

System Automation for z/OS  
Version 3 Release 4

*Customizing and Programming*



**Note!**

Before using this information and the product it supports, read the information in Appendix G, "Notices," on page 291.

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## Accessibility

Publications for this product are offered in Adobe Portable Document Format (PDF) and should be compliant with accessibility standards. If you experience difficulties when using PDF files, you may view the information through the z/OS® Internet Library website or the z/OS Information Center. If you continue to experience problems, send an email to [mhvrdfs@us.ibm.com](mailto:mhvrdfs@us.ibm.com) or write to:

IBM® Corporation  
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

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## 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.

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## 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/>



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## 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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## How to send your comments to IBM

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Use one of the following methods to send us your comments:

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Include the following information:

- Your name and address
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IBM Tivoli System Automation for z/OS V3R4.0 Customizing and Programming  
SC34-2644-00
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## If you have a technical problem

Do not use the feedback methods listed above. Instead, do one of the following:

- Contact your IBM service representative
- Call IBM technical support
- Visit the IBM zSeries support web page at [www.ibm.com/systems/z/support/](http://www.ibm.com/systems/z/support/).



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## About This Book

This book describes how to adapt your completed standard installation of IBM Tivoli® System Automation for z/OS (SA z/OS) as described in *IBM Tivoli System Automation for z/OS Planning and Installation* to your environment. This book contains information on how to add new applications to automation and how to write your own automation procedures. It also contains information about how to add new messages for automated applications.

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## Who Should Use This Book

This book is primarily intended for automation programmers responsible for:

- Customizing system automation and the operations environment
- Developing automation procedures and other operations capabilities

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## Prerequisites

Throughout this book, it is expected that readers are familiar with System Automation for z/OS and the following documentation:

- *IBM Tivoli System Automation for z/OS Operator's Commands*
- *IBM Tivoli System Automation for z/OS Programmer's Reference*
- *IBM Tivoli System Automation for z/OS Defining Automation Policy*

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## Where to Find More Information

### The System Automation for z/OS Library

Table 1 shows the information units in the System Automation for z/OS library:

Table 1. System Automation for z/OS Library

Title	Order Number
<i>IBM Tivoli System Automation for z/OS Planning and Installation</i>	SC34-2645
<i>IBM Tivoli System Automation for z/OS Customizing and Programming</i>	SC34-2644
<i>IBM Tivoli System Automation for z/OS Defining Automation Policy</i>	SC34-2646
<i>IBM Tivoli System Automation for z/OS User's Guide</i>	SC34-2647
<i>IBM Tivoli System Automation for z/OS Messages and Codes</i>	SC34-2648
<i>IBM Tivoli System Automation for z/OS Operator's Commands</i>	SC34-2649
<i>IBM Tivoli System Automation for z/OS Programmer's Reference</i>	SC34-2650
<i>IBM Tivoli System Automation for z/OS Product Automation Programmer's Reference and Operator's Guide</i>	SC34-2643
<i>IBM Tivoli System Automation for z/OS TWS Automation Programmer's Reference and Operator's Guide</i>	SC34-2651
<i>IBM Tivoli System Automation for z/OS End-to-End Automation Adapter</i>	SC34-2652
<i>IBM Tivoli System Automation for z/OS Monitoring Agent Configuration and User's Guide</i>	SC34-2653

The System Automation for z/OS books are also available on CD-ROM as part of the following collection kit:

IBM Online Library z/OS Software Products Collection (SK3T-4270)

#### SA z/OS Home Page

For the latest news on SA z/OS, visit the SA z/OS home page at [http://www.ibm.com/systems/z/os/zos/features/system\\_automation](http://www.ibm.com/systems/z/os/zos/features/system_automation)

## Related Product Information

You can find books in related product libraries that may be useful for support of the SA z/OS base program by visiting the z/OS Internet Library at <http://www.ibm.com/systems/z/os/zos/bkserv>

## Using LookAt to look up message explanations

LookAt is an online facility that lets you look up explanations for most of the IBM messages you encounter, as well as for some system abends and codes. Using LookAt to find information is faster than a conventional search because in most cases LookAt goes directly to the message explanation.

You can use LookAt from these locations to find IBM message explanations for z/OS elements and features, z/VM<sup>®</sup>, z/VSE<sup>®</sup>, and Clusters for AIX<sup>®</sup> and Linux:

- The Internet. You can access IBM message explanations directly from the LookAt Website at [www.ibm.com/systems/z/os/zos/bkserv/lookat/index.html](http://www.ibm.com/systems/z/os/zos/bkserv/lookat/index.html)
- Your z/OS TSO/E host system. You can install code on your z/OS or z/OS.e systems to access IBM message explanations using LookAt from a TSO/E command line (for example: TSO/E prompt, ISPF, or z/OS UNIX System Services).
- Your Microsoft Windows workstation. You can install LookAt directly from the *z/OS Collection* (SK3T-4269) or the *z/OS and Software Products DVD Collection* (SK3T-4271) and use it from the resulting Windows graphical user interface (GUI). The command prompt (also known as the DOS > command line) version can still be used from the directory in which you install the Windows version of LookAt.
- Your wireless handheld device. You can use the LookAt Mobile Edition from [www.ibm.com/systems/z/os/zos/bkserv/lookat/lookatm.html](http://www.ibm.com/systems/z/os/zos/bkserv/lookat/lookatm.html) with a handheld device that has wireless access and an Internet browser (for example: Internet Explorer for Pocket PCs, Blazer or Eudora for Palm OS, or Opera for Linux handheld devices).

You can obtain code to install LookAt on your host system or Microsoft Windows workstation from:

- A CD-ROM in the *z/OS Collection* (SK3T-4269).
- The *z/OS and Software Products DVD Collection* (SK3T-4271).
- The LookAt Website (click **Download** and then select the platform, release, collection, and location that suit your needs). More information is available in the LOOKAT.ME files available during the download process.

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## Summary of Changes for SC34-2644-00

This document contains information previously presented in System Automation for z/OS V3R3.0 Customizing and Programming, SC34-2570-03.

## New Information

### Recovering Auxiliary Storage Shortage

The capacity to allocate local data page sets for preventing auxiliary storage shortages is described and added in “Recovering Auxiliary Storage Shortage” on page 136.

### Autodiscovery

A discovery utility has been introduced to search multiple customer systems for automation information and import it into a SA z/OS policy database. See Chapter 19, “Automated System Resource Discovery,” on page 215. Appendix F, “Autodiscovery Mapper Files and Report Formats,” on page 271 is added outlining the report formats and mapper files used for the Autodiscovery process.

### JobLog Monitoring

A facility to set up a monitoring function for JES2 Spool files is now provided and described in Chapter 5, “Joblog Monitoring,” on page 65.

### Command Receivers

A new chapter describing how to enable the general purpose command receivers used for passing commands to SA z/OS is available in Chapter 10, “Command Receivers,” on page 113. This chapter also contains information about Submitting NetView Commands from a Batch Job moved from *IBM Tivoli System Automation for z/OS TWS Automation Programmer’s Reference and Operator’s Guide*. This section now contains the syntax explanation for the REXX procedure/command AOFRYCMD (identical to EVJRYCMD, but named differently here).

### Relational Data Services

A new chapter describing the Relational Data Services (RDS) provided for System Automation is available in Chapter 11, “Enabling Relational Data Services (RDS),” on page 121. The following variables for customizing this facility are available: AOF\_AAO\_RDS\_TSO\_DSN, AOF\_AAO\_RDS\_TSO\_RACFHLQ. See “Read/Write Variables” on page 230.

### AOFRYCMD (based on EVJRYCMD) command

The ASIS parameter is added for the AOFRYCMD REXX procedure/command. See “AOFRYCMD Description” on page 117.

### AOFEXX05 static exit

The “AOFEXX05” on page 169 static exit is added to “Static Exits” on page 167.

### INGRTAPE automation routine documentation

Documentation for INGRTAPE automation routine is added in “INGRTAPE” on page 210 located in Chapter 18, “Automation Solutions,” on page 183.

### INGROMON monitoring routine

The INGROMON monitoring routine is added to “Observed Status Monitoring” on page 39.

### INGHIST\_WIMAX parameter

The INGHIST\_WIMAX parameter has been added in “Parameter Defaults for Commands” on page 238 for defining a maximum number of history items displayed when using the INGHIST command.

### **INGRUN\_WAIT parameter**

The INGRUN\_WAIT parameter has been added in “Parameter Defaults for Commands” on page 238 for defining the WAIT parameter of the INGRUN command.

### **INGUXPPI PPI interface**

Use of the program-to-program interface INGUXPPI for USS process initialization and termination status updates is added in “Infrastructure Overview” on page 102 of Chapter 9, “How to Automate USS Resources,” on page 101.

### **IP Stack**

IP stack information has been added to “Customization of z/OS UNIX Resources” on page 102.

### **Additional Read Only Global Variables for SA z/OS**

AOFBFP, AOFCFP, and AOFPFP, have been added in “Read-Only Variables” on page 229.

### **Additional Read/Write Global Variables for SA z/OS**

Additional variables are added and described in “Read/Write Variables” on page 230:

- AOF\_AAO\_SHUTSYS\_OLD
- AOF\_AAO\_OMVS\_SHUTDOWN
- AOF\_AAO\_AAREQUEST\_MAX\_WAIT
- AOF\_AAO\_SHUTDOWN\_STOPAPPL
- AOF\_AAO\_RDS\_TSO\_DSN
- AOF\_AAO\_RDS\_TSO\_RACFHLQ
- INGCICS\_WAIT
- INGRAITF\_WAIT
- INGCICS\_CORRWAIT

## **Changed Information**

### **AOFSMARTMAT**

The AOFSMARTMAT global variable settings have been updated to provide settings for AT and MRT load options when refreshing an automation agent. See “AOFSMARTMAT” on page 237 in “Read/Write Variables” on page 230.

### **Extended Status Commands**

New pseudo-message definitions for application linking are added in “Extended Status Command Support” on page 27.

### **The INGJRMJSP automation routine**

This routine now appears as the INGRMJSP routine. See “INGRMJSP” on page 207.

### **INGVOTE\_SOURCE global installation variable**

A new global installation variable INGVOTE\_SOURCE replaces INGVOTE\_VERIFY in “Parameter Defaults for Commands” on page 238.

### **&\*JOBNAME. variable**

A new variable &\*JOBNAME. available as part of an automation table (AT) condition statement is described in “Defining Message Overrides” on page 26.

### SSHD Example

Examples for the Secure Shell Daemon (SSHD) application are now given and replace inetd examples for encrypted listening and communication within a Unix environment. See “Example: sshd” on page 108.

### SDF Global Read/Write Variables

Former global variable AOF\_AAO\_SDFROOT\_LIST is amended to allow four variables AOF\_AAO\_SDFROOT\_LISTn where n can be 1 to 4, for defining a value for &SDFROOT in SDF panels. See “Read/Write Variables” on page 230.

## Moved Information

The following routines are moved to *IBM Tivoli System Automation for z/OS Product Automation Programmer's Reference and Operator's Guide*.

- EVEERTRN
- EVIECT0X
- EVISTRCT
- EVIEET00
- EVIEI006
- EVISTRMN

The following routines are moved to *IBM Tivoli System Automation for z/OS TWS Automation Programmer's Reference and Operator's Guide*.

- EVJEAC04
- EVJEOSBV
- EVJRAC05
- EVJRSACT
- EVJRSJOB

## Deleted Information

### Defining the AT/MRT Scope

This section is now removed from Chapter 3, “How to Add a Message to Automation,” on page 23.

### EVIEI00Q

The EVIEI00Q routine is removed from IMS™ Transaction Recovery in Chapter 18, “Automation Solutions,” on page 183.

### AOFEXX16

This SA z/OS Static Exit is removed from Chapter 17, “SA z/OS User Exits,” on page 163.

### %AOF SIRTASK%

This generic synonym has been retired for use in the AOFMSGSY member used as a NetView® automation table. See “Generic Synonyms: AOFMSGSY” on page 261.

You may notice changes in the style and structure of some content in this document—for example, headings that use uppercase for the first letter of initial words only, and procedures that have a different look and format. The changes are ongoing improvements to the consistency and retrievability of information in our documents.

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



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# Chapter 1. How to Add a New Application to Automation

This chapter outlines the requirements to add and monitor a new application for SA z/OS.

---

## Preparation Before Automating an Application

Before you can automate a product you need to extract its characteristics like its start and stop behaviour and parameters like its jobname.

The following steps should help you to obtain these characteristics. Once you have finished you need to add the application to your automation policy. Refer to *IBM Tivoli System Automation for z/OS Defining Automation Policy* for this activity. The main requirements for the automation of an application are:

- Address Space properties
- Application Start
- Application Shutdown
- Application Events
- Application Monitoring
- Outstanding Reply Processing
- Topology

### Address Space properties

When adding an new application, you need to know the following most important characteristics of the application:

- Jobname
- JCL procedure name
- Is it scheduled by the Master Scheduler or a scheduling subsystem?
- Is it an MVS™, OMVS application or another kind of application (for example a NetView task)?
- Location for running the application: every sysplex's system, once in the sysplex or on a subset of systems within the sysplex?

The application's general properties are mostly defined in the APPLICATION INFO policy.

### Step 1 - Application Start

Before you can introduce a new application you should consider how it is started and all the actions required to make it operational. Therefore it is important to know:

*Table 2. Application Start*

Actions Required	Available Functionality
Are there any actions to complete before the application itself could be started?	To include these actions in automation, use the application's PRESTART policy. Any command specified there is issued prior to the insertion of the start command.

## How to Add a New Application to Automation

Table 2. Application Start (continued)

Actions Required	Available Functionality
What is the application's start command? And are there different start commands depending on the startup mode of an application (for example, the normal and the light start for a DB2® database)?	The start command should be located in the STARTUP policy. It also provides the full flexibility for different start commands by specifying different start types. Once a start type is set, the specified command will be chosen. The start type easily can be chosen/changed at System Automation's runtime.
Who starts the application when it is not started by System Automation? Is it started by another instance?	The APPLICATION INFO policy lets you specify an EXTERNAL STARTUP parameter.
Are there any actions to complete after the application initialization?	Use the POSTSTART policy to issue additional commands after the full initialization of the application.

**Note:** All startup policies support flexible start types.

## Step 2 - Application Stop

Once the application is no longer required, you need to take all the necessary steps to bring it down in a planned way. Therefore it is important to know:

Table 3. Application Stop (1)

Actions Required	Available Functionality
Should you issue commands to prepare the application shutdown ?	Use the SHUTDOWN INIT policy to identify additional commands to be issued before the application termination can be initiated.
Which command initiates the termination process? And what happens when the stop command does not take effect?	System Automation has the concept of command escalation. It provides the capacity to specify an order of termination commands. System Automation will issue the first command and verify the effect before it inserts the next more effective command. There are three policies (SHUTDOWN NORM, IMMED, FORCE) where you can specify different shutdown command sequences for different shutdown types.
Who stops the application when it is not stopped by System Automation? Is there another instance controlling the application?	The APPLICATION INFO policy lets you specify an EXTERNAL SHUTDOWN parameter.
Are there any final termination actions to complete after an orderly application termination?	Use the SHUTDOWN FINAL policy to issue additional commands after the termination of the application.

Sometimes it can happen that an application terminates unexpectedly. In this case it might be necessary to complete some cleanup actions before the application can be restarted. Consequently it is necessary to know:

Table 4. Application Stop (2)

Actions Required	Available Functionality
<b>Are there any necessary cleanup activities to be completed before the application can be restarted?</b>	The concept of status commands addresses this issue. Once the application reaches a specific status, the defined command will be issued.
<b>Is the application restartable in case of an unexpected termination?</b>	System Automation recognizes several termination situations for applications. Depending on the situation System Automation is able to distinguish between a recoverable and an unrecoverable error. As a result, System Automation determines whether to restart the application or not. This concept is Code Match processing. Additionally the RESTART option in the APPLICATION INFO policy defines the circumstances when System Automation should restart the application.
<b>Is the application restarted automatically by another application? Is the application ARM (Automatic Restart Manager) enabled and will it be restarted automatically?</b>	System Automation provides the concept of Move groups to accomplish the same behavior as the ARM mechanism does. It is recommended to use Move groups for achieving high availability of applications.

### Step 3 - Application Events

System Automation reacts to events. More specifically, it reacts to messages sent by applications or the system itself.

There are many kinds of applications. Each of them sends a varying degree of messages which can be used to determine its status. The messages represent different states during an application's life-cycle. Normally MVS resources provide proper messages to determine the status of an application. Resources within OMVS are mostly silent.

Step 3 points you to important messages in the life-cycle of the application. As you can see below a resource is started once. After an amount of initialization time it is fully operational. When the resource is no longer needed a stop command is invoked to terminate it. After the termination processing it does not exist any longer.

## How to Add a New Application to Automation

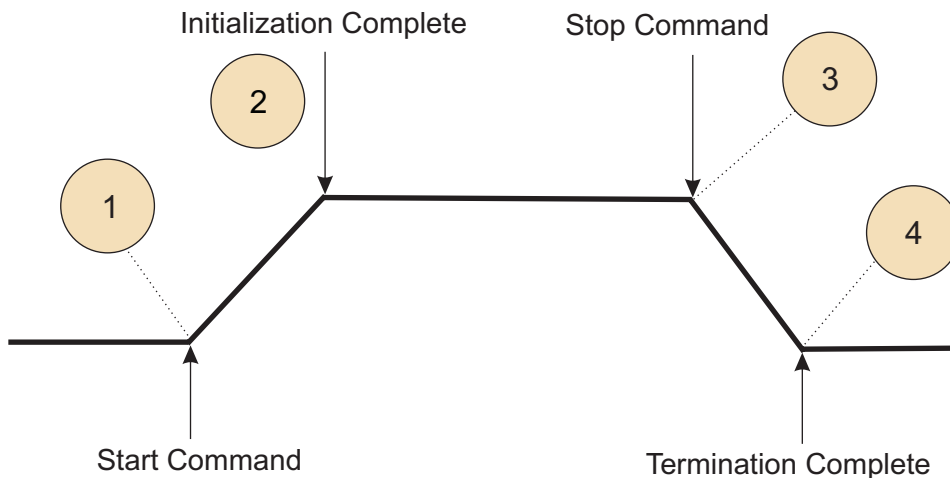


Figure 1. Application Lifecycle

*What are the important messages at the points in the application's life-cycle as illustrated in Figure 1 above?*

For example a message IEF403I is sent when the system observes that an application has been started. IEF404I is issued when the application terminated.

*Are there are other kinds of usable events at the specific points?*

Step 3 discusses also the situation of an unplanned application termination.

*Are there important messages at point 3 and 4 of Figure 1 in case of an unplanned termination?*

For example a message IEF450I points to an unplanned termination.

### Step 4 - Application Monitoring

Automating resources does not only consist of starting and stopping the resources. It is also important to know methods that determine whether the component is working as expected or already terminated. System Automation provides proper monitoring routines to be able to determine its state.

What kind of an application is it and could the state of the application be determined by:

- The existence of an address space
- The existence of a USS process
- The status of a NetView task

The corresponding monitor could be specified in the field MONITOR ROUTINE.

Step 4 presents messages issued by applications and how communicative they are. So it is useful to decide whether an application must be actively monitored or its state could be reliably derived from messages. If this is the case the MONITOR INTERVAL could be set to NONE. It helps to reduce the messages in the NetView log and to reduce unnecessary system activity. The monitoring action itself takes place at the startup and shutdown cycle to verify the state of the application.

In contrast, there are less communicative applications. In this case a well balanced monitor interval (specific enough) ensures a periodic monitoring service to verify the applications status.

Sometimes it is not enough to know whether a resource is running or not. Many situations require more detailed information as well as its status. The concept of monitor resources provides the infrastructure to evaluate the status of resources in detail and to react properly to the specific situation.

### Outstanding Reply Processing

SA z/OS keeps track of all outstanding Write-to-Operator Replies (WTORs) that it receives if it does not reply to them immediately. Because some applications may have more than one outstanding WTOR at the same time, and not all WTORs are equally important, they are classified accordingly. For more details refer to Chapter 16, "WTOR Processing," on page 159.

### Topology

Normally the application to be automated depends on the underlying infrastructure, like JES2 or TCPIP. This means that this infrastructure must be available before you can start the application.

Vice versa the application can be a prerequisite for other applications, before they can be started.

Likewise you need to think about which other applications must be terminated prior to the termination of the application.

As described above, there are relationships between the applications.

At this point it might be helpful to draw a picture and to visualize the relationships between the application in case of a start and a stop situation.

SA z/OS provides Best Practice policies containing solutions for several products. The solutions are illustrated in PDF file format located in: /usr/lpp/ing/doc/policies.

Please refer to the appropriate file to find out more information about the solution you are trying to automate.

---

## Adding the Application to Automation

### Define an Application Policy Object

To add a new application to SA z/OS, you must create and define a new Application policy object using the SA z/OS customization dialog. With the customization dialog, you also define how the new application should be automated by SA z/OS, for example:

- Specifying startup or shutdown commands for the application,
- Specifying the appropriate monitoring routine,
- Specifying relationships to correlate it with other applications,
- Linking the application into an application group,
- Considering where the applications should be visible.

SA z/OS provides Best Practice policies containing solutions for several products.

## How to Add a New Application to Automation

How to add a new application and how to access System Automation's Best Practice solutions is described in detail in *IBM Tivoli System Automation for z/OS Defining Automation Policy*.

### Using Automated Discovery to Define Application Policy Objects

This functionality is primarily intended to build a basic automation policy. You can discover z/OS system resources like address spaces and along with SA z/OS delivered policies you can map the discovered address spaces to applications defined in the SA z/OS delivered policies. Thus, a new user policy can be populated with APL policy objects.

For more information, refer to Chapter 19, “Automated System Resource Discovery,” on page 215.

### Build New Automation Configuration Files

When you finish defining the application in the customization dialog, build the new automation configuration files from the updated policy database. See *IBM Tivoli System Automation for z/OS Defining Automation Policy* for more information.

After you have completed this step, the application is known to SA z/OS and can therefore be automated according to the policy that was defined in “Define an Application Policy Object” on page 5.

---

## Chapter 2. How to Create Automation Procedures

You can write additional automation procedures to supplement the basic automation procedures that are supplied by SA z/OS. For example, you may want to develop procedures to automate an application that is used exclusively on your system or to perform specialized automated operations for a subsystem.

SA z/OS commands and routines perform basic functions such as logging messages and checking automation flags. You can use them in your own automation procedures.

SA z/OS automation routines are convenience routines that provide your automation procedures with a simple, standard way of interfacing with the automation control file, automation status file, and NetView log file. It is strongly recommended that you use these routines wherever possible in your own code.

“How Automation Procedures Are Structured” on page 8 describes how to structure your automation procedures. Refer to *IBM Tivoli System Automation for z/OS Programmer’s Reference* for detailed descriptions and examples of the automation routines and file manager commands you can use in your automation routines.

---

### How Automation Procedures Are Called

There are several ways to call an automation procedure including:

- Calling the automation procedure from the NetView automation table using SA z/OS automation
- Keying in the automation procedure name or its synonym into a NetView command line
- Calling the automation procedure from another program
- Starting the automation procedure with a timer
- Starting the automation procedure with the NetView EXCMD command
- Starting the automation procedure on an automation operator with the SA z/OS AOFEXCMD command routine
- In the customization dialog, entering your automation procedure name in the **Command text** or **Command** field of various policy items for the following entry types:
  - Application
  - MVS Component
  - Timers
  - Monitor Resources

**Note:** Not all routines can be called through all interfaces as some require extensive environmental setup before they are invoked.

### How Automation Procedures Are Structured

It is recommended that the structure of automation procedures contain three main parts, as follows:

1. Perform initialization processing
2. Determine whether automation is allowed
3. Perform automation processing.

Figure 2 illustrates the structure of automation procedures for system operations and Figure 3 for processor operations.

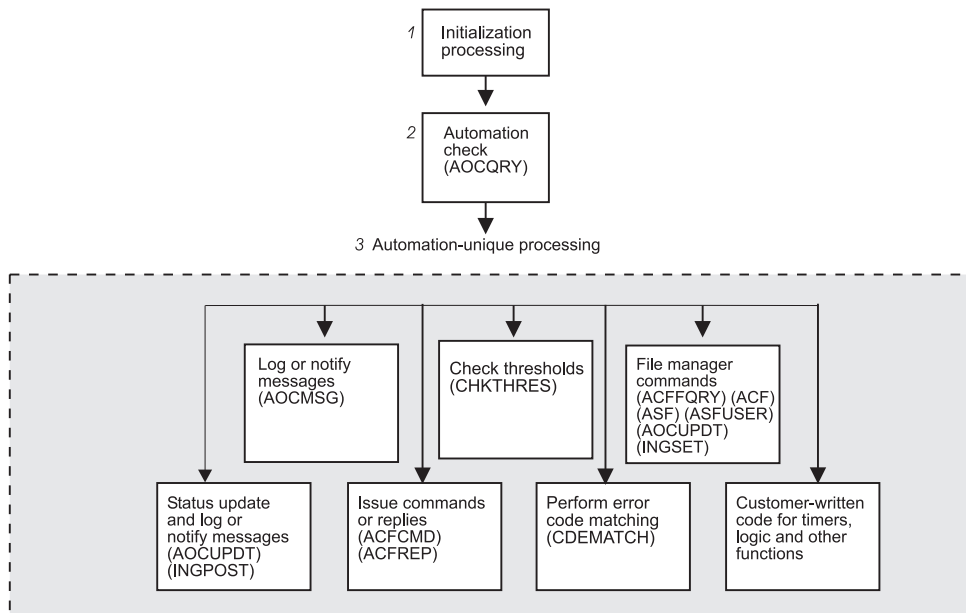


Figure 2. Automation Procedures for System Operations

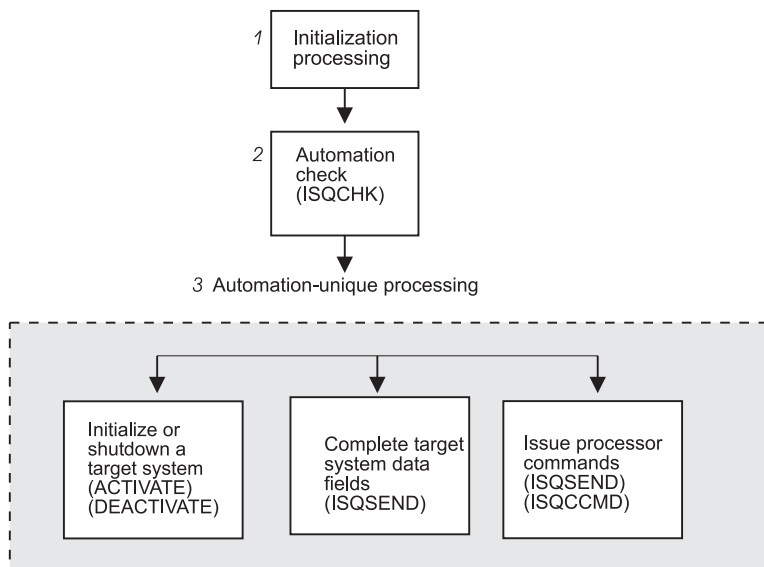


Figure 3. Automation Procedures for Processor Operations



The following sections provide more details about each part of an automation procedure.

### Performing Initialization Processing

Initialization processing may not be required for simple automation procedures.

Initialization processing is responsible for:

- Setting up any error trap routines.
- Identifying the automation procedure by setting a local variable either explicitly or at execution time. This step makes it simpler to code routines that log messages and send notifications.
- Declaring the global variables, such as common and task global variables, that are used for subsystem definition values in the automation procedure.  
See Appendix A, “Global Variables,” on page 229 for descriptions of global variables.
- Checking whether debugging is on.
- Issuing debugging messages, if debugging is turned on.
- Validating the automation procedure call.

This step can help prevent an operator from calling the automation procedure inappropriately. Automation procedures can also be validated using command authorization checking methods provided by NetView or an SAF product.

- Saving NetView message parameters. This step is necessary if your automation procedure uses the NetView WAIT statement and you need to access the original message text or control information.

For more information on coding automation procedure initialization sections, refer to “Example Automation Procedure” on page 16, to *Tivoli NetView for z/OS Customization Guide* and to *Tivoli NetView for z/OS Automation Guide*.

### Determining whether Automation Is Allowed

#### System Operations

Automation procedures for applications and MVS components that are called from the NetView automation table should always perform an automation check by calling the AOCQRY automation routine. AOCQRY checks that the automation flags allow automation. These checks eliminate the risk of automating messages for applications that should not be automated, or for which automation is turned off. AOCQRY also initializes most of the common and task global variables that are used in the automation procedure with values specific to the application.

Refer to *IBM Tivoli System Automation for z/OS Programmer's Reference* for more information on coding the automation check routine.

#### Processor Operations

Most of the processor operations commands run only when processor operations has been started. To determine whether processor operations is active, you can use the ISQCHK command in your automation routines. If processor operations is not running, ISQCHK returns return code 32 and issues the message:

```
ISQ0301 Cannot run cmd-name command until Processor Operations has started.
```

Your application can then issue the ISQSTART command to begin processor operations.

### Performing Automation Processing

Automation processing is performed by any combination of SA z/OS routines and your own code. The following documentation gives more information on coding automation procedures:

- “Automation Processing in System Operations”
- “Automation Processing in Processor Operations” on page 11

#### Automation Processing in System Operations

This section contains information on how to customize automation processing for system operations.

**Updating Status Information:** You can update status information by calling AOCUPDT. This routine is used when a message indicates a status change. This would normally be done from the automation routines ACTIVMSG, HALTMSG, and TERMMSG. Making your own status updates may cause unpredictable results.

For more information, see *IBM Tivoli System Automation for z/OS Programmer's Reference*.

**Logging Messages and Sending Notifications:** You can log messages and send notifications by calling AOCMSG.

AOCMSG performs the following actions:

- Formats a message for display or logging
- Issues messages as SA z/OS notification messages to notification operators

For more information, see *IBM Tivoli System Automation for z/OS Programmer's Reference*.

**Issuing Commands and Replies:** You can issue commands and replies by calling ACFCMD and ACFREP. You can use these routines to:

- Issue one or more commands in response to a message.
- Issue a single reply in response to a message.
- Use the step-by-step (PASS) concept to react to or recover from an automation event.

ACFCMD issues one or more commands. It supports both a single reaction and the step-by-step (PASS) concept. For more information, see *IBM Tivoli System Automation for z/OS Programmer's Reference*.

ACFREP issues a single reply. It supports both a single reaction and the step-by-step (PASS) concept. For more information see *IBM Tivoli System Automation for z/OS Programmer's Reference*.

In many cases you may be able to use the ISSUEACT automation procedure that also supports single and pass processing.

**Checking Thresholds:** You can check and update thresholds by calling the CHKTHRES automation routine. Use CHKTHRES to track and maintain a threshold, and to change the recovery action based on the threshold level exceeded. For more information see *IBM Tivoli System Automation for z/OS Programmer's Reference*.

**Checking Error Codes:** You can check error codes by calling CDEMATCH. It compares error codes in a message to a set of automation-unique error codes to determine the action to take. For more information, see *IBM Tivoli System Automation for z/OS Programmer's Reference*.

In some cases you may be able to use the code matching capabilities of ISSUEACT and TERMMSG.

**Using File Manager Commands:** You can use file manager commands to access SA z/OS control files such as the automation control file and automation status file:

- Use the ACF command if you need to load or display the automation control file.
- Use the ACFFQRY command to query the automation control file quickly.
- Use the ASF command to display the automation status file.
- Use the ASFUSER command to modify the automation status file fields reserved for your own information.

For more information, see *IBM Tivoli System Automation for z/OS Programmer's Reference*.

**Using External Code for Timers, Logic, and Other Functions:** Your automation procedures may require code to set timers, to perform logic unique to your enterprise or to the automation procedure itself, and to perform other functions. Some examples include:

- Issuing commands and trapping responses.  
You can issue commands and trap responses using the NetView WAIT or PIPE commands. You may need to use these commands in your code if it is necessary to check the value or status of a system component or application before continuing processing. For more information, see *Tivoli NetView for z/OS Customization Guide*.
- Setting Common Global and Task Global values to control processing.  
You can set Common and Task Global values by using NetView commands. You may need to set these values if it is necessary to set a flag indicating progress, message counts, and other indicators that must be kept from one occurrence of a message to the next. See *IBM Tivoli System Automation for z/OS Defining Automation Policy* for a table of all externalized SA z/OS global variables.  
Also refer to the discussion of common and task global variables in *Tivoli NetView for z/OS Customization Guide*.
- Setting timer delays to resume processing.  
You can set timer delays by using the NetView AT, AFTER, EVERY and CHRON commands. You can use these commands when an automation procedure must either resume processing or initiate another automation procedure after a given time to do additional processing. For example, you could use these commands to perform active monitoring of subsystems. For more information, see the discussion of AT, AFTER, EVERY and CHRON commands in *Tivoli NetView for z/OS Automated Operations Network User's Guide*.

### Automation Processing in Processor Operations

This section contains information on how to customize automation processing for processor operations.

**Initializing a Target System:** If your routines need to start target systems (hardware and/or operating system), issue the ISQCCMD ACTIVATE command.

## How Automation Procedures Are Structured

**Shutting Down a Target System:** If your routines need to shut down a target system, issue the ISQCCMD DEACTIVATE OCF command. Before issuing the command to close the target system, shut down all of your functioning subsystems. This avoids any unexpected situations at the target system.

**Issuing Other OCF Commands:** All OCF commands supported by processor operations can be issued from automation routines. See *IBM Tivoli System Automation for z/OS Operator's Commands* for details about these commands.

**Reserved SA z/OS Commands:** The SA z/OS commands ISQISUP, ISQISTAT, ISQCMMT, ISQSTRT, ISQXIPM, ISQGPOLL, and ISQGSMSG are not intended for your use. Do not use these in your automation routines. Unexpected results may occur.

The following commands can only be used from an operator console and should not be used in your automation routines or with ISQEXEC: ISQXDST, ISQXOPT, and ISQHELP.

The following commands are for automation and should not be used in your automation routines: ISQI101, ISQI212, ISQMCLR, ISQI320, ISQIUNX, ISQI347, ISQI470, ISQI886, ISQI888, ISQI889, ISQI128, ISQIVMT, ISQMVM11, ISQMVM12, ISQMWAIT, ISQMDCCF, ISQM020, and ISQIPLC.

**Serializing Command Processing:** Serializing command processing ensures that commands and automation routines are processed in the order in which they are sent to a target system console. It can also prevent the command sequence from being interrupted by other tasks.

Specific target control tasks are assigned to specific target systems during initialization of the target system. More than one target system can share a target control task, but a target system never has more than one target control task allocated to it to perform work.

When a command or an automation routine is sent to a target system, it can be processed partly in the issuing task (a logged-on operator or an autotask) and partially in a target control task. When the command or automation routine is to be processed by a target control task, it is either allocated to the target control task and processed, or queued to be processed by the target control task. This serializes the processing of commands and automation routines. Serializing ensures that they are processed in the order in which they were sent to the target system console.

The NetView program has priority defaults established during its initialization. Usually, everything running under NetView has a low priority. You can use the NetView DEFAULTS command to see what the settings are, but you should not change them. For SA z/OS command processing to be serialized as designed, all commands used in SA z/OS must have a priority setting of "low". If you change the priorities or have more than one priority for commands used in SA z/OS, the difference in the priorities may defeat the serialization that results from the architecture of the target control task.

**Sending an Automation Routine to a Target Control Task:** If you run the same series of SA z/OS commands regularly, you can program the commands into a NetView automation routine. Follow the guidelines you use for any NetView automation routine.

## How Automation Procedures Are Structured

A NetView autotask or a logged-on operator can then run this routine or send it to a target control task. Use the following command to transfer an automation routine to a target control task:

```
ISQEXEC target-system-name SC routine-name
```

When you issue the ISQEXEC command to process an automation procedure, all of the commands are processed in the order in which they occur in the automation procedure. This is because the ISQEXEC command sends work to a target control task, which processes commands serially. Any other commands or automation routines issued to the same console by the ISQEXEC command are queued for processing by the target control task and do not start until the previous command or automation procedure completes.

The ISQEXEC command also frees the original task from any long-running command sequence. This lets you use the issuing task, such as an OST, for other work.

The ISQEXEC command does not lock consoles to ensure command serialization; the command serialization process is due to the target control task allocation scheme. Commands and automation routines are processed in the order in which they occur; however, it is possible for commands from other tasks to interrupt the command sequence.

For more information about the ISQEXEC command, see *IBM Tivoli System Automation for z/OS Operator's Commands*.

**Locking a Console:** Several routines and operators may attempt to address the same console at the same time. The ISQEXEC command does not prevent other tasks from interrupting the sequence of commands being processed by the target control task; it does not lock the console.

To prevent a sequence of commands from being interrupted, use the ISQXLOC and ISQXUNL commands. The ISQXLOC command locks access to the console. If a task attempts to issue a command to a locked console, the task is told that the console is locked, and the command fails. When you are finished with the sequence of commands that must be processed without interruption, issue the ISQXUNL command to unlock access to the console.

You can use the ISQXLOC and ISQXUNL commands within automation routines to ensure that they complete without interference from other tasks. For automation routines that issue a number of SA z/OS commands, put the following command after the ISQEXEC command and near the beginning of the routine:

```
ISQXLOC target-system-name SC
```

This locks access to the target system console to the current task until the lock is dropped by the command:

```
ISQXUNL target-system-name SC
```

Only the task that issued ISQXLOC can successfully issue ISQXUNL. If an ISQXLOC command is issued from a locked sequence of commands, it is rejected because the console is already locked.

When you lock a system console for a target system running on a logical partition, you lock that system console for all other target systems using that processor. A command sent to a system console for any other target system (logical partition) on that target hardware definition does not run until the console is unlocked.

## How Automation Procedures Are Structured

If your automation routine cannot wait for a console to be released, use the ISQOVRD command to gain control of the console. Use the following command only in **critical** automation routines:

```
ISQOVRD target-system-name SC
```

When the routine issuing the override command completes, the lock is removed and the console is available.

---

## How to Make Your Automation Procedures Generic

By using the SA z/OS automation routines, you can make your own automation procedures generic. A generic automation procedure comprises three parts. For each part, there are special automation routines that help you to fulfill your tasks:

### Preparation

Check if automation is allowed and should be done. Use automation routine AOCQRY.

### Evaluation

What should be done? Use automation routine CDEMATCH.

### Execution

Do what should be done. Use automation routine ACFCMD or ACFREP.

```
*****
*****      Preparation      *****
*****
AOCQRY
- check if the resource is controlled by SA z/OS
- check if automation is allowed
- prepare/set task global variables for CDEMATCH, ACFCMD and ACFREP
...
CDEMATCH
- code matching (table search in ACF)
- find out required action
...
ACFCMD/ACFREP
- do required action:
  issue command / respond reply
```

*Figure 4. Skeleton of an Automation Procedure*

For more information on the mentioned automation routines refer to *IBM Tivoli System Automation for z/OS Programmer's Reference*. For more information on command processing or reply processing refer to *IBM Tivoli System Automation for z/OS User's Guide*.

## Processor Operations Commands

Whenever possible, your automation routines should make use of SA z/OS's processor operations OCF commands, also called common commands. These

commands are independent of the hardware type of the target system's processor. Therefore, the use of these commands minimizes the need for changes to your automation routines if you need to add new processors to your configuration. See *IBM Tivoli System Automation for z/OS Operator's Commands* for a detailed description of the processor operations commands.

---

### Developing Messages for Your Automation Procedures

Depending on the scope of additional programming, creating new automation procedures may also require developing additional messages.

Some SA z/OS facilities and commands you can use to develop messages include:

- The AOCMSG automation routine (see *IBM Tivoli System Automation for z/OS Programmer's Reference*).
- The AOCUPDT automation routine (see *IBM Tivoli System Automation for z/OS Programmer's Reference*).

The following steps summarize the message development process.

1. Choose a message ID. Make sure it is unique.
2. Use NetView message services to define the message to NetView.  
Put an entry for the message in a DSIMSG data set. This data set must be identified in a DSIMSG data definition (DD) name.
3. Use the AOCMSG automation routine to issue the message (see *IBM Tivoli System Automation for z/OS Programmer's Reference*).
4. Add an entry for the message to your production copy of the NetView DSIMSG data set.

### Example AOCMSG Call

This example shows how to code AOCMSG to issue message ABC123I.

Entries for messages in DSIMSG member DSIABC12 are as follows:

```
*****
120I ...
121I ...
122I ...
123I 10 40 THE EAGLE HAS &1
124I ...
*****
```

Your automation procedure contains the following AOCMSG call:

```
<other automation procedure code>
:
:   AOCMSG LANDED,ABC123
:
: <other automation procedure code>
```

When AOCMSG is called as specified in the automation procedure, DSIMSG member DSIABC12 is searched for message ABC123I. Substitution for variable &1 occurs, and the following message is generated:

```
ABC123I THE EAGLE HAS LANDED
```

Note that the message is defined with a 10 and a 40 between the message ID and the first word of the message. These are the SA z/OS message classes to which the

## Developing Messages for Your Automation Procedures

message belongs. When the message is issued a copy is sent to every notification operator who is assigned class 10 or class 40 messages.

Refer to *Tivoli NetView for z/OS Customization Guide* for further information on developing new messages.

---

### Example Automation Procedure

| This section provides an example of an application program that handles a z/OS  
| message. The automation procedure uses a subset of the SA z/OS automation  
| routines.

```
/* Example SA z/OS Automation Procedure */

1 Signal on Halt Name Aof_Error; Signal on Failure Name Aof_Error
Signal on Novalue Name Aof_Error; Signal on Syntax Name Aof_Error

2 Parse source . . ident .

3 "GLOBALV GETC AOFDEBUG AOF."||ident||".0DEBUG AOF."||ident||".0TRACE"
If AOFDEBUG = 'Y' Then
  "AOCMSG "||ident||",700,LOG,"||time()||","||opid()||","||Arg(1)
loc.0debug = AOF.ident.0DEBUG
loc.0trace = AOF.ident.0TRACE
loc.0me = ident
If loc.0trace <> '' Then Do
  loc.0debug = ''
  Trace Value loc.0trace
End

4 save_msg = msgid()
save_text = msgstr()
lrc = 0

5 /* This procedure can only be called for msg IEA099A */
If save_msg <> 'IEA099A' Then Do
  "AOCMSG "||loc.0me||",203,"||time()||","||opid()
Exit
End

6 "GLOBALV GETC AOFSYSTEM"
cmd = 'AOCQRY '||save_msg||' RECOVERY '||AOFSYSTEM
cmd
svretcode = rc
If loc.0debug = 'Y' Then
  "PIPE LIT /Called AOCQRY; Return Code was "||svretcode||"/" ,
  "| LOGTO NETLOG"

/* ----- **
** Check return code from AOCQRY **
** 0 = ok 1 = global flag off **
** 2 = specific flag off 3 = resource not in ACF **
** 4 = bad parms 5 = errors/timeout **
** ----- */
Select

7 When svretcode >= 3 Then Do
  "AOCMSG "loc.0me",206,,"time()",,,"cmd",RETCODE="svretcode
lrc = 1
End

8 When svretcode > 0 Then Do
  "GLOBALV GETT AUTOTYPE SUBSAPPL SUBSTYPE SUBSJOB"
  "AOCMSG "loc.0me",580,,"time()","SUBSAPPL","SUBSTYPE", ,
  SUBSJOB","AUTOTYPE","save_msg
lrc = 1
End
Otherwise Do
```



```

9      Parse Var save_text With . 'JOBNAME=' save_job 'ASID=' save_asid .

10     ehkvar1 = save_job
        ehkvar2 = save_asid
        "GLOBALV PUTT EHKVAR1 EHKVAR2"
11     cmd = 'ACFCMD ENTRY='||AOFSYSTEM||',MSGTYP='||save_msg
        cmd
        svretcode = rc
        If loc.0debug = 'Y' Then
            "PIPE LIT /Called ACFCMD; Return Code was "||svretcode||"/" ,
            "| LOGTO NETLOG"

        /* ----- **
        ** Check return code from ACFCMD **
        ** 0 = ok 1 = no commands found in ACF **
        ** 4 = bad parms 5 = errors/timeout **
        ** ----- */
12     If svretcode > 1 Then Do
        "AOCMSG "loc.0me",206,, "time()",,, "cmd",RETCODE="svretcode
        lrc = 1
        End
        End
    End /* End of Select svretcode */

13     Exit lrc

14     Aof_Error:
        Signal Off Halt; Signal Off Failure
        Signal Off Novalue; Signal Off Syntax
        errtype = condition('C')
        errdesc = condition('D')
        Select
            When errtype = 'NOVALUE' Then rc = 'N/A'
            When errtype = 'SYNTAX' Then errdesc = errortext(rc)
            Otherwise Nop
        End
        "AOCMSG "errtype",760,, "loc.0me", "sigl", "rc", "errdesc
        Exit -5
    
```

## Notes<sup>®</sup> on the Automation Procedure Example

- 1** This step sets error traps for negative return codes, operator halt commands, and REXX programming errors.
- 2** This step defines the identity of the automation procedure.
- 3** This step handles the debug and trace settings (refer to “Using AOCTRACE to Trace Automation Procedure Processing” on page 19).
- 4** Save the NetView message variables the automation procedure uses.
- 5** Perform authorization check. This procedure can only be called for a particular message.
- 6** This section performs the automation check:
  1. Fetch the AOFSYSTEM common global variable that contains the information under which entry name the system messages are stored in the automation control file (ACF).
  2. The automation procedure calls the AOCQRY command. This performs the automation flag check and presets some task global variables that are used by other automation routines like ACFCMD.
- 7** Issue message AOF206I if call to AOCQRY fails.
- 8** Issue message AOF580I if automation flag is off.

## Example Automation Procedure

- 9** Get the job name and asid reported in the message.
- 10** Set EHKVARn variables for ACFCMD.
- 11** Call ACFCMD to issue the command specified in the configuration files. The Automation Control File entry for the message IEA099A could look like this:

```
MVSESA IEA099A,  
CMD=(,,'MVS C &EHKVAR1,A=&EHKVAR2')
```
- 12** Issue message AOF206I if call to ACFCMD fails.
- 13** Exit with return code that indicates successful or unsuccessful processing.
- 14** This code logs a message if an error is trapped at step **1**.

---

## Installing Your Automation Procedures

The installation process for a new automation procedure depends on the language in which the automation procedure is written.

- If the automation procedure uses a compiled language, such as PL/I, C, or Assembler:
  1. Compile or assemble your source into an object module.
  2. Link-edit the object module into a NetView load library.
  3. Include an entry for the automation procedure in the CNMCMDU member of the NetView DSIPARM data set.
- If the automation procedure uses an interpreted language such as NetView command list or REXX:
  1. Copy the automation procedure into a NetView command list library
  2. Optionally include an entry for this automation procedure in the DSICMD member of the NetView DSIPARM data set. Then it is more quickly found and invoked.

For more information on preparing your code for use and installing it, refer to *Tivoli NetView for z/OS Customization Guide*

---

## Testing and Debugging Automation Procedures

This section describes SA z/OS and NetView facilities you can use for testing automation procedures, including:

- SA z/OS assist mode
- SA z/OS AOCTRACE operator facility
- NetView testing and debugging facilities

### The Assist Mode Facility

SA z/OS provides an *assist mode* facility, so that you can verify actions of automation procedures and automation policy before letting them run in a completely automated environment.

When assist mode is on, actions that are normally taken by SA z/OS automation procedures, such as issuing a command or reply or calling an automation routine, are not performed. Instead messages that describe what would have happened are written to the netlog.

The assist mode is associated with automation flags (Automation, Initstart, Start, Recovery, Terminate or Restart). Whether assist mode is used for any action is determined by the automation flag. This is checked to see whether that action is permitted.

Cases where you might want to use assist mode include:

- During early stages of developing and using your automation policy
- After changing your automation policy, such as after adding an application to automation
- After adding a new automation procedure to the SA z/OS code

### Using Assist Mode to Test Automation Procedures

Assist mode can help you to detect problems with your automation procedures before they are added to your production code. Assist mode works by intercepting commands and replies before they are issued through NetView. The intercepted commands and replies, as coded in the automation policy, are reformatted into a message that is sent to the NetView log.

The reformatted command is issued in message AOF320I and the reformatted reply in message AOF323I. Each message contains detailed information about the action defined in the automation policy and the actual action to be issued.

During run time of SA z/OS, the assist mode can be enabled with the INGAUTO command to set the related automation flag to the value L. The DISPFLGS command can be used to view the current automation flag settings. Any other value for the automation flag deactivates assist mode.

When an event triggers an automated action and assist mode is enabled, SA z/OS logs the action in the NetView log. The log can be reviewed to ensure that automation has run as expected.

Assist mode works for all routines that call the SA z/OS automation routines, after having checked the automation flag by calling AOCQRY.

### Using AOCTRACE to Trace Automation Procedure Processing

The AOCTRACE command dialog maintains both global execution flow traces and automation procedure-specific debugging flags. Setting the global flag causes all routines that support tracing and all message IDs to record a statement in the NetView log whenever they are invoked. The AOFDEBUG global variable is used to pass the global flag information to the automation procedure. The global flag is set to null if the global trace is off, or Y if the global trace is on.

Setting the automation procedure-specific flags lets you obtain information about what the automation procedure is doing when it executes, or lets you activate a REXX trace. The debug flag is either null or Y, and is stored in the AOF.*clist*.0DEBUG common variable (where *clist* is the true automation procedure name).

The trace flag is set to null or a valid REXX trace type, as follows:

- A (All)
- R (Results)
- I (Intermediate)
- C (Commands)
- E (Errors)

## Testing and Debugging Automation Procedures

- F (Failures)
- L (Labels)
- O (Off)
- N (Normal)

The S (Scan) trace type cannot be used.

The trace flag is stored in the common global variable AOF. *clist.OTRACE* (where *clist* is the true automation procedure name).

Message tracing can only be set from the command line, using the command AOCTRACE MSG/*id*,ON|OFF where *id* is the message to be traced.

AOCTRACE is documented in *IBM Tivoli System Automation for z/OS Operator's Commands*.

### REXX Coding Example

For examples of code that can be placed at the beginning and end of your REXX automation procedures to handle trace and debug settings, see AOFEXC00 in the SINGSAMP library.

When writing code to support the debug feature, you should expose *loc.* on all your procedures and insert fragments of code to check the value of the *loc.0debug* flag and output relevant information. The *loc.0me* assignment makes the automation procedure name available everywhere, so you can prefix all debug messages with it. You can then tell where the messages are coming from. For example:

```
Myproc:
  Procedure expose loc.
  If loc.0debug = 'Y' Then
    'PIPE LIT /' loc.0debug ' has called procedure MYPROC/',
    '| LOGTO NETLOG'
  Return
```

## NetView Testing and Debugging Facilities

NetView provides several facilities to assist in testing and debugging automation procedures.

To do detailed testing, you may want to trace every statement issued from automation procedures. This type of testing is enabled through the &CONTROL statement for NetView command lists and through the TRACE statement for REXX procedures.

You can also specify less detailed tracing on the TRACE and &CONTROL statements, so that only commands are traced. A comparable facility, the interactive debugging aid, is available for programs coded in PL/I and C.

Perform specific tracing by issuing NetView MSG LOG, PIPE LOGTO NETLOG commands at appropriate points throughout a NetView command list, REXX procedure, or PL/I routine.

To test for proper parsing and reaction to a message, write a short automation procedure to issue a NetView WTO command. This WTO is processed by the NetView automation table and triggers the appropriate automation procedure. If the automation procedure requires the job name, the job name must be temporarily hard-coded to the appropriate name. In this case, because the WTO was issued

from the NetView region, the job name associated with the message is the NetView region. A sample automation procedure follows:

```
WRITEWTO CLIST  
    WTO &PARMSTR  
    &EXIT
```

The sample automation procedure can issue any single-line message by calling the routine. For example, to issue message ABC123I, which indicates the start of a program, the command is:

```
WRITEWTO ABC123I My testprogram PRGTEST has started.
```

### Where to Find More Testing Information

More information on testing can be found in the following books:

- *Tivoli NetView for z/OS Customization Guide*  
This book lists requirements for your programs, including preparing your code for use, and detailed information on writing exit routines and command processors.
- *Tivoli NetView for z/OS Automation Guide*  
This book has guidelines for creating new automation procedures, including a recommended development process.

---

## Coding Your Own Information in the Automation Status File

You can code your own information in the automation status file with the ASFUSER command.

The automation status file has 40 user data fields that are associated with each resource that is defined within it. You may use these fields to store persistent information about resources that your code needs to access later. The information in the ASF is not lost when SA z/OS is shut down. It lasts until one of the following events occurs:

- The ASF VSAM data set is deleted and redefined,
- You bring SA z/OS up with an automation control file that does not include the application that the information has been defined for

Note that you should verify that the information you have stored in the automation status file is accurate whenever SA z/OS initializes, as circumstances may have changed while SA z/OS was down.

Each automation status file field reserved for your data can contain up to 20 characters. The ASFUSER command allows you to update and display data in these fields. See *IBM Tivoli System Automation for z/OS Programmer's Reference* for the ASFUSER command description.

---

## Programming Recommendations

This section contains tips and techniques that may help to reduce the coding effort required when writing your own automation procedures, and to improve performance of your automation procedures.

- Use variables, such as &IDENT, &SUBSAPPL, &SUBSTYPE, and &SUBSJOB in place of parameter values.

Using &IDENT for automation procedure names allows for changes to automation procedure names (only the &IDENT variable value needs changing).

## Programming Recommendations

The &SUBSxxx variables allow for subsystem and job name changes (changes to subsystem and job names need only be made in automation policy).

Using NetView command list language variable JOBNAME for the resource field on an AOCQRY call, an automation procedure can be written to support a known message for any job that can issue a message.

- Use defaults when possible to minimize coding.
- Use generic error codes (see CDEMATCH).
- Use available message parsing techniques:
  - Use the NetView command PARSEL2R or REXX PARSE command to parse a message without relying on a field position in a message.
  - Parse a message in the NetView automation table and send only necessary fields to an automation procedure.
- Consider not coding the ENTRY field in CDEMATCH calls (default is the SUBSAPPL returned from the last AOCQRY call).
- Use appropriate automation flags.
- Review the coding requirements in *Tivoli NetView for z/OS Customization Guide* including restrictions to consider when writing code, such as:
  - Restrictions when TVBINXIT is on
  - Variable names
  - Macro use
  - Register use
  - Re-entering programs
- Use SA z/OS automation routines where possible, because they reduce your maintenance overhead.
- Use SA z/OS's processor operations common commands where possible, because these:
  1. Are independent of the hardware type of the target system's processor
  2. Minimize the need for changes to your automation routines as you add new processors to your enterprise
- Consider using the NetView VIEW command to display online help text associated with new code, and to develop a fullscreen interface for new commands that are a part of the new code. Refer to *Tivoli NetView for z/OS Customization Guide* for information on the VIEW command.

---

## Global Variable Names

When creating your own automation procedures, you must ensure that the names of any global variables you create do not clash with SA z/OS external or internal global variable names. In addition, you must not use names beginning with:

- CFG
- AOF
- ING
- ISQ
- EVI
- EVE
- EVJ

---

## Chapter 3. How to Add a Message to Automation

SA z/OS exploits the NetView automation table (AT) and message revision table (MRT). The AT contains traps for messages that must be automated. If an action must be taken in response to a message, this action needs to be defined in the customization dialog. A related AT entry is required to call a routine to execute the action. The MRT allows you to modify message attributes such as color, route code, descriptor code, display and syslog settings, and text of original z/OS messages (rather than copies).

SA z/OS automatically generates the ATs and MRT.

---

### Conceptual Overview

This section gives a brief overview of the main aspects of SA z/OS message automation:

- A list of messages that are involved in SA z/OS automation is generated by SA z/OS. This can then be used as a message processing facility (MPF) member.
- Message automation is a process that is based on the NetView AT and MRT.
- The AT and MRT are generated by SA z/OS.
- AT entries are created for messages that actions are defined for.
- Messages can be defined to indicate a status change.
- Messages can be marked to be ignored or suppressed, thus not generating an AT or MRT entry.
- Messages can be marked to be captured for further display.
- Most AT entries trap messages independent of the issuing product instance, component or module.
- Predefined AT entries can be changed.
- You can define the AT/MRT scope to determine precisely if and what kind of ATs or MRT are built.

---

### Defining Actions for Messages

AT entries are generated by SA z/OS for messages that are defined for APL, MTR, or MVC policy entries and that have actions (for example, CMD or REP) defined for them.

**Note:** Throughout this chapter, whenever the term *policy entry* is used, it implies either an APL, MTR, or MVC policy entry, unless otherwise stated.

The first step in defining actions is to select a policy entry from the Policy Selection panel. From its policy selection list, select the MESSAGES/USER DATA policy item. This leads to the Message Processing panel, where you can then define actions for message IDs. If an AT entry is built according to the action, it only checks for the message ID by default, independent of the product instance, component or module issuing that message. If this is not intended, you can use the AT action (see “Defining Message Overrides” on page 26).

There are many messages that are already prepared by SA z/OS. For these messages specific AT entries are predefined by SA z/OS, see the

## Defining Actions for Messages

+SA\_PREDEFINED\_MSGS MVS component entry. If you want to know what kind of AT entry is built for automating a particular message, you can view it on the Message Automation Overview panel.

**Note:** You must not use SA z/OS symbols (AOCCLONES) or system symbols for or in message IDs because a correct AT cannot be built.

## Defining CMD or REP Actions

Suppose, for example, that you define a CMD or REP action for message XYZ222I on the Message panel, where XYZ222I is a completely new message that is not predefined by SA z/OS.

This definition leads to the creation of an AT entry for message XYZ222I using the ISSUEACT command after the next Configuration Build process.

**Note:** If you have code definitions that you expect to be passed to ISSUEACT, you have to manage the AT overrides to do this. This is *not* done by SA z/OS. See “Defining Message Overrides” on page 26.

Note that for MVC entries, messages have the parameter SYSTEMMSG=YES added to the SA z/OS command (ISSUEACT).

## Defining AT Actions

You can define various AT actions for messages using the Message Automation Overview panel:

- The condition in the AT entry
- Status changes for messages
- Capturing messages to be displayed but not automated
- Preventing the building of AT entries

You can also edit the AT entries directly using the AO option from this panel. Note that if you use one of the other options after you have specified an override, SA z/OS requires you to confirm whether you want to delete the override that exists for the message because it cannot be combined with the other options.

### Defining Conditions for AT Entries

You can improve the efficiency of AT processing by controlling where entries are placed within the AT and by specifying more precise conditions to trap the message. SA z/OS allows you to do this with the AT Entry Conditions panel, which you reach from the Message Automation Overview panel by entering the AC option.

### Defining Status Messages

Many messages that indicate a state change of APL, MTR, and MVC resources are known to SA z/OS. The related AT entries are already predefined. For these messages there is no need to define them in the policy database.

If necessary, you can define additional application messages that indicate a state change. The AT action leads to the Message Automation Overview panel, where you can enter the AS option to display the AT Status Specification panel that lists resource states.

The Status Message Report shows all status messages. It lists all user-defined and predefined status messages and their associated statuses.



Status messages can be defined for MVC policy entries as well as for APL and MTR instances or classes. As an example, to define an UP state indicated by message XYZ444I, enter A in the Cmd field next to the message ID on the Message Processing panel. On the Message Automation Overview panel, enter the AS option to display the AT Status Specification panel and select the UP status. Here, XYZ444I is a message that is unknown to SA z/OS.

This definition leads to the creation of an AT entry for message XYZ444I using the ACTIVMSG command after the next configuration build process, as shown on the Message Automation Overview panel.

### Notes:

1. There are certain messages that can be used as status messages, but for some messages, COD definitions are required (for example, IEF450I). TERMMSG sets the status depending on these definitions. For more details about TERMMSG, see *IBM Tivoli System Automation for z/OS Programmer's Reference*.
2. Automation table entries are generated based on the messages that are defined with MESSAGES/USER data. For size and performance reasons, these entries are message-oriented rather than job-oriented.

This means that an AT action (except IGNORE or SUPPRESS) for a particular message generates an AT entry. This entry traps that message independently of the issuing subsystem. It then sets the subsystem state as selected via the AT action.

If a state message should be processed for a particular subsystem only, you can define an AT override action.

## Defining Captured Messages

If messages only need to be captured to be displayed but not automated, the AT Status Specification panel provides an additional Capture option for APL and MVC entries.

Messages that have a CMD or REP action defined for them or that are defined as status message are implicitly captured. There is no need to explicitly define these messages to be captured.

For example, to define message XYZ555I to be captured, enter option AS on the Message Automation Overview panel to display the AT Status Specification panel and select the Capture option. Here XYZ555I is a message that is unknown to SA z/OS.

This definition leads to the creation of an AT entry for message XYZ555I using the AOFCPMSG command after the next configuration build process, as shown on the Message Automation Overview panel.

**Note:** The status (AUTO) action is mutually exclusive with the OVR action.

## Preventing the Building of AT, MRT and MPF Entries

**Inhibiting AT, MRT, and MPFLSTSA Entries:** Using the AUTO action you can select IGNORE or SUPPRESS for certain messages:

- Messages that are marked IGNORE do not cause an AT entry, MRT entry, or an MPFLSTSA entry to be generated.
- Messages that are marked SUPPRESS do not cause an AT entry or MRT entry to be generated. An MPFLSTSA entry is generated with the options SUP(YES),AUTO(NO).

## Defining Actions for Messages

IGNORE and SUPPRESS overrule other actions that are defined for the same message.

