPeriod	Specifies the maximum amount of time that the client expects the transition to the new state to take.
	[OUT] string ResponseText[]	Command response messages.
	[OUT] sint32 ReasonCode	Reason code referencing CEA errors.

IBMzOS_JES2SysoutDataset

Purpose

This class is a subclass of IBMzOS_SysoutDataset and contains those properties that are unique to a job that has run under JES2.

Inheritance

IBMzOS_SysoutDataset

← IBMzOS_JES2SysoutDataset

Properties

string Caption — A short description of the class

string Description — A description of the class

string ElementName — Name of given to this instance of the class

datetime InstallDate — Not supported for z/OS.

string Name [key] — JES2 Sysout Dataset name

uint16 OperationalStatus [ ] — The current status of the JES2SysoutDataset:

0 = Unknown
2 = OK
6 = Error
9 = Stopping

string StatusDescriptions [ ] — Not supported for z/OS.

string Status — Not supported for z/OS.

string CSCreationClassName [key] — The scoping ComputerSystem's CreationClassName.

string CSName [key] — The scoping ComputerSystem's Name.

string FSCreationClassName [key] — The scoping FileSystem's CreationClassName.

string FSName [key] — The scoping FileSystem's Name.

string CreationClassName [key] — Indicates the name of the class or the subclass used in the creation of an instance. When used with the other key properties of this class, this property allows all instances of this class and its subclasses to be uniquely identified.

uint64 FileSize — Not supported for z/OS.

datetime CreationDate — Not supported for z/OS.

datetime LastModified — Not supported for z/OS.

datetime LastAccessed — Not supported for z/OS.

boolean Readable — Boolean indicating that the File can be read.

boolean Writeable — Boolean indicating the File can be written.

boolean Executable — Boolean indicating the File is executable.

string CompressionMethod — Not supported for z/OS.

string EncryptionMethod	Not supported for z/OS.
uint64 InUseCount	Not supported for z/OS.
string ActiveMember	The JES member on which the sysout is active
string ActiveSysname	z/OS system on which the sysout is active
boolean Burst	Indicates whether 'Burst' mode is supported.
uint64 ByteCount	Byte count after blank truncation
string Class	The sysout class
datetime CreateTime	Date and time the data set became available This property is "Expensive".
string DataSetName	Sysout data set name This property is "Expensive".
uint32 DataSetNumber	Data set number This property is "Expensive".
string DDName	DDName for the data set creation This property is "Expensive".
string Destination	Sysout destination
string DeviceName	Name of the device on which sysout is active
string FCB	The name of the File Control Block (FCB) associated with this dataset.
boolean HeldByOperator	Sysout is held due to operator command
boolean HeldBySystem	Sysout is in a system hold
boolean HeldByUser	Sysout is currently held
string Identifier	This identifier is a value associated with this sysout that can be used in operator commands. The exact contents vary based on whether JES2 or JES3 owns the sysout and the release of JES processing the SSI request.
boolean IPAddrDest	Indicates that the 'Destination' property contains an Internet Protocol (IP) address.
string JobID	Job identified
string Jobname	Job name
uint16 MaxLogicalRecordLength	Maximum logical record length This property is "Expensive".
string ModifyModname	Modify=(modname)
string ModifyTrc	Modify=(,trc)
boolean NotSelectable	Not selectable
string OutDisp	Output disposition
string Owner	Sysout owner
uint32 PageCount	Page count

uint8 Priority	Sysout priority
string ProcessMode	Processing mode
string ProcName	Procname for the step creating this data set
uint32 RecordCount	Record count
string RecordFormat	Record format This property is "Expensive".
string Seclabel	Seclabel for sysput
uint32 SegmentID	Segment ID (zero if data set is not segmented)
boolean Spin	Spin data set
string StepName	Stepname for the step creating this data set This property is "Expensive".
string Subsystem	Subsystem name
string SystemHoldReason	Reason for system hold
string TPJobName	APPC transaction program jobname that created this data set
string TranslateTable [ ]	Printer translate table
string UCS	UCS
string WriterName	External writer name
string JobToken	Job token
string OutputGroupElement	Sysout group name
datetime OutputGroupElementCreateTime	JOE creation time
uint16 OGID1	JOE ID1
string Forms	specifies the forms on which the data set is to be printed
string Flash	specifies the form overlay

IBMzOS_JES3SysoutDataset

Purpose

This class is a subclass of IBMzOS_SysoutDataset and contains those properties that are unique to a job that has run under JES3.

Inheritance

IBMzOS_SysoutDataset

← IBMzOS_JES3SysoutDataset

Properties

The properties of IBMzOS_JES3SysoutDataset are the same as for IBMzOS_JES2SysoutDataset (see "IBMzOS_JES2SysoutDataset" on page 161 with some exceptions:

IBMzOS_JES3SysoutDataset does not provide the following properties of IBMzOS_JES2SysoutDataset:

- OutputGroupElement
- OutputGroupElementCreateTime
- OGID1

The following properties are only part of IBMzOS_JES3SysoutDataset:

boolean HeldForTSO Sysout is held for TSO

boolean HeldForExternalWriter
Sysout is held for external writer

IBMzOS_Job

Purpose

This class represents a z/OS job. Jobs are associated with a subsystem, such as JES2, JES3, or MSTR. Some properties may require significant overhead, including I/O, to obtain their data. These properties are identified with the qualifier of "Expensive". To reduce system overhead, the provider will only return the values for these expensive properties if they are explicitly requested by name.

Inheritance

Subclasses are **IBMzOS_JES2Job** (see "IBMzOS_JES2Job" on page 143) and **IBMzOS_JES3Job** (see "IBMzOS_JES3Job" on page 153).

IBMzOS_JobsManagementSettings

Purpose

The IBMzOS_JobsManagementSettings class provides a mechanism by which users can influence the behavior of the IBMzOS_JES2SysoutDataset, IBMzOS_JES3SysoutDataset, IBMzOS_JES2Jobs, and IBMzOS_JES3Jobs providers.

Properties

string Caption

A short description of the class

string Description

A description of the class

string ElementName

Name given to this instance of the class

string InstanceID [Key]

Within the scope of the instantiating NameSpace, ***InstanceID*** opaquely and uniquely identifies an instance of this class. In order to ensure uniqueness within the NameSpace, the value of InstanceID SHOULD be constructed using the following algorithm:

```
<OrgID>:<LocalID>
```

where <OrgID> and <LocalID> are separated by a colon ':', and where <OrgID> MUST include a copyrighted, trademarked or otherwise unique name that is owned by the business entity creating/defining the InstanceID, or is a recognized global authority (This is similar to the <Schema Name>_<Class Name> structure of Schema class names.) In addition, to ensure uniqueness <OrgID> MUST NOT contain a colon (':'). When using this algorithm, the first colon in InstanceID MUST be between <OrgID> and <LocalID>.

<LocalID> is chosen by the business entity and SHOULD not be re-used to identify different underlying (real-world) elements. If the above 'preferred' algorithm is not used, the defining entity MUST assure that the resultant InstanceID is not re-used across any InstanceIDs produced by this or other providers for this instance's NameSpace.

For DMTF defined instances, the 'preferred' algorithm MUST be used with the <OrgID> set to 'CIM'.

uint32 MaxInstances

The maximum number of instances that can be returned.

uint32 MaxProperties

The maximum number of properties that can be returned

IBMzOS_Subsystem

Purpose

This class represents a z/OS Subsystem.

Properties

string Caption — A short description of the class

string Description — A description of the class

string ElementName — Name given to this instance of the class

datetime InstallDate — Not supported for z/OS.

string Name [key] — Subsystem name

uint16 OperationalStatus [ ] — The current status of the JobSubSystem:
0 Unknown
2 OK
6 Error
9 Stopping

string StatusDescriptions [ ] — Strings describing the various Operational Status values.

string Status — Not supported for z/OS.

uint16 EnabledState — Indicates the Enabled or Disabled state.

string OtherEnabledState — String describing the Enabled State value.

uint16 RequestedState — The last requested State.

uint16 EnabledDefault — Indicates the default value for Enabled State.

datetime TimeOfLastStateChange — Not supported for z/OS.

string SystemCreationClassName [key] — The scoping System's CreationClassName.

string SystemName [key] — The scoping System's Name.

string CreationClassName [key] — Indicates the name of the class or the subclass used in the creation of an instance. When used with the other key properties of this class, this property allows all instances of this class and its subclasses to be uniquely identified.

string PrimaryOwnerName — Not supported for z/OS.

string PrimaryOwnerContact — Not supported for z/OS.

string StartMode — StartMode is a string value indicating whether the Service is automatically started by a System, Operating System, etc. or only started upon request.

This property is deprecated. Use the EnabledDefault property inherited from EnabledLogicalElement instead.

boolean Started — `True` if subsystem is active.

boolean Dynamic — `True` is subsystem is dynamic.

boolean DynamicCommands	`True` if subsystem responds to SETSSI command.
boolean Primary	Indicator for primary subsystem
uint8 Type	Subsystem type code: **1** Unknown **2** JES2 **3** JES3

IBMzOS_SysoutDataset

Purpose

This class represents a z/OS sysout dataset. Some properties may require significant overhead, including I/O, to obtain their data. These properties are identified with the qualifier of "Expensive". To reduce system overhead, the provider will only return the values for these expensive properties if they are explicitly requested by name.

Inheritance

Subclasses are

- IBMzOS_JES2SysoutDataset (see “IBMzOS_JES2SysoutDataset” on page 161) and
- IBMzOS_JES3SysoutDataset (see “IBMzOS_JES3SysoutDataset” on page 164).

Association IBMzOS_SubsystemJES2Jobs

Purpose

This class associates an IBMzOS_Subsystem with an IBMzOS_JES2Job.

Association IBMzOS_SubsystemJES3Jobs

Purpose

This class associates an IBMzOS_Subsystem with an IBMzOS_JES3Job.

Association IBMzOS_UsesJES2SysoutDatasets

Purpose

This class associates an IBMzOS_JES2Job with an IBMzOS_JES2SysoutDataset.

Association IBMzOS_UsesJES3SysoutDatasets

Purpose

This class associates an IBMzOS_JES3Job with an IBMzOS_JES3SysoutDataset.

OS management Cluster classes

The classes described in this section are implemented by z/OS to instrument the z/OS "Systems Complex" (Sysplex) clustering facility.

For using these providers you need an extra security setup as described in Chapter 10, “Cluster, CoupleDataset, and JES2-JES3Jobs provider setup,” on page 231.

IBMzOS_CFRMCoupleDataset

Purpose

This class represents Coupling Facility Resource Manager (CFRM) couple datasets. A CFRM couple dataset contains CFRM policies, one of which can be active (started), defining how z/OS manages coupling facility resources.

A CFRM couple dataset can be the active primary, or optionally, the active alternate couple dataset supporting the CFRM coupling function. Minimally, a CFRM couple dataset must be in use as the active primary CFRM couple dataset for CFRM coupling function to be active.

Inheritance

IBMzOS_CoupleDataset

← IBMzOS_CFRMCoupleDataset

Properties

string Name
The name of the couple dataset represented by an instance of this class.

uint32 NumberOfStructures
The number of coupling facility (CF) structures that the CFRM couple dataset is formatted to support.

It is the maximum number of structures that can be defined for use in a policy contained in this couple dataset.

uint32 NumberOfConnectors
Identifies the number of connectors per structure that the couple dataset is formatted to support.

Connectors are programs running under z/OS that establish a connection to a CF structure. It is the maximum number of concurrent connectors that can be supported for each structure defined in the couple dataset.

uint32 NumberOfCFs
The number of coupling facilities the couple dataset is formatted to support.

It is the maximum number of CFs that can be defined for use in a CFRM policy contained in this couple dataset.

uint32 NumberOfPolicies
The number of administrative (inactive) policies that the couple dataset is formatted to support.

boolean SystemManagedDuplexing
Indicates whether or not the couple dataset is formatted to support the use of the system-managed duplexing rebuild process.

System-managed duplexing rebuild is a process managed by z/OS that allows a structure to be maintained as a duplexed pair. The process is controlled by CFRM policy definitions as well as by the program owning the structure. The process can be initiated via operator command (SETXCF), programming interface (IXLREBLD), or can be z/OS-initiated. Note that user-managed duplexing rebuild is controlled and initiated in the same

manner as system-managed duplexing rebuild, but is managed by the program owning the structure and applies only to cache structures.

boolean SystemManagedRebuild

Indicates whether or not the couple dataset is formatted to support the use of the system-managed structure rebuild process.

System-managed structure rebuild is a process managed by z/OS that allows a structure to be rebuilt by z/OS. The process is controlled by CFRM policy definitions as well as by the program owning the structure. The process can be initiated via operator command (SETXCF), programming interface (IXLREBLD), or can be z/OS-initiated. Note that user-managed structure rebuild is controlled and initiated in the same manner as system-managed rebuild, but is managed by the program owning the structure and applies only to cache structures.

boolean MessageBased

Indicates whether or not the couple dataset is formatted to support the use of message-based CFRM event notification and confirmation capabilities.

IBMzOS_CFRMPolicy

Purpose

This class represents administrative (inactive) Coupling Facility Resource Manager (CFRM) policies. CFRM policies are used to control Coupling Facility (CF) and CF structure resources available to a z/OS Sysplex (Systems Complex). There can be only one active CFRM policy and some number of administrative (inactive) policies.

Properties

string Caption
A short description of the class.

string Description
A description of the class.

string ElementName
Name given to this instance of the class.

datetime InstallDate
A datetime value indicating when the object was installed. A lack of a value does not indicate that the object is not installed.

string Name [key]
Name of CFRM Policy

uint16 OperationalStatus [ ]
The current status of the SysplexCoupleDataset:

0 = Unknown
2 = OK
6 = Error
9 = Stopping

string StatusDescriptions [ ]
Strings describing the various Operational Status values.

string Status
A string indicating the current status

string EnabledState
Indicates the Enabled or Disabled state.

string OtherEnabledState
String describing the Enabled State value.

uint16 RequestedState
The last requested State.

uint16 EnabledDefault
Indicates the default value for Enabled State.

datetime TimeOfLastStateChange
The date and time Enabled State was last changed.

string PolicyText
This property contains the CFRM policy statements that define the Coupling Facilities (CFs) and CF structures that are eligible to be used by programs operating in the Sysplex when this policy is activated (started) via the ***StartPolicy()*** method.

The CFRM policy, as defined by its ***PolicyText***, governs many aspects of the use of CFs and CF structures by the Sysplex. For example, it governs CF structure placement, fixing, recovery and availability considerations.

Methods

StartPolicy()
Starts a policy.

StopPolicy()
Stops a policy.

IBMzOS_CFStructure

Purpose

This class represents a zSeries Coupling Facility Structure.

Properties

string Caption — A short description of the class.

string Description — A description of the class.

string ElementName — Name given to this instance of the class.

datetime InstallDate — A datetime value indicating when the object was installed. A lack of a value does not indicate that the object is not installed.

string Name — The Name of the structure as defined in the CFRM policy.

uint16 OperationalStatus [ ] — The current status of the CF Structure:
- **0** Unknown
- **2** OK
- **6** Error
- **9** Stopping

string StatusDescriptions [ ] — Strings describing the various Operational Status values.

string Status — A string indicating the current status

uint16 EnabledState — Indicates the Enabled or Disabled state.

string OtherEnabledState — String describing the Enabled State value

uint16 RequestedState — The last requested State

uint16 EnabledDefault — Indicates the default value for Enabled State

datetime TimeOfLastStateChange — The date and time Enabled State was last changed.

uint64 IdentityToken [key] — The generated identity value for sysplex cluster. (Part 1 of 2)

string IdentityName [key] — The generated identity value for sysplex cluster. (Part 2 of 2)

uint32 State — CF structure operational state:
- **1** Okay
- **2** Unknown
- **3** Error
- **4** Stopping

uint32 SubState — CF structure substate:
- **1** Normal (no exceptional conditions.
- **2** Temporarily degraded (alter in progress, structure dump serialization held).
- **3** Permanently degraded (allocated smaller than desired size, pending CFRM policy change).
- **4** Recovering (Valid only when the value of 'State' is 1 (Okay) or 4 (Stopping)).

uint8 Type

Structure type based on exploiter allocation requirements:
0x03 List
0xFF Lock
0x04 Cache
0xFE Serialized List

boolean AllowAlter

Indicator of whether this structure can be dynamically altered, based on current conditions. All active connectors to the structure specified ALLOWAUTO = YES on the IXLCONN connect request.

boolean AllowAuto

All active connectors to the structure specified ALLOWREBLD = YES on the IXLCONN connect request.

boolean AllowRebuild

All active connectors to the structure specified ALLOWDUPREBLD = YES on the IXLCONN connect request.

boolean AllowDupRebuild

All active connectors to the structure specified ALLOWALTER = YES on the IXLCONN connect request.

boolean IsDuplexed

Indicator of whether this structure actually is duplexed at this time. Only when this property indicates that the structure is duplexed, will the following properties be valid:

- MaximumStructureSize2
- InitialStructureSize2
- MinimumStructureSize2
- OverFullThreshold2
- StructureVersion2
- CFName2
- CurrentStructureSize2

boolean PendPolicyChange

Indicates that there is a change pending in structure policy.

boolean Disposition

Defines whether the structure is persistent when there are no longer any defined connections (active or failed):
FALSE Keep
TRUE Delete

string CFName1

The name of the Coupling Facility in which this structure instance has been allocated.

It is possible to have two structure instances due to rebuild-in-progress or duplexing.

It is possible to have no structure instances when the structure is not currently allocated.

When Duplexed this is the 'Old' instance of the structure.

string CFName2
The name of the Coupling Facility in which the 'New' structure instance has been allocated. Null if not allocated.

This property is only valid when Duplexed.

string StructureVersion1
Structure version number for the currently allocated instance of the structure.

It is possible to have two structure instances due to rebuild-in-progress or duplexing. It is possible to have no structure instances when the structure is not currently allocated.

When Duplexed this is the 'Old' instance of the structure.

string StructureVersion2
Structure version number for the 'New' instance of the structure, when the structure is in the process of rebuilding or has been duplexed.

This property is only valid when Duplexed.

uint32 MaximumStructureSize1
The maximum size to which this instance of the structure can be expanded, in units of 4KB.

When Duplexed this is the 'Old' instance of the structure.

uint32 MaximumStructureSize2
The maximum size to which the 'New' instance of the structure can be expanded, in units of 4KB.

This property is only valid when Duplexed.

uint32 InitialStructureSize1
The requested initial structure allocation size, in units of 4KB, for this instance of the structure.

When Duplexed this is the 'Old' instance of the structure.

uint32 InitialStructureSize2
The requested initial structure allocation size, in units of 4KB, for the 'New' instance of the structure.

This property is only valid when Duplexed.

uint32 MinimumStructureSize1
The minimum size at which this instance of the structure can be allocated or contracted to, in units of 4KB.

When Duplexed this is the 'Old' instance of the structure.

uint32 MinimumStructureSize2
The minimum size at which the 'New' instance of the structure can be allocated or contracted to, in units of 4KB.

This property is only valid when Duplexed.

uint32 CurrentStructureSize1 The allocated structure size, in units of 4 KB, for this instance of the structure. Not provided if the structure is not allocated.

When Duplexed this is the 'Old' instance of the structure.

uint32 CurrentStructureSize2 The allocated structure size, in units of 4 KB, for the 'New" instance of the structure. Not provided if the structure is not allocated.

This property is only valid when Duplexed.

uint32 SysMgdProcessLevel1 System Managed Process Level required by the instance of the structure to participate in a system-managed process.

When Duplexed this is the 'Old' instance of the structure.

uint32 SysMgdProcessLevel2 System Managed Process Level required by the 'New' instance of the structure to participate in a system-managed process.

This property is only valid when Duplexed.

uint32 ElementCount1 Element Count for the structure. List set element count for List structures. Data area element count for Cache Structures. Invalid for Lock Structures.

When Duplexed this is the 'Old' instance of the structure.

uint32 ElementCount2 Element Count for the 'New' structure. List set element count for List structures. Data area element count for Cache Structures. Invalid for Lock Structures.

This property is only valid when Duplexed.

uint32 EntryCount1 Entry Count for the structure. List set entry count for List and Lock Structures. Directory entry count for cache structures.

When Duplexed this is the 'Old' instance of the structure.

uint32 EntryCount2 Entry Count for the 'New' structure. List set entry count for List and Lock Structures. Directory entry count for cache structures.

This property is only valid when Duplexed.

uint32 EMCCount1 Event Monitor Controls count for List Structures. Invalid for Cache structures and Lock structures.

When Duplexed this is the 'Old' instance of the structure.

uint32 EMCCount2 Event Monitor Controls count for 'New' List Structures. Invalid for Cache structures and Lock structures.

This property is only valid when Duplexed.

uint32 LockCount1 Lock Entry Count. Valid for serialized List and

Lock Structures. Invalid for Cache Structures and unserialized List structures.

When Duplexed this is the 'Old' instance of the structure.

uint32 LockCount2

Lock Entry Count. Valid for 'New' serialized List and Lock Structures. Invalid for Cache Structures and unserialized List structures.

This property is only valid when Duplexed.

string LogicalVersion1

Logical Version numner for the instance of the structure.

When Duplexed this is the 'Old' instance of the structure.

string LogicalVersion2

Logical Version numner for the 'New' instance of the structure.

This property is only valid when Duplexed.

string PreferenceList1 [ ]

Structure Preference List for the instance of the structure. It is an array of up to 8 Coupling Facility names.

When Duplexed this is the 'Old' instance of the structure.

string PreferenceList2 [ ]

Structure Preference List for the instance of the structure. This is an array of up to 8 coupling facility names.

This property is only valid when Duplexed.

string ExclusionList1 [ ]

The Structure Exclusion List for the instance of the structure. This is an array of up to 8 coupling facility names.

When Duplexed this is the 'Old' instance of the structure.

string ExclusionList2 [ ]

Structure Exclusion List for the 'New' instance of the structure. This is an array of up to 8 coupling facility names.

This property is only valid when Duplexed.

uint32 AccessTimeMax1

This instance of the structure was allocated with access time for IXLCONN ACCESSTIME(MAXIMUM).

When Duplexed this is the 'Old' instance of the structure.

uint16 AccessTimeMax2

The 'New' instance of the structure was allocated with access time for IXLCONN ACCESSTIME(MAXIMUM).

This property is only valid when Duplexed.

uint16 MaximumConnections1

The maximum number of connections allowed when the structure was allocated in the coupling facility.

When Duplexed this is the 'Old' version of the structure.

uint16 MaximumConnections2

The maximum number of connections allowed when the 'New' instance of the structure was allocated in the coupling facility.

This property is only valid when Duplexed.

uint8 FullThreshold1

Percentage value for the structure full monitoring threshold for the structure, as defined in CFRM policy. This threshold is set on-platform and is not currently settable through the resource model.

When Duplexed this is the 'Old' version of the structure.

uint8 FullThreshold2

Percentage value for the structure full monitoring threshold for the 'New' version of the structure, as defined in CFRM policy. This threshold is set on-platform and is not currently settable through the resource model.

This property is only valid when Duplexed.

uint8 RebuildPercent1

REBUILDPERCENT for the instance of the structure as specified in CFRM active policy. Not valid indicates not specified.

When Duplexed this is the 'Old' version of the structure.

uint8 RebuildPercent2

REBUILDPERCENT for the 'New' instance of the structure as specified in CFRM active policy. Not valid indicates not specified.

This property is only valid when Duplexed.

uint8 DuplexPolicy1

The effective DUPLEX option for the structure as specified in the CFRM active policy or defaulted.

When Duplexed this is the 'Old' version of the structure.

uint8 DuplexPolicy2

The effective DUPLEX option for the 'New' structure as specified in the CFRM active policy or defaulted.

This property is only valid when Duplexed.

boolean OverFullThreshold1

Indicator of whether or not the instance of the structure is currently in violation of its structure full monitoring threshold.

When Duplexed this is the 'Old' instance of the structure.

boolean OverFullThreshold2

Indicator of whether or not the 'New' instance of the structure is currently in violation of its structure full monitoring threshold.

This property is only valid when Duplexed.

boolean AllowAutoAlter1 ALLOWAUTOALT(YES) was specified in the CFRM active policy for the structure.

When Duplexed this is the 'Old' instance of the structure.

boolean AllowAutoAlter2 ALLOWAUTOALT(YES) was specified in the CFRM active policy for the 'New' structure.

This property is only valid when Duplexed.

boolean EnforceOrder1 ENFORCEORDER(YES) was specified in the CFRM active policy for the structure.

When Duplexed this is the 'Old' instance of the structure.

boolean EnforceOrder2 ENFORCEORDER(YES) was specified in the CFRM active policy for the 'New' structure.

This property is only valid when Duplexed.

boolean AllowReallocate1 ALLOWREALLOCATE(YES) was specified in the CFRM active policy for the structure.

When Duplexed this is the 'Old' instance of the structure.

boolean AllowReallocate2 ALLOWREALLOCATE(YES) was specified in the CFRM active policy for the 'New' structure.

This property is only valid when Duplexed.

boolean AccessTimeNoLimit1 The instance of the structure was allocated with IXLCONN ACCESSTIME(NOLIMIT)

When Duplexed this is the 'Old' instance of the structure.

boolean AccessTimeNoLimit2 The 'New' instance of the structure was allocated with IXLCONN ACCESSTIME(NOLIMIT).

This property is only valid when Duplexed.

uint32 MaxElementCount1 The maximum Element Count for the structure. List set element count for List structures. Data area element count for Cache Structures. Invalid for Lock Structures.

When Duplexed this is the 'Old' instance of the structure.

uint32 MaxElementCount2 The maximum Element Count for the 'New' structure. List set element count for List structures. Data area element count for Cache Structures. Invalid for Lock Structures. This property is only valid when Duplexed.

uint32 MaxEntryCount1 The maximum Entry Count for the structure. List set entry count for List and Lock Structures. Directory entry count for cache structures.

When Duplexed this is the 'Old' instance of the structure

uint32 MaxEntryCount2 The maximum Entry Count for the 'New' structure.

List set entry count for List and Lock Structures. Directory entry count for cache structures.

This property is only valid when Duplexed.

uint32 MaxEMCCount1

The maximum Event Monitor Controls count for List Structures. Invalid for Cache structures and Lock structures. When Duplexed this is the 'Old' instance of the structure

uint32 MaxEMCCount2

The maximum Event Monitor Controls count for 'New' List Structures. Invalid for Cache structures and Lock structures. This property is only valid when Duplexed.

Methods

uint32 StartRebuild()

Asynchronously rebuilds the structure into the same or a different CF than the one in which it is currently located.

Only works if supported by exploiters. The Location parameter specifies the location where the new structure can be built.

The LessConnAction parameter indicates whether the rebuild should be allowed to continue, in spite of a degradation in connectivity to the new structure.

A rebuild operation should only be requested for structures that are identified as rebuild capable. The rebuild will be performed asynchronously. The return and reason codes will indicate whether the operation was initiated successfully. A property change event will be generated asynchronously when the rebuild has completed.

Coupling Facility Structure operations should only be invoked from a single system in the sysplex.

uint32 StopRebuild()

Stops a Rebuild operation.

A property change event will be generated when the operation has completed.

Coupling Facility Structure Operations should only be invoked from a single system in the sysplex.

uint32 StartDuplex()

Asynchronously establishes duplexing for the specified structure.

Only works if supported by exploiters. The request to start duplexing will be performed asynchronously. The return and reason codes will indicate whether the operation was initiated successfully. A property change event will be generated asynchronously when the duplexing has completed.

Coupling Facility Structure Operations should only be invoked from a single system in the sysplex.

uint32 StopDuplex()

Stops duplexing.

The required Keep parameter indicates which structure is to persist after duplexing has been stopped. The request to stop duplexing will be performed asynchronously. The return and reason codes will indicate whether the operation was initiated successfully. A property change event will be generated asynchronously when operation has completed.

Coupling Facility Structure Operations should only be invoked from a single system in the sysplex.

uint32 Force()

Asynchronously forces the deallocation of a persistent structure.

Force of a structure does not work if there are any active connectors to the structure, and may or may not work if there are failed connectors to the structure. The return and reason codes will indicate whether the operation was initiated successfully. CFStructure property change event or lifecycle event will be generated asynchronously when the Force operation has completed.

uint32 ForceAll()

Asynchronously forces the deletion of all failed-persistent connections for this structure.

The return and reason codes will indicate whether the operation was initiated successfully. Connector lifecycle events or relationship-related events will be generated asynchronously when the failed persistent connectors are deleted.

Associations

IBMzOS_CFStrDependsOn

Source	IBMzOS_CFStructure
Target	IBMzOS_CFStructureConnector
see	page 205

Indications

IBMzOS_CFStructureInstCreation

A 'lifecycle' indication that indicates that an instance of the IBMzOS_CFStructure class has been created.

IBMzOS_CFStructureInstDeletion

A 'lifecycle' indication that indicates that an instance of the IBMzOS_CFStructure class has been deleted.

IBMzOS_CFStructureInstModification

A 'lifecycle' indication that indicates that an instance of the IBMzOS_CFStructure class has been modified.

IBMzOS_CFStructureConnector

Purpose

This class represents a zSeries Coupling Facility Structure Connector.