The MPFLSTSA member is built for each policy database. Because IGNORE and SUPPRESS affect the build of the MPFLSTSA member, these definitions also have a policy database-wide scope. The MPFLSTSA member is built at an enterprise level, so whenever IGNORE is defined the MPF table is not built.

**AT Entries That Are Never Built:** There are many keywords that can be entered as message IDs in the customization dialog (for example, message MVSDUMPFULL). No AT entry is built for these keywords. A list of these keywords is given in the online help.

## Defining Message Overrides

You can apply an override on the Message Processing panel for a message ID for an APL instance, APL class or an MVC entry.

The Message Automation Overview panel allows you to preview an AT entry and MRT entry as it would be built according to the actions that are defined for the message. If you have not made a specification that would produce an AT or MRT entry, you are informed of this in the preview section of the panel.

The AO option on the Message Automation Overview panel allows you to override an AT entry. You can change any part of the AT entry. Condition and action statements can be changed, added or deleted. Deleting the condition statement removes the AT override. Note that a syntax check is not performed, you have to ensure that the specification obeys NetView automation table syntax rules.

If you define a message with an AT action or condition, and then invoke the override panel, the preview of the AT entry is shown on the override editor screen. You can use this as a model for your own AT definition. Use the CANCEL command to exit the editor without saving your changes.

Note that if you specify an AT status selection or an MRT action selection for a message with an AT or MRT override then a confirmation panel for the "override delete" is displayed because an override cannot be combined with the other specifications.

You can define "&\*JOBNAME." as part of an AT override. The variable will be replaced by the jobnames of the applications for which the AT is specified. This is very valuable when defining an AT entry for an application class with "...&JOBNAME='&\*JOBNAME.'...." as part of the AT condition. In the generated AT each linked instance will have its own AT entry with its jobname in the condition. Checking for the jobname may also be required if multiple applications issue the same message but not all of them should be affected by that message.

You can include SA z/OS symbols (AOCCLONES) and system symbols in an AT or MRT override definition. They are resolved at AT load time.

You can define '&\*JOBNAME.' as part of an AT condition statement that will be replaced by the jobname of the given policy entry when building the AT. This is very valuable when defining an AT entry for an APL class. Then each APL instance linked to that class will have its own AT entry with its jobname in the AT condition statement. Checking for the jobname may also be required if different instances of a product issue the same message but you only want certain jobs to be affected by that message.

To define an override for message XYZ666I, for example, on the Message Processing panel, you can either change an existing AT entry that then becomes a user-defined AT entry, or, if no predefinitions are available, you can define a user-specific AT entry. For example, if message XYZ666I should be trapped, and routine MYREXX1 should be called as a result, enter:

```
IF MSGID = 'XYZ666I' THEN  
EXEC(CMD('MYREXX1') ROUTE(ONE %AOFOPWTOURS%));
```

This definition leads to the creation of an AT entry for message XYZ666I using the routine MYREXX1 after the next configuration build process.

If you specify an override, nothing is added by SA z/OS during AT build because the override applies to all applications. Only the initial conversion of the policy database creates an override that contains all of the AT entries that would be built. After conversion, nothing else is added to the override. Thus if there is a message with an override and then, for some application with that message, a command is added, you have to ensure that the command is honored.

---

## Extended Status Command Support

The status command concept has been extended so that commands can be issued if two linked or dependent applications reach an “up” or “down” state. Thus, a command can be issued for one application (APL1) when another one APL2<sup>®</sup> enters or is in a certain state. Application APL1 is a *consumer* that consumes services provided by application APL2 which is a *provider*. In certain cases it is valuable to trigger a consumer action if the provider enters an UP or DOWN state. Alternatively the consumer may take an action when coming up, which depends on the state of the provider.

In addition to runtime variables such as &SUBSAPPL or &SUBSJOB, there are provider-specific runtime variables that can be used within a command or reply as specified for a Message ID in the MESSAGES/USER DATA policy. These variables start with &SU2 instead of &SUB. For a list of supported provider runtime variables, see ACFCMD and ACFREP in *IBM Tivoli System Automation for z/OS Programmer's Reference*.

## Policy Definitions

Links must be defined in the APL policy for the consumer application. A link is a data pair that is represented by a consumer and a provider subsystem name:

- The consumer name is defined as the **Subsystem Name** of the consumer APL
- The provider name is defined in the MESSAGES/USER DATA policy item of the consumer APL as part of a pseudo Message ID

In order to execute a command by a consumer APL whenever a provider APL becomes UP or DOWN, use:

- UP\_*provider-subsys* - to hold the commands that are executed when *provider-subsys* becomes UP
- DN\_*provider-subsys* - to hold the commands that are executed when *provider-subsys* becomes DOWN.

A dynamic link is created by defining a USER action with the Keyword/Data pair DYNAMIC=YES for the pseudo message ID.

## Defining Actions for Messages

Other pseudo messages are available to hold sets of commands on a consumer APL that are executed whenever the consumer becomes UP and the provider APL is UP or DOWN respectively:

- `ISUP_provider-subsys` - to hold the commands that are executed when the `provider-subsys` is UP
- `ISDN_provider-subsys` - to hold the commands that are executed when the `provider-subsys` is DOWN.

No commands are issued when the consumer becomes DOWN. For dynamic links the commands are executed when the link is activated and the provider is in the appropriate status.

For example, if you want to start the MQ Listener for the MQCHIN application whenever the TCPIP application reaches an up state, you define a command for the message ID `UP_TCPIP` using the `MESSAGES/USER DATA` policy item of MQCHIN. On the Message Processing panel, enter the line command `C` for the `UP_TCPIP` message ID and on the subsequent Command Processing panel enter `MVS START LISTENER` in the **Command Text** field.

For dynamic links, you need to define message IDs for all the providers that might be used by a consumer. There are several alternatives for defining when a link is activated:

1. In the `POSTSTART` phase of the `STARTUP` policy item
2. Based on a user-selectable message before the consumer is in the UP state
3. Based on the “up” state (this can be UP or ENDED)
4. Based on a user-selectable message after the consumer is in the UP state

You can make these definitions in either the `STARTUP` or `MESSAGES/USER DATA` policy item. Corresponding policy definitions are required for link deactivation either in the `SHUTDOWN` or `MESSAGES/USER DATA` policy item.

You must supply a user-written REXX automation procedure that:

1. Identifies the provider
2. Issues the `INGLINK` command to activate the link, if required

All the dynamic links of a consumer are automatically `DEACTIVATED` after the consumer is shut down. Thus you only need to define `DEACTIVATE` commands if you want this process to happen at an earlier point in time. Furthermore, you must not define a `DEACTIVATE` if the consumer is its own provider since this `DEACTIVATE` may take place before the `DN_` message can be processed.

There is no difference in the `DN_` and `UP_` message processing between normal and transient applications, with one exception: when stopping a transient provider the corresponding `DN_` message on the consumer is *not* processed.

### Special Considerations

You can define a consumer as its own provider. This can be done to perform a predefined action for an application whenever it enters any “down” state. A “down” state in this context is an agent state of:

- `DOWN`
- `RESTART`
- `AUTODOWN`
- `STOPPED`
- `CTLDOWN`
- `BROKEN`

Thus you no longer need to define the same action for each of the agent states. To achieve this, define the same name in the DN\_ message and subsystem name field of an application policy entry. You should note, however, that:

- If the consumer and provider applications are different, the action defined under DN\_ is only executed, when the consumer application is in the “up” state. However if the consumer and provider applications are the same, the action defined under DN\_ is executed even when the consumer application is not in the “up” state.
- Dynamic link definitions are not required. If you define a dynamic link, it is ignored.
- The action defined for the DN\_message is not executed if the status change resulted from a failed startup.

---

## Defining Entries for the Message Revision Table

The message revision table (MRT) enables user-defined modification of attributes such as color, route code, descriptor code, display and syslog settings, and text of original z/OS messages (rather than copies). You can make decisions about the message based on its message ID, job name, and many other properties. You can have only one MRT active per system.

Any MRT specifications that you make are independent of any AT entry data for the message. Thus if you make a definition for the MRT but not for the AT, any existing data for AT entry is still in effect.

The MS option on the Message Automation Overview panel allows you to define conditions and attributes that are used to generate NetView message revision table (MRT) entries for a message ID. Use the options on the Message Revision Table Conditions panel to specify the following:

- Delete the message completely (if you select this, no other selection is valid)
- Whether to automate the message
- Suppress the message from the console or system log
- Translate the message text to uppercase or append further text to it
- Change the color, highlighting, and intensity (if your terminal supports high intensity) attributes of the message. Only one selection for each of these attributes is allowed.

A syntax check is not made of the MRT entry because any system-specific definitions (for example, symbols) can only be verified on the system where the MRT is to run.

You should check that routines that are triggered by the AT entry for the message ID are compatible with any text that you append to the original message text.

You can also use the MO option on the Message Automation Overview panel to define the MRT entry directly using a fullscreen editor. Note that a syntax check is not performed on this panel. You must ensure that your specifications follow NetView message revision table syntax rules.

For more details, see the chapter “The Message Revision Table” in *IBM Tivoli NetView for z/OS Automation Guide*.

### Build

Once you have made all the message definitions that you need, you can start the Configuration Build Process to build the configuration files containing the AT, MRT, and MPF table. For more information about the build function, see the chapter “Building and Distributing Configuration Files” in *IBM Tivoli System Automation for z/OS Defining Automation Policy*.

The AT fragments, MRT, and the MPFLSTSA member are built into the configuration data output data set.

This may require more space than you have allocated for the output data set. Thus enlarging the output data set may be required.

This also applies to the DSILIST data set where the listings are stored.

It is recommended that you copy the build output to a Generation Data Group (GDG) to avoid token mismatch conditions and AT or MRT load errors.

---

### AT and MRT Build Concept

The AT and MRT are built if necessary.

**Note:** If the MPF Header or Footer definitions have changed, an MPFLSTSA build is not performed. The changes are taken into account at the next build.

---

### Load

After the NetView automation tables have been generated using the customization dialog, they are ready to be loaded. INGAMS REFRESH can be used to refresh the complete SA z/OS configuration, that is, the Automation Manager Configuration (AMC), the agent's Automation Control Files (ACFs) and the related NetView Automation Tables (ATs) as they are defined in the SA z/OS Policy Database. Alternatively, ATs can be loaded using ATLOAD.

The common global variable AOFSMARTMAT controls whether the AT and MRT fragments generated at Automation Control File build should be used. For compatibility reasons the provided default is 2 indicating that the generated AT fragment is loaded at SA z/OS initialization time or during an INGAMS REFRESH. The recommended value of AOFSMARTMAT is 3 indicating that the generated AT and MRT fragments are loaded at SA z/OS initialization time or during an INGAMS REFRESH.

For more information about the values refer to “AOFSMARTMAT” on page 237 Appendix A of *IBM Tivoli System Automation for z/OS Customizing and Programming*.

Some AT entries are required for SA z/OS to operate properly. These entries reside in a separate AT that is loaded during SA z/OS initialization. This AT is called INGMMSGSA. Do not edit it.

### Listings

The DSILIST data set is used to store listings. For example, if you want to view the listing of the AT INGMMSG01, issue the command:

```
br dsilist.ingmsg01
```

To view the listing of the MRT, issue:

```
br dsilist.ingmrt01
```

A listing is produced whenever SA z/OS loads an AT or MRT. You can use the advanced automation option (AAO) AOFMATLISTING to suppress listings by setting it to zero (see Appendix A, “Global Variables,” on page 229).

The AT can be reloaded at configuration refresh (INGAMS, ACF ATLOAD). Because of this you should:

- Use a separate DSILIST data set for each NetView
- Allocate the DSILIST data set as a PDSE in order to prevent Sx37 errors

If the testing or loading of an AT or MRT fails, a special INGERRLS listing that contains the data of the failing AT or MRT is written to DSILIST. To view this listing issue the following command:

```
br dsilist.ingerrls
```

## A Guide to SA z/OS Automation Tables

### NetView Automation Table Structure

SA z/OS provides a ready-to-use AT, INGMSG01. To activate the AT, perform the following steps:

1. Define the AT member INGMSG01 in the SYSTEM INFO policy of the system in the customization dialogs
2. Build the automation configuration files
3. Refresh the configuration using INGAMS REFRESH
4. Restart NetView with the new configuration

The SA z/OS AT contains:

- All entries for the SA z/OS basic automation infrastructure, which reside in INGMSGSA
- AT entries for messages that are defined in the PDB
- User include fragments

You do not have to customize the AT INGMSG01. All unused entries are disabled automatically according to the configuration that you use. If you want to have additional entries that are valid only for your environment, you can use either a separate AT (specified in the customization dialog) or use one of the user includes.

Figure 5 shows the structure of the AT:

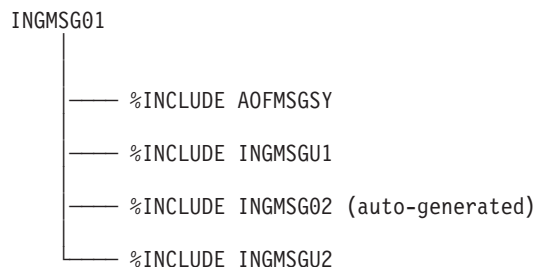


Figure 5. AT Structure

## NetView Automation Table Structure

For information about how to use the INCLUDE fragments that SA z/OS provides, refer to "Using SA z/OS %INCLUDE Fragments."

The following fragments are used by the AT:

### Synonym Definitions

There is one fragment, AOFMSGSY, that is used to initialize the various synonyms used throughout the rest of the table. SA z/OS requires the synonyms to be suitably customized to reflect your environment. See "Generic Synonyms: AOFMSGSY" on page 261 for more details about the synonyms.

### SA z/OS Functional Definitions

These definitions (located in the fragment that is loaded as INGMSG02) contain automation table statements for specific functions of SA z/OS. You should not change these statements. Any modifications can be made in INGMSGU1.

## Master Automation Tables

This section discusses the three master automation tables that SA z/OS provides.

**INGMSG00:** The automation table INGMSG00 is used for SA z/OS initialization. INGMSG00 should not have be modified by the user.

This table makes use of the synonyms that are defined in AOFMSGSY.

**INGMSG01:** INGMSG01 is suitable for use as a primary automation table.

INGMSG01 should not be included into any other table but should be activated as a separate table.

**AOFMSGST:** This is a table suitable for a NetView with a SA z/OS Satellite installed.

## Integrating Automation Tables

If you have any user-written automation table statements that you still want to use, you must now combine your primary table with SA z/OS's. There are several approaches to achieve this.

Refer to the NetView documentation for more information on how to use NetView automation tables.

### Multiple Master Automation Tables

Besides INGMSG01, you can specify multiple additional NetView automation tables for a system in the customization dialog. The tables are concatenated as entered in this panel and processed in this concatenation order.

You need not modify the INGMSG01 automation table or any of the fragments, except AOFMSGSY. It is easy to maintain SA z/OS automation table fragments. However, you have to watch for new messages. It is easy to maintain your entries, because they are independent from SA z/OS entries.

### Using SA z/OS %INCLUDE Fragments

INGMSG01 is the master include member. It provides some message suppression that is necessary to prevent mismatches and duplicate automation before the first %INCLUDE fragment.



The INGMMSGU1 fragment can be used for user entries. These entries have precedence over the SA z/OS entries. The default INGMMSGU1 fragment is an empty member.

The INGMMSGU2 fragment can be used for all entries that SA z/OS does not provide any entries for. The default INGMMSGU2 fragment is an empty member. During ACF COLD or WARM start the AT or ATs are loaded and they write a listing to the DSILIST data set. This enables the use of the NetView AUTOMAN command to monitor and manage the ATs. Make sure that the size of your DSILIST data set is sufficient to store these listings. Without these listings you can only monitor or manage the ATs using AUTOTBL. It is recommended that you define your DSILIST data set as a PDSE so that regular data set compression is not required. You should also make sure that the DSILIST DSN is unique to your NetView procedure.

**Examples:** An example output of AUTOTBL STATUS:

```
BNH361I THE AUTOMATION TABLE CONSISTS OF THE FOLLOWING LIST OF MEMBERS:
AUT02   COMPLETED INSERT FOR TABLE #1: INGMMSG01 AT 04/16/02 19:34:59
AUT02   COMPLETED INSERT FOR TABLE #2: HAIMSG01 AT 04/16/02 19:35:00
```

IPSN0

```
BNH363I THE AUTOMATION TABLE CONTAINS THE FOLLOWING DISABLED STATEMENTS:
TABLE: INGMMSG01 INCLUDE: __n/a__ GROUP : INGCICS
TABLE: INGMMSG01 INCLUDE: __n/a__ GROUP : INGIMAGE
TABLE: INGMMSG01 INCLUDE: __n/a__ GROUP : INGIMS
TABLE: INGMMSG01 INCLUDE: __n/a__ GROUP : INGJES3
TABLE: INGMMSG01 INCLUDE: __n/a__ GROUP : INGOPC
```

An example of the AUTOMAN panel:

EZLKATGB AUTOMATION TABLE MANAGEMENT				
MEMBER	TYPE	LABEL/BLOCK/GROUP NAME(S)	STATUS	NUMBER OF STATEMENTS
-----	----	-----	-----	-----
INGMSG02	GROUP	INGCICS	DISABLED	222
INGMSG02	GROUP	INGDB2	ENABLED	120
INGMSG02	GROUP	INGIMAGE	DISABLED	1
INGMSG02	GROUP	INGIMS	DISABLED	107
INGMSG02	GROUP	INGJES2	ENABLED	1
INGMSG02	GROUP	INGJES3	DISABLED	1
INGMSG02	GROUP	INGOPC	DISABLED	10
INGMSG02	GROUP	INGUSS	ENABLED	1

In this example the configuration loaded does not use the IMS, CICS®, OPC product automation and the IXC102A automation. It uses JES2, DB2 and USS automation.

**Restriction:** The NetView AUTOMAN cannot be used to RELOAD INGMMSG01.

## Generic Automation Table Statements

The basic automation table contains a number of generic automation table entries that can reduce your automation table overhead considerably. These samples use some of the advanced features of SA z/OS to make automating your applications as simple and reliable as possible.

For some of these entries (IEF403I and IEF404I in particular) the message flow may be quite high. To handle this, you can insert additional entries in INGMMSGU1 to

## Generic Automation Table Statements

suppress a block of messages. For example, if all your batch jobs started with the characters BAT or JCL, then the following entry would suppress them:

```
IF MSGID = 'IEF40'. & DOMAINID = %AOFDOM% THEN BEGIN;
*
  IF (TOKEN(2) = 'BAT'. | TOKEN(2) = 'JCL'.)
    THEN DISPLAY(N) NETLOG(N);
*
END;
```

---

## System Operations Automation Flow

SA z/OS uses dedicated *work operators* for all subsystem-related processing in order to:

- Keep the extra message-related workload off the NetView subsystem interface router task (CNMCSSIR) and primary POI task PPT
- Establish even load balancing
- Ensure that all messages for a subsystem are processed in the correct sequence

You define work operators in the customization dialog using the Automation Operators entry type (AOP). Here you define automated functions that allow you to specify automation operators, which are the NetView task name. This two-staged definition gives the flexibility to specify a second operator as a backup within the same Automated Function definition. The automation operator name that is specified here is the name of the task in NetView.

Note that the automation operators also need to be defined in the DSIOPF member in the NetView DSIPARM data set or in the SAF product.

By default SA z/OSS provides 20 Automated Functions, AOFWRK01 through AOFWRK20, with the automation operator names AUTWRKxx. The number can be increased according to the installation needs.

During SA z/OS initialization or refresh the subsystems that are defined in the configuration file are evenly distributed among the automation operators in a round-robin manner. Thus each automation operator has a list of subsystems that it is responsible for. Each automation operator then subscribes for the messages of those subsystems via the NetView ASSIGN command. Finally the initial monitoring of SA z/OS is run on the appropriate automation operator, which is then locked until message AOF540I is issued.

When SA z/OS is fully initialized all messages for a subsystem are queued to the same automation operator. This ensures that all messages are processed in the order they have been received.

If the automation table action uses standard SA z/OS capabilities (that is, SA z/OS commands), the message is processed at the automation operator in the following three steps. However, if there is a complete user defined automation table entry (that is, an AT override), only the first step can be run:

1. The message is driven through the NetView automation tables.
2. If there is a match, the SA z/OS data model is applied, which includes automation flag checking, code matching, threshold comparison, pass evaluation, and message capturing.
3. Finally the command is executed or the outstanding reply is answered.

There are two places where this processing can be modified for single messages:

- The assignment of messages to AUTWRKxx automation operators can be overruled.

To do this, the AOF\_ASSIGN\_JOBNAME advanced automation option must be set to 0, which lets ASSIGN BY MESSAGE ID take precedence over the ASSIGN BY JOBNAME that is established by SA z/OS.

An ASSIGN command with the MSG parameter must be issued to redirect the message. That particular message is then assigned according to the user specification while all other messages still run on the automation operators that are assigned by SA z/OS. However this should be used with care because it suspends SA z/OS load balancing and breaks the serialized command processing for that subsystem.

- Execution of the command on the automation operator that has been assigned by SA z/OS can be overruled by specifying an Automated Function name together with the command in the MESSAGES/USER DATA policy in the customization dialog.

Execution of the command is then routed to the task that has been specified for the Automated Function. The automation table and data model processing is still run on the automation operator and thus proper sequencing is guaranteed.

SA z/OS internally uses the AOFEXCMD command (described in *IBM Tivoli System Automation for z/OS Programmer's Reference*) to queue the command to the specified automation operator. The routine checks whether the requested automation operator is available and, if this is not the case, it queues the command to a backup operator, so that in any case the command does not run on the current automation operator.

It is recommended that you use this only if there are special reasons, for example, for long running commands, because it may break the serialized command processing for that subsystem (if not all commands are executed on the same automation operator).

---

## Inheritance Rules for Classes

Bear in mind the following inheritance rules for class data when building AT entries.

### Define Application Information

Data is inherited in the APPLICATION INFO policy item per individual field, independent from each other (except for Transient Rerun). If a field is blank, the class value is inherited (if it is available). There are a few exceptions where the inheritance can be blocked without specifying an instance value with the special value NONE , for example, Restart after IPL.

### Define Relationships

The External Startup and External Shutdown fields in the sub header area show inherited data individually in the same way as in the APPLICATION INFO policy item. However the relationships are only inherited as a whole if no relationships are defined for the child object.

### Define Application Messages and User Data

Data is inherited per message ID. For example, assume a message ID has a command definition for the instance, and the same message ID is defined for a class with reply data. The command and reply data is not merged on the instance,

## Generic Automation Table Statements

and the class definitions are not inherited at all. Message overrides (OVR) are not inherited at all. All OVRs are used to generate AT entries at the level where they are specified.

### Define Startup Procedures

The STARTUP policy offers two panels. The Subsystem Startup Processing panel with a subheader section with input fields that may show inherited values, and for each selected startup phase there is a Startup Command Processing panel with a command input area that also may show inherited data.

#### Subsystem Startup Processing

Data in the subheader section is inherited per individual field, similar to the APPLICATION INFO policy. Command definitions for the three phases PRESTART, STARTUP, and POSTSTART are inherited per start phase. So if PRESTART commands are defined for the instance and both PRESTART and STARTUP commands are defined for a class, the instance inherits the STARTUP commands from the class.

#### Startup Command Processing

Within each start phase the commands are inherited all together. So if a PRESTART command is defined for the instance and other PRESTART commands are defined for a class, none of the commands are merged on the instance. Instead the instance has only the one command defined there. No PRESTART commands are inherited from the class.

### Define Shutdown Procedures

Shutdown specifications are inherited per phase. So if a SHUTINIT command is defined for the instance and both SHUTINIT and SHUTNORM commands are defined for a class, the instance inherits the SHUTNORM commands from the class. Furthermore, command and reply definitions for one phase are inherited together. So if for SHUTFORCE a command is defined for the instance, and the class has a reply defined for SHUTFORCE, nothing is inherited by that instance.

Changes within inherited data result in creating definitions for the current application. So if for a phase, commands and reply definitions are inherited, and then commands are modified, both the reply and the command definitions become data of the current application. If only commands are inherited for a phase, and then reply data is specified, the command definitions are also copied to the phase definition of the current application.

### Define Error Thresholds

The data is inherited as a whole if no thresholds are defined for the child object – it is not possible to specify a level for Critical, Frequent, or Infrequent alone for an instance and inherit the other threshold levels from a class.

### Define IMS Subsystem-Specific Data

This policy combines fields that are built into the IMSCNTL and the ENVIRONMENT structures of the configuration files. The fields within a structure are inherited all together, but each structure is inherited independently from the other. Furthermore the IMSCNTL fields do not allow definitions for a class (though they are displayed on the class panel). And finally for a subtype other than CTL only a subset of the fields is available.

Thus there are three variations of this panel:

1. Instance of subtype CTL with all IMSCNTL and all ENVIRONMENT fields
2. Class of subtype CTL with all ENVIRONMENT fields
3. Instance or Class of subtype other than CTL with a subset of ENVIRONMENT fields (2 fields)

The first four fields (APPLid, Default HSBID, Startup parm1, Startup parm2) are never inherited. They cannot be specified for a class. The remaining fields are inherited all together in a blocks.

### Automatic AT Generation

CMD (Command), REP (Reply), COD (Code), and USR (User Data) are inherited per message ID. For example, assume a message ID has a command definition on the instance, and the same message ID is defined for a class with reply data. The command and reply data are not merged on the instance, and the class definitions are not inherited at all.

Message Override and Status specifications provide instructions for the generation of the AT entry. This data is never inherited, but is used to create one AT entry for the object where they are specified. Remember that the AT is message oriented and the AT entry usually has the message ID as a condition, so for example, inheriting a Status would create duplicate entries.



---

## Chapter 4. How to Monitor Applications

System Automation for z/OS provides different ways to monitor your applications:

- Using *observed status monitoring routines*, SA z/OS can determine whether your applications and several other automated resources are active, inactive, or in the process of being started. It is recommended to always enable observed status monitoring routines and to use the product-provided routines where possible. See “Observed Status Monitoring” for further details.
- With *monitor resources* you can optionally monitor the health of your applications and recover them on health status changes. SA z/OS distinguishes between active health monitoring and passive event-based health monitoring. See “Health Monitoring” on page 40 for further details.

Active and passive health monitoring is supported by SA z/OS in the following areas:

- Health monitoring of JES3, based on console messages
- Health monitoring of z/OS, DB2, CICS, IMS and other components, based on IBM Tivoli OMEGAMON II exceptions or IBM Tivoli OMEGAMON XE situations
- Health monitoring of CICS, based on CICSplex<sup>®</sup> SM
- Health monitoring of IMS, based on console messages

---

### Observed Status Monitoring

SA z/OS determines the observed status of an application by running a routine identified by the policy administrator in the customization dialog. The routine can be specified for an individual application (refer to *IBM Tivoli System Automation for z/OS Defining Automation Policy*), and a default monitor routine can be specified for all applications on an entire system (see the AUTOMATION INFO policy item in the customization dialog).

Table 5 lists the routines that can be specified as application monitors.

*Table 5. Observed Status Monitor Routines*

AOFADMON	This routine has been deprecated and is provided only for compatibility with earlier releases. This routine determines the status of an application by issuing the MVS D A, <i>jobname</i> command. The job name used is the job name defined in the customization dialog for the application. Possible values for the application monitor status as determined by this routine are Active, Starting, Inactive. IBM recommends to use INGPJMON instead of AOFADMON.
AOFATMON	This routine is used to determine the status of a task operating within the NetView environment.
AOFAPMON	This routine determines the status of a program-to-program interface (PPI) receiver.
AOFCPSM	This routine is a dedicated routine used to monitor the status of the SA z/OS processor operations applications.
AOFNCMON	This routine is used to determine the status of the NETCONV connection running between the NMC server and NetView for z/OS.

## Observed Status Monitoring

Table 5. Observed Status Monitor Routines (continued)

AOFUXMON	This routine determines the status of a resource with application type USS. This resource can either be a z/OS UNIX process, a file system in the UNIX file system (HFS), or a TCP port. Depending on the nature of the resource (process, file, or port) AOFUXMON decides which internal monitoring method to use.
INGPJMOM	This routine determines the status of an application by searching z/OS for address spaces with a particular job name. The job name used is the job name defined in the customization dialog for the application.
INGMTSYS	With this routine, IMAGE applications for BCPII usage can be monitored.
INGROMON	With this routine, OMVS can be monitored.
INGPSMON	This routine monitors the subsystem's registration to the subsystem interface.
ISQMTSYS	With this routine, a processor operations target system resource represented by its proxy can be monitored. See "Automating Processor Operations Resources of z/OS Target Systems Using Proxy Definitions" on page 85 for examples of how to use a proxy definition. Active operator console connections are mandatory and are used for sending a z/OS command (for example, d t) and receiving the related response.

SA z/OS expects certain return codes from all monitor routines, either from SA z/OS provided ones or from your own routines. These can be one of the following:

RC	Meaning
0	Active
4	Starting
8	Inactive
12	Error

---

## Health Monitoring

### Overview

Health monitoring is accomplished using special resources called *monitor resources*. Monitor resources, which have a resource type MTR, are policy objects that are used to obtain the health status of other resources, typically applications or application groups, or more generally, any object that can be monitored. The health status is useful when you need to know how well a resource is performing and not simply that it is active.

The health status can be used to provide application-specific performance and health monitoring information, for example, an application may be active but it is failing to meet performance objectives defined by the system administrator. The health status can be used either for information only, or by the automation manager to make decisions and, if necessary, trigger automation for the application.

Monitor resources are defined in the customization dialog with entry type MTR. They are resources with similar characteristics as all other SA z/OS resources.

Monitor resources are connected to application resources (APLs) or application group resources (APGs). The health status of the monitored object is propagated to



the APLs and APGs and results in a combined health status there. You can define and connect MTRs in the customization dialog (see *IBM Tivoli System Automation for z/OS Defining Automation Policy*).

Monitor resources obtain the health status of an object in two different ways:

- Actively, by polling—that is executing a monitoring command periodically
- Passively, by processing events

Active monitors are scheduled periodically based on the interval defined in the MTR policy.

Passive monitors do not have a monitor interval but can have a monitor command defined for them for initial health status determination. They rely on other events to set the health status using the INGMON command.

Monitor resources can be explicitly bound to the object that they are monitoring and optionally to a job. This allows SA z/OS to handle a variety of monitoring events in a generic way. A monitored object can be, for example, an OMEGAMON XE situation, or an event posted by CICSplex System Manager (CICSplex SM). See “Passive, Event-Based Health Monitoring” on page 44. Note that the monitored object is derived from the monitor resource name, if none was specified.

There can be one or more recovery commands associated with each health status (NORMAL, WARNING, MINOR, CRITICAL and FATAL). These commands are invoked by SA z/OS when the monitor resource switches to the corresponding health status.

You can display and control monitor resources with the DISPMTR command. Monitor resources are also displayed on the Tivoli Enterprise Portal (TEP) as well as SDF and NMC, provided that the appropriate inform list specifications have been made.

## Monitor Resource Commands

When defining a monitor resource you can specify activate, deactivate and monitor commands. Any command is suitable that can be executed in the NetView environment. These commands are divided into two groups:

- NetView activate and deactivate commands that expect a return code of zero
- Monitor commands that return a health status

The main difference between these two groups is that the activate and deactivate commands are executed only once, and SA z/OS expects a return code of zero.

If the activate command ended with a non-zero return code, the monitor resource remains in an INACTIVE status. The monitor resource ends in a BROKEN status if the deactivate command ended with a non-zero return code.

- The activate command is optional and can be used to establish the environment the monitoring routine can run in. The command is executed every time the monitor is started. The command must exit with return code 0.
- The deactivate command is optional and can be used to cleanup the environment. The command is executed every time the monitor is stopped. The command must exit with return code 0.
- The monitor command is executed after the activate command and then periodically if a monitoring interval is given. SA z/OS expects the monitor command to return a valid health status code. Additionally the monitor

command can issue a message that is then attached to the health status. The absence of a monitoring interval indicates that the given monitor resource is a passive or event-based health monitor. In this case, the monitor command is optional and, if specified, it is invoked for initial health monitoring only. Otherwise, if a monitoring interval is provided, the given monitor resource is an active health monitor. In this case, a monitor command must be provided to return a health status.

The activate, deactivate and monitor command can be a command procedure written in any language that is supported by NetView: REXX, Assembler, PL/I, C, or the NetView Command List Language (NCLL). Writing a monitor routine can be simple or it can be complex. The complexity depends upon the application that you are attempting to monitor.

### Writing a Recovery Routine

The recovery routine is invoked every time the monitor resource switches to the health status that the recovery routine is defined for. The goal of the recovery routine is to bring the monitor resource, and thus the monitored object, back to a health status of NORMAL.

#### Recovery Techniques

User data in the MESSAGES/USER DATA policy item can be used to disable additional recovery processing while other recovery is already in progress. In combination with the predefined keyword DISABLETIME, the recovery disable time can be specified in the formats hh:mm:ss, mm:ss, :ss, or mm. While recovery is disabled, no commands are processed on behalf of this monitor resource for messages and exceptions that are specified in the MESSAGES/USER DATA policy item.

Recovery is automatically enabled after the recovery disable time has expired. Recovery can also be enabled prematurely by calling the INGMON command with the option CLEARING=YES, for example:

```
INGMON CI2XREP MSGTYPE=XREP CLEARING=YES
```

In some cases, it is necessary to force increasingly strong recovery actions over a period of time. This can be accomplished using a PASS count that starts at 1 and runs to 99. SA z/OS maintains the PASS count individually per message or exception, and increments the PASS count each time that message or exception is processed. Upon successful recovery, it is the installation's responsibility to reset the PASS count. When specified with option CLEARING=YES, INGMON enables command processing for messages and exceptions, and resets the PASS count.

#### Task Global Variables for Recovery Routines

The following task global variables can be accessed by the recovery routine:

Task Global Variable	Value
&EHKVAR1	Contains the monitor name
&EHKVAR2	Contains the current health status
&EHKVAR3	Contains the old health status
&EHKVAR4	Contains the message that is associated with the health status
&EHKVAR5	Contains the object name of the monitor
&EHKVAR6	Contains the job name
&SUBSAPPL	Contains the monitor name

Task Global Variable	Value
&SUBSTYPE	Contains the string MONITOR

## Active Health Monitoring

In general, the monitor command needs to issue one or more commands to generate data, process the data, and set a return code. The return code is then used by SA z/OS to determine the health status for the resource. The possible return codes and the corresponding health status are given in Table 6.

Table 6. Health Status Return Codes

Return Code	Health Status	Description
1	BROKEN	The monitor detected an unrecoverable error. SA z/OS stops monitoring.
2	FAILED	The monitor is currently unable to obtain a health status. SA z/OS keeps the monitor active because the problem might disappear.
3	NORMAL	The monitor detected normal operation of the monitored object.
4	WARNING	The monitor detected a certain degree of degradation in the operation of the monitored object.
5	MINOR	The same as WARNING, but more severe.
6	CRITICAL	The same as MINOR, but more severe.
7	FATAL	The same as CRITICAL, but more severe.
8	DEFER	Used internally.

The health status values affect the compound status in the automation manager.

Most monitor commands use UNKNOWN, NORMAL, and WARNING statuses. The MINOR, CRITICAL, and FATAL statuses can be used as gradients to indicate that a problem is getting worse. BROKEN and FAILED are statuses that describe the status of the monitor itself and may be seen if an error is encountered with the monitor command. A health status of FATAL will trigger an application move as part of automated recovery.

FATAL is a guaranteed automatic ForceDown, and, if available, failover for the application associated with the monitor.

Optionally, the monitor routine can issue a message describing the condition that is trapped by the SA z/OS process that invoked the monitor. The message can be viewed on the DISPMTR panel.

Every monitor command needs several basic steps:

1. Issue one or more commands to collect data and interrogate the results.
2. Based on the results from the command or commands, set the return code to a value from 1 through 8 and, optionally, perform processing based on that value.
3. Optionally, supply more descriptive information about the health status in a message that can be viewed with the DISPMTR command.
4. Exit with the return code so SA z/OS can set the health status appropriately.

## Health Monitoring

Figure 6 is an example using the NetView PING command within a PIPE to query the status of a TCP/IP stack on a remote system. The IP address is passed on input. The routine uses the average round trip time (RTT) for the request provided in message BNH770I to determine the health.

```
/*REXX MYMON */
Arg parm
monrcs='BROKEN FAILED NORMAL WARNING MINOR CRITICAL FATAL DEFER'
'PIPE (STAGESEP | NAME PING)',
'| NETV PING' parm,
'| LOCATE 1.8 /BNH770I /',
'| STEM out.'
if out.0 = 0 then
  lrc = wordpos('FATAL',monrcs)
else
  do
    parse var out.1 . 'averaging' ms 'ms' .
    say 'PING lasted' ms 'ms'
    select
      when ms < 10 then lrc = wordpos('NORMAL',monrcs)
      when ms < 20 then lrc = wordpos('WARNING',monrcs)
      when ms < 30 then lrc = wordpos('MINOR',monrcs)
      when ms < 40 then lrc = wordpos('CRITICAL',monrcs)
      otherwise lrc = wordpos('FATAL',monrcs)
    end
  end
Return lrc
```

Figure 6. Sample Monitor Command

## Passive, Event-Based Health Monitoring

### Overview

Passive, event-based monitoring allows you to react to events, for example a message, an OMEGAMON XE situation, or a CICSplex SM event, directly. In contrast to active health monitoring, SA z/OS does not have to query the monitored object status periodically but is informed only when such an event has occurred.

The definitions in the MONITOR INFO policy item for a monitor resource allow you to define an object that the monitor resource is bound to and optionally a job that the monitor resource accepts events from.

The **Monitored Object** specification for the monitor resource can follow any naming convention that might be required for the monitoring process. For example, for CICS monitoring it has the prefix CPSM, followed by the CICS name, the type (such as a connection), and the name. For a link called CT12, the monitored object is called as follows, for example:

```
CPSM.CICSTOR1.CONNECT.CT12.
```

Whereas for monitoring OMEGAMON XE situations, it has the prefix ITM, followed by the situation name, for example: ITM.MYAUXSHORTAGE\_WARN.

There can be only one monitored object per monitor resource but more than one monitor resource can be bound to a monitored object, for example, several IMS monitors might specify OLDS as an object.

You can also optionally specify the **Monitored Jobname** that a monitor resource accepts events from. Thus, for example in the case of IMS monitor resources, you

might specify a job name of IMS1 for monitor resource MTR1 and IMS2 for MTR2. If an event arrives for OLDS and the issuer is IMS1 only MTR1 is affected.

## Event Types

In the simplest case, an event is represented by a plain message issued by a job. All monitor resources that register for a particular message accept this message unless you also specified the monitored job name.

In other cases, for example for OMEGAMON XE situations or events reported by CICSPlex SM, the event is represented by a triggering message provided by SA z/OS for the purpose of health monitoring only. This message, ING150I, that contains the monitored object name or the job can then be used by SA z/OS to locate the monitor resource and to set the health status or issue commands. This allows SA z/OS to handle a variety of monitoring events.

INGMON, the command that is responsible for health monitoring, is invoked from the NetView automation table whenever ING150I or any other message a monitor resource has registered for is issued. It locates the monitor resource for a given monitored object or job and then looks up the code match table for the health status or commands, or both, that should be issued whenever the triggering event occurs.

## Code Matching for Event-Triggering Messages

INGMON allows you to pass up to three codes that, when specified, are used to determine a specific set of commands to be issued in case of an event-triggering message. For message ING150I, SA z/OS creates an automation table entry where **Code 1** is used to select commands by event severity. For other messages, you can override the default automation table entry and pass the appropriate tokens in **Code 1**, **Code 2**, and **Code 3**, as you require.

In any case, the **Value Returned** field contains one or two tokens separated by a blank. The first token is a required command selector that can be one of the following:

*selection*

Execute commands with the given selection or commands for which no selection is specified.

# Perform pass processing and execute all commands that match the current pass.

*#selection*

Interpret *selection* as another pseudo message ID. Perform pass processing for this message and execute all commands that match the current pass.

This is useful for pass processing on behalf of the event triggering message, for example, ING150I. Suppose you have one entry for WARNING and one for CRITICAL. When you do pass processing for ING150I your pass counter may be on 5, for example, when the first CRITICAL event comes in (because you already had 4 WARNING events).

However, with *#selection* you can specify, for example, a value returned of #MYWARN WARNING and #MYCRIT CRITICAL for the corresponding levels. INGMON performs pass processing for the pseudo-message MYWARN and set the health status WARNING for a WARNING event. For a CRITICAL event it performs independent pass processing for the pseudo-message MYCRIT and finally sets a health status of CRITICAL.

## Health Monitoring

Remember to set the IGNORE action for the pseudo-messages to avoid AT entries being built.

The second token in the **Value Returned** column of the Code Processing panel indicates the optional health status to be set. If specified, it must be separated by a blank from the selection criterion.

## Programming Techniques

Commands that are called by INGMON have access to the message that triggered the invocation using the NetView SAFE, AOFMSAFE, for example:

```
/* MYCLIST, called by INGMON */  
'PIPE SAFE AOFMSAFE | STEM MSG.'  
If msg.0 > 0 Then  
    msgtext = msg.1      /* first message line */
```

In addition, INGMON fills the task global variables &EHKVAR0, &EHKVAR1–9, and &EHKVART with tokens that are derived from the message or exception that INGMON was invoked by. For messages, the assignment starts with the message ID, and for exceptions, it starts with the exception ID.

INGMON also sets the following task global variables:

**&SUBSAPPL** Contains the monitor name.

**&SUBSTYPE** Contains the string MONITOR.

**&SUBDESC** Contains the description of the monitor resource.

The following examples illustrate how message and exception tokens are assigned to these task global variables.

### Example 1:

```
$HASP9211 JES MAIN TASK NOT RUNNING. DURATION- hh:mm:ss.xx
```

Task Global Variable	Value
&EHKVAR0	\$HASP9211
&EHKVAR1	JES
&EHKVAR2	MAIN
&EHKVAR3	TASK
&EHKVAR4	NOT
&EHKVAR5	RUNNING.
&EHKVAR6	DURATION-
&EHKVAR7	hh:mm:ss.xx
&EHKVAR8 &EHKVAR9 &EHKVART	NULL

### Example 2:

```
ING080I CI2XREP/MTR/KEYA OMSY4MVS OMIIMVS XREP Number of Outstanding Replies = 4
```

Task Global Variable	Value
&EHKVAR0	XREP
&EHKVAR1	Number

Task Global Variable	Value
&EHKVAR2	of
&EHKVAR3	Outstanding
&EHKVAR4	Replies
&EHKVAR5	=
&EHKVAR6	4
&EHKVAR7 &EHKVAR8 &EHKVAR9 &EHKVART	NULL

When defining commands to be issued by the INGMON command, the &EHKVAR $x$  variables can be used to be replaced by the corresponding tokens of the message or exception.

When INGMON looks up the monitor resource for a given monitored object or job name, or both, it is possible to skip monitor resource processing dynamically through a user-specified REXX expression. In the absence of such a REXX expression, INGMON locates the monitor resource with the given monitored object name for the job that issued the message and proceeds with health status setting and commands as defined in the automation policy. By adding a REXX expression to the User Defined Data panel within the MESSAGES/USER DATA policy item for the automated message, further processing can be disabled depending on the result of this REXX expression.

To do this, the predefined keyword INGMON\_FUNCTION is specified as a keyword and an arbitrary REXX expression is defined as the value in the User Data Processing panel. If the result of the REXX expression is false (that is, 0), processing is stopped, otherwise INGMON processing continues. The following example for the message ID MYMTR controls monitor resource processing, based on the day of week that is defined in the common global variable DAY\_OF\_WEEK. (processing continues only if the current day is not a Sunday):

<b>Keyword</b>	INGMON_FUNCTION
<b>Data</b>	cglobal('DAY_OF_WEEK') \= 'SUN'

When a monitor resource is defined with a monitor command but without an interval, the initial health status of such a passive monitor resource is obtained at monitor resource start time only. Any other health status update must be derived from events that the monitor resource has registered for.

It is however possible to issue the monitor command at any point in time by executing the command AOFRCMTR. This command expects the monitored object name and optionally a job name as parameters. It locates the corresponding monitor resource and, if specified, issues the monitor command.

See *IBM Tivoli System Automation for z/OS Programmer's Reference* for the syntax of AOFRCMTR.

### Health Monitoring using OMEGAMON

SA z/OS allows you to interact with IBM Tivoli OMEGAMON II and IBM Tivoli OMEGAMON XE products to collect key performance indicators that represent the health status of address spaces, middleware, or even the system. The following sections show you how to interact with these products using monitor resources.

#### Overview

The SA z/OS OMEGAMON interface lets you gather a wide range of performance data on a system. You can gather data from the following performance monitoring products:

- IBM Tivoli OMEGAMON II for MVS
- IBM Tivoli OMEGAMON II for CICS
- IBM Tivoli OMEGAMON II for IMS
- IBM Tivoli OMEGAMON II for DB2
- IBM Tivoli OMEGAMON XE products
- Other IBM Tivoli Monitoring products running on z/OS

*Exception analysis* is an OMEGAMON feature that monitors predefined *thresholds* in a system. Each time exception analysis is invoked, an exception is displayed on the OMEGAMON console if a threshold is exceeded. Using SA z/OS, you can then act on these exception alerts by running execs or issuing commands, including issuing commands back to the host OMEGAMON.

*Situations* are much like exceptions but they are based on a combination of logical expressions and even on the status of other embedded situations. Each product based on the IBM Tivoli Monitoring infrastructure, such as IBM Tivoli OMEGAMON XE, provides a set of predefined situations that you can use as is, or modify as you wish. You can also create your own situations to tailor the monitoring to your specific needs. Situations are edited and displayed on the Tivoli Enterprise Portal (TEP). Using a TEP function called Reflex Automation, you can inform SA z/OS about a particular situation and then act upon it.

IBM Tivoli Monitoring services also allow you to interact with each and every product based on this infrastructure through a standardized SOAP services interface on the Tivoli Enterprise Monitoring Server (TEMS). SOAP services exist, for example, to obtain data from a particular object collected by Tivoli OMEGAMON XE for z/OS. Other services allow you to automatically manage situations and TEP workflow policies, or to send universal messages to the universal message console.

You can set up monitor resources to:

- Monitor sets of exceptions that may be of interest using an active monitor resource and set an application's health status based on the existence of such exceptions
- React to and resolve conditions that cause those exceptions
- Monitor sets of situations that may be of interest using a passive monitor resource, set an application's health status and react to and resolve conditions that cause those situations

#### Assumptions

Various topologies are possible for SA z/OS with IBM Tivoli OMEGAMON II monitors and IBM Tivoli Monitoring products such as OMEGAMON XE:



- There can be one or more monitoring product per system
- Connectivity is through VTAM<sup>®</sup> and the NetView Terminal Access Facility (TAF) for OMEGAMON II and through TCP/IP for OMEGAMON XE
- A TEMS SOAP Server is running locally, on a remote system or on a distributed system
- SA z/OS can act as a focal point either:
  - Globally, monitoring data from monitoring products running on different systems
  - Locally, monitoring data from monitoring products running on the local system

The following assumptions are made about the topologies that can be adopted for interaction with OMEGAMON II:

1. The OMEGAMON product is installed on each system where MVS and CICS, DB2, or IMS is installed.
2. OMEGAMON monitors are installed and configured already to support multiple VTAM-based connections to it. For interoperability with SA z/OS, logical units of type 3270 model 2 (24x80) are required.
3. OMEGAMON monitors are setup to interact with an external security product such as IBM SecureWay Security Server for z/OS (formerly RACF<sup>®</sup>).
4. OMEGAMON exceptions are reported when the threshold that is defined in OMEGAMON is exceeded. That threshold must be agreed within an installation because it must cater for the least severe condition that there might be an alert for.

The following assumption is made regarding the interaction with OMEGAMON XE:

1. Reflex automation is executed on the OMEGAMON XE agent that created the corresponding situation event

## OMEGAMON Interaction

The following subsections assume that, for OMEGAMON II interaction, you have defined one or more OMEGAMON sessions and automated functions that are designated to handle network communication using the SA z/OS customization dialog. For details on defining OMEGAMON sessions, refer to the OMEGAMON SESSIONS and AUTHENTICATION policy items in the Network (NTW) entry type and to the OPERATORS policy in the Auto Operators (AOP) entry type described in *IBM Tivoli System Automation for z/OS Defining Automation Policy*.

For OMEGAMON XE interaction using SOAP services you have to specify each SOAP server in the automation policy that you want to connect to. For details on defining SOAP servers, refer to the SOAP SERVER policy item in the Network (NTW) entry type described in *IBM Tivoli System Automation for z/OS Defining Automation Policy*.

### Using the INGOMX Programming Interface

INGOMX acts as the interface between operators (or auto-operators) and OMEGAMON. This includes not only any of the classic OMEGAMON monitors for CICS, DB2, IMS, and MVS, but also OMEGAMON XE monitors and other IBM Tivoli Monitoring products running on z/OS.

For the classic OMEGAMON monitors, INGOMX can be used to issue OMEGAMON major, minor, and immediate commands, and to filter one or more

## Health Monitoring using OMEGAMON

exceptions of interest from the list of exceptions reported by OMEGAMON exception analysis. Each request is written to the console (but not exposed to NetView) in the format as produced by the OMEGAMON monitor. When exception filtering is requested, multiple exception lines for one exception are combined into a single line and written to the console as a single message if the filter criterion (XTYPE) matches. INGOMX is best used within a NetView PIPE.

The INGOMX SOAP interface allows you to issue any of the SOAP services supported by the TEMS SOAP server, for example to

- Obtain attributes of interest from a particular OMEGAMON XE object, for example, Job\_name and CPU\_percent from the OMEGAMON XE for z/OS object Address\_Space\_CPU\_Utilization
- Start and stop situations as well as TEP workflow policies
- Issue a universal message
- Send an event into the IBM Tivoli Monitoring platform

The full set of SOAP services and a description of the XML-syntax is described in *IBM Tivoli Monitoring Administrator's Guide*.

The following examples illustrate the use of INGOMX. They are based on an OMEGAMON for MVS session with the name OMSY4MVS. The same techniques also apply to other OMEGAMON monitors. For more details, refer to *IBM Tivoli System Automation for z/OS Programmer's Reference*.

### Example 1. Returning Information on Common Storage Utilization Using the CSAA Command:

```
INGOMX EXECUTE,NAME=OMSY4MVS,CMD=CSAA
| IPXNG      CSAA  SUMMARY
| IPXNG      +
| IPXNG      +          System
| IPXNG      +          Maximum Pre-CSAA Orphan          Usage
| IPXNG      +          -----
| IPXNG      +          -----0  2  4  6  8  100
| IPXNG      +  CSA   3312K   1247K       0   1247K   37.6%|----->
| IPXNG      +  ECSA 307740K  78797K       0   78797K  25.6%|----->
| IPXNG      +  SQA   1620K    660K       0    660K   40.8%|----->
| IPXNG      +  ESQA 145696K  23930K       0   23930K  16.4%|-->
```

### Example 2. Using OMEGAMON Command Modifiers:

```
INGOMX EXECUTE,NAME=OMSY4MVS,CMD=ALLJ,MOD=#
| IPXNG      #ALLJ      166
INGOMX EXECUTE,NAME=OMSY4MVS,CMD=ALLJ,MOD=<
| IPXNG      <ALLJ *MASTER* PCAUTH RASP TRACE DUMPSRV XCFAS GRS SMSPDSE+
| IPXNG      +      CONSOLE WLM ANTMAIN ANTAS000 OMVS IEFSCAS JESXCF ALLOCAS+
| IPXNG      ...
```

### Example 3. Trapping Outstanding Operator Replies:

```
INGOMX TRAP,NAME=OMSY4MVS,XTYPE=(XREP)
| IPXNG + XREP Number of Outstanding Replies = 5
```

### Example 4. Issuing OMEGAMON Minor Commands:

```
/* REXX-Routine EXMINOR */
cmd.1 = "CMD=SYS" /* Major command, issued ahead of its minors */
cmd.2 = "CMD=FCSA" /* Minor: CSA frames below 16M */
cmd.3 = "CMD=FCOM" /* Minor: CSA, LPA, SQA, and nucleus below 16M */
cmd.0 = 3
'PIPE STEM cmd. COLLECT',
'| NETV INGOMX EXECUTE,NAME=OMSY4MVS,CMD=*',
'| CONSOLE ONLY'
* IPXNG EXMINOR
| IPXNG SYS >> WLM Goal mode OPT=00 SYSRES=(150526,8812) <<
| IPXNG fcsa 328 1312 K
| IPXNG fcom 849 3396 K
```

There is no need to explicitly establish a session between an operator and a particular OMEGAMON monitor before using INGOMX; such sessions are established automatically on their first use.

Selective protection of individual OMEGAMON sessions and commands, or both, is possible based on the NetView Command Authorization Table. Details can be found in the appendix, "Security and Authorization", in *IBM Tivoli System Automation for z/OS Planning and Installation*.

To use a SOAP service, for example to obtain certain attributes from an OMEGAMON XE object, you first have to describe the request's parameters in the form of an XML document. The XML document is validated and rejected by the SOAP server if it is found to be incorrect or incomplete. The spelling of the names enclosed in '<' and '>' is significant because XML is a case-sensitive document description language. Also, because the structure of every XML document is hierarchical, each element must be enclosed by an opening name (for example, '<CT\_Get>') and a corresponding closing name denoted by a forward slash preceding the name (for example, '</CT\_Get>').

The following is an example that describes the request parameters to retrieve the Job\_Name, the address space ID (ASID), and the CPU\_Percent attributes from the OMEGAMON XE for z/OS object, Address\_Space\_CPU\_Utilization, for all jobs with a CPU percentage greater than 1.0. In this example, the object that has been queried is collected on the TEMS called KEYAS:CMS.

```
<CT_Get>
  <target>KEYAS:CMS</target>
  <object>Address_Space_CPU_Utilization</object>
  <attribute>Job_Name</attribute>
  <attribute>ASID</attribute>
  <attribute>CPU_Percent</attribute>
  <afilter>CPU_Percent;GT;10</afilter>
</CT_Get>
```

You can pass this XML document either by pointing INGOMX to a sequential or partitioned data set, or in the default SAFE, assuming INGOMX is invoked in a NetView PIPE.

## Health Monitoring using OMEGAMON

When INGOMX is invoked, the SOAP server that is connected to must be specified. In the following example, it is assumed that you have defined a SOAP server called KEYAYA in the SOAP SERVER policy item of the Network (NTW) entry type using the SA z/OS customization dialog. This definition includes the host name or IP address, the SOAP server's port and the path name of the SOAP service. The request parameters as shown above are located in the member GETCPU in the partitioned data set SYS1.SOAP.DATA:

```
soapsds = 'SYS1.SOAP.DATA(GETCPU)'  
soapsrv = 'KEYAYA'  
Address NETVASIS 'PIPE (END % NAME GETCPU)',  
' | NETV (MOE) INGOMX SOAPREQ SERVER='soapsrv' DATA='soapsds',  
' | L: LOC 1.8 'd|'|'DWO369I '||d,  
' | EDIT SKIPTO 'd|'|'RETURN CODE'|d,  
' | UPTO 'd|'|'. '|d,  
' | WORD 3 1',  
' | VAR omx_rc',  
' | %L:',  
' | CON ONLY'
```

On the successful return of INGOMX, the output of the SOAP server is returned in the multiline ING160I message:

```
ING160I RESPONSE FROM SOAP SERVER: 9.xxx.xxx.xxx:1920///cms/soap  
Job_Name:ASID:CPU_Percent  
IXGLOGR:20:2.1  
NET:59:2.1  
RMFGAT:89:6.9  
SDM1IRLM:108:1.7  
BBOS001S:113:22.1  
YANAMSJH:117:3.9
```

The first row of this message documents the IP address of the SOAP server that responded, that is, KEYAYA in the example (IP address anonymized).

The second row describes the names of the attributes returned by the SOAP server. The attribute names are separated from each other by the non-printable character X'FF' (represented by a :).

The third and all following rows contain the actual data that has been requested. The attribute values are presented in the same sequence as the corresponding attribute names in the second row. Also, like the attribute names, the attribute values are separated from each other by the non-printable character X'FF' (represented by a :).

The tabular structure of this message allows you to easily process it in a NetView PIPE.

### Using the INGMTRAP Monitor Command

INGMTRAP is a customized interface to INGOMX that provides filtering capabilities for exceptions of interest as reported by OMEGAMON exception analysis and triggering of automation on behalf of such exceptions. For each exception that matches the XTYPE filter that is provided by the caller, INGMTRAP issues message ING080I, which is exposed to NetView. For example:

```
ING080I CI2XREP/MTR/KEYA OMSY4MVS OMIIMVS XREP Number of Outstanding Replies = 4
```

If no exception matches the XTYPE filter that is provided by the caller, INGMTRAP creates a ING081I message that is not exposed to NetView but written to the monitor resource's log to document that no exception has been found. For example:

```
ING081I CI2XREP/MTR/KEYA OMSY4MVS OMIIMVS NO EXCEPTION FOUND
```

INGMTRAP can only be used as a monitor command. This means that it has to be specified directly as a monitor command in the definition of a monitor resource, or it has to be called on behalf of such a monitor command. The following example illustrates what you need to specify on the MONITOR INFO policy in entry type monitor resource (MTR) in order to trap outstanding operator replies that are reported by OMEGAMON for MVS session OMSY4MVS:

```
INGMTRAP NAME=OMSY4MVS,XTYPE=(XREP)
```

Be careful when specifying a list of exceptions: each exception may cause an ING080I message to be issued. Because each occurrence of an ING080I message triggers health status processing of the monitor resource, make sure you understand the impact that this may have on the monitor resource's final health status.

For more details about INGMTRAP refer to *IBM Tivoli System Automation for z/OS Programmer's Reference*. For more details about defining monitor resources, refer to *IBM Tivoli System Automation for z/OS Defining Automation Policy*.

## Health Monitoring Based on OMEGAMON Exceptions

This section describes how to set up the monitor resources for health-based monitoring based on OMEGAMON exceptions using the customization dialogs, provides a sample scenario, and gives recommendations when using OMEGAMON in combination with monitor resources.

### Defining the Monitor Resources

By combining monitor resources and the OMEGAMON interaction methods described in "OMEGAMON Interaction" on page 49, automation can be triggered as a result of analyzing the output reported by OMEGAMON and by the setting of an appropriate health status.

OMEGAMON exceptions can be periodically monitored using a monitor resource and the monitor command INGMTRAP. There are a variety of ways to handle such exceptions:

1. In the customization dialog, the MESSAGES/USER DATA policy of a given monitor resource needs to state the health status of each exception that INGMTRAP has been set up to monitor. Unlike messages, OMEGAMON exceptions are denoted by a '+' sign, followed by a blank and then a 4-character OMEGAMON exception ID.
2. In addition to the health status, a series of one or more commands can be specified to handle that particular exception. Commands are processed in the same way as for any other resources that a MESSAGES/USER DATA policy is provided for, such as applications (APL). This includes escalation processing based on a PASS count, or processing based on a selection value that can be defined using CODEs that are derived from a message.
3. The HEALTHSTATE policy can be used to issue recovery commands on behalf of an OMEGAMON exception each time the health status changes.

No matter which method or combination of method are chosen, the process of handling an exception is triggered by the occurrence of an ING080I message for a particular monitor resource and exception. The automation table that is built from the definitions in the MESSAGES/USER DATA policy contains statements that invoke the INGMON command to set the monitor resource's health status and to issue commands in response to exceptions. In most cases, the necessary entries in

## Health Monitoring using OMEGAMON

the NetView Automation Table are created automatically by SA z/OS. In some rare cases when, for example, command selection should be based on CODEs, it is necessary to override the automation table definition of the exception, and to specify up to 3 codes (CODE1, CODE2, and CODE3) on the invocation of INGMON.

Alternatively, an installation-written monitor command can be used to issue INGOMX for a series of exceptions to one or more OMEGAMON monitor. Such a monitor command then returns with an appropriate health status that is based on the analysis of the output produced by INGOMX. The recovery commands that are issued when the health status changes are specified in the HEALTHSTATE policy of that monitor resource.

### Example Scenario

To illustrate how SA z/OS and OMEGAMON operate together, consider the following scenario.

Suppose there is a DB2 application that should be continuously monitored. Of particular interest is the availability of primary active logs. The LOGN exception indicates that fewer primary active logs exist than specified by the respective threshold value. This is considered a critical health indicator because it can cause a DB2 hang situation if the last primary active log becomes 100% full. Such a situation can only be resolved by making one or more additional primary active logs available again.

In order to monitor this situation and react accordingly, the automation policy has to be changed. First, define the session attributes for the OMEGAMON for DB2 monitor, if they do not yet exist, to be able to establish a VTAM connection. The OMEGAMON session is referred to by its *session name*. Then review the number of session operators (automation operators) that are started to handle the VTAM session traffic and add an additional one if a higher degree of parallelism is required. You need to ensure that the number of session operators and predefined NetView tasks are identical.

Next, add a new monitor resource (MTR) that periodically requests exception information from this OMEGAMON session. Add the MTR by means of a *HasParent* relationship to the DB2 subsystem to be monitored. This ensures that the MTR is activated when the DB2 subsystem is started, and deactivated when the DB2 subsystem is stopped. Also define the MTR via a *HasMonitor* relationship to the DB2 subsystem to ensure that the monitor's health status can be propagated to the application.

While the MTR is active, it uses the monitor command, INGMTRAP, to gather OMEGAMON exceptions that currently exist, based on the thresholds that are defined in the OMEGAMON for DB2 installation profile. INGMTRAP analyses all exceptions returned by OMEGAMON and filters out those exceptions that the MTR is interested in, in this example, LOGN. SA z/OS subsequently issues message ING080I to initiate exception processing.

Finally, also add a new rule to the NetView automation table (using the SA z/OS policy) that executes a REXX automation procedure to add a new log data set to the pool of primary active data sets whenever the LOGN exception is reported and the health status is CRITICAL (6). The MTR's health status is considered CRITICAL if the number of available primary active logs is equal to 1. If the LOGN exception is reported again in the next monitor interval, a second rule in the automation table sets the MTR's health status to FATAL (7), which triggers an application move

because normal recovery handling doesn't seem to work anymore. In addition, an alert is sent to the operator to inform him about this situation. If the LOGN exception is no longer reported, the MTR's health status is set to NORMAL (3).

The health status assigned to the MTR by means of the automation table is propagated to the DB2 application that owns this MTR. Thus, you can see at a glance whether the DB2 subsystem is okay or not.

### Recommendations

You should consider the following recommendations when using OMEGAMON in combination with monitor resources:

- Avoid monitoring multiple exceptions using INGMTRAP. Note that there can be more than one exception that may trip and thus multiple ING080I messages may be generated. The monitor resource's health status, however, depends on the last ING080I message.
- Avoid setting different health statuses for the same exception that is monitored by different monitor resources using INGMTRAP. Note that only one automation table entry is generated by SA z/OS to process message ING080I for such an exception.

In these cases, the use of INGOMX, invoked from an installation-written monitor command, to determine a combined health status from multiple exceptions or to determine an individual health status for each monitor resource, is preferred to using INGMTRAP.

## Health Monitoring Based on OMEGAMON XE Situations

This section gives an overview of passive, event-based monitoring of OMEGAMON XE situations and describes how to set up the monitor resources using the customization dialogs.

### Overview

Unlike the exception-based monitoring that SA z/OS uses for classic OMEGAMON monitors, the IBM Tivoli Monitoring infrastructure provides the means to react to situations whenever they occur. On the Tivoli Enterprise Portal (TEP), a user can specify what kind of automated response (reflex automation) should be triggered for each individual situation.

SA z/OS makes use of this capability by providing a simple command called INGSIT. The ITM administrator enters this command on the TEP with the Situation Editor dialog for those situations where SA z/OS health monitoring or health-based automation should take place. For more details about INGSIT refer to *IBM Tivoli System Automation for z/OS Programmer's Reference*.

The Take Action command is carried out on the agent, for example, OMEGAMON XE for z/OS, and not the Tivoli Enterprise Monitoring Server (TEMS) unless the TEMS is running on the same system. This is because it is possible that the hub TEMS may not reside on z/OS and so the command may not be delivered.

INGSIT triggers message ING150I that allows you to set the health status of individual monitor resources. It is then possible to issue commands, such as recovery or notification commands, to automatically fix the situation. You can specify what the health status is and what associated commands are issued in the customization dialog.

### Defining the Monitor Resources

To set up the monitor resources:

## Health Monitoring using OMEGAMON

1. Define one MTR for each OMEGAMON XE situation that you want to respond to.
2. In the MONITOR INFO policy item fill in the following fields:

### Monitored Object

Enter the name of the OMEGAMON XE situation in uppercase with a prefix of ITM, for example, ITM.MYSIT

### Monitored Jobname

Enter an optional job name to match this situation to a particular monitor resource.

3. Define codes for the message ID ING150I in the MESSAGE/USER DATA policy of the MTR to yield the commands that are to be issued and to map the severity to a valid health status.

**Example Scenario:** Consider the following scenario:

The PAGEADD command is to be issued when an auxiliary storage shortage is detected, based on page data set utilization and page data sets that are not operational.

A situation called MyAuxShortage\_Warn is defined by the installation that is true when both predefined situations OS390\_Local\_PageDS\_PctFull\_Warn and OS390\_PageDSNotOperational\_Warn are true.

As reflex automation, the following system command is issued on the managed system, that is, the system that produced the situations:

```
F NETV,INGSIT MyAuxShortage_Warn,warn
```

Where *NETV* is the job name of NetView address space.

This command is issued from the Take Action dialog, as shown in Figure 7 on page 57.



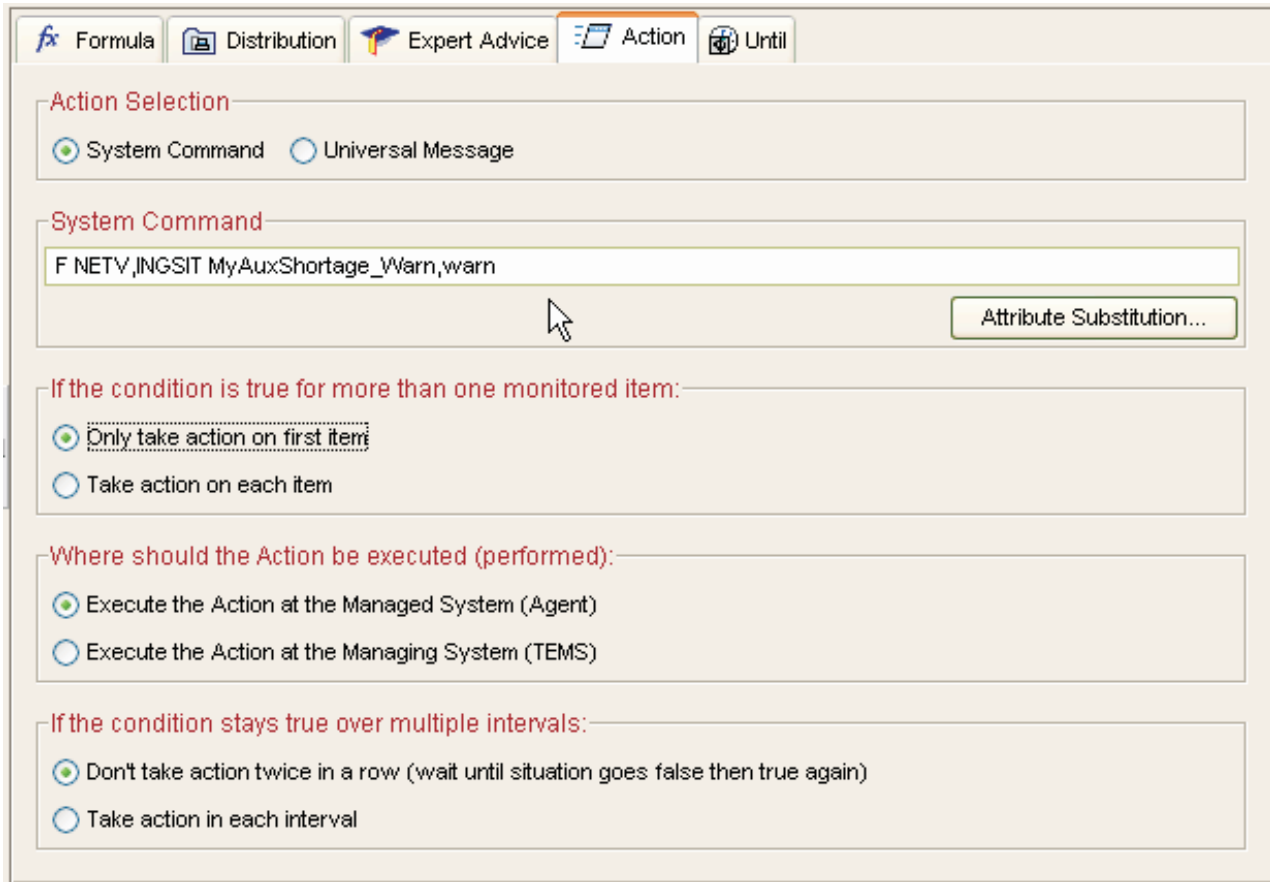


Figure 7. Take Action Dialog

INGSIT is called and produces an ING150I message, which contains the situation name that is mapped to the monitored object. Other optional information includes:

- The severity of the situation
- A job name that matches this situation to a particular monitor resource
- Other data that contains information related to the event

In this example, the situation, MyAuxShortage\_Warn, and its severity, warn, are included.

Using the customization dialog, a monitor resource, for example, AUXSHORT, is created that specifies ITM.MYAUXSHORTAGE\_WARN (in uppercase) as its monitored object.

ING150I is then specified in the MESSAGE/USER DATA policy item of the AUXSHORT monitor resource. In this example, the following code entry could be used to derive selection ADD and set the health status to MINOR:

Code 1	warn
Code 2	*
Code 3	*
Value Returned	ADD MINOR

In addition, one or more commands can be specified for ING150I for the selection that resulted from code match processing. In the example above, the PAGEADD

## Health Monitoring using OMEGAMON

command would be specified for selection ADD.

After executing all the commands that have been specified in the Command Processing panel for the selection, the health status that was mapped in the code processing is set (in this example, it was MINOR). Note that if no health status was specified in the code match table, it remains unchanged.

In a more sophisticated extension of this scenario, the situation, MyAuxShortage\_Warn, as shown on the TEP is automatically acknowledged using SOAP services. To do this, a small request parameter XML-document must be created and sent to the TEMS SOAP server for processing. To acknowledge a situation, a CT\_Acknowledge request must be issued as shown in the following example:

```
<CT_Acknowledge>
  <target>KEYAS:CMS</target>
  <name>MyAuxShortage_Warn</name>
  <source>KEYAPLEX:SYS1:MVSSYS</source>
  <data>System Automation is taking care of this</data>
</CT_Acknowledge>
```

The XML-document above references the TEMS that manages the situation (target), the situation itself (name), and the so-called monitoring agent (source) that is the source of this situation. With the data-element, you can pass any additional textual information to the person that is looking into this situation on the TEP.

As described in “OMEGAMON Interaction” on page 49, INGOMX is used to issue the SOAP request to the TEMS SOAP server. Once the situation has been acknowledged, it can be recognized as such on the TEP's situation event console or navigator flyover list.

---

## Health Monitoring using CICSplex SM

This section introduces the components of event-based CICS monitoring and describes how to set up the monitor resources using the customization dialogs.

### Component Overview

Event-based CICS link and health monitoring is implemented using CICSplex System Manager (CICSplex SM) objects. Whenever an event is received from CICSplex SM, message ING150I is issued.

INGCPSM is the event listener for CICSplex SM. Because it is a long-running automation procedure it needs to be run in a virtual operator station task (VOST). It scans the configuration on startup and listens for events. It then periodically checks whether the configuration has changed (that is, monitor resources have been added, deleted, or changed, etc.) or monitor resources are waiting for initial monitoring (that is, they have STATUS=ACTIVE and HEALTH=UNKNOWN).

### Creating an Application to Manage the VOST

You can manage the VOST that executes INGCPSM using an application of type NONMVS:

- Start the VOST by using the INGVSTRT command as the start command of the APL, where its job name is used as the *attach\_name* of the VOST.
- Stop the VOST using a sequence of INGVSTOP stop commands in the management APL.

- Monitor the status of the VOST using the INGVMON monitoring routine in the management APL.

For more details, see *IBM Tivoli System Automation for z/OS Programmer's Reference*.

### Defining the Monitor Resources

To set up the monitor resources:

1. Define one MTR for each CPSM object (for example, each connection).
2. Fill in the **Monitored Object** field in the MONITOR INFO policy item according to the naming conventions, for example, CPSM.CICS1TOR.CONNECT.CON1
3. Leave the **Monitored Jobname** field empty.
4. Define codes for the message ID ING150I in the MESSAGE/USER DATA policy of the MTR to map the CPSM severities to valid health statuses, for example:

Code 1	Value Returned
VLS	* NORMAL
LS	* WARNING
LW	* WARNING
HW	* MINOR

Refer to the \*CICS add-on policy for sample definitions to monitor the connection between two CICS resources.

---

### Monitoring JES3 Components

The concept of a monitor resource is used to monitor the health of various JES3 components. SA z/OS provides two commands that support a strict separation of the monitoring part and the resulting recovery processing:

- AOFRJ3MN: used to monitor components in the JES3 environment, for example spool space.
- AOFRJ3RC: used to perform recovery actions against the monitored JES3 object.

The following example defines a spool space monitor:

1. Define a monitor resource with a "HasParent" relationship to the corresponding JES3 because it only makes sense to monitor the spool space when JES3 is active.
2. Activate and deactivate commands are not necessary for the spool monitor.
3. Use the AOFRJ3MN command as the monitor command and setup the monitoring interval as desired. In this example, spool usage of up to 60% is NORMAL, 61-70% WARNING, 71-80% MINOR, 81-90% CRITICAL and greater than 90% FATAL.

```
AOFRJ3MN JES3_subys SPOOLSHORT 60,70,80,90
```

4. Define the recovery action in the HEALTHSTATE policy, for example:

```
NORMAL : AOFR3RC JES3_subsys SPOOLSHORT RESET
CRITICAL: AOFRJ3RC JES3_subsys SPOOLSHORT 05
FATAL : AOFRJ3RC JES3_subsys SPOOLSHORT 01
```

## Monitoring JES3 Components

Issue one recovery command every minute. The commands are read from the SPOOLSHORT policy of the JES3 subsystem. When the spool usage goes down to 60% or less, the health status goes to NORMAL. This causes to invoke the AOFR3RC command but now with the RESET option - the RESET option stops recovery. It is recommended that you use JESOPER as the auto-operator for the recovery commands. Note, that the recovery commands for the SPOOLSHORT condition must be defined for the JES3 subsystem.

5. For the JES3 subsystem, define the necessary actions that should be performed for SPOOLSHORT in the Message/User data policy:

Pass	Automated Function	Command
1	JESOPER	MVS &SUBSCMDPFXF U,Q=HOLD,AGE=30D,N=ALL,C
2	JESOPER	MVS &SUBSCMDPFXF U,Q=HOLD,AGE=10D,N=ALL,C
3	JESOPER	MVS &SUBSCMDPFXF U,Q=HOLD,AGE=3D,N=ALL,C
10	JESOPER	MVS &SUBSCMDPFXF U,Q=HOLD,AGE=1D,N=ALL,C

This purges all jobs from the hold queue that are older than 30 days in the first pass. On pass 2, all jobs older than 10 days are purged. On pass 3 all jobs older than 3 days are purged. Finally, after 10 times the pass interval (in our example 5 minutes), all jobs older than 1 day are deleted if the recovery action is not reset in the meantime.

## AOFRJ3MN Routine

Use this routine to monitor various objects in a JES3 environment. The following objects can be monitored:

- MDS queues (Fetch queue, Verify queue, Wait volume queue, Error queue, Allocation queue, Breakdown queue, Unavailable queue, Restart queue, System select queue, System verify queue)
- Current<sup>®</sup> setup depth
- Spool space

For each of the 10 JES3 MDS queues, thresholds may be set for each of the 4 health statuses (Warning, Minor, Critical and Fatal) indicating the number of jobs that particular queue may contain causing to set the corresponding health status. If, for example, the WARNING threshold for the Error queue is set to 5, if 5 or more jobs are pending on the MDS Error queue, the health status is set to Warning.

For the spool space the thresholds define the amount of used space that when exceeded causes to set the corresponding health status.

Whenever AOFRJ3MN is called, it issues the appropriate JES3 command (\*I,Q,S for SPOOLSHORT and \*I,S for the MDS queues) and parses the response. The value extracted from the message text is compared with the thresholds and then the return code is set to the corresponding health status. This simply sets the health status of the Monitor resource (MTR). No recovery action is taken by AOFRJ3MN routine. Use the HEALTHSTATE policy of the Monitor resource to define a recovery action for each health status, if necessary.

The syntax of the AOFRJ3MN routine is as follows:

```
▶▶—AOFRJ3MN—jes3apl—| object |—| threshold-list |—————▶▶
```

**object:**

MDCOUNTQ
MDCOUNTF
MDCOUNTV
MDCOUNTW
MDCOUNTE
MDCOUNTA
MDCOUNTB
MDCOUNTU
MDCOUNTR
MDCOUNTSS
MDCOUNTSV
SPOOLSHORT

**threshold-list:**

|—*warning,minor,critical,fatal*—|

***jes3apl***

Specifies the name of an APL of category JES3 for which this monitor works.

***monitor***

Specifies the JES3 object to be monitored:

<b>MDCOUNTQ</b>	Current setup depth
<b>MDCOUNTF</b>	Fetch queue
<b>MDCOUNTV</b>	Verify queue
<b>MDCOUNTW</b>	Wait volume queue
<b>MDCOUNTE</b>	Error queue
<b>MDCOUNTA</b>	Allocation queue
<b>MDCOUNTB</b>	Breakdown queue
<b>MDCOUNTU</b>	Unavailable queue
<b>MDCOUNTR</b>	restart queue
<b>MDCOUNTSS</b>	System select queue
<b>MDCOUNTSV</b>	System verify queue
<b>SPOOLSHORT</b>	Spool

***threshold-list***

Specifies a list of four threshold values separated by commas:

<b><i>warning</i></b>	Set health status to WARNING if this value is exceeded
<b><i>minor</i></b>	Set health status to MINOR if this value is exceeded
<b><i>critical</i></b>	Set health status to CRITICAL if this value is exceeded
<b><i>fatal</i></b>	Set health status to FATAL if this value is exceeded

If *warning* is not exceeded the health status is set to NORMAL.

## Monitoring JES3 Components

Note that for SPOOLSHORT the values are in percent but for the MDS queues they are absolute numbers. No value checking is done by AOFRJ3MN except for whole numbers.

Note also that the thresholds are tested from FATAL to WARNING. So if you want to go directly from NORMAL to FATAL, you could specify 50,50,50,50

### AOFRJ3RC Routine

This routine performs the recovery action against a monitored object in a JES3 environment.

When AOFRJ3RC is called, it checks whether the system that it is running that holds the JES3 global processor. If not AOFRJ3RC terminates without any further action.

The syntax of the AOFRJ3RC routine is as follows:

```
▶▶—AOFRJ3RC—jes3apl—msg-type—pass-interval—▶▶  
                                  └─RESET─┘
```

*jes3apl* Specifies the name of an APL of category JES3.

*msg-type*

Specifies the message type within the given JES3 APL that the recovery commands are to be read from:

*pass-interval*

Specifies the time interval that AOFRJ3RC should wait before executing the next pass. The format is in NetView notation ( mm, hh:mm, hh:mm:ss or :ss).

#### RESET

If RESET is specified AOFRJ3RC stops the recovery.

AOFRJ3RC looks into the MESSAGE/USER DATA policy definition of the specified JES3 APL. It issues the command that is defined for PASS1 of the given message type. As long as there are commands in higher passes it sets up a NetView timer that re-calls AOFRJ3RC after the given pass interval. Whenever AOFRJ3RC is executed the command that is defined for the next pass is issued as long as one exists.

If RESET is specified instead of a pass interval any pending timer is killed and processing stops.

The return code is always zero.

**Note:** AOFRJ3RC issues the recovery commands in a *fire-and-forget* manner. It does not check whether the recovery action has the desired result. This is done by the monitor. After one or more monitor intervals the health status changes to a less severe one if the recovery shows an effect. If you want to stop recovery actions when the health status returns to NORMAL, for example, you have to code a HEALTHSTATE command that calls AOFRJ3RC with RESET.

---

## JES2 Spool Monitoring

An SA z/OS monitor resource (MTR) is used to monitor JES2 spool file usage. This can be accomplished with an active monitor that queries the spool usage periodically or a passive monitor that listens for HASP050 and HASP355 events.

The JES2 spool monitoring function that is provided includes the following items:

- Automation routines INGRMJSP, INGRMJSP (AOFKSD01), AOFKSD09, and AOFKSD0H. See “INGRMJSP” on page 207, “INGRMJSP (AOFKSD01)” on page 209, “AOFKSD09” on page 200, and “AOFKSD0H” on page 205.
- Automation table entries for system messages HASP050 and HASP355.
- Configuration parameters for the JES2 spool recovery process in the JES2 SPOOLSHORT and JES2 SPOOLFULL policy items of the JES2 application.

---

## DB2 Connection Monitoring

SA z/OS allows you to monitor DB2 connections for both CICS and IMS:

**CICS** The CICS command CEMT INQUIRE DB2CONN is issued regularly after each monitor interval to query the status of the CICS DB2 connection.

For more details, see the sections “Monitoring of CICS DB2 Connections” and “INGRMCDB Routine for the Monitoring of CICS DB2 Connections” in *IBM Tivoli System Automation for z/OS Product Automation Programmer’s Reference and Operator’s Guide*

**IMS** The IMS command DISPLAY SUBSYS is issued regularly after each monitor interval and the response to this command is analyzed with respect to the status of the connection to a DB2 subsystem.

For more details, see the sections “Monitoring of IMS DB2 Connections” and “INGRMIDB Routine for the Monitoring of IMS DB2 Connections” in *IBM Tivoli System Automation for z/OS Product Automation Programmer’s Reference and Operator’s Guide*

---

## IMS Component Monitoring

For IMS automation, SA z/OS enables the monitoring of online log data sets (OLDS) and recovery control data sets (RECON) of IMS control regions, and allows the status checking of the VTAM Application Control Blocks (ACB) and the enablement of logons.

The monitor routines that are provided for this and the necessary definitions to enable the monitoring functions are described in *IBM Tivoli System Automation for z/OS Product Automation Programmer’s Reference and Operator’s Guide*.





---

## Chapter 5. Joblog Monitoring

This section introduces the components of joblog monitoring and describes how to set up the monitoring function using the customization dialogs.

---

### Overview

Joblog monitoring is designed to monitor JES2 spool files only. The current implementation supports any JES2 spool output file regardless of whether the job is executing or the job has finished. However, in the latter case the output must still be available on the JES2 output queue and the user has to ensure that the output is processed only once.

The monitoring function is controlled by SA z/OS based on the definitions of the customization dialog. However, you can monitor jobs which are not controlled by SA z/OS with the following restrictions:

1. You cannot specify any filter criteria to limit the data that is passed to automation. This means any line of data except an empty line which is generally excluded is forwarded to the message automation.
2. The message that is forwarded to message automation is always queued to the autotask LOGOPER. For SA z/OS controlled jobs those messages are queued to the autotask that is responsible for the job in view of SA z/OS.
3. You need to start the monitoring manually using the command `INGJLM START`. Required parameters are the job name and the monitoring interval. In case you want to monitor a data set other than the default data set `JESMSG LG` you also need to specify the appropriate `ddname`. The specification of the owner or the job id are necessary only when multiple jobs with the same job name exist. This could be the case when the job already ended and the output is held on the output queue. In this case it is your responsibility that the job is monitored only once.

You can stop the monitoring function for a particular job at any time using the command `INGJLM STOP` even for SA z/OS controlled jobs. Normally, the monitoring is automatically stopped when the job has ended. For SA z/OS controlled jobs this is done when the job reaches a termination status like `AUTOTERM`, `ENDING`, and so forth. For non-SA z/OS controlled jobs the monitoring is automatically stopped when the job has ended and the monitoring interval has expired twice.

The monitoring task can be suspended for an indefinite time frame using the command `INGJLM SUSPEND`. The accumulated output of all monitored jobs is processed not before the task has been restarted. The output of jobs that have finished in the meantime is lost unless the output is still held on the JES2 output queue. Jobs that have been started after the task was suspended will not be monitored after the task has been restarted. To restart the task use the NetView command `START TASK=INGTJLM`.

In the case of an abend condition the monitoring task performs an internal suspend command with the following exception. The job that caused the error condition is marked "in error" and will be excluded from monitoring when the task is restarted.

**Note:** The monitoring task must be terminated before JES2 is shut down. For this reason the default policy has been updated and the following STOP command has been added to the SHUTINIT phase of JES2:

```
PIPE NETV INGTJLM STATUS
      | LOC /INGTJLM: ACTIVE/
      | EDIT /STOP TASK=INGTJLM/ 1
      | NETV
```

## Limitations

1. The implementation supports ddnames like SYSPRINT rather than the 4th part of the internal data set name of a SYSOUT data set like `userid.jobname.jobid.D000nnnn.*` which makes the data set name unique. However, this limits the monitoring of ddnames that are specified more than once in a multi-step job. In this case only the last ddname is and can be monitored.
2. Executing SA z/OS controlled jobs which are running less than two seconds are probably not monitored. One reason is that the automation does not find the job active any longer. Or, JES has deallocated the resource before the monitoring task could allocate it. The latter case is also true for non-SA z/OS controlled jobs when the output is not held on the JES output queue after the job ended. In any case specify a message class when starting the job that leaves the output on the JES output queue and trigger the monitoring manually.

---

## Customization

For SA z/OS controlled jobs you have to define the monitoring interval, the messages and data sets to be monitored for each job in the customization dialog. The main definition which actually initiates the monitoring for a job is the definition of the monitoring interval. You specify the interval at the policy "APPLICATION INFO".

**Note:** Without the interval definition no monitoring takes place regardless of what the policy "MESSAGES/USER DATA" specifies.

```
Command ==> _____ Application Information _____ Line 00000001
                               Scroll ==> CSR_

Entry Type : Application          PolicyDB Name : SAMPLE_PDB
Entry Name : JLMS05              Enterprise Name : KEYPLEX
:
JCL Procedure Name . . . . AAZJLMS _____
Job Log Monitor Interval . 00:17 (mm:ss NONE)
Captured Messages Limit . ____ (0 to 999)
:
```

*Figure 8. ISPF dialog defining the joblog monitoring for an application. The dialog accepts an interval time from 1 second up to 1 hour.*

One predefined message id exists to trap all messages of a particular ddname:

### **JOBLOGALL**

forwards all non-empty messages to automation. It requires the Key/Data pair "JLM\_OFFSET NO" (see below) for building the appropriate ACF fragment. You can optionally specify the keyword JLM\_DDNAME for monitoring a different ddname than JESMSGGLG.

Three keywords are supported for trapping dedicated messages that should be forwarded to automation:

**JLM\_DDNAME**

defines the ddname of the data set that contains the message id. By default the ddname JESMSGGLG is used.

**Note:** You can specify multiple ddnames for the same message id.

**JLM\_OFFSET**

defines the offset of the message id in the data set. For dummy message ids specify the offset 0. In this case you also need to define Key/Data pair of keyword JLM\_TOKEN.

**JLM\_TOKEN**

consists of two values enclosed in parentheses and separated by a comma. The first value defines the token number while the second value defines the value to be checked. The wildcard '\*' is supported.

**Notes:**

1. For the JESMSGGLG data set the token number depends on the message line that is to be checked.
2. Generally speaking, the message text starts at column 20.
3. The very first line of a message shows the time and the job id in the first 19 columns.
4. The wrapped text shows blanks in the first 19 columns.
5. Follow-on lines of a multi-line message show the number ending the first line in the first 19 columns.<sup>1</sup>

Dedicated messages that should be automated must be defined by specifying the offset of the message id within a single line and optionally one or more tokens making the message unique. An offset value of 0 indicates a message without a particular id. In this case at least one token pair must be defined to identify the message. In case all messages are relevant and should be automated the common message id value JOBLGALL is to be specified. This id does not require any further user data specification. However, the dialog will not generate an ACF fragment unless the message id has attached any of the definitions "S", "C", "R", "K", or "U". For this reason, the user data keyword/value pair JLM\_OFFSET=N0 is required.

```

Message Processing          Line 00000001 Col 001 075
Command ==>>> _____ Scroll ==>>> CSR__
Entry Type : Application      PolicyDB Name : SAMPLE_PDB
Entry Name : JLMS05          Enterprise Name : KEYPLEX
:
Cmd Message id      Description          Cmd Rep Cod Usr A M
u_ JOBLGALL        Automate all JESMSGGLG messages_____  * *
:
  
```

Figure 9. ISPF dialog defining the joblog monitoring of all JESMSGGLG messages (1/3)

**Note:** Each message id processed by joblog monitoring must be excluded from the AT, the MRT, and the MPF member unless the message id is also processed by another automation function which requires an entry in one or all

1. For example specifying JLM\_TOKEN (4,'1') results in checking:

- the 1st token after the message id or the 2nd token of the message text without a message id
- the 4th token of the message text
- the 3rd token of the message text.

indicated members.

```

User Data Processing : JOBLGALL          Line 00000001 Col 001 075
Command ==> _____ Scroll ==> CSR_
:
Cmd Keyword          Data
___ JLM_OFFSET _____ NO _____
:

```

Figure 10. ISPF dialog defining the joblog monitoring of all JESMSGLG messages (2/3)

When specific messages are monitored the keyword JLM\_OFFSET must define the actual offset of the message id in the corresponding SYSOUT data set. For the JESMSGLG data set the offset of all text begins at column 20 regardless of whether it is a multi-line message or the message text is wrapped because it is longer than 126 characters (including the 19 bytes prefix). Follow-on lines of a multi-line message show the console id of the multi-line message at column 4. Wrapped message text shows blanks in the first 19 columns. Thus, trapping tokens of such messages requires the knowledge of the exact position of each token. The first two tokens of the first line of each message are the time and the job id. Other SYSOUT data sets certainly have different layouts.

The first token definition in the sample below ends with the character '\*'. This indicates that the message tokens are checked for all characters up to the star character only. The star character and all immediately following non-blank characters are ignored. The indicated message is passed to automation when its id is found at column 21 and the next token after the id has the value '3' and the 7th token begins with KEY=.

```

User Data Processing : cccnnna          Line 00000001 Col 001 075
Command ==> _____ Scroll ==> CSR_
:
Cmd Keyword          Data
___ JLM_OFFSET _____ 21 _____
___ JLM_TOKEN _____ (7, 'KEY=*) _____
___ JLM_TOKEN _____ (4, '3') _____
:

```

Figure 11. ISPF dialog defining the automation of specific messages. The value of the token must be enclosed in apostrophes.

In the case where you want to monitor data sets other than the JESMSGLG data set you need to qualify your message definition(s). The following sample shows you that the SYSOUT data sets referenced by the ddname AAZOUT and SYSPRINT pass every message to automation.

```

User Data Processing : JOBLGALL          Line 00000001 Col 001 075
Command ==> _____ Scroll ==> CSR_
:
Cmd Keyword          Data
___ JLM_OFFSET _____ NO _____
___ JLM_DDNAME _____ SYSPRINT _____
___ JLM_DDNAME _____ AAZOUT _____
:

```

Figure 12. ISPF dialog defining the joblog monitoring of specific messages. The parameter JLM\_DDNAME defaults to JESMSGLG when omitted.

The build process will automatically generate the following common MAT entry for automating the message INGY1300I but only for SA z/OS controlled jobs:

```

* INGY1300I for jobs defining a message id
IF MSGID = 'INGY1300I' & TOKEN(6) ^= 'N/A'
  & TOKEN(3) = SVJOB & TOKEN(6) = MSGTYPE THEN
  DISPLAY(N) NETLOG(Y) SYSLOG(N)
  EXEC(CMD('ISSUEACT JOBNAME='SVJOB' MSGTYPE='MSGTYPE)
    ROUTE(ONE %AOFOPGSSOPER%)
  );

```

Figure 13. Common MAT entry for message INGY1300I and jobs defining a message id for monitoring. The value N/A indicates a message coming from a job that has not defined a message id for monitoring.

This just needs the definition of the command(s) that should be executed on behalf of the message id, for example:

Message Processing		Line 00000001 Col 001 075
Command ==>		Scroll ==> CSR
Entry Type :	Application	PolicyDB Name : SAMPLE_PDB
Entry Name :	JLMS05	Enterprise Name : KEYPLEX
:		
Cmd Message id	Description	Cmd Rep Cod Usr A M
c_ JOBLOGALL	Automate all JESMSGLG messages	1 * *
:		

Figure 14. ISPF dialog defining the joblog monitoring of all JESMSGLG messages (3/3)

Note that the message INGY1300I is a multi-line message. The first line is the label line which provides the following tokens OWNER, JOBNAME, JOBID, DDNAME, MSGID in the sequence as shown. The latter token is exactly the message id that you have specified on the 'Message Processing' dialog. Each subsequent line represents a line of the original message.

If you want to monitor jobs that are not defined in the policy or that are defined in the policy but do not have defined a message id for monitoring, you need to add a MAT entry manually like the following:

```

* INGY1300I for jobs having no message id defined
IF MSGID = 'INGY1300I' & TOKEN(6) = 'N/A' THEN
  DISPLAY(N) NETLOG(Y) SYSLOG(N)
  EXEC(CMD('xxxxxxx ...))
  ROUTE(ONE %AOFOPGSSOPER%)
);

```

Figure 15. Common MAT entry for message INGY1300I and jobs without defining a message id for monitoring

In both cases you have to start the monitoring manually. And, since no filter criteria are defined all messages are passed to automation.

**Note:** When you use the NetView PIPE stage SAFE for retrieving the message you will find the message in the named area '\*'.

## Status Information

The command `INGJLM STATUS` which can also be issued in a NetView PIPE returns the current status of the monitoring task and its monitored data sets:

```

Status of task IGNTJLM: {ACTIVE|INACTIVE|SUSPENDED}
Owner   Jobname  Jobid   DDname  Status  Freq. Last      Read  Passed
-----
xxxxxxx xxxxxxx xxxxxxx xxxxxxx xxxxxxx mm:ss hh:mm:ss nnnnnn nnnnnn
                nnnnnn nnnnnn
xxxxxxx xxxxxxx xxxxxxx xxxxxxx xxxxxxx mm:ss      n/a nnnnnn nnnnnn
                nnnnnn nnnnnn
*** Status complete ***
    
```

Figure 16. Joblog monitoring status information

The status of a data set shows the following information:

- E.....** The data set is marked "in error" and is not monitored any longer.
- .A.....** The data set is allocated.
- ..0.....** The data set has been opened successfully.
- ...U....** The user is not allowed to read the data set.
- ....S...** The monitoring of the data set is ACF-based.
- .....M..** All messages are passed to automation.
- .....J.** The corresponding job has not been found on the chain of active address spaces.
- .....I** The spool data set is not initialized. The allocation of the data set is retried at the next monitoring interval. This repeats until the data set has been initialized.

The frequency shows the interval in minutes and seconds between two checks for accumulated messages. The next column shows the time when the last check occurred. The last two numbers show the total number of messages that have been read as well as the number of messages that have been passed to the automation table. The second status line of each data set shows the number of messages read and passed to automation since the last check.

---

## Chapter 6. Alert-Based Notification

SA z/OS provides an alert-based notification service that enables you to alert subject-matter experts. You can escalate automation problems that require manual intervention by sending alerts, events or trouble tickets to different kinds of notification targets. SA z/OS supports several communication methods that allow you to deliver alerts to notification targets such as:

- System Automation for Integrated Operations Management (SA IOM)
- Tivoli Enterprise Console (TEC)
- Tivoli NETCOOL/OMNIbus
- IBM Tivoli Service Request Manager®
- A user-defined alert handler

---

### Overview

The alert-based notification service of SA z/OS allows alerts to be sent to operators or system programmers for predefined situations. You can also customize when to issue alerts, if desired, using the customization dialog and the INGALERT utility. Alerts can only be issued for applications (APL), monitor resources (MTR), application groups (APG), and MVS components.

An alert is a set of information that is collected and sent by an SA z/OS automation agent to a target for notification processing. The information that is sent consists of the text that is to be forwarded to the alerted person or group. This information is supplemented by additional options that determine in detail the processing at the different kinds of notification targets.

In SA z/OS there are several predefined alert points that trigger alerts whenever a command encounters a problem situation, such as a resource becoming degraded or not being up within a given time interval.

Alerting can be enabled or disabled at various levels:

- Globally using the INGCNTL command
- Resource-specific using the resource's Inform List
- Alert-specific using code definitions for the message ID INGALERT

---

### Communication Flow

Figure 17 on page 72 outlines the communication between the automation manager and the automation agents.

## Alert-Based Notification

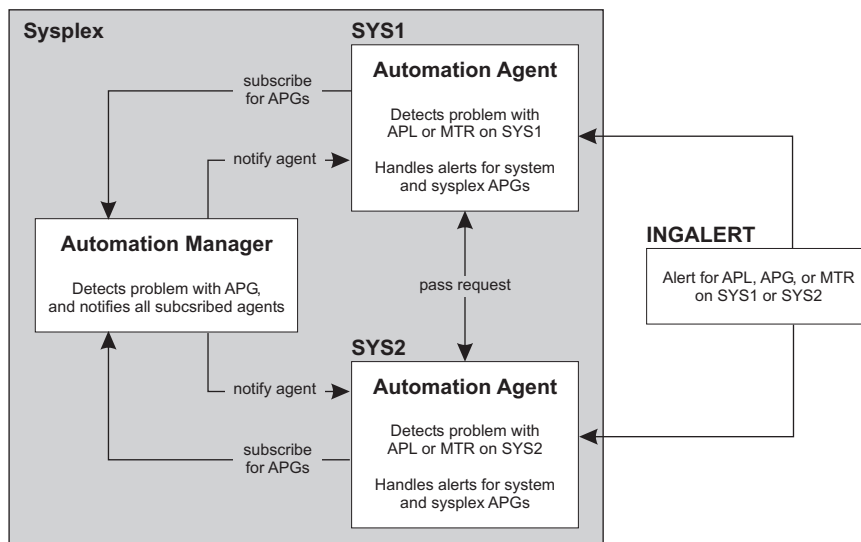


Figure 17. Alert Communication Flow

The automation agents on the systems in the sysplex subscribe to the automation manager to be alerted about problems with system or sysplex application groups (APGs). This is because the automation manager cannot itself send alerts to the notification targets. Whenever the automation manager detects a problem with an APG it sends an alert to the subscribed automation agents (one in case of a system APG, and all in case of a sysplex APG). Any alerts for sysplex APGs are handled by only one automation agent in the sysplex.

The automation agents can also receive alerts for applications, application groups, or monitor resources via the INGALERT command. If the affected resource is managed by a different automation agent, the request is passed on. The automation agent that manages the resource sends the alert to the notification target. If, for whatever reason, this automation agent cannot send the alert, it passes on the request to the next automation agent in the sysplex. This can happen several times until the alert is successfully sent or no more automation agents are available.

For each alert, the automation agent connects to a notification target, sends the alert and then disconnects. The automation agent does not maintain a permanent connection to the SA IOM server.

---

## Enabling Alerting

By default alerting is not enabled. To activate it you must perform setup actions in both SA z/OS and notification target.

### Setup in SA z/OS

You can turn alerting on or off at three different levels in SA z/OS:

- The system level, via the INGCNTL command. Turning off alerting means that no alerts are detected or accepted by the system. Alerting must be turned on explicitly either globally or selectively for at least one notification target.
- The resource level, via the Inform List policy field. Turning off alerting means that no alerts are detected or accepted for the resource. The notification target must be explicitly specified (or inherited from the defaults) to activate alerting for it.



- The alert ID level, via code definitions for the INGALERT message ID of the resource or MVS component entry.

### INGCNTL Command

By default alerting is not enabled. You have to issue the INGCNTL command to enable it and set the connection properties for the notification target. This can be done as follows:

- In the NetView style sheet using auxiliary commands:
 

```
*****
* Auxiliary commands
*****
* Enable Alerting and set connection properties
auxInitCmd.A = INGCNTL SET ALERTMODE=IOM ALERTHOST=saiom:1040:SAALERT
```
- From the AOFEXDEF exit that is supplied with SA z/OS:
 

```
'INGCNTL SET ALERTMODE=IOM ALERTHOST=saiom:1040:SAALERT'
```

See *IBM Tivoli System Automation for z/OS Programmer's Reference* for more information about the INGCNTL command.

### Inform List

You have to include the appropriate communication method for the notification target in the Inform List field of the appropriate policy item to explicitly enable alerting for specific resources or classes of resources, as shown in Table 7.

Table 7. Inform List Policy Items

Policy Object	Policy Item
Application Group (APG)	APPLGROUP INFO *
Application (APL)	APPLICATION INFO *
Monitor Resource (MTR)	MONITOR INFO *
MVSCOMP Defaults (MDF)	MVSESA INFO *
System Defaults (SDF)	AUTOMATION OPTIONS
Sysplex Defaults (XDF)	RESOURCE INFO
* Leaving the Inform List field blank allows the policy object to inherit the value specified in the system defaults or sysplex defaults definition.	

You must also specify the appropriate communication method for the desired notification target as shown in Table 8.

Table 8. Inform List Communication Methods

Value in Inform List	Communication Method	Supported Notification Target in SA z/OS
IOM	Peer-to-peer protocol of IBM Tivoli System Automation for Integrated Operations Management (SA IOM)	SA IOM
EIF	Tivoli Event Integration Facility (EIF)	TEC or OMNIBUS
TTT	XML	TSRM via TDI
USR	Command call	User-defined alert handler

You can specify a blank-separated list of values to enable alerting for several notification targets.

## Alert-Based Notification

### Code Processing

Code processing with the INGALERT message ID allows you to define additional characteristics for events to be passed to the notification target or to prevent event creation for certain alerts. Such definition can be made, dependent on the alert ID, issuing job and type of notification target.

Code definitions for message ID INGALERT can be used for resources of type APL, APG, MTR, and for MVS components. If no matching code definitions are found for the APL, APG or MTR resources, the INGALERT code definitions are checked for the corresponding MVS component entry on the system where the resource resides.

Enter the following in the Code Processing panel for the INGALERT message ID:

**Code 1**      The alert ID that identifies the type of alert. SA z/OS provides the following set of built-in alert points:

Alert ID	Description	For Resource Type
CMD_FAILED	Return code checking is on and the command ended with RC≠0	APL, MTR
COMM_FAILED	An error was detected during communication to another system	APL
CRITICAL_WTOR	WTOR defined as CRITICAL without defined REPLY.	APL
MSG/Message ID	Messages with a critical severity. The message can be abbreviated by means of wildcard, for example, MSG/DFS54*	APL, APG, MTR
OS_DEGRADED	The observed status of the resource has become degraded	APL
OS_PROBLEM	The automation status is ZOMBIE or BROKEN, or a shutdown outside SA z/OS and restart is not allowed	APL
REC_FAILED	Automation was halted because the critical threshold for a minor resource was exceeded	APL
REP_FAILED	No further outstanding WTORs that are stored by SA z/OS need to be replied to	APL
START_FAILED	The start command failed	APL
START_PENDING	The up message was not received within the timeout interval	APL
STOP_PENDING	Ran out of stop commands	APL
CS_PROBLEM	The compound status PROBLEM has been set	APG
OPCERR	Indicates a status change to a TWS resource as reported by message EVJ120I	APL

You can also use any user-defined alert ID. Simply specify it in the corresponding code entry and call `INGALERT` with this ID. Wildcards are supported.

**Code 2** For APL this is the job name that alerting should be done for. For MVC it contains `MVSESA`. For APG and MTR Code 2 is ignored. Wildcards are supported. This allows you to set alerting for several APLs at once by using APL classes.

**Code 3** The communication method that is used to send the alert to the notification target. Valid values are `IOM`, `EIF`, `TTT` or `USR`. Wildcards are supported.

### Value Returned

This can be either `IGNORE` to prevent event creation, or parameters that are sent to the notification target together with the passed event. The meaning of these parameters depends on the type of communication method, as follows:

**IOM** The first two tokens of the Value Returned are considered to be:

- The priority of the alert (0–999).
- The escalation ID that is used in SA `IOM` to define the rules that determine how the alert should be processed. The length of this value is limited to 20 characters.

If the first two tokens have invalid values, the Value Returned is assumed to be `IGNORE`.

If you specify more than two tokens in the Value Returned field, the superfluous tokens are ignored.

**EIF** The Value Returned is considered to be the event severity. Valid values are `HARMLESS`, `WARNING`, `MINOR`, `CRITICAL` or `FATAL`, or a corresponding number between 1 and 5, where 1 corresponds to `HARMLESS`, etc. Both alternatives for specifying a severity can be used for events to `TEC` or `NETCOOL/OMNIbus`. When specifying the severity as a number, the code definition can also be used to send alerts to SA `IOM`.

If you do not specify a valid severity, the Value Returned is assumed to be `IGNORE`.

Superfluous tokens in the Value Returned field are ignored.

**TTT** If `TSRM` is the notification target, the values in Value Returned are used as:

- The priority of the trouble ticket as it is initially reported (1-5)
- The urgency, which is a indication of how quickly a trouble ticket should be resolved (1-5)
- The business impact or severity of the trouble ticket (1-5)

These values are not validated because other targets may expect other values.

If you specify more than three tokens in the Value Returned field, the superfluous tokens are ignored. If you specify less than three tokens, they are used according to their position and the missing tokens default to `N/A`.

## Alert-Based Notification

**USR** The content of the Value Returned field is passed to the user-defined alert handler that is called.

**Code Definitions Example:** Consider the example in Table 9.

Table 9. Code Processing Example for the *INGALERT* Message ID

Code 1	Code 2	Code 3	Value Returned
START_FAILED	IMS*	IOM	500 IMS_start
START_FAILED	DB2*	EIF	CRITICAL
*	*	*	IGNORE

The code definitions in this example result in the following behavior:

- Alerts with the alert ID `START_FAILED` for jobs with the name prefix `IMS` are sent to `IOM` with priority 500 and escalation ID `IMS_start`.
- Alerts with the alert ID `START_FAILED` for jobs with the name prefix `DB2` are sent as `EIF` events to `TEC` or `NETCOOL/OMNIbus` with event severity `CRITICAL`.
- All other alerts are ignored for all notification targets.

---

## INGALERT Command

You can use the `INGALERT` command to inject alerts into a system. This can be from either the NetView automation table, an automation procedure, or the command line.

You can specify the following parameters:

- A resource name , the text `MVSESA`, or a job or subsystem name.
- The alert ID, for example, `CS_PROBLEM`, `CMD_FAILED`, etc.
- A message ID that identifies the message text or a text string that is passed to the notification target.

For example, the following can be used from the command line or an automation procedure:

```
INGALERT MYGRP/APG/SYS1 ID=MYALERT TEXT=(MYGRP HAS A PROBLEM)
```

In this example, `INGALERT` uses the alert ID, `MYALERT`, to obtain additional parameters via a matching code definition for the message ID `INGALERT`, and it uses the `TEXT` parameter value for the alert text.

The following can be used from the NetView automation table to send an alert whenever message `ABC123I` is issued:

```
IF MSGID='ABC123I'  
THEN  
EXEC(CMD('INGALERT'));
```

`INGALERT` uses `ABC123I` as the alert ID and the complete text of message `ABC123I` as the alert text. The resource parameter of `INGALERT` is defaulted to the job name of the subsystem that issued the message.

See *IBM Tivoli System Automation for z/OS Programmer's Reference* for more information about the `INGALERT` utility.

---

## Chapter 7. Availability and Recovery Time Reporting

SA z/OS introduces support to assist you in billing users or reporting reliability of your critical applications or the software that those applications are dependent on. For example, you might want to charge accurately based on the amount of time required to run an application. This is of importance for non-MVS resources, such as USS applications, or monitoring resources that might run in the NetView address space.

---

### Overview

SA z/OS collects and records job-related information, and writes System Management Facility (SMF) records at specific events in the lifetime of a resource. This resource can be:

- A subsystem (APL)
- An application group (APG) that is hosted by the local system as well as sysplex application groups
- A monitor resource (MTR)

The INGPUSMF batch utility produces a report file that you can import into a spreadsheet. You can also convert and write the report into DB2 tables that are provided and exploited by the IBM Tivoli System Automation Application Manager. For more details, see “Writing the SMF Report to DB2” on page 82.

You can control whether a record is written for a resource by entering the value SMF in the Inform List field in the resource's information policy item.

---

### Resource Lifecycle

Figure 18 shows the events in the lifetime of an application when SA z/OS records information.

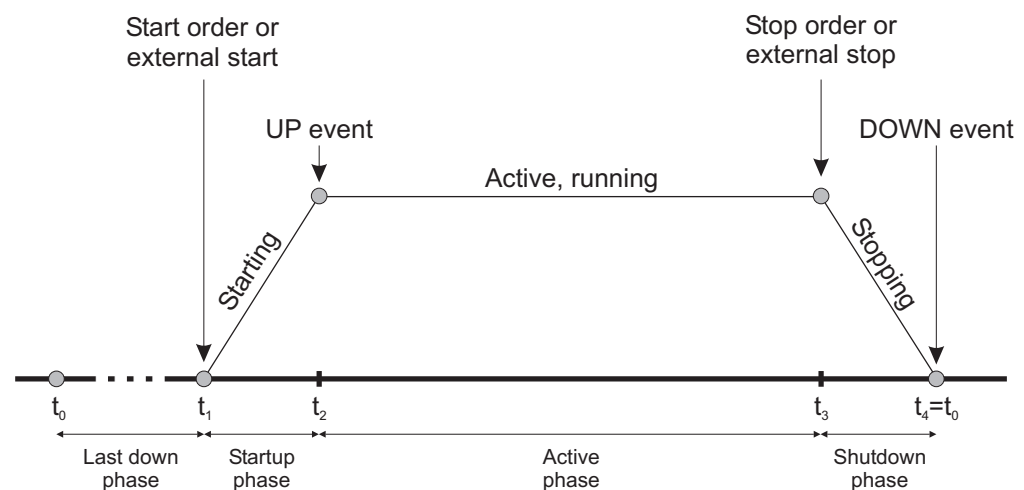


Figure 18. Events in the Lifecycle of an Application

These events are:

## Availability and Recovery Time Reporting

- Start order received from the automation manager ( $t_1$ )
- UP signal received ( $t_2$ )
- Stop order received from the automation manager ( $t_3$ )
- DOWN signal received ( $t_4=t_0$ )

By examining these records you can establish the following information for a given time period:

- Application up time and downtime
- Application startup and shutdown time
- The number of scheduled stoppages and the approximate amount of scheduled downtime
- The number of unscheduled stoppages and the approximate amount of unscheduled downtime

To make using SA z/OS SMF records easier, the following periods are automatically calculated and stored (in units of seconds) in the SMF record:

- The startup time ( $t_2-t_1$ )
- The shutdown time ( $t_4-t_3$ )
- The time the application was active ( $t_3-t_2$ )
- The last down time ( $t_1-t_4$ )

You therefore have a precise view of the lifecycle of the application.

---

## Layout of the SMF Record

Table 10 provides details of the data that is stored in the SMF record.

*Table 10. Layout of the SMF Record*

Offset	Length	Format	Description
00	2	Binary	Record length. This field and the next (a total of 4 bytes) form the record descriptor word (RDW).
02	2	Binary	Segment descriptor. This is zero.
04	1	Binary	System Indicator Bit: 0 Reserved 1 Subtypes used
05	1	Binary	SMF Record Type. This is 114.
06	4	Binary	The time, since midnight, that the record was moved into the SMF buffer (in hundredths of a second).
10	4	Packed	The date when the record was moved into the SMF buffer, in the form <i>0cyydddF</i> .
14	4	EBCDIC	System Identification (from the SID parameter).
18	2	Binary	Record subtype: 1 Automation tracking record
20	2	Binary	Record version.
22	2	—	Reserved.
24	4	Binary	Offset to product section from start of record, including the record descriptor word (RDW).
28	2	Binary	Length of product section.
30	2	Binary	Number of product sections. This is always 1.

Table 10. Layout of the SMF Record (continued)

Offset	Length	Format	Description
32	4	Binary	Offset to resource section from start of record, including the record descriptor word (RDW).
36	2	Binary	Length of resource event section.
38	2	Binary	Number of resource event sections. This is always 1.
40	8	—	Reserved.
<b>Product Section</b>			
00	16	EBCDIC	Product name, for example SA z/OS V3R2M0.
16	8	EBCDIC	Name of the SYSPLEX.
24	8	EBCDIC	Domain identifier.
32	8	EBCDIC	MVS System name.
40	8	EBCDIC	XCF group name.
<b>Automation Section</b>			
00	24	EBCDIC	Resource name (in automation manager notation).
24	8	EBCDIC	Job name (optional).
32	2	Binary	Event type: X'0001' Starting X'0002' Active X'0003' Stopping X'0004' Inactive X'0005' Degraded
34	2	—	Reserved.
36	12	EBCDIC	Automation agent status (optional).
48	12	EBCDIC	Start type.
60	12	EBCDIC	Stop type.
72	5	EBCDIC	Termination type (abend code). Optional.
77	3	—	Reserved.
80	4	Binary	Total startup time in seconds.
84	4	Binary	Elapsed time in seconds that the resource was active.
88	4	Binary	Total shutdown time in seconds.
92	4	Binary	Last down time of resource in seconds.

---

## Enabling SMF Records

To enable SMF records for a resource:

1. Ensure that the SMFPRMxx member in SYS1.PARMLIB is set up to collect type 114 SMF records by adding type 114 to the SYS(TYPE statement:  
SYS(TYPE(30,...,114)
2. Specify SMF in the Inform List of the APPLICATION INFO policy item for the resource.

### The INGPUSMF Utility

You can use the INGPUSMF utility to analyze SMF records and produce a data set that can be imported into a spreadsheet program. The data set contains the type 114 records that SA z/OS produces in a format that can easily be imported. By default, the fields are semicolon delimited.

#### Output

The first record in the data set is a title record that describes each column. The remaining records are the data records. One data record is written for each type 114 SMF record.

Table 11 describes the format of each record.

*Table 11. Format of INGPUSMF Utility Data Set Records*

Column	Description
1	SMF system ID
2	Date when SMF record was written, in YYYYMMDD format
3	Time when SMF record was written, in hhmmss format
4	SA z/OS product name, including release level
5	Name of sysplex
6	System name
7	NetView domain ID
8	XCF group name
9	Resource name in automation manager notation
10	Job name, if present
11	Event
12	Automation agent status
13	Startup time in seconds
14	Active time in seconds
15	Shutdown time in seconds
16	Down time in seconds
17	Start type
18	Stop type
19	Termination (abend) code

#### The INGPUSMF Utility JCL

The INGPUSMF utility runs as a batch job. See INGEUSMF for a sample. The meaning of the DD statements is as follows:

##### **STEPLIB**

The load library that contains the INGPUSMF utility. The utility resides in the SINGMOD1 library.

##### **REPORT**

The output data set that contains the spreadsheet import data set in a semicolon-delimited format. The record size is 255 bytes.



### **SYSPRINT**

Contains information that is written by the utility.

### **HSATRACE**

Is used for debugging purposes only. If present, the INGPUSMF utility writes trace entries to record the process flow.

### **SMFDATA**

Contains the SMF records. The record format is: Variable, blocked, spanned.

### **USRPARMS**

Contains user options, such as filter criteria or a specific separator character.

## **User Options**

You can specify various options in the USRPARMS data set that control the processing of the utility. You must specify each option in a separate record. The options are defined as keyword=value pairs. If you specify an option several times, the last occurrence is used. The keyword must start in column 1 of the record. No blanks are allowed in front of or after the equal sign (=). An asterisk (\*) is considered to be a comment.

The following options are supported:

### **SEPCHAR=*char***

Defines the separator character to be used to separate the columns. The default is a semicolon (;) if omitted.

### **SYSID**

Defines the SMF system ID used as a filter. Only SMF records that are generated by that system are taken. The value can be 1–4 characters.

### **FROM=*date***

The starting date used as a filter. The format is YYYYMMDD. All SMF records written on the specified date or later are taken.

### **TO=*date***

The ending date used as a filter. The format is YYYYMMDD. All SMF records that are written no later than the specified date are taken.

### **RESOURCE=**

Defines the resources in automation manager notation used as a filter. You can specify up to 10 resource names. The name can be a wildcard, such as \*abc, abc\* or \*abc\*.

## **Return Codes**

The following return codes are set by the utility:

- 0** Normal completion.
- 8** Invalid option detected in the USRPARMS data set.
- 12** REPORT data set is not accessible.
- 16** A severe error occurred, for example, an open error for the SMFDATA data set, or writing a record to the REPORT file.

### Writing the SMF Report to DB2

You can convert and write the SMF report that is produced by INGPUSMF into DB2 tables that are provided and exploited by the IBM Tivoli System Automation Application Manager.

The following reports are provided:

- **Startup and Shutdown Reports:**
  - Report the cumulative startup and shutdown times for a resource, including its dependencies.
  - Report resources with the longest startup and shutdown times in a selected domain.
- **Availability and Recovery Reports:**
  - Report a resource's uptimes and downtimes, unexpected outages and corresponding recovery times.
  - Report resources that had the highest number of unexpected outages in a selected domain.

A conversion utility, known as the z/OS offloader, delivers the z/OS domain data that is required to run these reports.

The z/OS offloader component runs as a batch job (see Figure 19) and uses existing and new programs that are installed into the end-to-end automation adapter HFS directory, which is normally /ust/lpp/ing/adapter.

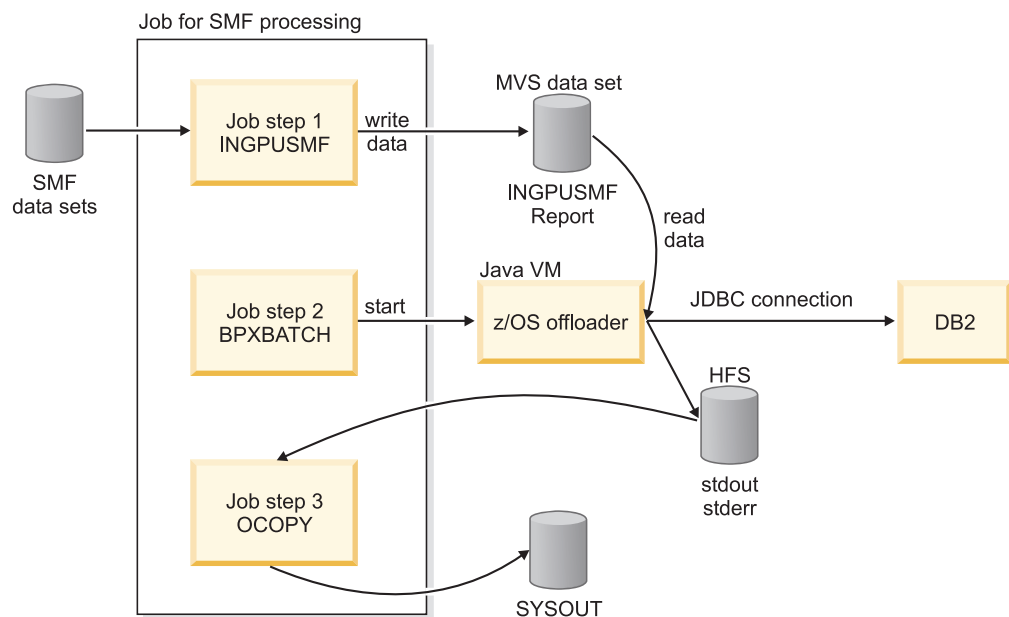


Figure 19. SMF Processing with z/OS Offloader

You can use the sample job INGXPRT to run the z/OS offloader.

### Customization

After installing the z/OS offloader you must carry out the following customization steps:

Step 1. Customize the script /usr/lpp/ing/adapter/ingreport.sh.

Adapt the installation path:

## Availability and Recovery Time Reporting

INSTALL\_DIR=/usr/lpp/ing/adapter

Step 2. Copy the sample job INGXRPT and follow the steps as described in it.

There are several input parameters that you need to set correctly otherwise the conversion utility cannot access the DB2 table:

Parameter	Details
INGDSN=HLQ.SMF.REPORT	The data set of the SMF report created by the INGPUSMF utility.
INGSEPCHAR=;	This must be the separator as used by the INGPUSMF utility.
INGDOMAIN= <i>MyDomain</i>	The name of the E2E domain as specified in the E2E adapter configuration file, <i>ing.adapter.plugin.properties</i> . If omitted the default is used, which consists of the sysplex name and XCF group name.
INGDB2_USER= <i>db2inst1</i>	The DB2 user name for remote logon.
INGDB2_PSW= <i>db2admin</i>	The DB2 password for remote logon.
INGDB2_PORT=50000	The TCP/IP port to connect to the remote DB2.
INGDB2_SERVER= <i>db2-host-name</i>	The TCP/IP host name to connect to the remote DB2.
INGDB2_NAME=EAUTODB	The DB2 name or the DB2 location if DB2 resides on z/OS.
INGDB2_SCHEMA=EAUTOUSR	The DB2 schema of the table.

Step 3. (Optional) If the database is located on a z/OS system, a DB2 license file is required. An appropriate license file for the z/OS platform, *db2jcc\_license\_\*.jar*, must be installed in the application classpath. Connectivity to z/OS databases is enabled with the license file as defined by the following table.

Update DB2 database From==> To	License file required
Distributed system ==> z/OS DB2	<i>db2jcc_license_cisuz.jar</i>
z/OS system ==> z/OS DB2	<i>db2jcc_license_cisuz.jar</i>
z/OS system ==> distributed DB2	<i>db2jcc_license_cu.jar</i>

- a. Copy the appropriate license file, for example, from *DB2\_INSTALL\_PATH/db2/db2v8/jcc/classes/db2jcc\_license\_cisuz.jar* to the directory */usr/lpp/ing/adapter/lib*.
- b. Modify the classpath in the script */usr/lpp/ing/adapter/ingreport.sh* and add the license file for example:

```
DB2_LICENSE=$INSTALL_LIB/db2jcc_license_cu.jar
```

Step 4. Run the INGXRPT job that copies the SMF report to DB2.

## Output

The output of the *ingreport.sh* shell script shows the progress of the z/OS offloader. Any errors that occur are reported in this output. See *IBM Tivoli System Automation for z/OS Messages and Codes* for details of these messages (INGX9850E, INGX9855E, and INGX9856E).



---

## Chapter 8. How to Automate Processor Operations-Controlled Resources

This chapter contains information on how to customize your SA z/OS installation to enable the automation of messages coming from target systems that are controlled by processor operations. These target systems or resources are referred to as *processor operations resources* in the following.

Processor Operations, which is a focal point type function, allows you to monitor and control processor hardware including Coupling Facility images, from a single NetView, the processor operations focal point.