Properties

string Caption — A short description of the class.

string Description — A description of the class.

string ElementName — Name given to this instance of the class.

datetime InstallDate — A datetime value indicating when the object was installed. A lack of a value does not indicate that the object is not installed.

string Name — The Connector name.

uint16 OperationalStatus [ ] — The current status of the CF connector:
0 Unknown
2 OK
6 Error
9 Stopping

string StatusDescriptions [ ] — Strings describing the various Operational Status values.

string Status — A string indicating the current status

uint16 EnabledState — Indicates the Enabled or Disabled state.

string OtherEnabledState — String describing the Enabled State value

uint16 RequestedState — The last requested State

uint16 EnabledDefault — Indicates the default value for Enabled State

datetime TimeOfLastStateChange — The date and time Enabled State was last changed.

uint64 IdentityToken [key] — The generated identity value for sysplex cluster. (Part 1 of 2)

string IdentityName [key] — The generated identity value for sysplex cluster. (Part 2 of 2)

string ConnectorStructureName — The CFStructure name for the connection.

string ConnectorSystemName — OperatingSystem name for the system where the connector is running.

string ConnectorProcessName — Process name for the process in which the connector is running (for z/OS this is a jopbname).

string ConnectorProcessID [ ] — Unique process identification for the process in which the connector is running (for z/OS this is a ttoken).

uint32 State — Operational state of the CF connector:
0 Okay
2 Unknown
6 Error
9 Stopping

string ConnectorLevel Connector-specified level information, or 0 if not provided by the connector.

boolean FailureIsolation Indicator of whether or not the structure as currently allocated satisfies this connector's requirements for failure-isolation.

boolean Disposition Indicator of the connector disposition. Defines whether the connection is persistent if the connection abnormally terminates.
FALSE Delete
TRUE Keep

boolean NonVolatileRequest Indicator of whether the connector requested non-volatility.

string ConnectorIdentifier Connector Identifier.

string ConnectorVersion Connector version number.

string ConnectorData Connector data.

uint8 ConnectorInfoLevel Connector Level of information.

uint8 ConnectorCFLevelRequired
Connector CF Level required.

boolean AllowRebuild Indicates that the connector was connected with ALLOWREBUILD = YES

boolean AllowDupRebuild Indicates that the connector was connected with ALLOWDUPBUILD = YES

boolean AllowAuto Indicates that the connector was connected with ALLOWAUTO = YES

boolean AllowAlter Indicates that the connector was connected with ALLOWALTER = YES

boolean Suspend Indicates that the connector was connected with ALLOWALTER = YES, SUSPEND = YES

boolean AllowRatio Indicates that the connector was connected with ALLOWALTER = YES, RATIO = YES

uint8 MinEntry Indicates the value the connector specified for MINENTRY

uint8 MinElement Indicates the value the connector specified for MINELEMENT

uint8 MinEMC Indicates the value the connector specified for MINEMC

Methods

uint32 Force() Asynchronously forces deletion of a failed connector to a structure, following a failure.

For some structures this is not permitted unless the structure itself is also forced (deallocated). This operation can only be performed against a structure connector in the ERROR state. The return and reason codes will indicate whether the operation was initiated successfully. Structure connector property change events or lifecycle

events will be generated asynchronously when the force operation has completed.

Indications

IBMzOS_CFStrConnectorInstCreation

A 'lifecycle' indication that indicates that an instance of the IBMzOS_CFStrConnector class has been created.

IBMzOS_CFStrConnectorInstDeletion

A 'lifecycle' indication that indicates that an instance of the IBMzOS_CFStrConnector class has been deleted.

IBMzOS _CFStrConnectorInstModification

A 'lifecycle' indication that indicates that an instance of the IBMzOS_CFStrConnector class has been modified.

IBMzOS_CoupleDataset

Purpose

This class represents the methods and properties common to all specific types of z/OS couple datasets. Examples of z/OS couple datasets include z/OS System Complex (Sysplex) and Coupling Facility Resource Manager (CFRM) couple datasets.

Inheritance

Subclasses are

- IBMzOS_SysplexCoupleDataset (see "IBMzOS_SysplexCoupleDataset" on page 201) and
- IBMzOS_CFRMCoupleDataset (see "IBMzOS_CFRMCoupleDataset" on page 172).

Properties

string Caption — A short description of the class.

string Description — A description of the class.

string ElementName — Name given to this instance of the class.

datetime InstallDate — Not supported for z/OS.

string Name [key] — Name of Couple Dataset

uint16 OperationalStatus [ ] — The current status of the SysplexCoupleDataset:

0 = Unknown
2 = OK
6 = Error
9 = Stopping

string StatusDescriptions [ ] — Strings describing the various Operational Status values.

string Status — Not supported for z/OS.

string CSCreationClassName [key] — The scoping ComputerSystem's CreationClassName.

string CSName [key] — The scoping ComputerSystem's Name.

string FSCreationClassName [key] — The scoping FileSystem's CreationClassName.

string FSName]key] — The scoping FileSystem's name.

string CreationClassName [key] — CreationClassName indicates the name of the class or the subclass used in the creation of an instance.

When used with the other key properties of this class, this property allows all instances of this class and its subclasses to be uniquely identified.

uint64 FileSize — Not supported for z/OS.

datetime CreationDate — Not supported for z/OS.

datetime LastModified — Not supported for z/OS.

datetime LastAccessed — Not supported for z/OS.

boolean Executable
Indicates that the File is executable.

string CompressionMethod
Not supported for z/OS.

string EncryptionMethod
Not supported for z/OS.

uint64 InUseCount
Not supported for z/OS.

string SysplexName
This is the name of the z/OS Sysplex to which the couple dataset represented by an instance of this class belongs.

Couple datasets are formatted for use in a particular Sysplex and cannot be used by a Sysplex other than the one for which they have been formatted.

string Volser
This is the volume serial of the logical volume on which the couple dataset is defined.

string DeviceNumber
This is the z/OS device number of the logical volume on which the couple dataset is defined. The device number is local to the z/OS system from which this instance was obtained.

A logical volume may have different device numbers on different z/OS systems in the Sysplex, even though it is the same logical volume being shared by the different z/OS systems.

string NarrativeInfo
This property contains information used by the couple dataset owner to provide additional descriptive information about the couple dataset and its usage. This information includes formatting characteristics and any special functions or attributes that the couple dataset supports.

string Type
This property identifies the type of couple dataset the instance represents. Some examples of couple dataset types include CFRM and SYSPLEX. There are other types of couple datasets, although not all of them are externalized through CIM.

boolean IsPrimary
This property identifies whether the couple dataset represented by an instance is currently in use as the primary couple dataset for its type.

A value of True indicates that this instance represents the couple dataset that is currently in use as the primary couple dataset of its type.

boolean IsAlternate
This property identifies whether the couple dataset represented by an instance is currently in use as the alternate couple dataset "for its type.

A value of True indicates that this instance represents the couple dataset that is currently in use as the alternate couple dataset of its type.

uint32 MaximumNumberOfSystems
This property identifies the number of z/OS

systems in the Sysplex that the couple dataset represented by this instance was formatted to support.

datetime FormatTime
This property identifies the local time that the couple dataset was formatted.

Note: This property is in the local time of the operating system host servicing the request.

boolean IsSynchronized
This property applies only to instances representing couple datasets that are currently in use as the alternate couple dataset for their type.

A value of True indicates that the couple dataset has been fully synchronized with the primary couple dataset of its type.

A value of False indicates that the couple dataset is still in the process of synchronizing with the primary couple dataset of its type.

An alternate couple dataset must be fully synchronized with the primary couple dataset of its type in order to provide failover capability in the event of an error affecting the primary couple dataset.

boolean ErrorState
This property identifies whether the couple dataset is in an error state. When `True`, the couple dataset has experienced a permanent error and is in the process of being removed from active use.

uint32 NumberOfStructures
This is the number of coupling facility (CF) structures that the CFRM couple dataset is formatted to support. It is the maximum number of structures that can be defined for use in a policy contained in this couple dataset.

uint32 NumberOfConnectors
Connectors are programs running under z/OS that establish a connection to a CF structure. This property identifies the number of connectors per structure that the couple dataset is formatted to support. It is the maximum number of concurrent connectors that can be supported for each structure defined in the couple dataset.

uint32 NumberOfCFs
This is the number of coupling facilities the couple dataset is formatted to support. It is the maximum number of CFs that can be defined for use in a CFRM policy contained in this couple dataset.

uint32 NumberOfPolicies
This is the number of administrative (inactive) policies that the couple dataset is formatted to support.

Methods

uint32 SwitchPrimary()
This method switches the couple dataset represented by this instance as follows:

If the instance represents a current in-use alternate couple dataset, it is switched to become the current primary couple dataset. If the alternate couple dataset is not fully synchronized or is in an error state, the method returns an error.

If the instance represents a current in-use primary couple dataset, then it is switched out and the current in-use alternate couple dataset is switched to become the primary. If there is no current in-use alternate couple dataset or the in-use alternate couple dataset is not fully synchronized or in an error state, the method returns an error.

This method functions like the z/OS operator command:

```
SETXCF COUPLE,TYPE=___,PSWITCH
```

IBMzOS_CouplingFacility

Purpose

This class represents a zSeries Coupling Facility, which is the system that manages a Sysplex (System Complex).

Properties

string Caption — A short description of the class. Returns *'IBM z/OS Coupling Facility'*.

string Description — A description of the class. Returns *This is an IBM z/OS Coupling Facility*.

string ElementName — Name given to this instance of the class (same as Name)

datetime InstallDate — A datetime value indicating when the object was installed. A lack of a value does not indicate that the object is not installed.

string Name — Coupling Facility Logical Name as assigned by CFRM policy definitions.

Note: CF Name is not considered an immutable property of a Coupling Facility, since the name can be changed via a CFRM policy update. The physical CF information is the immutable identification information.

uint16 OperationalStatus [ ] — The current status of the CF (summarized from more granular CF state information):

0 Unknown
2 OK
6 Error
9 Stopping

string StatusDescriptions [ ] — Strings describing the various Operational Status values.

string Status — A string indicating the current status

uint16 EnabledState — Indicates the Enabled or Disabled state.

string OtherEnabledState — String describing the Enabled State value

uint16 RequestedState — The last requested State

uint16 EnabledDefault — Indicates the default value for Enabled State

datetime TimeOfLastStateChange — The date and time Enabled State was last changed.

uint64 IdentityToken [key] — The generated identity value for sysplex cluster. (Part 1 of 2)

string IdentityName [key] — The generated identity value for sysplex cluster. (Part 2 of 2)

string MachineType — Machine type of the server hosting the CF

string Manufacturer — Name of the manufacturer of the server hosting the CF

string ManufacturerPlant The plant number where the machine was manufactured

string SerialNumber A manufacturer assigned number to identify the server hosting the CF

uint8 LPARid Platform-assigned ID of a logical partition in which the CF is running. Null if the Computer System is not virtualized

uint32 CFLevel Facility operational (functionality) level

uint32 State CF Operational State (summarized from more granular CF state information):
1 Okay
2 Unknown
6 Error
9 Stopping

uint16 NumberOfProcessors Total number of CF processors

uint16 CPUUtilization Percent CF processor utilization

uint32 FreeSpace Currently unused storage available in the CF (in number of 4KB blocks)

uint32 TotalSpace Total storage available in the CF (in number of 4KB blocks)

uint32 FreeDumpSpace Currently unused allocated dump storage available in the CF (in number of 4KB blocks)

uint32 TotalDumpSpace Total allocated dump storage available in the CF (in number of 4KB blocks)

uint32 StorageIncrementSize Storage increment. The number of 4K blocks in a single storage increment in this CF.

boolean Standalone Coupling Facility Standalone indicator:
TRUE Not Standalone
FALSE Standalone

boolean Volatile Indicator of whether this CF is volatile or nonvolatile (based on battery backup or standby power source)

boolean CPUType Indicates whether all of the CF processors are shared, or whether at least one is dedicated:
TRUE All shared
FALSE Some are dedicated

boolean MaintenanceMode Indicates whether the CF is currently in Maintenance mode:
TRUE Not in Maintenance mode
FALSE CF is in Maintenance mode

boolean RecoveryMgrSite
TRUE Recovery Manager is not active or the CF does not reside at the recovery site
FALSE Recover Manager is active and the CF resides at the recovery site.

string SiteName Name of the SITE specified in the CFRM policy.

string CPCID
Coupling Facility's Central Processor Complex (CPC) ID.

string CFCCReleaseLevel
The release level of the CFCC code.

string CFCCServiceLevel
The service level of the CFCC code.

datetime CFCCCodeBuildDate
The date and time that the CFCC code was built.

Methods

uint32 StartCFMaintenanceMode()
Sets the maintenance mode of the specified coupling facility to ON.

When a CF is in maintenance mode, the CF is not eligible for CF structure allocation purposes and all structure allocation processes will modify their CF selection processing accordingly.

uint32 StopCFMaintenanceMode()
Sets the maintenance mode of the specified coupling facility to OFF.

When a CF is no longer in maintenance mode, the CF is eligible for CF structure allocation purposes.

Associations

IBMzOS_HostedCFStructure

Source	IBMzOS_CFStructure
Target	IBMzOS_CouplingFacility
see	page 205

Indications

IBMzOS_CouplingFacilityInstCreation
A 'lifecycle' indication that indicates that an instance of the IBMzOS_CouplingFacility class has been created.

IBMzOS_CouplingFacilityInstDeletion
A 'lifecycle' indication that indicates that an instance of the IBMzOS_CouplingFacility class has been deleted.

IBMzOS _CouplingFacilityInstModification
A 'lifecycle' indication that indicates that an instance of the IBMzOS_CouplingFacility class has been modified.

IBMzOS_CouplingFunction

Purpose

This class represents an abstraction of z/OS clustering capabilities. The clustering capabilities are referred to as coupling functions, each serving a unique purpose in a z/OS Systems Complex (Sysplex). Coupling functions are capabilities that are facilitated through the use of:

- Couple datasets, which serve as repositories.
- Coupling facilities, which are used by z/OS systems to cache data structures, serialization structures and provide signaling capabilities to z/OS systems participating in a Sysplex.
- Cross-System Coupling Facility (XCF) software, which is a component of z/OS that provides functions to support cooperation between authorized programs running within a Sysplex.

Coupling functions include such capabilities as basic Sysplex support and Coupling Facility Resource Manager (CFRM) support. There are other such coupling functions supported by z/OS, though not all of them may be externalized through CIM providers.

Properties

string Caption
A short description of the class.

string Description
A description of the class.

string ElementName
Name given to this instance of the class.

datetime InstallDate
A datetime value indicating when the object was installed. A lack of a value does not indicate that the object is not installed.

string Name [key]
Name of the coupling function

uint16 OperationalStatus [ ]
The current status of the SysplexCoupleDataset:

0 = Unknown
2 = OK
6 = Error
9 = Stopping

string StatusDescriptions [ ]
Strings describing the various Operational Status values.

string Status
A string indicating the current status

uint16 EnabledState
Indicates the Enabled or Disabled state.

string OtherEnabledState
String describing the Enabled State value.

uint16 RequestedState
The last requested State.

uint16 EnabledDefault
Indicates the default value for Enabled State.

datetime TimeOfLastStateChange
The date and time Enabled State was last changed.

uint32 Redundancy
This identifies the level of couple dataset redundancy currently active for the coupling function.

0 No couple datasets in use. The coupling function is not active.

1 Primary couple dataset in use.
2 Primary and alternate couple dataset are in use.

string ActivePolicyName
Specifies the name of the active policy for the coupling function. Instances of coupling functions such as SYSPLEX, which have no policy, will have a null string value.

datetime TimeActivePolicyStarted
The local date and time that the active policy was started.

Note: This property is in the local time of the operating system host servicing the request.

boolean isActive
Identifies whether the coupling function is active.

Coupling functions with no primary CDS are considered inactive.

Coupling functions that support policies will be identified as active if they have a primary couple dataset in use, even if there is not active policy.

Methods

uint32 StartPolicy()
This method activates (starts) the specified policy.

The policy specified by the name parameter must be an administrative policy defined in the primary couple dataset currently in use by the coupling function.

uint32 StopPolicy()
This method inactivates the currently active policy. For Coupling Facilities (CFs) or structures that are actively being used, not all aspects of the policy may become inactive immediately. These changes will become pending until the resources in question are no longer being used by programs operating in the Sysplex.

uint32 DeletePolicy()
This method deletes the specified administrative policy.

The policy specified by the name parameter must be an administrative policy defined in the primary couple dataset currently in use by the coupling function.

uint32 SwitchPrimary()
This method makes the current in-use alternate couple dataset the current primary couple dataset for the type represented by the coupling function instance.

The current in-use primary couple dataset at the time this method is invoked, upon successful completion of the method, will no longer be recognized by XCF and the coupling function instance will be operating solely with a primary couple dataset.

This method is similar to the z/OS operator command:

```
SETXCF COUPLE,TYPE=__,PSWITCH
```

uint32 MakeAlternate()

This method makes the specified couple dataset the current in use alternate couple dataset for the type represented by the coupling function instance.

The type of the specified couple dataset must be compatible with the coupling function instance for which the method was invoked.

The specified couple dataset must be a newly formatted couple dataset, formatted specifically for use in the Sysplex in which the coupling function instance exists. The method will fail if the specified couple dataset is currently or was previously active in the Sysplex.

The specified couple dataset may be one created using the Duplicate method or one created manually via the XCF couple dataset format utility (IXCL1DSU).

uint32 Duplicate()

This method duplicates the characteristics of the currently active primary couple dataset, for the type represented by the coupling function instance, to a new couple dataset. The name of the new couple dataset and the volume serial of the logical volume on which it will be allocated must be specified by the method invoker. The type of the couple dataset is determined by the coupling function instance.

Associations

IBMzOS_UsesCouplingFunctions

Source	IBMzOS_Sysplex
Target	IBMzOS_CoupliingFunction
see	page 207

IBMzOS_UsesSysplexCoupleDatasets

Source	IBMzOS_CouplingFunction
Target	IBMzOS_SysplexCoupleDataset
see	page 207

IBMzOS_UsesCFRMCoupleDatasets

Source	IBMzOS_CouplingFunction
Target	IBMzOS_CFRMCoupleDataset
see	page 206

IBMzOS_SFMAttributes

Purpose

An array of embedded instances of this class is used as input parameter to method SetSFMAttributes() (see "Methods" on page 199).

Properties

uint64 IdentityToken
Is the 'IdentityToken' of the SysplexNode whose SFM attributes are to be modified. The IdentityToken is a 64 bit unsigned integer that must be converted to a 20 character field, padded on the left with the character zero ('0'). An IdentityToken and IdentityName of '0' indicates that default values should be set for all SysplexNodes.

string IdentityName
Is the 'IdentityName' of the SysplexNode whose SFM attributes are to be modified. An IdentityToken and IdentityName of '0' indicates that default values should be set for all SysplexNodes.

boolean SetSystemWeight
Indicates that the SFM_Weight property should be updated.

boolean SetSystemSFMAction
Indicates that the SFM_Action (and possibly the SFM_Interval) property should be updated.

boolean SetMemStallTime
Indicates that the SFM stalled member action for the system should be updated.

boolean ResetMemStallTime
Indicates that the SFM stalled member action for the system should be cleared.

uint32 System_Weight
Is the new SFM weight value. The SFM weight is a 32 bit unsigned integer that must be converted to a 10 charater field, padded on the left with the character zero ('0').

uint32 SFM_Action
Is the new SFM action value. Valid character values are:

1 Prompt operator
2 Isolate
3 System reset
4 Deactivate

uint32 SFM_Interval
Is the time in seconds corresponding to the SFM action. It is valid only when the action is being set to isolate (2), SystemReset (3), or Deactivate (4). The time is a 32 bit unsigned integer that must be converted to a 10 charater field, padded on the left with the character zero ('0').

uint32 MemStallTime
Is the time in seconds that must pass before SFM takes action against a stalled member causing signal sympathy sickness.

IBMzOS_Sysplex

Purpose

This class represents a zSeries Sysplex (System Complex).

Inheritance

A subclasses is IBMzOS_SysplexNode (see "IBMzOS_SysplexNode" on page 202).

Properties

string Caption
A short description of the class.

string Description
A description of the class.

string ElementName
Name given to this instance of the class.

datetime InstallDate
A datetime value indicating when the object was installed. A lack of a value does not indicate that the object is not installed.

string Name
Sysplex name

uint16 OperationalStatus [ ]
The current status of the Sysplex, based on the states of the systems it is comprised of:
0 Unknown
2 OK
6 Error
9 Stopping

string StatusDescriptions [ ]
Strings describing the various Operational Status values.

string Status
A string indicating the current status

uint16 EnabledState
Indicates the Enabled or Disabled state.

string OtherEnabledState
String describing the Enabled State value

uint16 RequestedState
The last requested State

uint16 EnabledDefault
Indicates the default value for Enabled State

datetime TimeOfLastStateChange
The date and time Enabled State was last changed.

uint64 IdentityToken [key]
The generated identity value for sysplex cluster. (Part 1 of 2)

string IdentityName [key]
The generated identity value for sysplex cluster. (Part 2 of 2)

uint32 Type
The type of sysplex cluster:
1 Local
2 Monoplex
3 Multisystem

uint32 State
State of the Sysplex, based on the states of the systems it is comprised of:
1 Okay
2 Unknown
3 Error
4 Stopping

z/OS, will only report a state of ''Okay' (1)

boolean SysplexConnectionFail

Corresponds to the CONNFAIL attribute in the SFM policy. Indicates whether or not action taken when connectivity failure occurs in the sysplex.

Methods

uint32 SetSFMAttributes()

Updates the SFM policy to set the SFM weights for each system specified in the input, SystemArray, and will set the Sysplex Connect Fail property value for the sysplex.

Successful execution of this method will indicate that all the entries in the SystemArray were processed. If any of the system entries could not be processed the method will return an error.

An array of embedded instances of class **IBMzOS_SFMAttributes** is used as input parameter to this method (see "IBMzOS_SFMAttributes" on page 197).

uint32 SetSysplexConnFail()

Sets the ConnectionFail property value.

uint32 ResetSysplexConnFail()

Resets the ConnectionFail property value.

uint32 StartReallocate()

Analyzes all structures in the Sysplex and performs corrective actions on structures that are operating outside current CFRM policy parameters.

Sysplex Process Completion Indication will be generated when asynchronous processing has completed.

uint32 StopReallocate()

Stops the reallocation of CF structures.

Sysplex Process Completion Indication will be generated when asynchronous processing has completed.

uint32 ForceReallocate()

Forces an in process reallocation to be stopped.

Sysplex Process Completion Indication will be generated when asynchronous processing has completed.

Associations

IBMzOS_CollectionOfCFs

Source	IBMzOS_Sysplex
Target	IBMzOS_CouplingFacility
see	page 205

IBMzOS_CollectionOfSysplexNodes

Source	IBMzOS_Sysplex
Target	IBMzOS_SysplexNode
see	page 205

IBMzOS_UsesCouplingFunctions

Source	IBMzOS_Sysplex
Target	IBMzOS_CoupliingFunction
see	page 207

Indications

IBMzOS_SysplexInstCreation

A 'lifecycle' indication that indicates that an instance of the IBMzOS_Sysplex class has been created. The Sysplex supports services that may report on cluster manageable resources. This event occurs when each system has IPLed into the Sysplex with a Cluster capable Sysplex Couple Dataset. This event occurs on each system when a Cluster capable dataset has been brought into use.

IBMzOS_SysplexInstModification

A 'lifecycle' indication that indicates that an instance of the IBMzOS_Sysplex class has been modified. The SysplexConnectionFail property has changed.

IBMzOS_Sysplex_CFRM_CDS_Initialized

A 'process' indication that indicates that the process of reallocating the CF Structures has completed. CFRM Resources (Coupling Facility, CF Structure and CF Structure Connectors) has been defined to the Sysplex. The z/OS Cluster MR Services should be issued to obtain the CFRM resource instances in use by the Sysplex.

IBMzOS_Sysplex_ReallocateInitiated

A 'process' indication that indicates that the Start Reallocate CF Structures process has been initiated. The reallocate command may have been initiated by an operator command or through a CIM StartReallocate() method.

IBMzOS_Sysplex_ReallocateCompleted

A 'process' indication that indicates that the Start, Stop, or Force Reallocate CF Structures command has completed processing. The reallocate command may have been initiated by an operator command or through a CIM StartReallocate(), StopReallocate(), or ForceReallocate() methods.

IBMzOS_SysplexCoupleDataset

Purpose

This class represents the z/OS Systems Complex (Sysplex) couple datasets. A Sysplex couple dataset contains Sysplex-wide data about systems, groups, and members that use Cross-System Coupling Facility (XCF) services. All z/OS systems in a Sysplex must have connectivity to the Sysplex couple dataset.

A Sysplex couple dataset can be the primary, or optionally, the active alternate couple dataset supporting the Sysplex coupling function. Minimally, a Sysplex couple dataset must be in use as the active primary Sysplex couple dataset for the Sysplex function to be active.

Inheritance

IBMzOS_CoupleDataset

← IBMzOS_SysplexCoupleDataset

Properties

string Name
The name of the couple dataset represented by an instance of this class.

uint32 NumberOfGroups
The number of XCF groups that the couple dataset is formatted to support. It is the maximum number of concurrently active XCF groups that can be active in the Sysplex while this couple dataset is in use as the primary Sysplex couple dataset.

uint32 NumberOfMembers
The number of XCF members per group that this couple dataset is formatted to support. Each XCF group in the Sysplex may have up to this number of concurrently active programs (XCF members) participating in the group.

uint32 GRSLevel
Indicates whether or not this couple dataset supports the use of Global Resource Serialization (GRS) STAR for Sysplex-scope resource serialization. GRS STAR provides improved performance and reliability over the use of GRS RING.

IBMzOS_SysplexNode

Purpose

This class represents a node in a zSeries Sysplex (System Complex). There is one node in a Sysplex for every z/OS system that comprises the Sysplex.

Inheritance

IBMzOS_Sysplex

↖ IBMzOS_SysplexNode

Properties

string Caption — A short description of the class.

string Description — A description of the class.

string ElementName — Name given to this instance of the class.

datetime InstallDate — A datetime value indicating when the object was installed. A lack of a value does not indicate that the object is not installed.

string Name — SysplexNode name which is the same as the Operating System's System Name

uint16 OperationalStatus [ ] — The current status of the SysplexNode:

- **0** Unknown
- **2** OK
- **6** Error
- **9** Stopping

string StatusDescriptions [ ] — Strings describing the various Operational Status values.

string Status — A string indicating the current status

uint16 EnabledState — Indicates the Enabled or Disabled state.

string OtherEnabledState — String describing the Enabled State value

uint16 RequestedState — The last requested State

uint16 EnabledDefault — Indicates the default value for Enabled State

datetime TimeOfLastStateChange — The date and time Enabled State was last changed.

uint64 IdentityToken [key] — The generated identity value for sysplex cluster. (Part 1 of 2)

string IdentityName [key] — The generated identity value for sysplex cluster. (Part 2 of 2)

uint32 State — State of node:

- **1** Okay
- **2** Unknown
- **3** Error
- **4** Stopping

uint32 SubState — SubState of node:

- **1** Normal
- **2** StatusUpdateMissing
- **3** InActive
- **4** IPLing

Valid when State = Error. Not valid for all other system states.

uint32 SystemSFMWeight Corresponds to System Weight attribute on SFM policy. Relative system weight used by clique algorithm following Sysplex connectivity failure

uint32 SystemFDIInterval Corresponds to Failure Detection Interval attribute of SFM policy. Time interval during which missing status updates are tolerated. When failure interval is exceeded the SystemPartitionPolicy determines response

uint32 SystemSFMAction Corresponds to Action attribute on SFM policy. One of four actions are settable in the SFM policy:

- **1** Prompt Operator
- **2** Isolate (isolate system using the CF fencing controls)
- **3** System Reset Partition
- **4** Deactivate Partition (deactivate the partition using the HMC controls)

uint32 SystemSFMInterval When the System SFM Action is Automatic, System Reset, or Deactivate, this property will contain the time value in seconds corresponding to the SFM action.

uint32 SystemMemStallTime For MEMSTALLTIME(stalltime), SFM will take action to resolve a sympathy sickness problem attributed to a stalled XCF group member if the problem persists for stalltime seconds.

uint32 SystemOpNotify The length of time after a system is status update missing before SFM takes action. For PROMPT, the interval used is the XCF OPNOTIFY value.

Methods

uint32 SetSystemFDIInterval()

Sets the SFM failure detection interval (FDI) for the system.

Associations

IBMzOS_HostedCFStrConnector

Source	IBMzOS_SysplexNode
Target	IBMzOS_CFStructureConnector
see	page 206

IBMzOS_UsesCFs

Source	IBMzOS_SysplexNode
Target	IBMzOS_CouplingFacility
see	page 206

Indications

IBMzOS_SysplexNodeInstCreation

A 'lifecycle' indication that indicates that an instance of the IBMzOS_SysplexNode class has been created.

IBMzOS_SysplexNodeInstDeletion

A 'lifecycle' indication that indicates that an instance of the IBMzOS_SysplexNode class has been deleted.

IBMzOS_SysplexNodeInstModification

A 'lifecycle' indication that indicates that an instance of the IBMzOS_SysplexNode class has been modified.