### Notes:

1. VM guest systems are treated the same as any other target systems that are controlled by ProcOps (see *IBM Tivoli System Automation for z/OS Operator's Commands* for details).
2. PSMs are "virtual" hardware and therefore not all target hardware commands apply (see *IBM Tivoli System Automation for z/OS Operator's Commands* for details).

With the method described in this chapter, you can use SA z/OS system operations to react on these messages. This information is contained in "Automating Processor Operations Resources of z/OS Target Systems Using Proxy Definitions," which introduces the general process how to achieve such message automation.

---

### Automating Processor Operations Resources of z/OS Target Systems Using Proxy Definitions

SA z/OS processor operations can be used to automate messages that cannot be automated on the target systems themselves. Typically these messages include those appearing at IPL time.

In a sysplex environment there are additional messages (XCF WTORs) being displayed at IPL time when joining the sysplex and at shutdown time when a system is leaving a sysplex. These WTOR messages cannot be automated yet because SA z/OS system operations is not active at that time.

With the XCF message automation framework described in this chapter, you have a method of exploiting your own XCF message automation.

**Note:** There are XCF WTOR messages which are automatable by Sysplex Failure Management (SFM). In these cases, to avoid conflicting automation, it is not recommended that you automate these messages by SA z/OS.

### Concept

You can use the SA z/OS standard interface and routines to handle system external messages in almost the same way as system internally generated messages. This applies to the way of defining message automation in the customization dialog as well as to the means available for controlling message automation at automation time.

## How to Automate Processor Operations Controlled Resources

To exploit the system operations mechanism for message automation, a *proxy resource* representing the processor operations resources must be generated in the customization dialog as entry type Application (APL).

There is a one-to-one relation between a proxy and a processor operations resource (target system). How to implement this relation in the customization dialog is described in the following subsections.

Messages that are generated on external systems, where no SA z/OS is active or not yet active, can also be automated. The resources generating these messages are called *processor operations resources*. They are defined in the customization dialog as entry type System (SYS).

### Customizing Automation for Proxy Resources

It is assumed that you have already used the customization dialog to define processor operations target systems and made these systems accessible to the processor operations focal point via the Processor Control file (see also *IBM Tivoli System Automation for z/OS Defining Automation Policy*). So for every processor operations target system that has been defined on the processor operations focal point, you should define a proxy resource. You do this by defining the proxy resource as entry type Application (APL) in the customization dialog.

**Note:** If you want to define many proxy resource applications, you can use the application class concept as described in *IBM Tivoli System Automation for z/OS Defining Automation Policy*.

Defining the proxy resource as an Application (APL) has another advantage: The system is then visible in the INGLIST panel and it can be managed and monitored like an application resource. SA z/OS users are able to not only use message automation for target system messages, they can also issue start and stop commands to IPL and shut down systems. These commands can be defined like any start and stop command for an application. Unlike application resources, target systems are managed by processor operations commands (for example, ISQCCMD *target\_system\_name* ACTIVATE FORCE(NO) or ISQSEND *target\_system\_name* OC vary xcf,*target\_system\_name*,off,retain=yes). Processor operations commands allow you to send MVS commands to target systems as well as hardware commands to the processor (support element).

The rules that you need to obey when defining the proxy resource are as follows:

1. You need to define (or have defined) the processor operations target systems that you want to automate. For those systems, the following rule applies:  
**MVS SYSNAME = ProcOps name**  
The **MVS SYSNAME** must be identical with the **ProcOps name**.  
If this is not the case, you need to change it subsequently.
2. **Job Name = ProcOps name**  
The **Job Name** of the application for the proxy resource must match the processor operations target system's name as defined when creating this system in the customization dialog.
3. **Job Type = NONMVS**  
The **Job Type** for the proxy application must be NONMVS.
4. The **Monitor Routine** for the proxy application must be ISQMTSYS.
5. **Sysname = MVS SYSNAME**

## How to Automate Processor Operations Controlled Resources

The **Sysname** for the proxy application must match the **MVS SYSNAME** defined for the processor operations target system. This definition is used for resource monitoring.

6. If you want to inhibit operators from performing a startup or shutdown for a target system resource using the **INGREQ** command, **External Startup** and **External Shutdown** must be set to 'ALWAYS'.
7. If you do not want the proxy resource to be automatically started, you should set the **Restart after IPL** option to **NO**.
8. Because you can only automate applications by linking them to systems via an application group, you need to define an application group for the proxy applications. Do not merge the proxy applications with other applications into this application group because destructive requests applied to a merged application group would also affect the proxy resources contained in that group.

You may choose **PASSIVE** behavior to not forward requests against the application group to each member. This prevents you from unintentionally sending requests to processor operations target systems represented by their proxies.

9. In the Message Processing panel for the proxy application define the messages to be automated in the **Message ID** column. Do not specify message ID **ISQ900I**, as this message is used as a carrier for the original target system message.

Enter **cmd** in the **Action** column to specify the command to be processed if the defined message occurs.

10. If the message to be automated is a **WTOR**, the variable **&EHKVAR1** contains the reply ID. This variable may then be used as a parameter to the **ISQSEND** command:

```
ISQSEND &SUBSJOB OC R &EHKVAR1,COUPLE=00
```

### Startup and Shutdown Considerations

Processor operations commands must be used to start or stop processor operations resources, for example:

- Start example:  

```
ISQCMD &SUBSJOB LOAD FORCE(NO)
```

- Stop example:  

```
Pass 1 ISQSEND &SUBSJOB OC Z EOD
```

---

```
Pass 2 ISQSEND &SUBSJOB OC VARY XCF,&SUBSAPPL,OFF,RETAIN=YES
```

#### Note:

If the delay time between sending the commands in pass 1 and pass 2 is not appropriate, you can define a resource-specific Shut Delay in the Application Automation Definition panel.

For more details about processor operations commands refer to *IBM Tivoli System Automation for z/OS Operator's Commands*.

### Preparing Message Automation

The interaction with target systems is based on the SA z/OS processor operations component. Therefore the installation and customization of this component must be complete at this point.

Operating System messages from processor operations target systems receiving at the focal point are transferred to ISQ900I messages.

ISQ901I is not relevant. It is used to inform interested operators about target system messages. It is not used for automation purposes.

#### **MSCOPE() parameter in CONSOLxx member**

MSCOPE allows you to specify those systems in the sysplex from which this console is to receive messages not explicitly routed to this console. An asterisk (\*) indicates the system on which this CONSOLE statement is defined. Because the default is \*ALL, indicating that unsolicited messages from all systems in the sysplex are to be received by this console, this parameter must be set to '\*' for correct automation by SA z/OS processor operations.

---

## Automating Linux Console Messages

### The Linux Console Connection to NetView

When a Linux target system IPLs, its boot messages are displayed on the Console Integration facility (CI) of the System z® or 390-CMOS processor Support Element (SE). For SA z/OS processor operations, CI is the only supported interface to communicate with the Linux operating system. The communication between the processor operations focal point and CI is based on the NetView RUNCMD and the Support Element's Operator Command Facility (OCF), an SNA application. In SA z/OS processor operations, this connection path is referred to as a NetView Connection (NVC).

### Linux Console Automation with Mixed Case Character Data

Unlike operating systems which translate console command input into uppercase characters, Linux is case sensitive. The NetView automation table syntax allows the use of mixed case characters in compare arguments of an IF statement. When an automation command is to be scheduled as a result of such a comparison, any message token arguments passed, are not translated into uppercase by NetView. Make sure that your automation routine does not do an uppercase translation of parameters passed. For example, in REXX use the statement `PARSE ARG P1 P2` instead of `ARG P1 P2`, which implicitly performs a translation into uppercase. If a Linux message invokes your automation code and the message information is retrieved using NetView's GETMLINE function, no uppercase translation occurs. In order to send mixed case command data to the Linux console consider the following REXX statement:

```
Address Netvasis 'ISQsend MYlinux 0c whoami'
```

The addressed REXX command environment, Netvasis, passes the command string without doing an uppercase translation. The ISQSEND command internally translates its destination parameters into MYLINUX and OC but leaves command whoami as is.



## Security Considerations

After Linux system initialization, usually a LOGIN prompt message is displayed allowing users defined to the system to login. The ISQSEND command interface does not suppress any password data from being displayed. You may use the NetView LOG suppression character to avoid the password information to be visible in the NetView log. In Support Element log files, such password data can be viewed in text form.

## Restrictions and Limitations

The following Linux systems are supported:

- Linux systems running in an LPAR of a System z or 390-CMOS processor hardware
- Linux systems running on a System z or 390-CMOS processor hardware, configured in Basic mode
- Linux systems running as VM guest machines under z/VM Version 4.3 or higher

Linux systems running under a VM, which itself runs as a VM guest, are not supported.

In the command shell environments of a Linux console it is possible to pass control keys as character strings instead of pressing the keyboard control key combination to perform functions like Control-C. The current Linux support of SA z/OS processor operations has not been tested using this Linux capability. Any Linux program or command script that requires a user interaction with control keys should not be invoked using the SA z/OS processor operations ISQSEND interface.

---

## How to Add a Processor Operations Message to Automation

Use the NetView automation table (AT) and the SA z/OS command set to implement console automation. You can automate the routine functions that an operator performs when a particular message is generated. For more information see *IBM Tivoli System Automation for z/OS Defining Automation Policy*, SC33-7039.

## Messages Issued by a Processor Operations Target System

When a target system issues a message, the message is forwarded to the processor operations focal point system. The focal point system repackages the message within an SA z/OS ISQ900I message, an ISQ901I message, or both, and routes the message to the appropriate task:

- ISQ900I messages are routed to SA z/OS processor operations autotasks. If you want automation that you write to receive ISQ900I messages, use the ISQEXEC command to run the automation in a target control task. For information about using the ISQEXEC command, see section *Sending an Automation Routine to a Target Control Task* in “Issuing Other OCF Commands” on page 12. Your NetView automation table entries for SA z/OS should acknowledge the ISQ900I identifier for all target system messages forwarded to the processor operations focal point system. You can specify your ISQ900I automation table entries to be target system specific, however, this is not recommended.
- ISQ901I messages are routed to all logged-on operators identified as interested operators by the ISQXMON command or marked as such in the customization dialog.

For information about the ISQEXEC and ISQXMON commands, see *IBM Tivoli System Automation for z/OS Operator's Commands*.

## How to Add a Processor Operations Message to Automation

A message forwarded from an SNMP connection consists of the following:

- ISQ900I or ISQ901I message identifier
- Name of target system where the message originated
- Console designator form describing where the message originated
- Message identifier and text of the original message from the target system

For example, if a NetView connection forwards the message IEA101A SPECIFY SYSTEM PARAMETERS from the operating system to the focal point system, SA z/OS creates one or both of the following SA z/OS messages:

```
ISQ900I target-system-name OC IEA101A SPECIFY SYSTEM PARAMETERS
ISQ901I target-system-name OC IEA101A SPECIFY SYSTEM PARAMETERS
```

This message format applies to all processor operations target system messages. It is independent of the target system resource that generated the original message.

The processor operations target system message is sent in the same format as it would be displayed on the processor Support Element (SE) or Hardware Management Console (HMC).

### Specifics of VM second level systems:

Messages from guest machine operating system appear in the following format:

```
ISQ900I psm-name.guest-name OC IEA101A SPECIFY SYSTEM PARAMETERS
```

Messages from CP on the virtual machine appear in the following format:

```
ISQ900I psm-name.guest.name OC HCPGSP2627I The virtual machine is
placed in CP mode due to a SIGP initial CPU reset from CPU 00.
```

Messages from the PSM itself appear in the following format:

```
ISQ700I psm-name SC ISQCS0314E Message Handler has failed.
```

### Note:

Make sure your consoles issue messages in the format that you expect and write your NetView automation table entries accordingly.

## Sample NetView Automation Table Statements

The following message response example presents a request for system parameters when the message ID string contains 'IEA101A':

```
IF      TEXT = . 'IEA101A SPECIFY SYSTEM PARAMETERS'
      & MSGID = 'ISQ900I' .
THEN    EXEC( CMD('ISQI101 ' ) ROUTE ( ONE * ))
      DISPLAY(N) NETLOG(Y);
```

This NetView automation table statement initiates the ISQI101 routine when the message condition is true.

**Note:** Text within messages may be in mixed case. Be sure your coding accounts for mixed case text.

## How to Add a Processor Operations Message to Automation

### Message ISQ211I

Some SA z/OS commands attempt to lock and unlock ports. Where an operator owns the lock for a port, the SA z/OS unlock command, ISQXUNL, returns RC=12 associated with message ISQ211I Unable to unlock *target name console*.

In such a case, you have the choice of either using the ISQOVRD command to force an unlock or you may end your automation with a message. Thereafter, you can view your NetView log to find out the reason for the lock of the port.

Your automation may encounter this message ISQ211I frequently. Attempting to unlock a locked port is not an error condition; however, it may be a sign that the calling command did not succeed. Schedule your automation from messages that indicate positively that a command did not run, not from the ISQ211I message.

### Processor Operations Command Messages

Some SA z/OS commands run on the target system. The message returned from these commands indicates only that the support element was told to schedule the operation. Consequently, the operation at the target system may not complete even though the SA z/OS message indicates a successful completion.

SA z/OS acknowledges only that the command was successfully forwarded to the support element. An unsuccessful operation at the target system generates an unsolicited message that the support element forwards to the focal point system in an ISQ900I message. Schedule your automation from the message that positively indicates that a target system operation did or did not complete.

The SINGSAMP SA z/OS sample library contains the PL/I source code for several automation routines that issue responses to selected messages. You can select the response that is most appropriate for your enterprise. You can also use them as models to create your own automation routines. The list in Table 12 summarizes these routines, the messages they respond to, and the responses they issue initially.

Table 12. SINGSAMP SA z/OS Sample Library Routines

SINGSAMP Member	Routine	Description
INGEI120	ISQI120	Responds to the following messages: <b>IEA120A</b> Device ddd volid read, reply cont or wait. <b>IOS120A</b> Device ddd shared (PR volid not read.) the recovery task, reply cont or wait.  Issues the following response to the target: CONT
INGEI357	ISQI357	Responds to the following message: <b>IEE357A</b> Reply with SMF values or U.  Issues the following response to the target: U
INGEI426	ISQI426	Responds to the following message: <b>\$HASP426</b> Specify options - subsystem_id.  Issues the following response to the target: WARM,NOREQ.
INGEI502	ISQI502	Responds to the following message: <b>ICH502A</b> Specify name for primary/backup RACF data set sequence nnn or none.  Issues the following response to the target: NONE

## How to Add a Processor Operations Message to Automation

Table 12. SINGSAMP SA z/OS Sample Library Routines (continued)

SINGSAMP Member	Routine	Description
INGEI877	ISQI877	Responds to the following message: <b>IEA877A</b> Specify full DASD SYS1.DUMP data sets to be emptied, tape units to be used as SYS1.DUMP data sets or G0.  Issues the following response to the target: G0
INGEI956	ISQI956	Responds to the following message: <b>IEE956A</b> Reply - ftime = hh.mm.ss, name = operator, reason = (ipl,reason) or u.  Issues the following response to the target: U

The SA z/OS automation table entries in the ISQMSG0 member of the SINGNPRM data set include inactive entries that call these automation routines. To incorporate these routines into your automation, do the following:

1. Remove the comments from the corresponding automation table entries for the messages that initiate the automation routines you want to use. If you perform these steps as part of the initial SA z/OS installation, make these changes before you incorporate the SA z/OS entries. If you do this after the initial SA z/OS installation, change the NetView automation table.
2. Code the routines you are using to issue the responses you want.
3. Compile the PL/I source code for the routines you want to use, and link the resulting object code to your PL/I library.
4. Recycle the NetView program to activate the new entries.

For automation processing to occur, each message in the NetView automation table at the focal point system and at each target system must be made available to the system's NetView program. In z/OS, MPF controls message availability to the NetView program. Examine the MPF list member in the SYS1.PARMLIB data set to ensure that the necessary messages are marked for automation. For target systems using other operating systems, check the message suppression facilities used on those systems.

### Testing Messages

SA z/OS provides a collection of NetView automation table entries for your SA z/OS configuration. NetView automation table entries are in the AOFPCMD member of the SA z/OS SINGNPRM installation data set. When these entries are moved to your NetView automation table, they may need additional editing.

For example, you may already test for a particular message in your production NetView automation table. If you add an entry that tests for that same message, your automation table will not run as you expect. After a match with the test criteria is found, the search of the automation table is aborted. The second NetView automation table statement is not found. Consequently, the message does not drive all of your required actions.

To avoid this, combine entries into a single test condition. This ensures that all required actions are scheduled for all messages. For the following message:

```
IEA320A RESPECIFY PARAMETERS OR CANCEL
```

## How to Add a Processor Operations Message to Automation

your NetView automation table may already have the following entry: ( **1** )

```
IF      MSGID = 'IEA320A'  
THEN   EXEC (CMD('USERJOB') ROUTE( ONE * ) ) CONTINUE(Y);
```

With SA z/OS installed, the following message appears when forwarded from System z or 390-CMOS processor hardware:

```
ISQ900I SYS1 OC IEA320A RESPECIFY PARAMETERS OR CANCEL
```

After the SA z/OS entries are added, the NetView automation table includes the following entry:

```
IF      TEXT = . 'IEA320A RESPECIFY PARAMETERS' .  
        & MSGID = 'ISQ900I' .  
THEN  
        EXEC (CMD('ISQI320 ' ) ROUTE( ONE * ) )  
        DISPLAY(N) NETLOG(Y);
```

In this case, the first entry satisfies the IF test and the command USERJOB runs ( **1** ). The second command, ISQI320, is not scheduled to run because once the message matches a table entry, the autotask stops searching. Combine these two entries into a single entry, such as:

```
IF      TEXT = . 'IEA320A RESPECIFY PARAMETERS' .  
        & MSGID = 'ISQ900I' .  
THEN  
        EXEC(CMD('ISQI320 ' ) ROUTE( ONE * ) )  
        EXEC(CMD('USERJOB ' ) ROUTE( ONE * ) )  
        DISPLAY(N) NETLOG(Y);
```

When you use the second example, both commands are scheduled.

If your NetView automation table tests the text of SA z/OS messages, the message format must match the character case for which you test. This can be done by requiring all sites to use the same format for their messages, or by duplicating AT entries in uppercase and in mixed formats.

## Building the New Automation Definitions

When you are finished using the customization dialog to add message response and automation operator information to the automation policy, you need to build the system operations control files. The complete description of how to build and distribute these files is provided in *IBM Tivoli System Automation for z/OS Defining Automation Policy*.

The SA z/OS build function places the new automation definitions in the data set defined in the Build Parameters panel.

Copy the new automation definitions into the SA z/OS NetView DSIPARM concatenation in the NetView startup procedures, or concatenate it to the NetView DSIPARM data set.

## Loading the Changed Automation Environment

To reload the AMC file, automation control file and the AT perform the following actions:

To reload the MPF list, enter the following command:

- From the z/OS console:  
SET MPF=xx

## Loading the Changed Automation Environment

- From a NetView console using the MVS prefix:

```
MVS SET MPF=xx
```

Where *xx* is the suffix of the MPF member in the SYS1.PARMLIB data set to load.

To reload the automation manager configuration file, all updated automation control files and the automation tables issue:

```
INGAMS REFRESH
```

Specify a data set name or an asterisk (\*) which means reload the current data set.

---

## Using Pipes and ISQCCMD for Synchronous HW Commands

The System Automation for z/OS Hardware interfaces command, ISQCCMD, available for Processor Operations SNMP connections and with imitations for BCP Internal Interface connections, allows the management and control of processors and logical partitions, as well as hardware activation profiles. When used in automation procedures, ISQCCMD provides an easy-to-use interface to automate processor operations management and configuration tasks.

The following HW commands return all their response information immediately to NetView on command completion and are therefore called *synchronous* commands:

- CCNTL
- CONDATA
- CPCDATA
- GETCLUSTER
- GETISTAT
- GETIINFO
- GETSDGA
- GETSINFO
- GETSSTAT
- ICNTL
- PROFILE
- STPDATA
- TCDATA

For SNMP and BCPII connections, ISQCCMD supports NetView PIPES. On completion of the ISQCCMD command, a PIPE KEEP with the name ISQ.SNMP contains the immediate command response of the HW command that was issued, for example:

```
* ISQCCMD G14 GETSINFO
| ISQ417I GETSINFO STATUS(SUCCESS)
| ISQ900I G14.KEY3 SC AOFA0017 GETSINFO G14 STATUS(OPERATING) PDATA(TYPE(2084)
| ,MODEL(B16),S/N(000020016F7A)) MODE(LPAR) APROF() CPCNAME(IBM390PS.G14) NAME(G14)
| TSTIME(070825131936)
| ISQ419I ISQCCMD GETSINFO processing on G14 is complete.
* IPSFO PIPE KEEP ISQ.SNMP | CONS
| IPSFO AOFA0017 GETSINFO G14 STATUS(OPERATING)
| PDATA(TYPE(2084),MODEL(B16),S/N(000020016F7A)) MODE(LPAR) APROF()
| CPCNAME(IBM390PS.G14) NAME(G14) TSTIME(070825131936)
```

In the example above, the HW common command GETSINFO was issued at a NetView console. Embedded in the 'ISQ' messages the response from the hardware is displayed on the console, starting at report ID AOFA0017.

## Using Pipes and ISQCCMD for Synchronous HW Commands

The same information is available if you reference the PIPE KEEP with the name ISQ.SNMP, once the ISQCCMD command completed, as shown in the example, with the content of ISQ.SNMP displayed on the console.

In an automation procedure, this can be coded as shown in the following example:

```
/*ReXX*/
/* Display CPC information using the ISQ.SNMP KEEP */
Arg cpcname
'ISQCCMD 'cpcname' GETSINFO'
If RC = 0 Then Do
  'PIPE KEEP ISQ.SNMP ' ,
  ' | LOC /AOFA0017/ ' ,
  ' | LOC /'cpcname'/ ' ,
  ' | CONS ONLY'
End
```

As an alternative, you can get the immediate ISQCCMD HW responses directly into the PIPE input stream if you use the PIPE NETVIEW stage followed by an EXPOSE TOTRAP stage. In this case, all ISQ messages and the AOFA0017 report data is available for PIPE processing.

```
/*ReXX*/
/* Display CPC information in a PIPE */
Arg cpcname
'PIPE NETV ISQCCMD 'cpcname' GETSINFO' ,
' | EXPOSE TOTRAP ' ,
' | LOC /ISQ90/ , /* takes ISQ901I or ISQ900I */
' | LOC /AOFA0017/ ,
' | LOC /'cpcname'/ ' ,
' | CONS ONLY'
```

---

## Automating Asynchronous Hardware Commands with ISQCCMD and PIPES

The following ISQCCMD hardware commands return two messages to NetView. First a message that the HW command has either been accepted for execution or rejected. Second, if an acceptance message was issued, a completion event message that contains the actual success or failure information of the command is sent asynchronously.

- ACTIVATE
- CBU
- CTRLCONS
- DEACTIVATE
- EXTINT
- LOAD
- OOCOD
- RESERVE
- RESTART
- START
- STOP
- STP
- SYSRESET
- TCM

Automation scripts using the ISQCCMD interface must distinguish between the accepted or rejected response of an asynchronous HW command and the actual

## Automating Asynchronous Hardware Commands with ISQCCMD and PIPES

command completion information, which may either indicate successful execution or a failure. The asynchronous command completion events from the hardware are made available for message automation and TRAP AND WAIT processing by ProcOps. Application scripts using the ISQCCMD interface can get the Accepted or Rejected responses directly at ISQCCMD termination time. The Accepted response can then be used to wait for the command completion event message.

Member INGEI004 of the SINGSAMP library provides a REXX sample illustrating how asynchronous hardware commands can be automated using ISQCCMD and NetView PIPES, together with TRAP and WAIT.

---

## VM Second Level Systems Support

This feature provides ProcOps support to control and monitor guest machines running under VM.

ProcOps allows an operating system to be IPLed into a processor, amongst other facilities. Such an operating system is VM. Within VM other operating systems can be IPLed as guest machines. Of particular interest are LINUX guest machines, but MVS, VSE and even VM guest machines may be possible. (Lower levels of guest machines are not considered). Previously there was no effective way to enter commands to and receive messages from such a guest target system in order to validate that it had IPLed correctly, or that it is behaving correctly.

With second level guest machine support you can:

- Capture messages issued by the guest machine itself and route these back to the ProcOps process for display or automated processing, or both
- Send commands to the guest machine from ProcOps, either as operator requests or automated actions

## Guest Target Systems

The most likely guest machine that is used as a target system is a LINUX system. When a LINUX machine has a secondary user, the secondary user can use CP SEND commands to:

- Issue CP commands to the guest machine
- Log on as a user to LINUX
- Enter LINUX commands (after logging on)

(It is also possible to set up the LINUX system in such a way that LINUX commands can be entered on the VM console without logging on to LINUX.)

The secondary user receives:

- All "boot up messages"
- Responses to CP commands that are run on the guest machine
- Responses to logon and LINUX commands

MVS machines are more complex. When an MVS machine is running, the original VM user first becomes an NIP console and then an MCS console. In these console modes MVS takes over all I/O to and from the console, and MVS messages to it cannot be intercepted by any CP facilities. Hence the SCIF SEND command cannot be used to send commands to MVS, nor can MVS messages to this console be intercepted.



However a "virtual SCLP console" for the guest machine can be used. During the NIP phase of initialization, use of this console can be forced by configuring the guest virtual machine so that it has no usable 3270 consoles. NIP then directs its messages to the guest machine as line mode commands. This is analogous to the stream of messages sent to the Operating System Messages (OSM) window on an HMC by an MVS system running in a logical partition.

Responses to any NIP messages are entered using the CP VINPUT command. Internally this is done when an ISQSEND command is issued to the operator console (OC) of the target system. To ensure that such VINPUT commands are processed correctly, the guest machine must be operating in RUN ON state at this time.

To ensure that RUN ON state is set, a CP SET RUN ON command is sent to all MVS guest machines at the time when the guest machine is started by the PSM.

Once MCS operation is established, important messages requiring operator action are directed to the guest machine. Again, these are analogous to the stream of messages directed to the OSM window of the HMC. Initially, commands cannot be entered to MVS. To do so, it is necessary to enter "Problem Determination Mode". To enter this mode, a VARY CONSOLE(\*),ACTIVATE command must be entered. Once this is done:

- All MVS messages that are displayed are routed to the guest machine
- Commands may be entered using the CP VINPUT command.

Problem Determination is not generally recommended.

To enter LINUX commands it is normally necessary to log on to LINUX. This requires a user ID and a password. So, to provide for LINUX commands would require the specification of a user ID and a password to ProcOps, with all the attendant difficulties in the area of security. At present the LINUX system is considered IPL COMPLETE when specified messages have appeared. These do not require a user logon.

VM machines may also be guest machines. Third level guest machines are not supported.

VSE machines may also be guest machines.

## Customizing Target Systems

### LINUX

The LINUX target system should have in its VM Directory entry, a CONSOLE statement that sets its PSM as its default secondary user. For example, if the virtual machine LNXAO1 is controlled by a PSM running in virtual machine ISQPSM1, then its CONSOLE statement might be:

```
CONSOLE 009 3215 T ISQPSM1
```

When a LINUX target system is to be deactivated a FORCE command is used to shut it. The default guest signal timeout interval values (set by the SET SIGNAL command) and values defined for the guest machine determine the interval used when allowing the LINUX system to shut in an orderly fashion. If this function is required for a guest, you must ensure that this is set accordingly.

Such actions may include updating the etc/inittab entry on the LINUX system itself, and setting up a SHUTTRAP module on the VM host.

## VM Second Level Systems Support

### MVS

This too should have a `CONSOLE` statement in its VM directory entry that defines its PSM as its secondary user:

```
CONSOLE 01F 3270 T ISQPSM1
```

It should also IPL a CMS system as its initial action. Once this CMS system is IPLed it should run a PROFILE EXEC that includes the statements similar to the following:

```
SET RUN ON
DETACH 01F
IPL 7700
```

The `SET RUN ON` is needed so that when a response is to be sent to a NIP console the `VINPUT` command used is effective.

The `DETACH` is used so that when the MVS system IPLs it finds none of its defined 3270 consoles available to it. (You should also ensure that no user issues a VM `DIAL` to an address that is defined as a NIP or MCS console.)

The `IPL` command is used to IPL the MVS system.

The MVS system itself should have included in its active `CONSOLxx` definition a `CONSOLE` statement for the `SYSCONS` so that commands can be entered to MVS after it is IPLed, for example:

```
CONSOLE DEVNUM(SYSCONS)
        ROUTCODE(ALL)
        AUTH(MASTER)
        MSCOPE(*)
        CMDSYS(*)
        UD(Y)
```

### VM

This too should have a `CONSOLE` statement in its VM directory entry that defines its PSM as its secondary user:

```
CONSOLE 01F 3270 T ISQPSM1
```

It should also IPL a CMS system as its initial action. Once this CMS system is IPLed it should run a PROFILE EXEC that includes the statements similar to the following:

```
SET RUN ON
DETACH 01F
IPL 7700
```

The `SET RUN ON` is needed so that when a response is to be sent to a console the `VINPUT` command used is effective.

The `DETACH` is used so that when the VM system IPLs it finds none of its defined 3270 consoles available to it. (You should also ensure that no user issues a VM `DIAL` to an address that is defined as a Operator Console)

The `IPL` command is used to IPL the VM system.

The VM system itself should include within its `OPERATOR_CONSOLES` statement in the `SYSTEM CONFIG` file (which resides on the "parm disk") a specification for the emulated system console, for example:

```
OPERATOR _CONSOLES 01F 020 System_Console
```

This ensures that when VM IPLs and finds no regular consoles available, it then uses the emulated system console. This in turn directs the messages to the secondary user as a stream of line-mode messages.

### VSE

This too should have a CONSOLE statement in its VM directory entry that defines its PSM as its secondary user:

```
CONSOLE 01F 3270 T ISQPSM1
```

It should also IPL a CMS system as its initial action. Once this CMS system is IPLed it should run a PROFILE EXEC that includes the statements similar to the following:

```
TERM CONMODE 3215  
IPL 7700
```

The TERM CONMODE 3215 command sets the console into line mode.



---

## Chapter 9. How to Automate USS Resources

This chapter describes how z/OS UNIX System Services are integrated into SA z/OS, how to set up z/OS UNIX automation, and provides tips about using z/OS UNIX automation.

### Note

USS tasks behave differently when started as STCs rather than directly in the USS environment.

When a USS task is started as an STC, the starting user ID may differ so that, in most cases, the AOFUXMON monitor routine is not able to internally trigger ACTIVMSG UP=YES.

In this case it is much simpler for SA z/OS to start these applications with INGUSS. An AT entry is then not required for the UP message. SA z/OS is able to internally simulate this so that you do not have to worry about UP messages.

Job names (that is, the last character of the job name) are not predictable for USS resources. However, AOFUXMON is able to handle this by monitoring the path within USS and changing the defined job name in SA z/OS accordingly.

For the syslog daemon you would define the job name as SYSLOGD. When the application is started and changes the job name to, say, SYSLOGD7, AOFUXMON adjusts the SA z/OS data model to reflect this. However, this cannot be handled in the AT with a generic entry for SYSLOGD\*. This is because the change in the job name is caused by the USS process that creates a new address space with a new name, so that the old address space with the old name terminates. This means that you get an ended message for the old address space and an UP message for the new address space. The sequence of these messages is also unpredictable.

---

## Integration of z/OS UNIX System Services

The following functions are supported by SA z/OS for z/OS UNIX applications:

- Starting and stopping of applications
- Monitoring of:
  - Processes (represented by the command or path and user ID)
  - TCP Ports
  - Files and file systems
  - Generic User Monitoring (the user supplies a z/OS UNIX monitoring routine or script)
- Using an API to execute z/OS UNIX commands (INGUSS command)

### Infrastructure Overview

The z/OS UNIX resources that should be automated must run in the z/OS UNIX of a z/OS system that is already automated by SA z/OS. From the automation manager's perspective the NetView agent of this system is responsible for the z/OS UNIX resources.

For command execution through INGUSS or user-defined monitoring, a z/OS UNIX program (provided by SA z/OS) is directly invoked by SA z/OS. This program (ingcmd) executes UNIX commands and runs when started by SA z/OS with the jobname INGCUNIX. The ingcmd program is the extension of the NetView-based agent into z/OS UNIX. To monitor the standard z/OS UNIX resources (processes, ports, or files) an internal SA z/OS routine is started.

Process initialization and termination status updates of USS resources are directly reported from system exits to the SA z/OS environment by the program-to-program interface INGUXPPI. A NetView task with the same name immediately posts the UP or DOWN status. The automation agent recognizes and then sets the correct automation status for the resource.

For this functionality, the NetView Subsystem Interface (SSI) is required. For a correct customization of the SSI, refer to Step 5 in the chapter "Installing SA z/OS on Host Systems" in *IBM Tivoli System Automation for z/OS Planning and Installation*.

When monitoring of the USS process indicates that it is down, its status is updated to AUTODOWN. However, because it may take some time before a USS process has ended (that is, to clean up the resources that it had acquired), monitoring is repeated after a cleanup delay. If you define your own USS processes, you should specify a suitable cleanup delay using the APPLICATION INFO policy item. Consider using an application class if you need to define several processes.

---

## Setting Up z/OS UNIX Automation

### Customization of z/OS UNIX Resources

z/OS UNIX resources are introduced to SA z/OS by defining them in the SA z/OS customization dialogs.

The customization dialogs support the application type USS. If USS is selected, you can enter z/OS UNIX-specific data such as a UNIX user ID, command or path, filename, or monitored port. Choose one of these fields to enter the data.

The start and stop definitions can be varied between MVS and z/OS UNIX commands. For example, to stop an application you can issue a UNIX kill command first and (if this was not successful) you can perform an MVS cancel later.

#### Definitions for Automation Setup

The USS path where the program shipped with SA z/OS is located must be defined in the USS Automation Path field of the System Info policy.

#### Definitions for z/OS UNIX Resources

To define a new application entry (APL, class, or instance), specify the application type USS on the Define New Entry panel. When choosing the application type USS, the option USS Control is displayed on the Policy Selection panel.

Select USS Control on the Policy Selection panel to enter the data for the new z/OS UNIX resource. You can specify only the user ID and the z/OS UNIX monitoring routine for a class on this panel. All other definitions (for example, from/to, dependencies, and so on.) can be entered as usual. For more details about this panel, see *IBM Tivoli System Automation for z/OS Defining Automation Policy*.

USS applications must be defined with a HASPARENT relationship to JES.

Use the USS Control Specification policy item for an object of type INSTANCE to define the resource as a:

### Process

Enter the path of the command that is running (as shown by the UNIX command `ps -e`) in the **Process Command/Path** field.

**Filter** Enter additional filter criteria to uniquely identify the USS process. The field is optional and can only be specified if a 'Command/Path' specification is available.

### TCP port

Enter the TCP port number that the resource is to listen to on the local host in the **Port Number** field.

**File** Enter the path of a file in the HFS in the **File Name** field.

### IP Stack

For TCP port monitoring, you may enter optionally the name of the IP stack if multiple IP stacks are configured.

Often the command/path specification, especially for Java processes, is not unique. The Filter field allows you to uniquely identify the USS process if this is not possible.

There are two methods of monitoring USS applications:

- The *standard* method is to specify the monitoring routine AOFUXMON in the APPLICATION INFO policy item, which is called by SA z/OS for UNIX System Services resources.
- If you choose to use your own script or program in the HFS, this is called by AOFUXMON. You must then specify the script or program in the **Monitoring Command** field of the USS CONTROL policy item, and you must also specify AOFUXMON in the APPLICATION INFO policy item.

If this program does not begin with a forward slash (/) it must reside in the same directory as the z/OS UNIX ingccmd routine that is supplied by SA z/OS. Otherwise the name specified is considered to be an absolute path identifier.

The UNIX monitoring routine must have an exit value. It can be one of the following:

- 0 Resource is available
- 4 Resource is starting
- 8 Resource is unavailable
- 12 Error occurred

If the user-specified monitoring routine loops, it receives a SIGKILL after the AOFUSSWAIT time (defined in the NetView stylesheet).

**Hint:**

It is possible to write a message from this UNIX monitoring routine to the MVS system log, in order to trigger an action or perform a status change through the NetView Automation Table (AT).

The monitoring routine AOFUXMON must be specified, otherwise the default monitoring routine (usually INGPJMON) is called, which is not sufficient for z/OS UNIX resources.

The **Job Type** field can be either MVS or NONMVS:

**MVS** Is only used for resources that represent a process with a unique jobname. For these resources SA z/OS accepts the following messages for status changes:

- IEF403I Job started
- IEF404I Job ended
- IEF450I Job abended

If no start command is specified, the default MVS start method (s <JOBNAME>) is used.

**NONMVS**

SA z/OS ignores the messages listed above for status changes. This is necessary if the job name is not unique.

For z/OS UNIX resources the Start Delay interval that has been defined begins when SA z/OS issues a start command for an application. SA z/OS is informed by z/OS that the resource that is to be monitored has started. This results in the USS resource being set in the status ACTIVE. After the first start delay interval and successful monitoring, the ACTIVMSG command is triggered, which sets the agent status to UP. The default value for the Start Timeout is 2 minutes.

If you set the **Skip ACTIVE status** field in the APPLICATION INFO policy item to YES, the resource is immediately set to UP when SA z/OS is informed by z/OS that the process is running.

For application shutdown, SA z/OS is informed by z/OS as soon as the process has ended. At this point, SA z/OS immediately sets the resource into the AUTODOWN status.

As a result of this behavior you should carefully consider how you set the following parameters in the APPLICATION INFO policy item, either for the application or at the class level:

- Start Delay
- Start Cycles
- Skip ACTIVE status
- Shutdown Pass Interval
- Cleanup Delay

For more information, see the \*USS best practices policy.



## Automated Resources

**Process Monitoring:** No UNIX process identifiers (PIDs) can be monitored. The monitoring routine needs the start command and the user ID that the process belongs to. This information can be obtained with the UNIX command `ps`. In the following example all processes that belong to the user `USER` are displayed:

```
USER:/u/user/ingcmd>ps -e

      PID COMMAND
33554481 /bin/sh
50331698 /usr/sbin/rlogind2
33554486 /usr/lpp/netview/bin/cnmeunix
67108927 /bin/sh
83886176 /bin/ps
33554821 /usr/sbin/inetd
83886472 FTPD
67109276 /bin/sh
16777629 /usr/sbin/rlogind2
33554924 HSAPYTCP
```

This means that automation could not distinguish between the two processes started by `/usr/sbin/rlogind2`. Processes started by identical commands must have different user IDs.

*Alternative 1:* If it is necessary to automate processes running multiple instances, a user could use softlinks to distinguish between the different processes. For example, the process:

```
/u/user/usstest/testme
```

should be started more than once. In this case, create some softlinks:

```
USER:/u/user/usstest> ln -s testme test1
USER:/u/user/usstest> ln -s testme test2
```

This results in:

```
| USER:/u/user/usstest>ls -al
| total 216
| drwxrwxr-x  2 USER  DE#03243  8192 Jan 24 16:24 .
| drwxr-xr-x 19 USER  DE#03243  8192 Jan 24 16:23 ..
| lrwxrwxrwx  1 USER  DE#03243    6 Jan 24 16:24 test1 -> testme
| lrwxrwxrwx  1 USER  DE#03243    6 Jan 24 16:24 test2 -> testme
| -rwxrwxr-x  1 USER  DE#03243 94208 Jan 24 16:23 testme
```

These three programs (being the same "real" program) can be automated with the three different start commands `test1`, `test2`, and `testme`. These links may be created as a `prestart` command and deleted as a `shutfinal` command.

**Note:** Only the command is used, not the parameters that were used to start the program. This is because a program may be started by `SA z/OS` with different startup parameters, depending on what the automation manager told the automation agent to do. In this case, the only constant value is the command, not the parameters.

*Alternative 2:* The same program can run in parallel several times by using different startup parameters (like Java programs). In this case it is inefficient to automate these processes as described above. Java programs run in a Java environment and are visible as Java processes, for example:

```
# ps -e
      PID TTY          TIME CMD
50331734 ?           5h24  .../V6R1/AP/AppServer/java/bin/java
```

## Setting Up z/OS UNIX Automation

```
83886173 ?          1:44 .../V6R1/AP/AppServer/java/bin/java
60341724 ?          2h36 .../V6R1/AP/AppServer/java/bin/java
73392173 ?          1:02 .../V6R1/AP/AppServer/java/bin/java
```

It is impossible in this case to distinguish and evaluate the process that should be monitored.

The command `ps -ef` shows the same processes (for example, programs running in a Java environment), without the fully-qualified Java path but with a parameter chain that is used for startup.

```
#ps -ef
  UID          PID PPID  C   STIME TTY   TIME CMD
EEZDMN  50331734   1  - Jun 27 ?    5h25 java -Djava.util.logging.configureByServer=true
EEZDMN  83886173   1  - Jun 27 ?    1:44 java -Dcom.ibm.eez.adapter.debug=true
EEZDMN  60341724   1  - Jun 27 ?    2h36 java -Djava.util.logging.manager=connect
EEZDMN  73392173   1  - Jun 27 ?    1:02 java -Djava.security.auth.login.config=/etc/security.conf
```

Mapping the output of both commands using the matching PID, a unique process can be evaluated and monitored. The process that is distinguished is then:

```
/SYSTEM/local/WebSphere/V6R1/AP/AppServer/java/bin/java
-Djava.util.logging.configureByServer=true
```

Where the data that is specified in the UNIX Control Specification panel in the **Process Command/Path** field is `/SYSTEM/local/WebSphere/V6R1/AP/AppServer/java/bin/java` and in the **with Filter** field is the filter `-Djava.util.logging.configureByServer=true`.

If the USS program has the sticky bit set, the MVS load is performed using the symbolic link name. For example, running two instances of `syslogd` requires the usage of a symbolic link, for example, `/tmp/syslogd`. A separate `/tmp` directory must be used so that the same name (`syslogd`) can be created.

**TCP Port Monitoring:** Exactly one TCP port number can be entered for one resource. SA z/OS monitors the local host as returned by the function `gethostid()`. When this port has a state of 'listening,' this resource is considered to be 'available' in terms of SA z/OS. All other states of the port map to 'unavailable.'

No user ID is required for definitions.

If your system is configured with multiple IP stacks you may specify the name of the corresponding IP stack for the defined port in the IP Stack field.

**File or File-System Monitoring:** The existence of a file (belonging to a certain user) is verified. Many applications create files at startup and delete these files when terminating normally. If more than one file should be monitored, this can be modeled as an application group (APG) in the automation manager.

This monitoring can be used to determine if a certain file system is mounted. The start command for this resource would be a UNIX 'mount' command, the stop command a UNIX 'umount'.

### Start and Stop Definitions (INGUSS Command)

If the resource is to be controlled by traditional MVS commands, this could be done in the same way as for all other MVS applications. Issuing commands in the z/OS UNIX environment is done by specifying the INGUSS command in the start or stop definitions for the resource.

To issue commands in the USS environment use the INGUSS command (for more details see *IBM Tivoli System Automation for z/OS Programmer's Reference*).

**Note:** INGUSS can only be used if the primary JES is available. Therefore, z/OS UNIX resources using INGUSS need a HASPARENT dependency to JES. Most z/OS UNIX applications have this dependency. If you want to issue prestart commands, an additional PREPAVAILABLE dependency is necessary.

z/OS UNIX and MVS commands can be mixed in different shutdown passes.

### Command Examples:

*Start Command for a Process:* To start a process with the command and job name specified in the customization dialogs, enter INGUSS JOBNAME=&SUBSJOB &SUBSPATH &SUBSFILTER in the **Command Text** field on the Startup Command Processing panel of the STARTUP policy item of the resource.

Only the command that was used to start an application or a process can be monitored. If the same program is to be started multiple times, a softlink as prestart command could be used to distinguish the processes.

*Use a Softlink to Distinguish Processes That Run the Same Executable File as a Prestart Command:* To create a softlink for &SUBSPATH (the path parameter of the resource issuing the command, for example, /u/user1/uss1) and link to the file /u/user1/usstest, enter the following command in the **Command Text** field on the PRESTART Command Processing panel:

```
INGUSS /bin/ln -s /u/user1/usstest &SUBSPATH
```

When looking at the HFS, this results in:

```
USER1:/u/user1>ls -l
total 408
lrwxrwxrwx  1 USER1      DE#03243      7 Feb 13 12:44 uss1 -> usstest
-rwxrwxr-x  1 USER1      DE#03243    163840 Jan 29 14:55 usstest
```

*Stop Commands for a Process:* A z/OS UNIX process may be stopped in different ways (using escalation passes). For example, you can first use the z/OS UNIX kill command, if that does not work use z/OS UNIX kill -9, and finally enter an MVS cancel command.

Enter the definitions for this example as shown in Figure 20 on the Command Processing panel for the normal shutdown phase of the resource (via its SHUTDOWN policy item).

Cmd	Ps	AutoFn/*	Command Text
1			INGUSS /bin/kill &SUBSPID
3			INGUSS /bin/kill -9 &SUBSPID
4			MVS C &SUBSUSSJOB,A=&SUBSASID

Figure 20. Stop Definitions for a Process

&SUBSPID is replaced at run time by the real PID of the process.

*Stop Command for a File:* A stop command for a file may be deleting the file. The file name entered in the customization dialogs can be found in &SUBSFILE, as shown in Figure 21 on page 108.

Cmd	Ps	AutoFn/*	Command	Text
___	1	_____	INGUSS	/bin/rm &SUBSFILE

Figure 21. Delete a File

### Example: sshd

The Secure Shell Daemon application (SSH daemon or sshd) is the daemon program for ssh. This program is an alternative to rlogin and rsh and provides encrypted communications between two untrusted hosts over an insecure network. The sshd is the daemon that listens for connections from clients on port 22. It is normally started when z/OS UNIX is initialized. It forks a new process for each incoming connection. The forked processes/connections handle key exchange, encryption, authentication, command execution, and data exchange. These connections show the same jobname and Command/Path and Filter as the SSH daemon does. At sshd startup time its process ID (pid) is written in the /var/run/sshd.pid file.

Any adaptation and configuration changes to the sshd can be done in the sshd configuration file sshd\_config. It is located in the /etc/ssh directory.

Keeping the Secure Shell Daemon application (sshd) highly available requires that the sshd will not be detached from its parent process. Additionally, the sshd must be started in a separate shell environment. This shell is needed to establish a unique process which can be monitored. It can be accomplished by starting the sshd with option -D

For shutdown purposes it is required that the process ID file (sshd.pid) is written to your file system. This process ID will be read from that file and used to identify the sshd to terminate.

The ps -ef command supplies further parameters to identify the process referenced as Filter, for example:

```
ps -ef | grep ssh
  UID      PID      PPID      C  STIME TTY          TIME CMD
  AUT01   83886553   67109368  - 14:53:27 ?           0:00 -sh -c /usr/sbin/sshd -D
  AUT01   83886563   50335037  - 14:53:37 ttyp0000    0:00 grep ssh
  AUT01   83887096   83886553  - 14:53:28 ?           0:00 /usr/sbin/sshd -D
```

Process 83886553 represents the address space containing the covering parent shell process for monitoring purposes. Process 83887096 is the sshd itself.

From this output, set the Filter as -c '/usr/sbin/sshd -D'.

**Note:** Even though the quotation marks are not shown in the output for the command ps -ef, they must not be defined in the Filter field of the USS Control policy.

To check for the required information for the Command/Path issue the ps -e command and look for the process Id of the parent shell:

```
PID      TTY  TIME  COMMAND
...
83886553 ? 14:53:27 /bin/sh
67109368 ? 14:34:28 BPXBATCH
83887096 ? 14:53:28 /usr/sbin/sshd
...
```

or issue ps -e | grep 83886553 to get the process directly:

```
83886553 ? 14:53:27 /bin/sh
```

This shows the process ID (PID) for the sshd monitoring process. From this output, set the Command/Path as /bin/sh

Next find out the z/OS user ID that the process is running on by issuing the following z/OS command and locating the user ID in the first column where the process ID (PID) is listed:

```
D OMVS,PID=83886553
```

The following output is displayed:

```
BPX0070I 19.01.02 DISPLAY OMVS 035
OMVS      000E ACTIVE          OMVS=(PA,F9,11,LO,S0,09)
USER      JOBNAME ASID        PID        PPID STATE  START    CT_SECS
OMVSKERN  SSHD     00D0     83886553   67109368 1WI----- 14.53.27  .0
LATCHWAITPID=      0 CMD=-sh -c /usr/sbin/sshd -D
THREAD_ID      TCBO     PRI_JOB  USERNAME  ACC_TIME SC STATE
21ADF00000000001 008FF1C0 OMVS                .006 WAT  W
```

From this output, set the User ID to OMVSKERN

Verify that sshd listens on port 22 as stated above. Use the netstat -a command and evaluate the output by looking for the SSHD jobname:

```
# netstat -a
...
SSHD     00000049 Listen
Local Socket:  0.0.0.0..22
Foreign Socket: 0.0.0.0..0
...
```

From this output, set the port to 22.

You can define the UNIX internet daemon (sshd) using the fields of the USS Control policy item for applications (APLs) of type USS in the customization dialogs with, for example, the data in Table 13.

*Table 13. Example Customization Dialog Definitions for sshd*

	Process	File	Port
Application Name*	SSHD/APL	SSH_FILE/APL	SSH_PORT/APL
User ID	OMVSKERN		
Process Command/Path	/bin/sh		
Filter	-c '/usr/sbin/sshd -D'		
File Name		/var/run/sshd.pid	
PORT			22
IP Stack			TCPIP**
* This is the name that was specified for the applications when they were created.			
** Only if the system is configured for multiple IP stacks.			

Define a basic group containing all resources with relationships that indicate that:

- The group containing all sshd related resources depends on TCPIP
- The file is created by the sshd process and can never be started or created directly by SA z/OS

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- The sshd process listening on the port can never be started or created directly by SA z/OS.

Figure 22 illustrates the SSHD (modeled as a group) as up and running when the process `/bin/sh -c '/usr/sbin/sshd -D'` started by user OMVSKERN appears, the file `/var/run/sshd.pid` exists, and port 22 is in the status 'listen' (sshd listens to this port for incoming login requests). You can only choose a port that is defined in `/etc/ssh/sshd_config`.

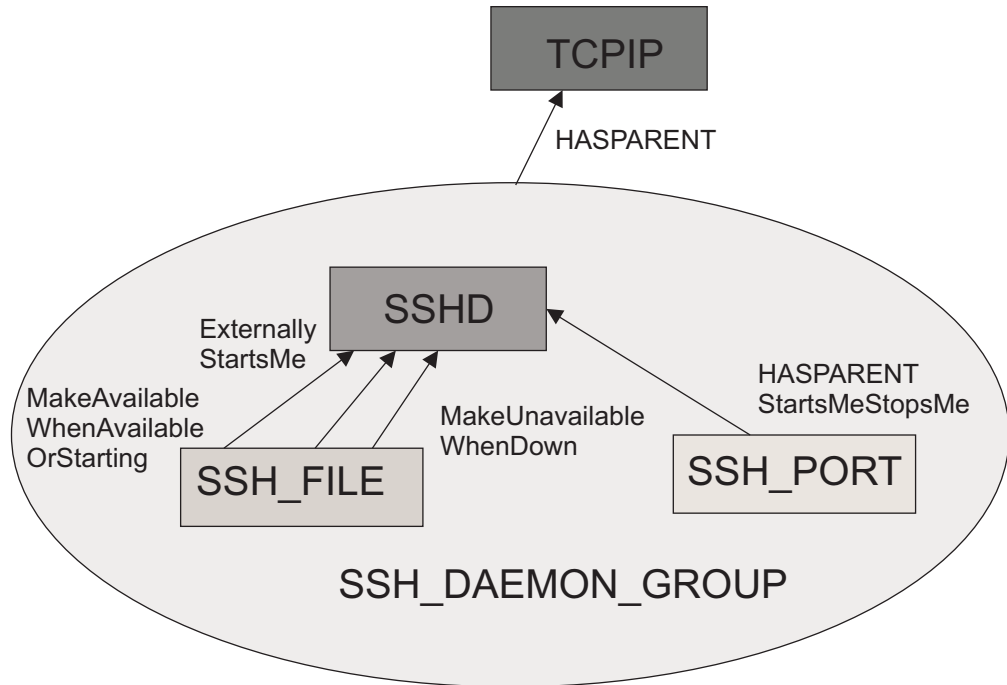


Figure 22. SSH Daemon Listening

### Start definition for SSHD\_FILE/APL

None.

### Start definition for SSHD\_PORT/APL

None.

### Start definition for SSHD/APL

CMD: `INGUSS JOBNAME=&SUBSJOB &SUBSPATH &SUBSFILTER (&SUBSxxx variables are substituted at run time)`

### Stop definitions for SSHD\_FILE/APL

These commands remove the file if it has not yet been removed by the sshd process.

Table 14. Pass description for sshd

Number of Pass	Pass Description	Command
1	If not done yet by sshd	<code>INGUSS /bin/rm &amp;SUBSFILE</code>
4	If Pass 1 did not remove the file	<code>INGUSS /bin/rm -f &amp;SUBSFILE</code>

### Stop definitions for SSHD/APL

When stopping the SSHD the correct process ID from the `sshd.pid` file must be extracted. The kill command is used to terminate the sshd process

itself. Once the sshd command is issued the parent shell used for monitoring purposes terminates and the SSHD/APL will go into a AUTODOWN status.

Use the following commands:

```
CMD:INGUSS /bin/sh -c '/bin/ps -ef | /bin/grep ~/bin/cat
/var/run/sshd.pid` | /bin/grep -q sshd && /bin/kill ~/bin/cat
/var/run/sshd.pid`'
```

```
CMD:INGUSS /bin/sh -c '/bin/ps -ef | /bin/grep ~/bin/cat
/var/run/sshd.pid` | /bin/grep -q sshd && /bin/kill -9 ~/bin/cat
/var/run/sshd.pid`'
```

```
CMD:INGRCLUP &SUBSJOB
```

These commands and the USS pipe are described here:

*Table 15. INGUSS Command and USS Pipe Summary*

Command	Task
INGUSS	Is the interface to USS
/bin/sh -c '...'	Provides a fully-equipped shell environment to extract the pid of the sshd
~/bin/cat /var/run/sshd.pid`	Subshell extracts the pid of the sshd: the extract pid is represented by 'extracted_pid' in the left column
/bin/ps -ef	Asks for all USS processes
/bin/grep <i>extracted_pid</i>	Shows only the sshd process
/bin/grep -q sshd	Suppresses output and returns the appropriate return code: return code 0: sshd process exists return code 1: sshd process does NOT exist
&&	Continues only if return code is 0 / if sshd exists
/bin/kill <i>extracted_pid</i> or /bin/kill -9 <i>extracted_pid</i>	Issues SIGTERM signal against the 'extracted pid' of the sshd

In case, the kill command does not terminate the sshd process use INGRCLUP routine to invoke a z/OS CANCEL command against the address spaces of the sshd and the monitored parent shell.

SA z/OS provides the \*USS best practices policy that provides definitions for several automated USS daemons, such as sshd. Common definitions for USS resources can be found in the APL classes starting with C\_USS\_xxx .

Use also the Unix man pages to get more information about the used USS commands and their parameters.

---

## Hints and Tips

### Trapping UNIX syslogd Messages

To trap UNIX syslogd messages, an entry must be added to the syslogd configuration file /etc/syslog.conf in order to forward the messages to the MVS system log. Thus, messages can be processed by the NetView automation table (AT).

## Hints and Tips

To forward all messages to the MVS log add the following entry:

```
*.* /dev/console
```

To send special messages to the MVS log only, follow the syslog message naming guidelines (for example, for warning messages use \*.warn). You can use /dev/console as an ordinary file to write to.

To test this, issue the following UNIX command from a USS console:

```
echo 'This is a test message' >>/dev/console
```

The UNIX messages have the MVS message ID BPXF024I and are multiline messages.

Figure 23 shows an example of the output of the UNIX command in the system log.

```
M 13:45:21.34 STC03602 00000090 BPXF024I (USER) Feb 13 13:45:21 SYS1 syslogtest 67109100 : This is  
S                               498  
D                               498 00000090 a test message
```

*Figure 23. Example of a UNIX Message*

## Debugging

Debugging can be activated for z/OS UNIX monitoring and command execution on the AOCTRACE panel. The automation procedure for monitoring is AOFUXMON and for command execution AOFRSUSS.

Turning on debugging for AOFRSUSS implicitly turns on debugging for ingccmd (the SA z/OS command server).

The debugging messages are written to the netlog and to the z/OS UNIX system log (syslogd).



---

## Chapter 10. Command Receivers

This chapter describes how to set up and use command receivers for general use. The command receiver is able to pass NetView, SA z/OS or MVS commands to SA z/OS for execution. The command receiver is able to dispatch incoming commands to a dedicated group of tasks, called the command work tasks. The command receiver uses a round robin algorithm that ensures, on average, each of the associated automated functions has the same number of commands to process. In short, the technique enables the execution of multiple received commands in parallel.

The command receiver is used by:

- the Batch Command Interface
- SA z/OS provided REXX functions running in a TSO environment emulating function calls of other automation products.

---

### Setting Up the Command Receiver

Setting up the command receiver consists of the following:

1. Setting up the TSO/Batch environment by means of establishing the INGTXFPG REXX function package. This function package is necessary for PPI communication with the local NetView
2. Defining the command receiver as a subsystem automated by SA z/OS
3. Defining the command work tasks used by the command receiver.

It is recommended to use the SA resources defined in the add-on policy \*IBMCOMP. Select the following entries:

*Table 16. Policy Entry Names and Types for Command Receivers*

Policy Entry Name	Policy Entry Type
CMDRCVR	APL
CMD_RECEIVER	APG
CMD_RECEIVER_AUTOOPS	AOP

These SA z/OS resources ensure that the command receiver task is started at SA z/OS initialization time and ready to receive commands. The operator is able to monitor the status of the command receiver by means of the INGLIST command via SDF.

---

### Setting Up TSO/Batch Environment

Add REXX function package INGTXFPG in the appropriate TSO module below. TSO/E provides the following samples in SYS1.SAMPLIB that you can use to code your own load modules:

*Table 17. Sample Names and Load Modules for a TSO/Batch Environment*

Sample Name	Load Module name
IRXREXX1	IRXPARRMS for MVS
IRXREXX2	IRXTSPRM for TSO/E
IRXREXX3	IRXISPRM for ISPF

## Command Receivers

There are various considerations for providing your own parameter modules. For details, see the section "Function Package Table" in chapter "Language Processor Environments" of *TSO REXX Reference*. The different considerations depend on whether you want to change a parameter value only for an environment that is initialized for:

- ISPF
- both TSO/E and ISPF sessions
- a non-TSO/E address space

Select the appropriate sample parameters modules, for example, IRXREXX2 for TSO/E also for batch PGM=IKJEFT01, and add function package INGTXFPG as a system function package.

The following must be considered:

1. You must link-edit the REXX default parameters module with the corresponding names. For example, the load for the sample IRXREXX2 must have the name IRXTSPRM
2. Place the resultant REXX default parameter module in the Linklist
3. Make sure that also the function package INGTXFPG resides in the Linklist.

---

## Defining Command Receiver as a Subsystem Automated by SA z/OS

Import the CMDRCVR and CMD\_RECEIVER objects from the sample policy \*IBMCOMP. This creates an application group containing a non-MVS subsystem called CMDRCVR presenting the command receiver. The command receiver task will run in a VOST. The name of the VOST is the name of the associated resource, in this case CMDRCVR.

When the CMDRCVR starts, it starts the PPI receiver by means of command:

```
INGRCRCV START OPF=AOFCDOPER
```

The default PPI receiver identifier is INGRRCV, but can be changed to any other name. If you want to use a different PPI receiver ID you must specify the parameters PPI and CSAKEY. The CSAKEY parameter defines a key that all command receiver clients are using for communicating with the receiver. EMULATOR is the only key supported. The INGRRCV command would look like:

```
INGRCRCV START PPI=xxxxxxx CSAKEY=EMULATOR OPF=AOFCDOPER
```

where xxxxxxx is the PPI name of choice.

Be aware that the command receiver is not able to route the incoming command to one of the command work tasks when the OPF=AOFCDOPER parameter is missing. In this case, all incoming commands are processed sequentially by the VOST task hosting the command receiver.

When subsystem CMDRCVR terminates, it stops the command receiver by means of INGRRCV STOP command.

Notice that the sample definition has escalation commands defined for the stop process. It uses the INGVSTOP DETACH and INGVSTOP TASK commands for the stop passes. These commands stop the VOST hosting the command receiver directly rather than terminating the command receiver gracefully.

---

## Defining Command Work Tasks Used by the Command Receiver

Import object `CMD_RECEIVER_AUTOOPS` from the sample policy `*IBMCOMP`. This object import defines a set of automated functions named `AOFCMDnn` where `nn` starts from 1 running up. By default 5 command work tasks are defined. You may add more command work tasks if needed.

### Notes:

1. The command receiver checks if the automated functions (command work tasks) are defined and active. If this is not the case, the command receiver terminates with error message `ING347I`.
2. Note that the names of NetView Automation Operators must match those that you define in member `ING.SINGNPRM(AOFOPFSO)`. You may customize this sample to your needs. By default, the following map is used:

*Table 18. Functions and Operators for SA and NetView respectively*

SA Automated Function	NetView Automation Operator
AOFCMD01   AOFCMDnn	AUTCMD01   AUTCMDnn

---

## Starting and Stopping the Command Receiver

The command receiver is controlled by SA z/OS. It is defined as a non-MVS subsystem. Unless changed, the name of the command receiver subsystem is `CMDRCVR`. To start the command receiver, issue the `INGREQ REQ=START` command against the appropriate subsystem, for example:

```
INGREQ CMDRCVR/APL/SYS1/ REQ=START
```

You should not have to start the command receiver in normal circumstances, because it should start automatically when the SA z/OS agent registers with the automation manager.

To stop the command receiver, issue the `INGREQ REQ=STOP` command against the appropriate subsystem, for example:

```
INGREQ CMDRCVR/APL/SYS1 REQ=STOP
```

To see the list of VOSTs used by the command receiver(s) use the `INGRCRCV QUERY` command.

---

## Submitting NetView Commands from a Batch Job

This section describes how to execute NetView commands from a Batch job. This is particularly useful for Tivoli Workload Scheduler, but can be used stand alone.

### Sample Batch Job JCL

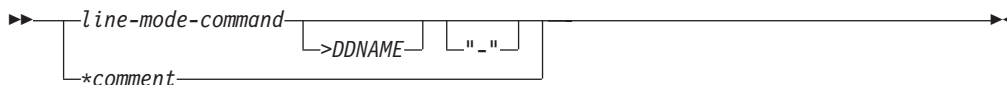
A sample batch job can be found in the System Automation for z/OS Installation library `SINGSAMP`. Member `EVJSJ001` contains the sample JCL. The batch job must be run on the same system as the SA z/OS Agent that contains the command receiver specified by the batch job. In most cases there will be a command receiver running on every SA z/OS Agent. The use of the general purpose command receiver is recommended since it can handle the execution of multiple commands concurrently. The use of the general purpose command receiver is triggered by the `SERVER=*` parameter. However, customization of the command receivers can alter the names of the command receivers and also the number and configuration of the

## Sample Batch Job JCL

command receivers. You should check with your system programmers to determine the correct system and command receiver to use for these batch jobs.

### Command Statement Syntax

The commands supplied to the batch job in the //SYSIN ddname have the following syntax:



1. All blank lines are ignored.
2. All lines starting with an asterisk (\*) are comment lines and are printed in the output but otherwise ignored.
3. Comments on the end of commands are not allowed.
4. Comments are not allowed between continuation lines.
5. A command can be continued by appending a dash (-) to the line.
6. Command output normally goes to //SYSTSPRT.
7. Command output may be redirected to other DDNAMEs. The default for this is the right angle bracket (>) symbol.
8. PIPE > stage is prohibited. Use PIPE QSAM instead.
9. Fullscreen commands are not allowed.

### Valid Command Types

Any command, clist or REXX program that issues correlated line messages may be used.

This means almost all NetView commands, all SA z/OS commands that support OUTMODE=LINE and any clist or REXX program that either issues SAY messages or PIPES the messages to CONSOLE.

The return code from the command can be used to stop the remaining commands from being executed. See the "MAXRC parameter" on page 118 of the AOFRCMD procedure definition.

### Command Continuation

Commands are continued across lines by appending a dash to the end of the command, for example:

```
PIPE NETVIEW LIST STATUS=OPS | -  
CONSOLE ONLY
```

### Command Output Redirection

Normally command output is printed on the //SYSTSPRT DDNAME. However, the output of commands may be redirected to other DDNAMEs. This is achieved via a redirection symbol. The default is the > symbol, for example:

```
PIPE NETVIEW LIST STATUS=OPS | CONSOLE ONLY >MYOUTPUT
```

This allows subsequent steps in the batch job or other batch jobs to use the output of the command for their own purpose.

You can change the redirection symbol with the REDIRECT parameter of AOFRCMD if, for example, you use > as a command prefix. Note that the

redirection symbol must not be the same as any of the characters that occur in the command. For more details, see "AOFRYCMD Description."

The DCB characteristics of the output DDNAME should be as follows:

LRECL=132,RECFM=FB

## Executing a Command on a Different NetView

Almost all SA z/OS commands can specify the TARGET= parameter to force the command to execute on the target system. If a command does not have this facility, for example the NetView LIST command, you can use PIPE labels to send the command to the appropriate NetView, for example:

```
PIPE CC dom01: LIST STATUS | CONSOLE ONLY
```

Or even:

```
PIPE CC dom01/auto1: LIST STATUS=OPS | CONSOLE ONLY
```

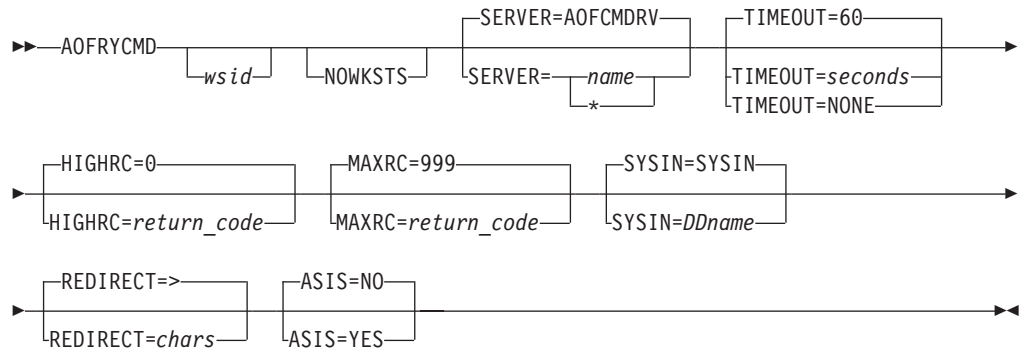
## JCL for the Batch Command Interface

You will find the sample JCL EVJSJ001 to execute commands on SA z/OS/NetView agents in the SA z/OS product sample library (SINGSAMP).

### AOFRYCMD Description

**Purpose:** AOFRYCMD is a REXX procedure that issues commands to a SA z/OS agent and receives the results of those commands.

**Note:** AOFRYCMD is identical to EVJRYCMD. For an easy migration EVJRYCMD still exists in the library SINGNREX while AOFRYCMD resides in SINGTRES. The use of AOFRYCMD is recommended.



#### Parameters:

*wsid* This parameter is optional.

This parameter specifies the name of the TWS workstation that submitted this batch job. This information is used by the command to disable the workstation in the event that communications between the batch job and the SA z/OS Agent cannot be established.

If this parameter is specified, any NetView PPI communications problem will cause the command to issue a TWS WSSTAT command to place the workstation offline.

## JCL for the Batch Command Interface

### NOWKSTS

This parameter is optional. It is also deprecated. It is preferable to omit the workstation ID.

This parameter modifies the behavior of the command. In the event of a failure in communications to the SA z/OS Agent, this parameter prevents the command from disabling the TWS workstation that is defined with the *wsid* parameter.

### SERVER

This parameter is optional.

The default for this parameter is EVJCMDRV. This parameter specifies the name of the PPI receiver in the SA z/OS Agent NetView that commands will be sent to. Specifying SERVER=\* causes the command receiver to pass the command to one of the associated work tasks to enable parallel processing of commands. The command receiver EVJCMDRV is deprecated but still exists for compatability reasons.

For details on defining EVJCMDRV, refer also to the \*IBMCOMP Add-on policy.

**Note:** When using the general purpose command receiver by coding SERVER=\*, the SINGTREX library must be added to the SYSPROC concatenation chain.

### TIMEOUT

This parameter is optional.

The default for this parameter is 60 seconds.

This parameter specifies the time in seconds that the batch job will wait for a command to execute in the SA z/OS Agent NetView. This timeout is applied separately to each command. If the timeout is set to NONE, no timeout will be applied to the batch job.

**Note:** It is recommended that the INGREQ timeout (as defined with the FDBK parameter) should be less than the TIMEOUT= parameter for the job.

This is because the INGREQ command's FDBK parameter can be used to specify a WAIT period that will result in the command waiting until the desired status change is complete. For example, if the TIMEOUT parameter is defaulted to 60 seconds, the INGREQ FDBK parameter should be coded as, say, FDBK=(WAIT, :55)

### HIGHRC

This parameter is optional.

The default for this parameter is 0 (zero).

This parameter specifies the highest acceptable Return Code for the job. Any return codes from commands that are less than or equal to this value will reset the JCL Step return code to zero. Any command return code that is greater than this value will be passed as the JCL Step return code.

**Note:** The JCL Step return code will be the highest return code of all the command return codes.

### MAXRC

This parameter is optional.

The default for this parameter is 999.

This parameter specifies the maximum acceptable return codes from commands issued by the batch job. If a command return code is higher than the value specified, the batch job is aborted and any remaining commands will not be executed.

The return code that is reported to the JCL is determined by the HIGHRC parameter.

### **SYSIN**

This parameter is optional.

The default for this parameter is SYSIN.

This parameter sets the DDNAME of the input file that contains the command to be executed.

### **REDIRECT**

This parameter is optional.

The default for this parameter is >.

This parameter defines the redirection character. Enclose it in quotes or double-quotes if the string contains special characters, such as the equal sign. It must not be the same as any of the characters that occur in the command.

**ASIS** This parameter is optional.

The default for this parameter is NO.

This parameter enables the submission of a required command in mixed case, to be executed as presented, when the parameter value is YES.

**Usage:** When the SA z/OS Agent is started, it will automatically issue a WSSTAT command to mark the workstation online. The specifications of which workstations to mark online at agent restart are contained in the WORKSTATION message/user data policy for the tracker or controller. Multiple workstations may be defined. Workstations that are assigned to trackers should have their WORKSTATION policy defined to the same trackers that they are assigned to.

Each command is submitted in turn and the results of the command are retrieved. These results are then written to either SYSTSPRT or to the output redirection DDNAME.

Whether or not the command completed successfully is indicated by message ING330I for satisfactory completion or message ING332I when the command failed. Message ING332I shows the return code of the command completion. These messages are written to SYSPRINT (//SYSTSPRT DDName).

**Note:** The DW0369I message that might have been requested when using the NetView PIPE command with the MOE option or automatically injected by SA when the command completed successfully is no longer passed along.





---

## Chapter 11. Enabling Relational Data Services (RDS)

SA z/OS provides Relational Data Services (RDS) which are available through the INGRDS command. It provides basic access methods for SA z/OS built-in relational data tables. The syntax of the command INGRDS is close to the concept of SQL but much simpler and without the support of the full SQL language parser. SA z/OS saves the relational data tables in VSAM files.

For fast access, the relational data tables are held in the GETMAIN storage of the NetView address space. The available amount of free memory in the NetView address space limits the amount of data that can be stored in the RDS tables. Persistency is achieved by an algorithm that periodically saves the tables into a VSAM KSDS file with DD INGEMUGL. The tables will be restored during SA initialization when NetView is started.

Each SA z/OS agent maintains its own VSAM data file and in memory tables that only hold data associated with it. When the SA z/OS agent is down, the table data cannot be accessed.

**Note:** There is one VSAM KSDS file per SA/NetView agent which holds the persistent RDS tables. Accessing the RDS tables is only possible via INGRDS if the SA/NetView is running.

---

### Enable/Disable Persistent Relational Data Services

Relational Data Services (RDS) are by default disabled since an extra DD is required in the NetView startup procedure.

RDS will be initialized and enabled if the SA automated function AOFRDSAR is defined (see AOP entry RDS\_AUTOOPS below).

RDS needs an extra VSAM cluster in order to make the RDS tables persistent. Refer to the step "Install Relational Data Services" in the chapter "Installing SA z/OS on Host Systems" of *IBM Tivoli System Automation for z/OS Planning and Installation*.

Once RDS is initialized you may disable making RDS tables persistent by stopping the resource RDSARCH. This will stop archiving the RDS tables. However RDS still works with the in-memory RDS tables.

---

### Import System Automation Resources

It is recommended you use the SA z/OS resources defined in the add-on PDB \*IBMCOMP. Select the following entries:

*Table 19. Receiver Names and Related Policies*

Policy Entry Name	Policy Entry Type
RDSARCH	APL
RDS_ARCHIVER	APG
RDS_AUTOOPS	AOP

## Enabling Relational Data Services (RDS)

These SA resources ensure that the RDS archive task makes the RDS table persistent. The advantage is to start or stop archiving easily. Error situations reflected by error messages such as VSAM IO error could also be trapped in the message table and associated with the SA resource. The resource status might become broken indicating a severe error.

After importing the RDS\_ARCHIVER and RDSARCH, the SA z/OS customization dialog defines an APG resource group that includes an APL resource RDSARCH. It has the function to start or stop RDS archiving. Using INGTIMER as a pre-start command, the RDS archiving command will be scheduled on the automated function AOFRDSAR.

After importing RDS\_AUTOOPS the SA customization dialog defines the corresponding automated functions AOFRDSAR and AOFRDSEV. Note that the names of the NetView Automation Operators must match those that you define in member ING.SINGPRM(AOFOPFSO). You may customize this sample to your needs. By default the following mapping is used:

*Table 20. RDS/SA Functions and NetView Operators*

SA Automated Function/Operator	NetView Automated Operator
AOFRDSAR	AUTRDSAR
AOFRDSEV	AUTRDSEV

---

### Regular Snapshot

By default, the RDS archiving resource RDSARCH issues the command "INGVALUE ARCHIVE" every 30 seconds. It runs on the automated function AOFRDSAR. Archiving and restoring must run always on the same task. Make sure that the RDS archiving works well and periodically performs the backup of RDS tables.

---

### RDS Initialization

During SA z/OS initialization the persistent RDS tables are restored into memory, if the SA z/OS automated function AOFRDSAR is defined.

If this status of the RDS initialization is not OK then the following message may appear:

```
ING388I Function or command INGRCVAC failed, RC=36 REASON=ARCHIVE rejected INIT STATUS=xxxx
```

If xxxx is a NULL string then the initialization of RDS was not performed.

---

### RACF Protection of INGRCRDX under TSO

This section provides some general guidelines for System Automation(SA) Relational Data Services on TSO.

#### Enable and Disable RACF Checking

In order to enable RACF checking for INGRCRDX on TSO you must set the CSA key following AAO to a value of your choice denoting the RACF high level qualifier, for example, to ING, via the new AAO:

```
AOF_AAO_RDS_TSO_RACFHLQ=ING
```

The value 'ING' is the high level qualifier used as prefix when the emulator builds the RACF profile. The high level qualifier could be up to 26 bytes long and may contain dots (for example, MY.HLQ). You may disable RACF checking again when you remove the AAO or set it to the empty string or to #RACFHLQ#.

### RACF Profile and Class

The RACF class is always FACILITY and cannot be changed. If RACF checking is enabled, Relational Data Services commands/functions on TSO perform automatically authorization checking. It checks whether the current TSO user id has UPDATE authority to the profile of following format:

```
<EMU.RACF.HLQ>.EMULATOR.SQL
```

and <EMU.RACF.HLQ> is the value of your choice previously defined above in the AAO above.

Examples for profiles with the assumption that <EMU.RACF.HLQ> was set to ING:

```
ING.EMULATOR.SQL
```

**Important:**

Read the section "Install SA Provided Authorized TSO Command" on how to install INGPAUTH as authorized TSO command. If RACF protection is enabled the receiver commands will use INGPAUTH under the cover for RACF checking.

### Install SA Provided Authorized TSO Command

System Automation delivers an authorized TSO command with ING.SINGMOD1(INGPAUTH). The Relational Data Services require that the TSO command INGPAUTH must be defined as authorized command in TSO. This can be achieved by adding the command name to the PARMLIB member IKJTSO00 in SYS1.PARMLIB under AUTHCMD. Use the TSO/E command PARMLIB UPDATE(00), or MVS command SET IKJTSO=00, to activate the new settings. Be sure that INGPAUTH is in the LINKLIST.

---

### RDS Table Editor

System Automation provides support for the ISPF editor on TSO in order to edit a RDS table and to save changes made at the RDS table. While editing a RDS table it is protected against modification by other users via a LOCK token. The lock token is JOB\$xxx where xxx is the TSO user id.

**Note:** If you have defined the data set with variable records you may get the warning message below. It is acceptable that all trailing blanks are removed. Saving the table again will work anyway. "Truncation warning. The data you are editing is variable length data with at least one record that ends with a blank. Saving the data will result in removal of any trailing blanks from all records. ..."

For an ISPF EDIT example see screenshot below:

## Enabling Relational Data Services (RDS)

```

000001 @SA_RDS_TABLE: TABLE1 (30,20,15)
000002 NAME FIRST_NAME CITY
000003 -----
000004 Bond James London
000005 Smith John New York
000006 Schulz Emma Berlin
000007 Metzger NULL München
000008 Wagner Frankfurt
000009 Schiller Eva Stuttgart
000010 Schmidt Hugo Hamburg
000011 Fischer Egon Hamburg
***** ***** Bottom of Data *****

ssssssssssssssssssssssssssssssssssssssssssssssssssssssssssssssssssssssssssN
Truncation warning. The data you are editing is variable length data with at e
least one record that ends with a blank. Saving the data will result in e
removal of any trailing blanks from all records. You can issue the PRESERVE e
ON command if you don't want the blanks removed. e
ssssssssssssssssssssssssssssssssssssssssssssssssssssssssssssssssssssssssssM

```

**Note:** Trailing blanks can be removed to save space.

### Add SA TSO REXX Library

SA provides an extra library for use by SA REXX clists under TSO.

Make sure that the library ING.SINGTREX is added to the TSO allocation chain for REXX clists.

### Define a RDS Working Data Set for Viewing/Editing under TSO

Viewing and editing a table is done by use of a temporary member of a dedicated PDS. NetView and TSO must have read and write access to this PDS. The PDS is reserved for this function. It must have maximum record length big enough to support table rows with longest length that fit to your needs. A unique temporary member will be created on behalf of the TSO user that calls INGRDS EDIT or VIEW. For that purpose the TSO user id is used. The member will always be overwritten with subsequent calls to INGRDS EDIT or VIEW.

The RDS working data set must be made know to all TSO address spaces and to NetView via following AAO:

```
AOF_AAO_RDS_TSO_DSN=HLQ.RDS.WORK
```

The data set name HLQ.RDS.WORK is customizable. You may create a PDS with a name of its own.

Sample of a PDS characteristics with maximum records length of 1000 if the total sum of all columns definition of a table is smaller 1000 bytes:

```

Organization . . . : P0
Record format . . . : VB
Record length . . . : 1000
Block size . . . . : 32000
Data set name type : PDS

```

### Viewing a RDS Table within TSO

You use the following command on TSO:

```

INGRCRDX VIEW mytab
INGRCRDX BROWSE mytab

```

| It retrieves the table **mytab** and displays it using the ISPF editor.

### | **Editing a RDS Table via TSO**

| You use the following command on TSO:

| INGRCDX EDIT mytab

| It retrieves the table **mytab** and displays it using the ISPF editor. You may change  
| the table. Please observe the rules of column specifications as described below.  
| Changes to the table will be saved in a temporary file and imported to the RDS  
| table **mytab**. A table lock is obtained until the table is saved or quit.

| The following rules apply:

- | 1. Respect the column length and keep one blank between each column.
- | 2. For an existing table you should not delete columns or insert new columns  
| because you cannot overwrite column definitions.
- | 3. For a table that does not exist yet: After you modified the table name in line 1  
| and saved the table you can delete, insert and rename columns. Make sure that  
| the numbers in parenthesis match the column width. The new table name must  
| not exist. If the new table name exists already the old column definitions are  
| used.

## Enabling Relational Data Services (RDS)

---

## Chapter 12. How to Enable Sysplex Automation

This chapter covers SA z/OS specific capabilities for Parallel Sysplex® automation, how to use the SA z/OS customization dialogs to enable them, and how to customize your system.

**Note:** If you use a host code page other than 037, the hexadecimal representation of the at sign (@) can be different. Use the letter represented by the hex code X'7C' for the at sign.

---

### Sysplex Functions

The following functions are described:

- “Managing Couple Data Sets”
- “Managing the System Logger” on page 128
- “Managing Coupling Facilities” on page 129
- “Recovery Actions” on page 131
- “Hardware Validation” on page 138

### Managing Couple Data Sets

*Couple data sets* (CDSs) contain control information about the sysplex and its resources, and are of crucial importance for the functioning of a Parallel Sysplex. Particularly important are the SYSPLEX couple data set, which contains information about the systems and the communication structure (XCF groups) of the sysplex, and the CFRM couple data set, which specifies its coupling facilities (CFs) and structures (see “Managing Coupling Facilities” on page 129). Every MVS system in a Parallel Sysplex must have access to these CDSs, and to those of all other implemented sysplex functions, such as SFM and Application Response Measurement (ARM).

If a member system cannot access a CDS, the corresponding sysplex function is impacted, and in some cases the sysplex goes down. It is therefore recommended that you define two CDSs to XCF for every CDS type required for the implementation of the sysplex. One of these, the *primary* CDS, is the one that is actually used. The other, which is called the *alternate* CDS, serves as a backup copy. The two CDSs contain the same data. Whenever the primary CDS changes, XCF updates the alternate CDS accordingly. If an alternate CDS is available for a certain type, XCF automatically switches to this alternate CDS whenever a member can no longer access the primary CDS.

All CDSs except the sysplex couple data set contain one or more user-defined configurations, called *policies*. For each CDS type, only one policy can be active. However, it is possible to switch the active policy at run time. Refer to *IBM Tivoli System Automation for z/OS Operator’s Commands* for further information about the INGPLEX command.

SA z/OS offers two functions for easier CDS management:

- Automated creation and recovery of alternate couple data sets for continuous availability
- INGPLEX CDS, which simplifies management of couple data sets

## Managing Couple Data Sets

### Ensuring Continuous Availability of Couple Data Sets

When an alternate CDS exists for a given CDS type and the current primary CDS fails, XCF makes this alternate the primary CDS. After this switch, however, an alternate CDS no longer exists, and if the current primary CDS also fails, the problems that were to be avoided by the creation of an alternate occur again. To avoid this single-point-of-failure situation, SA z/OS provides a recovery mechanism that tries to ensure that an alternate CDS is always available for every CDS type used.

SA z/OS creates a new alternate CDS in the following two situations:

- During initialization, SA z/OS checks that an alternate CDS is specified for every primary CDS. If there is a primary CDS for which no alternate CDS exists, SA z/OS automatically creates it.
- At run time, SA z/OS ensures that a new alternate is created whenever the current alternate has been removed or switched to the primary one.

### Customization

Recovery of alternate CDSs is initiated either by the CDS function of INGPLEX or in the background (for example, at initialization time). Background recovery can be switched on and off by using the SA z/OS customization dialogs. Automatic re-creation with INGPLEX CDS is always enabled.

You must specify the spare volumes that SA z/OS may use for creating missing alternate CDSs (using the policy item SYSPLEX from the Policy Selection panel for sysplex groups). This is also required for automatic creation with INGPLEX CDS. Every CDS type has its own pool of spare volumes. Note that if you do not define spare volumes for a CDS type, no recovery is performed for this type. For details on the use of the customization dialogs, see “Enabling Continuous Availability of Couple Data Sets” on page 141.

You can control access to those functions of INGPLEX CDS that modify the sysplex configuration. Refer to Appendix A of *IBM Tivoli System Automation for z/OS Planning and Installation* for details.

## Managing the System Logger

### Terms and Concepts

The *system logger* provides a sysplex-wide logging facility. Applications that use the system logger write their log data into *log streams*. Within a Parallel Sysplex, these log streams are usually associated with a coupling facility structure. For further information about coupling facility structures, refer to “Managing Coupling Facilities” on page 129. By using a coupling facility log stream, members of a multisystem application can merge their logs even when residing on different systems.

When an application writes data to a log stream this data is stored at first temporarily in the associated structure (coupling facility log stream) or a local buffer (DASD-only log stream). From there, it is off-loaded into a log stream data set which is automatically allocated by the system logger. When this log stream data set is full, the system logger allocates a second one, and so on.

The control information for the system logger, which includes a directory for the log stream data sets of every log stream, is contained in the LOGR couple data set. The total number of log stream data sets that can be allocated by the system logger is determined when the LOGR couple data set is formatted.



Two problems that can arise in connection with the log stream data sets are a shortage of directory space in the LOGR CDS and incorrect share options for the log stream data sets. SA z/OS provides the following recovery actions for these problems:

- The primary and alternate LOGR CDSs are automatically re-sized if there is a directory shortage
- The operator is notified if the share options for log stream data sets are not defined correctly

### Resizing the LOGR Couple Data Sets in Case of Directory Shortage

The LOGR CDS contains information about the log stream data sets used by the system logger. This information is stored in *directory extents*. Every directory extent record can hold information about up to 168 log stream data sets. The number of directory extents available in a LOGR CDS is specified when the CDS is formatted (DSEXTENT parameter). When all available directory extents are used up the system logger can no longer allocate new log stream data sets. This can cause considerable problems for applications that use the system logger.

With SA z/OS, you can avoid this situation. If you switch on logger recovery, SA z/OS automatically reformats your primary and alternate LOGR CDS with an increased DSEXTENT parameter whenever the system reports a directory shortage.

### Customization

Automation of system logger recovery is enabled through the SA z/OS customization dialogs. For more details, see “System Log Failure Recovery” on page 184.

## Managing Coupling Facilities

A *coupling facility* (CF) is a logical partition that provides storage for data exchange between components of an application that is distributed across different systems in a Parallel Sysplex. A Parallel Sysplex can contain more than one CF. The storage of a coupling facility is divided into areas that are called *structures*. You can imagine a structure as a special kind of data set. It is these structures, which are identified by their name, that are accessed for reading and writing by the application components.

The association between CFs and structures is dynamic. A structure that is used by an application need not be allocated at all (for example, when the application is not running), and can be allocated on different CFs at different points in time. For every structure, there exists a *preference list* that defines the CFs on which it may be allocated. The order of the CFs in that list determines which CF is selected when more than one member of the list satisfies all allocation requirements (for example, provides enough space).

The preference list, the space requirements, and other properties of the structures are defined in the active CFRM policy. This policy is contained in the CFRM couple data set. Refer to “Managing Couple Data Sets” on page 127 for further information.

XES allocates a structure that does not yet reside on any CF when an application component needs to be connected to it. Note that the application component only specifies the name of the structure that it wants to access. It is XES that decides on which CF the structure is allocated. This decision is influenced by the structure definition in the active CFRM policy. After the structure has been allocated, the

## Managing Coupling Facilities

requesting application component can access it, and further components of this application can require to connect to it. An application component that has access to an allocated structure is referred to as an *active connector* to this structure.

In the simplest case, XES deallocates a structure when all connected application components have disconnected from the structure. However, an application component can require that the structure or its own connection to the structure be *persistent*. When the *structure* is persistent it remains allocated even when the application component is no longer connected to it. When a *connection* is persistent the structure remains allocated after a failure of that connection. The application component in question remains a connector to the structure, although not an active one. It is now a *failed persistent* connector. In both cases, you can force the deallocation of the structure as soon as it no longer has active connectors.

Allocated structures can be *rebuilt*. Rebuilding is the process of reconstructing a structure on the same or another CF. A rebuild consists of three main steps. First, XES allocates the new structure instance. Then, the data of the old structure is reconstructed in the new structure. Finally, XES deallocates the old structure instance. Note that you cannot specify the target CF in your rebuild request. As with structure allocation, XES selects it from the preference list.

There are two methods for rebuild: user-managed and system-managed. With user-managed rebuild, the active connectors are responsible for reconstructing the data. With system-managed rebuild, XES transfers the data to the new structure instance. System-managed rebuild is thus also available for structures without active connectors. These structures can either themselves be persistent or have failed persistent connections.

When an application component connects to a structure, it specifies whether it allows the structure to be rebuilt through user-managed or system-managed rebuild. For structures with active connectors, both rebuild methods require that all active connectors allow the respective rebuild method.

You can also *duplex* structures. Duplexing means maintaining two instances of the same structure on different CFs at the same time. Duplexing serves to increase availability and usability of a structure.

Typical management tasks for CFs are removing a CF from the sysplex and reintegrating it again. These tasks have several steps that must be performed in a certain order and can be quite complex. To simplify these operations, SA z/OS offers the INGCF command. INGCF has several functions, which serve to manipulate structures and the CFs themselves. For more information, see *IBM Tivoli System Automation for z/OS Operator's Commands* and the online help.

Some functions deal with the sender paths of a coupling facility. They have the following limitations. First, at least one system in the sysplex that is running the automation must know the control unit ID (CUID) of the coupling facility. If this is not the case, no missing sender paths can be resolved.

A missing sender path occurs when a coupling facility is deactivated prior to a system IPL (or reIPL) and then activated afterwards. The system that has been IPLed (or reIPLed) does not recognize the coupling facility. To determine the missing sender paths, the automation calls the HOM interface of HCD. Resolving the missing path information is only possible when either the complete network address is defined in HCD along with the processor ID, or you provide the CPC

synonym used by the automation as the processor ID. However, it is recommended that you define both. If neither is defined, the system that misses the sender paths must run the automation.

## Recovery Actions

### Resolving WTO(R) Buffer Shortages

When all WTO(R) buffers are in use, it is possible that commands can no longer be processed. To resolve this, there are several options: you can extend the buffer, change the properties of the affected consoles, or cancel jobs that issue WTO(R)s.

SA z/OS provides recovery of buffer shortage in two stages. It first tries to extend the buffer and modify the console characteristics, if applicable. If this does not help, it then cancels jobs that issue WTO(R)s. You must specify which jobs can be canceled by SA z/OS if there is a buffer shortage.

**Customization:** Automation of buffer shortage recovery is enabled using the SA z/OS customization dialogs. For more information, see “Enabling WTO(R) Buffer Shortage Recovery” on page 142.

WTO Recovery is performed when different messages are received by SA z/OS. The action taken when each of these messages is received is described in Table 21 on page 132.

## Recovery Actions

Table 21. WTOBUF Recovery Process

Recovery	Message		Command	
WTO	IEA405E	Set the console attributes.		
		If the deletion mode is not roll or wrap, set the mode to roll.	K S,DEL=R,L=x	
		If any out-of-line display area exists, delete the status display.	K E,D,L=x	
		If the interval between message rolls is greater than 1 second and not '*', set the interval to 0.25 seconds.	K S,RTME=1/4,L=x	
		If the console receives messages not only from the local system and the WTO message buffer size has reached its maximum, remove the buffering systems from the list and add the local system to the list.	V CN(x),MSCOPE=(1)	
	IEA404A	Suspend the console.		
		Requeue the messages to the hardcopy log.	K Q,L=x	
		Vary the active console (COND=A) offline. For SMCS consoles, issue the appropriate VTAM command.	V {CN(x),OFFLINE  NET,TERM,LU1=x, TYPE=FORCE }	
		Cancel the job or TSO user that caused the shortage, but only when defined as a candidate during customization.	C {jobnm,A=asid  U=userid }	
	IEA406I	Resume the console if it was suspended and if it is not a SMCS console.		V CN(x),ONLINE
		Restore the console attributes.		
		Set the deletion mode to the value before the buffer shortage occurred.	K S,DEL=old,L=x	
		Set the interval between message rolls to the value before the buffer shortage occurred.	K S,RTME=old,L=x	
Set the list from which the console is to receive unsolicited messages to the list before the buffer shortage occurred.		V CN(x),MSCOPE=(1)		
Increase the WTO message buffer size to minimise future shortages as follows: new = min(9999 ,max(1500 ,1.2 * current MLIM ) ) )		K M,MLIM=new		
Issue the message AOF929 for permanent changes (MLIM).				
WTOR	IEA230E	Increase the maximum number of reply IDs to the maximum allowable value if the maximum number of systems in the sysplex is greater than 8 or the system runs in local mode.	K M,RMAX=9999	
		Increase the WTOR message buffer size if the current RMAX value is greater than the current RLIM value as follows: new = min(9999 ,max(10 + 2 * maxsys_in_sysplex ,1.2 * current RLIM ) ) )	K M,RLIM=new	
	IEA231A	Cancel all jobs and TSO users that have outstanding WTORs and that are defined as candidates during the customization.	C {jobnm,A=asid  U=userid }	
	IEA232I	Issue the message AOF928 for irreversible changes (RMAX). Issue the message AOF929 for permanent changes (RLIM).		

## Handling Long-Running Enqueues (ENQs)

This type of recovery is divided into the following individual functions:

- Long-running enqueue recovery
- "Hung" command recovery
- Command flooding recovery

All these recoveries can be enabled and disabled individually or globally.

The long-running enqueue recovery function lets you:

- Check which resources are blocked
- Customize automation to cancel or keep the jobs that block the resource
- Customize automation to dump the jobs before they are canceled

You can determine which resources you want to monitor. You can define a value for the maximum time a job can lock a resource while other jobs are waiting for it. If this amount of time is exceeded, recovery takes place. Identification of and elimination of these potential bottlenecks helps to reduce the risk of a Parallel Sysplex outage.

While the time definition describes an inclusion list, you also have the possibility to define an *exclusion list* of resources that are not monitored at all.

For more information about enabling the ENQ function, see "Enabling Long Running Enqueues (ENQs)" on page 145.

This function has been extended by two supplementary functions:

- "'Hung" Command Recovery"
- "Command Flooding Recovery" on page 134

**"Hung" Command Recovery:** The purpose of this function is to detect hung commands that often result in multisystem outages. We distinguish three situations:

1. Commands that inhibit other commands from completing execution
2. Commands that inhibit jobs from completing execution
3. Jobs that inhibit commands from completing execution

Automation examines ENQ contention associated with command processing and builds a list of blockers and waiters. The SA z/OS policy is then examined to see how long waiting commands and waiting jobs are allowed to wait before automated action is taken. The policy is also examined to determine what action (DUMP, NODUMP, KEEP or exclude) is to be taken against the blocking command or job, as follows:

1. When a command inhibits other commands from completing and no policy definitions exist for any of the waiting commands, no automated action is taken.
2. When a command inhibits jobs from completing and no policy definitions exist for the blocking command, no automated action is taken.
3. When a job inhibits commands from completing and no policy definitions exist for any of the waiting commands, no automated action is taken.

## Recovery Actions

If long-running ENQ and hung command recovery detect that the same resource requires automated action at the same time, the hung command recovery policy definitions take precedence and hung command recovery automates the resource.

The action taken (DUMP, NODUMP, KEEP or exclude) is identical to the long-running ENQ recovery action.

In either case only commands that are waiting on blocked resources are considered. "Hung" command recovery only considers those resources that are not being monitored by long-running ENQ recovery. If long-running ENQ recovery is disabled then all resources, even those defined as long-running ENQ resources, are considered for "hung" command recovery. It is also important to realize that if long-running ENQ recovery is enabled and a generic "catchall" resource definition applies, then "hung" command recovery cannot occur, because long-running ENQ recovery always take precedence.

Commands are executed by the master and console address spaces. Thus when a resource blocker is from either of these address spaces it is considered to be a blocking command rather than a blocking job.

As with resources, you can make similar definitions for commands that determine how long a command is permitted to lock a resource while other commands are waiting for the resource.

If the resource blocker is a job then recovery actions are only taken when the job has blocked the command for 3 consecutive iterations of "hung" command recovery processing. This results in a job blocking a command for no more than 90 to <120 seconds.

Recovery action for the blocking job or the job that issued the blocking command is the same as that specified for long-running ENQ recovery automation.

**Command Flooding Recovery:** The purpose of this function is to detect jobs that flood a command class. Command flooding can cause log buffer shortages and inhibits other commands from executing. Both can lead to a multisystem outage.

When all (50) TCBs that are reserved for command processing are in use, new commands are queued to the waiting queue. In this case the system issues message IEE806A which triggers this function to evaluate what jobs are causing the situation.

Jobs that just issue a set of commands, such as 200 (or more) "VARY dev,ONLINE" commands should *not* be considered during the evaluation. This is achieved by comparing the current and the previous snapshot of the affected command class.

Snapshot processing is scheduled when message IEE806A is trapped. The interval time between the snapshots is 3 seconds by default (see "Enabling Long Running Enqueues (ENQs)" on page 145 for details about adjusting this value if necessary). The interval should give these jobs enough time to finish issuing commands before the first snapshot is taken. Only jobs that issue commands on two consecutive snapshots become subject of the recovery action.

Before the recovery action takes place, the number of commands that are issued by the job must exceed a threshold (see below) and at least one of the commands must not be involved in a lock contention that is handled by the "hung" commands recovery.

The recovery action depends on the job definitions (see “Enabling Long Running Enqueues (ENQs)” on page 145). If the job can be canceled, the recovery also removes its waiting commands and terminates its executing commands. The recovery action is completed either with message ING922E or with message ING924E. The latter message is repeatedly issued approximately every minute until the waiting queue becomes empty.

The threshold is calculated by subtracting the number of jobs that are issuing commands in the command class from the total number of TCBS (50) that are reserved for command processing. This prevents jobs that repeatedly issue few commands from being evaluated.

The recovery ends when the message IEE061I is issued.

**Note:** The dump definitions are not in effect if a dump should be taken when the job is canceled. This is because the recovery routine of the job that is being canceled can suppress the dump.

**Customization:** Automation of handling long-running enqueues is enabled through the SA z/OS customization dialogs. For more details, see “Enabling Long Running Enqueues (ENQs)” on page 145.

### Managing System Removal

The purpose of this function is to isolate failed systems from a Parallel Sysplex by removing them as quickly as possible. It also ensures fast mean time to recovery (MTTR) for those system images that you wish to restart immediately if an unavoidable outage occurs.

**Note:** This function is unavailable when running on a z/OS image which runs under z/VM, even if the function is enabled.

In particular, the function automates the messages IXC102A and IXC402D.

The automation of the IXC102A message completes the Sysplex Failure Management (SFM). Under certain circumstances SFM cannot complete the isolation of a failed system. This is because SFM's HW isolation, resetting the channel subsystem (CSS) of the failed system, is driven through the CF. When connectivity between the system image and the coupling facility is lost, SFM cannot perform the hardware isolation (ISOLATE command) and defers resetting the system image until manual operator intervention occurs. Message IXC102A tells the operator to manually reset the HW and then reply "DOWN" to the message, after which SFM safely partitions the system image out of the sysplex. The longer the delay lasts, the more the components and applications that rely on XCF messaging are impacted. The delay can eventually lead to a sysplex outage when the failed system has I/O operations pending. Automation of this message minimizes the delay.

Message IXC402D has the same impact as IXC102A. However, this message indicates a possible temporary inoperative status of the system due to a missing status update. For this reason the automation gives the system the chance to recover before the removal takes place by replying "INTERVAL=sss" to the first occurrence of message IXC402D. The interval time, sss, is the failure detection interval that is displayed by the command D XCF,CPL.

The automation does the removal of a system in two stages. The first stage clears any pending I/O operations by sending a hardware command to the Support

## Recovery Actions

Element. This requires information about the software running on the hardware. Because the system issuing message IXC102A or IXC402D does not necessarily have access to the hardware of the failed system, the automation needs predefined mapping between software and hardware. Depending on this mapping, it then routes the hardware command to the system that has access to the hardware of the failed system. For information about how to do the mapping refer to “Enabling System Removal” on page 142. For further information about the hardware requirements refer to *IBM Tivoli System Automation for z/OS Planning and Installation*.

The second stage replies to the outstanding WTOR with "DOWN" triggering the removal of the system from the sysplex.

**Customization:** Automation of message IXC102A is enabled through the SA z/OS customization dialogs. For more details, see “Step 4: Automating IXC102A and IXC402D Messages” on page 143.

### Recovering Auxiliary Storage Shortage

With the automation of local page data sets that is controlled by the recovery flag of the automation flag MVSESA.PAGE, you can prevent auxiliary storage shortage outages by dynamically allocating spare local page data sets when needed. The function checks which job causes the shortage condition and whether additional page data sets can be added. If this is not possible, the job that is causing the shortage will be cancelled if this has been defined. For more details see Table 22 on page 137.

To enable local page data set automation, you should customize the PAGTOTL parameter (defined in one of the IEASYSxx PARMLIB members used during IPL). Make sure that you set the PAGTOTL parameter to a value greater than the number of local page data sets currently used.

Local page data sets must be defined in the master catalog and should not be SMS-managed. It is recommended that you use pre-allocated local data sets instead of dynamically allocated ones. This makes the process faster because formatting newly allocated page data sets is time-consuming. Each predefined local page data set should be allocated with 10% space of local page space that is currently used by the system. If predefined page data sets can no longer be allocated, new local page data sets will be created dynamically.

The following table shows the recovery actions in detail. Generally speaking;

- In case the recovery cannot complete successfully it always terminates with message AOF953 and a specific reason code.
- On invocation the recovery first checks whether some preformatted page data sets and the HLQ for data sets that should be dynamically created have been defined. If none has been defined the recovery terminates with RSN=4.
- If the command PAGEADD returns a message other than IEE782I and IEE783I the recovery is terminated with RSN=24.
- If an IDCAMS service fails the recovery is terminated with RSN=16.

MVS WorkLoad Manager (WLM) - responsible for the Auxiliary Storage Management (ASM) - recommends that you automate the message IRA210E rather than message IRA206E which has replaced the message IRA204E since z/OS release 1.10. The reason is that the system has already identified the address space that caused the shortage.



Table 22. Auxiliary Storage Management

Recovery	Message		Command
MSG	IRA205I IRA200E IRA201E	Check the maximum number of local page data sets. When the value PAGTOTL is reached the recovery is terminated RSN=20.	MVS D ASM,LOCAL
		Add a free page data set that has been allocated and formatted in a prior recovery.	MVS PAGEADD
		If the previous action was unsuccessful and message is not IRA201E create and add a page data set.	MVS PAGEADD
		If the previous action was unsuccessful add a pre-formatted data set.	MVS PAGEADD
		If the previous action was unsuccessful and message is IRA201E create and add a page data set.	MVS PAGEADD
		If PAGEADD was successful schedule timer INGT742P for adding more page data sets in case this action was insufficient. Otherwise, the recovery is terminated with RSN=8 or RSN=12.	AFTER 00.00:10, ID=INGT742P
	IRA204E IRA210E	Save the jobname of the very first message only. Next, check if the job has been defined for cancellation. Finally, schedule a timer to pop up 10 seconds later than the timer INGT742P. If this timer does not exist, use the current time.	AT hh:mm:ss ID=INGT742J
IRA202I	Delete any pending recovery action.	MVS D ASM,LOCAL PURGE TIMER=INGT742P PURGE TIMER=INGT742J	
ILR009E		Mark the page data set "unuseable" if it is a spare data set and remove the volume from the list of available volumes for dynamic allocation.	MVS D ASM,LOCAL
		If the data set was a spare data set:	
		<ul style="list-style-type: none"> <li>Check the maximum number of local page data sets. When the value PAGTOTL is reached the recovery is terminated with RSN=20</li> <li>Create and add a page data set. If PAGEADD was unsuccessful the recovery is terminated with RSN=8 or RSN=12</li> </ul>	PAGEADD
IEE205I	Mark the page data set 'free' if it is a spare data set.		
PAGE	n/a	Repeats the recovery of messages IRA200E and IRA205I after the timer INGT742P has expired.	
PAGECRIT	n/a	Repeats the recovery of messages IRA201E after the timer INGT742P has expired.	
JOB	n/a	Cancels the job that caused the recovery after the timer INGT742J has expired.	MVS CANCEL

### Hardware Validation

This function performs cross-validation of the hardware configuration mapped out in the customization dialogs against the actual hardware configuration that is running. This information is critical to accurately control logical partitions (LPARs) on any supported CPC within the HMC/SE LAN over the BCP Internal Interface.

Hardware validation uses the CPC name, Partition name and Partition number to ensure that the LPARs defined in the customization dialogs are on the correct CPC and located on the correct partition number. However, this helps only for coupling facilities because their partition identifiers must be defined in the active CFRM policy.

For MVS images, information from the HMC/SE (such as system name and sysplex name that are stored during initialization) is used to verify the corresponding customization dialog definitions. During initialization of the automation's Hardware Command Interface and just before a disruptive request is sent to a partition, new checks are made to ensure that everything matches correctly.

**Note:** Only active images can be verified. For inactive images we must still rely on definitions made in the customization dialogs.

An active system in this context is a system belonging to the same sysplex as the system that runs the hardware validation, that is SA z/OS checks only systems and coupling facilities within its own sysplex.

Hardware validation runs on an SA z/OS system primarily during startup, and subsequently when changes to the definition in the customization dialogs are applied through the INGAMS REFRESH command. The validation checks the definitions of all registered systems, that is whenever an SA z/OS system performs the hardware validation, it validates all systems and coupling facilities that are active in the sysplex at this point in time. Registered systems are systems running msys for Operations or SA z/OS that have joined the same XCF group.

The validation of active systems and coupling facilities requires that the CPCs that host the active systems must all be defined in the customization dialogs.

The data for inactive systems cannot be verified. However, these definitions are checked for consistency across all registered systems. As soon as one of these inactive systems or coupling facilities joins the sysplex or is made available for use, the validation is run for the particular image only.

Retrieving actual hardware information can take up to 5 minutes per CPC depending on the model and its LPARs. During the time that the hardware validation takes place all other hardware-related automation is either delayed or cannot be performed, depending on the type of recovery. For this reason the validation carries out "delta" processing. That is validating only the data that has changed. This also includes the absence of data resulting in terminating CPC connections when CPC definitions are missing that have been applied by a prior validation. The actions resulting from the validation are performed on ALL registered systems. This has two advantages:

- you don't need to recycle NetView for changes in hardware definitions.
- you only need to make the changes available to one system.

The first part of the hardware validation triggered by the ACF command or the automation startup determines what CPC connections must be terminated and initiated, namely in this sequence. The resulting actions are performed on all registered systems. When this step has been completed successfully the image validation is performed.

The image validation collects actual hardware information, and verifies the current hardware definitions against the actual data and the definitions found on all other registered systems. It informs you if:

- A real system or coupling facility could not be validated because either actual hardware information or user definitions are not available
- The image definitions could not be evaluated because the actual hardware information is not available
- The real system or coupling facility is not active and the image definitions of some of the registered systems are different
- Any definition value has been corrected that was improperly defined or not defined at all

Changes in hardware definitions can be made available to all registered systems by simply invoking the command `INGAMS REFRESH` on only one of the these systems. There is one exception: the change of the authorization token value used for the communication with a particular CPC. A change of this value requires 3 steps:

1. In the first step you must remove the particular CPC definition and then invoke the ACF command as above.
2. When the command completes successfully the next step is to change the authorization token value of the CPC at the Support Element.
3. The final step is to define the CPC again with the new token value and invoke the ACF command again.

**Note:** This behavior of the `INGAMS` command applies to the hardware definitions *only*.

The second part of the validation is triggered by either the message `IXC517I` that is issued when a coupling facility is made available for use, or by the automation itself when notified that a system joined the sysplex. Both trigger the automation to perform only the validation of the new system or coupling facility. Multiple occurrences of messages for the same system or coupling facility are ignored while this system or coupling facility is validated. In case of a new system, the advantage here is that the real hardware is validated before the system starts NetView and the automation. If this automation then detects no difference between its current definitions and the definitions of the other registered systems—which is the normal case—only a consistency check takes place. This check does not require any real hardware information.

### Prerequisites

**Note:** Hardware validation is not supported on MVS systems running under z/VM.

### Enabling Hardware-Related Automation

To enable the sysplex automation that SA z/OS provides for recovery actions and coupling facility management, the following definitions must be made in the customization dialog.

#### Step 1: Defining the Processor

Use the customization dialog to define a new processor of Entry Type PRO. The name should be the real physical name of the processor defined in HCD. For more information, refer to the online help or the section "Creating a New Processor" in *IBM Tivoli System Automation for z/OS Defining Automation Policy*.

#### Step 2: Using the Policy Item PROCESSOR INFO

Use the Processor Information panel, to define a processor using entry type PRO.

**Note:** The connection type protocol must be INTERNAL  
For more information, refer to the online help or the section "More about Policy Item PROCESSOR INFO" in *IBM Tivoli System Automation for z/OS Defining Automation Policy*.

#### Step 3: Defining Logical Partitions

If the processor that you have defined runs in LPAR mode, define its logical partitions using the LPAR Definitions panel. You should define all LPARs that are physically available on your processor, together with the systems that run on them.

For more information, refer to the online help or the section "More about Policy Item LPARS AND SYSTEMS" in *IBM Tivoli System Automation for z/OS Defining Automation Policy*.

#### Step 4: Defining the System

Define a system using entry type SYS, and the Define New Entry panel.

**Note:** To avoid receiving hardware validation messages during SA z/OS initialization, you should define all your systems (including your coupling facilities).

For more information, refer to the online help or the section "Creating a New System" in *IBM Tivoli System Automation for z/OS Defining Automation Policy*.

#### Step 5: Connecting the System to the Processor

Connect this system to the processor that you defined in "Step 2: Using the Policy Item PROCESSOR INFO" and to its logical partition (if you set the processor mode as LPAR).

Connect this system to the sysplex or standard group (see "Step 6: Defining Logical Sysplexes" on page 141 and "Step 7: Defining the Physical Sysplex" on page 141).

**Note:** MVS SYSNAME and the Image/ProcOps Name *must* be the same.

**Restriction:**

Usually, the MVS SYSNAME may begin with a number. However, in this case, it must be the same as the Image/ProcOps Name, which *cannot* begin with a number. Therefore, this naming restriction also applies to the MVS SYSNAME.

### Step 6: Defining Logical Sysplexes

Define EACH logical sysplex (systems within the same XCF group ID) using entry type GRP with group type SYSPLEX.

Use policy SYSPLEX to enter the real physical sysplex name. You can use the same name in several SYSPLEX GRPs.

Use policy SYSTEMS to connect all systems within the same XCF group ID to the SYSPLEX GRP. A system can only be connected to one SYSPLEX GRP.

### Step 7: Defining the Physical Sysplex

Define your real physical sysplex using entry type GRP with group type STANDARD.

Use policy SYSTEMS to connect all systems of your physical sysplex to the STANDARD GRP.

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## Enabling Continuous Availability of Couple Data Sets

Couple data sets (CDSs) contain important information about how to manage certain aspects of your sysplex. For example, the SFM CDS (sysplex failure management couple data set) defines how the system manages system and signalling connectivity failures and PR/SM™ (Processor Resource/Systems Manager™) reconfiguration actions.

The following couple data sets are particularly important for the functioning of your Parallel Sysplex:

- The SYSPLEX couple data set, which defines the systems and the XCF groups of the sysplex
- The CFRM couple data set, which defines the coupling facilities and structures of the sysplex

It is recommended that you define alternate couple data sets for all couple data sets in your sysplex. These alternate couple data sets serve as backups when the primary CDS fails.

With the customization dialog you can specify a series of spare volumes for every CDS type, for example, SYSPLEX, ARM, CFRM. The first volume in the series is used to create an alternative CDS if one of the primary alternate CDSs fails.

In the customization dialog you define the potential alternate couple data sets using the Group entry type. Select a sysplex group, then select its policy item SYSPLEX (define sysplex policy) from the panel Policy Selection.

The Sysplex Policy Definition panel is displayed if you select policy item SYSPLEX from the Policy Selection panel for sysplex groups.

For a description of this panel refer to the online help or the section "More About Policy Item SYSPLEX" in *IBM Tivoli System Automation for z/OS Defining Automation Policy*.

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### Enabling WTO(R) Buffer Shortage Recovery

You can customize the WTO(R) buffer shortage recovery of SA z/OS with the MESSAGES/USER DATA policy item of the customization dialog for the MVS Component entry type (MVC). Code definitions for the message ID WTOBUF are used to specify jobs that are canceled or kept in case a WTO(R) buffer shortage is threatening. The jobs that you select for cancelation will then no longer issue WTO(R)s.

Specify code definitions for message ID WTOBUF with the following values:

**CODE1**

Specifies the name of the job which might or might not be canceled.

**CODE2**

This must be WTO, WTOR, or \* to indicate which requests the job (or jobs) might or might not be canceled for. Use just \* to specify WTO and WTOR requests.

**CODE3**

This must be blank.

**Value Returned**

This must be CANCEL to indicate that the job (or jobs) might be canceled or KEEP to indicate that they might not.

**Example:**

Code 1	Code 2	Code 3	Value Returned
JOB1	WTOR		KEEP
JOB2*	WTO		KEEP
JOB3*	*		CANCEL
JOB4*	*		KEEP
*	*		KEEP

To set up the default behavior for all jobs not explicitly defined, a specification of CODE1=\* and CODE2=\* is needed. To indicate that all other jobs might be canceled specify CANCEL in the **Value Returned** field, otherwise specify KEEP.

The job name \*MASTER\* cannot be entered in the **Code 1** field. Even if your default behavior is set up to cancel all jobs that have not been explicitly defined, a cancel command is not issued against \*MASTER\* if it is the job name being checked. This is because \*MASTER\* is non-cancelable.

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### Enabling System Removal

SA z/OS helps you to resolve pending I/Os for systems being removed from the sysplex. See "Recovery Actions" on page 131 and "Managing System Removal" on page 135 for further details.

Because the automation must know where the system is located to send the command to the appropriate Support Element, you must use the customization dialog to define its hardware configuration.

The BCP Internal Interface allows you to perform hardware operations from each NetView in your sysplex member as long as its processor hardware supports this. Refer to *IBM Tivoli System Automation for z/OS Planning and Installation* for more information.

**Hint:**

If you want to use the IXC102A automation, make sure there is no processor operation related IXC102A automation defined in your automation policy. Likewise, if you want to continue to use the processor operations based automation of messages IXC102A and IXC402D, the IXC102A automation flag must be disabled.

**Step 1: Defining the Processor and System**

The processor and system must be defined as described in “Enabling Hardware-Related Automation” on page 140.

**Step 2: Defining the Application with Application Type IMAGE**

Use entry type APL to define a new application with Application Type IMAGE and subsystem name that is the same as the Image Name of the system that this application represents (as defined in “Step 4: Defining the System” on page 140).

Use entry type APL and select policy item APPLICATION INFO for your system. On the panel *Application Information* you can define a new application type IMAGE. For more information, refer to the online help or the section “Policy Items for Applications” in *IBM Tivoli System Automation for z/OS Defining Automation Policy*.

Because the application has been defined as type IMAGE, the job name is set by default to the subsystem name and cannot be changed.

The Subtype, Scheduling Subsystem, JCL Procedure Name, ARM Element Name, and WLM Resource Name are forced to be blank.

Some other definitions in the policy item APPLICATION INFO are also defaulted:

- the Job Type is forced to NONMVS
- the Monitor Routine is defaulted to INGMTSYS if nothing is specified
- the External Startup is defaulted to ALWAYS if the Monitor Routine is INGMTSYS
- the External Shutdown is defaulted to ALWAYS if the Monitor Routine is INGMTSYS

For more information, refer to the online help or the section “More About Policy Item APPLICATION INFO” in *IBM Tivoli System Automation for z/OS Defining Automation Policy*.

**Step 3: Defining an Application Group**

Because you can only automate applications by linking them to systems via an application group, you need to define an application group for the IMAGE applications.

**Step 4: Automating IXC102A and IXC402D Messages**

You can automate IXC102A and IXC402D messages to avoid sysplex outages.

**Note:** The following shows examples for defining commands and codes for message IXC102A.

## Enabling System Removal

You can specify one of the following four hardware commands for each system in the sysplex that is automated. If you specify nothing SYSRESET CLEAR is used.

- SYSRESET [CLEAR]
- DEACTIVATE
- ACTIVATE [P(*image\_profile\_name*)]
- LOAD [P(*load\_profile\_name*)]

Where:

CLEAR            Indicates that the storage is cleared

P                 Specifies the profile to be used. The name can consist of up to 16 alphanumeric characters. If the parameter is omitted, the last used profile is taken.

**Note:**

The following restriction applies to the hardware commands ACTIVATE and LOAD:

Both commands invoke processor functions that can cause asynchronous events such as operator messages at BCP (Basic Control Program) Internal Interface initialization time or processor hardware wait states. Currently, the BCP Internal Interface does not allow the monitoring and control of these events.

Use policy item MESSAGES/USER DATA of the SA z/OS customization dialog within the application type IMAGE you created to define commands and codes for message IXC102A and IXC402D. Enter C or S in the **Cmd** column and IXC102A in the **Message ID** column (or IXC402D for IXC402D message automation). For more information, refer to the online help or the section "MESSAGES/USER DATA Policy Item for Applications " in *IBM Tivoli System Automation for z/OS Defining Automation Policy*. The definitions here also apply to message IXC402D.

Pressing Enter displays the CMD Processing panel, as shown in Figure 24. Use this panel to specify a valid hardware command for the image in the Command Text column and a "Pass/Selection" value that must match the "Value Returned" definition specified on the *Code Processing* panel.

Cmd	Ps	AutoFn/*	Command Text
___	ACTCODE	_____	LOAD P(LOADPROF)

Figure 24. Sample Panel for Command Processing

On the Message Processing panel enter k to define codes. Specify on the Code Processing panel, as shown in Figure 25, the following:

Code 1	Code 2	Code 3	Value Returned
IXC102A	BCPII	_____	ACTCODE

Figure 25. Sample Panel for Code Processing

If you want to automate messages IXC102A and IXC402D , you must enter IXC102A for Code 1 and BCPII for Code 2 for both messages.



## Step 5: Verify Automation table entries

Verify that the entries of IXC102A and IXC402D of the predefined messages are used in your automation table and that the auto-operator AUTXCF and AUTXCF2 are defined (see \*BASE sample policy).

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## Enabling Long Running Enqueues (ENQs)

If you automate long running ENQs, you must define the following:

- The resource or resources that are being checked
- The time frame when a long ENQ is detected

If you automate "hung" commands, you must define the following:

- The command (or commands) that are being monitored or excluded from monitoring
- The time frame for each command that a command is granted for completion or, if commands are to be excluded from monitoring, the exclusion keyword
- The action to be taken against this command if this command is determined to be a blocker of other commands or jobs

In addition, the following definitions can be made:

- The names of jobs that should be canceled or kept when detecting a long ENQ, a "hung" command, or command flooding
- The snapshot interval for a command class
- The title of the dump taken before the job is cancelled
- The default storage areas to be dumped
- Symbol definitions to be used when the dump specifications are provided by a PARMLIB member

Use the entry type GRP in the customization dialog to define the following policies:

- Resource definition
- JOB/ASID definitions
- IEADMCxx symbols
- Command definition
- Snapshot interval definition

## Step 1: Defining Resources

Use the Long Running ENQ Resource Definition panel to define your resources. This panel is displayed if you select policy item RESOURCE DEFINITIONS from the Long Running Enqueue Policy section of the Policy Selection panel for sysplex groups. For more information, refer to the online help or the section "More About Policy Item RESOURCE DEFINITIONS" in *IBM Tivoli System Automation for z/OS Defining Automation Policy*.

## Step 2: Making Job/ASID Definitions

Use the Long Running ENQ Job/ASID Definitions panel that is displayed if you select policy item JOB/ASID DEFINITIONS from the Long Running Enqueue Policy section of the Policy Selection panel for sysplex groups. For more information, refer to the online help or the section "More About Policy Item JOB/ASID DEFINITIONS" in *IBM Tivoli System Automation for z/OS Defining Automation Policy*.

## Enabling Long Running Enqueues (ENQs)

### Step 3: Defining IEADMCxx Symbols

Use the *Long Running ENQ IEADMCxx Symbols* panel that is displayed if you select policy item IEADMCxx SYMBOLS from the Long Running Enqueue Policy section of the Policy Selection panel for sysplex groups. For more information, refer to the online help or the section "More About Policy Item IEADMCxx SYMBOLS" in *IBM Tivoli System Automation for z/OS Defining Automation Policy*.

### Step 4: Defining Commands

Use the Long Running Command Definition panel to define your commands. This panel is displayed if you select policy item COMMAND DEFINITIONS from the Long Running Enqueue Policy section of the Policy Selection panel for sysplex groups. For more information, refer to the online help or the section "More About Policy Item COMMAND DEFINITIONS" in *IBM Tivoli System Automation for z/OS Defining Automation Policy*.

### Step 5: Defining Snapshot Intervals

Use the Command Flooding Definition panel to define the individual snapshot times. This panel is displayed if you select policy item COMMAND FLOODING from the Long Running Enqueue Policy section of the Policy Selection panel for sysplex groups. For more information, refer to the online help or the section "More About Policy Item COMMAND FLOODING" in *IBM Tivoli System Automation for z/OS Defining Automation Policy*.

---

## Enabling Auxiliary Storage Shortage Recovery

To prevent auxiliary storage shortage outages you can predefine local page data sets, using the SA z/OS customization dialog for entry type GRP to define the following:

- local page data set
- job definitions

### Step 1: Defining the Local Page Data Set

Use the Local Page Data Set Recovery panel that is displayed if you select policy item LOCAL PAGE DATA SET from the Local Page Data Set Policy section of the Policy Selection panel for sysplex groups. For more information, refer to the online help or the section "More About Policy Item LOCAL PAGE DATA SET" in *IBM Tivoli System Automation for z/OS Defining Automation Policy*.

### Step 2: Defining the Handling of Jobs

Use the Local Page Data Set Recovery Job Definition panel that is displayed if you select policy item JOB DEFINITIONS from the Local Page Data Set Policy section of the Policy Selection panel for sysplex groups. For more information, refer to the online help or the section "More About Policy Item JOB DEFINITIONS" in *IBM Tivoli System Automation for z/OS Defining Automation Policy*.

---

## Defining Common Automation Items

There are definitions that relate to utilities running as a started task. The first one (Temporary Data Set HLQ/TEMPHLQ) replaces the usage of the first qualifier of the automation status file. The second definition (Started Task Job Name/STCJOBNM) allows the unique assignment of started task job names scheduled by the automation in case you have dedicated job name assignments that conflict with the procedure names provided by the automation.

It is recommended that you define the Temporary Data Set HLQ/TEMPHLQ. If it is not defined, the automation uses the first qualifier of the automation status file.