Association IBMzOS_CFStrDependsOn

Purpose

This class associates an IBMzOS_CFStructure with an IBMzOS_CFStructureConnector.

Indications

IBMzOS_CFStrDependsOnInstCreation
A 'lifecycle' indication that indicates that an instance of the IBMzOS_CFStrDependsOn association class has been created.

IBMzOS_CFStrDependsOnInstDeletion
A 'lifecycle' indication that indicates that an instance of the IBMzOS_CFStrDependsOn association class has been deleted.

Association IBMzOS_CollectionOfCFs

Purpose

This class associates an IBMzOS_Sysplex with an IBMzOS_CouplingFacility.

Indications

IBMzOS_CollectionOfCFsInstCreation
A 'lifecycle' indication that indicates that an instance of the IBMzOS_CollectionOfCFs association class has been created.

IBMzOS_CollectionOfCFsInstDeletion
A 'lifecycle' indication that indicates that an instance of the IBMzOS_CollectionOfCFs association class has been deleted.

Association IBMzOS_CollectionOfSysplexNodes

Purpose

This class associates an IBMzOS_Sysplex with an IBMzOS_SysplexNode.

Indications

IBMzOS_CollectionOfSysplexNodesInstCreation
A 'lifecycle' indication that indicates that an instance of the IBMzOS_CollectionOfSysplexNodes association class has been created.

IBMzOS_CollectionOfSysplexNodesInstDeletion
A 'lifecycle' indication that indicates that an instance of the IBMzOS_CollectionOfSysplexNodes association class has been deleted.

Association IBMzOS_HostedCFStructure

Purpose

This class associates an IBMzOS_CFStructure with an IBMzOS_CouplingFacility.

Indications

IBMzOS_HostedCFStructureInstCreation
A 'lifecycle' indication that indicates that an instance of the IBMzOS_HostedCFStructure association class has been created.

IBMzOS_HostedCFStructureInstDeletion
A 'lifecycle' indication that indicates that an instance of the IBMzOS_HostedCFStructure association class has been deleted.

Association IBMzOS_HostedCFStrConnector

Purpose

This class associates an IBMzOS_SysplexNode with an IBMzOS_CFStructureConnector.

Indications

IBMzOS_HostedCFStrConnectorInstCreation
A 'lifecycle' indication that indicates that an instance of the IBMzOS_HostedCFStrConnector association class has been created.

IBMzOS_HostedCFStrConnectorInstDeletion
A 'lifecycle' indication that indicates that an instance of the IBMzOS_HostedCFStrConnector association class has been deleted.

Association IBMzOS_UsesCFs

Purpose

This class associates an IBMzOS_SysplexNode with an IBMzOS_CouplingFacility.

Indications

IBMzOS_UsesCFsInstCreation
A 'lifecycle' indication that indicates that an instance of the IBMzOS_UsesCFs association class has been created.

IBMzOS_UsesCFsInstDeletion
A 'lifecycle' indication that indicates that an instance of the IBMzOS_UsesCFs association class has been deleted.

Association IBMzOS_UsesCFRMCoupleDatasets

Purpose

This class associates an instance of ***IBMzOS_CouplingFunction*** with instances of ***IBMzOS_CFRMCoupleDataset*** classes.

Association IBMzOS_UsesCFRMPolicies

Purpose

This class associates an instance of the IBMzOS_CFRMCoupleDataset class with instances of the IBMzOS_CFRMPolicy classes.

Association IBMzOS_UsesCouplingFunctions

Purpose

This class associates an instance of the IBMzOS_Sysplex class with instances of the IBMzOS_CoupliingFunction classes.

Association IBMzOS_UsesSysplexCoupleDatasets

Purpose

This class associates an instance of the IBMzOS_CouplingFunction class with instances of the IBMzOS_SysplexCoupleDataset classes.

Storage management classes

CIM_FCPort

Purpose

This class represents capabilities and management of a Fiber Channel Port device.

Inheritance

The z/OS specific subclass is IBMzOS_FCPort (see IBMzOS_FCPort on page 211).

CIM_FCPortStatistics

Inheritance

The z/OS specific subclass is IBMzOS_FCPortStatistics (see "IBMzOS_FCPortStatistics" on page 214).

CIM_PortController

Inheritance

The z/OS specific subclass is IBMzOS_PortController (see "IBMzOS_PortController" on page 215).

CIM_Product

Inheritance

The z/OS specific subclass is IBMzOS_Product (see "IBMzOS_Product" on page 217).

CIM_ProtocolEndpoint

Inheritance

The z/OS specific subclass is IBMzOS_SBProtocolEndpoint (see "IBMzOS_SBProtocolEndpoint" on page 218).

CIM_SoftwareIdentity

Inheritance

The z/OS specific subclass is IBMzOS_SoftwareIdentity (see "IBMzOS_SoftwareIdentity" on page 220).

CIM_StorageExtent

Inheritance

CIM_StorageExtent is supported as a superclass of IBMzOS_LogicalDisk (see "IBMzOS_LogicalDisk" on page 131) and won't have a separate implementation.

CIM_ManagedElement
- ← CIM_ManagedSystemElement
- ← CIM_LogicalElement
- ← CIM_EnabledLogicalElement
- ← CIM_LogicalDevice
- ← CIM_StorageExtent

Used by the following CIM profiles

- Host Discovered Resources Profile

Association CIM_ControlledBy

Purpose

The CIM_ControlledBy relationship indicates which devices such as IBMzOS_FCPort are controlled by a CIM_Controller such as IBMzOS_PortController on z/OS.

Inheritance

The z/OS specific subclass is IBMzOS_ControlledBy (see "Association IBMzOS_ControlledBy" on page 222).

Association CIM_DeviceSAPImplementation

Inheritance

The z/OS specific subclass is IBMzOS_SBDeviceSAPImplementation (see "Association IBMzOS_SBDeviceSAPImplementation" on page 224).

Association CIM_ElementSoftwareIdentity

Inheritance

The z/OS specific subclass is IBMzOS_ElementSoftwareIdentity (see "Association IBMzOS_ElementSoftwareIdentity" on page 222).

Association CIM_ElementStatisticalData

Inheritance

The z/OS specific subclass is IBMzOS_FCPortStatisticalData (see "Association IBMzOS_FCPortStatisticalData" on page 223).

Association CIM_HostedAccessPoint

Inheritance

The z/OS specific subclass is IBMzOS_SBHostedAccessPoint (see "Association IBMzOS_SBHostedAccessPoint" on page 224).

Association CIM_InitiatorTargetLogicalUnitPath

Inheritance

The z/OS specific subclass is IBMzOS_SBInitiatorTargetLogicalUnitPath (see "Association IBMzOS_SBInitiatorTargetLogicalUnitPath" on page 225).

Association CIM_InstalledSoftwareIdentity

Inheritance

The z/OS specific subclass is IBMzOS_InstalledSoftwareIdentity (see "Association IBMzOS_InstalledSoftwareIdentity" on page 223).

Association CIM_ProductElementComponent

Inheritance

The z/OS specific subclass is IBMzOS_ProductElementComponent (see "Association IBMzOS_ProductElementComponent" on page 223).

Association CIM_SystemDevice

Inheritance

The z/OS specific subclasses are

- IBMzOS_CSFCPort (see "Association IBMzOS_CSFCPort" on page 222) and
- IBMzOS_CSFCPortController (see "Association IBMzOS_CSFCPortController" on page 222).

IBMzOS_FCPort

Purpose

The IBMzOS_FCPort class defines the capabilities and management of a Fiber Channel Port device on z/OS.

Inheritance

CIM_ManagedElement
- ← CIM_ManagedSystemElement
- ← CIM_LogicalElement
- ← CIM_EnabledLogicalElement
- ← CIM_LogicalDevice
- ← CIM_LogicalPort
- ← CIM_NetworkPort
- ← CIM_FCPort
- ← IBMzOS_FCPort

Used by the following CIM profiles

- Storage HBA profile

Properties

string Caption
Returns `IBM z/OS FCPort`.

string Description
Returns `This is a z/OS FCPort`.

string ElementName
Returns *LPARName*:*CSSID*:*CHPID*, where

LPARName
is the name of the logical partition - empty if z/OS does not run in an LPAR

CSSID is the channel subsystem ID

CHPID is the channel path ID

string Name
Returns *LPARName*:*CSSID*:*CHPID*, where

LPARName
is the name of the logical partition - empty if z/OS does not run in an LPAR

CSSID is the channel subsystem ID

CHPID is the channel path ID

uint16 OperationalStatus [ ]
Returns the current status of the FCPort:
2 OK
11 Stopped

uint16 EnabledState
Returns
2 enabled

uint16 RequestedState
Returns
2 enabled

uint16 EnabledDefault
Indicates the administrator's default or startup configuration for the enabled state of an element.
Always returns
2 enabled

string SystemCreationClassName
Indicates the system's CreationClassName.

Returns `IBMzOS_ComputerSystem`.

string SystemName
Displays the fully qualified host name of the system.

string CreationClassName
Indicates the name of the class or the subclass used in the creation of an instance.

Returns `IBMzOS_FCPort`.

string DeviceID
Displays a unique address or other identifying name for the LogicalDevice.

Returns

WWPN:*LPARID*
or

NodeDescriptor:*LPARID*
when the WWPN cannot be retrieved.

where

WWPN is the World Wide Port Number

LPARID is the logical partition ID

NodeDescriptor
is the node descriptor

uint16 PortNumber
Returns the logical port number (CHPID).

uint64 Speed
Returns the bandwidth of the port in bits per second - 0 if z/OS does not run in an LPAR

uint64 MaxSpeed
Returns the maximum bandwidth of the port in bits per second - 0 if z/OS does not run in an LPAR

uint16 UsageRestriction
Returns
4 not restricted

uint16 PortType
Specifies the specific mode currently enabled for the port.

Returns
10 N-Port

uint16 LinkTechnology
Specifies the type of link.

Returns
4 FC

string PermanentAddress
Defines the network address of the port.

Returns
WWPN if a network address is available
NULL else

uint64 SupportedMaximumTransmissionUnit
Specifies the maximum transmission unit (MTU) that can be supported.

Returns 8192.

uint64 ActiveMaximumTransmissionUnit
Specifies the active or negotiated maximum transmission unit (MTU) that can be supported.

Returns 8192.

uint16 SupportedCOS []
Indicates the Fibre Channel Class of Service that is supported.

Returns 3.

uint16 ActiveCOS []
Indicates the Fibre Channel Class of Service that is active. Returns 3.

uint16 SupportedFC4Types []
Indicates the supported Fibre Channel FC-4 protocol.

Returns
27 FC-SB-x channel

uint16 ActiveFC4Types []
Indicates the currently running Fibre Channel FC-4 protocol.

Returns
27 FC-SB-x channel

Associations

IBMzOS_ FCPortStatisticalData
Source IBMzOS_FCPort
Target IBMzOS_FCPortStatistics
see page 223

IBMzOS_ControlledBy
Source IBMzOS_PortController
Target IBMzOS_FCPort
see page 222

IBMzOS_ SBDeviceSAPImplementation
Source IBMzOS_FCPort
Target IBMzOS_SBProtocolEndpoint
see page 224

IBMzOS_CSFCPort
Source IBMzOS_ComputerSystem
Target IBMzOS_FCPort
see page 222

IBMzOS_FCPortStatistics

Purpose

The IBMzOS_FCPort class defines the statistics for the FCPort on z/OS.

Inheritance

CIM_ManagedElement
- ← CIM_StatisticalData
- ← CIM_NetworkPortStatistics
- ← CIM_FCPortStatistics
- ← IBMzOS_FCPortStatistics

Used by the following CIM profiles

- Storage HBA profile

Properties

string Caption
Returns `IBM z/OS FCPortStatistics`.

string Description
Returns `This is a z/OS FCPortStatistics`.

string InstanceID
Returns
**`IBM:FCPortStat:`*`WWPN`*`:`*`LPARID`*
or
**`IBM:FCPortStat:`*`NodeDescriptor`*`:`*`LPARID`*
when the WWPN cannot be retrieved.

string ElementName
Returns `FCPortStat:`*`LPARName`*`:`*`CSSID`*`:`*`CHPID`*, where

`LPARName`
is the name of the logical partition - empty if z/OS does not run in an LPAR

`CSSID` is the channel subsystem ID

`CHPID` is the channel path ID

uint64 BytesTransmitted
Returns the total number of bytes that are transmitted, including framing characters - 0 if z/OS does not run in an LPAR

uint64 BytesReceived
Returns the total number of bytes that are received, including framing characters - 0 if z/OS does not run in an LPAR

uint64 PacketsTransmitted
Returns the total number of packets that are transmitted - 0 if z/OS does not run in an LPAR

uint64 PacketsReceived
Returns the total number of packets that are received - 0 if z/OS does not run in an LPAR

Associations

IBMzOS_FCPortStatisticalData

Source	IBMzOS_FCPort
Target	IBMzOS_FCPortStatistics
see	page 223

IBMzOS_PortController

Purpose

The IBMzOS_PortController class represents a logical device corresponding to a hardware network port controller on z/OS. Port controllers provide various features depending on their types and versions. Since it is not possible from inband z/OS instrumentation to distinguish between Ports and PortControllers, the PortController provider returns one instance for each FCPort, using the same key information.

Inheritance

CIM_ManagedElement
- ← CIM_ManagedSystemElement
- ← CIM_LogicalElement
- ← CIM_EnabledLogicalElement
- ← CIM_LogicalDevice
- ← CIM_Controller
- ← CIM_PortController
- ← IBMzOS_PortController

Used by the following CIM profiles

- Storage HBA profile

Properties

string Caption
Returns `IBM z/OS PortController`.

string Description
Returns `This is a z/OS PortController.`

uint16 OperationalStatus []
Returns
2 OK

uint16 EnabledState
Returns
2 enabled

uint16 RequestedState
Returns
2 enabled

uint16 EnabledDefault
Indicates the administrator's default or startup configuration for the enabled state of an element.

Returns
2 enabled

string SystemCreationClassName
Returns `IBMzOS_ComputerSystem`.

string SystemName
Displays the fully qualified host name of the system.

string CreationClassName
Returns `IBMzOS_PortController`.

string DeviceID
Returns a unique name for the logical device:

WWPN **:** *LPARID*
when the WWPN can be retrieved

NodeDescriptor **:** *LPARID*
else

where

WWPN is the World Wide Port Number

LPARID is the logical partition ID

NodeDescriptor
is the node descriptor

uint16 ControllerType Returns
4 FC

Associations

IBMzOS_ControlledBy
Source IBMzOS_PortController
Target IBMzOS_FCPort
see page 222

IBMzOS_ElementSoftwareIdentity
Source IBMzOS_SoftwareIdentity
Target IBMzOS_PortController
see page 222

IBMzOS_Product

Purpose

The IBMzOS_Product is a concrete class that aggregates PhysicalElements, software (SoftwareIdentity and SoftwareFeatures), services or other products on z/OS.

For z/OS 1.12, an instance of IBMzOS_Product is created for each FCPort returned by the IBMzOS_FCPort provider.

Inheritance

CIM_ManagedElement

← CIM_Product

← IBMzOS_Product

Used by the following CIM profiles

- Storage HBA profile

Properties

string Caption	Returns `IBM z/OS Product`.
string Description	Returns `Represents a z/OS FCPortController Product`.
string Name	Returns the DeviceID from IBMzOS_FCPort.
string ElementName	Returns the DeviceID from IBMzOS_FCPort.
string IdentifyingNumber	Returns the DeviceID from IBMzOS_FCPort.
string Vendor	Returns `IBM`.
string Version	Returns `unknown`.

IBMzOS_SBProtocolEndpoint

Purpose

The IBMzOS_SBProtocolEndpoint class is used to represent two different entities, Initiator and Target. The Initiator entity describes the protocol endpoint on the computer system side, the target entity describes the protocol endpoint on the disk controller side of a logical disk attached to a computer system.

Protocol endpoints are identified via World Wide Port Numbers (WWPN), which are used as the primary key for the instances of the class IBMzOS_SBProtocolEndpoint, reflected in the name property. For the retrieval of WWPN the IOS services IOSCDR and IOSCHPD have been extended for z/OS 1.12 to facilitate the retrieval of WWPN for the Initiator (IOSCHPD) and Target (IOSCDR) protocol endpoints. Therefore, the retrieval of WWPN through IOSCDR is only possible under the following conditions:

1. The used hardware is at least an IBM System z10™ GA2.
2. The requestor or CIM client has `UPDATE` access to the IOSCDR profile.

Inheritance

CIM_ManagedElement
- ← CIM_ManagedSystemElement
- ← CIM_LogicalElement
- ← CIM_EnabledLogicalElement
- ← CIM_ServiceAccessPoint
- ← CIM_ProtocolEndpoint
- ← IBMzOS_SBProtocolEndpoint

Used by the following CIM profiles

- Host Discovered Resources Profile
- Storage HBA profile

Properties

string Caption
Returns `IBM z/OS SBProtocolEndpoint`.

string Description
Returns `This is a z/OS SBProtocolEndpoint.`

string Name
The *Initiator* returns the WWPN of the computer system side.

The *Target* returns the WWPN of the storage controller side.

uint16 OperationalStatus []
Returns
2 OK

uint16 EnabledState
Returns
2 Enabled

uint16 RequestedState
Returns
2 Enabled

uint16 EnabledDefault
Returns
2 Enabled

string SystemCreationClassName
Returns `IBMzOS_ComputerSystem`

string SystemName
Displays the name of the host system.

string CreationClassName	Returns `IBMzOS_SBProtocolEndpoint`
uint16 ProtocolIFType	Returns **56** Fibre Channel
string OtherTypeDescription	Returns `SB`.
uint16 ConnectionType	Returns **2** Fibre Channel
uint16 Role	Returns **2** Initiator or **3** Target

Associations

IBMzOS_SBHostedAccessPoint

Source	IBMzOS_ComputerSystem
Target	IBMzOS_SBProtocolEndpoint (Initiator Instance)
see	page 224

IBMzOS_SBDeviceSAPImplementation

Source	IBMzOS_FCPort
Target	IBMzOS_SBProtocolEndpoint
see	page 224

IBMzOS_SBInitiatorTargetLogicalUnitPath

Source	IBMzOS_SBProtocolEndpoint (Initiator Instance)
Target	IBMzOS_SBProtocolEndpoint (Target instance)
see	page 225

IBMzOS_SoftwareIdentity

Purpose

The IBMzOS_SoftwareIdentity class provides descriptive information about a software component for asset tracking or installation dependency management.

The idea behind SoftwareIdentity as defined in the SMI-S Storage HBA profile does not match the concepts of z/OS. Therefore this class has only been implemented for formal compliance with the SMI-S Storage HBA profile.

For z/OS 1.12, therefore only one instance of IBMzOS_SoftwareIdentity is created and associated to all PortControllers. .

Inheritance

CIM_ManagedElement
- ← CIM_ManagedSystemElement
- ← CIM_LogicalElement
- ← CIM_SoftwareIdentity
- ← IBMzOS_SoftwareIdentity

Used by the following CIM profiles

- Storage HBA profile

Properties

string Caption
Returns `IBM z/OS SoftwareIdentity`.

string Description
Returns `The Software driving the IBMzOS_PortController`.

uint16 OperationalStatus []
Returns
2 OK

string InstanceID
Uniquely identifies an instance of this class.
Returns `IBMzOS:`*`CSSID`*`:`*`LPARID`*, where
`CSSID` is the channel subsystem ID
`LPARID` is the logical partition ID

string ElementName
Returns `IBMzOS:`*`CSSID`*`:`*`LPARID`*, where
`CSSID` is the channel subsystem ID
`LPARID` is the logical partition ID

string VersionString
Returns the z/OS Version and Release number in the form *`Major`*`.`*`Minor`*`.`*`Revision`*, where
`Major` is the z/OS version
`Minor` is the release
`Revision` is the revision number

string Manufacturer
Returns `IBM`.

uint16 Classifications []
Returns
2 Driver

and
8 Operating System

string TargetOperatingSystems []
Returns `z/OS`.

Associations

IBMzOS_ElementSoftwareIdentity

Source IBMzOS_SoftwareIdentity
Target IBMzOS_PortController
see page 222

IBMzOS_InstalledSoftwareIdentity

Source IBMzOS_ComputerSystem
Target IBMzOS_SoftwareIdentity
see page 223

Association IBMzOS_ControlledBy

Inheritance

CIM_Dependency
- CIM_DeviceConnection
- CIM_ControlledBy
- IBMzOS_ControlledBy

Used by the following CIM profiles

- Storage HBA profile

Properties

Ref Antecedent	References an IBMzOS_PortController
Ref Dependent	References an IBMzOS_FCPort
Uint16 AccessState	Returns **1** Active
String DeviceNumber	Returns the device number of the IBMzOS_FCPort.
Uint16 AccessMode	Returns **2** ReadWrite

Association IBMzOS_CSFCPort

Inheritance

CIM_Component
- CIM_SystemComponent
- CIM_SystemDevice
- IBMzOS_CSFCPort

Properties

Ref GroupComponent	References an IBMzOS_ComputerSystem
Ref PartComponent	References an IBMzOS_FCPort

Association IBMzOS_CSFCPortController

Inheritance

CIM_Component
- CIM_SystemDevice
- IBMzOS_CSFCPortController

Properties

Ref GroupComponent	References an IBMzOS_ComputerSystem
Ref PartComponent	References an IBMzOS_PortController

Association IBMzOS_ElementSoftwareIdentity

Purpose

The IBMzOS_ElementSoftwareIdentity class allows a Managed Element such as an IBMzOS_PortController to report its software related asset information (such as firmware, drivers, or configuration software) on z/OS.

Inheritance

CIM_Dependency

← CIM_ElementSoftwareIdentity

← IBMzOS_ElementSoftwareIdentity

Used by the following CIM profiles

- Storage HBA profile

Properties

Ref Antecedent	References an IBMzOS_SoftwareIdentity
Ref Dependent	References an IBMzOS_PortController

Association IBMzOS_FCPortStatisticalData

Purpose

This class associates an **IBMzOS_FCPort** with **IBMzOS_FCPortStatistics**.

Inheritance

CIM_ElementStatisticalData

← IBMzOS_FCPortStatisticalData

Properties

Ref ManagedElement	References an IBMzOS_FCPort
Ref Stats	References IBMzOS_FCPortStatistics

Association IBMzOS_InstalledSoftwareIdentity

Purpose

The IBMzOS_InstalledSoftwareIdentity association identifies the Software installed on a system. On z/OS this class has only been implemented for formal compliance with the SMI-S Storage HBA profile and is of limited use.

Inheritance

CIM_InstalledSoftwareIdentity

← IBMzOS_InstalledSoftwareIdentity

Used by the following CIM profiles

- Storage HBA profile

Properties

Ref System	References an IBMzOS_ComputerSystem
Ref InstalledSoftware	References an IBMzOS_SoftwareIdentity

Association IBMzOS_ProductElementComponent

Inheritance

CIM_Component

← CIM_ProductElementComponent

← IBMzOS_ProductElementComponent

Used by the following CIM profiles

- Storage HBA profile

Properties

Ref GroupComponent	References an IBMzOS_Product
Ref PartComponent	References an IBMzOS_PortController

Association IBMzOS_SBDeviceSAPImplementation

Purpose

The IBMzOS_SBDeviceSAPImplementation class describes an association between a ServiceAccessPoint (SAP) and how it is implemented.

Inheritance

CIM_Dependency

← CIM_DeviceSAPImplementation

← IBMzOS_SBDeviceSAPImplementation

Used by the following CIM profiles

- Storage HBA profile

Properties

Ref Antecedent	References an IBMzOS_FCPort
Ref Dependent	References an IBMzOS_SBProtocolEndpoint

Association IBMzOS_SBHostedAccessPoint

Purpose

The IBMzOS_SBHostedAccessPoint class is an association between a Service Access Point and the System on which it is provided.

Inheritance

CIM_Dependency

← CIM_HostedDependency

← CIM_HostedAccessPoint

← IBMzOS_SBHostedAccessPoint

Used by the following CIM profiles

- Host Discovered Resources Profile
- Storage HBA profile

Properties

Ref Antecedent	References an IBMzOS_ComputerSystem
Ref Dependent	References an IBMzOS_SBProtocolEndpoint (Initiator instance)

Association IBMzOS_SBInitiatorTargetLogicalUnitPath

Purpose

The IBMzOS_SBInitiatorTargetLogicalUnitPath class is an association that models a host driver path to a logical unit on z/OS. Each permutation of initiator and target ProtocolEndpoints and logical units is considered as a separate path.

Retrieving the data for IBMzOS_SBInitiatorTargetLogicalUnitPath is only possible under the following conditions:

1. The used hardware is at least an IBM System z10 GA2.
2. The requestor or CIM client user ID has `UPDATE` access to the IOSCDR profile.

Inheritance

CIM_InitiatorTargetLogicalUnitPath

↖ IBMzOS_SBInitiatorTargetLogicalUnitPath

Used by the following CIM profiles

- Host Discovered Resources Profile
- Storage HBA profile

Properties

Ref Initiator	References an IBMzOS_SBProtocolEndpoint (Initiator instance)
Ref Target	References an IBMzOS_SBProtocolEndpoint (Target instance)
Ref LogicalUnit	References an IBMzOS_LogicalDisk

Chapter 9. WLM classes

IBMzOS_WLM

Purpose

This class represents the z/OS Workload Manager. READ access to the RACF facility class MVSADMIN.WLM.POLICY is required to access this class.

Properties

string Caption — A short description of the class

string Description — A description of the class

string ElementName — Name given to this instance of the class

datetime InstallDate — Not supported

uint16 OperationalStatus[] — The current status of WLM:
[2] [OK]

string StatusDescriptions[] — Not supported

string Status — Not supported

uint16 HealthState — The health status of WLM:
5 OK

uint16 EnabledState — Indicates the Enabled or Disabled state:
2 Enabled

string OtherEnabledState — Not supported

uint16 RequestedState — The last requested state:
2 Enabled

uint16 EnabledDefault — Indicates the default value for Enabled State:
2 Enabled

datetime TimeOfLastStateChange
Not supported

string SystemCreationClassName [key]
The scoping system's CreationClassName

string SystemName [key] — The name of the scoping system

string CreationClassName [key]
Indicates the name of the class used in the creation of an instance

string Name [key] — Name of z/OS Workload Management service

string PrimaryOwnerName — Not supported

string PrimaryOwnerContact — Not supported

boolean Started — Indicates if z/OS WLM runs

string ActiveServicePolicy — Name of WLM service policy activated for the sysplex

string PolicyDescription Description of the WLM service policy activated for the sysplex

datetime PolicyActivationTimestamp
The time the WLM service policy has been activated

string PolicyActivationUser Userid that activated the WLM service policy

string PolicyActivationSystem
System from which the WLM service policy activation was triggered

string RelatedServiceDefinition
Name of the service definition the WLM service policy was activated from

datetime ServiceDefinitionInstallationTimestamp
Time the service definition was installed

string ServiceDefinitionInstallationUser
User that installed the service definition

string ServiceDefinitionInstallationSystem
System from which the service definition installation was triggered

uint8 ServiceDefinitionFunctionalityLevel
Functionality level of the service definition

string EmbeddedEWLMPolicy
Name of the EWLM policy embedded in the active WLM service policy

datetime EWLMDMPolicyActivationTimestamp
Time the EWLM Domain Manager has triggered the activation of the EWLM policy that is activated on this system

datetime EWLMPolicyActivationTimestamp
Time the EWLM Managed Server has activated the EWLM policy that is activated on this system

datetime EWLMManagementActivationTimestamp
Time when management towards EWLM goals has been activated on this system

boolean PolicyActivationInProgress
Indicates whether a WLM policy activation is currently in progress

boolean AbnormalSystemConfiguration
Indicates an abnormal system configuration

string PolicyActivatingSystem
If a WLM policy activation is currently in progress, the name of the system where the policy activation was triggered

uint8 WLMVersion WLM version

uint16 CDSFormat WLM Couple Dataset format

string SysplexMembersSystemName[]
Name of systems in sysplex

uint8 SysplexMembersWLMMode[]
Workload management mode of systems in sysplex:
0 Undefined
1 Compatibility Mode
2 Goal Mode
3 EWLM Mode

uint8 SysplexMembersWLMStatus[]
Workload management status of systems in sysplex:
0 Undefined
1 Initializing
2 Active
3 Active, Not Running with Active Policy
4 Quiesce in Progress
5 Cleanup Initiated by System
6 WLM Inactive, Cleanup Complete
7 Unknown
8 System Inactive, Cleanup Pending
9 System Inactive, Cleanup Complete
10 Unknown

uint8 SysplexMembersGPAStatus[]
Guest platform management provider (GPMP) status of systems in sysplex:
0 PgmError
1 Inactive
2 Started
3 Active
4 Connected
5 Shutdown1
6 Shutdown2
7 Shutdown3
8 Failed
9 Stopped
10 SevFailed
11 Early-IPL
12 Disabled
13 Unavailable
14 Unknown

string SysplexMembersActivePolicy[]
Name of WLM service policy active on systems in sysplex

datetime SysplexMembersPolicyActivationTimestamp[]
Time the WLM service policy was activated on systems in sysplex

string SysplexMembersCleaningSystem[]
If WLM state is 'Cleanup Initiated by System', the name of the system performing the cleanup

string CouplingFacilityStructureNames[]
Name of the WLM coupling facility structures

uint8 CouplingFacilityStructureStatus[]
Status of the WLM coupling facility structures:

0 Disconnected
1 Connected

Methods

uint32 RequestStateChange() Not supported

uint32 StartService() Not supported

uint32 StopService() Not supported

uint32 ActivateServicePolicy()
Activate a service policy contained in the WLM service definition installed in the WLM couple dataset. UPDATE access to the RACF facility class MVSADMIN.WLM.POLICY is required to successfully invoke this method. Successful execution of this method is indicated by an IBMzOS_WLMPolicyActivationIndication indication.

uint32 InstallServiceDefinition()
Install the passed service definition to the WLM couple dataset. UPDATE access to the RACF facility class MVSADMIN.WLM.POLICY is required to successfully invoke this method.

uint32 ExtractServiceDefinition()
Extract the service definition from the WLM couple dataset. READ access to the RACF facility class MVSADMIN.WLM.POLICY is required to successfully invoke this method.

uint32 UploadServiceDefinition()
Save service definition in XML format in a sequential dataset.

uint32 DownloadServiceDefinition()
Download a service definition that is stored in XML format in a sequential dataset.

Indications

IBMzOS_WLMPolicyActivationIndication
A 'process' indication that indicates that a service policy has been activated in the sysplex. This event occurs on each system in the sysplex.

Associations

IBMzOS_WLMOS

Source	IBMzOS_WLM
Target	IBMzOS_ComputerSystem
see	page 230

Association IBMzOS_WLMOS

Purpose

This class associates an ***IBMzOS_WLM*** with an ***IBMzOS_ComputerSystem***.

Chapter 10. Cluster, CoupleDataset, and JES2-JES3Jobs provider setup

For using the Job and Cluster providers, some additional setup has to be done.

__ 1. Configure the Common Event Adapter (CEA):
   __ a. Define additional parameters in PARMLIB (see "Required PARMLIB updates")
   __ b. Prepare RACF for CEA (see "Required RACF setup")
__ 2. When running in a sysplex, format the sysplex couple dataset to allow it to be cluster capable (see "Sysplex couple dataset formatting").

Required PARMLIB updates

The following PARMLIB parameters have to be defined to enable the Job and Cluster providers:

MAXCAD limit
This parameter defaults to 50. If the installation sets a lower limit, it may be necessary to increase this setting to accommodate the Common Event Adapter (CEA) Common Area Data Space (CADS).

APF Authorize SYS1.MIGLIB
The following must be added to the installation's PROGxx member in PARMLIB to enable the CFRM-related CIM providers to function:

```
APF ADD DSNAME(SYS1.MIGLIB)  VOLUME(******)
```

REXX Alternate Library
The Couple Dataset providers require the use of compiled REXX execs provided as part of the z/OS 1.9 SYSREXX support. These execs require the use of the REXX alternate library. The following addition to the installation's PROGxx member in PARMLIB is one way to accomplish this.

```
LNKLST ADD,NAME(LNKLST00),DSN(REXX.V1R3M0.SEAGALT),ATTOP
```

Required RACF setup

For the necessary RACF setup to permit CEA to use Automatic Restart Manager (ARM), see *z/OS Planning for Installation*, chapter "Customizing for CEA". To permit CEA to operate in UNIX System Services with the Cluster, Couple Dataset and JES2/JES3 Jobs CIM providers, use job CFZSEC from the installation SAMPLIB as described in Chapter 2, "CIM server quick setup and verification," on page 15. For details see job steps PECEA and ENCLCDS in "Appendix A. Step-by-step explanation of the CFZSEC job" on page 287.

Sysplex couple dataset formatting

To format the sysplex couple dataset, use the IXCL1DSU format utility specifying `ITEM NAME(CLUSTER) NUMBER(1)`.

The following table shows a sample JCL formatting the sysplex couple dataset for enabling cluster functions. The IXCSYSPF member has been updated to indicate the new CLUSTER keyword.

Table 9. Sample sysplex couple dataset formatting JCL

```
IXCSYSPF JOB
*
* SAMPLE JCL TO FORMAT THE PRIMARY AND/OR ALTERNATE COUPLE DATA SETS
* - SYSPLEX COUPLE DATA SETS
*
*   1. SYSPLEX NAME IS REQUIRED AND IS 1-8 CHARACTERS
*   2. SYSPRINT DD IS A REQUIRED DD STATEMENT FOR FORMAT UTILITY
*      MESSAGES
*   3. SYSIN DD IS A REQUIRED DD STATEMENT FOR FORMAT UTILITY CONTROL  STATEMENTS
*
//STEP1    EXEC PGM=IXCL1DSU
//STEPLIB  DD   DSN=SYS1.MIGLIB,DISP=SHR
//SYSPRINT DD   SYSOUT=A
//SYSIN    DD   *
     DEFINEDS SYSPLEX(PLEX1)
              DSN(SYS1.XCF.CDS01) VOLSER(CDSPK1)
              MAXSYSTEM(8)
              CATALOG
          DATA TYPE(SYSPLEX)
             ITEM NAME(GROUP) NUMBER(50)
             ITEM NAME(MEMBER) NUMBER(120)
             ITEM NAME(GRS) NUMBER(1)
             ITEM NAME(CLUSTER) NUMBER(1)
     DEFINEDS SYSPLEX(PLEX1)
              DSN(SYS1.XCF.CDS02) VOLSER(CDSPK1)
              MAXSYSTEM(8)
              CATALOG
          DATA TYPE(SYSPLEX)
               ITEM NAME(GROUP) NUMBER(50)
               ITEM NAME(MEMBER) NUMBER(120)
               ITEM NAME(GRS) NUMBER(1)
               ITEM NAME(CLUSTER) NUMBER(1)
/*
```

Chapter 11. Connecting the RMF CIM providers to the RMF Distributed Data Server (DDS)

If you have installed RMF, you should consider the following chapter for the connection of your RMF CIM providers to the RMF Distributed Data Server (DDS).

The setup steps depend on whether you are running systems prior to z/OS 1.10 in your sysplex or not:

If you are running systems prior to z/OS 1.10 in your sysplex

__ 1. Start the DDS manually on one particular system and use the environment variables RMF_CIM_HOST and RMF_CIM_PORT to specify the location of the DDS in order for the CIM Monitoring providers being able to connect. A more flexible solution, where the DDS can run on any system in the sysplex, can be set up by using Dynamic Virtual IP Address support (DVIPA). For more information, see *z/OS Communications Server: IP Configuration Guide*.

__ 2. The CIM monitoring providers cannot authenticate themselves to the DDS. This requires the use of the HTTP_NOAUTH option in the active GPMSRVxx parmlib member to disable authentication for a specific IP address, a group of IP addresses using wildcards, or entirely.

Example:

```
HTTP_NOAUTH(192.0.2.100)
HTTP_NOAUTH(192.0.2.*)
HTTP_NOAUTH(*)
```

If all the systems in your sysplex run z/OS 1.10 and above

__ 1. The CIM monitoring providers can automatically locate an active RMF DDS in the sysplex. When the DDS gets restarted on different systems through RMF management, or through manual action, the CIM monitoring providers can connect to an active DDS without additional configuration. To enable this option, comment out or omit the RMF_CIM_HOST environment variable from your `cimserver.env` file. For more information on the RMF-managed DDS refer to "Starting the Distributed Data Server" in the *z/OS RMF User's Guide*.

__ 2. The CIM monitoring providers support PassTicket authentication to the DDS. In this case the HTTP_NOAUTH option must be disabled. Secure signon through PassTickets needs to be enabled in your security manager.

   If you are using z/OS Security Server (RACF), the following commands can be used (for more information about configuring RACF to use PassTicket services, refer to *z/OS Security Server RACF Security Administrator's Guide*):

   __ a. Activate the PTKTDATA class and the SETROPTS RACLIST processing:

   ```
   SETROPTS CLASSACT(PTKTDATA)
   SETROPTS RACLIST(PTKTDATA)
   ```

__ b. Define a DDS application profile with an associated encryption key:

```
RDEFINE PTKTDATA GPMSERVE SSIGNON(KEYMASKED(<key>))
```

where <key> is a user-supplied 16-digit value that is used to generate the PassTicket. The valid characters are 0 - 9 and A - F.

__ c. Define an access profile for the PassTicket service:

```
RDEFINE PTKTDATA IRRPTAUTH.GPMSERVE.* UACC(NONE)
```

__ d. Give UPDATE access to the user connecting to the DDS:

```
PERMIT IRRPTAUTH.GPMSERVE.* CLASS(PTKTDATA)
          ID(<user>)
          ACCESS(UPDATE)
```

where <user> is the user ID assigned to the CIM server started task. The default user ID is CFZADM.

__ e. Activate the changes:

```
SETROPTS RACLIST(PTKTDATA) REFRESH
```

If you migrate from a release prior to z/OS 1.10 to release z/OS 1.10 or above, and if you do not want to enable PassTicket support

__ 1. Start the DDS manually

__ 2. Disable authentication with the HTTP_NOAUTH option in the active GPMSRVxx parmlib member for all systems in the sysplex running the CIM server

__ 3. Make sure that the environment variables RMF_CIM_HOST and RMF_CIM_PORT on all CIM server systems contain the correct IP address and port number of the active DDS

Chapter 12. Developing CMPI providers for z/OS

The system-specific management data for the CIM Schema and system-specific Schema extension classes are provided through management instrumentation. While some management instrumentation is already provided by the z/OS CIM (see Chapter 8, "z/OS Management Instrumentation for CIM," on page 105), it is also possible to develop additional management instrumentation for other z/OS resources which are not accessible through the existing z/OS management instrumentation.

Management instrumentation is implemented by developing a provider. A provider is a dynamic load library that implements a given interface and contains the program code used by the CIM server to interact with the system resource described by a certain CIM class, for example ***CIM_Processor***. Providers are registered with the CIM server for a defined CIM class, allowing the CIM server to route all client requests directed against this class to the provider for interacting with the resource. A provider logically acts as an extension of the CIM server for interfacing directly with the managed resources.

Providers are the de facto standard concept for developing management instrumentation, though this purpose of providers is not explicitly mentioned by the various CIM and WBEM standards available from the DMTF. The ***Common Manageability Programming Interface*** (CMPI) technical standard was defined by ***The OpenGroup*** to allow for developing providers independently from a specific CIM server implementation.

Figure 16 shows the CMPI provider interfaces:

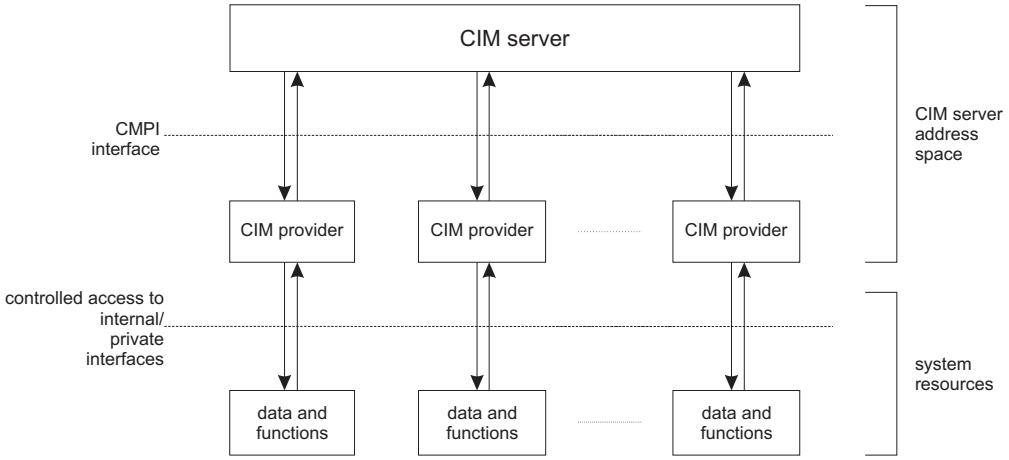


Figure 16. CMPI provider interfaces

CMPI is a C-based programming interface for providers designed for binary compatibility. All management instrumentation included with the z/OS CIM server was developed following the CMPI standard and CMPI is the only supported provider programming interface for the z/OS CIM server. Documentation about the CMPI Technical Standard is available from ***The OpenGroup*** and is not repeated in any documentation available for z/OS. Developers of management instrumentation for z/OS need to be familiar with the CMPI and CIM/WBEM

standards. The information contained here explains the specific aspects that need to be considered for developing CMPI Providers for z/OS.

To be able to develop a CMPI provider for z/OS, a set of C header files is required that define the CMPI interface (see "Obtaining the required header files").

Due to legal implications with the OpenSource nature of these files, they are not provided together with z/OS CIM, but must be obtained from their original location at ***The OpenGroup*** instead. "Obtaining the required header files" explains how to accomplish this.

Due to the CMPI interface design, you need not link a CMPI provider to any library of the z/OS CIM server. Only the header files are needed for developing a CMPI provider library.

Obtaining the required header files

Before you can start to develop a provider dynamic load library, you must obtain the following C header files from the OpenPegasus project through the internet:

cmpidt.h Data type definitions

cmpift.h Function signature definitions in the form of function tables

cmpimacs.h CMPI convenience macros (optional)

These files are available in the ***OpenPegasus CVS Repository***. Users familiar with ***CVS*** can check out these files using a ***CVS*** client on any platform by following the instructions on ***http://www.openpegasus.org/*** in the *CVS Overview* section. The required files are located in directory `pegasus/src/Pegasus/Provider/CMPI`. To get the correct version of the files, they need to be checked out with at least the RELEASE_2_8_1 tag.

Users who are not familiar with using ***CVS***, are recommended to obtain the files through a web browser starting at ***http://www.openpegasus.org/***. From the main page switch to the *Web CVS* section from where you can navigate to the required CMPI files by clicking on the following directory names:

`pegasus` (see Figure 17) **→ `src` → `Pegasus` → `Provider` → `CMPI`**

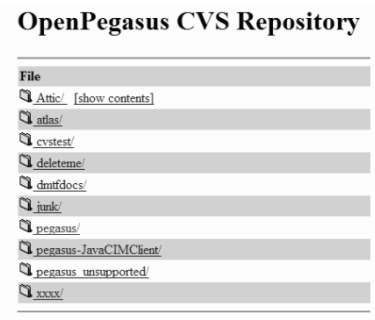


Figure 17. OpenPegasus CVS Repository

Once you have successfully navigated to the CMPI directory, the required header files are found at the end of the list of displayed files. To get the correct version of the files, the tag RELEASE_2_8_1 or above needs to be selected from the list at the bottom of the file list.

To download the files, first click on the version number displayed in the column after each file name and then click on ***download*** on the next screen where the content of the file is displayed. Once you have successfully downloaded the files, transfer them to the z/OS system on which the provider dynamic load library will be developed, ideally to a ZFS directory. Please note that when transferring files from the workstation to a z/OS system, they should be converted from ASCII to EBCDIC encoding.

There are also a couple of samples for CMPI providers available on the **OpenPegasus CVS Repository**. They can be obtained the same way as the header files by navigating to the ***pegasus/src/Providers/sample/CMPI*** directory.

General aspects for developing a provider

Before you can start to develop a CMPI provider, you first need to have the CIM class model containing descriptions for the resource to be instrumented in the form of a CIM class. Such a class should follow the standards from ***DMTF Standards and Initiatives***, and in particular it should be consistent with the CIM Schema supported by the CIM server. Usually, a CIM class for which a provider is written, is derived from one of the classes in the CIM Schema provided by the DMTF, and named with a vendor-specific class name prefix. For example, the prefix *IBMzOS_* is used for all classes provided by IBM for the z/OS operating system. This naming scheme also helps to prevent conflicts with the resources that have already been instrumented for CIM by IBM or other vendors.

Note: In general it is not recommended to create new providers for resources that have already been instrumented by IBM.

Provider initialization and function signatures

The nature of a CMPI provider does not require static linking to any of the CIM server's libraries. Instead, for each provider function group a single initialization routine (factory) entry point must be exposed following a defined naming scheme, so that the CIM server can call this entry point by name once it has dynamically loaded a provider dynamic load library. The CIM server will attempt to determine the function groups supported by a provider and the respective entry points by verifying the existence of the according provider factory entry points.

The signature for the factory functions looks like this:

```
CMPI<mi-type>MI * <mi-name>_Create_<mi-type>MI(CMPIBroker*,
                                               CMPIContext*,
                                               CMPIStatus*);
```

<mi-type> refers to the function group of the provider, and <mi-name> refers to the actual provider name as specified during provider registration.

Important:
The actual signature of this function has an additional '_' after '_Create', which is not described as such in the initial version of the ***CMPI Technical Standard***, but is changed in a Corrigendum to match the existing implementations of the CMPI interface.

The factory function must return a pointer to a valid `CMPI<mi-type>MI` structure where the major component of this structure is the table holding the function pointers, and thus enabling access to the individual provider group functions for the CIM server. An example of such a function pointer is the pointer to the *enumerateInstances* function in the `CMPIInstanceMI` structure.

The function groups for CMPI providers are ***Instance***, ***Association***, ***Property***, ***Method*** or ***Indication***, where type ***Property*** is not supported by the z/OS CIM server.

In file *cmpimacs.h*, a set of C preprocessor macros are defined that you may use for the provider initialization code and through which the required code for the <mi-name>_Create_<mi-type>MI function is generated in a convenient way. These macros are called ***CM<mi-type>MIStub*** and they are used in many of the examples referenced in "Samples" on page 247.

For further details please read chapter *MI Factories* of the *CMPI Technical Standard Document* provided by ***The OpenGroup***.

For each of the CMPI provider function groups, a set of C functions must be implemented as described in chapter *MI Function Signatures* of the *CMPI Technical Standard Document*.

Instance provider functions

Instance providers are the most common kind of management instrumentation. They implement the basic access to the resources described in a CIM class. With an instance provider it is possible to create, enumerate, modify, delete, query or simply retrieve system resources:

- cleanup(...)
- enumInstanceNames(...)
- enumInstances(...)
- getInstance(...)
- createInstance(...)
- modifyInstance(...)
- deleteInstance(...)
- execQuery(...)

Method provider functions

Method providers are needed to implement the methods defined for a CIM class.

- cleanup(...)
- invokeMethod(...)

Association provider functions

Association providers are needed to implement the relationships between system resources as defined by the association classes.

- cleanup(...)
- Associators(...)
- AssociatorNames(...)
- References(...)
- ReferenceNames(...)

Indication provider functions

Event or indication providers must be implemented for event subscription and notification:

- cleanup(...)
- AuthorizeFilter(...)
- MustPoll(...)
- ActivateFilter(...)
- DeActivateFilter(...)
- EnableIndications(...)
- DisableIndications(...)

Please note that the function ***MustPoll*** is not supported for z/OS.

Security aspects

When developing a CMPI provider for z/OS, consider the security context in which the provider runs. Besides the levels of security provided by the z/OS CIM server for authentication and authorization, a provider is processed in the context of a user ID:

Requestor's user ID

By default, a provider is processed in the context of the requestor's user ID for all invocations that are caused by an external CIM operation. This means that the provider runs under the identity of the requestor's user ID, and resource access authorization occurs against this user ID. See the usage notes for the ***pthread_security_np*** call in chapter *Callable services descriptions* in *z/OS UNIX System Services Programming: Assembler Callable Services Reference* for additional information.

Designated user ID

Alternatively, you can provide a designated user ID that runs the provider.

Specify the designated user ID during provider registration using the *UserContext* and *DesignatedUserContext* properties of the ***PG_ProviderModule*** class.

When a provider is registered with a designated user ID, the CIM server processes all requests under the designated user ID, regardless which client user ID has issued the request.

The user ID of the requestor is still available for the provider and should be used for further authorization checking in order to prevent unauthorized access to a resource. You have to specify similar security definitions for the designated user ID as for regular client users, as described in "Switching identity (surrogate)" on page 31.

Data conversion ASCII / EBCDIC

The z/OS CIM server executes in the Enhanced ASCII mode. This means that all string data within the CIM server's address space is represented in ASCII rather than EBCDIC encoding. For a provider this means that all string data exchanged with the CIM server is expected to be in ASCII (codepage ISO/IEC 8859-1), encoded in UTF8 format. Since the native data of z/OS resources is usually represented in EBCDIC, the provider code needs to convert this data before it can return it to the CIM server through the CMPI interface, or when it receives data from the CIM server through the CMPI interface.

Therefore it is also recommended to compile the provider's C code using the ASCII option of the z/OS XL C/C++ compiler. Please note that using the ASCII option also requires the XPLINK compile and link option.

See *Appendix B* in the *z/OS XL C/C++ Run-Time Library Reference* for additional information about the Enhanced ASCII support. Also see the *z/OS XL C/C++ Guide* and the *z/OS XL C/C++ Programming Guide* for details about the ASCII compiler option.

Registering a provider with the CIM server

In order for the CIM server to be able to recognize a provider, you first need to store the provider in the CIM server's provider directory and then register it with the CIM server for the respective CIM class.

The providers belonging to the z/OS operating system are located in the `/usr/lpp/wbem/provider` hierarchical file system directory. It is not recommended to store non-IBM providers in this directory as well. Either store them in their own separate hierarchical file system directory and create a symbolic link into the CIM server owned provider directory, or extend the CIM server's search list for provider directories by setting the *providerDir* configuration property. See section "Advanced configuration properties" on page 47 for details on how to set this property.

On systems where "program control" is enabled, you must also flag the provider dynamic load library as program controlled. You achieve this using the `extattr` UNIX System Services command (`extattr +p <providerfile>`). Details about enabling shared libraries for program control can be found in ***Defining modules to program control*** in *z/OS UNIX System Services Planning*.

Once the provider dynamic load library has been made physically accessible to the CIM server, it needs to be registered via a special MOF file using the `cimmof` command. A provider registration MOF file contains instances of the CIM classes from the provider registration schema, namely of classes ***PG_ProviderModule***, ***PG_Provider*** and ***PG_ProviderCapabilities*** as shown in Figure 18 on page 241:

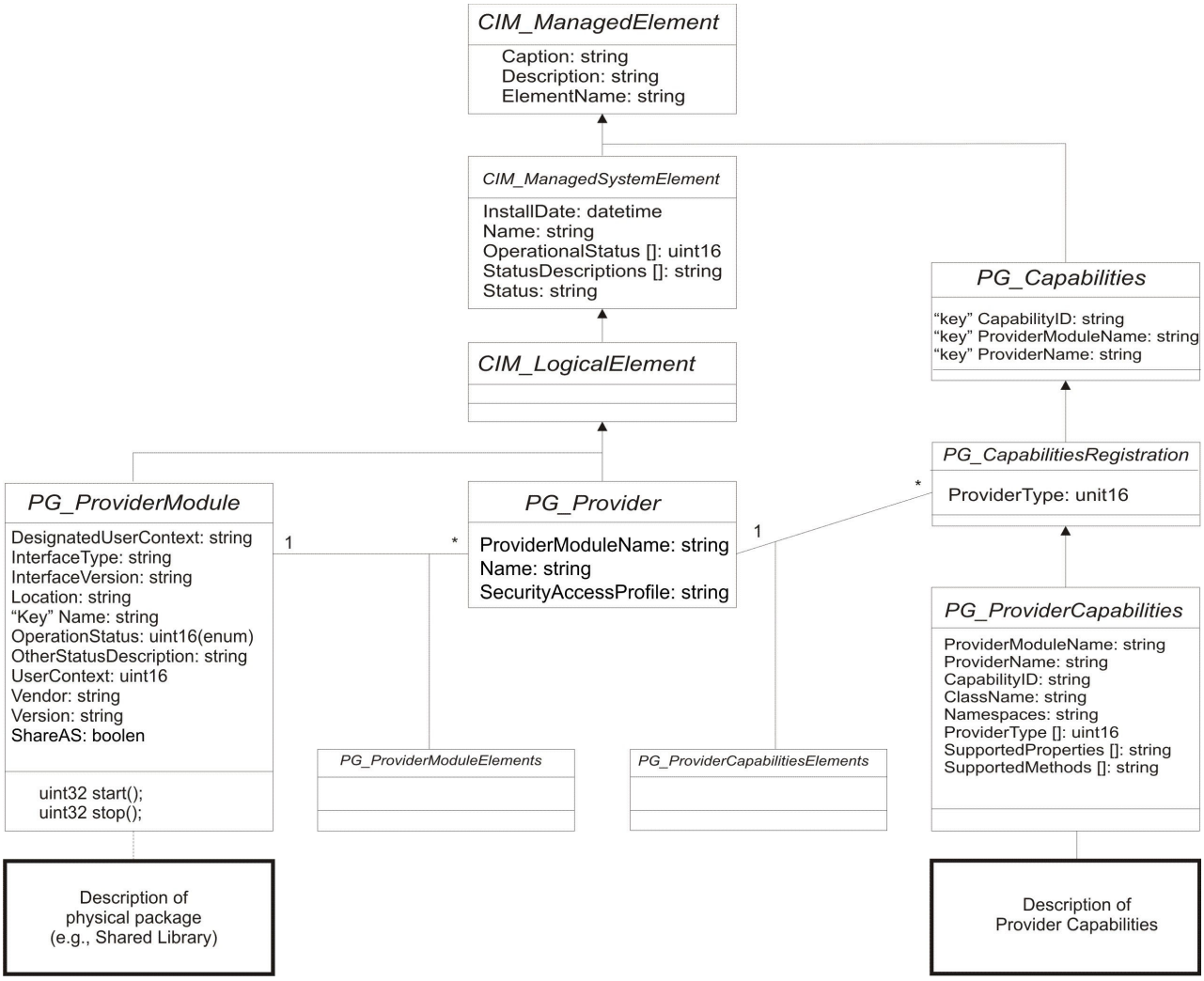


Figure 18. CIM classes from the provider registration schema

The instances of these classes contain all the information that the CIM Server needs to know about a provider, for example its physical packaging structure, supported CIM classes and namespaces, as well as the set of supported provider operations.

PG_Provider

Purpose

This class is the logical representation of a CIM provider. Its only properties are the name of the provider, the name of the provider module in which the code of the provider physically resides and the name of a SAF security profile to be checked before a client is granted access to the provider.

Properties

string ProviderModuleName The name of the provider module containing the code for this provider. This name needs to match the value of the *Name* property of the corresponding instance of class PG_ProviderModule.

string Name The name of the provider. This name is used to identify a specific provider within a provider module (dynamic load library) and specifies the prefix of a provider's ***_Create_<mi-type>MI()*** initialization function.

string SecurityAccessProfile This property defines the name of a z/OS security server's profile in the CIM server's WBEM class that will be checked for a requestor's access before a request is routed to this provider. Depending on the type of the CIM operation, a different level of access to the security profile is required as listed in Table 4 on page 31.

This is not a required property and can be omitted from the provider registration MOF.

Examples

Example of an instance of class PG_Provider in MOF syntax:

```
instance of PG_Provider
{
   //The provider module as defined in PG_ProviderModule
   ProviderModuleName = "TestClassProviderModule";
   // The provider name as referenced in the code
   Name = "TestClassProvider";
};
```

PG_ProviderModule

Purpose

This class represents the physical packaging of one or more providers in a dynamic load library or shared library.

Properties

string Name
The logical name of the provider module.

string Vendor
The name of the provider module vendor, for example, `IBM`.

string Version
The provider module version.

string InterfaceType
The interface type implemented by the provider. Must be `CMPI` for z/OS.

string InterfaceVersion
The interface version number implemented by the provider. Must be `2.0.0` for CMPI on z/OS.

string Location
The name of the dynamic load library or shared library in the hierarchical file system without a path name. The name specified for *Location* is automatically prefixed with `lib` and extended with `.so` by the CIM server:

```
lib<Location>.so
```

boolean ShareAS
Setting the *ShareAS* property to `false` causes the provider module to run in its own copy of a Provider Agent process. No other provider module will be loaded into this process.

Setting the *ShareAS* property to `false` has a major impact on the performance, so you should not set it to 'false' unless there is an urgent need for a provider module to be protected from other provider modules. The default setting of *ShareAS* is `true`.

Setting *ShareAS* to `false` is only honored by the CIM server, if it is running with the configuration property *forceProviderProcesses* set to `true`.

uint16 UserContext
Defines the user context in which this provider module is invoked.

Values:

2 (Requestor), default
The provider is invoked in the security context of the user requesting an operation.

3 (Designated User)
The provider is invoked in the security context of the user ID specified by the *DesignatedUserContext* property.

See "Running providers in a designated user context" on page 41 for a general description on running a provider module with a designated user context.

string DesignatedUserContext

Specifies the user ID providing the context in which this provider module is invoked (regardless of which user requests an operation).

Values:

NULL when *UserContext* = 2

non-NULL value
when *UserContext* = 3

See "Running providers in a designated user context" on page 41 for a general description on running a provider module with a designated user context.

Examples

Example of an instance of class PG_ProviderModule in MOF syntax:

```
instance of PG_ProviderModule
{
   Name = "TestClassProviderModule";
   //The library name on disk
   Location = "TestClassProvider";
   // (will be extended to libTestClassProvider.so)
   Vendor = "IBM";
   Version = "1.0.0";
   InterfaceType = "CMPI";
   InterfaceVersion = "2.0.0";
   ShareAS = true;
   UserContext = 2;
};
```

PG_ProviderCapabilities

Purpose

This class describes the specific capabilities of a provider. Multiple instances of PG_ProviderCapabilities can be created for each provider allowing the same provider to be registered, for example, for multiple CIM classes.