You can define both of these items using the Sysplex Policy Definition panel that is displayed if you select the policy item SYSPLEX from the Policy Selection panel for sysplexes. For more information, refer to the online help or the section "More About Policy Item SYSPLEX" in *IBM Tivoli System Automation for z/OS Defining Automation Policy*.

---

## Customizing the System to Use the Functions

### Additional Automation Operator IDs

To automate the Parallel Sysplex, you must define the additional automation operator IDs. Refer to Table 7 of *IBM Tivoli System Automation for z/OS Defining Automation Policy*. You can import these auto-operator definitions from the \*BASE sample policy provided.

### Switching Sysplex Functions On and Off

Use the SA z/OS customization dialog to specify the following minor resource names:

<b>CDS</b>	For the recovery of alternate CDSs.
<b>ENQ</b>	Enables the handling of the next four individual recoveries.
<b>ENQ.CMDFLOOD</b>	Enables the handling of commands that flood a particular command class.
<b>ENQ.HUNGCMD</b>	Enables the handling of jobs and commands that inhibit other commands from completing execution.
<b>ENQ.LONGENQ</b>	Enables the handling of long-running ENQs.
<b>LOG</b>	For the recovery of the system log.
<b>LOGGER</b>	For the recovery of the system logger.
<b>PAGE</b>	For the recovery of auxiliary storage shortage.
<b>WTO</b>	For the recovery of WTO(R) buffer shortages.
<b>XCF</b>	For automating messages IXC102A and IXC402D.

By default, all recovery actions are enabled. If you want to disable them, use the customization dialog *Flag Automation Specification* and set the recovery flag to NO.

**Note:** You can change the automation recovery flag during run time by using the command INGAUTO.

## Customizing the System to Use the Functions

---

## Chapter 13. Automating Networks

---

### Automation Network Definition Process

This section summarizes the steps for defining an automation network to SA z/OS. More detail for each step of the process is provided later in this chapter.

1. Define your message forwarding paths between different systems. To do this, you define:
  - A primary focal point, where all notifications are sent.
  - An optional backup focal point, used when the primary focal point is unavailable.
  - Target systems, which are monitored and controlled by the focal point system.
  - Gateway sessions between the systems.  
“Defining Gateway Sessions” on page 150 describes how to define gateway sessions.
2. Modify the NetView definitions to reflect your automation network configuration. The chapter on how to install SA z/OS on host systems in *IBM Tivoli System Automation for z/OS Planning and Installation* provides details.

For an example of the automation network definition process, see also the chapter about installing SA z/OS on host systems in *IBM Tivoli System Automation for z/OS Planning and Installation*.

These definitions create a path allowing message forwarding from target systems to the focal point system.

A message forwarding path is best implemented by defining systems in the following top-down manner:

1. Primary focal point system
2. Backup focal point system
3. Target systems

Defining the primary focal point first ensures that it is ready to handle forwarded messages as soon as forwarding is turned on for the target systems.

If the message forwarding path is not yet implemented on all systems in an automation network, messages are displayed to notification operators on the target systems. Once the message forwarding path is implemented, notifications are forwarded to the focal point system.

If the target systems are implemented first, additional overhead occurs because the target systems unsuccessfully attempt to forward notifications, and the notifications are logged in the NetView log.

### Defining an SDF Focal Point System

The focal point system and backup focal point systems are defined using the Network entry type in the customization dialog. Each system has a single entry in the automation policy defining the next system or domain in the message forwarding path. Figure 26 on page 150 shows an example automation network. In

## Automation Network Definition Process

this example, the primary focal point system is CHI01. The backup focal point is CHI02.

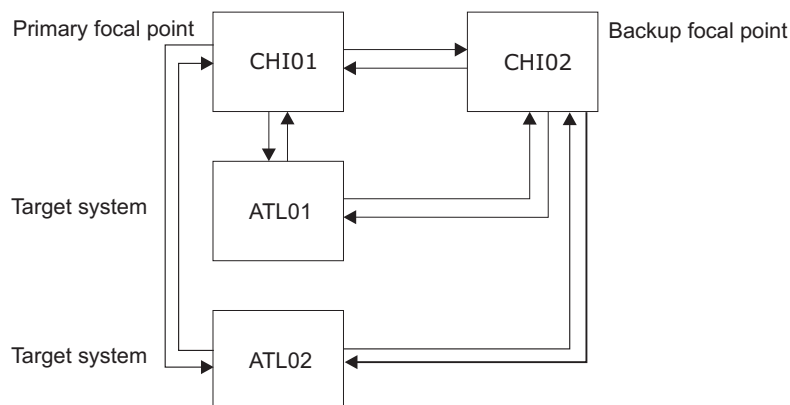


Figure 26. Focal Point Forwarding Definitions for Systems

SA z/OS always displays messages on the local system. It forwards them to a focal point, if there is one defined.

## Defining Gateway Sessions

To define gateway sessions:

1. For each system, define the *outbound* gateway autotask (GATOPER) on the Automation Operators policy object of the customization dialog. See “Defining an Outbound Gateway Autotask” for details.
2. On the SA z/OS Network policy object, use the GATEWAY policy item to define the domains of all systems within the network which need to communicate with each other.
3. Define operator IDs used for all inbound and outbound gateway autotasks used on the system in the NetView DSIPARM data set member DSIOPF. See the chapter on how to install SA z/OS on host systems in *IBM Tivoli System Automation for z/OS Planning and Installation* for details.

### Defining an Outbound Gateway Autotask

In any system, only the outbound gateway task is defined using the Automation Operators entry type.

If GATOPER has not previously been defined, type the automation operator name, *gatoper*, in the *Automated Function* field of the *Auto Operator Definition* policy item, as shown in Figure 27 on page 151.

```

COMMANDS  ACTIONS  HELP
-----
AOFPIA00          Automation Operator Definitions      Row 1 to 10 of 20
Command ==> _____ SCROLL==> PAGE

Entry Type : Automation Operators  PolicyDB Name   : USER_PDB
Entry Name  : GATEWAY_AUTOOPS      Enterprise Name : USER_ENTERPRISE

Actions: S = Select  M = Move  B = Before  A = After  I = Insert

Action      Automated
Function    Messages for this Operator (* notation ok)
-----
gatoper

```

Figure 27. Automation Operator Definitions Panel

|  
|  
|

You do not need to specify any messages for GATOPER. When you press Enter, the Automation Operator NetView Userids panel is displayed, as shown in Figure 28 on page 152.

If GATOPER has previously been defined, select it by entering an S in the *Action* column.

Enter the NetView operator ID that is associated with the GATOPER function on the Automation Operator NetView Userids panel.

**Note:**

This NetView operator ID must be unique within the enterprise.

For example, to define the outbound gateway autotask for system CHI01 in the automation network shown in *IBM Tivoli System Automation for z/OS Planning and Installation*, the values shown in Figure 28 on page 152 are specified.

## Automation Network Definition Process

```
COMMANDS  HELP
-----
AOFPIA01      Automation Operator Definitions
Command ==>> _____

Entry Type : Automation Operators  PolicyDB Name  : USER_PDB
Entry Name  : GATEWAY_AUTOOPS      Enterprise Name : ENTERPRISE_NAME

Automated Function: GATOPER
Messages assigned:

MVS Console Name . . _____ Console for NetView cmds

Enter automation operators and NetView operator(s) to receive messages.

Automation Operators          NetView Operators
Primary . . GAT&DOMAIN.      Id 1 . . _____
Backup. . . _____      Id 2 . . _____
                               Id 3 . . _____
                               Id 4 . . _____
                               Id 5 . . _____
                               Id 6 . . _____
```

Figure 28. Automation Operator NetView Userids Panel

**Note:** This generic GATOPER definition works because the &DOMAIN. symbol is not resolved until the ACF is loaded by the automation agent - at which point it resolves to that agent's NetView domain. As a result, provided your NetView domains are unique within your enterprise it will generate a set of unique GATOPER operator ids.

---

## Defining Automatically-Initiated TAF Fullscreen Sessions

You can automatically establish Terminal Access Facility (TAF) fullscreen sessions for applications that SA z/OS monitors, so that the operators need not define the sessions on a daily basis.

These TAF fullscreen sessions are defined in the FULL SESSIONS policy item for a Network policy object.

In addition to defining TAF fullscreen sessions using the customization dialog, you follow the NetView process for customizing TAF fullscreen sessions, as outlined in *Tivoli NetView for z/OS Customization Guide*.

Once TAF fullscreen sessions are set up, they can be managed using the TAF Fullscreen Menu in the SA z/OS Operator Interface. See *IBM Tivoli System Automation for z/OS User's Guide* for more information on managing TAF fullscreen sessions.

To define an application on the Fullscreen TAF Application Definition panel that you reach by selecting the FULL SESSIONS policy item of a Network policy object, specify the following:

- The session name, or the name of the application that a TAF fullscreen session is to be established for, for example, TSO. This name is displayed in the Description field on the TAF Fullscreen Menu operator panel. This value can be the same as that used for the application ID.
- The application ID. You can obtain this value from the library containing the network definitions (VTAMLST) or from your network system programmer.



## Defining Automatically-Initiated TAF Fullscreen Sessions

- The system name that the application runs on, for example, CHI01. This is an information-only field and is displayed in the System field on the TAF Fullscreen Menu operator panel.

For example, the following panel defines a TAF fullscreen session for TSO in system CHI01:

```
COMMANDS  HELP
-----
AOFPINE3          Fullscreen TAF Application Definition  Row 1 to 10 of 20
Command ==> _____ SCROLL==> PAGE

Entry Type : Network          PolicyDB Name   : USER_PDB
Entry Name  : FOCAL_NETWORK    Enterprise Name : USER_ENTERPRISE

Enter the applications with which SA z/OS operators can establish TAF
sessions automatically using the operator interface.

Session Name  Application ID  System
  TSO         TAIN1        CHI01
  _____  _____  _____
  _____  _____  _____
  _____  _____  _____
  _____  _____  _____
  _____  _____  _____
  _____  _____  _____
  _____  _____  _____
  _____  _____  _____
  _____  _____  _____
```

Figure 29. Fullscreen TAF Application Definition Panel



---

## Chapter 14. Defining a VTAM Application to SA z/OS

VTAM applications need to have Application nodes activated for the application to operate correctly. This is normally not a problem if an application is to run on a single system. However, if the application is to be switched from one system to another (via a move group or server group), the application node definition must be deleted from the system that the application is moving from. If this is not done, users may not be able to log on to the application because there is a definition for the application node that is not active, that is, the application has not opened the node ACB.

To alleviate this problem, the application node must be deleted from the old system and created on the new system. Unfortunately, the only way to delete a node in VTAM is to deactivate its major node, that is, the member that it is defined in.

Newer releases of VTAM have introduced the concept of *Model node definitions*. In this case a major node is created with the type of node and a name that includes wildcards. Whenever a node of the type is accessed, VTAM will use the name requested to match the models. It will then dynamically create a node based on the model definitions with the name requested. When the node is no longer required it will delete it. What this means for application nodes is that a model definition can be defined once on each VTAM in the network that the application might be run on. Then when the application is started and opens its ACB, VTAM will dynamically create the node for it. Likewise when moving the application, upon closing the ACB, VTAM will delete the node and another VTAM on another system will dynamically create the node.

VTAM applications may require recovery commands to be issued if VTAM is restarted, or the VTAM application node is reactivated. These commands differ from subsystem to subsystem and can be specified in the Messages/User Data policy items as described in the following section.

The INGVTAM command provides a method of activating the Major Nodes for an application before the application is started, and deactivating the Major Nodes after it is down. To enable the function you must code the INGVTAM command in the prestart, ACORESTART, post-shut policies. In addition, if VTAM should ever be restarted whilst the applications are running, the major nodes must be reactivated. This can be accomplished by coding the INGVTAM command in the UP messages/user data policy for the VTAM subsystem.

---

### Registering VTAM Application Subsystems with SA z/OS Recovery

To enable VTAM application recovery to take place, the subsystems must be registered with the SA z/OS recovery code. This is achieved by using the INGVTAM command that is described in *IBM Tivoli System Automation for z/OS Programmer's Reference*. The following application policy items must be customized:

1. PRE-START policy

The PRE-START policy must have at least a NORMAL start item with the INGVTAM command to activate a list of major nodes. The following command can be used as an example:

```
INGVTAM &SUBSAPPL REQ=ACTIVATE MAJNODE=(majnode1,majnode2,...)
```

## Defining a VTAM Application to SA z/OS

Where *majnodes* are VTAM application major nodes. Each major node will be varied active to VTAM when the subsystem prestart commands are issued. Note, it is expected that only one of the major nodes will contain the minor node that the VTAM application subsystem will use.

### 2. POST-SHUTDOWN policy

The POST-SHUTDOWN policy is used to deregister the subsystem with SA z/OS VTAM application recovery. Use the `INGVTAM REQ=DEACTIVATE` command in the policy. For example:

```
INGVTAM &SUBSAPPL REQ=DEACTIVATE
```

The `DEACTIVATE` request issues a vary net inactive for each major node registered by the `REQ=ACTIVATE`. The vary is not done if the major node is shared by other subsystems that have also registered the major node. When the last subsystem registered issues an `INGVTAM REQ=DEACTIVATE`, the major node will be varied inactive. The only exception to this is when the major node contains model resources with wildcards in the node definition. In this case the major node is never inactivated.

### 3. ACORESTART Messages/User Data policy

The `ACORESTART` message policy must have the same definition as the `PRE-START` policy. This policy item is used to reregister the subsystem with SA z/OS VTAM application recovery.

### 4. VTAMUP Messages/User Data policy

Enter commands that are issued when the VTAM subsystem is restarted. Typically these commands reopen the VTAM ACB that the subsystem uses to communicate with VTAM.

### 5. Relationships policy

Optionally enter a relationship for the subsystem to ensure that the prestart commands are only issued when VTAM is up. The required relationship is:

```
PrepAvailable(WhenAvailable),Passive,Weak -> VTAM/APL/=
```

Where `VTAM` is the name of the VTAM subsystem and that is the supporting resource. `Passive` forces the relationship to wait until VTAM is UP. `Weak` specifies that only the supporting resource status is checked.

In addition the UP message for VTAM should have the following command:

```
INGVTAM REQ=ACTIVATE
```

When `INGVTAM` is executed with `REQ=ACTIVATE` and no positional subsystem, it finds all the subsystems that had previously registered via `INGVTAM` and issues `Vary NET ACT` commands for their major nodes. After this has been done, it will execute any policy command(s) that is/are specified to `USER MESSAGE VTAMUP` for the subsystems.

## Chapter 15. Shutting Down z/OS systems in a GDPS Environment

SA z/OS allows you to shutdown z/OS systems either through the INGREQ ALL command in a GDPS® production environment or from a GDPS controlling system. There are three distinct phases in the final shutdown processing that are defined using the special message id SYSTEM\_SHUTDOWN message/user data policy item for the MVS Component entry type:

### Phase 0

This phase is entered prior to shutting down the resource that is identified by the GDPS STOPAPPL parameter (the STOPAPPL resource). In this phase you can perform any action before the actual system shutdown starts.

### Phase 1

This phase begins when the resource that is identified by the GDPS STOPAPPL parameter (the STOPAPPL resource) has been terminated. In this phase you can specify additional INGREQ stop commands or any other commands through NetView to terminate any subsystems that are still present.

### Phase 2

This phase begins after the termination of OMVS and any local automation manager (PAM and SAMs). Only NetView commands or z/OS commands issued through NetView can be specified. For example, the MVS Z EOD command.

#### Notes:

1. OMVS and all local automation managers are always shutdown by SA z/OS automatically. Do not specify termination commands for OMVS or automation managers in PHASE1 or PHASE2.
2. Be aware that the NetView address space is still present and must stay up in order to signal the nearly termination of the system to GDPS.
3. Whenever NetView is ended without its CLOSE command being invoked, it cannot automatically archive recent messages in its active Canzlog. This can be accomplished instead by invoking NetView 's CANZLOG CUE command during Phase 2.

The scenario is based on the provided best practice policies \*BASE and \*GDPS. For more details refer to the MVC entry GDPS\_SYSTEM\_SHUTDOWN in the \*GDPS best practice policy.

## Example Definition

The actions you take to shutdown z/OS systems from within GDPS are defined using the SYSTEM\_SHUTDOWN message/user data policy item for the MVS Component entry type. These actions can include instructing SA z/OS to shutdown resources out of the affected dependency path of GDPS STOPAPPL, shutdown file systems, and so on.

Table 23. Example SYSTEM\_SHUTDOWN Command Processing Entry

Cmd	Ps/Select	AutoFn/*	Command Text
	PHASE1		INGREQ RACF/APL/&SYSNAME. REQ=STOP PRECHECK=NO REMOVE=SYSGONE VERIFY=NO OUTMODE=LINE

## Shutting Down z/OS systems in a GDPS Environment

Table 23. Example SYSTEM\_SHUTDOWN Command Processing Entry (continued)

Cmd	Ps/Select	AutoFn/*	Command Text
	PHASE1		INGREQ RRS/APL/&SYSNAME. REQ=STOP PRECHECK=NO REMOVE=SYSGONE VERIFY=NO OUTMODE=LINE
	PHASE1		INGREQ GDPS_ALL/APG/&SYSNAME. REQ=STOP PRECHECK=NO REMOVE=SYSGONE VERIFY=NO OUTMODE=LINE
	PHASE1		INGREQ LOOKASIDE/APG/&SYSNAME. REQ=STOP PRECHECK=NO REMOVE=SYSGONE VERIFY=NO OUTMODE=LINE
	PHASE1		INGRCHCK BASE_SYS/APG/&SYSNAME.OBSERVED=(SO HA)
	PHASE1		INGRCHCK LOOKASIDE/APG/&SYSNAME.OBSERVED=(SO HA)
	PHASE2		MVS Z EOD

Table 23 on page 157 shows example definitions for the SYSTEM\_SHUTDOWN entry that place stop votes against the listed resources in PHASE1 in a sequential order. The desired completion of the resource shutdown is processed in parallel. The specified INGRCHCK command at the end of the PHASE1 sequences waits for the completion of the stop requests for the specified resources.

For example:

```
INGRCHCK LOOKASIDE/APG/&SYSNAME OBSERVED=(SOFTDOWN HARDDOWN)
```

For more information about the INGRCHCK command, see *IBM Tivoli System Automation for z/OS Programmer's Reference*.

If synchronization is necessary, the FDBK option for the INGREQ command permits waiting until the appropriate subsystem has been shutdown. The FDBK=WAIT option causes an INGREQ stop command to be processed sequentially. In this way it slows down the shutdown process.

The primary and all secondary automation managers (PAM and SAMs) on the local system will be shutdown by SA z/OS automatically unless they are moved to another system. OMVS will be shutdown by SA z/OS automatically too. Only the MVS Z OED command is issued in PHASE2.

---

## Chapter 16. WTOR Processing

When System Automation for z/OS receives WTORs (write-to-operator-with-reply requests), it either automatically replies to them, or stores them if they are to be used for recovery or to shut down the subsystem that issued them. WTORs that are stored for later use are known as outstanding WTORs.

---

### Process Flow of WTORs

All WTORs that are issued at a system should be forwarded to NetView. Otherwise SA z/OS is not able to process them.

From NetView V5R2 the following definition in the message revision table ensures that all WTORs are provided to NetView for automation:

```
UPON (ALWAYS)
  SELECT
  * Ensure all WTORs are being automated
    WHEN (WQE SUBSTR 345 C2D ^= "+0")
      REVISE("Y" AUTOMATE)
    OTHERWISE
  END
```

For earlier releases of NetView:

- The known WTORs that are to be forwarded to NetView have to be defined for automation in the MPF table
- The unknown WTORs have to be forwarded by means of an assembler exit

Incoming WTORs are processed by the NetView automation table (AT) and this triggers commands according to the processing purpose:

Called automation routine	Processing Purpose
ISSUEACT	<ol style="list-style-type: none"><li>1. Issue commands or replies (or both) that have been defined to a subsystem.</li><li>2. Store the WTOR if it has not been replied to.</li></ol>
ACTIVMSG, HALTMSG, TERMMSG	<ol style="list-style-type: none"><li>1. Update the status of the subsystem that issued the WTOR.</li><li>2. Issue defined commands or replies (or both).</li><li>3. Store the WTOR if it has not been replied to.</li></ol>
INGMON	<ol style="list-style-type: none"><li>1. Issue commands or replies (or both) that have been defined to a monitor resource.</li><li>2. Store the WTOR if it has not been replied to.</li></ol>
OUTREP	Store the WTOR.

The commands (other than OUTREP) are routed to the first active task that is defined in the AT synonym %AOFOPGSSOPER%. Thus they are usually routed to the work operator of the subsystem that issued the WTOR. This is done based on the job name that is associated with the WTOR.

## WTOR Processing

| Automation routines that process WTORs from subsystems that are not defined in  
| SA z/OS or are from MVS components are routed to tasks that the WTORs have  
| been assigned to based on their message ID.

The OUTREP command is routed to the first active task that is defined in the AT synonym %AOFOPSYSSOPER%.

### Actions in Response to Incoming WTORs

You can use the MESSAGES/USER DATA automation policy item to define what response SA z/OS should make to incoming WTORs for applications, monitor resources and MVS components, as follows:

- Use the CMD action (possibly combined with the CODE action) to define commands that are to be issued in response to an incoming WTOR.
- Use the REP action (possibly combined with the CODE action) to define a reply that is to be made immediately in response to an incoming WTOR.
- Use the AUTO action to define the incoming WTOR as a status message that changes the status of the subsystem that issued the WTOR.

NetView automation table statements are created that call the relevant command, depending on the defined actions.

If you used CODE definitions to define actions, the automation table statements that are created have to be supplemented with an OVR action to tell SA z/OS what variable information is to be extracted from the WTOR and how to pass this data as code values to the related command.

WTORs that have no actions defined for them are stored by SA z/OS via OUTREP. Appropriate automation table statements are created for this purpose.

### Customizing how WTORs Are Stored by SA z/OS

SA z/OS keeps track of all outstanding WTORs that have not yet been replied to and displays them via SDF or NMC.

These outstanding WTORs include:

- Permanent outstanding WTORs that are issued by applications at startup and thus provide an interface for critical operator communication and shutdown
- WTORs that no replies have been defined for in the SA z/OS automation policy
- WTORs that were issued before SA z/OS had initialized or during down time of SA z/OS

You can use the automation policy to define the severity for outstanding WTORs and a priority that allows you to distinguish between primary and secondary WTORs:

#### Severity

The severity of a WTOR determines the color of the WTOR in SDF and NMC. The following values can be specified for the severity:

- NORMAL** Ordinary messages that do not indicate a problem.
- UNUSUAL** Messages that might indicate a problem.
- IMPORTANT** Messages that indicate serious problems.
- IGNORE** Messages that are to be ignored by SA z/OS.



**Priority**

A primary WTOR is stored and can later be used for operator communication and to shut down the subsystem that issued it. In contrast, secondary WTORs are replied to immediately, or may be stored to be displayed in SDF and NMC.

This customization is done with code definitions in the MESSAGES/USER DATA policy item for a message ID of WTORS. For details see the description of the OUTREP command in *IBM Tivoli System Automation for z/OS Programmer's Reference*.

**Processing of Primary WTORs**

To prevent SA z/OS from replying to primary WTORs as soon as they are received, the replies are *not* defined directly for the message ID of the primary WTOR. Instead, the issuing of replies to primary WTORs is invoked by other messages or executed commands. Thus the replies for primary WTORs that are to be deferred are defined for the ID of these invoking messages, or the replies to be issued are provided for a predetermined message ID. For example, the SHUTDOWN automation policy item is used to define the replies to be issued during shutdown.

The reply ID of any stored, primary WTOR to a subsystem can be used for operator communication or the shutdown of this subsystem.

If SA z/OS has to communicate with a subsystem by issuing a reply but an outstanding WTOR has not yet been stored for the subsystem, the RETRY option is used to wait for the required WTOR.

You can define multiple replies with the same pass or selection option for a message ID. These replies can be used in response to a sequence of incoming primary WTORs.

**Example**

Message ABC123D is issued by application ABCAPPL during startup as permanent, outstanding WTOR and SA z/OS stores it as primary WTOR for this application. During the lifetime of the application, whenever message ABC789I is issued in special situations, a reply should be issued to the permanent, outstanding WTOR ABC123D for this application. The MESSAGES/USER DATA automation policy item for message ID ABC789I of the application is used to define this reply.

When message ABC789I is issued by the application, SA z/OS retrieves the reply ID of the permanent, outstanding WTOR and issues command MVS R 117,ABC RESTORE, as shown in Figure 30 on page 162.

## WTOR Processing

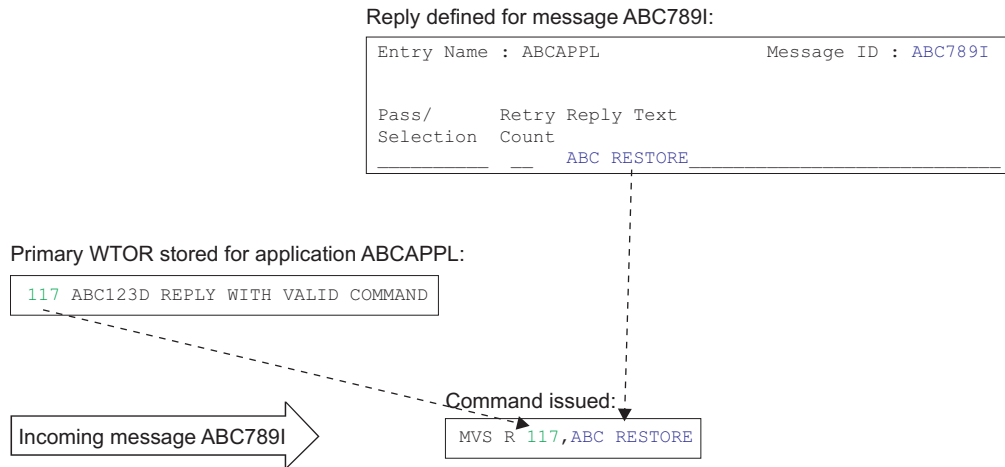


Figure 30. Example Processing of a Primary WTOR

### Restrictions

The reply IDs of a subsystem's outstanding primary WTORS are stored by SA z/OS as a blank-separated list without leading zeros. The storage for this is restricted to 255 bytes. If this limit is reached, the reply IDs of further incoming primary WTORS are ignored.

### Usage Notes

When storing incoming WTORS, a search for code definitions for the message ID, WTORS, is first made in the entry for the subsystem that issued the WTOR. If the subsystem itself cannot be found in the automation policy or the code definitions that are searched for are not found for the subsystem, they are searched for under the MVSESA entry. For subsystems such as IMS or NetView that have a permanent outstanding reply, you should specify the code definitions for the subsystem entries themselves instead of MVSESA. This improves performance by reducing searches within the automation policy.

---

## Chapter 17. SA z/OS User Exits

To allow user-specific activities that are not covered by the customization dialogs, SA z/OS provides support for the following classes of user exits:

- Initialization exits that are called at the start of SA z/OS initialization, before message AOF603D is issued, see “Initialization Exits” on page 164
- Static exits that are called at fixed points during SA z/OS processing, see “Static Exits” on page 167
- Flag exits that are called when SA z/OS needs to evaluate an automation flag, see “Flag Exits” on page 169
- Customization Dialog exits that can be called during certain phases when working with the customization dialog, see “Customization Dialog Exits” on page 172
- Command exits that can be called during the processing of certain commands, see “Command Exits” on page 176

Additionally, SA z/OS has a number of facilities that behave in an exit-like manner, see “Pseudo-Exits” on page 181.

Figure 31 on page 164 shows the sequence that exits may be invoked in during SA z/OS initialization.

## Initialization Exits

Exit Sequence during SA z/OS Initialization

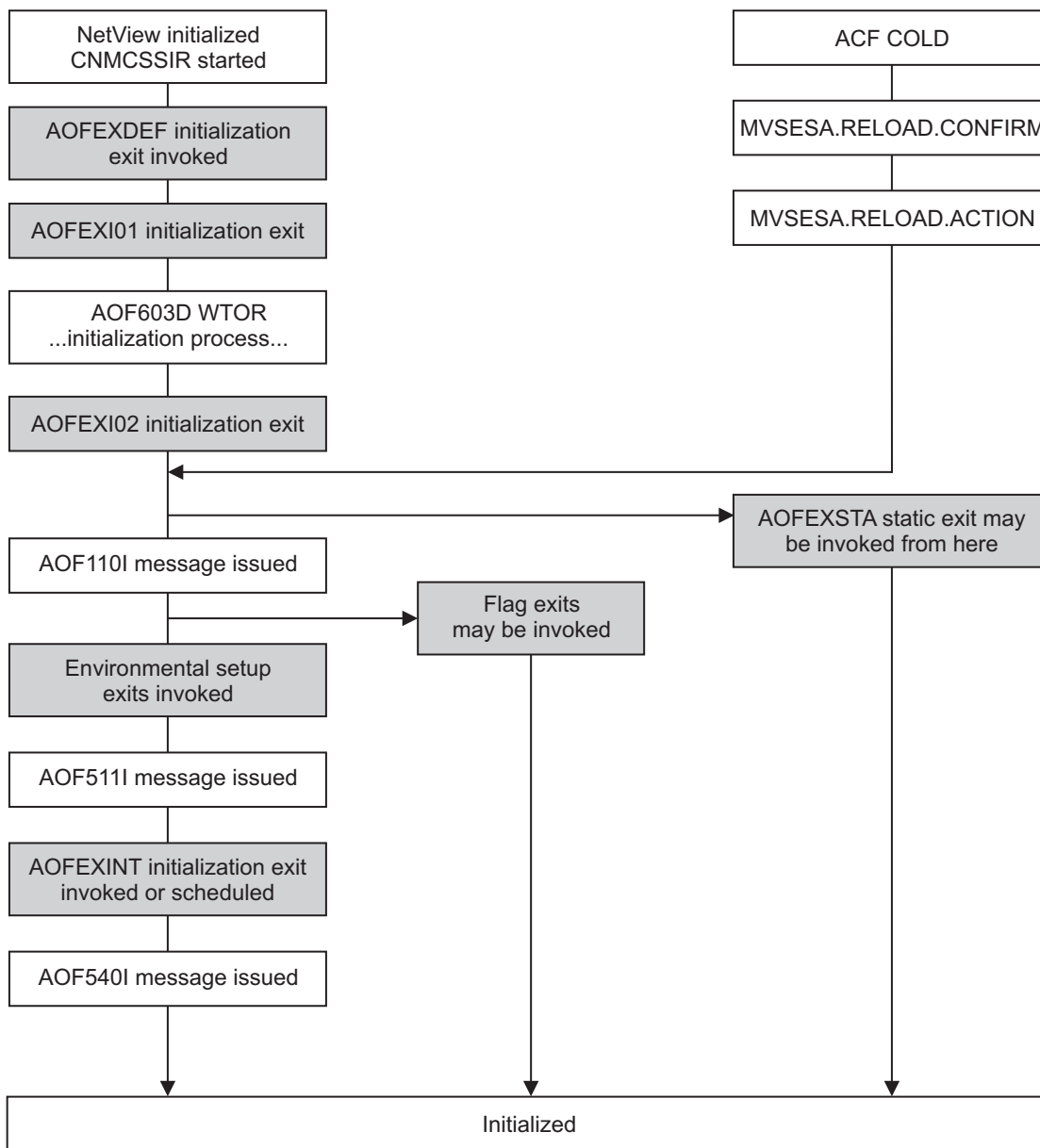


Figure 31. SA z/OS Exit Sequence during SA z/OS Initialization

## Initialization Exits

These exits are invoked during SA z/OS initialization:

- AOFEXDEF
- AOFEXI01
- AOFEXI02
- AOFEXI03
- AOFEXI04
- AOFEXI05
- AOFEXI06

- AOFEXINT
- Environmental Setup Exits

## AOFEXDEF

This exit is called at the start of SA z/OS initialization, before message AOF603D is issued. For example, using AOFEXDEF you can load a different MPF table.

This exit is run on AUTO1.

**Parameters:** None.

**Return Codes:** 0 is expected.

## AOFEXI01

This exit is invoked before the AOF603D ENTER AUTOMATION OPTIONS reply is issued. It is invoked in a NetView PIPE and gets the data that is displayed in the AOF767I message as input in the default SAFE. With this exit you can add or remove lines from the message and add additional options to the reply.

**Parameters:** The Load Type is passed on input.

**IPL|RECYCLE**

**IPL**

Indicates that SA z/OS has been started after an IPL.

**RECYCLE**

Indicates that NetView and therefore SA z/OS has been restarted.

**Return Codes:** 0 is expected.

## AOFEXI02

This exit is invoked after the operator has replied to the AOF603D reply. It gets the operator's response to the reply as input in the default safe and it can remove, add, or change the options that the operator has entered.

**Parameters:** The Load Type is passed on input. See "AOFEXI01."

**Return Codes:** 0 is expected.

## AOFEXI03

This exit is invoked before SA z/OS loads NetView automation table. It can be used to create statistics of the currently loaded ATs. Together with the AT listings that SA z/OS produces at load, these statistics can be used for any purpose.

**Parameters:** None.

**Return Codes:** 0 is expected.

## AOFEXI04

This exit is invoked after SA z/OS loads NetView automation tables. It can be used to store the AT listings that SA z/OS produces at load.

**Parameters:** None.

**Return Codes:** 0 is expected.

## Initialization Exits

### AOFEXI05

This exit is called before either an ACF load or refresh takes place. The parameter indicates what action the automation agent is going to process: REFRESH or LOAD.

**Parameters:** Type of ACF action (REFRESH or LOAD).

**Return Codes:** 0 (**Note:** the return code is ignored by the caller).

### AOFEXI06

This exit is called after an ACF process (LOAD or REFRESH) has completed (AOFCOMPL=YES) and before the AOF540I message is issued.

**Parameters:** Type of ACF action (REFRESH or LOAD).

**Return Codes:** 0 (**Note:** the return code is ignored by the caller).

### AOFEXINT

This exit is called when SA z/OS initialization is complete, before message AOF540I is issued. You can use AOFEXINT to call your own initialization processing after SA z/OS has finished. Refer also to the description of the global variable AOFSERXINT in “AOFSERXINT global variable” on page 236.

**Parameters:** The input parameter is the *Starttype* which is one of the following: RESYNC, IPL, REFRESH, RELOAD, RECYCLE.

**Return Codes:** 0 is expected.

---

## Environmental Setup Exits

The SA z/OS customization dialog allows you to define a string of exits that are invoked during SA z/OS initialization processing. These exits are defined using the SYSTEM INFO policy item of the System (SYS) entry type. See *IBM Tivoli System Automation for z/OS Defining Automation Policy* for more information.

Environmental setup exits are invoked after SA z/OS has started its various tasks, but before the primary automation table has been loaded. You can use these exits to initiate your own automation, but some SA z/OS services may be unavailable because SA z/OS has not yet finished initializing when these exits are called. In particular, status information may be inaccurate because SA z/OS may not have finished resynchronization. Environmental setup exits run on AUTO1.

### Parameters

Parameters are passed in sequence, delimited by blanks.

#### INITIALIZATION

INITIALIZATION is a constant.

#### RELOAD|REFRESH|IPL|RECYCLE

<b>RELOAD</b>	Indicates that the automation control file has been reloaded.
<b>REFRESH</b>	Indicates that the automation control file has been refreshed.
<b>IPL</b>	Indicates that SA z/OS has just been restarted after a system IPL.
<b>RECYCLE</b>	Indicates that NetView has been restarted.

## Return Codes

0 is expected. If you return a non-zero return code you may prevent other exits from being invoked or disrupt SA z/OS initialization.

## Usage Notes

- These exits are not driven if you run RESYNC.
- Unlike the other static exits, you must specify the name of the routine or routines to invoke in the automation control file.

---

## Static Exits

These exits are invoked at fixed points in SA z/OS processing. They are always invoked if they are found in the DSICLD concatenation. Positive return codes from these exits are generally ignored, though it is recommended that you always exit with a return code of 0.

The main purpose of static exits is to allow you to take your own actions at specific points during SA z/OS processing. The static exits available are described below.

### AOFEXSTA

This exit is called from AOCUPDT every time the automation status of an application is updated.

**Note:** It is not necessary for AOCUPDT to *change* an application automation status for this exit to be called. The exit is still invoked if the update does not result in a change of status.

AOFEXSTA can be used to perform any special status transition processing that cannot be triggered by other methods.

**Note:** This exit is invoked frequently, and is invoked at times when SA z/OS is not fully initialized. Your exit code should be as robust and efficient as possible.

SA z/OS attempts to load AOFEXSTA into storage at initialization. If this attempt fails, AOFEXSTA is not invoked on any AOCUPDT calls. To activate the exit it must be present in the DSICLD concatenation when the automation control file is loaded or reloaded.

AOFEXSTA runs on the task that called AOCUPDT, after all other processing has finished.

**Attention:** AOFEXSTA is scheduled with EXCMD opid(). If your operators are issuing commands that change application statuses and you want to use AOFEXSTA, you may have to modify your command authorization definitions.

**Parameters:** Parameters are passed in sequence, delimited by commas.

#### Resource type

SA z/OS uses types of SUBSYSTEM, MVSESA, WTORS, and SPOOL. Other users may use other resource types.

#### Resource Name

For an application, this is the name of the subsystem it is defined as.

## Static Exits

### Automation Status

For an application, this is one of the automation statuses that is supported by SA z/OS.

### SDF Root

This is the SDF Root, as specified in the customization dialog, for the system that originated the status update. Generally the exit is driven only for status changes on other systems on the automation focal point.

**Return Codes:** 0 is expected.

### Restrictions:

- Because the exit is scheduled with EXCMD, the status update and subsequent processing in the caller will have completed before the exit is invoked.
- Check the resource type and the SDF root to ensure you are only trying to process the right things.
- Plan carefully before you take any action to change the status of an application from this exit. If you are not careful you may create a loop (AOCUPDT to AOFEXSTA to AOCUPDT to AOFEXSTA).

#### Note:

Consider using ISSUEACT or status change commands as alternatives to AOFEXSTA, because AOFEXSTA is invoked for **every** status update that seriously degrades performance.

If the advanced automation options are set up appropriately, the ACTIVMSG and TERMMSG commands issues commands whenever an application changes to a particular status. It may be more appropriate to place commands here, rather than in the status change exit, which gets driven for every status update of every resource. It is recommended to use status change commands for better performance.

## AOFEXX02

The exit allows the installation to decide whether or not an SDF update should be performed for the specified resource.

A non-zero return code from the exit causes the SDF update processing to be skipped, both locally as well as for the focal point.

This exit is called prior to posting entries to SDF to provide the facility to filter out specific events.

Refer to the sample exit for details of the parameters passed to the exit and the return codes.

## AOFEXX03

The exit allows the installation to decide whether or not status change notification should be forwarded to the NMC focal point for the specified resource.

A non-zero return code from the exit causes status change forwarding to be skipped.



This exit is called prior to posting entries to NMC to provide the facility to filter out specific events.

Refer to the sample exit for details of the parameters passed to the exit and the return codes.

## AOFEXX04

This exit is called from CHKTHRES every time that this routine is called to check the number of errors recorded in the automation status file for a given resource against error thresholds that are defined in the automation control file.

Refer to the sample exit for details of the parameters passed to the exit and the return codes.

## AOFEXX05

The exit is driven by SA z/OS at initialization time when setting up the SDF panels or by means of the RESYNC SDFDEFS command.

The exit is used by the installation to replace user variables in the SDF panel definition. A user variable must follow the same convention as a z/OS system symbol, that means it must start with an ampersand (&) and finish with a dot(.). An example is &MVDOMAIN.

Refer to the sample exit for details of the parameters passed to the exit and the return codes.

## AOFEXX15

This exit allows you to write a log entry for each status change notification that arrives at the NMC focal point.

Refer to the sample exit for details of the parameters passed to the exit.

---

## Flag Exits

Using automation flag exits you can cause your automated operations code to exit normal SA z/OS processing to an external source, such as a scheduling function, to determine whether automation should be on or off for a given resource at that particular instant.

Flag exits can be defined for any flag (AUTOMATION, INITSTART, START, RECOVERY, TERMINATE, or RESTART) on any major or minor resource. See the description of the MINOR RESOURCES policy item in *IBM Tivoli System Automation for z/OS Defining Automation Policy* for more information on minor resources.

You can specify multiple exits for each flag.

A flag exit is invoked only if SA z/OS checks the value of the current flag setting during the flag evaluation process of AOCQRY, as described in *IBM Tivoli System Automation for z/OS Programmer's Reference*. If one of the global or specific flags, which have to be checked in one iteration step during the evaluation process over the inheritance hierarchy levels is set to NO, the other flag no longer has to be checked.

## Flag Exits

With the default BYPASS option of AOCQRY, exits that have been defined for the automation flag of a resource are executed when that automation flag is checked during flag evaluation and the flag value is EXITS.

With the FORCED option of AOCQRY, exits that have been defined for the automation flag of a resource are executed when that automation flag is checked during flag evaluation, independent of the flag value, as long as it is not empty.

If an automation flag is set to EXITS, the flag value is assumed to be YES during flag checking as long as none of the exits that have been defined for the checked resource switch the flag to NO. Exits that are forced to execute do not change the flag value.

Flag settings are determined by:

- The automation policy settings
- NOAUTO periods (the flag is OFF during a NOAUTO period)
- The user-entered INGAUTO command

For example, if you enter the following flag settings:

Resource	Flag	Setting
DEFAULTS	AUTOMATION	YES
SUBSYSTEM	RESTART	NO
JES2	AUTOMATION	Exit J2AUT
JES2	START	Exit J2STR
JES2	RECOVERY	NO
JES2	TERMINATE	Exits J2SD1 and J2SD2

The effective flags for JES2 are:

Flag	Effective setting
AUTOMATION	YES, Exit J2AUT
INITSTART	YES
START	YES, Exit J2STR
RECOVERY	NO
TERMINATE	YES, Exits J2SD1 and J2SD2
RESTART	NO

When SA z/OS checks the current value of any flag for the JES2 application, the process is as follows:

Flag	Process
AUTOMATION	<ol style="list-style-type: none"> <li>1. Call exit J2AUT.</li> <li>2. If the exit returns: <ul style="list-style-type: none"> <li>• <b>RC=0:</b> AUTOMATION flag is YES</li> <li>• <b>RC&gt;0:</b> AUTOMATION flag is NO</li> </ul> </li> </ol>

Flag	Process
INITSTART	<ol style="list-style-type: none"> <li>1. Call exit J2AUT (because of AUTOMATION global flag).</li> <li>2. If the exit returns: <ul style="list-style-type: none"> <li>• <b>RC=0:</b> INITSTART flag is YES</li> <li>• <b>RC&gt;0:</b> INITSTART flag is NO</li> </ul> </li> </ol>
START	<ol style="list-style-type: none"> <li>1. Call exit J2AUT (because of AUTOMATION global flag).</li> <li>2. If exit returns RC=0, call exit J2STR.</li> <li>3. If: <ul style="list-style-type: none"> <li>• <b>Both flags return RC=0:</b> START flag is YES</li> <li>• <b>Either flag returns RC&gt;0:</b> START flag is NO</li> </ul> </li> </ol>
RECOVERY	RECOVERY flag is NO
TERMINATE	<ol style="list-style-type: none"> <li>1. Call exit J2AUT (because of AUTOMATION global flag).</li> <li>2. If exit returns RC=0, call exit J2SD1.</li> <li>3. If exit J2SD1 returns RC=0, call exit J2SD2.</li> <li>4. If: <ul style="list-style-type: none"> <li>• <b>Both flags return RC=0:</b> TERMINATE flag is YES</li> <li>• <b>Either flag returns RC&gt;0:</b> TERMINATE flag is NO</li> </ul> </li> </ol>
RESTART	<ol style="list-style-type: none"> <li>1. Call exit J2AUT (because of AUTOMATION global flag).</li> <li>2. Regardless of the return code, the RESTART flag is NO.</li> </ol>

**Note:** Normally the START and RECOVERY flags are checked by SA z/OS only for minor resources but not for the subsystem itself.

## Parameters

Parameters are supplied in sequence, delimited by blanks.

### Flag

This is the name of the flag that is being checked. Possible values are AUTOMATION, INITSTART, START, RECOVERY, TERMINATE or RESTART.

### Time Setting

Time Setting is a constant. It can be either:

#### AUTO

Automation is currently turned on.

#### NOAUTO

Automation is currently turned off.

A value of NOAUTO is possible only if AOCQRY is called with the parameter EXITS=FORCED.

**Note:** This ensures that the exit is invoked, but it is not possible for an exit to override a NOAUTO period.

### Resource Name

This is the name of the resource that the flag is being requested for. For minor resources it contains the fully qualified minor resource name. Given no flag definition for TSO.USER.MAG1 and an exit enabled for TSO.USER, the resource name passed to the exit would be TSO.USER.MAG1 if a check was made for TSO.USER.MAG1.

## Flag Exits

### Resource Type

This is the type of the resource that the flag is being requested for. Possible values are DEFAULTS, SUBSYSTEM, or MVSESA (the value of the common global variable AOFSYSTEM).

### Target Prefix

This is the TGPFX value with which AOCQRY was invoked. If TGPFX is not specified, the value SUB is passed.

## Task Global Variables

The task global variables that are set by the AOCQRY command are available in flag exits.

## Return Codes

0 Automation is allowed by the exit.

> 0 Automation is not allowed.

### Notes:

1. Flag exits are always called through the AOCQRY command. This means that the task global variables for the resource have been primed and are available for use. Normally the names of the task global variables are prefixed with SUB, but if AOCQRY is called with a different value for parameter TGPFX, they are found in variables that are prefixed with that value. You should use the TGPFX parameter that is passed to locate the task global variables.
2. The set of task global variables that are set by AOCQRY depends on the values for the resource and request parameter. Make sure that the task global variables that you rely on in your exit are being set up.
3. If an exit is invoked for a minor resource, the task global variables are set for the major resource that is associated with that minor resource.
4. If you call AOCQRY from within your exit you must specify a TGPFX value that is different from the TGPFX parameter value you were passed. You are responsible for ensuring the uniqueness of all TGPFXs if you nest AOCQRY exits. Because this can become quite complex, it is recommended you avoid nesting exits.
5. Do not code calls to ACFCMD, ACFREP, or CDEMATCH because these use task global variables that are prefixed with SUB that may not be set up for the application that you want to process.
6. Do not change any of the task global variables that have been set by AOCQRY.
7. Flag exits may be called frequently, so performance is important.
8. If AOCQRY is specified with FORCE and multiple exits are defined for a flag, the exits are called in order.

---

## Customization Dialog Exits

SA z/OS provides a series of user exits that can be invoked during certain phases while working with the customization dialog. They are:

- “User Exits for BUILD Processing” on page 173
- “User Exits for COPY Processing” on page 174
- “User Exits for DELETE Processing” on page 174
- “User Exits for CONVERT Processing” on page 175
- “User Exits for RENAME, and IMPORT Functions” on page 175

“Invocation of Customization Dialog Exits” on page 176 provides information on how to activate the user exits.

## User Exits for BUILD Processing

The following user exits are provided for the process of building the automation control file.

- **INGEX10::** This is called before the automation control file build function starts. This exit is only available when the build process is initiated from the customization dialogs.
- **INGEX01::** This is called before the automation control file build function starts. This exit is available when the build process is initiated from the customization dialogs, from a batch job submitted via the customization dialogs, or from a batch job submitted independently from the customization dialogs. When a BUILD mode of BATCH is selected in the customization dialogs, the JCL for the batch job is submitted and INGEX01 is called when the job begins execution and before the automation control file build function starts in batch.
- **INGEX02::** This is called after the configuration file build has ended. This exit is available when the BUILD process is initiated from the customization dialogs, from a batch job submitted through the customization dialogs, or from a batch job submitted independently from the customization dialogs.

The following parameters are passed to both INGEX01 and INGEX02 exits, separated by commas:

- Parm1 = PolicyDB name
- Parm2 = Enterprise name
- Parm3 = BUILD output data set
- Parm4 = entry type (or blank)
- Parm5 = entry name (or blank)
- Parm6 = BUILD type (MOD/ALL)
- Parm7 = BUILD mode (ONLINE/BATCH)
- Parm8 = Configuration (0=NORMAL/1=ALTERNATE)
- Parm9 = Sysplex name (or blank)
- Parm10 = Build option (1,2, or 3)
- Parm11 = return code (for INGEX02 *only*)

If user exit INGEX10 produces return code RC = 0, build processing continues. If a return code RC > 0 is produced, an error message is returned and the build processing terminates.

If user exit INGEX10 ends with return code RC > 0, user exits INGEX01 and INGEX02 are not called. Processing terminates.

If user exit INGEX10 ends with return code RC > 0 and a BUILD mode of BATCH was selected in the customization dialogs, no JCL is submitted to run the build in batch. Processing terminates.

If user exit INGEX01 produces return code RC = 0, build processing continues. If a return code RC > 0 is produced, an error message is returned and build processing terminates. If the build is run in batch mode, and a return code RC > 0 is produced, the job finishes with a return code RC 08.

If user exit INGEX01 ended with return code RC > 0, user exit INGEX02 is not called because the build function was not started. Processing terminates.

## Customization Dialog Exits

User exit INGEX02 is always called when the BUILD process has started, irrespective of whether it has completed or not.

If user exit INGEX02 produces a return code RC > 0, an error message is displayed. If the build is run in batch mode, and a return code RC > 0 is produced, the job completes with a return code RC 04. If a severe build error occurred, the job completes with a return code RC 20.

The return codes and their meaning are as follows:

- 0 Successful
- 4 Build with minor errors
- 12 No build (data is inconsistent)
- 20 No build (severe errors)

## User Exits for COPY Processing

Two user exits are implemented for the COPY processing.

1. **INGEX03:** This is called before the COPY function starts. The following parameters are passed:
  - Entry name of the entry to be copied to (target)
  - Entry name of the entry to be copied from (source)
  - Entry type (for example, APL)
2. **INGEX04:** This is called after the COPY function has ended. The following parameters are passed:
  - Entry name of the entry to be copied to (target)
  - Entry name of the entry to be copied from (source)
  - Entry type (for example, APL)
  - Indicator whether the COPY process was successful or not (S=successful, U=unsuccessful)

If user exit INGEX03 produces return code RC = 0, COPY processing continues. If a return code RC > 0 is produced, an error message is displayed, the COPY function does not start, and processing terminates.

If user exit INGEX03 ended with return code RC > 0, the user exit INGEX04 is not called because the COPY processing will terminate.

User exit INGEX04 is always called once the COPY function has started. The information about the success or failure of the COPY function is passed as a parameter.

If user exit INGEX04 produces a return code RC > 0, an error message is displayed.

## User Exits for DELETE Processing

Two user exits are implemented for the DELETE processing.

1. **INGEX05:** This is called before the DELETE process starts. The following parameters are passed:
  - Entry name of the entry to be deleted
  - Entry type (for example, APL)

2. **INGEX06:** This is called after the DELETE process has ended. The following parameters are passed:
  - Entry name of the entry to be deleted
  - Entry type (for example, APL)
  - Indicator whether the DELETE process was successful or not (S=successful, U=unsuccessful)

If user exit INGEX05 produces return code RC = 0, the DELETE processing continues. If a return code RC > 0 is produced, an error message is displayed, the DELETE function does not start and the processing terminates.

If user exit INGEX05 ended with a return code RC > 0, user exit INGEX06 is not called because the DELETE processing will terminate.

User exit INGEX06 is always called once the DELETE function has started. The information about the success or failure of the DELETE function is passed as a parameter.

If user exit INGEX06 produces a return code RC > 0, an error message is displayed.

## User Exits for CONVERT Processing

Two user exits are implemented for the CONVERT processing.

1. **INGEX07:** This is called before the CONVERT process starts. No parameters are passed.
2. **INGEX08:** This is called after the CONVERT process has ended. No parameters are passed.

If user exit INGEX07 produces return code RC = 0, the CONVERT processing continues. If a return code RC > 0 is produced, an error message is displayed, the CONVERT function does not start and the processing terminates.

If user exit INGEX07 ended with a return code RC > 0, user exit INGEX08 is not called because the CONVERT processing will terminate.

User exit INGEX08 is always called once the CONVERT function has started.

If user exit INGEX08 produces a return code RC > 0, an error message is displayed.

## User Exits for RENAME, and IMPORT Functions

The following user exits are provided for the renaming, and import functions.

1. **INGEX09:** This is called when the log data set is switched, usually because the current data set is full. One parameter is passed:
  - Name of current log data set, for example, the data set that went out of space
2. **INGEX15:** This is called before an entry is renamed. The following parameters are passed:
  - Entry Name
  - Entry Type
3. **INGEX16:** This is called after an entry has been renamed. The following parameters are passed:

## Customization Dialog Exits

- Entry Type
  - Old Entry Name
  - New Entry Name
4. **INGEX17:** This is called during the IMPORT function, when reading data from the source policy database. One parameter is passed:
    - Name of copy data work table. This table contains the entry types and entry names of the data to be copied.
  5. **INGEX18:** This is called after the IMPORT function has ended. INGEX18 is only called if INGEX17 was called at the beginning of the IMPORT function. If checks have been made that prevent INGEX17 being called, INGEX18 is not called either.

One parameter is passed:

    - Indicator whether the IMPORT process was successful (S=successful, U=unsuccessful)
  6. **INGEX20:** This is called after the links have been changed. No parameters are passed.
  7. **INGEX21:** This is called before the policy database report is invoked. No parameters are passed.

## Invocation of Customization Dialog Exits

The user exits are part of the SA z/OS product. Therefore they are supplied in the same data set as all other ISPF REXX modules (part of SINGIREX). All of the supplied samples just perform a 'RETURN' with return code RC=0.

You have two possibilities to apply your user modifications:

1. Edit the user exit (or exits) in the supplied library. Your changes do not have any consequences for the code of the SA z/OS product. These exits are not serviced (via PTF) by IBM because they do not include any code at the time of product delivery.
2. Supply the modified user exit in a private data set. Then you have to concatenate your private data set to your SYSEXEC library chain. As INGDLG supports multiple data set names specified for ddname SYSEXEC, this can be done in the following way:

```
INGDLG SELECT(ADMIN) ALLOCATE(YES) HLQ(SYS1)
        SYSEXEC(usr.private.dsn SYS1.SINGIREX)
```

This example assumes that the high level qualifier of the data sets where the IBM supplied parts exist is SYS1.

If you specify the SYSEXEC parameter in the INGDLG call, you need to specify the IBM supplied library explicitly with its **fully qualified** data set name.

---

## Command Exits

These exits can be called during the processing of certain commands.

### AOFEXC00

The AOFEXC00 exit routine is called if the selection L has been entered in the AOC command dialog. No parameters are passed to the routine. The purpose of this routine is to act as the starting point for installation-provided local functions.



**AOFEXC01**

If this exit is defined, it is invoked during INGREQ processing before Precheck and Verification processing.

The exit allows you to modify the parameters that are passed.

Refer to the sample exit for details of the parameters that are passed to the exit and the return codes.

**AOFEXC02**

If this exit routine is defined, it is invoked during INGSCHED processing before the schedule override file is updated. The parameters are positional and separated by a comma.

Refer to the sample exit for details of the parameters that are passed to the exit and the return codes.

**AOFEXC03**

If this exit routine is defined, it is invoked by the DISPINFO command slave to retrieve user-supplied information about the subsystem. The input for the routine is the subsystem name. The data returned by the exit is shown as part of the DISPINFO output.

Refer to the sample exit for details of the parameters that are passed to the exit and the return codes.

**AOFEXC04**

If this exit routine is defined, the command code U is supported for the DISPMTR, DISPSTAT, and INGLIST commands. The input for the AOFEXC04 exit is the resource name (subsystem name for DISPSTAT) and the location of the resource. The location is either the system name if the resource resides on a system member of the local sysplex, or the domain ID if the resource resides on a system which is outside of the local sysplex. The parameters are separated by a comma.

Refer to the sample exit for details of the parameters that are passed to the exit and the return codes.

**AOFEXC05**

This exit is called on entry of the INGLIST command. The exit allows you to modify the input parameters. The modified input parameters are returned to the INGLIST command by sending a message (single or multiline) to the console, for example:

```
OBSERVED=* DESIRED=*
```

Refer to the sample exit for details of the parameters that are passed to the exit and the return codes.

**AOFEXC06**

This exit is called on entry of the INGSET command with the SET action. The exit allows you to perform authorization checking of the resources for the INGSET command.

## Command Exits

Refer to the sample exit for details of the parameters that are passed to the exit and the return codes.

### **AOFEXC07**

This exit is called on entry of the INGIMS command. The exit allows you to perform authorization checking of the IMS subsystem that is the subject of the INGIMS command.

Refer to the sample exit for details of the parameters that are passed to the exit and the return codes.

### **AOFEXC08**

This exit is called on entry of the INGVOTE command. The exit allows you to perform authorization checking of the resources for the INGVOTE command. Because the INGSET CANCEL/KILL action uses the INGVOTE command, this exit is also called when performing this action.

Refer to the sample exit for details of the parameters that are passed to the exit and the return codes.

### **AOFEXC09**

This exit is called on entry of the SETSTATE command. The exit allows you to perform authorization checking of the resources for the SETSTATE command.

Refer to the sample exit for details of the parameters that are passed to the exit and the return codes.

### **AOFEXC10**

This exit is called on entry of the INGEVENT command. The exit allows you to perform authorization checking of the resources for the INGEVENT command.

Refer to the sample exit for details of the parameters that are passed to the exit and the return codes.

### **AOFEXC11**

This exit is called on entry of the INGCICS command. The exit allows you to perform authorization checking of the resources for the INGCICS command.

Refer to the sample exit for details of the parameters that are passed to the exit and the return codes.

### **AOFEXC12**

This exit is called on entry to the command slave (EVJRVCMD) for the TWS command server (EVJRVCMD0). The exit allows you to perform authorization checking of the commands scheduled via the TWS batch interface (EVJRYCMD) against the user ID of the batch job requesting the command.

Refer to the sample exit for details of the parameters passed to the exit and the return codes.

## AOFEXC13

This exit is called on entry to the INGGROUP and INGMOVE commands. The exit allows you to perform authorization checking of the user ID that issues the command.

Refer to the sample exit for details of the parameters passed to the exit and the return codes.

## AOFEXC14

This exit is called by the SA z/OS GDPS termination routine (INGRGDPS) after stopping the PAM or selecting a SAM to become the PAM.

Refer to the sample exit for details of the return codes.

## AOFEXC15

If this exit routine is defined, it is invoked during INGREQ processing after the GO confirmation has been received.

The user exit is called in a PIPE. Refer to the sample exit for details of the parameters that are passed to the exit.

## AOFEXC16

This exit is invoked by the INGTHRES command prior to updating or deleting the thresholds for a given resource. It allows you to perform authorization checking of the requested action. If the exit returns with a non-zero return code and additional data is written to the console, this data is shown in the message panel. If no additional data is passed back in the exit, message AOF227I is issued.

Refer to the sample exit for details of the parameters that are passed to the exit and the return codes.

## AOFEXC17

This exit is invoked by the INGALERT command. It allows you to:

- Modify the event text
- Reduce the Inform List with event notification targets such as IOM, EIF, TTT, and USR
- Modify the value that is returned from the matching code definition with information such as the event severity or whether to ignore the event

Refer to the sample exit for details of the parameters that are passed to the exit and the return codes.

## AOFEXC18

This exit is invoked by the INGLKUP command. It is driven prior to stopping or canceling the specified address space. It allows you to perform authorization checking of the requested action. If the exit returns with a non-zero return code and additional data is written to the console, this data is shown in the message panel. If no additional data is passed back in the exit, message AOF227I is issued.

Refer to the sample exit for details of the parameters that are passed to the exit and the return codes.

### AOFEXC19

This exit is invoked by the INGAMS command. It is driven in the following cases:

- Enabling or disabling access to the takeover file
- Suspending or resuming systems
- Refreshing the configuration
- Performing a diagnostic action (starting or stopping recording, taking a snapshot)
- Switching the primary automation manager

The exit allows you to perform authorization checking of the INGAMS command. If the exit returns with a non-zero return code and additional data is written to the console, this data is shown in the message panel. If no additional data is passed back in the exit, message AOF227I is issued.

Refer to the sample exit for details of the parameters that are passed to the exit and the return codes.

### AOFEXC20

This exit is called when a command is passed via the TWS request interface. The exit allows the installation to perform authorization checking. Optionally, the exit can modify the command and/or the completion information by returning up to two data lines:

- line 1 is the modified command including all its parameters. A null string must be returned when the command is not modified. This is only necessary when modifying the completion information via the exit
- line 2 is the completion information:
  - maximum return code
  - completion checking coding.

The parameters must be separated by a comma. Error code U010 will be posted when one of the parameters is wrong.

The installation exit is called in a PIPE. If the exit returns a bad return code and additional data is written to the console, this data is written in the netlog. If no additional data is passed in the exit, message AOF227I is issued.

Refer to the sample exit for details of the parameters that are passed to the exit and the return codes.

### AOFEXC21

This exit is invoked by the INGOPC command with the option REQ=MOD. It allows you to perform authorization checking of the requested action. If the exit returns with a non-zero return code and additional data is written to the console, this data is shown in the message panel. If no additional data is passed back in the exit, message AOF227I is issued.

Refer to the sample exit for details of the parameters that are passed to the exit and the return codes.

### AOFEXC22

This exit is called when a trouble ticket is created using the INGALERT command. It allows you to determine the trouble ticket detail data that is to be written to the detail data set.

Refer to the sample exit for details of the parameters that are passed to the exit and the return codes.