Properties

string ProviderModuleName The name of the provider module as specified in the corresponding instances of classes PG_Provider and PG_ProviderModule.

string ProviderName The name of the provider as specified in the corresponding instance of class PG_Provider.

string CapabilityID A value that uniquely identifies this ***Capabilities*** instance within the set of ***Capabilities*** for the designated provider.

uint16[] ProviderType Enumerates the kind of provider capabilities (=supported operations) defined for the associated provider:

- **2** Instance
- **3** Association
- **4** Indication
- **5** Method
- **6** IndicationConsumer (not supported for z/OS)
- **7** InstanceQuery

string ClassName Describes the CIM class for which the associated provider supplies instances, associations or indications information.

string[] Namespaces Describes the namespaces that are supported by the provider for this CIM class.

string[] SupportedProperties Lists the properties supported by this provider. If this array is empty, the provider **must** support all of the properties defined in the class.

string[] SupportedMethods Lists the methods supported by this provider. If this array is empty, the provider **must** support all the methods defined in the class.

Examples

Example of an instance of class PG_ProviderCapabilities in MOF syntax:

```
instance of PG_ProviderCapabilities
{
   //The provider module as defined in PG_ProviderModule
   ProviderModuleName = "TestClassProviderModule";
   //The provider name as defined in PG_Provider
   ProviderName = "TestClassProvider";
   CapabilityID = "1";
   //Name of the CIM class as defined in the mof
   ClassName = "IBMzOS_TestClassB";
   Namespaces = {"root/cimv2","root/test"};
   ProviderType = { 2, 5 }; // Instance, Method
   SupportedProperties = NULL; // All properties
   SupportedMethods = NULL; // All methods
};
```

```
instance of PG_ProviderCapabilities
{
   //The provider module as defined in PG_ProviderModule
   ProviderModuleName = "TestClassProviderModule";
   //The provider name as defined in PG_Provider
   ProviderName = "TestClassProvider";
   CapabilityID = "2";
   //Name of the CIM class as defined in the mof
   ClassName = "IBMzOS_TestIndication";
   Namespaces = {"root/cimv2"};
   ProviderType = { 4 }; // Indication
   SupportedProperties = NULL; // All properties
   SupportedMethods = NULL; // All methods
};
```

Provider registration processing

Once the provider registration MOF file has been created with the instances of classes ***PG_Provider***, ***PG_ProviderModule*** and ***PG_ProviderCapabilities***, the content of this MOF file can be loaded into the CIM server's `root/PG_InterOp` namespace using the `cimmof` command described in "cimmof/cimmofl" on page 60.

Example:

```
cimmof -n root/PG_InterOp TestProviderRegistration.mof
```

Samples

Examples for CMPI providers can be found on the ***OpenPegasus CVS Repository***, located in the `pegasus/src/Providers/sample/CMPI` directory. You can be access them in the same ways as described in "Obtaining the required header files" on page 236. Please note that these examples have been enabled for z/OS only in an ***OpenPegasus*** build environment and will need some minor adoptions for a custom build environment.

Additional examples are available from the ***SBLIM OpenSource*** project (packages sblim-cmpi-<xxx>) hosted on ***http://sourceforge.net/***. Although the CIM providers from SBLIM apply to Linux® platforms only, they are examples for how to write CIM providers in general. The SBLIM project also provides a number of useful tools and documents related to provider development.

Part 3. Messages and troubleshooting

Chapter 13. Messages

Messages are written into the appropriate logs and also displayed at the z/OS console.

All messages issued by the CIM server are part of the underlying OpenPegasus code. This section documents only those messages that are specific while using the CIM server on z/OS, together with explanation, system action, (system) programmer and user response.

All other OpenPegasus messages are wrapped by one of the following generic z/OS messages.

CFZ00001I for INFORMATION log messages

CFZ00002W for WARNING log messages

CFZ00004E for SEVERE and FATAL log messages

CEZ02000I Requesting CONFIG ONLINE for CPU *CPU-address*

Explanation: The IBMzOS_Processor method RequestStateChange has been issued with RequestedState=`Enabled`.

System action: None.

System programmer response: Issue a `CF CPU(`*`CPU-address`*`),ONLINE` command, or use your automation tool to set the CPU *CPU-address* online.

User response: None.

CEZ02001I Requesting CONFIG OFFLINE for CPU *CPU-address*

Explanation: The IBMzOS_Processor method RequestStateChange has been issued with RequestedState=`Offline`.

System action: None.

System programmer response: Issue a `CF CPU(`*`CPU-address`*`),OFFLINE` command, or use your automation tool to set the CPU *CPU-address* offline.

User response: None.

CEZ03000E Request user ID *user-ID* **requires UPDATE permission on profile IOSCDR CL(FACILITY).**

Explanation: A CIM operation was invoked that requires the use of an authorized IOSCDR service. The IOSCDR service is used by CIM providers to retrieve device identification information (such as the serial number and the model number) for an I/O device. Providers that instrument the CIM classes IBMzOS_SBProtocolEndpoint or IBMzOS_SBInitiatorTargetLogicalUnitPath are an example for this scenario.

System action: The requested CIM operation is returned in error.

System programmer response: Verify if the user should be permitted to perform operations using the IOSCDR service. If so, grant the user *user-ID* `UPDATE` permission to the profile IOSCDR in the class FACILITY.

User response: Report this problem to your system programmer.

CEZ05000E Internal error detected in provider module *module-name* **when method** *method-name* **invoked system service** *service-name***. The service returned RC=***return-code* **RSN=***reason-code***. Additional diagnostic information: CEAERRO_Diag1=***code1* **CEAERRO_Diag2=***code2* **CEAERRO_Diag3=***code3* **CEAERRO_Diag4=***code4* **CEAERRO_Msg=***text*

Explanation: The system encountered an internal error while processing a CIM request. The following information is provided:

module-name
: Name of CIM provider module

method-name
: Name of CIM method invoked

service-name
: Name of the internal service, usually in the CEA component

return-code
: Internal return code

reason-code
: Internal reason code

CEAERRO_Diag1-4
: Internal values representing errors in system processing on behalf of the CIM request

CEAERRO_Msg
: Textual information saved by system processing on behalf of the CIM request

System action: System processing ended with the error information described in this message.

System programmer response: See CEAERRO_Msg for more informational messages about the problem. If the problem is still unclear or no additional messages are available, contact IBM Service for assistance.

User response: Report this problem to your system programmer.

CEZ05001E Internal error detected in provider module *module-name* **when method** *method-name* **invoked system service** *service-name***. The service returned RC=***return-code* **RSN=***reason-code*

Explanation: The system encountered an internal error while processing a CIM request. The following information is provided:

module-name
: Name of CIM provider module

method-name
: Name of CIM method invoked

service-name
: Name of the internal service, usually in the CEA component

return-code
Internal return code
reason-code
Internal reason code

System action: The requested CIM operation is returned in error. System processing ended with the error information described in this message.

System programmer response: Contact IBM Service for assistance.

User response: Report this problem to your system programmer.

CEZ05002E Common Event Adapter (CEA) not available.

Explanation: A CIM method was invoked, but the CEA address space was not active to process the request.

System action: The requested CIM operation is returned in error.

System programmer response: Enter the command `START CEA` from the operator console to start the CEA address space. Verify that CEA is active through the command `D A,CEA`.

User response: Report this problem to your system programmer.

CEZ05003E User *user-name* not authorized for Common Event Adapter (CEA) request.

Explanation: A CIM method was invoked, but the user is not authorized to issue requests to the CEA component.

System action: The requested CIM operation is returned in error.

System programmer response: Ensure that the user has access to CEA. Refer to "Required RACF setup" on page 231.

User response: Report this problem to your system programmer.

CEZ05004E IPCS Sysplex Dump Directory cannot find incident information.

Explanation: A CIM method was invoked to locate a specific incident, but the Common Event Adapter (CEA) component cannot locate the incident in the sysplex dump directory (SYS1.DDIR). Common reasons include:

- Sysplex dump directory SYS1.DDIR (or equivalent data set name) is not set up correctly
- Dump incident is not in the directory
- Incident could have been previously deleted from the directory.

System action: The requested CIM operation is returned in error. If the failure occurred while performing a set tracking number or set PMR number operation, the function ends without having updated either value.

System programmer response: Verify that the sysplex dump directory exists and is usable. Default name is SYS1.DDIR. For more information, see the topic on troubleshooting problems in *z/OS Management Facility User's Guide*. If the problem persists, contact IBM Service for assistance.

User response: Report this problem to your system programmer.

CEZ05005E System REXX not available.

Explanation: A CIM method was invoked, requiring the invocation of a system REXX exec. However, the System REXX address space (AXR) or facilities that it provides are not available.

System action: The requested CIM operation is returned in error.

System programmer response: Enter the command `START AXRPSTRT` from the operator console to start System REXX. Verify that System REXX is active with the `D A,AXR` command.

User response: Report this problem to your system programmer.

CEZ05006E System REXX is not configured to support compiled REXX execs.

Explanation: A CIM method was invoked, requiring the invocation of a system REXX exec. However, the System REXX component cannot process the exec. This usually indicates that the run time support for compiled REXX has not been set up.

System action: The requested CIM operation is returned in error.

System programmer response: The REXX library and the REXX Alternate library must be installed. Refer to the Program Directory of these optional products for installation instructions.

User response: Report this problem to your system programmer.

CEZ05007W The request *method-name* has timed out.

Explanation: A CIM method was invoked, requiring the invocation of a system REXX exec that timed out.

System action: The requested CIM operation is returned in error.

System programmer response: This is an internal problem related to the TIMEINT parameter on the AXREXX macro. Contact IBM Service for assistance.

User response: Report this problem to your system programmer.

CEZ05008W The request *method-name* could not be processed at this time.

Explanation: A CIM method was invoked, but System REXX is overloaded and cannot schedule the corresponding REXX exec to run at this time.

System action: System REXX limits the number of active and waiting requests to 5000. The requested CIM operation is returned in error.

System programmer response: Enter the command `SYSREXX STATUS` and check the value specified as "REQUESTS QUEUED" in message AXR0200I. Have the user retry the operation when there are fewer System REXX requests being processed. If still unsuccessful, contact IBM Service for assistance.

User response: Report this problem to your system programmer.

CEZ05009E SYS1.MIGLIB is not APF authorized.

Explanation: A CIM method was invoked that requires the use of an authorized service in SYS1.MIGLIB (such as AMATERSE). However, SYS1.MIGLIB is not APF authorized, which prevents CEA from invoking those programs.

System action: The requested CIM operation is returned in error.

System programmer response: From the operator console, enter the command

```
SETPROG APF,ADD,DSN=SYS1.MIGLIB,
        VOL=<volser>
```

where <*volser*> is the volume on which MIGLIB resides.

User response: Report this problem to your system programmer.

CEZ05010E User *user-name* not authorized to view operator log snapshot *logstream-or-dataset-name*.

Explanation: A CIM method was invoked, referencing an OPERLOG snapshot for a specific incident, but the invoker is not SAF authorized to view information about the snapshot. OPERLOG diagnostic snapshots are stored in DASD log streams with data set names containing the high level data set qualifier specified in the CEAPRMxx parmlib member.

System action: The requested CIM operation is returned in error.

System programmer response:

- The security administrator must authorize the invoker of the service to the high-level qualifier (HLQ) of this dataset.
- The parmlib member CEAPRM00 (or the customized member CEAPRMxx, where xx is the suffix particular to your system) should contain the customized HLQ value or its default ('CEA').

User response: Report this problem to your system programmer.

CEZ05011E The System Logger is not available. CEAERRO_Diag4=*code*

Explanation: A CIM method was invoked, attempting to access a DASD log stream, but the System Logger facility is not available. The *code* value associated with CEAERRO_Diag4 refers to a system logger return code.

System action: The requested CIM operation is returned in error.

System programmer response:

- See the description of IXGCON in *z/OS MVS Data Areas, Vol 3* for an explanation of the logger reason code in CEAERRO_Diag4.
- If the system is not running with a logger couple data set, this is a permanent condition for the IPL. Otherwise, restart the system logger and enter the request again.

User response: Report this problem to your system programmer.

CEZ05012E The Common Event Adapter (CEA) event *event-name* was forced removed by the system operator.

Explanation: The system operator used the `CEAunsubscribe` console command to force the removal of this event while there was a CIM user subscribed to it. The following console command may have been issued:

```
f cea,diag,remove,client=clientname,
      event=eventname
```

System action: The CIM indication will no longer be surfaced.

System programmer response: Avoid removing events that have outstanding subscriptions.

User response: Unsubscribe to the event specified in the message and resubscribe.

CEZ05013E Common Event Adapter (CEA) is running in minimum mode.

Explanation: The system operator has forced CEA into 'minimum mode' by using the command:

```
f cea,mode=min
```

CIM indication processing is unavailable.

System action: CIM indications will not be supported.

System programmer response: Change CEA to run in

'full mode'. The following console command can be used:

```
f cea,mode=full
```

User response: Contact your system programmer.

CEZ05014E Internal error detected in provider module *module-name* **while invoking method** *method-name***.**

Explanation: A CIM method was invoked, but an internal provider error occurred in the CIM provider.

System action: The requested CIM operation is returned in error.

System programmer response: Contact IBM Service for assistance.

User response: Report this problem to your system programmer.

CEZ05015E Target operating system *version/release* **not supported for provider module** *module-name* **method** *method-name***.**

Explanation: A CIM method was invoked, but the provider requires the identified minimum operating system *version/release*.

System action: The requested CIM operation is returned in error.

System programmer response: Contact IBM Service for assistance.

User response: Report this problem to your system programmer.

CEZ05016E IPCS Sysplex Dump Directory failure.

Explanation: A CIM method was invoked to locate incident information, but the Common Event Adapter (CEA) component encountered a File Open Error when accessing the sysplex dump directory (SYS1.DDIR or equivalent data set name). A possible cause is that SYS1.DDIR is not set up correctly.

System action: The requested CIM operation is returned in error. If the failure occurred while performing a set problem tracking number or set PMR number operation, the function will end without having updated the value.

System programmer response:

- Verify that the sysplex dump directory exists and is usable. Default name is SYS1.DDIR.
- For more information, see the topic on troubleshooting problems in *IBM z/OS Management Facility User's Guide*.
- If you still encounter a problem, contact IBM Service for assistance.

User response: Report this problem to your system programmer.

CEZ05017E IPCS Sysplex Dump Directory busy. Please try request again.

Explanation: A CIM method was invoked to locate incident information, but the Common Event Adapter (CEA) experienced an ENQ Problem when accessing the Sysplex Dump Directory (SYS1.DDIR). A possible cause is that a job or IPCS user is accessing SYS1.DDIR while CEA is attempting to access it.

System action: The requested CIM operation is returned in error.

System programmer response: Ensure that no other users are attempting to access the sysplex dump directory at the same time by checking for an exclusive ENQ on SYS1.DDIR (using `D GRS`). If so, consider cancelling the suspect user or job.

User response: Report this problem to your system programmer.

CEZ10000E Unable to obtain a passticket for GPMSERVE. RACF permissions probably missing

Explanation: The Monitoring providers were unable to obtain a valid passticket for the application GPMSERVE (RMF Distributed Data Server).

System action: The CIM request is not processed.

System programmer response: Make sure that the RMF Distributed Data Server is set up for accepting PassTickets as described in *z/OS RMF User's Guide*.

User response: Contact your system programmer.

CFZ02202W Property value is not valid: *name*=*value*

Explanation: The value that was specified for the configuration property is not valid. See "CIM server configuration properties" on page 45 for the correct values of configuration properties.

System action: None.

System programmer response: None.

User response: Re-enter the command specifying a correct value for the configuration property.

CFZ02207W The configuration property *name* **is not dynamic.**

Explanation: The configuration property *name* cannot be changed dynamically for a running CIM server. Instead the change has to be made as a planned value to become effective after a CIM server restart. See "cimconfig" on page 62 or "MODIFY console command" on page 93 for details on how to change planned values.

System action: None.

System programmer response: None.

User response: Change the planned configuration value and restart the CIM server.

CFZ02300I Configuration property *conf-property* is not supported. Setting ignored.

Explanation: The mentioned configuration property is no longer supported.

System action: The CIM server ignores this setting and continues.

System programmer response: Please remove the mentioned configuration property from the planned configuration of the CIM server's */etc/wbem/cimserver_planned.conf*.

User response: None.

CFZ03029E Unsupported *UserContext* value: "*value*".

Explanation: A provider module was registered with a *UserContext* value of *value*, but that value is not supported by this version of the CIM server. Valid values are 2 for "Requestor" and 3 for "Designated User".

System action: The provider module is not registered.

System programmer response: Check the provider registration MOF and replace the invalid *UserContext* value with a value that is valid on z/OS.

User response: Contact your system programmer.

CFZ03030E Missing *DesignatedUserContext* property in PG_ProviderModule instance.

Explanation: A provider module was registered with a *UserContext* value of 3 ("Designated User"). The user ID of the designated user has to be specified in *DesignatedUserContext*, but no value was found (see "PG_ProviderModule" on page 243).

System action: The provider module is not registered.

System programmer response: Check the provider registration MOF and add a valid user ID for the *DesignatedUserContext* property to all provider modules that are registered with a *UserContext* value of 3.

User response: Contact your system programmer.

CFZ05000E A system error occurred. Retry the CIM operation at a later time.

Explanation: A CIM-XML operation exceeds the server's memory.

System action: Stop the CIM-XML operation.

System programmer response: Look for message CFZ08101E identifying the source of the CIM-XML request. Contact the owner of the application issuing the request and analyze the reason for the size of the operation. Limit the result objects for this request. Restart the server to clean it up.

User response: Contact your system programmer.

CFZ05203W The user *user-ID* is not authorized to run *operation* in the namespace *namespace*.

Explanation: The user ID that invoked CIM operation *operation* is not authorized to run this operation in namespace *namespace* of the CIM server.

System action: The CIM request is denied.

System programmer response: Check the system console for further detailed error messages that indicate which authorization is missing for user *user-ID*. In most cases, the user has no `UPDATE` authority for profile CIMSERV in class WBEM.

User response: Contact your system administrator for obtaining the required level of authorization.

CFZ06201W Command not recognized by CIM server.

Explanation: The command that was entered in the system console is not supported by the CIM server.

System action: None.

System programmer response: None.

User response: None.

CFZ06202I STOP command received from z/OS console, initiating shutdown.

Explanation: The CIM server received the STOP command from the console.

System action: The CIM server is shutting down.

System programmer response: None.

User response: None.

CFZ06203E CIM server Console command thread cannot be created: *error-text* (errno *error-number*, reason code X'*reason-code*').

Explanation: The CIM server cannot start the thread handling commands issued at the console. For a description of error *error-text* with error number *error-number* and the last four digits of the reason code X'*reason-code*', see *z/OS UNIX System Services Messages and Codes*, or enter the reason code in the BPXMTEXT TSO command.

System action: None.

System programmer response: The CIM server cannot be stopped using the console command. To stop the CIM server, purge the address space or use a privileged

UNIX user ID to issue the command `cimserver -s` from the UNIX System Services command prompt.

User response: Contact your system programmer.

CFZ06204E Console Communication Service failed: *error-text* (errno *error-number*, reason code X'*reason-code*').

Explanation: The CIM server is connected to the system console by using the Console Communication Service. The CIM server received the unrecoverable error *error-text*. For a description of error *error-text* with errno *error-number* and the last four digits of the reason code X'*reason-code*, see *z/OS UNIX System Services Messages and Codes*, or enter the reason code in the BPXMTEXT TSO command.

System action: CIM server shuts down.

System programmer response: Errno *error-number* and the last four digits of the reason code X'*reason-code*' point out the reason for the error. Check the console for more messages indicating the problem.

User response: None.

CFZ06205E CIM MODIFY command rejected due to syntax error.

Explanation: A `MODIFY` command was entered for the CIM server that could not be recognized due to invalid syntax.

System action: None.

System programmer response: None.

User response: Enter the command with the correct syntax.

CFZ06206I Syntax is: MODIFY CFZCIM,APPL=CONFIG, *name*=*value*æ,PLANNED]

Explanation: This messages describes the expected format for CIM server `MODIFY` command.

System action: None.

System programmer response: None.

User response: None.

CFZ06207E Failed to update configuration value.

Explanation: The CIM server failed to update a configuration value that was entered through the system console.

System action: None.

System programmer response: Look for other messages indicating the problem.

User response: Look for other messages indicating the problem.

CFZ06208I Updated current value for *name* to *value*.

Explanation: A configuration value for a running CIM server has immediately been updated. The changed value will stay in effect as long as the CIM server is running. After a restart the value is reset to either the default or to the planned configuration value.

System action: The change requested by the `MODIFY` command is now in effect.

System programmer response: None.

User response: None.

CFZ06209I Updated planned value for *name* to *value*.

Explanation: A configuration value has been updated for the planned configuration of the CIM server. It will become active after the CIM server is restarted. This change is persistent until the planned value is changed again.

System action: The change requested by the `MODIFY` command becomes effective after the next CIM server restart.

System programmer response: None.

User response: None.

CFZ06210I This change will become effective after CIM server restart.

Explanation: The change requested by the `MODIFY` command will not be in effect until the CIM server is restarted.

System action: None.

System programmer response: None.

User response: None.

CFZ06211E MODIFY command failed: *message*

Explanation: A configuration update requested through the `MODIFY` command failed. The detailed cause is indicated by *message*.

System action: None.

System programmer response: None.

User response: None.

CFZ06212E *name* is not a valid configuration property.

Explanation: The configuration property *name* is not recognized by the CIM server as a valid configuration property.

System action: None.

System programmer response: None.

User response: Use the correct name for the configuration property and re-enter the command.,

---

CFZ07805E Failed to bind socket on port *port-number*: *error-text* **(error code** *error-code*, **reason code 0x***reason-code*).

Explanation: Before listening on network port *port-number* the CIM server failed to bind the socket with *error-code* and 0x*reason-code*. It therefore will not be able to communicate over this network port. Probably the port is already in use by another program or has been reserved by the TCP/IP configuration.

System action: The CIM server does not start.

System programmer response: Error code *error-code* and the last four digits of the reason code 0x*reason-code* point out the reason for the error.

For a description of error *error-text* with error code *error-code* and the last four digits of the reason code 0x*reason-code*, see *z/OS UNIX System Services Messages and Codes*, or enter the reason code in the BPXMTEXT TSO command.

User response: None.

CFZ07806E Failed to set permission on local domain socket *socket*: *error-text* **(error code** *error-code*, **reason code 0x***reason-code*).

Explanation: The CIM server is not able to set the permission on socket file *socket* for local communication.

System action: The CIM server does not start.

System programmer response: Error code*error-code* and the last four digits of the reason code 0x*reason-code* point out the reason for the error. For a description of error *error-text* with error code *error-code* and the last four digits of the reason code 0x*reason-code*, see *z/OS UNIX System Services Messages and Codes*, or enter the reason code in the BPXMTEXT TSO command.

User response: None.

CFZ07807E Failed to listen on socket *socket-number*: *error-text* **(error code** *error-code*, **reason code 0x***reason-code*).

Explanation: The CIM server failed to listen on socket *socket-number*. It therefore will not be able to communicate over this network port. Probably the port is already in use by another program or has been reserved by the TCP/IP configuration.

System action: The CIM server does not start.

System programmer response: Error code*error-code* and the last four digits of the reason code 0x*reason-code* point out the reason for the error. For a description of error *error-text* with error code *error-code* and the last four digits of the reason code 0x*reason-code*, see *z/OS UNIX System Services Messages and Codes*, or enter the reason code in the BPXMTEXT TSO command.

User response: None.

CFZ09100I TCP/IP temporary unavailable.

Explanation: The TCP/IP stack used by the CIM server is not available.

System action: The CIM server is waiting for a restart of the TCP/IP stack. The CIM server will be not able to handle any commands and requests until the restart of the TCP/IP stack has completed. Currently processed requests are terminated.

System programmer response: Restart the TCP/IP stack the CIM server was using. If this stack is no longer used, restart the CIM server.

User response: None.

CFZ08101E Internal server error. Connection with IP address *IP-address* **closed.**

Explanation: An unrecoverable error occurred during the communication with the client connected by *IP-address*.

System action: The connection is closed.

System programmer response: This message provides the affected IP address. Look for a previous CFZ message describing details of the internal error.

User response: Contact your system programmer.

CFZ10024I Unable to start the CIM server. CIM server is already running.

Explanation: The CIM server detects that another instance of the CIM server is already running. There can be only one running CIM server.

System action: None.

System programmer response: Do not start the CIM server again. If you want to start a new CIM server on the system, use the stop command at the system console (`/p cfzcim`) or look for the CIM server running in the UNIX System Services (`/d omvs,a=all`) and cancel the process (`/c cfzcim`).

User response: None.

CFZ10025I The CIM server is listening on HTTP port *port-number*.

Explanation: The CIM server is starting up and will listen on port *port-number* for incoming requests from clients. For information about how to configure the CIM server's HTTP connections see “CIM server configuration” on page 45.

System action: None.

System programmer response: None.

User response: None.

CFZ10026I The CIM server is listening on HTTPS port *port-number***.**

Explanation: The CIM server is starting up and will listen on port *port-number* for incoming requests from clients using SSL encryption. Please note that special TCP/IP configuration settings are required for enabling the CIM server to support SSL encryption for HTTPS. For information about how to configure the CIM server's HTTPS connections see "Configuring the CIM server HTTPS connection using AT-TLS" on page 32.

System action: None.

System programmer response: None.

User response: None.

CFZ10028I The CIM server is listening on the local connection socket.

Explanation: The CIM server is starting up and will listen for incoming requests from clients. For information about how to configure the CIM server's HTTP connections see "CIM server configuration" on page 45.

System action: None.

System programmer response: None.

User response: None.

CFZ10030I Started CIM server version *version***.**

Explanation: The CIM server is now started and accepts CIM client requests.

System action: None.

System programmer response: None.

User response: None.

CFZ10031I CIM server - stopped.

Explanation: The CIM server is now stopped. CIM client requests are no longer accepted.

System action: None.

System programmer response: None.

User response: None.

CFZ10034E CIM server repository contains files with wrong tags. Unable to set file tags. Stopping CIM server startup.

Explanation: The CIM server repository contains files tagged with the wrong CCSID. The CIM server tried to set the right CCSID (ISO8859-1) tag on this file, but was not successful.

System action: The CIM server stops.

System programmer response: Look for previously issued messages (CFZ10035E or equivalent LE messages) about access violations for path */var/wbem*. Grant the denied access right to the user ID running the CIM server. Restart the CIM server.

User response: None.

CFZ10035E Failed to change file tag for *file-name***. Error (***error-number***):** *error-message***.**

Explanation: The CIM server is not able to change the file tag for the file *file-name*. For the reason, see the system error number *error-number* and the system error message *error-message*.

System action: The CIM server stops.

System programmer response: Correct the reason for failing to change the file tag. The reason is indicated by the system error number *error-number* and the system error message *error-message*.

User response: None.

CFZ10036W CIM server repaired file tags for *number* **repository files.**

Explanation: The CIM server was able to restore the correct CCSID (ISO8859-1) file tag for a number of *number* repository files.

System action: None.

System programmer response: Repository file tags were missing or wrong. Please revise procedures handling files located in */var/wbem* to preserve file tags. If file tags are preserved, this message will not be displayed again.

User response: None.

CFZ10037E Failed to open repository directory *repositoy-directoy***:** *error-text* **(error code** *error-code***, reason code 0x***reason-code***).**

Explanation: The CIM server is not able to open the directory *repository-directory* containing the repository.

System action: The CIM server does not start.

System programmer response: Error code *error-code* and the last four digits of the reason code 0x*reason-code* point out the reason for the error. For a description of error *error-text* with error code *error-code* and the last four digits of the reason code 0x*reason-code*, see *z/OS UNIX System Services Messages and Codes*, or enter the reason code in the BPXMTEXT TSO command.

User response: None.

CFZ12500E Not loading dynamic load library *library-name* due to missing program control flag.

Explanation: The CIM server runs on a system with Enhanced Security and thus does not load dynamic libraries which are not audited by a system programmer.

System action: The system does not load the named dynamic library.

System programmer response: Set the program control flag on the dynamic library using the UNIX System Services command `extattr +p <filename>`.

User response: Contact a system programmer to audit the dynamic library and set the program control flag.

CFZ12501E Security profile CIMSERV in CLASS WBEM must be defined. Ending CIM server.

Explanation: The CIM server detected an incomplete security setup.

System action: The CIM server does not start.

System programmer response: Complete the security setup by defining the profile CIMSERV in class WBEM. Refer to "Customizing the security for the CIM server" on page 25 for further details.

User response: Contact your system programmer.

CFZ12502E CIM server user ID requires either READ access to BPX.SERVER or must be UID 0. Ending CIM server.

Explanation: The CIM server user ID must have `READ` access to the security profile BPX.SERVER, or, if BPX.SERVER is not defined on your system, must be a privileged user.

System action: The CIM server stops.

System programmer response: Permit the user ID to run the CIM server by either giving it `READ` access to profile BPX.SERVER, or, if not running in an Enhanced Security environment, set the UID to 0.

User response: Contact your system programmer.

CFZ12503E CIM server address space dirty due to loading from a not program controlled load library. Ending CIM server.

Explanation: The CIM server loaded a dynamic library that is not program controlled. Either the security setup is not complete or a dynamic library has been changed without a system programmer's audit.

System action: The CIM server stops.

Programmer response: Check all dynamic libraries for their program control flag and ensure that no library changed. Make sure that the Language Environment® libraries SCEERUN and SCEERUN2 are program controlled.

User response: Contact your system programmer.

CFZ12504E CIM server does not have appropriate privileges to check SAF security environment. Ending CIM server.

Explanation: The CIM server user ID must have `READ` access to the security profile BPX.SERVER, or, if BPX.SERVER is not defined on your system, must be privileged.

System action: The CIM server stops.

System programmer response: Permit the user ID to run the CIM server by either giving it `READ` access to profile BPX.SERVER, or, if not running in an Enhanced Security environment, set the UID to 0.

User response: Contact your system programmer.

CFZ12505E CIM server user ID requires either READ access to BPX.SERVER or must be UID 0. Ending CIM server.

Explanation: The CIM server user ID must have `READ` access to the security profile BPX.SERVER, or, if BPX.SERVER is not defined on your system, must be privileged.

System action: The CIM server stops.

System programmer response: Permit the user ID to run the CIM server by either giving it `READ` access to profile BPX.SERVER, or, if not running in an Enhanced Security environment, set the UID to 0.

User response: Contact your system programmer.

CFZ12506E CIM server address space dirty due loading from a not program controlled load library. Ending CIM server.

Explanation: The CIM server has loaded a dynamic library that is not program controlled. Either the security setup is not complete or a dynamic library has been changed without a system programmer's audit.

System action: The CIM server stops.

Programmer response: Check all dynamic libraries for their program control flag and ensure that no library has changed. Make sure the Language Environment libraries SCEERUN and SCEERUN2 are program controlled.

User response: Contact your system programmer.

CFZ12507W CIM server does not have surrogate for client user ID *user-ID*.

Explanation: A request sent from the user ID could not be processed. The CIM server does not have access to act as surrogate for the requesting user ID.

System action: The user request is ignored and an error message is sent to the client.

System programmer response: To permit the CIM server user ID to act as a surrogate for the client user, grant the user ID running the CIM server `READ` access to the RACF profile BPX.SRV.*user-ID* as described in "Switching identity (surrogate)" on page 31.

User response: Contact your system programmer.

CFZ12508W Failure *error-number* deleting thread security.

Explanation: The CIM server was not able to delete the thread level security built for a specific request.

System action: None.

System programmer response: None.

User response: None.

CFZ12509E The CIM server user ID requires either READ access to BPX.SERVER or must be UID 0. Stopping CIM server startup.

Explanation: The user ID that starts the CIM server must have `READ` access to the security profile BPX.SERVER, or, if BPX.SERVER is not defined on your system, must be a privileged user.

System action: The CIM server does not start.

System programmer response: Permit the user ID to run the CIM server by either giving it `READ` access to profile BPX.SERVER, or, if not running in an Enhanced Security environment, set the UID to 0.

User response: Contact your system programmer.

CFZ12510E CIM server address space dirty due to loading from a not program controlled load library. Stopping CIM server startup.

Explanation: The CIM server loaded a dynamic library that is not program controlled during startup. Probably the security setup is not complete or a dynamic library has been changed without a system programmer's audit.

System action: The CIM server does not start.

Programmer response: Check all dynamic libraries for their program control flag and ensure that no library changed. Make sure the Language Environment libraries SCEERUN and SCEERUN2 are program controlled.

User response: Contact your system programmer.

CFZ12511E CIM server does not have appropriate privileges to check SAF security environment. Stopping CIM server startup.

Explanation: The user ID that starts the CIM server must have `READ` access to the security profile BPX.SERVER, or, if BPX.SERVER is not defined on your system, must be a privileged user.

System action: The CIM server does not start.

System programmer response: Permit the user ID to run the CIM server by either giving it `READ` access to profile BPX.SERVER, or, if not running in an Enhanced Security environment, set the UID to 0.

User response: Contact your system programmer.

CFZ12512E Security profile CIMSERV in CLASS WBEM must be defined. Stopping CIM server startup.

Explanation: The CIM server detected an incomplete security setup on startup.

System action: The CIM server does not start.

System programmer response: To complete the security setup, define the profile CIMSERV in class WBEM. Refer to "Customizing the security for the CIM server" on page 25 for further details.

User response: Contact your system programmer.

CFZ12513E The CIM server user ID requires CONTROL access to security profile CIMSERV in CLASS WBEM. Stopping CIM server startup.

Explanation: The CIM server user ID requires `CONTROL` access to security profile CIMSERV in CLASS WBEM.

System action: The CIM server does not start.

System programmer response: To permit the CIM server user ID to perform administrative CIM tasks, give it `CONTROL` permission to profile CIMSERV in class WBEM. Refer to "Customizing the security for the CIM server" on page 25 for further details.

User response: Contact your system programmer.

CFZ12514E Security profile *profile-name* in CLASS WBEM must be defined.

Explanation: A provider defined a security profile at registration that is not defined for RACF class WBEM.

System action: None.

System programmer response: Create the RACF profile in class WBEM and permit users who should have access to the provider.Verify if the security profile

is defined for RACF and make sure that the class WBEM has been refreshed. Verify if the provider really should be registered with the mentioned security profile and if it should be checked.

User response: Contact your system programmer.

CFZ12515W **User *user-ID* not authorized to perform intrinsic CIM operation *operation* against provider *provider-name*. *access-type* access to *profile-name* in CLASS WBEM required.**

Explanation: User *user-ID* is not authorized to perform CIM operation *operation* involving the provider *provider-name*. The user needs *access-type* access to SAF security profile *profile-name* that is defined in class WBEM.

System action: The request is not processed and an "Access Denied" notification is sent to the client.

System programmer response: Verify if the user should be permitted to perform the current request. If so, grant the user *access-type* access to the profile *profile-name*.

User response: None. Access has been denied to a user with insufficient authority.

CFZ12516E **CIM server does not have appropriate privileges to check SAF security environment. Ending CIM server.**

Explanation: The CIM server user ID must have `READ` access to the security profile BPX.SERVER, or, if BPX.SERVER is not defined on your system, must be a privileged user.

System action: The CIM server stops.

System programmer response: Permit the user ID to run the CIM server by either giving it `READ` access to profile BPX.SERVER, or, if not running in an Enhanced Security environment, set the UID to 0.

User response: None.

CFZ12517E **Missing IdentityContainer (no username) in request.**

Explanation: The security component of the CIM server detected an invalid operation context that does not contain a username.

System action: The request is not processed and an "Access Denied" notification is sent to the client.

System programmer response: None.

User response: None.

CFZ12519E **An unexpected error occurs: *error-text* (error number *error-number*, reason code 0x*reason-code*). Stopping CIM server startup.**

Explanation: During startup, the CIM server received the unrecoverable error *error-text*. For a description of error *error-text* with error number *error-number* and the last four digits of the reason code 0x*reason-code*, see *z/OS UNIX System Services Messages and Codes*, or enter the reason code in the BPXMTEXT TSO command.

System action: The CIM server does not start.

System programmer response: Error number *error-number* and the last four digits of the reason code 0x*reason-code* point out the reason for the error. Check the console for more messages indicating the problem.

User response: Contact your system programmer.

CFZ12520E **CIM server did not set *Must Stay Clean*. Stopping Provider Agent startup.**

Explanation: The Provider Agent determined that the ***Must Stay Clean*** flag was not set. The Provider Agent startup is not processed by the CIM server.

System action: The Provider Agent does not start.

System programmer response: Ensure that the Provider Agent can only be started by the CIM server.

User response: Contact your system programmer.

CFZ12521E **An unexpected error occurs: *error-text* (error number *error-number*, reason code X'*reason-code*'). Stopping Provider Agent startup.**

Explanation: During startup, the Provider Agent received the unrecoverable error *error-text*. For a description of error *error-text* with error number *error-number* and the last four digits of the reason code X'*reason-code*', see *z/OS UNIX System Services Messages and Codes*, or enter the reason code in the BPXMTEXT TSO command.

System action: The Provider Agent does not start.

System programmer response: Error number *error-number* and the last four digits of the reason code X'*reason-code*' point out the reason for the error. Check the console for more messages indicating the problem.

User response: Contact your system programmer.

CFZ12523E **CIM Runtime Environment user ID requires either READ access to BPX.SERVER or has to be UID 0. Stopping Provider Agent startup.**

Explanation: The user ID that runs the Provider Agent must have `READ` access to the security profile BPX.SERVER, or, if BPX.SERVER is not defined on your

system, must be a privileged user.

System action: The Provider Agent does not start.

System programmer response: Permit the user ID to run the CIM server by either giving it READ access to profile BPX.SERVER, or, if not running in an Enhanced Security environment, set the UID to 0.

User response: Contact your system programmer.

CFZ12524E Provider Agent address space dirty due to loading from a not program controlled load library. Stopping Provider Agent startup.

Explanation: The Provider Agent has loaded a dynamic library that is not program controlled. Either the security setup is not complete or a dynamic library has been changed without a system programmer's audit.

System action: The Provider Agent does not start.

System programmer response: Check all dynamic libraries for their program control flag and ensure that no library has changed. For details on program control look at *z/OS UNIX System Services Planning* and *z/OS Security Server RACF Security Administrator's Guide*.

User response: Contact your system programmer.

CFZ12525E CIM Runtime Environment does not have appropriate privileges to check SAF security environment. Stopping Provider Agent startup.

Explanation: The user ID that runs the Provider Agent must have READ access to the security profile BPX.SERVER, or, if BPX.SERVER is not defined on your system, must be a privileged user.

System action: The Provider Agent does not start.

System programmer response: Permit the user ID to run the Provider Agent by either giving it READ access to profile BPX.SERVER, or, if not running in an Enhanced Security environment, set the UID to 0.

User response: Contact your system programmer.

CFZ12526E Unsupported *UserContext* value: "*value*".

Explanation: A provider module was registered with a *UserContext* value of *value*, but that value is not supported by this version of the CIM server. Valid values are 2 ("Requestor") and 3 ("Designated User").

System action: The addressed provider module is not correctly registered. The request fails and an error is sent back to the requestor.

System programmer response: Identify the failing provider module, remove the provider using the cimprovider utility (see "cimprovider" on page 64) and re-register the provider with a correct provider registration MOF.

User response: Contact your system programmer.

CFZ12527E Missing *DesignatedUserContext* property in PG_ProviderModule instance.

Explanation: A provider module was registered with a *UserContext* value of 3 ("Designated User"). The user ID of the designated user has to be specified in *DesignatedUserContext*, but no value was found (see "PG_ProviderModule" on page 243).

System action: The request that is directed against the provider module in error will fail and an error is sent back to the requestor.

System programmer response: Identify the failing provider module, remove the provider using the cimprovider utility (see "cimprovider" on page 64) and re-register the provider with a correct provider registration MOF.

User response: Contact your system programmer.

CFZ12528I Cannot switch to designated user *user-ID*. User is unknown to the security product, or has no OMVS segment.

Explanation: The CIM server failed to switch the security context to *user-ID* for a provider configured with a designated user context. The user *user-ID* defined for the provider's security context is not defined to the system or does not have an OMVS segment.

System action: The request fails and an authorization error is sent back to the requestor/client.

System programmer response: Check if the user *user-ID* is the right user ID to run with or check for the existence of the user *user-ID* within your security product with the appropriate OMVS segment. If the problem persists you may want to remove the failing provider using the cimprovider utility and re-register the provider with the correct designated user defined in the provider registration MOF.

User response: None.

CFZ12529E An unexpected error occurred when switching to user *user-ID*: *error-text* (error code *error-code* , reason code 0x*reason-code*).

Explanation: The CIM server failed to switch to *user-ID* for the designated user context of a provider.

System action: The request fails and an authorization error is sent back to the requestor/client.

System programmer response: Error code *error-code* and the last four digits of the reason code 0x*reason-code* point out the reason for the error. For a description of

error *error-text* with error code *error-code* and the last four digits of the reason code 0x*reason-code*, see *z/OS UNIX System Services Messages and Codes*, or enter the reason code in the BPXMTEXT TSO command.

User response: None.

CFZ12532I **CIM server successfully registered to ARM using element name CFZ_SRV_*system-name*.**

Explanation: The CIM server successfully registered to the Automatic Restart Manager.

System action: None.

System programmer response: None.

User response: None.

CFZ12533I **CIM server failed to register with ARM using element name CFZ_SRV_*system-name*: return code X'*error-number*', reason code X'*reason-code*'.**

Explanation: The CIM server failed to register with the Automatic Restart Manager using the element name CFZ_SRV_*system-name*.

System action: None.

System programmer response: If you do not want to use the Automatic Restart Manager, you can ignore this message. If you want to use ARM, use X'*error-number*' and X'*reason-code*' to look up the return and reason codes for the IXCARM macro in the *z/OS MVS Programming: Sysplex Services Reference* for the reason to fail to register with ARM.

User response: None.

CFZ12534W **Authorization failed: User ID *user-ID* does not have CONTROL permission to profile CIMSERV CL(WBEM).**

Explanation: The user ID requesting an administrative task, for example, `cimconfig` or `cimprovider`, does not have the required permission.

System action: The request is not processed and an "Access Denied" notification is sent to the client.

System programmer response: Permit the user to perform administrative CIM tasks by giving him `CONTROL` permission to profile CIMSERV in class WBEM.

User response: Contact your system programmer.

CFZ12535W **Authorization failed: User ID *user-ID* misses UPDATE permission to profile CIMSERV CL(WBEM) to execute a writing CIM operation.**

Explanation: A client with the named user ID has sent a CIM request for a CIM write operation (SetProperty, InvokeMethod, CreateInstance, ModifyInstance, DeleteInstance) to the CIM server without having the appropriate access rights.

System action: The request is not processed and an "Access Denied" notification is sent to the client.

System programmer response: None.

User response: If you need to perform CIM write operations, ask your system programmer to grant you at least `UPDATE` access to profile CIMSERV CL(WBEM).

CFZ12540E **ATTLS reset the connection due to handshake failure. Connection closed.**

Explanation: AT-TLS reset the connection with the client due to a handshake failure.

System action: The connection is closed.

System programmer response: This message documents an unsuccessful connect to AT-TLS. If this prevents a connection from a client to the server, switch on tracing at the AT-TLS policy to find the reason for this closure.

User response: Contact your system programmer.

CFZ12541E **An unexpected error occurs: *error-text* (error number *error-number*, reason code X'*reason-code*'). Connection closed.**

Explanation: While querying the AT-TLS connection using `ioctl()`, the CIM server received an unknown error. For a description of error *error-text* with error number *error-number* and the last four digits of the reason code X'*reason-code*', see *z/OS UNIX System Services Messages and Codes*, or enter the reason code in the BPXMTEXT TSO command.

System action: The connection is closed.

System programmer response: Contact IBM support.

User response: Contact your system programmer.

CFZ12542E **ATTLS policy is not active for the CIM server HTTPS port. Communication not secured. Connection closed.**

Explanation: The CIM server is configured to use HTTPS by defining the configuration property *enableHttpsConnection*, but the AT-TLS policy is not configured correctly for the CIM server.

System action: The connection is closed.

System programmer response: Please refer to “Customizing the security for the CIM server” on page 25 for information about how to configure AT-TLS for the CIM server.

User response: Contact your system programmer.

CFZ12543E **ATTLS policy not valid for CIM server. Set *ApplicationControlled* to `OFF`. Connection closed.**

Explanation: The value of the property *ApplicationControlled* defined in the AT-TLS policy for the CIM server is `ON`. Hence, the CIM server is only aware of AT-TLS but does not control it.

System action: The connection is closed.

System programmer response: Change the property *ApplicationControlled* to `OFF` in the AT-TLS policy defined for the CIM server. Refer to "Customizing the security for the CIM server" on page 25 for information about how to configure AT-TLS for the CIM server.

User response: None.

CFZ12544E **ATTLS policy specifies the wrong HandshakeRole for the CIM server HTTPS port. Communication not secured. Connection closed.**

Explanation: The property *HandshakeRole* defined in the inbound AT-TLS policy for the CIM server is not configured correctly.

System action: The connection is closed.

System programmer response: Change the property *HandshakeRole* to `ServerWithClientAuth` or to the server at the inbound AT-TLS policy defined for the CIM server. Refer to "Customizing the security for the CIM server" on page 25 for information about how to configure AT-TLS for the CIM server.

User response: None.

CFZ12545E **Automatic repository upgrade failed at step *step-number*. Stopping CIM server startup.**

Explanation: The CIM server failed to automatically migrate the old repository in ***/var/wbem*** to the new schema level. No actual migration action was run, because the basic setup is not correct.

System action: The CIM server does not start.

System programmer response: To find out the reason for this error, check the previously issued message. Correct the basic setup and restart the CIM server.

User response: None.

CFZ12546E **Automatic repository upgrade failed at step *step-number*. Recovery completed successfully. Stopping CIM server startup.**

Explanation: The CIM server failed to automatically migrate the old repository in ***/var/wbem*** to the new schema level. Migration started and ran to a certain point. Though they failed, the accomplished migration actions were successfully rolled back.

System action: The CIM server does not start.

System programmer response: To find out the reason for this error, check the previously issued message. Correct the setup problem and restart the CIM server.

User response: Contact your system programmer.

CFZ12547F **Automatic repository upgrade failed at step *step-number*. Recovery failed, manual intervention required. Stopping CIM server startup.**

Explanation: The CIM server failed to automatically migrate the old repository in ***/var/wbem*** to the new schema level. Migration started and ran into a critical break. The attempt to roll back the taken actions failed. Manual user intervention is required to roll back taken migration actions.

System action: The CIM server does not start.

System programmer response: To find out the reason for this error, check the previously issued message. Rollback the taken migration actions as described in that message. Fix the setup problem and restart the CIM server.

User response: None.

CFZ12548E **Failed to initiate command: *command* with error: *error-number*.**

Explanation: The CIM server failed to automatically migrate the old repository in */var/wbem* to the new schema level. Processing of the named command failed with error *error-number*.

System action: The CIM server will roll back already taken migration actions. The CIM server does not start.

System programmer response: Investigate why the named command cannot perform successfully. Fix the system setup and restart the CIM server.

You can find further details in `STDERR` and `STDOUT` of the job output.

User response: Contact your system programmer.

CFZ12549E **Command *command* failed with status *status-code*.**

Explanation: The CIM server failed to automatically migrate the old repository in */var/wbem* to the new schema level. The processing of the named command failed with status *status-code*.

System action: The CIM server will roll back the already taken migration actions. CIM server does not start.

System programmer response: Investigate why the named command cannot perform successfully. Fix the

system setup and restart the CIM server.

Further details can be found in STDERR and STDOUT of the job output.

User response: Contact your system programmer.

CFZ12550E Failed to rename directory *source-directory-name* **to** *target-directory-name* **with error:** *error-number***.**

Explanation: The CIM server failed to automatically migrate the old repository in */var/wbem* to the new schema level. Renaming of source directory to target directory failed.

System action: The CIM server will roll back already taken migration actions. CIM server does not start.

System programmer response: Investigate the reason of the renaming failure. Possible reasons are missing file access rights, a full file system or missing access right to run a program in an extra UNIX System Services address space.

User response: Contact your system programmer.

CFZ12551E Failed to create repository status files with: *error-text***.**

Explanation: The CIM server failed to write the repository status file while automatically migrating the old repository in */var/wbem* to the new schema level. The migration is nearly complete, but writing the repository status file failed. The repository status file serves to avoid repeated attempts to migrate the repository.

System action: A message is logged to the system console. The CIM server startup continues.

System programmer response: Either fix the reason for the failed write of the repository status file and stop and restart the CIM server, or copy the file supplied in */usr/lpp/wbem/* to */var/wbem*.

User response: Contact your system programmer.

CFZ12552I Starting automatic repository upgrade.

Explanation: The CIM server will start to migrate the old repository to the new schema level.

System action: The CIM server starts to migrate the repository.

System programmer response: None.

User response: None.

CFZ12554E Error during automatic repository upgrade. No reference repository found at *directory-name***.**

Explanation: The CIM server could not locate the new repository at location *directory-name*. No actual migration action was run, because basic setup is not correct.

System action: The CIM server does not start.

System programmer response: Check the SMP/E installation. Directory and files should have been copied to the named location in the SMP/E APPLY step.

User response: Contact your system programmer.

CFZ12555E Rename of previous repository to *directory-name* **failed.**

Explanation: The CIM server failed to automatically migrate the old repository in */var/wbem* to the new schema level. Even though migration successfully created the new repository, renaming the old repository for backup failed.

System action: The CIM server will remove the new repository to roll back the taken migration actions. The CIM server does not start.

System programmer response: Investigate why the CIM server was unable to rename the directory */var/wbem/repository* to the directory *directory-name*. Probable causes are insufficient disk space or missing access rights.

User response: None.

CFZ12556E Rename of new repository to *directory-name* **failed.**

Explanation: The CIM server failed to automatically migrate the old repository in */var/wbem* to the new schema level. Even though migration successfully created the new repository and backed up the old repository, renaming the new repository to */var/wbem/repository* failed.

System action: The CIM server tries to roll back the taken migration actions and also removes the new repository and renames the backed up version to */var/wbem/repository*.

System programmer response: Investigate why the CIM server was unable to rename the directory. Probable reasons are insufficient disk space or missing access rights. If rollback actions fail (indicated by message CFZ12547E), manually remove the directory named */var/wbem/repository_new* and rename the latest backed up repository version to */var/wbem/repository*.

User response: None.

CFZ12557E Failure during automatic repository upgrade. Trying to recover.

Explanation: The CIM server failed to automatically migrate the old repository in */var/wbem* to the new schema level.

System action: The CIM server will try to roll back the taken migration actions.

System programmer response: Check former and further messages for details and possible required actions.

User response: None.

CFZ12558E Failed to remove incomplete new repository at *directory-name***.**

Explanation: The CIM server failed to automatically migrate the old repository in */var/wbem* to the new schema level. Removing the new, migrated repository failed.

System action: The CIM server does not start.

System programmer response: Remove the directory */var/wbem/repository_new* and its subfolders and files. Check the system log for earlier messages for details on the actual migration step that failed. Fix the situation and restart the CIM server. The most common reason for this problem is insufficient disk space at */var/wbem*.

User response: None.

CFZ12559F Failed to restore previous repository on recovery. Manual rename of *source-directory-name* **back to** *target-directory-name* **required!**

Explanation: The CIM server tried to roll back the migration actions. Renaming the backed up copy of the old repository to target directory name failed.

System action: The CIM server does not start.

System programmer response: Rename the source directory to the target directory name. Investigate the reason for the failure of the automatic repository migration by checking the system log for former error messages. Fix the system setup and restart the CIM server.

User response: Contact your system programmer.

CFZ12560E Failed to create repository status file *directory-name***. Manual intervention required!**

Explanation: The CIM server failed to write the repository status file while automatically migrating the old repository in */var/wbem* to the new schema level. The migration is nearly complete, but writing the repository status file failed. The repository status file serves to avoid repeated tries to migrate the repository.

System action: A message is logged to the system console. The CIM server startup continues.

System programmer response: Either fix the reason for the failed write of the repository status file and stop and restart the CIM server, or copy the file supplied in */usr/lpp/wbem/ to /var/wbem*.

User response: Contact your system programmer.

CFZ12561E Repository in directory *directory-name* **is backlevel. Run migration job for repository upgrade.**

Explanation: The CIM server failed to automatically migrate the old repository in */var/wbem* to the new schema level. No actual migration action was run, because the basic setup is not correct. The old repository found at *directory-name* is not a z/OS 1.8 level repository.

System action: The CIM server does not start.

System programmer response: Use migration job CFZRCUST to migrate the repository.

User response: Contact your system programmer.

CFZ12562I Previous repository was renamed to *directory-name* **for backup and can be removed.**

Explanation: The CIM server successfully migrated the old repository to the new schema level. A backup copy of the old repository is stored at *directory-name*. The copy should be backed up and then can be deleted to free up disk space.

System action: The CIM server startup continues.

System programmer response: You may want to backup the old repository, and delete the copy on hard disk.

User response: None.

CFZ12563I Automatic repository upgrade completed successfully.

Explanation: The CIM server successfully migrated the old repository to the new schema level.

System action: The CIM server startup continues.

System programmer response: None.

User response: None.

CFZ12564W Failed to obtain information about file system *path-name***. Error:** *error-text***.**

Explanation: The CIM server failed to determine information about the file system at *path-name*. The cause of the failure was error *error-text*.

System action: Automatic repository upgrade continues.

System programmer response: None.

User response: None.

CFZ12565W File system at *path-name* is smaller than the recommended 102400 KB (100MB).

Explanation: The file system available at *path-name* should be at least 100MB large or be able to extend to that size. The CIM server might run out of space when automatically upgrading the repository.

System action: Automatic repository upgrade continues.

System programmer response: Make sure that there is enough space for data to be stored in the file system at *path-name*. Recommended is a system specific data set with at least 100MB space mounted at */var/wbem*.

User response: None.

CFZ12566W Less free space than 61440 KB (60MB) available on file system *path-name*.

Explanation: The CIM server detected less than 60MB space available in the file system *path-name*. The CIM server might run out of space when automatically upgrading the repository.

System action: Automatic repository upgrade continues.

System programmer response: Make sure that there is enough space for data to be stored in the file system at *path-name*. Recommended is a system specific data set with at least 60MB space mounted at */var/wbem*.

User response: None.

CFZ12568E ATTLS is not active for TCP-IP stack the CIM server is using for HTTPS connections. Communication not secured. Connection closed.

Explanation: The CIM server is configured to use HTTPS by defining the configuration property *enableHttpsConnection*, but the Communication Server Policy Agent was not enabled on the stack the CIM server is using when AT-TLS policy mapping was performed for the connection.

System action: The connection is closed.

System programmer response: Ensure that Communication Server Policy Agent is configured for the TCP/IP stack the CIM server is listening. Please refer to "Customizing the security for the CIM server" on page 25 for information about how to configure AT-TLS for the CIM server.

User response: Contact your system programmer.

CFZ12569E There is no ATTLS policy found for the CIM server HTTPS connections. Communication not secured. Connection closed.

Explanation: The CIM server is configured to use HTTPS by defining the configuration property *enableHttpsConnection*, but the Communication Server Policy Agent did not find an AT-TLS policy for the CIM server when AT-TLS policy mapping was performed for the connection.

System action: The connection is closed.

System programmer response: Ensure that a Communication Server Policy Agent policy is defined for CIM Server. Please refer to "Customizing the security for the CIM server" on page 25 for information about how to configure AT-TLS for the CIM server.

User response: Contact your system programmer.

CFZ12570I Created directory */var/wbem*.

Explanation: CIM server successfully created the directory */var/wbem*.

System action: None.

System programmer response: None.

User response: None.

CFZ12571E Failed to create directory */var/wbem* with error: *error-message*. Stopping CIM server startup.

Explanation: CIM server failed to create the directory */var/wbem* with error *error-message*.

System action: The CIM server does not start.

System programmer response: Check the system setup for a system-specific data set mounted at path */var/wbem* with 100Mb space. Fix the problem and restart the CIM server.

User response: Contact your system programmer.

CFZ12572W Failed to read repository status file: *error-message*.

Explanation: CIM server failed to read information from the repository status file at */var/wbem*.

System action: CIM server startup proceeds and the repository is automatically migrated to the latest level available from */usr/lpp/wbem*.

System programmer response: Check the error condition described by *error-message* and fix the indicated problem in the system setup.

User response: Contact your system programmer.

CFZ12574W File *file-name* contains quotes which should be removed. Removing quotes and stopping CIM server startup. Restart the CIM server.

Explanation: CIM server found quote characters in file *file-name*. Quotes can cause environment variable setup problems.

System action: CIM server tries to remove all quotes. The CIM server does not start.

System programmer response: None.

User response: Restart the CIM server.

CFZ12575E Failed to open *file-name* for write with error: *error-message*.

Explanation: CIM server failed to open *file-name* for writing. The reason is named in *error-message*. CIM server found quote characters in the environment variable setup file for the started task procedure. CIM server tried to open the environment variable setup file to remove all quotes.

System action: CIM server does not start.

System programmer response: Remove all quotes in file *file-name* manually or check the error condition described by *error-message* and fix the indicated problem in the system setup. Restart the CIM server.

User response: Contact your system programmer.

CFZ12576F Failed to write all data to *file-name* file.

Explanation: CIM server failed to write to *file-name* for the reason named in *error-message*. CIM server found quote characters in the environment variable setup file for the started task procedure. CIM server tried to write the environment variable setup file with all quote removed, but the file was written partially.

System action: CIM server does not start.

System programmer response: Check the error condition described by *error-message* and fix the indicated problem in the system setup. Create a new environment variables setup file *file-name* using the default shipped in */usr/lpp/wbem/install*. Restart the CIM server.

User response: Contact your system programmer.