### AOFEXC23

This exit is invoked when a request is passed via the TWS interface. It allows you to perform authorization checking of the requested action. If the exit returns a non-zero return code and additional data is written to the console, this data is taken as a message. If no additional data is passed back in the exit, message AOF227I is issued.

Refer to the sample exit for details of the parameters that are passed to the exit and the return codes.

### AOFEXC24

If this exit is defined, it is invoked during INGRUN processing. This exit allows you to modify the parameters that are passed. Refer to the sample exit for details of the parameters that are passed to the exit and the return codes.

---

## Pseudo-Exits

This section discusses a number of places where SA z/OS either makes special use of a flag exit or has a function with certain, exit-like, qualities.

### Automation Control File Reload Permission Exit

When an operator issues the ACF COLD command, SA z/OS checks the global AUTOMATION flag of minor resource MVSESA.RELOAD.CONFIRM. If the flag is set to NO, the automation control file reload is not allowed. If the flag is set to YES, the task global AOFCONFIRM is checked. If AOFCONFIRM has been set to a non-null value, the user is prompted to confirm that they want the automation control file to be reloaded.

#### Notes:

1. Note that an exit can be associated with the global AUTOMATION flag for this resource.
2. An automation control file cannot be loaded if the global AUTOMATION flag for the major resource MVSESA is set to N. If the global AUTOMATION flag for the minor resource MVSESA.RELOAD.CONFIRM is set to Y, reloading the ACF is permitted.

### Automation Control File Reload Action Exit

After the automation control file reload permission exit is checked, when SA z/OS is committed to reloading the automation control file, it checks the global AUTOMATION flag for minor resource MVSESA.RELOAD.ACTION. The actual setting of this flag (ON or OFF) is ignored, but any exits defined for it are invoked. All exits should return a return code of 0.

### Subsystem Up at Initialization Commands

Using the customization dialog you can specify commands that are run if SA z/OS finishes resynchronizing statuses and an application is found to be up. These commands can be useful for synchronizing local automation that has been built on top of SA z/OS.

### Testing Exits

Exits should be well tested with a variety of different input parameters before they are put into production. For exits that need AOCQRY task globals, you can call AOCQRY to set up the globals without evaluating the flag exits, and then invoke the exit on its own for testing purposes. This method saves the overhead of calling AOCQRY every time you run the exit.

**Attention:**

If you have a syntax error or a no-value-condition in your exit it can cause parts of SA z/OS to abend, resulting in severe disruption of your automation.

---

## Chapter 18. Automation Solutions

SA z/OS provides solutions that enable automatic processing of z/OS components, data sets and job scheduling systems as well as automation procedures that are useful tools in the automation processing context. By using these prefabricated automation procedures you can save the time to develop your own procedures to handle the processing in corresponding situations.

In particular these automation routines provide solutions for:

- “LOGREC Data Set Processing”
- “SMF Data Set Processing” on page 184
- “SYSLOG Processing” on page 184
- “System Log Failure Recovery” on page 184
- “SVC Dump Processing” on page 185
- “Deletion of Processed WTORs from the Display” on page 185
- “AMRF Buffer Shortage Processing” on page 185
- “JES2 Spool Monitoring” on page 63
- “Drain Processing Prior to JES2 Shutdown” on page 186
- “IMS Transaction Recovery” on page 186

The solutions for automatic processing of these situations include definitions in the automation configuration files and automation procedures.

It is common to all the solutions that are provided that the automation procedures first determine whether automation is allowed by checking the corresponding automation flags with the AOCQRY command. See *IBM Tivoli System Automation for z/OS Defining Automation Policy* for further information concerning types and settings of automation flags. Use the DISPFLGS command to display or temporarily change the current settings of the automation flags.

Some of the automation routines respond to messages by issuing commands from the automation configuration files. Most of these automation routines keep track of the reception of these messages and compare the frequency of the incoming messages with predefined thresholds of infrequent, frequent, and critical levels. If such a defined threshold is exceeded, it is used as the option for selecting the appropriate commands according to the first field in the command entry of the MESSAGES/USER DATA policy item of the configuration file. If no threshold is exceeded the commands defined for the selection option ALWAYS are issued. See “How SA z/OS Uses Error Thresholds” in *IBM Tivoli System Automation for z/OS User’s Guide* for further information on setting up thresholds.

This chapter describes the details of the automation functions that are provided with SA z/OS.

---

### LOGREC Data Set Processing

The logrec recovery function responds to system messages that indicate that the logrec data set is full or nearly full. The recovery function issues predefined commands to dump and clear the logrec data sets. While the recovery function is in progress, it prevents the automation processing being started a second time.

## LOGREC Data Set Processing

The logrec recovery function includes the following items:

- Automation routines AOFRSA01 and AOFRSA02, see “AOFRSA01” on page 186 and “AOFRSA02” on page 187
- Automation table entries for system messages IFB040I, IFB060E, IFB080E, IFB081I, and IFC001I
- Error threshold definitions for MVS component minor resource LOGREC
- Command specification in the MESSAGES/USER DATA automation policy item for the special message ID LOGREC

---

## SMF Data Set Processing

The SMF recovery function that is provided responds to system messages that indicate that the SMF data set is full or has been switched. Predefined commands from the configuration files are selected to dump and clear the contents of the SMF data set. The commands to be selected can be defined depending on the occurrence of the incoming messages. Additionally SA z/OS checks at initialization time whether SMF data sets need to be dumped and triggers the appropriate recovery action (see “AOFRSA03” on page 189 for further details). The SMF recovery function includes the following items:

- Automation routine AOFRSA03, see “AOFRSA03” on page 189
- Automation table entries for system messages IEE362A, IEE362I, IEE391A and IEE392I
- Error threshold definitions for MVS component minor resource SMFDUMP
- Command specification in the MESSAGES/USER DATA automation policy item for the special message ID SMFDUMP

---

## SYSLOG Processing

The syslog function that is provided responds to messages that are queued to the syslog. The function starts an external writer to save the syslog that was queued. The commands to be selected can be defined depending on the occurrence of the incoming messages.

The syslog function includes the following items:

- Automation routine AOFRSA08, see “AOFRSA08” on page 192
- Automation table entry for system message IEE043I
- Error threshold definitions for MVS component minor resource SYSLOG
- Command specification in the MESSAGES/USER DATA automation policy item for the special message ID SYSLOG

---

## System Log Failure Recovery

The system log failure recovery function that is provided responds to a system log inactive message by restarting the system log. If the system log should be available to be used as the hardcopy medium, the recovery function assigns the system log as the hardcopy medium.

The recovery commands are only issued if the occurrence of the system log inactive message that is received does not exceed a defined critical threshold.

The system log failure recovery function that is provided includes the following items:



- Automation routine INGRX740, see “INGRX740” on page 211
- Automation table entries for system messages IEE037D, IEE041I, IEE533E, IEE769E, IEE043I
- Recovery automation flag for the MVS component minor resource LOG
- Error threshold definitions for the MVS component minor resource LOG
- Command specification in the MESSAGES/USERDATA automation policy item for the special message ID LOG

---

### SVC Dump Processing

The SVC dump processing function that is provided responds to an SVC dump-taken message by issuing predefined commands from the configuration files to handle the dump. The commands to be selected can be defined depending on the occurrence of the incoming messages.

The provided SVC dump processing function includes the following items:

- Automation routine AOFRSA0C, see “AOFRSA0C” on page 194
- Automation table entries for system messages IEA611I and IEA911E
- Error threshold definitions for MVS component minor resource MVSDUMP
- Command specification in the MESSAGES/USER DATA automation policy item for the following special message IDs:
  - MVSDUMP
  - MVSDUMPTAKEN
  - MVSDUMPRESET

---

### Deletion of Processed WTORs from the Display

The WTOR processing function that is provided deletes WTORs from SA z/OS display capabilities when they are replied to or canceled.

The WTOR processing function includes the following items:

- Automation routine AOFRSA0E, see “AOFRSA0E” on page 197
- Automation table entries for system messages IEE400I and IEE600I

---

### AMRF Buffer Shortage Processing

The AMRF buffer shortage processing function that is provided responds to messages that report buffer shortage of the action message retention facility (AMRF). The function issues commands from the configuration files to process buffer shortage automation.

The AMRF buffer shortage processing function that is provided includes the following items:

- Automation routine AOFRSA0G, see “AOFRSA0G” on page 198
- Automation table entries for system messages IEA359E, IEA360A and IEA361I
- Command specification in the MESSAGES/USER DATA automation policy item for the following special message IDs:
  - AMRFSHORT
  - AMRFFULL
  - AMRFCLEAR

### Drain Processing Prior to JES2 Shutdown

SA z/OS provides functions for drain processing of JES2 resources prior to JES2 shutdown.

The JES2 drain processing function that is provided includes the following items:

- Automation routines AOFRSD07, AOFRSD0F, AOFRSD0G. See “AOFRSD07” on page 199, “AOFRSD0F” on page 202 and “AOFRSD0G” on page 204.
- Automation table entries for system message HASP607.
- Specifications in the JES2 DRAIN automation policy item for the JES2 applications that are to be drained and how they are to be drained prior to JES2 shutdown.

---

### IMS Transaction Recovery

SA z/OS provides an IMS transaction recovery function. This responds to an IMS application program abend message by issuing predefined replies or commands from the configuration files for recovery purposes. A recovery action is not issued if the program is excluded from recovery processing, or the occurrence of the incoming message exceeds a predefined critical threshold.

The IMS transaction recovery function that is provided by SA z/OS includes the following:

- A NetView automation table entry for the application program abend message, DFS554A
- The subsystem that issues the abend message has the following automation policy definitions:
  - Error threshold definitions in the MINOR RESOURCE policy item for the minor resource *PROG.progid* or *TRAN.tran*
  - Code definitions in the MESSAGES/USER DATA policy item for the message types *ABCODEPROG.progid*, *ABCODEPROG*, *ABCODETRAN.tran*, or *ABCODETRAN*
  - Reply or command specifications in the MESSAGES/USER DATA policy item for the message ID DFS554A

---

### AOFRSA01

#### Purpose

You can use the AOFRSA01 automation routine to respond to logrec data set nearly full or full messages from your system by issuing commands from the configuration files to dump and clear the contents of the logrec data set.

AOFRSA01 keeps track of the incoming logrec data set messages and compares their occurrence with predefined thresholds of infrequent, frequent, and critical level. An exceeded threshold is used as the option to select the appropriate commands according to the first field in the command entry of the MVSESA/LOGREC entry/type-pair in the configuration file. If no threshold is exceeded the commands defined for the selection option ALWAYS are issued.

AOFRSA01 should be called from the NetView automation table.

## Syntax

▶▶—AOFRSA01—▶▶

## Restrictions

- Actions are only taken in AOFRSA01 if the recovery automation flag for LOGREC is on.
- Processing in AOFRSA01 is only done if it is called from NetView automation table by one of the expected messages IFB040I, IFB060E, IFB080E or IFB081I.
- The commands from automation policy to dump and clear the LOGREC data set are only issued if a LOGREC recovery function is not already in progress.

## Usage

Automation routine AOFRSA01 is intended to respond to the following messages:

```
IFB040I SYS1.LOGREC AREA IS FULL, hh.mm.ss
IFB060E SYS1.LOGREC NEAR FULL
IFB080E LOGREC DATA SET NEAR FULL, DSN=dsname
IFB081I LOGREC DATA SET IS FULL,hh.mm.ss, DSN=dsn
```

The commands to issue are selected from the command entry of the MVSESA/LOGREC entry/type-pair in the configuration file.

If no threshold is reached when one of the expected messages arrive, all commands to entries with no selection option and to selection option ALWAYS are selected. If the threshold at level infrequent is exceeded, all commands to entries with no selection specification option and to selection option INFR are selected. In the same way a level of frequent corresponds to selection option FREQ and a level of critical corresponds to selection option CRIT.

Make sure that the automation routine AOFRSA02 is issued by message IFC001I from the NetView automation table, to indicate the completion of the LOGREC recovery function.

## Global Variables

### &EHKVAR1

When defining the commands in the configuration files to dump and clear the contents of the LOGREC data set, the variable &EHKVAR1 can be used for the name of the LOGREC data set. This variable is substituted with the complete data set name of the LOGREC data set name.

---

## AOFRSA02

### Purpose

You can use the AOFRSA02 automation routine to respond to the initialization message of the LOGREC data set to reset the flag, which indicates that the LOGREC recovery function is in progress

AOFRSA02 should be called from the NetView automation table.

## Syntax

▶▶—AOFRSA02—◀◀

## Restrictions

- Actions are only taken in AOFRSA02 if the recovery automation flag for LOGREC is on.
- Processing in AOFRSA02 is only done if it is called from NetView automation table.

## Usage

Automation routine AOFRSA02 is intended to respond to the following message:  
IFC001I D=devtyp N=x F=track1\* L=track2\* S=recd\*\* DIP COMPLETE

This is produced during the initialization of the LOGREC data set and describes the limits of the data set.

The flag, indicating that the LOGREC recovery function is in progress, is used by automation routine AOFRSA01.

## Examples

This example shows a sample scenario for LOGREC data set processing:

The following entries in the NetView automation table are created automatically to issue the appropriate automation routine when one of the expected messages arrives:

```
IF MSGID = 'IFB040I' | MSGID = 'IFB060E' |
   MSGID = 'IFB080I' | MSGID = 'IFB081I'
THEN
EXEC(CMD('AOFRSA01')ROUTE(ONE %AOFOPRECOPER%));

IF MSGID = 'IFC001I'
THEN
EXEC(CMD('AOFRSA02')ROUTE(ONE %AOFOPRECOPER%));
```

COMMANDS	HELP
----- Thresholds Definition	
Command ==>	_____
Entry Type : MVS Component	PolicyDB Name : DATABASE_NAME
Entry Name : MVS_COMPONENTS	Enterprise Name : YOUR_ENTERPRISE
Resource : MVSESA.LOGREC	
Critical Number . . . . 3	(1 to 50)
Critical Interval . . . 00:05	(hh:mm or hhmm, 00:01 to 24:00)
Frequent Number . . . . 3	(1 to 50)
Frequent Interval . . . 00:30	(hh:mm or hhmm, 00:01 to 24:00)
Infrequent Number . . . 3	(1 to 50)
Infrequent Interval . . 24:00	(hh:mm or hhmm, 00:01 to 24:00)

Figure 32. Threshold Definitions for MVS Component LOGREC

Pass/Selection Automated Function/'*' Command Text <hr/> MVS S CLRLOG,DSN=&EHKVAR1
--

Figure 33. MESSAGES/USER DATA Policy Item for Entry/Type-Pair MVSESA/LOGREC

Assume that the following message arrives the first time for one day:

```
IFB080E LOGREC DATA SET NEAR FULL, DSN=SYS1.AOC1.MAN3
```

Because none of the defined thresholds is exceeded, the automation routine AOFRSA01 searches for defined commands without selection option and to selection option ALWAYS to be issued. With the control file shown above the command MVS S CLRLOG,DSN=&EHKVAR1 is selected. Before issuing this command, the variable &EHKVAR1 is substituted by the data set name of the received message resulting in MVS S CLRLOG,DSN=SYS1.AOC1.MAN3.

If message IFB080E continues to arrive and the occurrence of the expected messages thus exceeds the infrequent, frequent or critical threshold, the automation routine AOFRSA01 searches for defined commands without selection option and to selection option INFR, FREQ or CRIT to be issued.

Because no command is defined with any selection option, only the defined command with no selection option is selected and issued, as in the previous case.

Message AOF589I, AOF588I or AOF587I is issued in cases, where an infrequent, frequent or critical threshold has been exceeded. These messages indicate that an infrequent, frequent or critical threshold action has been processed.

If the recovery processing for a LOGREC data set is still in progress when an expected error message arrives, the following message is issued:

```
AOF585I 15:45 : RECOVERY OF LOGREC IS ALREADY IN PROGRESS -
```

The recovery process is considered to be finished, when message IFC001I arrives telling that the LOGREC data set has been initialized.

## AOFRSA03

### Purpose

You can use the AOFRSA03 automation routine to respond to SMF data set full or switch messages from your system. AOFRSA03 issues commands from the configuration files to dump and clear the contents of the SMF data set.

AOFRSA03 keeps track of incoming SMF data set messages and compares their occurrence with predefined thresholds at infrequent, frequent, and critical levels. An exceeded threshold is used as the option for selecting the appropriate commands according to the first field in the command entry of the MVSESA/SMFDUMP entry/type pair in the configuration file. If no threshold is exceeded the commands that are defined for the selection option ALWAYS are issued.

AOFRSA03 should be called from the NetView automation table.

| Besides that kind of automation, SA z/OS also checks for full SMF data sets which  
 | were filled up while SA z/OS was not active. For each data set where a dump is  
 | required a command is issued if the selection option is set to 'ALWAYS'.  
 | &EHKVAR contains fully qualified SMF data set name.

## Syntax

▶▶—AOFRSA03—▶▶

## Restrictions

- | • Processing in AOFRSA03 is done if it is called from NetView automation table
- | by one of the expected messages: IEE362A, IEE262I, IEE391A or IEE392I.
- | • If AOFRSA03 was triggered by one of the above messages, then actions are
- | only taken if the recovery automation flag for SMFDUMP is on.
- | • Actions in AOFRSA03 are only taken if the recovery automation flag for
- | SMFDUMP is on.
- | • Processing in AOFRSA03 is only done if it is called from the NetView
- | automation table by one of the expected messages: IEE362A, IEE262I, IEE391A or
- | IEE392I.

## Usage

Automation routine AOFRSA03 is intended to respond to the following messages:

```
| IEE362A SMF ENTER DUMP FOR dsname ON ser
| IEE362I SMF ENTER DUMP FOR dsname ON ser
| IEE391A SMF ENTER DUMP FOR DATA SET ON VOLSER ser, DSN=dsname
| IEE392I SMF ENTER DUMP FOR DATA SET ON VOLSER ser, DSN=dsname
```

that indicate that the SMF data set is ready to be dumped.

## Global Variables

### &EHKVAR1

When defining the commands in the configuration file to dump and clear the contents of the SMF data set, the variable &EHKVAR1 can be used for the name of the SMF data set. This variable is substituted with the complete data set name by AOFRSA03 when message IEE391A or IEE392I is received. In case of message IEE362A or IEE362I this variable is substituted with MANn, the second part of the SMF data set name.

### &EHKVAR2

When defining the commands in the configuration file to dump and clear the contents of the SMF data set, the variable &EHKVAR2 can be used for the name of the SMF data set. This variable is substituted with the complete data set name by AOFRSA03 when message IEE391A, IEE392I, IEE362A, or IEE362I is received.

## Examples

| This example shows SMF data set processing when AOFRSA03 is called from the  
 | automation table.

The following entries in the NetView automation table are created automatically to issue the appropriate automation routine when one of the expected messages arrives:

```
IF (MSGID = 'IEE362I' | MSGID = 'IEE362A' |
    MSGID = 'IEE391A' | MSGID = 'IEE392I')
THEN
EXEC(CMD('AOFRSA03')ROUTE(ONE %AOFOPRECOPER%));
```

COMMANDS HELP

---

Thresholds Definition

Command ==> \_\_\_\_\_

Entry Type : MVS Component                      PolicyDB Name : DATABASE\_NAME  
 Entry Name : MVS\_COMPONENTS                    Enterprise Name : YOUR\_ENTERPRISE

Resource : MVSESA.SMFDUMP

Critical Number . . . . 3                      (1 to 50)  
 Critical Interval . . . 00:05                    (hh:mm or hhmm, 00:01 to 24:00)

Frequent Number . . . . 3                      (1 to 50)  
 Frequent Interval . . . 00:30                    (hh:mm or hhmm, 00:01 to 24:00)

Infrequent Number . . . 3                      (1 to 50)  
 Infrequent Interval . . 24:00                    (hh:mm or hhmm, 00:01 to 24:00)

Figure 34. Threshold Definitions for MVS Component SMFDUMP

Pass/Selection Automated Function/'\*'  
 Command Text

---

MVS S SMFDUMP1,DA='&EHKVAR2'

---

Figure 35. MESSAGES/USER DATA Policy Item for Entry/Type-Pair MVSESA/SMFDUMP

Assume that the following message arrives the first time on one day:  
 IEE391A SMF ENTER DUMP FOR DATASET ON VOLSER 123, DSN=SYS1.AOC1.MAN3

Because none of the defined thresholds has been exceeded, the AOFRSA03 automation routine searches for commands to issue that have been defined without a selection option or with the selection option ALWAYS. With the control file shown above the command MVS S SMFDUMP1,DA='&EHKVAR2' is selected. Before issuing this command, the variable &EHKVAR1 is substituted with the data set name from the received message, resulting in MVS S SMFDUMP1,DA='SYS1.AOC1.MAN3'.

If message IEE391A continues to arrive and the occurrence of the expected messages thus exceeds the infrequent, frequent or critical thresholds, the AOFRSA03 automation routine searches for commands to issue that have been defined without a selection option or with selection option INFR, FREQ or CRIT.

Because no command has been defined with a selection option, only the command that has been defined without a selection option is selected and issued, as in the previous case.

Message AOF589I, AOF588I or AOF587I is issued in cases where an infrequent, frequent or critical threshold has been exceeded. These messages indicate that an infrequent, frequent or critical threshold action has been processed.

---

## AOFRSA08

### Purpose

You can use the AOFRSA08 automation routine to respond to syslog being queued messages by starting an external writer to save the syslog that was queued.

AOFRSA08 keeps track of the incoming syslog queued messages and compares their occurrence with predefined thresholds at infrequent, frequent, and critical levels. An exceeded threshold is used as the option for selecting the appropriate commands according to the first field in the command entry of the MVSESA/SYSLOG entry/type-pair in the configuration file. If no threshold is exceeded the commands that are defined for the selection option ALWAYS are issued.

AOFRSA08 should be called from the NetView automation table.

### Syntax

▶▶—AOFRSA08—▶▶

### Restrictions

- Processing in AOFRSA08 is only done if it is called from NetView automation table by the expected message IEE043I.
- Actions are only taken in AOFRSA08 if the recovery automation flag for SYSLOG is on and if the status of JES is UP or HALTED.

### Usage

Automation routine AOFRSA08 is intended to respond to the message:  
IEE043I A SYSTEM LOG DATA SET HAS BEEN QUEUED TO SYSOUT CLASS class

which indicates that the system closed the system log (SYSLOG) data set and queued the data set to a SYSOUT class.

The commands to issue are selected from the command entry of the MVSESA/SYSLOG entry/type-pair in the configuration file.

If no threshold is reached when one of the expected messages arrive, all commands that are defined for entries without a selection option and for the selection option ALWAYS are selected.

If the threshold at the infrequent level is exceeded, all commands that are defined for entries without a selection specification option and for entries with the selection option INFR are selected.

In the same way, a level of frequent corresponds to the selection option FREQ and a level of critical corresponds to the selection option CRIT.

### Examples

This example shows a sample scenario for SYSLOG processing:



The following entry in the NetView automation table is created automatically to issue AOFRSA08 as response to the incoming IEE043I message:

```
IF MSGID = 'IEE043I'
THEN
EXEC(CMD('AOFRSA08')ROUTE(ONE %AOFOPRECOPE%));
```

COMMANDS HELP

---

Thresholds Definition

Command ==> \_\_\_\_\_

Entry Type : MVS Component                    PolicyDB Name : DATABASE\_NAME  
Entry Name : MVS\_COMPONENTS                Enterprise Name : YOUR\_ENTERPRISE

Resource : MVSESA.SYSLOG

Critical Number . . . . 3                    (1 to 50)  
Critical Interval . . . 00:05                (hh:mm or hhmm, 00:01 to 24:00)

Frequent Number . . . . 3                    (1 to 50)  
Frequent Interval . . . 00:30                (hh:mm or hhmm, 00:01 to 24:00)

Infrequent Number . . . 3                    (1 to 50)  
Infrequent Interval . . 24:00                (hh:mm or hhmm, 00:01 to 24:00)

Figure 36. Threshold Definitions for MVS Component SYSLOG

Pass/Selection Automated Function/'\*'  
Command Text

MVS S SAVELOG \_\_\_\_\_

Figure 37. MESSAGES/USER DATA Policy Item for Entry/Type-Pair MVSESA/SYSLOG

Assume that the following message arrives the first time for one day:  
IEE043I A SYSTEM LOG DATA SET HAS BEEN QUEUED TO SYSOUT CLASS A

Because none of the defined thresholds is exceeded, the automation routine AOFRSA08 searches for defined commands without selection option and to selection option ALWAYS to be issued. With the control file shown above the command MVS S SAVELOG is selected.

If message IEE043I continues to arrive and the occurrence of the expected messages thus exceeds the infrequent, frequent or critical threshold, the automation routine AOFRSA08 searches for defined commands without selection option and to selection option INFR, FREQ or CRIT to be issued.

Because no command is defined with any selection option, only the defined command with no selection option is selected and issued, as in the previous case.

Message AOF589I, AOF588I or AOF587I is issued in cases, where an infrequent, frequent or critical threshold has been exceeded. These messages indicate that an infrequent, frequent or critical threshold action has been processed.

---

## AOFRSA0C

### Purpose

You can use the AOFRSA0C automation routine to respond to a SVC dump taken to a dump data set message by issuing commands from the configuration file to format the dump, to clear the dump data sets, or to prevent further dumping. The commands to issue are taken from the MVSESA/MVSDUMP and MVSESA/MVSDUMPTAKEN entry/type-pairs and selected according to the frequency of the incoming messages and the thresholds defined in the automation policies. The first field in the command entry gives detailed criteria to select the appropriate commands from the configuration file.

AOFRSA0C should be called from the NetView automation table.

### Syntax

▶▶—AOFRSA0C—▶▶

### Restrictions

- Actions in AOFRSA0C are only taken if the recovery automation flag for MVSDUMP is on.
- Processing in AOFRSA0C is only done if it is called from NetView automation table by one of the expected messages IEA611I or IEA911E.

### Usage

Automation routine AOFRSA0C is intended to respond to the following messages:

```
IEA611I {COMPLETE|PARTIAL} DUMP ON dsname
DUMPID=dumpid REQUESTED BY JOB (jobname)
FOR ASIDS(id,id,...)
...
```

```
IEA911E {COMPLETE|PARTIAL} DUMP ON SYS1.DUMPnn
DUMPID=dumpid REQUESTED BY JOB (jobname)
FOR ASIDS(id,id,...)
...
```

These indicate that the system wrote a complete or partial SVC dump to an automatically allocated or pre-allocated dump data set on a direct access storage device or a tape volume.

AOFRSA0C keeps track on the reception of these messages and compares the frequency of the incoming messages with predefined thresholds of infrequent, frequent and critical level, where the thresholds to MVS component MVSDUMP are considered. The commands to issue are selected according to the frequency of the incoming messages.

If no threshold is reached, all commands to entries with no selection option and to selection option ALWAYS are selected. If the threshold at level infrequent is exceeded, all commands to entries with no selection option and to selection option INFR are selected. In the same way a level of frequent corresponds to selection option FREQ and a level of critical corresponds to selection option CRIT.

The commands to issue are taken from MVSESA/MVSDUMP entry/type-pair of the configuration file with respect to the frequency of the incoming of these messages.

If AOFRSA0C has been triggered by receipt of message IEA911E, all the commands from the MVSESA/MVSDUMPTAKEN entry/type-pair of the configuration file are also selected and issued, as long as the critical threshold has not been exceeded.

After dump processing has been done, AOFRSA0C further monitors the frequency of messages IEF611I and IEF911E in intervals of 15 minutes. As soon as the frequency falls below the infrequent threshold, all the commands of MVSESA/MVSDUMPRESET entry/type-pair are issued.

## Global Variables

When defining the commands in the configuration file to handle the SVC dump data set, the variables &EHKVAR1 to &EHKVAR6 can be used to be substituted by variable contents of message IEA611I or IEA911E. The variables &EHKVAR1 to &EHKVAR6 are not available in command entries of type MVSDUMPRESET. These variables are substituted as follows:

### &EHKVAR1

The dsname of IEA611I or suffix of SYS1.DUMPnn in IEA911E

### &EHKVAR2

The data set name

### &EHKVAR3

The dump ID

### &EHKVAR4

The job name

### &EHKVAR5

The ID of address space

### &EHKVAR6

The dump type (PARTIAL or COMPLETE)

## Examples

This example shows the use of automation routine AOFRSA0C in a sample context:

An entry in the NetView automation table is used to issue AOFRSA0C when one of the expected messages arrives:

```
IF MSGID = 'IEA611I' | MSGID = 'IEA911E'
THEN
EXEC(CMD('AOFRSA0C ')ROUTE(ONE %AOFOPRECOPER%));
```

Three threshold levels are defined in the automation policy for MVS component MVSDUMP:

```

AOFKAASR          SA z/OS - Command Dialogs
Domain ID = IPSNO ----- INGTHRES ----- Date = 08/28/03
Operator ID = SAUSER                               Time = 09:38:02

Specify thresholds and resource changes:

Resource => MVSESA.MVSDUMP   Group or specific resource
System   => KEY3             System name, domain ID, sysplex name or *all

Critical => 6   errors in 00:30   Time (HH:MM)
Frequent => 4   errors in 00:20   Time (HH:MM)
Infrequent => 2   errors in 00:20   Time (HH:MM)

Pressing ENTER will set the THRESHOLD values

Command ==>>
PF1=Help   PF2=End   PF3=Return

PF6=Roll
PF12=Retrieve
    
```

Figure 38. MVSDUMP Thresholds

The MESSAGES/USER DATA automation policy item of the MVSESA/MVSDUMP entry/type-pair contains the following command entries for the message ID MVSDUMP with selection options at different levels:

Ps/Select	Command Text
FREQ	'MVS DD ALLOC=INACTIVE'
INFR	'MVS DD ALLOC=ACTIVE'
CRIT	'MVS DD ALLOC=INACTIVE'

The MESSAGES/USER DATA automation policy item of the MVSESA/MVSDUMPTAKEN entry/type-pair contains the following entry without any selection options:

```
'MVS DD CLEAR,DSN=&EHKVAR1'
```

The MESSAGES/USER DATA automation policy item of the MVSESA/MVSDUMPRESET entry/type-pair contains the following entry without any selection options:

```
'MVS DD ALLOC=ACTIVE'
```

As long as no threshold is exceeded at receipt of one of the IEA611I and IEA911E messages, no action is taken.

If dumps have been taken more often than defined with the infrequent threshold, the command MVS DD ALLOC=ACTIVATE, specified in entry type MVSDUMP, is issued. This makes sure that automatic dump data set allocation is enabled. In cases when the dump has been written to a pre-allocated SYS1.DUMP data set, additionally the data set is cleared using the command MVS DD CLEAR,DSN=&EHKVAR1, specified in the entry type MVSDUMPTAKEN. Variable &EHKVAR1 is substituted by the numeric suffix of the SYS1.DUMP data set.

The same processing is done in cases when the incoming dump data set messages exceeds the frequent level.

As soon as the critical threshold is exceeded, the automation routine stops clearing pre-allocated SYS1.DUMP data sets.

After commands having been issued by the automatic processing of dump data sets, automation routine AOFRSA0C checks every 15 minutes whether the infrequent threshold is satisfied again. As soon as this situation is reached, automatic dump data set allocation is enabled again by command MVS DD ALLOC=ACTIVE, as defined in entry type MVSDUMPRESET.

## AOFRSA0E

### Purpose

Automation routine AOFRSA0E deletes WTORs from SA z/OS display capabilities when they are replied to or canceled.

### Syntax



### Parameters

*id* The reply identifiers for cancelled messages.

### Restrictions

Processing in AOFRSA0E is only done if it is called from NetView automation table by message IEE400I or IEE600I or if one of these messages are passed by parameter.

### Usage

Automation routine AOFRSA0E is intended to respond to the following messages:

```
IEE400I THESE MESSAGES CANCELED- id,id,id
IEE600I REPLY TO id IS; text
```

Message IEE400I says that the system cancelled messages because the issuing task ended or specifically requested that the messages be cancelled. Message IEE600I notifies all consoles that received a message that the system accepted a reply to the message.

As well AOFRSA0E can extract the identifiers of the messages to delete from passed parameters.

### Example

The following example shows how to issue AOFRSA0E from the NetView automation table:

```
IF MSGID = 'IEE400I' | MSGID = 'IEE600I'
THEN
EXEC(CMD('AOFRSA0E ')ROUTE(ONE %AOFOPWTORS%));
```

---

## AOFRSA0G

### Purpose

You can use the AOFRSA0G automation routine to respond to messages reporting buffer shortage of the action message retention facility (AMRF) by issuing commands from the configuration file to process buffer shortage automation.

In the case of an incoming buffer shortage message, the commands to issue are taken from the MVSESA/AMRFSHORT entry/type-pair with the selection option PASS1 and reissued at 1 minute intervals with an incremented pass count.

In the case of a buffer full message, the commands to issue are taken from the MVSESA/AMRFFULL entry/type-pair. If buffer shortage relieved is reported, the commands that are defined for the MVSESA/AMRFCLEAR entry/type-pair are selected.

AOFRSA0G should be called from the NetView automation table.

### Syntax

▶▶—AOFRSA0G—◀◀

### Restrictions

- Actions are only taken in AOFRSA0G if the recovery automation flag for AMRF is on.
- Processing of system messages in AOFRSA0G is only done if it is called from NetView automation table by message IEA359E, IEA360A or IEA361I.

### Usage

Automation routine AOFRSA0G is intended to respond to the messages:

```
IEA359E BUFFER SHORTAGE FOR RETAINED ACTION MESSAGES - 80% FULL
IEA360A SEVERE BUFFER SHORTAGE FOR RETAINED ACTION MESSAGES - 100% FULL
IEA361I BUFFER SHORTAGE RELIEVED FOR RETAINED ACTION MESSAGES
```

IEA359E and IEA360A reports buffer shortage of the buffer area for immediate action messages, non-critical and critical eventual action messages and WTOR messages. IEA361I indicates the reduction of the number of retained action messages so that the buffer is now less than 75% full.

If AOFRSA0G has been triggered on receipt of message IEA359E the commands to issue are taken from entry/type-pair MVSESA/AMRFSHORT, starting at selection option PASS1 and continuing with incremented selection options in 1 minute intervals until message IEA361 reports that buffer shortage has relieved. After arriving the maximal used selection option for a defined command processing restarts at selection option PASS1.

If AOFRSA0G has been triggered on receipt of message IEA360A all commands from entry/type-pair MVSESA/AMRFFULL are issued.

If AOFRSA0G has been triggered on receipt of message IEA361I all commands from entry/type-pair MVSESA/AMRFCLEAR are issued.

## Examples

The following example shows a sample scenario for AMRF shortage processing:

Entries in the NetView automation table are used to issue AOFRSA0G when message IEA359E, IEA360E or IEA361I arrives:

```
IF MSGID = 'IEA359E'
THEN
EXEC(CMD('AOFRSA0G')ROUTE(ONE %AOFOPRECOPER%));
IF MSGID = 'IEA360A'
THEN
EXEC(CMD('AOFRSA0G')ROUTE(ONE %AOFOPRECOPER%));
IF MSGID = 'IEA361I'
THEN
EXEC(CMD('AOFRSA0G')ROUTE(ONE %AOFOPRECOPER%));
```

To specify how to respond to message IEA359E and IEA361I, the following command definitions are made in the automation policy under the entry/type-pair MVSESA/AMRFFULL and MVSESA/AMRFCLEAR:

```
Command = ACF ENTRY=MVSESA,TYPE=AMRF*,REQ=DISP
SYSTEM = AOC1      AUTOMATION CONFIGURATION DISPLAY - ENTRY= MVSESA
-----
AUTOMATION CONFIGURATION DISPLAY - ENTRY= MVSESA
TYPE IS AMRFCLEAR
CMD          = (,,'MVS CONTROL M,AMRF=Y')
TYPE IS AMRFFULL
CMD          = (,,'MVS CONTROL M,AMRF=N')
END OF MULTI-LINE MESSAGE GROUP
```

Figure 39. MVSESA AMRF Command Definitions

If for example message

```
IEA360A SEVERE BUFFER SHORTAGE FOR RETAINED ACTION MESSAGES - 100% FULL
```

arrives, AOFRSA0G is issued by the shown statement in the NetView automation table, which causes the command CONTROL M,AMRF=N to be issued to clear the AMRF buffers.

After AMRF buffer shortage is relieved, the incoming message

```
IEA361I BUFFER SHORTAGE RELIEVED FOR RETAINED ACTION MESSAGES
```

causes command CONTROL M,AMRF=Y to be issued to reactivate AMRF.

---

## AOFRSD07

### Purpose

You can use the AOFRSD07 automation routine to respond to a JES2 not dormant message during JES2 shutdown by issuing commands for resources that are not drained.

The commands to issue are taken from the automation policy item JES2 DRAIN of application JES2.

Additionally AOFRSD07 calls AOFRSD0F which outputs a list of all active jobs and started tasks and a list of all resources not yet drained.

AOFRSD07 should be called from the NetView automation table.

## Syntax

▶▶—AOFRSD07—◀◀

## Restrictions

Processing in AOFRSD07 is only done if:

- It is called from NetView automation table by JES2 message HASP607
- The terminate automation flag for JES2 is on
- JES2 is in shutdown progress

## Usage

Automation routine AOFRSD07 is intended to respond to message

```
HASP607 JES2 NOT DORMANT -- MEMBER DRAINING, RC=rc text
```

which indicates in case the P JES2 command was entered to withdraw JES2 from the system that not all of JES2's functions have completed.

To find out all resources not drained, the response to JES2 command DU,STA is processed. For each resource in status DRAINING the corresponding command from the automation policy item JES2 DRAIN for this resource type to force drain is issued. Resources in status ACTIVE are first stopped with JES2 command P resource, before the command from the automation policy item to force drain is issued. Resources in status INACTIVE are only stopped with JES2 command P resource.

In cases, where the automation is unable to issue actions on not yet drained resources, JES2 is set to status STUCK and a message is issued which tells that an operator action is required. Those situations occur if no command is specified in automation policy item JES2 DRAINED of JES2 to drain a resource or if a not yet drained resource is in an unknown status

## AOFRSD09

### Purpose

Automation routine AOFRSD09 is used for JES2 spool recovery. It is called by AOFRSD01 via a timer every retry interval to monitor spool utilization of JES2 and to successive issue the recovery commands of policy item JES2 SPOOLSHORT or JES2 SPOOLFULL.

For this purpose AOFRSD09 processes the following steps:

- AOFRSD09 issues the JES2 command D SPOOL to obtain the current spool usage.
- AOFRSD09 re-evaluates the target of recovery process based on the actual warning threshold for TG and the buffer value from the configuration file.
- If the recovery target has not yet been achieved and the current JES2 subsystem is responsible for the spool recovery, AOFRSD09 increments the pass count and issues the appropriate commands from the configuration file. In a shared JES2 environment, where all JES2 subsystems receive a copy of the spool shortage message, AOFRSD09 determine the appropriate JES2 subsystem for spool recovery. To do this, AOFRSD09 compares the list of cpuids, as defined in configuration file, with the response to JES2 command D



MEMBER,STATUS=ACTIVE. The first active cpuid on the list is considered to be the appropriate JES2 subsystem for spool recovery.

- In case the spool shortage problem has already been relieved, AOFRSD09 stops the recovery process and sets a timer to reset the pass count for the recovery commands after the reset interval.

You define recovery commands and configuration parameters for JES2 recovery processing, such as buffer value, reset interval and cpuid list, using automation policy item JES2 SPOOLSHORT for spool shortage recovery processing and JES2 SPOOLFULL for spool full recovery processing.

For further information about the JES2 SPOOLSHORT and JES2 SPOOLFULL automation policy items see *IBM Tivoli System Automation for z/OS Defining Automation Policy*.

## Syntax

▶▶—AOFRSD09—*subsystem*—*recovery type*—▶▶

## Parameters

*subsystem*

The subsystem name of JES2. This parameter is required.

*recovery type*

This parameter is used to distinguish between a JES2 spool shortage and a JES2 spool full condition. This parameter is required.

**SHORT**

The automatic recovery from a JES2 spool shortage condition is to be processed.

**FULL** The automatic recovery from a JES2 spool full condition is to be processed.

## Restrictions

- Processing of recovery commands in AOFRSD09 is only done if the recovery automation flag for JES2 is on. Otherwise the recovery process is suspended and the pass count for selection recovery commands from the configuration file is not incremented.
- Automation routine AOFRSD09 should be processed by JESOPER. If it is called on another task it is routed back to JESOPER.
- Processing in AOFRSD09 is only done if the specified type of spool recovery process has been initiated by automation routine AOFRSD01.
- During a SPOOLFULL recovery condition, the processing for SPOOLSHORT recovery is suspended.

## Usage

The recovery commands to issue are selected from the command entry of policy item JES2 SPOOLSHORT or JES2 SPOOLFULL. A pass count is used as selection option and incremented at each successive processing of automation routine AOFRSD09. At initialization of the recovery process, the pass count is set to value PASS1 by automation routine AOFRSD01.

## AOFRSD09

If pass processing runs out of defined recovery commands before the spool shortage condition is resolved, AOFRSD09 re-executes the recovery sequence from PASS1. You can change this behavior by setting the appropriate advanced automation option at start up of System Automation. You can use the AOFSPPOOLSHORTCMD variable (for SPOOLSHORT conditions) and the AOFSPPOOLFULLCMD variable (for SPOOLFULL conditions) to tell automation routine AOFRSD09 to stop recovery attempts when all commands have been executed and to issue message AOF294I to inform the operator that manual intervention is required in order to resolve the spool condition. For more information about advanced automation options refer to “Read/Write Variables” on page 230.

### Global Variables

When defining the commands in the SPOOLFULL or SPOOLSHORT processing panel of the configuration file to handle the recovery, the variables &EHKVAR1 and &EHKVAR2 can be used to be substituted by variable contents. Variable &EHKVAR1 is substituted by the current spool utilization and &EHKVAR2 contains the recovery target.

---

## AOFRSD0F

### Purpose

Automation routine AOFRSD0F is used by AOFRSD07 for drain processing prior to JES2 shutdown. Every shutdown delay interval, AOFRSD0F displays all JES2 resources not yet drained. For this purpose it scans the response to JES2 command DA,S for executing tasks, the response to JES2 command DA,J for executing jobs and the response to JES2 command DU,STA for started devices or lines not yet drained and displays the result in a message.

### Syntax

▶▶—AOFRSD0F—*subsystem*————▶▶

### Parameters

*subsystem*

The subsystem name of JES2.

### Restrictions

Processing in AOFRSD0F is only done if the following conditions are met:

- The subsystem is of type JES2
- JES2 is in shutdown progress
- The terminate automation flag is on

### Usage

This automation routine is performed as part of the SHUTDOWN processing.

### Examples

This example shows a sample scenario for JES2 drain processing prior to JES2 shutdown.

The following statement shows how AOFRSD07 is issued from the NetView automation table by JES2 message

```
$HASP607: IF MSGID(2) = 'HASP607'
THEN
EXEC(CMD('AOFRSD07')ROUTE(ONE %AOFOPJESOPER%));
```

Assume the following drain processing specifications in automation policy item JES2 DRAIN:

```

COMMANDS  HELP
-----
                                JES2 DRAIN Specifications
Command ==> _____

Entry Type : Application          PolicyDB Name : DATABASE_NAME
Entry Name  : JES2                Enterprise Name : YOUR_ENTERPRISE

Subsystem: JES2
Enter information (Yes or No) for initial drain to bring down JES2 facilities.
LIN . . . . . YES      Drain lines
LOG . . . . . YES      Drain JES2-VTAM interface
OFF . . . . . NO       Drain spool offloaders
PRT . . . . . YES      Drain printers
RDR . . . . . YES      Drain readers
PUN . . . . . YES      Drain punches
Enter information (Command or No) for force drain if normal drain fails.
LIN . . . . . $E       Force drain lines
LOG . . . . . $E       Force drain JES2-VTAM interface
OFF . . . . . NO       Force drain spool offloaders
PRT . . . . . $I       Force drain printers
RDR . . . . . $C       Force drain readers
F1=HELP    F2=SPLIT    F3=END      F4=RETURN   F5=RFIND    F6=RCHANGE
F7=UP      F8=DOWN     F9=SWAP    F10=LEFT   F11=RIGHT   F12=RETRIEVE

```

Figure 40. JES2 DRAIN Specifications Panel

The list of commands to force drain of JES2 resources are passed to the JES2/FORCEDRAIN entry/type-pair in the configuration file and can be displayed with the DISPACF command:

```

Command = ACF ENTRY=JES2,TYPE=FORCEDRAIN,REQ=DISP
SYSTEM = KEY3      AUTOMATION CONFIGURATION DISPLAY - ENTRY= JES2
-----
AUTOMATION CONFIGURATION DISPLAY - ENTRY= JES2
TYPE IS FORCEDRAIN
LIN          = "$E"
LOG          = "$E"
OFF          = "NO"
PRT          = "$I"
RDR          = "$C"
PUN          = "$E"
END OF MULTI-LINE MESSAGE GROUP

```

Figure 41. DISPACF Panel

Assume that during a shutdown of JES2 message \$HASP607 arrives, indicating that not all of JES2's functions have completed and that JES2's response to command \$DU, STATUS is:

```
$HASP636 13.53.22 $DU,STA
LINE1      UNIT=0FF3,STATUS=ACTIVE/BOEVM9,DISCON=NO
```

Automation routine AOFRSD07 first issues JES2 command \$PLINE1 to stop the line and then issues JES2 command \$E, according to the policy specifications FOR entry/type-pair JES2/FORCEDRAIN.

Then automation routine AOFRSD0F is executed every shutdown delay interval, to list all JES2 resources not drained.

## AOFRSD0G

### Purpose

You can use the AOFRSD0G automation routine to drain JES2 resources prior to JES2 shutdown. AOFRSD0G issues commands to drain the initiators, offloader tasks, lines, printers, punches and readers, depending on which resources are listed and enabled in the automation policy item JES2 DRAIN of application JES2.

AOFRSD0G is used by the DRAINJES command.

### Syntax

▶▶ AOFRSD0G *subsystem* ◀◀

### Parameters

*subsystem*  
The subsystem name of JES2.

### Restrictions

- Processing in AOFRSD0G is only done if the subsystem is of type JES2.

### Usage

For all resources enabled to initial drain in automation policy item JES2 DRAIN of application JES2 the JES2 command P is issued.

### Example

Call AOFRSD0G JES2 to stop all resources enabled in JES2 DRAIN for init drain.

These resources can be listed with command DISPACF JES2 INITDRAIN.

```

Command = ACF ENTRY=JES2,TYPE=INITDRAIN,REQ=DISP
SYSTEM = AOC1      AUTOMATION CONFIGURATION DISPLAY - ENTRY= JES2
-----
AUTOMATION CONFIGURATION DISPLAY - ENTRY= JES2
TYPE IS INITDRAIN
LIN           = ""YES""
LOG           = ""YES""
OFF           = ""NO""
PRT           = ""YES""
RDR           = ""YES""
PUN           = ""YES""
END OF MULTI-LINE MESSAGE GROUP
    
```

Figure 42. DISPACF JES2 INITDRAIN Panel

## AOFRSD0H

### Purpose

The AOFRSD0H automation routine is used for JES2 spool recovery. It is called by AOFRSD09 with a timer command after the reset interval and cleans up the pass counter for the pass processing of the recovery commands of the configuration file.

### Syntax

►►—AOFRSD0H—*subsystem*—*recovery type*—◄◄

### Parameters

#### *subsystem*

The subsystem name of JES2. This parameter is required.

#### *recovery type*

This parameter is used to distinguish between a JES2 spool shortage and a JES2 spool full condition. This parameter is required.

#### **SHORT**

The pass counter for spool shortage recovery processing is to be reset.

**FULL** The pass counter for spool full recovery processing is to be reset.

### Restrictions

- The AOFRSD0H automation routine should be processed by JESOPER. If it is called on another task it is routed back to JESOPER.
- Each recovery action during the reset interval
- AOFRSD0H is only scheduled after the reset interval if no new recovery action of the corresponding type SHORT or FULL has been taken during this time.
- The pass counter for spool full recovery processing is reset by AOFRSD0H after the reset interval, even if spool short recovery is still in progress.

### Examples

The following example shows a sample scenario for JES2 spool recovery processing:

The following entries in the NetView automation table are used to issue the AOFRSD01 automation routine from the NetView automation table, when one of the expected messages arrives:

```
IF MSGID(2) = 'HASP050' & TEXT = '.'TGS'.
THEN
EXEC(CMD('AOFRSD01')ROUTE(ONE %AOFOPJESOPER%));
IF MSGID(2) = 'HASP355'
THEN
EXEC(CMD('AOFRSD01')ROUTE(ONE %AOFOPJESOPER%));
```

The SPOOLSHORT recovery is configured using the automation policy item JES2 SPOOLSHORT as shown in Figure 43 on page 206.

```

COMMANDS  HELP
-----
                                SPOOLSHORT Processing
Command ==> _____

Entry Type : Application          PolicyDB Name : DATABASE_NAME
Entry Name : JES2                Enterprise Name : YOUR_ENTERPRISE

Enter SPOOLSHORT settings.

Retry Time . . . . 00:05:00      Spool recovery attempt interval (hh:mm:ss)
Buffer . . . . . 5              Recovery target below TGWARN (0->50)
Reset Time . . . . 00:15:00     Recovery reset interval (hh:mm:ss)

Priority of systems for spool recovery:

CPUID  1  ___  2  ___  3  ___  4  ___  5  ___  6  ___  7  ___  8  ___
        9  ___ 10  ___ 11  ___ 12  ___ 13  ___ 14  ___ 15  ___ 16  ___
       17  ___ 18  ___ 19  ___ 20  ___ 21  ___ 22  ___ 23  ___ 24  ___
       25  ___ 26  ___ 27  ___ 28  ___ 29  ___ 30  ___ 31  ___ 32  ___

Edit Spoolshort Pass Commands . . YES  YES  NO

```

Figure 43. JES2 SPOOLSHORT Recovery Definition

Because no cpuids are defined, the own JES2 subsystem is responsible for JES2 spool recovery processing. Entering YES in **Edit Spoolshort Pass Commands** field allows you to edit the pass recovery commands that are defined as shown in the response panel to command DISPACF JES2, .

```

Command = ACF ENTRY=JES2,TYPE=*,REQ=DISP
SYSTEM = KEY3      AUTOMATION CONFIGURATION DISPLAY - ENTRY= JES2
-----
TYPE IS SPOOLSHORT
CMD      = (PASS1,, 'MVS $PQ,Q=N,A=3')
CMD      = (PASS1,, 'MVS $OQ,Q=N,A=3,CANCEL')
CMD      = (PASS1,, 'MVS $PQ,Q=V,A=3')
CMD      = (PASS1,, 'MVS $OQ,Q=V,A=3,CANCEL')
CMD      = (PASS2,, 'MVS $PQ,ALL,A=4')
CMD      = (PASS2,, 'MVS $OQ,ALL,A=4,CANCEL')
CMD      = (PASS3,, 'MVS $PQ,ALL,A=3')
CMD      = (PASS3,, 'MVS $OQ,ALL,A=3,CANCEL')
CMD      = (PASS4,, 'AORRSPLS RANGE=JOB1-5000,NAME=T*')
CMD      = (PASS4,, 'AORRSPLS RANGE=JOB5000-10000,NAME=T*')
CMD      = (PASS4,, 'AORRSPLS RANGE=JOB10000-15000,NAME=T*')
CMD      = (PASS4,, 'AORRSPLS RANGE=JOB15000-20000,NAME=T*')

```

Figure 44. DISPACF Command Response Panel

Assume that a JES2 spool shortage problem is reported by the following message:  
\$HASP050 JES RESOURCE SHORTAGE OF TGS - 80% UTILIZATION REACHED

This issues the AOFRSD01 automation routine by the appropriate NetView automation table entry. AOFRSD01 initiates the JES2 SPOOLSHORT recovery process and sets an every timer to call the pass processing routine by issuing AOFRSD09 JES2 SHORT every 5 minutes, as defined in the customization dialog for SPOOLSHORT processing, see Figure 43.

AOFRSD09 redetermines the actual spool usage, compares it with the defined TGWARN of 80% and calculates the target of recovery as difference of TGWARN and the buffer value resulting in a value of 75. If this value is exceeded by the actual spool usage, all recovery commands with the PASS1 selection option in the configuration file for the SPOOLSHORT recovery type are issued. After the retry interval of 5 minutes, AOFRSD09 is reissued by the timer.

If AOFRSD09 now determines that the JES2 spool shortage problem has been relieved, it stops recovery processing and sets a timer to issue AOFRSD0H JES2 SHORT after the reset interval of 15 minutes.

If none of the expected JES2 messages arrives by the end of the reset interval, the AOFRSD0H automation routine resets the pass count to 1 so that the next SPOOLSHORT recovery process issues recovery commands beginning again at PASS1 selection option.

---

## HASP099

### Restrictions

Shutdown processing of the JES2 message HASP099 is only done if:

- Shutdown automation for JES2 is on
- JES2 is in the process of being shut down

### Usage

The ISSUEACT command responds to message:

HASP099 ALL AVAILABLE FUNCTIONS COMPLETE

This indicates that all JES2 job processors have become dormant, and no JES2 RJE lines are active.

---

## INGRMJSP

### Purpose

You use the INGRMJSP automation routine to monitor JES2 spool file usage. It queries the spool usage to obtain the current spool usage and the warning level. If necessary it calls the INGRMJSP automation routine for JES2 spool recovery processing.

The INGRMJSP command also updates the SPOOL entry in the status display facility (SDF) every time it is called.

### Syntax

▶▶—INGRMJSP—▶▶

### Restrictions

- Monitoring by INGRMJSP is only done if it has been defined as the monitor command for an appropriate monitor resource in the customization dialog.

### Usage

The INGRMJSP monitoring routine queries the spool usage by issuing the D SPOOLDEF,TGSPACE command to obtain the current spool usage and the warning level as set up by the JES2 system programmer:

- If the spool file is full, INGRMJSP sets the health status to CRITICAL and calls INGRMJSP.

- If the spool usage is above the warning level, INGRMJSP sets the health status to WARNING and calls INGRMJSP.

Depending on the spool full percentage and the warning level, one of the following return codes is set:

Return code	Meaning
1	A severe error occurred: <ul style="list-style-type: none"> <li>• The monitor does not have a job name</li> <li>• The monitored object is not SPOOL or associated with JES2</li> <li>• The specified job name does not refer to a JES2 resource</li> <li>• No command prefix for JES2 was found</li> </ul>
2	Monitoring command failed: <ul style="list-style-type: none"> <li>• The D SPOOLDEF command failed</li> </ul>
3	OK: Spool usage is below the warning level
4	WARNING: Spool usage is above the warning level
6	CRITICAL: The spool file is full

### Example

To create a spool usage monitor in the customization dialog you must define the following items:

1. A monitor resource (MTR) with INGRMJSP as the monitoring command. For example, if you create a monitor resource called JES2SPOOL with the short description JES2 Spool Monitor, specify the following information in the MONITOR INFO policy item:

Monitored Object	SPOOL
Monitored Jobname	JES2
Activate Command	
Deactivate Command	
Monitor Command	INGRMJSP
Monitoring interval	00:15
Captured Messages Limit	20
Desired Available	
Inform List	SDF
Owner	
Info Link	

2. The following relationships to the JES2 application using the RELATIONSHIPS policy item:

Relationship type	Supporting Resource	Condition
HasParent	JES2/APL/=	
ForceDown	JES2/APL/=	WhenObservedDown

The monitor has a HasParent relationship to the corresponding JES2 resource because it only makes sense to monitor the spool usage when JES2 is active.

3. The following recovery actions in the HEALTHSTATE policy item:



State	Command
WARNING	INGRCJSP
CRITICAL	INGRCJSP

## INGRCJSP (AOFRSD01)

### Purpose

You can use the INGRCJSP automation routine for JES2 spool recovery processing. It responds to JES2 spool shortage messages by initiating the recovery process for JES2 spool shortage. It responds to JES2 spool full messages by initiating the recovery process for JES2 spool full to downgrade the problem of excessive spool usage.

The INGRCJSP routine does the following:

- Makes linear and first order predictions of spool usage, based on actual and historical values.
- Posts the spool status to the status display facility (SDF).
- Determines the target of recovery processing as the difference between the actual warning threshold for track groups and the buffer value from the configuration file. The spool shortage condition is considered as relieved if the recovery process achieves this target.
- Initiates pass processing to execute the recovery commands of the configuration file, as defined with the JES2 SPOOLSHORT or JES2 SPOOLFULL policy item. The pass processing itself is done by the AOFRSD09 automation routine, which is issued every retry interval. The retry interval is taken from the configuration file.

You define recovery commands and configuration parameters for JES2 recovery processing, such as buffer value and retry interval, using automation policy item JES2 SPOOLSHORT for spool shortage recovery processing and JES2 SPOOLFULL for spool full recovery processing.

For further information about the JES2 SPOOLSHORT and JES2 SPOOLFULL automation policy items see *IBM Tivoli System Automation for z/OS Defining Automation Policy*.

INGRCJSP should be called from the NetView automation table.

### Syntax

▶▶—INGRCJSP—▶▶

### Restrictions

- Processing in INGRCJSP is only done if it is called from NetView automation table by JES2 messages HASP050 or HASP355.
- Message HASP355 is only processed if it reports a shortage of track groups (TG).

### Usage

The INGRJSP automation routine is intended to respond to the following messages:

HASP050 JES2 RESOURCE SHORTAGE OF TGs - nnn% UTILIZATION REACHED

HASP355 SPOOL VOLUMES ARE FULL

HASP050 indicates that JES2 has a shortage of track groups and the current spool utilization exceeds the current TGWARN value on this JES. TGNWARN is defined in the SPOOLDEF statement in the JES initialization member and can be changed dynamically.

HASP355 indicates that a request for JES2 direct access spool space cannot be processed because all available space has been allocated to JES2 functions or no spool volumes are available. Therefore the recovery targets in this case are based on a figure of 100% spool utilization.

You should code TGWARN in the SPOOLDEF statement in the JES initialization member so that SPOOLSHORT recovery is initiated before a SPOOLFULL condition is reached. If you do not do this the recovery process may become unpredictable.

When resetting after a SPOOLFULL condition, the problem is downgraded to a SPOOLSHORT condition. SA z/OS expects the SPOOLSHORT recovery that was previously running to activate and try to downgrade the problem to an OK. Without the prior SPOOLSHORT recovery, the spool status remains in SPOOLSHORT after a successful SPOOLFULL recovery.

The NetView automation table entries for JES2 messages must respect the one character prefix in front of the message identifier of JES2 messages that identifies the issuing JES.

The spool status is posted to SDF under the SPOOL generic, with the name of the subsystem as its specific name. To have these displayed on an SDF panel, you need status fields for *xxxx.SPOOL*, elements 1 through *n*, where *n* is the number of different subsystems that use the spool.

---

## INGRTAPE

### Purpose

INGRTAPE maintains tape status details under SDF and NMC. When SA z/OS detects an outstanding tape mount request then it feeds the related message into SDF and/or NMC. If the request is not satisfied before the warning interval has expired, the status will change to warning.

If the tape mount request is still not satisfied after the alert delay, the status will change to alert.

The tape mount request is deleted from SDF and/or NMC dynamically when the related tape is mounted or the requesting job is canceled.

The routine INGRTAPE automation routine is used to visualize the pending tape mount requests within SDF. Its behaviour is based on the definitions in the "Tape

Attendance' policy entry. For information about activating and customizing Tape attendance, refer to *IBM Tivoli System Automation for z/OS Defining Automation Policy*.

## Syntax

▶▶—INGRTAPE—▶▶

## Usage

Automation routine INGRTAPE is intended to respond to the following messages: IEC501E, IEC501A, IEC502E, IEC503I, IEC507D, IEC509A, IEC510D, IEC512I, IEC513D, IEC514D, IEC701D, IEC702I, IEC703I, IEC704A, IEC706I, IEC707I, IEC708I, IEC708D, IEC709I, IEC710I, IEC711I, IEC712I, IEC713I, IEC714I, IEC715I, IEF233A, IEF233D, IEF234E, IEF455D, IAT5210, TMS001, TMS002, TMS0012

## Restrictions

The monitoring of tape mounts is only enabled when activated via the Customization Dialogs.

---

## INGRX740

### Purpose

You can use the INGRX740 automation routine to respond to some syslog related system messages by issuing defined recovery actions from the automation control file to restart the syslog or to assign the syslog as a hardcopy medium.

INGRX740 keeps track of the incoming IEE037D syslog inactive message and compares its occurrence with predefined thresholds for the MVS component minor resource, LOG. As long as the critical threshold level is not exceeded, a recovery action related to a previously received system message is issued.

If one of the messages IEE043I, IEE533E or IEE769E is received prior to the IEE037D message that is currently being processed, the commands that have been defined for IEE043I, IEE533E or IEE769E in the MVSESA/*msgid* entry/type-pair of the configuration file are issued. If none of these messages has been received prior to the IEE037D message that is currently being processed, the command MVS WRITELOG START is issued.

The recovery routine INGRX740 also responds to an incoming IEE041I message if this indicates that the SYSLOG data set is available for use as a hardcopy log. Commands are issued in response to message IEE041I that are defined in the MVSESA/IEE041I entry/type-pair of the configuration file. An appropriate command in this case would be MVS VARY SYSLOG,HARDCPY to have the SYSLOG receive the hardcopy log.

INGRX740 should be called from the NetView automation table.