CFZ12577I Successfully removed all quotes from *file-name*.

Explanation: CIM server removed all quote characters from file *file-name*. Quotes can cause environment variable setup problems for the started task procedure. To avoid issues caused by partially setup environment variables the CIM server is stopped and needs to be restarted.

System action: CIM server does not start.

System programmer response: Restart the CIM server.

User response: Restart the CIM server.

CFZ12578W Directory */var/wbem* does not exist. CIM server will create it.

Explanation: On CIM server startup the automated migration procedure detected that path */var/wbem* does not exist.

System action: CIM server creates the directory */var/wbem*.

System programmer response: None.

User response: None.

CFZ12579W Failed switching to zIIP mode, RC=*returncode.* CIM server running on CP.

Explanation: An error occurred when the CIM server process tried to establish eligibility for running on zIIP processors.

RC=0x00000408 and
RC=0x00000508
indicate a problem with the CIM server installation in the z/OS UNIX file system.

RC=0x00000708
indicates that CIM server library `libcfzsys.so` located in `/usr/lpp/wbem/lib` is not APF authorized.

System action: The CIM server process with all its threads is executing on CP processors.

System programmer response: For RC=0x00000708, use the command

```
extattr +a /usr/lpp/wbem/lib/libcfzsys.so
```

to restore the extended attribute to APF authorize the library.

All other return codes indicate a general problem during program execution, please contact IBM for service.

User response: Contact your system programmer.

CFZ12580I CIM server running eligible for zIIP.

Explanation: CIM server process has successfully established eligibility for running on zIIP processors.

System action: The CIM server process with all its threads is executing on zIIP processors.

System programmer response: None.

User response: None.

CFZ13006W Request user ID *user-ID* doesn't have READ permission to profile CIMSERV CL(WBEM).

Explanation: The user ID requesting a CIM operation using a remote connection is not permitted to use the CIM server.

System action: The request is not processed and an "Access Denied" notification is sent to the client.

System programmer response: Permit the user to perform CIM requests by giving the user ID `READ` access to profile CIMSERV CL(WBEM).

User response: Contact your system programmer to permit your user ID to perform CIM requests. Repeat your request.

CFZ13007W Request user ID *user-ID* doesn't have READ permission to profile CIMSERV CL(WBEM).

Explanation: The user ID requesting a CIM operation using a local connection is not permitted to use the CIM server.

System action: The CIM request is not processed and an "Access Denied" notification is sent to the client.

System programmer response: Permit the user to perform CIM requests by giving the user ID `READ` access to profile CIMSERV CL(WBEM).

User response: Contact your system programmer to permit your user ID to perform CIM requests. Repeat your request.

CFZ13607E CIM server cannot execute Out-Of-Process Provider Agent: *error-text* (error number *error-number*, reason code X'*reason-code*').

Explanation: The CIM server failed to process the Out-Of-Process Provider Agent caused by the problem *error-text*. For further details, see the description of error number *error-number* and the last four digits of the reason code X'*reason-code*' in *z/OS UNIX System Services Messages and Codes*.

System action: None.

System programmer response: Stop the CIM server. Error number *error-number* and the last four digits of the reason code X'*reason-code*' point out the reason for the error. Check the console for more messages indicating the problem.

User response: Contact your system programmer.

CFZ17200W Authentication failed for user *user-ID*.

Explanation: The authentication for user *user-ID* against the z/OS system failed. Either the user ID or password contained in a request was invalid or revoked, or the user ID has not been authorized to use CIM.

System action: The CIM request is denied.

System programmer response: None.

User response: Check that you are using a valid user ID and password and that the user ID has been authorized to use CIM. If the problem persists, contact the system programmer of the target system to check for more detailed authentication error messages on the system console.

CFZ17201W Authentication failed for user *user-ID* because *enableRemotePrivilegedUserAccess* is not set to `true`.

Explanation: The CIM server refused login for user *user-ID*, because *user-ID* is a superuser (UID=0), and the current CIM server configuration prohibits superuser logins (the configuration option *enableRemotePrivilegedUserAccess* is `false`).

System action: The CIM request is denied.

System programmer response: To allow superuser logon to the CIM server set the *enableRemotePrivilegedUserAccess* configuration option to `true`, as described in "Advanced configuration properties" on page 47.

User response: Either use a non-superuser user ID for logon to the CIM server, or contact your system administrator to enable superuser login for the CIM server.

CFZ17202W Request user ID *user-ID* doesn't have READ permission to profile CIMSERV CL(WBEM).

Explanation: The user ID requesting a CIM operation using a remote connection is not permitted to use the CIM server.

System action: The request is not processed and an "Access Denied" notification is sent to the client.

System programmer response: Permit the user to perform CIM requests by giving the user `READ` access to profile CIMSERV CL(WBEM).

User response: Contact your system programmer to permit your user ID to perform CIM requests and afterwards repeat your request.

CFZ17203W Request user ID *user-ID* misses password.

Explanation: A request was sent to the CIM server with user *user-ID* but no password was specified.

System action: The request is rejected as unauthorized.

System programmer response: None.

User response: Specify a password with your request.

CFZ17204I CIM server authentication is using application ID OMVSAPPL.

Explanation: The CIM server is using the application ID 'OMVSAPPL' for authentication.

System action: Application ID 'OMVSAPPL' is used for authentication.

System programmer response: If the usage of application ID 'OMVSAPPL' is intended, no action has to be taken.

Otherwise, if you want to use the application ID 'CFZAPPL',

1. Set the configuration property *enableCFZAPPLID* to `true` (see "Advanced configuration properties" on page 47)
2. Restart the CIM server

User response: None.

CFZ17205W Authentication failed for user *user-ID* from client IP address *IP-address*.

Explanation: The authentication for user *user-ID* issued by the IP address *IP-address* against the z/OS system failed. Either the user ID or password contained in a request was invalid or revoked, or the user ID has not been authorized to use CIM.

System action: The CIM request is denied.

System programmer response: None.

User response: Check that you are using a valid user ID and password and that the user ID has been authorized to use CIM. If the problem persists, contact the system programmer of the target system to check for more detailed authentication error messages on the system console.

CFZ17400W Request user ID *user-ID* does not have READ permission to profile CIMSERV CL(WBEM).

Explanation: The user ID requesting a CIM operation using a local connection is not permitted to use the CIM server.

System action: The request is not processed and an "Access Denied" notification is sent to the client.

System programmer response: Permit the user to perform CIM requests by giving the user `READ` access to profile CIMSERV CL(WBEM).

User response: Contact your system programmer to permit your user ID to perform CIM requests and afterwards repeat your request.

CFZ17600E Change owner action of security token file failed, which is required for local authentication.

Explanation: The CIM server cannot change the ownership of a file to the user requesting local authentication. The file is located at */tmp* and the file name matches the pattern: *cimclient_<USERID>_**. The file is only valid for a short time. The server should remove this file automatically. It can be deleted.

System action: The request is not processed and an "Access Denied" notification is sent to the client.

System programmer response: Either define CHOWN.UNRESTRICTED in RACF, or grant the CIM server runtime environment user ID `READ` access to the SUPERUSER.FILESYS.CHOWN resource in the UNIXPRIV RACF class. For details refer to "Configuring the CIM server's resource authorization model" on page 28.

User response: Contact your system programmer.

CFZ17805I Audit logging is enabled.

Explanation: Audit logging is enabled.

System action: The CIM server starts writing SMF 86 records. These records are only recorded if the SMF configuration contains record 86 and the security is set up accordingly. For details see "Audit logging with SMF record 86" on page 54.

System programmer response: None.

User response: None.

CFZ17806I Audit logging is disabled.

Explanation: Audit logging is disabled.

System action: The CIM server stops writing SMF 86 records.

System programmer response: None.

User response: None.

CFZ18202E CIM server registration with internal SLP failed.

Explanation: The CIM Server failed to register itself as a service for the Service Location Protocol (SLP). Clients will not be able to detect the CIM server on the local networking using the SLP protocol.

System action: None.

System programmer response: Check the system log for further messages indicating CIM server configuration problems or general communication problems. This message usually indicates an issue with the CIM server setup.

User response: None.

CFZ18204I SLP registration initiated.

Explanation: The CIM server has successfully registered itself as a service for the Service Location Protocol (SLP). Clients using the SLP protocol can now detect this CIM server on the local network.

System action: None.

System programmer response: None.

User response: None.

CFZ18603E Could not get CLASSPATH from environment.

Explanation: Initialization of the Java Virtual Machine failed due to environment variable CLASSPATH not being set. The CIM client request cannot be answered as JMPI (Java Managed Provider Interface) providers do not run without a correctly set CLASSPATH.

System action: None.

System programmer response: Set the CLASSPATH as described by the provider.

User response: Contact your system programmer.

CFZ20400E A system error occurred. Retry the WS-Management operation at a later time.

Explanation: A WS-Management operation exceeds the server's memory.

System action: Stop the WS-Management operation.

System programmer response: Look for message CFZ08101E identifying the source of the WS-Management request. Contact the owner of the application issuing the request and analyze the reason for the size of the operation. Limit the result objects for this request. Restart the server to clean it up.

User response: Contact your system programmer.

IWMCP001E Internal error.

Explanation: An unspecified internal error occurred. The requested operation could not be completed.

System action: No action was performed.

System programmer response: None.

User response: No action required. The function may be successful if invoked again.

IWMCP002E Severe internal error.

Explanation: An unspecified internal error occurred. The requested operation might have been partly or completely processed.

System action: Operation was partly or fully completed.

System programmer response: None.

User response: Check the system state. If the operation was not fully completed, the function may be successful if invoked again.

IWMCP003E Memory shortage.

Explanation: Storage is not available for the requested operation. The requested operation could not be performed.

System action: No action was performed.

System programmer response: None.

User response: There is a storage shortage. The function may work successfully later on.

IWMCP004E Module IWMP2PCS missing.

Explanation: Unsupported operating system environment. The WLM CIM provider requires z/OS V1R10 or higher. It cannot be used on z/OS V1R9 or lower.

System action: No action was performed.

System programmer response: Install WLM CIM provider on z/OS V1R10 or higher.

User response: None.

IWMCP005E Invalid or missing parameter.

Explanation: One or several CIM provider method parameters are not valid.

System action: No action was performed.

System programmer response: None.

User response: Check the parameters passed to CIM provider methods.

IWMCP006E Insufficient access rights.

Explanation: The caller is not authorized to perform the requested operation. The RACF facility class is active and a profile has been defined for the MVSADMIN.WLM.POLICY RACF facility class profile to which the caller does not have sufficient read or update access.

System action: No action was performed.

System programmer response: Grant user appropriate access for RACF profile MVSADMIN.WLM.POLICY.

User response: Contact the System Programmer to get the required authorization.

Chapter 14. Logs

The CIM server sends log messages to the z/OS system console as well as to the z/OS Communications Server's syslog daemon. For information how to configure logging for the CIM server please refer to “Configuring logging” on page 52.

When using the system logger (syslog) daemon, `TRACE` level log messages can be captured that will not be sent to the z/OS system console. However, since a log level of `TRACE` will cause a significant amount of messages to be logged, it is not recommended to turn it on by default.

Chapter 15. Reason codes

The following list of reason codes may be returned by the methods in the Jobs providers. The first four digits (X'xxxx') may be any value.

Table 10. Jobs providers' reason codes

Reason code (hex)	Description	User action	IBM Service Information
X'xxxx0100'	Common Event Adapter (CEA) communication unavailable.	Ensure CEA is active; Call IBM Service.	CEAUNAVAIL
X''xxxx0117'	Instrumentation is unable to accommodate additional CIM indication providers.	Remove unused/unnecessary indication provider connections from the instrumentation. Call IBM Service is this is a consistent problem.	CEAMAXCLIENTSCONNECTED
X'xxxx011F'	z/OS System Operator forced the unsubscribe of the event.	Resubscribe to the event.	CEASYSOPFORCEUNSUBSCRIBE
X'xxxx0121'	Common Event Adapter (CEA) is no longer able to communicate with CIM indication providers.	Adjust CEA by transitioning the component from minimum mode to full mode. Operator must use `F CEA,MODE=FULL`	CEAFORCEMINMODE
X'xxxx0126'	Instrumentation is unable to accept any more subscriptions to indication events.	Remove unused/unnecessary indication event subscriptions	CEAMAXPGMSUBSCRIBED
X'xxxx0300'	Internal CIM error.	Call IBM Service.	CEAREQUESTNOTRECOGNIZED
X'xxxx0301'	Internal CIM error.	Call IBM Service.	CEAREQUESTNOTIMPLEMENTED
X'xxxx0302'	Internal CIM error.	Call IBM Service.	CEAPROPERTYSTRUCTBADPTR
X'xxxx0303'	Internal CIM error.	Call IBM Service.	CEAPROPERTYSTRUCTBADEYE
X'xxxx0304'	Internal CIM error.	Call IBM Service.	CEAPROPERTYSTRUCTBADVERSION
X'xxxx0305'	Internal CIM error.	Call IBM Service.	CEAPROPERTYBADRESOURCE
X'xxxx0306'	Internal CIM error.	Call IBM Service.	CEAPROPERTYNOMATCH
X'xxxx0307'	Internal CIM error.	Call IBM Service.	CEAPROPERTYSTRUCTEMPTY
X'xxxx0308'	Internal CEA error.	Call IBM Service.	CEAENVBAD
X'xxxx0309'	Internal CIM error.	Call IBM Service.	CEAFILTERSTRUCTBADEYE
X'xxxx030A'	Internal CIM error.	Call IBM Service.	CEAFILTERSTRUCTBADVERSION
X'xxxx030B'	Internal CIM error.	Call IBM Service.	CEAFILTERBADRESOURCE
X'xxxx030C'	Internal CIM error.	Call IBM Service.	CEAFILTERNOMATCH
X'xxxx030D'	Internal CIM error.	Call IBM Service.	CEABADPARMPTR

Table 10. Jobs providers' reason codes (continued)

Reason code (hex)	Description	User action	IBM Service Information
X'xxxx030E'	Internal CEA error.	Call IBM Service.	CEABADSSISUBSYSTEM
X'xxxx030F'	Internal CEA error.	Call IBM Service.	CEABADSSICALL
X'xxxx0310'	Internal CEA error.	Ensure JES2/JES3 is active. Ensure that ExtendedSubsystem is available. Call IBM Service.	CEANOSSI
X'xxxx0311'	Internal CEA error.	Call IBM Service.	CEABADSSIENV
X'xxxx0312'	Internal CEA error.	Look for SDUMP. Call IBM Service.	CEAENVBADSSI
X'xxxx0314'	Internal CEA error.	Look for SDUMP. Check storage indicators (monitors). Call IBM Service if external symptom not resolved.	CEAUNABLETOALLOCATE
X'xxxx0315'	Internal CEA error.	Call IBM Service.	CEANOTJOBSTERSEELEMENT
X'xxxx0316'	Internal CEA error.	SSI Abend. Look for SDUMP. Call IBM Service.	CEAJOBCHAINBROKEN
X'xxxx0317'	Internal CEA error.	Look for SDUMP. Call IBM Service.	CEABADDATENV
X'xxxx0318'	Internal CEA error.	Look for SDUMP. Call IBM Service.	CEASYSOUTCHAINBROKEN
X'xxxx0319'	Internal CEA error.	Look for SDUMP. Call IBM Service.	CEANOTSYSOUTHDRELEMENT
X'xxxx031A'	Internal CEA error.	Call IBM Service.	CEABADFREEPTR
X'xxxx031B'	Internal CEA error.	Call IBM Service.	CEABADFREEBLK
X'xxxx031C'	Internal CEA error.	Call IBM Service.	CEABADFREEENV
X'xxxx031D'	Internal CEA error.	Call IBM Service.	CEAUNABLETOFREE
X'xxxx031E'	Internal CEA error.	Call IBM Service.	CEABADIEFQRY
X'xxxx031F'	Internal CEA error.	Look for SDUMP. Call IBM Service.	CEASSCHAINBROKEN
X'xxxx0320'	Internal CEA error.	Look for SDUMP. Call IBM Service.	CEAENVBADJSQY
X'xxxx0321'	Internal CEA error.	Call IBM Service.	CEABADFILTEROPER
X'xxxx0322'	Internal CEA error.	Call IBM Service.	CEABADS54SUBSYSTEM
X'xxxx0323'	Internal CEA error.	Call IBM Service.	CEABADS54CALL
X'xxxx0324'	Internal CEA error.	SSI not activated. Call IBM Service.	CEANOS54
X'xxxx0325'	Internal CEA error.	Call IBM Service.	CEABADS54ENV
X'xxxx0327'	Internal CEA error.	Call IBM Service.	CEABADS54STOR
X'xxxx0328'	Internal CIM error.	Call IBM Service.	CEATIMEOUTMAXIMUMEXCEEDED
X'xxxx0329'	Internal CEA error.	Call IBM Service.	CEANEEDSYSOUTFILTER
X'xxxx032A'	Internal CIM error.	Call IBM Service.	CEABUFFERTOOLARGE

Table 10. Jobs providers' reason codes (continued)

Reason code (hex)	Description	User action	IBM Service Information
X'xxxx032B'	Internal CEA error.	Call IBM Service.	CEACCMDSDIAGRCSET
X'xxxx032C'	Internal CEA error.	Ensure SYSREXX is active/operational using the F AXR,DISPLAY command. Call IBM Service if AXREXX is active.	CEACCMDSAXREXXRCSET
X'xxxx032D'	Client not authorized for instrumentation	Ensure user has access to instrumentation facilities.	CEANOINSTRAUTH
X'xxxx032E'	Internal CIM error.	Call IBM Service.	CEATOOMUCHDATA
X'xxxx032F'	Internal CEA error.	Call IBM Service.	CEAFILTERNOTSUPPORTED
X'xxxx0330'	Internal CEA error.	Call IBM Service.	CEAPRIMARYTYPEMISMATCH
X'xxxx0331'	Internal CEA error.	Call IBM Service.	CEABADSUBSYSTEM
X'xxxx0332'	Internal CEA error.	Call IBM Service.	CEAUNABLETOALLOCATE2
X'xxxx0333'	Internal CEA error.	Call IBM Service.	CEABADBUFFER
X'xxxx0334'	Internal CIM error.	Call IBM Service.	CEATIMEOUTLESSTHANMINIMUM
X'xxxx0335'	Internal CIM error.	Call IBM Service.	CEACMDSSYNTAXERROR
X'xxxx0336'	The CIM provider request was cancelled in-process.	Retry the command request. If it does not work, call IBM Service.	CEACMDSHALTERROR
X'xxxx0337'	Internal CIM error.	Call IBM Service.	CEACMDSUNINITERROR
X'xxxx0338'	Internal CEA error.	Call IBM Service.	CEAFILTERBADCOMBO
X'xxxx0339'	Underlying command did not complete in the time specified.	Increase timeout value in the CIM method request and retry request.	CEACMDSTIMEDOUT

Chapter 16. Troubleshooting

This chapter contains the following subsections:

- "ASCII-EBCDIC conversion"
- "Error messages"

For problem determination, you can switch on tracing and logging. For details, see

- "Configuring tracing" on page 50
- "Configuring logging" on page 52

You can find further helpful information in:

- Chapter 14, "Logs," on page 275
- Chapter 13, "Messages," on page 251

ASCII-EBCDIC conversion

Since the z/OS CIM server and all of its command-line utilities operate in the enhanced ASCII environment, all output is written using ASCII encoding. This can lead to garbage being displayed when watching the output from the CIM server command-line utilities, sample programs or from the CIM server itself. By default, the configuration files *cimserver.env* and *profile.add* shipped with the CIM server provide the required settings for automatic conversion to the correct encoding. For details on how to enable the automatic conversion and about Enhanced ASCII in general, refer to ***Using Enhanced ASCII functionality*** in *z/OS UNIX System Services Planning*.

One important issue is that automatic conversion so far only occurs for ***UNIX System Service*** applications. When the output of the CIM server or any of its clients should be consumed or displayed by applications other than ***UNIX System Services*** applications, the conversion must take place when the data are created. To achieve this, the output files need to be tagged as EBCDIC so that, for example, the CIM server's output is converted to EBCDIC before it is consumed by these applications.

Error messages

The following is a list of typical errors that can be observed when working with CIM:

Error: BPXP014I ENVIRONMENT MUST REMAIN CONTROLLED FOR DAEMON (BPX.DAEMON) PROCESSING.

BPXP015I HFS PROGRAM /usr/lpp/wbem/provider/<provider_library> IS NOT MARKED PROGRAM CONTROLLED.

The provider <provider_library> is not marked program controlled.

When or where seen: Messages on the console.

Solution: Mark the dynamic load library `/usr/lpp/wbem/provider/<provider_library>` as program controlled by using the command `extattr +p <fully qualified dynamic load library name>`. Restart the CIM server and try again.

Error: CIM_ERR_ACCESS_DENIED

Access to a CIM resource was not available to the client: "Not authorized to run <name of a CIM Operation> in the namespace root/PG_Internal"

When or where seen: Client application / Details in the CIM server trace log

Solution: Permit the user ID to execute a configuration command with `CONTROL` access to Security profile CIMSERV in CLASS WBEM.

Error: CIM runtime environment user ID requires either `READ` access to BPX.SERVER or it must be user ID 0.

When or where seen: The CIM server error log after CIM server fails to start

Solution: Either permit the user ID `READ` access to BPX.SERVER if BPX.SERVER is set up, or run the command under a privileged user ID (UID 0).

Error: CIM runtime environment user ID requires CONTROL access to profile CIMSERV in class WBEM.

When or where seen: The CIM server error log after CIM server fails to start

Solution: The CIM server startup fails because the CIM server user ID fails to have `CONTROL` access to profile CIMSERV in class WBEM. Grant the CIM server user ID `CONTROL` access to profile CIMSERV in class WBEM.

Error: failed to bind to HTTP port

When or where seen: CIM server startup console message

Solution: The CIM server cannot start because it fails to listen on one of the ports 5988 (for http) or 5989 (for https). Either the CIM server is already running, another Server is listening on one of these ports, or the ports have been blocked in the TCPIP configuration.

Error: HTTP Error (401 Unauthorized)

When or where seen: Client application

Solution: The user authentication failed. The client application either did not provide user ID and password on a request at all, or the supplied user ID and password are not valid for the z/OS system on which the CIM server is running.

Permit the user ID to execute a client request with at least `READ` access to Security profile CIMSERV in CLASS WBEM. Check the server log for a detailed error report.

Error: ICH14080I

Warning: RACF detected a possible error in the dynamic class descriptor table, entry WBEM, error code 01. The class is available for further processing. The class name does not contain a national character nor a number. To assure IBM does not create an IBM-defined class in the future by this same name, you should choose a class name which contains at least one national character or a number.

When or where seen: RACF setup of dynamic class WBEM

Solution: Ignore the warning.

Error: CFZ17201W: ACCESS IS NOT ENABLED FOR REMOTE USERS WITH SUPERUSER AUTHORITY.

When or where seen: On the client side.

Solution: The remote client uses a local user with UID=0. However, the CIM server is configured to reject remote access if the local user is a super-user (parameter `enableRemotePrivilegedUserAccess=false`). If you want to enable the local user with remote privileged access, then switch the parameter to true. Otherwise, change the local user to a non-super-user by setting the UID ≠ 0.

Client Side Error: CIM_ERR_ACCESS_DENIED

Access to a CIM resource was not available to the client: "EDC5139I Operation not permitted."

When or where seen: Client application / Details in the CIM server trace log

Solution: Permit the CIM server runtime environment user ID as surrogate for the requesting client user ID to use the command: `PERMIT BPX.SRV.<client uid> CL(SURROGAT) ID(<CIMServer UID>) ACCESS(READ)`

Error: JGP00001W: Number of Instances Exceeded Threshold

This error message might be issued at enumeration of IBMzOS_Job instances, when the number of instances to be enumerated is greater than a configured limit. This limit has been defined to prevent the CIM server from resource exhaust.

It is recommended to change your enumeration to a subset of IBMzOS_Job.

To query the current limit of the IBMzOS_Job provider, receive the IBMzOS_JobsManagementSettings instance of the CIM server. The property *MaxInstances* contains the currently defined limit.

To change the limits, set the property *MaxInstances* to a new value by modifying the IBMzOS_JobsManagementSettings instance.

Part 4. Appendixes

Appendix A. Step-by-step explanation of the CFZSEC job

This appendix provides an explanation for each single step of the CIM security setup job CFZSEC.

Please note that the CFZSEC job provides a quick security setup for CIM. Because this job provides a solution for each configuration, necessarily the job steps which do not apply to your system will fail. But this does not affect the job's functionality.

The job creates security profiles, users and groups required to run CIM and grants them the necessary permissions to system resources.

Step CRUSR

Step CRUSR

```
//*
//* Step CRUSR creates default groups and users required for CIM
//* CFZSRVGP    -   CIM Server ID's default group
//* CFZADMGP    -   CIM Admin ID's default group
//* CFZUSRGP    -   CIM End-Users ID's default group
//*
//* CFZSRV      -   CIM Server UserId used by Started Task
//*
//CRUSR EXEC PGM=IKJEFT01,DYNAMNBR=99
//SYSPRINT DD SYSOUT=*
//SYSTSPRT DD SYSOUT=*
//SYSTSIN  DD *

 ADDGROUP CFZSRVGP OMVS(GID(9501))
 ADDGROUP CFZADMGP OMVS(GID(9502))
 ADDGROUP CFZUSRGP OMVS(GID(9503))

 ADDUSER CFZSRV DFLTGRP(CFZSRVGP) OMVS(UID(0) PROGRAM('/bin/sh') +
   HOME('/u/cfzsrv')) NOPASSWORD NOOIDCARD

 ALTUSER CFZSRV DFLTGRP(CFZSRVGP) OMVS(UID(0) PROGRAM('/bin/sh') +
   HOME('/u/cfzsrv')) NOPASSWORD NOOIDCARD NOPHRASE
/*
```

This step creates or updates the user CFZSRV for running the CIM server as a started task. By default the UID for the CIM server user is set to 0 to run the CIM server with superuser privileges. While this may be sufficient for a simple setup, if you have defined the BPX.SERVER profile in the class FACILITY, and class FACILITY is activated, it is recommended to change the UID for CFZSERV to a non null value. The default in this case is 9500.

In addition this step creates distinct groups for the CIM server user (CFZSRVGP), CIM server administrators (CFZADMGP) and end users (CFZUSRGP). To grant a user access to CIM, simply connect the user to the according group, for example with the command

```
CONNECT (username) GROUP(CFZUSRGP) AUTHORITY(USE)
```

The CFZUSRGP grants a user access to all resources that are managed through CIM. Depending on how granular you want to control users' access to CIM, you may want to create additional groups that allow access only to a subset of resources managed through CIM.

Step CRWBEM

Step CRWBEM

```
//* Step CRWBEM creates class WBEM and profile CIMSERV
//CRWBEM EXEC PGM=IKJEFT01,DYNAMNBR=99
//SYSPRINT DD SYSOUT=*
//SYSTSPRT DD SYSOUT=*
//SYSTSIN  DD *

 SETROPTS CLASSACT(CDT) RACLIST(CDT)

 RDEFINE +
   CDT WBEM +
   UACC(NONE) +
   CDTINFO( CASE(UPPER) +
     MAXLENGTH(246) +
     FIRST(ALPHA) +
     OTHER(ALPHA,NUMERIC) +
     MAXLENX(246) +
     KEYQUALIFIERS(0) +
     PROFILESALLOWED(YES) +
     POSIT(200) +
     DEFAULTRC(8) +
     DEFAULTUACC(NONE) +
     RACLIST(REQUIRED))

 SETROPTS RACLIST(CDT) REFRESH

 SETROPTS CLASSACT(WBEM) RACLIST(WBEM)

 RDEFINE WBEM CIMSERV UACC(NONE)

 SETROPTS CLASSACT(WBEM) RACLIST(WBEM)
/*
```

This step creates the RACF class and profile required to control access to the CIM server.

If the POSIT value 200 for RACF is already in use on your system, change the value defined in this step.

Step PEUSR

Step PEUSR

```
//* Step PEUSR
//*      - permits default UserID's to required resources
//*      - sets up required surrogate
//*      - permits CFZSRV to BPX.SERVER (no effect if BPX.SERVER is not
//*                                      enabled on the system)
//*      - authorizes CIM Server to write SMF records
//*      - authorizes CIM Server to write to console
//PEUSR EXEC PGM=IKJEFT01,DYNAMNBR=99
//SYSPRINT DD SYSOUT=*
//SYSTSPRT DD SYSOUT=*
//SYSTSIN  DD *

 PERMIT CIMSERV CL(WBEM) ACCESS(CONTROL) ID(CFZSRV)
 PERMIT CIMSERV CL(WBEM) ACCESS(CONTROL) ID(CFZADMGP)
 PERMIT CIMSERV CL(WBEM) ACCESS(UPDATE) ID(CFZUSRGP)
 SETROPTS RACLIST(WBEM) REFRESH

 SETROPTS CLASSACT(SURROGAT) RACLIST(SURROGAT) GENERIC(SURROGAT)
 RDEFINE SURROGAT BPX.SRV.** UACC(NONE)
 PERMIT BPX.SRV.** CL(SURROGAT) ACCESS(READ) ID(CFZSRV)
 SETROPTS RACLIST(SURROGAT) REFRESH

 PERMIT BPX.SERVER CL(FACILITY) ACCESS(UPDATE) ID(CFZSRV)
 SETROPTS RACLIST(FACILITY) REFRESH

 RDEFINE FACILITY BPX.SMF UACC(NONE)
 PERMIT BPX.SMF CL(FACILITY) ACCESS(READ) ID(CFZSRV)
 PERMIT BPX.CONSOLE CL(FACILITY) ACCESS(READ) ID(CFZSRV)
 SETROPTS RACLIST(FACILITY) REFRESH

/*
```

This step grants CIM users the necessary permissions to run, to control and to access the CIM server.

In detail it grants the following permissions:

For the CIM server user:

- `CONTROL` access to profile CIMSERV in class WBEM

  This allows the user to start the CIM server.
- `READ` access to profile BPX.SRV.** in class SURROGAT

  This allows the CIM server to switch a TCB into a requestor's user for running client requests under the authority of the client's user.
- `UPDATE` access to profile BPX.SERVER in class FACILITY

  This authorizes the CIM server to validate user credentials and to verify user access to RACF profiles.
- `READ` access to profile BPX.SMF in class FACILITY

  This allows the CIM server to write SMF records when it is configured to do so. (See "Audit logging with SMF record 86" on page 54 for details on SMF support in CIM.)
- `READ` access to profile BPX.CONSOLE in class FACILITY

  This allows the CIM server to issue messages on the z/OS console when the BPX.CONSOLE profile is defined.

For the CIM administrator group:

- CONTROL access to profile CIMSERV in class WBEM

  This allows a user to perform administrative functions.

For the CIM users group:

- UPDATE access to profile CIMSERV in class WBEM

  This allows a user to access CIM as a regular user.

Step PEAPPL

Step PEAPPL

```
//* Step PEAPPL Permit CIM groups and users to net application CFZAPPL
//*             This has no effect if class APPL is not active.
//PEAPPL EXEC PGM=IKJEFT01,DYNAMNBR=99
//SYSPRINT DD SYSOUT=*
//SYSTSPRT DD SYSOUT=*
//SYSTSIN  DD *
 RDEFINE APPL CFZAPPL UACC(NONE)
 PERMIT CFZAPPL CL(APPL) ACCESS(READ) ID(CFZSRV)
 PERMIT CFZAPPL CL(APPL) ACCESS(READ) ID(CFZADMGP)
 PERMIT CFZAPPL CL(APPL) ACCESS(READ) ID(CFZUSRGP)
 SETROPTS RACLIST(APPL) REFRESH
/*
```

When class APPL is active, the CFZAPPL profile protects access to the CIM server application. Any user who wants to access the CIM server requires at least READ access to the CFZAPPL profile in the APPL class. This job step grants this access for the CIM server user, the CIM administrator group, and the CIM users group.

Step SETARM

Step SETARM

```
//* Step SETARM establishes security setup required for ARM
//*             A sample ARM policy (CFZARMP) resides in the installed
//*             SYS1.SAMPLIB
//SETARM EXEC PGM=IKJEFT01,DYNAMNBR=99
//SYSPRINT DD SYSOUT=*
//SYSTSPRT DD SYSOUT=*
//SYSTSIN  DD *
 SETROPTS CLASSACT(FACILITY) RACLIST(FACILITY)
 RDEFINE FACILITY IXCARM.DEFAULT.CFZ_SRV_* UACC(NONE)
 PERMIT IXCARM.DEFAULT.CFZ_SRV_* CLASS(FACILITY) +
  ID(CFZSRV) ACCESS(UPDATE)

 SETROPTS RACLIST(FACILITY) REFRESH
/*
```

This step enables the CIM server for registering with the z/OS Automatic Restart Manager (ARM).

To completely enable the CIM server for ARM, additional customization is required as described in "Automatic restart of the CIM server" on page 55.

Step ENSTC

Step ENSTC

```
//* Step ENSTC establishes CFZSRV as the Started Task User for CIM
//ENSTC EXEC PGM=IKJEFT01,DYNAMNBR=99
//SYSPRINT DD SYSOUT=*
//SYSTSPRT DD SYSOUT=*
//SYSTSIN  DD *
 SETROPTS CLASSACT(STARTED) RACLIST(STARTED)
 RDEFINE STARTED CFZCIM.* STDATA(USER(CFZSRV) GROUP(CFZSRVGP))
 SETROPTS RACLIST(STARTED) REFRESH
/*
```

This step connects the CIM server started task procedure CFZCIM with the CIM server user CFZSRV.

For further details on configuring the CIM Server started task procedure, see "Customizing the started task procedure CFZCIM" on page 38.

Step PECEA

Step PECEA

```
//* Step PECEA permits CIM Cluster and JES jobs provider to access CEA
//*
//PECEA EXEC PGM=IKJEFT01,DYNAMNBR=99
//SYSPRINT DD SYSOUT=*
//SYSTSPRT DD SYSOUT=*
//SYSTSIN  DD *
 ADDSD CEA.* UACC(NONE)
 PERMIT CEA.* CLASS(DATASET) ID(CFZUSRGP) ACCESS(ALTER)
 PERMIT CEA.* CLASS(DATASET) ID(CFZADMGP) ACCESS(ALTER)
 SETROPTS GENERIC(DATASET) REFRESH

 SETROPTS CLASSACT(SERVAUTH) RACLIST(SERVAUTH) GENERIC(SERVAUTH)
 RDEFINE SERVAUTH CEA.* UACC(NONE)

 PERMIT CEA.* CLASS(SERVAUTH) ID(CFZADMGP) ACCESS(UPDATE)
 PERMIT CEA.* CLASS(SERVAUTH) ID(CFZUSRGP) ACCESS(UPDATE)

 PERMIT CEA.CONNECT CLASS(SERVAUTH) ID(CFZADMGP) ACCESS(UPDATE)
 PERMIT CEA.SUBSCRIBE.* CLASS(SERVAUTH) ID(CFZADMGP) ACCESS(UPDATE)
 PERMIT CEA.SUBSCRIBE.ENF_0068* CLASS(SERVAUTH) ID(CFZADMGP) +
 ACCESS(UPDATE)
 PERMIT CEA.CEAGETPS CLASS(SERVAUTH) ID(CFZADMGP) ACCESS(UPDATE)
 PERMIT CEA.CEADOCMD CLASS(SERVAUTH) ID(CFZADMGP) ACCESS(UPDATE)
 PERMIT CEA.CEAPDWB CLASS(SERVAUTH) ID(CFZADMGP) ACCESS(UPDATE)
 PERMIT CEA.CEADOCONSOLECMD CLASS(SERVAUTH) ID(CFZADMGP) ACCESS(UPDATE)

 PERMIT CEA.CONNECT CLASS(SERVAUTH) ID(CFZUSRGP) ACCESS(UPDATE)
 PERMIT CEA.SUBSCRIBE.* CLASS(SERVAUTH) ID(CFZUSRGP) ACCESS(UPDATE)
 PERMIT CEA.SUBSCRIBE.ENF_0068* CLASS(SERVAUTH) ID(CFZUSRGP) +
 ACCESS(UPDATE)
 PERMIT CEA.CEAGETPS CLASS(SERVAUTH) ID(CFZUSRGP) ACCESS(UPDATE)
 PERMIT CEA.CEADOCMD CLASS(SERVAUTH) ID(CFZUSRGP) ACCESS(UPDATE)
 PERMIT CEA.CEAPDWB* CLASS(SERVAUTH) ID(CFZUSRGP) ACCESS(UPDATE)
 PERMIT CEA.CEADOCONSOLECMD CLASS(SERVAUTH) ID(CFZUSRGP) ACCESS(UPDATE)

 SETROPTS RACLIST(SERVAUTH) REFRESH
/*
```

This step permits CIM users and administrators to access CEA through the CIM providers for the OS management Jobs and Cluster classes described in "OS management Job classes" on page 142 and "OS management Cluster classes" on page 171.

Note: This step defines the generic resource profile CEA.* and permits the CIM default groups CFZADMGP and CFZUSRGP access to it.

For the case that you have already defined the specific resource profiles (CEA.CONNECT, etc), this step also permits the CIM default groups to these specific resource profiles.

Depending on what you have actually defined, you can customize this job step to match your environment by removing obsolete commands.

For granting users a more fine grained access to CIM you may consider to define an additional group here that grants access just for OS management Jobs and Cluster classes.

For further details on the required setup for using the OS management Jobs and Cluster classes see Chapter 10, "Cluster, CoupleDataset, and JES2-JES3Jobs provider setup," on page 231.

Step ENCLCDS

Step ENCLCDS

```
//* Step ENCLCDS Setup for Cluster/Couple Dataset Providers
//*
//ENCLCDS EXEC PGM=IKJEFT01,DYNAMNBR=99
//SYSPRINT DD SYSOUT=*
//SYSTSPRT DD SYSOUT=*
//SYSTSIN  DD *

 SETROPTS CLASSACT(FACILITY) RACLIST(FACILITY) GENERIC(FACILITY)

 RDEFINE FACILITY MRCLASS.CLUSTER UACC(NONE)
 PERMIT MRCLASS.CLUSTER CLASS(FACILITY) ID(CFZUSRGP) ACCESS(UPDATE)
 PERMIT MRCLASS.CLUSTER CLASS(FACILITY) ID(CFZADMGP) ACCESS(UPDATE)

 RDEFINE FACILITY MVSADMIN.* UACC(NONE)
 PERMIT MVSADMIN.* CLASS(FACILITY) ID(CFZUSRGP) ACCESS(UPDATE)
 PERMIT MVSADMIN.* CLASS(FACILITY) ID(CFZADMGP) ACCESS(UPDATE)
 PERMIT MVSADMIN.XCF.* CLASS(FACILITY) ID(CFZUSRGP) ACCESS(UPDATE)
 PERMIT MVSADMIN.XCF.* CLASS(FACILITY) ID(CFZADMGP) ACCESS(UPDATE)
 PERMIT MVSADMIN.XCF.CFRM CLASS(FACILITY) ID(CFZUSRGP) ACCESS(UPDATE)
 PERMIT MVSADMIN.XCF.CFRM CLASS(FACILITY) ID(CFZADMGP) ACCESS(UPDATE)

 SETROPTS RACLIST(FACILITY) REFRESH
/*
```

This step permits CIM users and administrators to use the CIM providers for the OS management Cluster classes described in "OS management Cluster classes" on page 171.

For granting users a more fine-grained access to CIM, you may consider to define an additional group here that grants access just for OS management Cluster classes.

For further details on the required setup for using the OS management Cluster classes see Chapter 10, "Cluster, CoupleDataset, and JES2-JES3Jobs provider setup," on page 231.

Step ENSMIS

Step ENSMIS

```
//* Step ENSMIS enables the SMI-S CIM providers
//ENTCPIP EXEC PGM=IKJEFT01,DYNAMNBR=99
//SYSPRINT DD SYSOUT=*
//SYSTSPRT DD SYSOUT=*
//SYSTSIN  DD *
 SETROPTS CLASSACT(FACILITY) RACLIST(FACILITY) GENERIC(FACILITY)
 RDEFINE FACILITY IOSCDR UACC(NONE)

 PERMIT IOSCDR CL(FACILITY) ID(CFZUSRGP) ACCESS(UPDATE)
 PERMIT IOSCDR CL(FACILITY) ID(CFZADMGP) ACCESS(UPDATE)

 SETROPTS RACLIST(FACILITY) REFRESH
/*
```

This step permits CIM users and administrators to use the CIM providers for the Storage management classes described in "Storage management classes" on page 208.

In particular a CIM user requires this permission to access the CIM providers for the following storage management classes:

- IBMzOS_SBProtocolEndpoint
- Association IBMzOS_SBInitiatorTargetLogicalUnitPath

For granting users a more fine-grained access to CIM, you may consider to define an additional group here that grants access just for Storage management classes.

Step ENTCPIP

Step ENTCPIP

```
//* Step ENTCPIP enables the Network CIM providers
//ENTCPIP EXEC PGM=IKJEFT01,DYNAMNBR=99
//SYSPRINT DD SYSOUT=*
//SYSTSPRT DD SYSOUT=*
//SYSTSIN  DD *

 SETROPTS CLASSACT(SERVAUTH) RACLIST(SERVAUTH) GENERIC(SERVAUTH)
 RDEFINE SERVAUTH EZB.CIMPROV.* UACC(NONE)

 PERMIT EZB.CIMPROV.* CL(SERVAUTH) ID(CFZADMGP) ACCESS(READ)
 PERMIT EZB.CIMPROV.* CL(SERVAUTH) ID(CFZUSRGP) ACCESS(READ)

 SETROPTS RACLIST(SERVAUTH) REFRESH
/*
```

This step permits CIM users and administrators to use the CIM providers for the OS management Network classes described in "OS management Network classes" on page 137.

For granting users a more fine-grained access to CIM, you may consider to define an additional group here that grants access just for the OS management Network classes.

Step ENWLM

Step ENWLM

```
//* Step ENWLM Setup for WLM Providers
//*
//ENWLM EXEC PGM=IKJEFT01,DYNAMNBR=99
//SYSPRINT DD SYSOUT=*
//SYSTSPRT DD SYSOUT=*
//SYSTSIN  DD *

 SETROPTS CLASSACT(FACILITY) RACLIST(FACILITY)

 RDEFINE FACILITY MVSADMIN.* UACC(NONE)
 PERMIT MVSADMIN.* CLASS(FACILITY) ID(CFZUSRGP) ACCESS(UPDATE)
 PERMIT MVSADMIN.* CLASS(FACILITY) ID(CFZADMGP) ACCESS(UPDATE)
 PERMIT MVSADMIN.WLM.* CLASS(FACILITY) ID(CFZUSRGP) ACCESS(UPDATE)
 PERMIT MVSADMIN.WLM.* CLASS(FACILITY) ID(CFZADMGP) ACCESS(UPDATE)
 PERMIT MVSADMIN.WLM.POLICY CLASS(FACILITY) ID(CFZUSRGP) ACCESS(UPDATE)
 PERMIT MVSADMIN.WLM.POLICY CLASS(FACILITY) ID(CFZADMGP) ACCESS(UPDATE)

 SETROPTS RACLIST(FACILITY) REFRESH
/*
```

This step permits CIM users and administrators to use the CIM providers for the WLM classes described in Chapter 9, "WLM classes," on page 227.

For granting users a more fine-grained access to CIM, you may consider to define an additional group here that grants access just for the WLM classes.

Step ENRMF

Step ENRMF

```
//* Step ENRMF creates profiles necessary to allow passtickets being
//*             generated for authentication with the DDS
//ENRMF EXEC PGM=IKJEFT01,DYNAMNBR=99
//SYSPRINT DD SYSOUT=*
//SYSTSPRT DD SYSOUT=*
//SYSTSIN  DD *
 SETROPTS CLASSACT(PTKTDATA) RACLIST(PTKTDATA) GENERIC(PTKTDATA)
 RDEFINE PTKTDATA GPMSERVE SSIGNON(KEYMASKED(#rkeymask))
 RDEFINE PTKTDATA IRRPTAUTH.GPMSERVE.* UACC(NONE)
 PERMIT IRRPTAUTH.GPMSERVE.* CL(PTKTDATA) ID(CFZSRV) ACCESS(UPDATE)
 SETROPTS RACLIST(PTKTDATA) REFRESH
/*
```

If you are not using the z/OS Resource Measurement Facility (RMF) optional element, remove this step from the job. Otherwise this step permits the CIM server access to the RMF Distributed Data Server using passtickets. For this, replace `#rkeymask` by a 16-digit (0-9,A-F) keymask value to setup connectivity between CIM and RMF via passtickets.

Note:
The keymask value is a secret passkey. In a secure environment it is recommended to execute step ENRMF separately to avoid storing the passkey in the job log in readable format.

The CIM classes implemented by RMF are described in the *z/OS RMF Programmer's Guide* and *z/OS RMF User's Guide*.

Appendix B. Sample CIM request and response

The provided sample shows an XML request for an EnumerateInstances request for class IBMzOS_ComputerSystem and the related XML response. See the *CIM Operations over HTTP* and *Representation of CIM in XML* specifications available from the DMTF Published Documents website.

Request:

```
<?xml version="1.0" encoding="utf-8" ?>
<CIM CIMVERSION="2.0" DTDVERSION="2.0">
  <MESSAGE ID="4711" PROTOCOLVERSION="1.0">
    <SIMPLEREQ>
      <IMETHODCALL NAME="EnumerateInstances">
        <LOCALNAMESPACEPATH>
          <NAMESPACE NAME="root"></NAMESPACE>
          <NAMESPACE NAME="cimv2"></NAMESPACE>
        </LOCALNAMESPACEPATH>
        <IPARAMVALUE NAME="ClassName">
          <CLASSNAME NAME="IBMzOS_ComputerSystem"/>
        </IPARAMVALUE>
        <IPARAMVALUE NAME="DeepInheritance">
          <VALUE>TRUE</VALUE>
        </IPARAMVALUE>
        <IPARAMVALUE NAME="LocalOnly">
          <VALUE>FALSE</VALUE>
        </IPARAMVALUE>
        <IPARAMVALUE NAME="IncludeQualifiers">
          <VALUE>FALSE</VALUE>
        </IPARAMVALUE>
        <IPARAMVALUE NAME="IncludeClassOrigin">
          <VALUE>TRUE</VALUE>
        </IPARAMVALUE>
      </IMETHODCALL>
    </SIMPLEREQ>
  </MESSAGE>
</CIM>
```

Response:

```
<?xml version="1.0" encoding="utf-8" ?>
<CIM CIMVERSION="2.0" DTDVERSION="2.0">
  <MESSAGE ID="4711" PROTOCOLVERSION="1.0">
    <SIMPLERSP>
      <IMETHODRESPONSE NAME="EnumerateInstances">
        <IRETURNVALUE>
          <VALUE.NAMEDINSTANCE>
            <INSTANCENAME CLASSNAME="IBMzOS_ComputerSystem">
              <KEYBINDING NAME="CreationClassName">
                <KEYVALUE VALUETYPE="string">IBMzOS_ComputerSystem</KEYVALUE>
              </KEYBINDING>
              <KEYBINDING NAME="Name">
                <KEYVALUE VALUETYPE="string">BOEMT11.boeb.de.ibm.com</KEYVALUE>
              </KEYBINDING>
            </INSTANCENAME>
            <INSTANCE  CLASSNAME="IBMzOS_ComputerSystem" >
              <PROPERTY NAME="Caption"  TYPE="string">
                <VALUE>IBM z/OS Computer System</VALUE>
              </PROPERTY>
              <PROPERTY NAME="Description"  TYPE="string">
                <VALUE>This is an IBMzOS_ComputerSystem</VALUE>
              </PROPERTY>
              <PROPERTY NAME="ElementName"  TYPE="string">
```

```
  <VALUE>BOEMT11.boeb.de.ibm.com</VALUE>
</PROPERTY>
<PROPERTY NAME="InstallDate"  TYPE="datetime">
</PROPERTY>
<PROPERTY.ARRAY NAME="OperationalStatus"  TYPE="uint16">
  <VALUE.ARRAY>
    <VALUE>0</VALUE>
  </VALUE.ARRAY>
</PROPERTY.ARRAY>
<PROPERTY.ARRAY NAME="StatusDescriptions"  TYPE="string">
</PROPERTY.ARRAY>
<PROPERTY NAME="Status"  TYPE="string">
</PROPERTY>
<PROPERTY NAME="EnabledState"  TYPE="uint16">
  <VALUE>2</VALUE>
</PROPERTY>
<PROPERTY NAME="OtherEnabledState"  TYPE="string">
  <VALUE>NULL</VALUE>
</PROPERTY>
<PROPERTY NAME="RequestedState"  TYPE="uint16">
  <VALUE>2</VALUE>
</PROPERTY>
<PROPERTY NAME="EnabledDefault"  TYPE="uint16">
  <VALUE>2</VALUE>
</PROPERTY>
<PROPERTY NAME="TimeOfLastStateChange"  TYPE="datetime">
</PROPERTY>
<PROPERTY NAME="CreationClassName"  TYPE="string">
  <VALUE>IBMzOS_ComputerSystem</VALUE>
</PROPERTY>
<PROPERTY NAME="Name"  TYPE="string">
  <VALUE>BOEMT11.boeb.de.ibm.com</VALUE>
</PROPERTY>
<PROPERTY NAME="PrimaryOwnerName"  TYPE="string">
</PROPERTY>
<PROPERTY NAME="PrimaryOwnerContact"  TYPE="string">
</PROPERTY>
<PROPERTY.ARRAY NAME="Roles"  TYPE="string">
  <VALUE.ARRAY>
    <VALUE>Unknown</VALUE>
  </VALUE.ARRAY>
</PROPERTY.ARRAY>
<PROPERTY NAME="NameFormat"  TYPE="string">
  <VALUE>IP</VALUE>
</PROPERTY>
<PROPERTY.ARRAY NAME="OtherIdentifyingInfo"  TYPE="string">
</PROPERTY.ARRAY>
<PROPERTY.ARRAY NAME="IdentifyingDescriptions"  TYPE="string">
</PROPERTY.ARRAY>
<PROPERTY.ARRAY NAME="Dedicated"  TYPE="uint16">
  <VALUE.ARRAY>
    <VALUE>0</VALUE>
  </VALUE.ARRAY>
</PROPERTY.ARRAY>
<PROPERTY.ARRAY NAME="OtherDedicatedDescriptions"  TYPE="string">
</PROPERTY.ARRAY>
<PROPERTY NAME="ResetCapability"  TYPE="uint16">
  <VALUE>5</VALUE>
</PROPERTY>
<PROPERTY.ARRAY NAME="PowerManagementCapabilities"  TYPE="uint16">
</PROPERTY.ARRAY>
<PROPERTY NAME="MachineType"  TYPE="string">
  <VALUE>2084</VALUE>
</PROPERTY>
<PROPERTY NAME="Model"  TYPE="string">
  <VALUE>314</VALUE>
</PROPERTY>
```

```
              <PROPERTY NAME="SerialNumber"  TYPE="string">
                <VALUE>0000000000016F7A</VALUE>
              </PROPERTY>
              <PROPERTY NAME="LPARName"  TYPE="string">
                <VALUE></VALUE>
              </PROPERTY>
              <PROPERTY NAME="VMGuestID"  TYPE="string">
                <VALUE>MT11</VALUE>
              </PROPERTY>
              <PROPERTY NAME="CPUID"  TYPE="string">
                <VALUE>026F7A2084</VALUE>
              </PROPERTY>
            </INSTANCE>
          </VALUE.NAMEDINSTANCE>
        </IRETURNVALUE>
      </IMETHODRESPONSE>
    </SIMPLERSP>
  </MESSAGE>
</CIM>
```

Accessibility

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Attention: MHVRCFS Reader Comments
Department H6MA, Building 707
2455 South Road
Poughkeepsie, NY 12601-5400
U.S.A.

Accessibility features help a user who has a physical disability, such as restricted mobility or limited vision, to use software products successfully. The major accessibility features in z/OS enable users to:

- Use assistive technologies such as screen readers and screen magnifier software
- Operate specific or equivalent features using only the keyboard
- Customize display attributes such as color, contrast, and font size

Using assistive technologies

Assistive technology products, such as screen readers, function with the user interfaces found in z/OS. Consult the assistive technology documentation for specific information when using such products to access z/OS interfaces.

Keyboard navigation of the user interface

Users can access z/OS user interfaces using TSO/E or ISPF. Refer to *z/OS TSO/E Primer*, *z/OS TSO/E User's Guide*, and *z/OS ISPF User's Guide Vol I* for information about accessing TSO/E and ISPF interfaces. These guides describe how to use TSO/E and ISPF, including the use of keyboard shortcuts or function keys (PF keys). Each guide includes the default settings for the PF keys and explains how to modify their functions.

z/OS information

z/OS information is accessible using screen readers with the BookServer or Library Server versions of z/OS books in the Internet library at:

`http://www.ibm.com/systems/z/os/zos/bkserv/`

Dotted decimal syntax diagrams

Syntax diagrams are provided in dotted decimal format for users accessing the Information Center using a screen reader. In dotted decimal format, each syntax element is written on a separate line. If two or more syntax elements are always present together (or always absent together), they can appear on the same line, because they can be considered as a single compound syntax element.

Each line starts with a dotted decimal number; for example, 3 or 3.1 or 3.1.1. To hear these numbers correctly, make sure that your screen reader is set to read out punctuation. All the syntax elements that have the same dotted decimal number (for example, all the syntax elements that have the number 3.1) are mutually exclusive alternatives. If you hear the lines 3.1 USERID and 3.1 SYSTEMID, you know that your syntax can include either USERID or SYSTEMID, but not both.

The dotted decimal numbering level denotes the level of nesting. For example, if a syntax element with dotted decimal number 3 is followed by a series of syntax elements with dotted decimal number 3.1, all the syntax elements numbered 3.1 are subordinate to the syntax element numbered 3.

Certain words and symbols are used next to the dotted decimal numbers to add information about the syntax elements. Occasionally, these words and symbols might occur at the beginning of the element itself. For ease of identification, if the word or symbol is a part of the syntax element, it is preceded by the backslash (\) character. The * symbol can be used next to a dotted decimal number to indicate that the syntax element repeats. For example, syntax element *FILE with dotted decimal number 3 is given the format 3 * FILE. Format 3* FILE indicates that syntax element FILE repeats. Format 3* * FILE indicates that syntax element * FILE repeats.

Characters such as commas, which are used to separate a string of syntax elements, are shown in the syntax just before the items they separate. These characters can appear on the same line as each item, or on a separate line with the same dotted decimal number as the relevant items. The line can also show another symbol giving information about the syntax elements. For example, the lines 5.1*, 5.1 LASTRUN, and 5.1 DELETE mean that if you use more than one of the LASTRUN and DELETE syntax elements, the elements must be separated by a comma. If no separator is given, assume that you use a blank to separate each syntax element.

If a syntax element is preceded by the % symbol, this indicates a reference that is defined elsewhere. The string following the % symbol is the name of a syntax fragment rather than a literal. For example, the line 2.1 %OP1 means that you should refer to separate syntax fragment OP1.

The following words and symbols are used next to the dotted decimal numbers:

- ? means an optional syntax element. A dotted decimal number followed by the ? symbol indicates that all the syntax elements with a corresponding dotted decimal number, and any subordinate syntax elements, are optional. If there is only one syntax element with a dotted decimal number, the ? symbol is displayed on the same line as the syntax element, (for example 5? NOTIFY). If there is more than one syntax element with a dotted decimal number, the ? symbol is displayed on a line by itself, followed by the syntax elements that are

optional. For example, if you hear the lines 5 ?, 5 NOTIFY, and 5 UPDATE, you know that syntax elements NOTIFY and UPDATE are optional; that is, you can choose one or none of them. The ? symbol is equivalent to a bypass line in a railroad diagram.

- ! means a default syntax element. A dotted decimal number followed by the ! symbol and a syntax element indicates that the syntax element is the default option for all syntax elements that share the same dotted decimal number. Only one of the syntax elements that share the same dotted decimal number can specify a ! symbol. For example, if you hear the lines 2? FILE, 2.1! (KEEP), and 2.1 (DELETE), you know that (KEEP) is the default option for the FILE keyword. In this example, if you include the FILE keyword but do not specify an option, default option KEEP will be applied. A default option also applies to the next higher dotted decimal number. In this example, if the FILE keyword is omitted, default FILE(KEEP) is used. However, if you hear the lines 2? FILE, 2.1, 2.1.1! (KEEP), and 2.1.1 (DELETE), the default option KEEP only applies to the next higher dotted decimal number, 2.1 (which does not have an associated keyword), and does not apply to 2? FILE. Nothing is used if the keyword FILE is omitted.
- * means a syntax element that can be repeated 0 or more times. A dotted decimal number followed by the * symbol indicates that this syntax element can be used zero or more times; that is, it is optional and can be repeated. For example, if you hear the line 5.1* data area, you know that you can include one data area, more than one data area, or no data area. If you hear the lines 3*, 3 HOST, and 3 STATE, you know that you can include HOST, STATE, both together, or nothing.

  Notes:

  1. If a dotted decimal number has an asterisk (*) next to it and there is only one item with that dotted decimal number, you can repeat that same item more than once.
  2. If a dotted decimal number has an asterisk next to it and several items have that dotted decimal number, you can use more than one item from the list, but you cannot use the items more than once each. In the previous example, you could write HOST STATE, but you could not write HOST HOST.
  3. The * symbol is equivalent to a loop-back line in a railroad syntax diagram.
- + means a syntax element that must be included one or more times. A dotted decimal number followed by the + symbol indicates that this syntax element must be included one or more times; that is, it must be included at least once and can be repeated. For example, if you hear the line 6.1+ data area, you must include at least one data area. If you hear the lines 2+, 2 HOST, and 2 STATE, you know that you must include HOST, STATE, or both. Similar to the * symbol, the + symbol can only repeat a particular item if it is the only item with that dotted decimal number. The + symbol, like the * symbol, is equivalent to a loop-back line in a railroad syntax diagram.

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Programming Interface Information

This book is intended to help the customer to use the Common Information Model to write system management applications for z/OS systems.

The book also documents intended Programming Interfaces that allow the customer to write programs to obtain the services of CIM.

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