### Syntax

▶▶—INGRX740—▶▶

## Restrictions and Limitations

Processing in routine INGRX740 is only done if the following conditions are met:

- The recovery automation flag for LOG is on.
- The routine is running on an automation task.
- The routine is called from NetView automation table by one of the expected messages
  - IEE037D
  - IEE041I
  - IEE533E
  - IEE769E
  - IEE043I

Actions in response to message IEE037D are only taken in INGRX740, if the Job Entry Subsystem is up and running.

## Usage

Automation routine INGRX740 responds to the following messages:

```
IEE037D LOG NOT ACTIVE
IEE041I THE SYSTEM LOG IS NOW ACTIVE[-MAY BE VARIED AS HARDCOPY LOG]
IEE043I A SYSTEM LOG DATA SET HAS BEEN QUEUED TO SYSOUT CLASS class
IEE533E SYSTEM LOG INITIALIZATION HAS FAILED
IEE769E SYSTEM ERROR IN SYSTEM LOG
```

## Example

This example shows a sample scenario for system log failure recovery.

The following entry in the NetView automation table is provided by SA z/OS to issue INGRX740 in response to incoming messages IEE043I and IEE037D:

```
IF MSGID = 'IEE037D' THEN
EXEC(CMD('INGRX740')ROUTE(ONE %AOFOPRECOPER%));
IF MSGID = 'IEE043I' THEN
EXEC(CMD('INGRX740')ROUTE(ONE %AOFOPRECOPER%));
```

Assume that the following threshold levels are defined in the automation policy for MVS component minor resource, LOG.

COMMANDS	HELP
-----	
Thresholds Definition	
Command ==>	_____
Entry Type : MVS Component	PolicyDB Name : DATABASE_NAME
Entry Name : MVS_COMPONENTS	Enterprise Name : YOUR_ENTERPRISE
Resource : MVSESA.LOG	
Critical Number . . . . 3	(1 to 50)
Critical Interval . . . 00:05	(hh:mm or hhmm, 00:01 to 24:00)
Frequent Number . . . . 3	(1 to 50)
Frequent Interval . . . 00:30	(hh:mm or hhmm, 00:01 to 24:00)
Infrequent Number . . . 3	(1 to 50)
Infrequent Interval . . 24:00	(hh:mm or hhmm, 00:01 to 24:00)

Figure 45. Threshold Definitions for MVS Component LOG

Assume that a command is defined for message IEE043I in the automation policy item MESSAGES/USER DATA of MVS components, as shown in the following

figure.

```

COMMANDS  HELP
-----
Command ==> _____ CMD Processing Row 1 to 4 of 20
                                SCROLL==> PAGE

Entry Name : MVS_COMPONENTS      Message ID : IEE043I

Enter commands to be executed when resource issues the selected message.
or define this message as status message.

Status . . . _____ ('?' for selection list)

Pass/Selection Automated Function/'*'
Command Text

MVS WRITELOG START

```

Figure 46. MESSAGES/USER DATA Policy Item for Entry/Type-Pair MVSESA/LOG

Assume that the following messages arrive the first time for one day, while the Job Entry Subsystem is up and running and the recovery automation flag for the MVS component minor resource LOG has not been switched off:

```

IEE043I A SYSTEM LOG DATA SET HAS BEEN QUEUED TO SYSOUT CLASS 1
IEE037D LOG NOT ACTIVE

```

Because IEE043I has been received prior to message IEE037D and the critical threshold that has been defined for message IEE037D has not been exceeded, the command that has been defined for message IEE043I is issued in response to message IEE037D.



---

## Chapter 19. Automated System Resource Discovery

The discovery utility can be run against one or multiple customer systems, extracting all automation relevant data from the currently active address spaces. That will let SA z/OS make a simple link between the address spaces details (job name, command prefix, start command, and so forth) and a class definition that provides messages, dependencies and appropriate automation policy. It runs through the control blocks, pulling out not only job names, but also procedure and step names. It pulls out the start commands, and the PGM name from the JCL. It can search through CICS and IMS implementations to pull out lists of dependent regions. All that data is then imported into the customer's Policy DB which will create a basic automation policy for them.

This policy then requires manual steps to create a ready to run automation policy. The policy will contain:

- Sysplex Group(s)
- Systems
- A System APG w/o Automation name where all applications found on that system are linked to
- APL Classes
- APL Instances, linked to classes
- Basic dependency structures

Note, there is no intention to discover any service period (schedule) related data. Furthermore, only applications that are running when the discovery utility is run would be included in the SA z/OS policy.

In a subsequent step, rerunning the discovery utility and re-importing it will update the policy DB to add any newly discovered APLs.

The discovery utility can be used when:

- installing and setting up SA z/OS,
- customers who need basic automation want a simplified way to maintain their policies.

**Note:** Automated System Resource Discovery is designed to support you when setting up a new policy. The generated policy requires manual steps to adapt the policy to your installation. You therefore need to be familiar with the SA z/OS Customization Dialogs.

---

### Disclaimer

The Autodiscovery function provides a basic automation policy which must be finalized. It is the responsibility of the user to finalize the policy in a way that does not cause unwanted effects in the user's installation.

## Components Overview

There are three major process elements to this design. They are the discovery engine, the preloader and the file update facility of the SA z/OS Customization Dialog, here called 'importer'. In this overview you will read about the purpose of these processes and the data they require and generate.

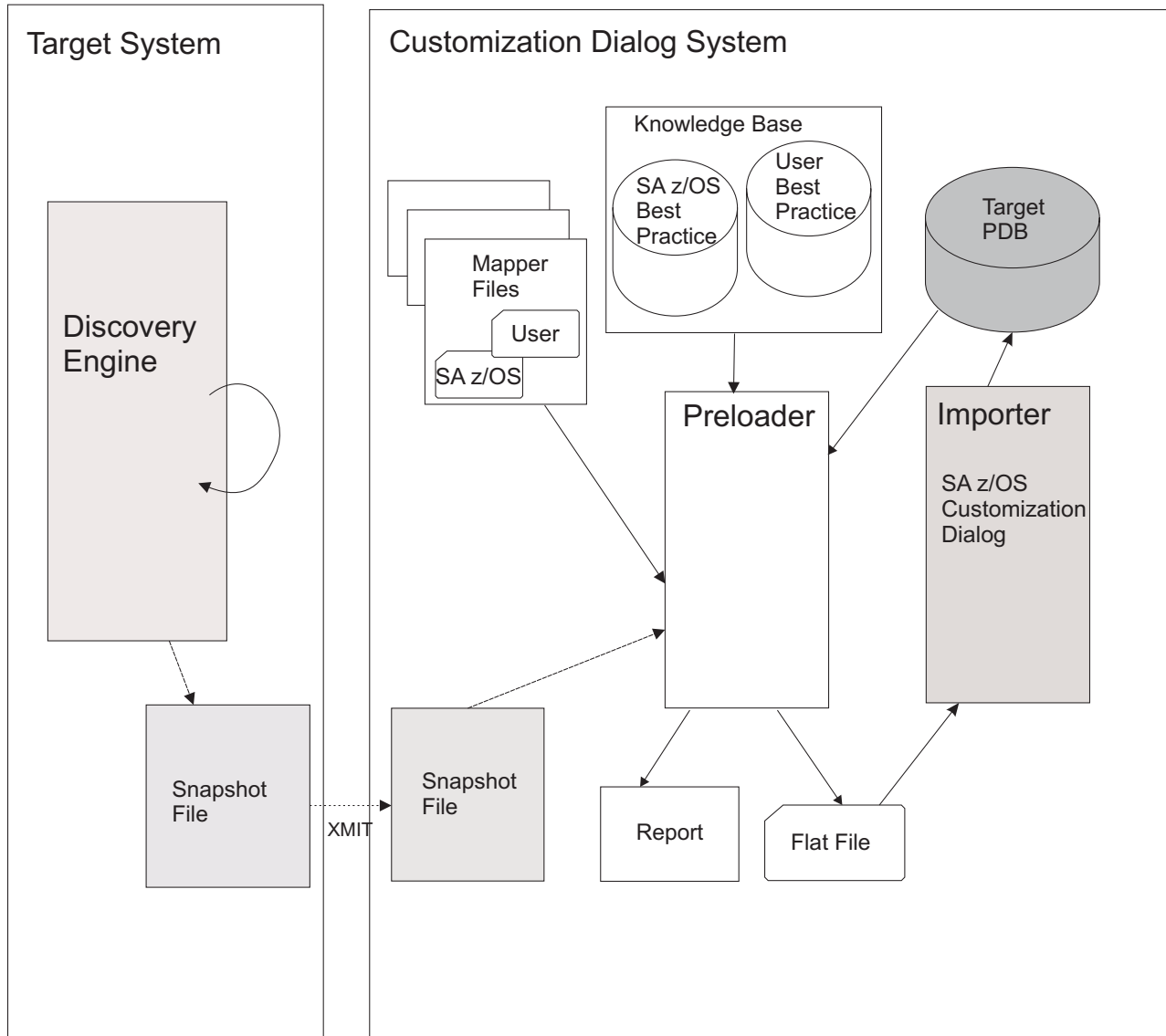


Figure 47. Automated Discovery Overview

### DISCOVERY ENGINE

The DISCOVERY engine runs on each target system. It non-disruptively extracts information from the system's current workload and writes it to a system specific SNAPSHOT file.

### SNAPSHOT FILE

The SNAPSHOT file is a regular text file and can be browsed with the ISPF browser. It should not be edited. It mainly contains resources such as address spaces which were active at that point in time when the discovery



engine was running. The snapshot file is then sent over to the central system where the customer is running the SA z/OS Customization Dialogs.

### PRELOADER

The PRELOADER reads the data from the SNAPSHOT file, applies the rules encoded in the MAPPER FILES to the data, extracts the relevant policy from the KNOWLEDGE BASE and then determines a delta update that needs to be made to the PDB to add the newly discovered data. It writes out a set of instructions for the IMPORTER in a FLAT FILE.

### KNOWLEDGE BASE

The KNOWLEDGE BASE represents two automation policies, a best practice policy provided by SA z/OS and an installation specific automation policy. The SA z/OS provided policy already contains a variety of different applications that are expected to be encountered on a customer's system. This policy cannot be changed by users. The installation's automation policy is a PDS that must be created by the installation using the Customization Dialog. It is intended to be populated with automation policy items to be used as a model for entities that you have identified in your installation's MAPPER FILES.

### MAPPER FILES

The MAPPER FILES primarily describe how the PRELOADER has to map a resource listed in the SNAPSHOT file to a policy entry contained in the KNOWLEDGE BASE. Besides those mapper files, which are predefined by SA z/OS, there may be installation defined mapper files. The preloader will first try to map a discovered resource using the installation's mapper file. If no mapping was found, the preloader will continue using the SA z/OS provided mapper file. The MAPPER FILES are regular text files and can be processed with a normal text editor.

### PDB

The PDB - also referred to as 'Target PDB' - is an SA z/OS Policy Database that the user has created to hold the definitions of the discovered data. The user may have manually updated it to add or customize specific policies.

### FLAT FILE

The FLAT FILE is read in by the IMPORTER, and the instructions contained within it are then executed to edit the PDB that it is being imported into. This will create the policy elements that represent the discovered data.

FLAT FILES are regular text files and can be processed with a normal text editor. They should be edited with caution however as they both need to follow the syntax rules for the SA Customization Dialogs file update utility and the introduction of even a small error or incompatibility will prevent the whole file from loading.

### IMPORTER

The IMPORTER is just a short term for the file update facility of the SA z/OS Customization Dialog. It reads a FLAT FILE and imports the data into the Target PDB.

### Overview of Using the Automated System Resource Discovery Process

The Automated System Resource Discovery process can be considered as two separate steps: Gathering data and feeding the discovered data into a policy.

**Step 1:** Scan each of the systems to be modelled with a discovery tool - the 'Discovery Engine'. For that purpose, you will need to install this tool on each system to be modelled, unless there is a full SA z/OS installation on it. When the discovery engine is run, it produces a SNAPSHOT data file containing information about the system resources. This snapshot file then needs to be sent to the system where you will run the SA z/OS customization dialogs.

**Step 2:** During this step the snapshot files are consolidated and accumulated into a Policy Database. The *consolidation process* involves:

Step2a: running each discovered data file through a PRELOADER which will apply some identification heuristics to the discovered data and construct a delta update to the PDB in order to:

Step2b: add in the newly discovered applications through the IMPORTER.

At the start of Step 2 you need to identify the PDB that you are going to add the data to – it can be a newly allocated one or an existing one. You then run each data file through the preloader (Step 2a) and import it into the PDB (Step 2b) before you process the next data file.

During the preloader's analysis phase the discovery data is run through a set of heuristic rules, as defined in MAPPER FILES, to classify it. Once it has been classified, its classification is utilized to select the automation policy that will be used as a model for it during the construction phase.

You may specify your own policy selection rules to supplement those supplied and maintained by System Automation. System Automation provides 'best practice' automation policy models for many applications – and provides the ability for you to supplement or replace them with your own policy models. The output of all of this processing is a flat file containing PDB update statements that can be applied to the PDB through the Customization Dialog's Data Management function.

You have an opportunity to inspect the flat file and the reports produced by the preloader before you import it into the PDB, so you can return to the analysis and construction process to refine the identification and selection rules and then rerun the preloader, if it is necessary to do so. Once you have imported the flat file into your PDB, you can move onto running the next data file through the preloader.

#### Step 1: Using The Discovery Engine

The 'DISCOVERY Engine' scans each of the systems to be modelled and stores its output in a system specific snapshot data file.

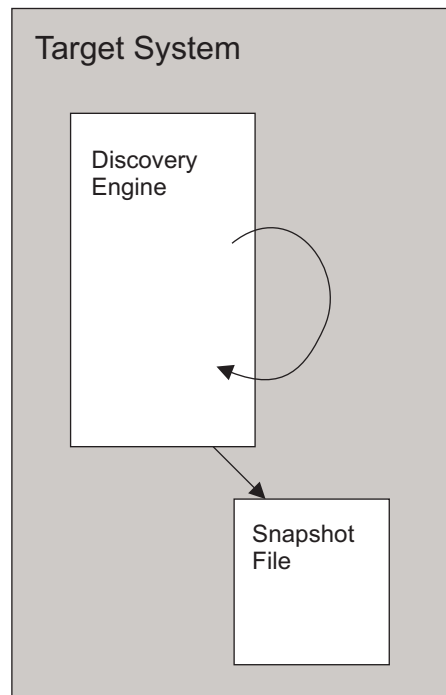


Figure 48. Discovery Engine Overview

### Extraction of the Discovery Engine

If the systems you wish to automatically model do not have a full installation of SA z/OS upon them, you will need to submit a supplied sample job to extract the discovery engine from a SA z/OS Installation. The sample jobs are located in the SINGSAMP data set.

1. Job INGEDEX0 should be run on a system where a full SA z/OS is installed. It needs to be edited to specify the userid and system that the discovery engine should be sent to prior to submission.
2. Job INGEDEX1 should be sent to the target system.
3. Receive the transmitted data sets on the target system.
4. Job INGEDEX1 should then be run on the target system. It will unpack the data sets sent by INGEDEX0 after allocating the appropriate data sets to hold them. It needs editing to specify some details of the data sets prior to submission.

You then need to make the code available to all systems where it will be run and to secure it to prevent unauthorized execution.

### Preparing the Discovery Jobs

There is a single piece of JCL that needs to be submitted to run the discovery for a system. It has two parameters – the system affinity setting in the JCL and the name of the output data set. Prior to running the discovery job there is some set up that is required:

1. APF authorize the library the discovery code will be executed out of. For a full SA installation this has probably already been done.
2. Ensure that the user you will be executing the discovery process under has appropriate authority – permission to enter authorized mode on the z/OS side and superuser access on the USS side. These permissions are only needed

## Step 1: Using the Discovery Engine

during the running of the discovery code and may be revoked afterwards. Note that this has to be done for each system.

3. Produce the JCL to discover each system, with the system affinity and output data set properly set. You can use the INGEDDSC sample member to do this. You need to edit it to specify some of the details before you run it.

### Running the Discovery Jobs

When you are prepared, submit the discovery jobs to:

- step through all address space control blocks and return information for each address space that is active at the time the discovery runs. If the address space hosts an USS process, information about the USS process are returned as well.
- provide information about all XCF groups defined for the local system
- provide information about all ARM elements defined for the local system
- provide information about all locally defined system symbols.

This data is then written to a snapshot file.

It is better to submit all the jobs to the discovery systems within the same sysplex at around the same time, as it provides a more consistent view of activity across the sysplex. Ideally, the job should be run at a point in time when most of the applications are active. If your workload changes significantly during the day or week, you can rerun the discovery process (once you have saved the output data files) to get a view of the systems other workload. These can then be integrated into the PDB, although you will need to manually create and link the Service Periods to automatically switch between the workloads.

## Step 2: Building the Automation Policy

This step is performed on that system, where you run the SA z/OS Customization Dialog to build the target PDB.

### Step 2a: The Preloader

The Preloader will analyze the data in a single snapshot and produce a corresponding model of those resources within a flat file suitable for the dialogs to import.

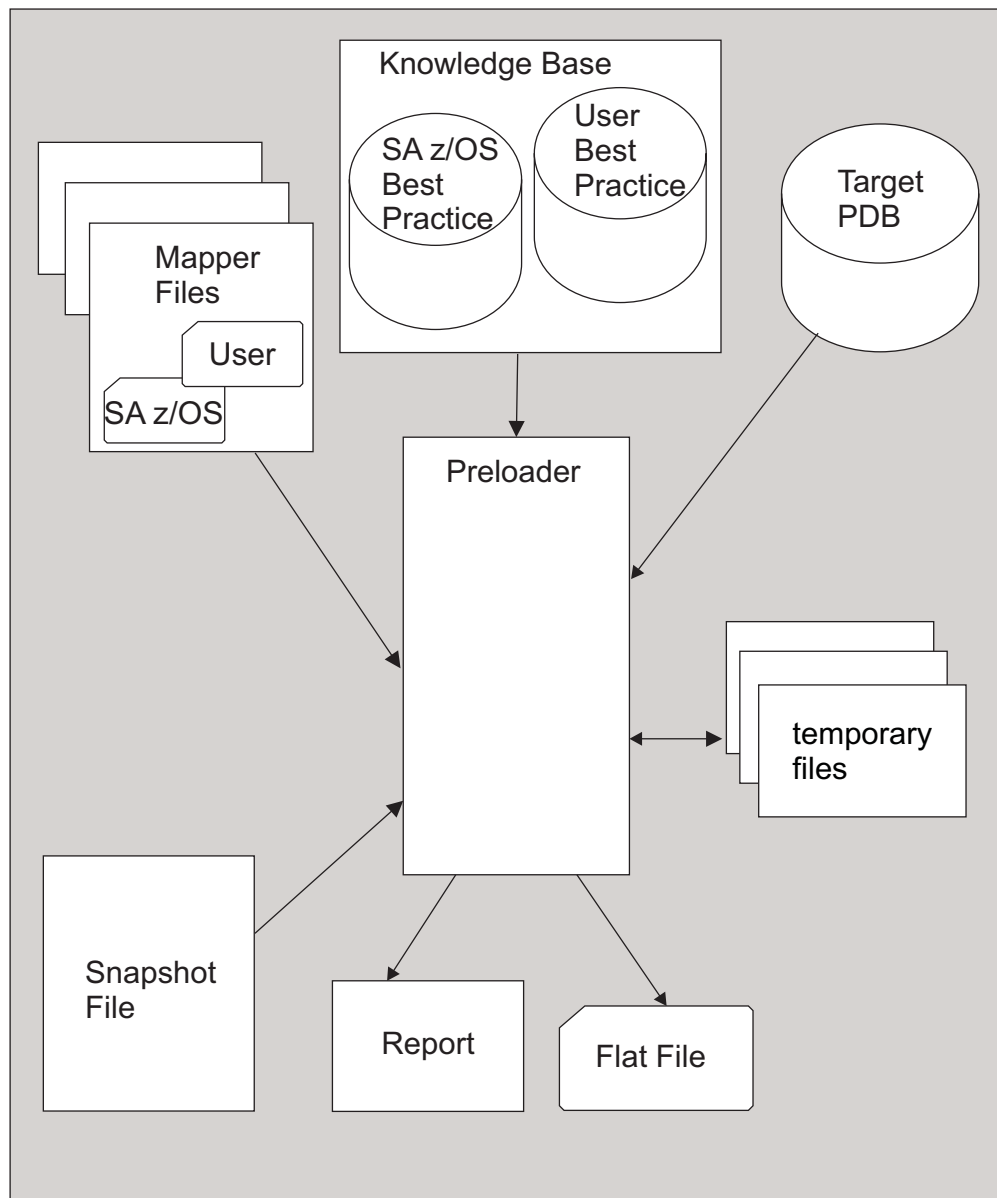


Figure 49. Preloader Processes

### Gathering of the Snapshot Files

You need to have identified the system where you run your SA z/OS Customization Dialogs as this is usually where you want to run the preloader to transform the snapshot data files into flat files you can import through the Customization Dialog's data management function. Then the snapshot data files from the system discovery jobs need to be transmitted to the system where you will run the preloader and stored there.

**Note:** If you choose to run the preloader on a different system to the one where you keep your PDBs and run the Customization Dialogs, then you will need to make the PDB and KNOWLEDGE BASEs available to it and to bring the flat files back to your Customization Dialog system for import.

## Step 2: Building the Automation Policy

### Preparing the Preloader Job

Before you can run the preloader you need to do a few things:

Customize the preloader job. A sample JCL is shipped as member INGEDPLD located in the ING.SINGSAMP data set. You need to customize a copy of INGEDPLD as described in its prolog. Here are the major steps:

1. **SA z/OS Knowledge Database PDB:** Identify the HLQ of your SA z/OS installation's target library. The HLQ is used to locate the SA z/OS Knowledge Base PDB. This automation policy is generated based upon best practice policies supplied by SA z/OS. It contains the models for all of the resources identified in the System Automation provided mapper files (and for a few others).
2. **User's Knowledge Database PDB:** Create or locate your installation's Knowledge Base PDB. Even though you will not have edited your installation's mapping files yet if this is your first time through, you need to have an installation's Knowledge Base PDB, which initially might be empty. Later on you might want to populate this knowledge base. This is recommended if you need to deviate from the SA z/OS knowledge base or if you want to enhance the knowledge base with your own entries.
3. **Target PDB:** Select the Target PDB. This is the PDB that you are going to update. It is recommended that this is either a newly allocated, empty PDB or one that has previously been occupied with automatically modelled data. If you use a PDB containing hand modelled data or data from our hand modelling samples, you are likely to get a lot of duplication, as the automatically modelled entries tend to be more complete, containing data that isn't necessarily specified on a hand made models.
4. **Snapshot File:** Locate the snapshot file which you want to process with this preloader run. For each target system, you will have a snapshot file containing all discovered system resources and definitions. You need to invoke the preloader for each snapshot file separately. Before processing another snapshot file with the preloader, the generated flat file must be fed into the target PDB by the importer. This is required because the preloader needs to know the current content of the target policy to avoid generating invalid flat files.
5. **Mapper files:** Locate the mapper files. They are members of the SINGIMAP data set. There are some SA ones and some user ones. The users' mapper files end in a U. When you want to modify them, you should allocate a new PDS where you copy and maintain them. User mapper files must exist even though they initially may not contain any mappings.  
  
You will find the mapper files documented in Appendix F, "Autodiscovery Mapper Files and Report Formats," on page 271.
6. **Flat File:** This is the output file of the preloader. It must exist before the preloader job is submitted. After the flat file was generated and before another flat file will be generated, it is mandatory to import it into the target policy.
7. **Report Data Set:** When generating a flat file, the preloader documents its progress in various members of a report data set. The report is always generated and the partitioned data set must exist before starting the preloader job.  
  
You will find the report members documented in Appendix F, "Autodiscovery Mapper Files and Report Formats," on page 271.
8. The **Preloader** takes two parameters that affect its' output: Unless you have been specifically requested to do so by service, you would normally omit the **DEBUG** parameter.

## Step 2: Building the Automation Policy

- - DISPLAY - Which causes the contents of generated reports to also appear in the JOBLLOG.
- - DEBUG - Which causes detailed debugging information to appear in the JOBLLOG. Specifying DEBUG forces the DISPLAY option, even if you have not specified it.

You may wish to create one copy of the preloader job per target system, that is for each snapshot file. You are now ready to run the preloader.

### Running the Preloader Job

The sequence for running the preloader is:

1. Verify the preloader job to point to the correct input and output data sets for the first target system's snapshot file.
2. Submit the preloader job.
3. Inspect the output from the preloader.

**Hint:**

Before processing the next snapshot file with the preloader, the generated flat file must be imported into the target PDB (see Step 2b). Then the target PDB is prepared to serve as input to the preloader job for its next run. This sequence helps to avoid conflicts when importing flat files described below.

## Step 2: Building the Automation Policy

### Step 2b: The Importer

This is the Data Management function of the SA z/OS Customization Dialog to update a policy database with data from a file.

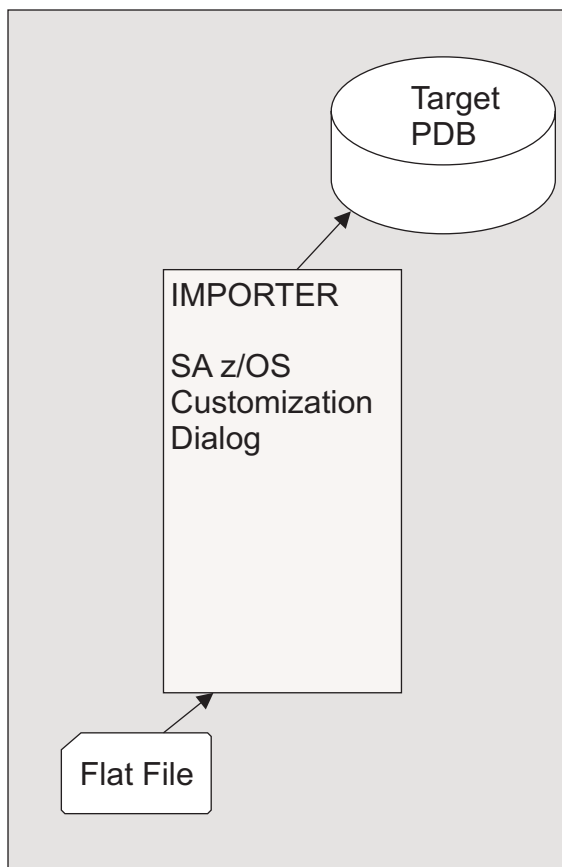


Figure 50. Flat File Processing

You can either use the customization dialogs to select the target PDB and then use the Data Management option to import the flat file into the target PDB, or you can use a batch job to perform the import. You should do so only once you are happy with the contents of the flat file, as it is virtually impossible to unimport it unless you have saved a copy of the PDB prior to performing the import.

Sample job INGEFLT is provided as a sample batch job to run the import. Once the import is complete you can run the preloader against another data file. You have to run it this way – preload/import – as the preloader uses the information from the extract to prepare a delta update in the flatfile, that is, one that contains things that are different. If you were to run multiple preloads against the same extract file, you could end up with conflicts between the data in the flat files that would produce an invalid model when they were imported.

---

## Extending Automated Modelling

SA z/OS ships with a large number of presets for IBM and some 3rd party software. There will, undoubtedly, be address spaces on your system that it has either not identified or which it has identified incorrectly or incompletely. Some of this will be because the applications are unique to your systems, some of it will be



because the allowed customization of the application is such that we do not have a suitable 'hook' to hard code into the files that we ship to reliably identify it.

### Mapping Files

The Automated Modelling Tool is extended by adding statements to a set of user mapping files that are processed by the preloader. System Automation (SA) versions of these files are also provided and should be used in conjunction with your user files to take full advantage of the automated modelling capabilities. The mapping files are listed below. The first name is the SA member, the second is a user member that you should edit your own policy into. Refer also to the appendix section "Mapper Files" on page 271.

#### INGSMAID / INGSMAIU

This is the Address Space Identification Mapping file. It contains rules for identifying Address Spaces from the data discovered about the address space.

#### INGSMGRP / INGSMGRU

This is the XCF Group identification file. It contains rules for identifying the XCF groups that were found to have been established.

#### INGSMGMB / INGSMGMU

This is the XCF Group Member identification file. It contains rules for identifying members of XCF groups based upon the type of the group and the name that the member joined the group with.

#### INGSMUID / INGSUIU

This is the USS Address Space Identification Mapping file. It contains rules for identifying processes that were found running under USS.

#### INGSMPLU / INGSMPY

This is the Policy Mapping file. It contains rules for selecting which identified Address Spaces will be converted into SA policy, what model policy, if any, will be used for them and which of their established fields will be over written.

#### INGSMVRS / INGSMVRU

This is the variable mapping file. It is used to define symbols – in addition to those found by the discovery process – that can be used in the field value formulas in the policy mapping file.

The supplied user files contain some sample values that will probably not work on your system. You should remove them.

---

### Finalizing the Target Policy

After the systems have been discovered and the target policy has been populated, manual updates are required in order to get an operational automation policy.

The steps below will lead you to an operational policy which supports starting, stopping and restarting resources in place where all applications are linked to a common application group (APG) per system.

### Creating and preparing a Reference Policy

There are a few definitions to be made in the target policy, which best can be imported from another policy. That policy is intended to serve as a reference policy. If you do not have such a policy yet, you may create it now while selecting those Best Practice policies, which contain samples for the discovered applications.

## Finalizing the Target Policy

As an example: if z/OS base components and DB2 were discovered, the \*BASE and \*DB2 Best Practice policies should be selected. This new policy also serves as the source, where missing policy elements can be copied from later on.

## Importing from the Reference Policy

Switch to the Target PDB. Navigate to the 'Import entries from a Policy Database' panel and select the reference policy as 'Source Policy Database'.

Enter 'GRP' as the 'Entry Type' and 'YES' in the 'Import Linked Entries' field. Then continue with selecting the sysplex(es) and proceed to panel 'Selected Entry Names for Import'.

This panel lists all policy entries as contained in the reference policy. It allows you to add additional entries to your target policy. Because all entries are imported by default -if they do not already exist- into your target policy, you need to:

1. Overtyping the GRP and SYS entry names in the 'Entry Name' column with those names used in the installation, so they match the Sysplex and System names in the target policy. As a result you will find a 'Y' in column 'D'.
2. Remove each entry from the list, which should not be imported. In order to get an initial operational policy, remove all entries from the 'Selected Entry Names for Import' panel except those entries of type MVC, SDF, ADF, AOP, NFY, NTW and XDF.

Then run the import.

If you have more sysplexes and/or systems in your target policy, you need to repeat this import step for each of the installation's sysplexes and systems.

## Avoiding multiple entries for the same application

In some situations you may be able to reduce the number of policies required by specifying values utilizing AOCCLONE variables. For example, if an application has an Application Restart Management (ARM) Element name like ABC@DEF and ABC@HIJ then you could choose to use an AOCCLONE value as the system dependent part. In the variable mapping file, add a rule for each system that specifies the correct system dependent value for that system:

```
PLEX1 SYS1 AOCCLONEA DEF
PLEX1 SYS2 AOCCLONEA HIJ
```

Then in the user policy mapping file, specify that the ARM Element name for the address space should be modelled as ABC@&AOCCLONEA. You may need to copy the mapping rule from the SA supplied mapping file.

This should result in the generation of an APL that has an ARM Element name of ABC@&AOCCLONEA. And which can be used on both the SYS1 and the SYS2 systems. The AOCCLONEA values would also be set on those two systems.

In situations where the values cannot be specified in the APL policy using AOCCLONE values, your options are more limited – clean up your system to reduce the variability or live with multiple application instances. In the latter case, you may want to create a class to hold the common policy and just leave the instances holding the discovered data values. This will give you a single place to change the automation policy for the APLs.

## Changing the Name of an APL.

You can use the dialogs RENAME function to rename APLs that have been created by the automated modelling tool. Provided you do not change any of the discovered data values the preloader will recognize the renamed APL if it is run again and will not create a new APL.

This works because the preloader creates a signature for each APL, based upon the discovered data values – Jobname, ARM Element name, Procedure Name, and so forth, and uses this to match discovered APLs to pre-existing APLs.

If you want to make the change on the preloader, find or copy the policy rule for it into your user policy mapping file and change its entry name to reflect the name you wish it to have.

## Target Policy Ready for Build

Your target policy is now ready for running the build process.

You can enhance the capabilities of this policy as you proceed with your automation needs. Importing from the reference policy can be repeated for further entries like application groups, monitors and transient applications. Their names, relationships and links need to be adapted according to the reference policy.

---

## Building the Configuration Control Data

You may either build the Configuration Control Data using the online or batch build process. During the build process, WARNINGS may be issued. Please review the build report after the build process completed. WARNINGS due to the following reasons are expected:

- relationships to non-existent APGs,
- HASMONITOR relationships to non-existent MTRs,
- missing subtype specifications and subsequent warnings related to a missing subtype definition
- missing Automation Name for automatically generated APGs (LK\_sysname\_plexname).

The steps below will lead you to an operational policy which supports starting, stopping and restarting resources in place where all applications are linked to a common application group (APG) per system.

---

## Troubleshooting

### My Application is Missing From the Flatfile

Check first that the APL has not already been imported. You need to open the PDB up in the customization dialogs and look at the APLs to check this. It may have been renamed. If the APL is already in the PDB, it will not be included in the Flatfile.

Next you need to check the EXCLUDE report to see if the address space is mentioned in there. If it is, you need to look at the Policy Mapping rule that it hit. If it is an exclusion rule, you need to add a new policy mapping rule to link the address space to the correct APL model for it.

For the APL import to work correctly, you need three things – correct identification of the address space, model automation policy in one of the

## Troubleshooting

| KB data sets (either an unmodified SA sample or an entry from your user  
| KB) and a rule in the policy mapping files to tie the two together.

| **Multiple Entries are Generated for the same Application**

| See the above section “Avoiding multiple entries for the same application”  
| on page 226.

---

## Appendix A. Global Variables

You must ensure that the names of any global variables you create do not clash with SA z/OS external or internal global variable names. You should check the following tables before creating any global variables of your own.

---

### Read-Only Variables

There are two different classes of variables, based on the level of access available to the programmer:

**Class 1:**

Read-only variables. These variables are set by SA z/OS and require at minimum an automation control file reload to be changed.

**Class 2:**

Read-only variables. These variables are set by SA z/OS CLISTs. They should not be changed except by calling the appropriate CLISTs.

Table 24. Externalized Common Global Variables

Variable Name	Description	Class	Reference
AOF.clst.0DEBUG	Contains either a Y or blank. If it contains Y an intermediate level of debug that is supported by SA z/OS automation procedures is turned on.	2	
AOF.clst.0TRACE	Contains a REXX trace setting to be used by the automation procedure <i>clst</i> .	2	
AOFAOCCLONEx	Where <i>x</i> either does not exist (AOFAOCCLONE) or is a value from 1 through 9 or A through Z. The AOFAOCCLONEx global variables contain the values specified for the &AOCCLONEx. variables for this system.	1	See the description of the System policy object in <i>IBM Tivoli System Automation for z/OS Defining Automation Policy</i> .
AOFBFP	Contains the backup focal point.	1	
AOFCFP	Contains the domain ID of the current focal point.	1	
AOFPFP	Contains the primary focal point.	1	
AOFCOMPL	Contains YES if initialization is complete.	2	
AOFDEBUG	Contains a REXX trace setting to be used globally.	2	See <i>IBM Tivoli System Automation for z/OS Planning and Installation</i> .
AOFINITIALSTARTTYP	Contains the value 'IPL' or 'RECYCLE' depending on whether SA z/OS has been started the first time after an IPL or after a NetView recycle.	1	

## Global Variables

Table 24. Externalized Common Global Variables (continued)

Variable Name	Description	Class	Reference
AOF_PRODLVL	Contains the release level of SA z/OS. The values are:  SA z/OS 3.4 SA x/OS,V3R4M0  SA z/OS 3.3 SA z/OS,V3R3M0  SA z/OS 3.2 SA z/OS,V3R2M0	1	
AOFJESPREFIX	The command prefix for the primary scheduling subsystem.	1	
AOFSUBSYS	The subsystem name of the primary scheduling subsystem.	1	
AOFSYSNAME	Contains the name of the system.	1	See AOCUPDT in <i>IBM Tivoli System Automation for z/OS Programmer's Reference</i> .
AOFSYSTEM	Contains the system type (MVSESA) as defined in the customization dialog.	1	The SYSTEM INFO panel of the customization dialog.

## Read/Write Variables

Table 25 lists the common global variables that can be user-defined. You can set them in your startup exit to change the way that SA z/OS behaves. These variables should be set only once for an SA z/OS system. You can enable or disable advanced automation options (AAOs) by changing the settings of the global variables in your CNMSTGEN stylesheet. For example:

```
*****
* System Automation AAO CGlobals
*****
COMMON.AOFCNMASK = 290C0D0E0F101518
COMMON.INGREQ_ORIGINATOR = 1
COMMON.AOFRESTARTALWAYS = 0
COMMON.AOFUPDRODM = NO
COMMON.AOFUPDAM = NO
COMMON.AOFSMARTMAT = 0
```

After modifying the exit, an SA z/OS COLD START is required for these changes to take effect.

Table 25. Global Variables to Enable Advanced Automation (CGLOBALS)

Variable	Value	Effect
AOF_AAO_INJECT_NOFORCE_REQ	Any value	SA z/OS does not inject a STOP vote with Priority Force for source *RECYCLE when processing an INGREQ REQ=STOP RESTART=YES request. Instead the regular stop request is passed to the automation manager and removed automatically when the resource is down. This also removes any previous request for the resource that was made by the same source.
AOF_AAO_AAREQUEST_MAX_WAIT	1 to 999 seconds	Defines the maximum wait time in seconds. Is used when the MAXWAIT parameter is not specified for the workload. See MAXWAIT parameter for valid range.

Table 25. Global Variables to Enable Advanced Automation (CGLOBALS) (continued)

Variable	Value	Effect
AOF_AAO_MSG_EHKVAR	YES	This indicates that when calling commands, the tokens of the triggering message are to be stored in variables EHKVAR0 through EHKVAR9 and EHKVART, if not specified in parameter EHKVAR.  YES is the default.
	NO	This indicates that the tokens of the triggering message are not to be stored in EHKVAR variables, if not specified in parameter EHKVAR.
AOF_AAO_MVSTAPEMON	>0	Set this value to represent the number of iterations for INGRTAPE to continue monitoring using MVS commands after the LATE alert has been reached. A non-zero entry also indicates using MVS commands for all tape mount monitoring prior to the LATE alert.
	0	INGRTAPE relies on the receipt of the DOMMED message to satisfy any outstanding alerts.
AOF_AAO_OMVS_SHUTDOWN	NOWAIT	This causes the wait for a complete termination of OMVS to be skipped.
AOF_AAO_RDS_TSO_DSN	User-defined	Must be set in order to use the RDS table editor under TSO. Specify a name of the RDS working data set.
AOF_AAO_RDS_TSO_RACFHLQ	User-defined	Must be set in order to use RACF protection of the RDS table editor under TSO. Specify high level qualifier which could be up to 26 bytes long and may contain dots.
AOF_AAO_RETENTIONPERIOD	0 to 1440	Defines how long (in minutes) SA z/OS should keep the CGLOBALS that are used to keep track of command requests that are received from TWS. The default is 60 minutes.
AOF_AAO_SDFROOT_LIST AOF_AAO_SDFROOT_LIST $n$ (where $n$ is 1 to 4)	User-defined	Defines the value of the &SDFROOT variable that is used as the root name for the sample SDF panels that are provided with SA z/OS.  The value can be the name of a single system or a list of system names separated by a blank character. A list can be used at the SDF focal point to have SA z/OS generate the necessary panel definitions for all systems in the list.  Use the AOF_AAO_SDFROOT_LIST $n$ variables to honor the maximum length of common global variables within the NetView environment.  The system name can be appended by one or more member names separated by slashes, the first name refers to the panel definitions, and the second name refers to the tree definitions, for example SYS1 SYS2/MYPNLS SYS3//MYTREE SYS4/MYPNLS/MYTREE. Refer to "Status Component Panel Definition" in <i>IBM Tivoli System Automation for z/OS Programmer's Reference</i> for the interpretation of these definitions.
AOF_AAO_SHUTDOWN_STOPAPPL	User	Specifies the name of the defined resource (in AM notation) to be used for the shutdown.

## Global Variables

Table 25. Global Variables to Enable Advanced Automation (CGLOBALS) (continued)

Variable	Value	Effect
AOF_AAO_SHUTSYS_OLD	YES	Indicates that SA z/OS should not redirect the INGREQ ALL REQ=STOP command to the GDPS STOPAPPL resource when the GDPS tower is active.
AOF_AAO_TRANRERUN	YES	This indicates that a transient job can be rerun within the lifecycle of a particular z/OS, if not specified otherwise in the automation policy for this job.
	NO	This indicates that a transient job is only run once in the lifecycle of a particular z/OS, if not specified otherwise in the automation policy for this job. NO is the default value.
AOF_AAO_TWS_CMD_OUTPUT_NETLOG	YES NO	Set this AAO to YES to place the output of the command execution in the netlog.
AOF_AAO_TWS_ERRMSG		This AAO can be used to inhibit the ERRMSG parameter. If set to NON BLANK, it erases the contents of the ERRMSG parameter.
AOF_AAO_TWS_MAX_WAIT_TIME		Defines the installation default for the maximum wait time for the INGREQ and INGMOVE command. The default is taken when no wait time is specified in the completion information parameter.
AOF_AAO_TWS_RESYSplex	YES NO	This AAO can be used to allow the TWS special resource name to use the SA z/OS Sysplex name instead of SYSplex to facilitate an enterprise wide naming convention.  Default: NO for SYSplex
AOF_AAO_VPCEINIT	0	SA z/OS does not invoke the GDPS initialization exit, VPCEINIT,
AOF_ASSIGN_JOBNAME	1	This indicates that SA z/OS exploits the NetView "ASSIGN BY JOBNAME" feature with a higher priority than the "ASSIGN BY MESSAGE ID" feature (priority level 3).  This is the default setting.
	0	SA z/OS exploits the NetView "ASSIGN BY JOBNAME" feature with a lower priority than the "ASSIGN BY MESSAGE ID" feature (priority level 4).
AOF_E2E_EAS_PPI	User-defined	PPI receiver ID of the event/automation service to be used to forward events to the end-to-end automation adapter.
AOF_E2E_EVT_RETRY	1 to <i>n</i>	Specifies the number of retries, at intervals of one second, that are used to transfer events via PPI TECROUTE to the message adapter of the event/automation service. The events are then forwarded to the end-to-end automation adapter.
AOF_E2E_EXREQ_NETLOG	1	The output to requests received from the end-to-end automation adapter and issued by the primary automation agent, is logged to the NetView log.
	0	The output to those requests is not logged to the NetView log.  0 is the default setting.



Table 25. Global Variables to Enable Advanced Automation (CGLOBALS) (continued)

Variable	Value	Effect
AOF_E2E_TKOVN_TIMEOUT	hh:mm:ss	If a hot restart of the automation manager takes longer than the value specified in this variable, the end-to-end automation manager is informed about the outage and has to resynchronize with the first-level automation.
AOF_EMCS_AUTOTASK_ASSIGNMENT	1	SA z/OS assigns an autotask to extended MCS consoles with a console status of MASTER or ACTIVE
	0	SA z/OS does not assign an autotask to extended MCS consoles with a console status of MASTER or ACTIVE  0 is the default.
AOF_EMCS_CN_ASSIGNMENT	1	SA z/OS obtains an extended MCS console with a unique name for operator station tasks (OSTs). If an MVS console was obtained for the OST previously, it is released.  1 is the default setting.
	0	SA z/OS does not obtain an extended MCS console with a unique name for OSTs and the command AOCGETCN is disabled.
AOFACFINIT	1	This indicates that SA z/OS attempts to proceed with initialization despite error messages during the processing of the automation control file.  1 is the default setting.
	0	SA z/OS stops the initialization process upon such errors.
AOFARMQUERYRETRY	User-defined numeric value	The number of times AOFARMQ is called to query the ARM status of an element after a status of UNKNOWN is returned. If the ARM status does not change to another status before the number of retries is exhausted, SA z/OS continues processing and assume the element is not ARM-enabled.  The default is 10.
AOFARMQUERYWAIT	User-defined numeric value	The number of seconds to wait between retries as specified in the AOFARMQUERYRETRY value above.  The default is 15.

## Global Variables

Table 25. Global Variables to Enable Advanced Automation (CGLOBALS) (continued)

Variable	Value	Effect
AOFCNMASK	User-defined	<p>The characters that are used in determining unique console names can be tailored by updating the common global variable AOFCNMASK. This global is used as a hex mask to extract characters from the following string when generating unique console names with command AOCGETCN:</p> <pre>left(opid(),8)  right(opid(),8),   left(aofsysname,4)  right(aofsysname,4),   left(applid(),8)  right(applid(),8),  'ABCDEFGHIJKLMNPOQRSTUVWXYZ0123456789\$&amp;#155;#@_!?'</pre> <p>Where</p> <ul style="list-style-type: none"> <li>• opid() is a function that returns the OST task name</li> <li>• aofsysname is a common global that stores the system name</li> <li>• applid() is a function that returns VTAM LU name</li> </ul> <p>The default for AOFCNMASK is 290C0D0E0F101718. X'29' selects character A in position 41, X'0C' through X'10' selects the last five characters of the opid in positions 12 to 16, X'17' and X'18' select the last two characters of the sysname in positions 23 and 24.</p> <p>If AOFCNMASK is null, AOCGETCN attempts to obtain a unique extended MCS console after a 1 minute interval, followed by a two minute interval and so forth for a maximum of 5 passes (15 minutes elapsed from the initial invocation of the command).</p> <p>For example, with AOFCNMASK: 2A01020304051718</p> <p>X'2A' selects character B in position 42, X'01' through X'05' selects the first five characters of the opid in positions 1 to 5, X'17' and X'18' select the last two characters of the sysname in positions 23 and 24.</p>
AOFDEFAULT_TARGET	User-defined	Sets a default for the TARGET parameter for all commands where this parameter is used.
AOFDESCA	0100001000001000	Descriptor code for action messages
AOFDESCD	0100001000001000	Descriptor code for decision messages
AOFDESCE	0010001000001000	Descriptor code for eventual action messages
AOFDESCI	0000011000001000	Descriptor code for informational messages
AOFDESCW	1000001000001000	Descriptor code for wait messages
AOFEXPLAIN_USER	User-defined	<p>The EXPLAIN command accepts this variable to include help support for customer installation supplied terms. It can hold one or more pairs of <i>term/help panel</i> specifications separated by a blank. If the specified status in the EXPLAIN command is not a valid SA z/OS status, the command routine checks whether it is an installation defined term. If so, the associated help panel is displayed.</p>

Table 25. Global Variables to Enable Advanced Automation (CGLOBALS) (continued)

Variable	Value	Effect
AOFINITREPLY	hh:mm:ss	The initial reply AOF603D is issued and automatically responded after hh:mm:ss.  00:02:00 (2 minutes) is the default setting.
	0	The initial reply AOF603D is not issued and automation continues with the default start without asking the operator.
AOF_INIT_MCSFLAG	User-defined valid value	This variable contains the MCSFLAG that is used for WTOs and WTORs that are issued by SA z/OS during initialization.  The default is '00000000'.
AOF_INIT_ROUTCDE	User-defined valid value	This variable contains the ROUTCDE (routing code) that is used for WTOs and WTORs that are issued by SA z/OS during initialization.  The default is '01000000'.
AOF_INIT_SYSCONID	User-defined valid value	This variable contains the SYSCONID that is used for WTOs and WTORs that are issued by SA z/OS during initialization.  The default is blank.
AOFLOCALHOLD	0	INGNTFY and SA z/OS initialization executes the SETHOLD AUTO command on the notify operator.  0 is the default setting.
	1	SETHOLD must be manually invoked.
AOFMATLISTING	0	Setting this variable means that the NetView automation table listing is not placed in the DSILIST data set at NetView automation table load time.
AOFOPCCMDMSG	0	OPCAMOD only produces messages that are generated by INGOPC.  0 is the default setting.
	1	OPCAMOD produces EVJ011I, EVJ412I, EVJ420I, and EVJ423I messages.
AOFPAUSE	0 to 5	This is the number of seconds that SA z/OS allows for applications that have shut down to be cleared by MVS, in addition to their termination delay. As the AOFPAUSE value is applied to all applications it should be kept small. AOFPAUSE may be useful on a slow machine, where allowing an extra second or two before SA z/OS checks if the application has been cleared could avoid the need to use a termination delay timer.  No matter how AOFPAUSE is set, the application status is not updated to AUTODOWN or CTLDOWN until SA z/OS is sure that the application has been cleared from the system by MVS.  0 is the default setting.

## Global Variables

Table 25. Global Variables to Enable Advanced Automation (CGLOBALS) (continued)

Variable	Value	Effect
AOFRESTARTALWAYS	1	An application that has been shut down normally, outside the control of SA z/OS, with RESTARTOPT=ALWAYS, is restarted regardless of whether or not it has reached its critical error threshold.
	0	An application that has been shut down normally, outside the control of SA z/OS, with RESTARTOPT=ALWAYS, is <i>not</i> restarted if it has reached its critical error threshold.  0 is the default setting.
AOFRMTCMDWAIT	See NetView RMTCMD	Contains the installation wait time when RMTCMD is used for communication.  <b>60 seconds</b> is the default setting for RMTCMD.
AOFRPCWAIT	0 to <i>n</i>	This is the number of seconds that SA z/OS waits for command responses from other systems in the sysplex.  <b>10</b> is the default setting.
AOFSENDALERT	Yes or No	This defines whether NetView alert forwarding (YES) or the command handler (NO) is used to forward data to the focal point.  <b>Yes</b> is the default setting.
AOFSEXINT	1	The exit AOFEXINT is processed under the BASEOPER automation operator under the initialization process. This is the default.
	0	The exit AOFEXINT execution is serialized within the initialization process.
AOFSHUTDELAY	0 to 59	This is the number of minutes that SA z/OS waits for a termination message before continuing the shutdown process. Any values outside this range are treated as 0. With a setting of 0, message AOF745E is not issued.  <b>0</b> is the default setting.

Table 25. Global Variables to Enable Advanced Automation (CGLOBALS) (continued)

Variable	Value	Effect
AOFSMARTMAT	0	The SA z/OS Agent is disabled from refreshing ATs and the MRT. The user must supply an AT member INGMSG02 which is included when SA z/OS initially loads INGMSG01.
	1	The SA z/OS Agent is enabled to refresh ATs when an INGAMS REFRESH is issued. The AT fragment built by the customization dialog is <i>not</i> loaded; the user must supply a member INGMSG02 which is used instead.  The ATs are loaded after a successful test load. This will allow the agent to notify the AM about a load problem of the AT. The agent may notify the AM of an AT load failure, thus stopping the configuration refresh. The SA z/OS Agent will not load any MRT.
	2	The SA z/OS Agent is enabled to load the AT that is generated by the customization dialog and to refresh ATs when an INGAMS REFRESH is issued. The AT that is built by the customization dialog is dynamically loaded into storage as the INGMSG02 fragment.  The ATs are loaded after a successful test load. This allows the agent to inform the AM about any load problem for the AT. The agent may notify the AM of an AT load failure, thus stopping the configuration refresh.  The SA z/OS Agent will not load any MRT.  This is the default value.
	3	The SA z/OS automation agent is enabled to load the MRT that is generated by the customization dialog and to refresh the MRT when an INGAMS REFRESH is issued. The AT built by the customization dialog is dynamically loaded into storage as the INGMSG02 fragment. The MRT built by the customization dialog is dynamically loaded as INGMRT01. The ATs and the MRT will be loaded after a successful test load. If an error is detected in the MRT, then the Agent initialization is not interrupted and no MRT is loaded. If an error is detected when a configuration refresh is requested, then the refresh is not performed.
AOFSPoolFULLCMD	1	SA z/OS does not execute the Spool recovery passes more than once. Message AOF2941I is issued if the SPOOLFULL condition persists.
	0	SA z/OS re-executes the Spool recovery commands.  0 is the default setting.
AOFSPoolSHORTCMD	1	SA z/OS does not execute the Spool recovery passes more than once. Message AOF2941I is issued if the SPOOLSHORT condition persists.
	0	SA z/OS re-executes the Spool recovery commands.  0 is the default setting.

## Global Variables

Table 25. Global Variables to Enable Advanced Automation (CGLOBALS) (continued)

Variable	Value	Effect
AOFSTATUSCMDSEL	0	Issue all status commands or replies that are associated with the new status, without respect to any specified selection values. No thresholds are checked for the minor resource <i>subsystem.status</i> to derive selection criteria or prevent the issuing of commands or replies if critical thresholds are exceeded.  If AOFSTATUSCMDSEL is not set, or it is set to a value other than 0, only commands or replies with a given selection criterion such as starttype or stoptype are issued.
AOFUPDAM	Yes or No	This controls whether updates are made in the automation manager.  No is the default setting.
AOFUPDRODM	Yes or No	This controls whether updates are made in RODM and must be set to the same value for each system within a sysplex.  No is the default setting.
AOFUSSWAIT	1 to <i>n</i>	This is the number of seconds SA z/OS waits for the completion of a user-defined z/OS UNIX monitoring routine (specified in the z/OS UNIX Control Specification panel) until it receives a timeout. When the timeout occurs, SA z/OS no longer waits for a response from the monitoring routine and sends a SIGKILL to the monitoring routine.  10 is the default setting.
INGCICS_CORRWAIT	User-defined numeric value	The number of seconds that INGCICS waits for output from a CICS transaction. If not specified, INGCICS uses a default CORRWAIT (CCDEF) value.
INGIMS_CORRWAIT	User-defined numeric value	The number of seconds that INGIMS waits for output from an IMS command. If not specified, INGIMS uses the default CORRWAIT (CCDEF) value.
INGOPC_MULTIPLIER	1 to <i>n</i>	This is used in conjunction with AOFRMTCMDWAIT and AOFRPCWAIT to determine how long to wait before giving up.
INGRAITF_WAIT	User-defined numeric value	The number of seconds that the INGRAITF routine waits.
INGREQ_ORIGINATOR	1	Indicates that SA z/OS assigns individual originator IDs for each operator issuing an INGREQ command.
	0	All operators are grouped under originator ID OPERATOR.  0 is the default setting.

## Parameter Defaults for Commands

Table 26. Global Variables That Define the Installation Defaults for Specific Commands

Variable Name	Description	Reference <sup>1</sup>
AOFSETSTATEOVERRIDE	Sets the default OVERRIDE value for the SETSTATE command.	SETSTATE

Table 26. Global Variables That Define the Installation Defaults for Specific Commands (continued)

Variable Name	Description	Reference <sup>1</sup>
AOFSETSTATESCOPE	Allows you to override the predefined default for the SCOPE parameter of the SETSTATE command.	SETSTATE
AOFSETSTATESTART	Allows you to override the predefined default for the START parameter of the SETSTATE command.	SETSTATE
DISPEVT_WAIT	Sets the WAIT parameter of the DISPEVT command to the specified value.	DISPEVT
DISPEVTS_WAIT	Sets the WAIT parameter of the DISPEVTS command to the specified value.	DISPEVTS
DISPTRG_WAIT	Sets the WAIT parameter of the DISPTRG command to the specified value.	DISPTRG
INGAUTO_INTERVAL	Sets the default for the INTERVAL parameter of the INGAUTO command.	INGAUTO
INGEVENT_WAIT	Sets the WAIT parameter of the INGEVENT command to the specified value. The parameter specifies whether or not to wait until the request is complete.	INGEVENT
INGEXEC_RESP	Sets the RESP parameter of the INGEXEC command to the specified value.	INGEXEC
INGEXEC_SELECT	Sets the SELECT parameter of the INGEXEC command to the specified value.	INGEXEC
INGEXEC_WAIT	Sets the WAIT parameter of the INGEXEC command to the specified value.	INGEXEC
INGGROUP_WAIT	Sets the WAIT parameter of the INGGROUP command to the specified value. The parameter specifies whether or not to wait until the request is complete.	INGGROUP
INGHIST_MAX	Sets the MAX parameter of the INGHIST command to the specified value.	INGHIST
INGHIST_WIMAX	Sets the WIMAX parameter of INGHIST command to the specified value.	INGHIST
INGIMS_CMDWAIT	Sets the CMDWAIT parameter (the maximum wait time for a command to complete) of the INGIMS command to the specified value.	INGIMS
INGIMS_REQ	Sets the REQ parameter (the request to be issued to the IMS subsystem) of the INGIMS command to the specified value.	INGIMS
INGINFO_WAIT	Sets the WAIT parameter of the INGINFO command to the specified value.	INGINFO
INGLIST_WAIT	Sets the WAIT parameter of the INGLIST command to the specified value.	INGLIST
INGMON_WAIT	Sets the WAIT parameter of the INGMON command to the specified value.	INGMON
INGMOVE_WAIT	Sets the WAIT parameter of the INGMOVE command to the specified value.	INGMOVE
INGRELS_SHOW	Sets the SHOW parameter of the INGRELS command to the specified value.	INGRELS
INGRELS_WAIT	Sets the WAIT parameter of the INGRELS command to the specified value.	INGRELS
INGREQ_EXPIRE	Sets the default EXPIRE parameter of the INGREQ command to the specified value.	INGREQ

## Global Variables

Table 26. Global Variables That Define the Installation Defaults for Specific Commands (continued)

Variable Name	Description	Reference <sup>1</sup>
INGREQ_INTERRUPT	Sets the default INTERRUPT parameter of the INGREQ command to the specified value. The parameter specifies whether or not the automation manager should wait until the resource has reached its UP state, but the resource is still in the startup phase when the higher priority stop request is given.	INGREQ
INGREQ_OVERRIDE	Sets the default OVERRIDE parameter of the INGREQ command to the specified value.	INGREQ
INGREQ_PRECHECK	Sets the default PRECHECK parameter of the INGREQ command to the specified value.	INGREQ
INGREQ_PRI	Sets the default priority (PRI parameter) of the INGREQ command to the specified value.	INGREQ
INGREQ_PRI.E2EMGR	Specifies the priority that incoming requests from the end-to-end automation manager are executed at. Default: LOW	INGREQ
INGREQ_REMOVE	Sets the default value for the REMOVE parameter of the INGREQ command to the specified value. If the resource reaches the specified status (condition), the request is automatically removed.	INGREQ
INGREQ_REMOVE.START	Sets the default value for the REMOVE parameter of the INGREQ START command. If not specified the value set by INGREQ_REMOVE is used.	INGREQ
INGREQ_REMOVE.STOP	Sets the default value for the REMOVE parameter of the INGREQ STOP command. If not specified the value set by INGREQ_REMOVE is used.	INGREQ
INGREQ_RESTART	Sets the default for the RESTART parameter of the INGREQ command when shutting down the resource.	INGREQ
INGREQ_SCOPE	Sets the SCOPE parameter of the INGREQ command to the specified value.	INGREQ
INGREQ_SOURCE	Sets the default SOURCE parameter of the INGREQ command to the specified value. The parameter specifies the originator of the request.	INGREQ
INGREQ_TIMEOUT	Sets the interval in minutes used to check for the INGREQ command used to check whether the request has been successfully completed, and whether to send a message or cancel the request if it has not been satisfied after that time.	INGREQ
INGREQ_TYPE	Sets the default startup/shutdown type (TYPE parameter) of the INGREQ command to the specified value.	INGREQ
INGREQ_VERIFY	Sets the default VERIFY parameter of the INGREQ command to the specified value.	INGREQ
INGREQ_WAIT	Sets the WAIT parameter of the INGREQ command to the specified value.	INGREQ
INGRPT_WAIT	Sets the WAIT parameter of the INGRPT command to the specified value.	INGRPT
INGRUN_WAIT	Sets the WAIT parameter of the INGRUN command to the specified value.	INGRUN
INGSCHED_WAIT	Sets the WAIT parameter of the INGSCHED command to the specified value. The parameter specifies whether or not to wait until the request is complete.	INGSCHED
INGSET_VERIFY	Sets the default VERIFY parameter of the INGSET command to the specified value.	INGSET



Table 26. Global Variables That Define the Installation Defaults for Specific Commands (continued)

Variable Name	Description	Reference <sup>1</sup>
INGSET_WAIT	Sets the WAIT parameter of the INGSET command to the specified value. The parameter specifies whether or not to wait until the request is complete.	INGSET
INGSTX_WAIT	Sets the WAIT parameter of the INGSTX command to the specified value.	INGSTX
INGTRIG_WAIT	Sets the WAIT parameter of the INGTRIG command to the specified value.	INGTRIG
INGVOTE_EXCLUDE	Sets the EXCLUDE parameter of the INGVOTE command to the specified value. The parameter specifies the resource types (for example SVP or GRP) to be excluded when showing all requests. Resources of that type are filtered out.	INGVOTE
INGVOTE_SOURCE	Sets the default SOURCE parameter of the INGVOTE command to the specified value.	INGVOTE
INGVOTE_STATUS	Sets the STATUS parameter of the INGVOTE command to the specified value. The parameter specifies which requests should be displayed: winning, losing or all.	INGVOTE
INGVOTE_WAIT	Sets the WAIT parameter of the INGVOTE command to the specified value.	INGVOTE

1. See the specified command in *IBM Tivoli System Automation for z/OS Operator's Commands*.



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## Appendix B. Customizing the Status Display Facility

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### Overview of the Status Display Facility

This appendix explains how to customize the Status Display Facility (SDF) panels, descriptors, and operations.

#### How the Status Display Facility Works

The SA z/OS Status Display Facility (SDF) uses colors and highlighting to represent subsystem resource states. Typically, a subsystem shown in green on the SDF status panel indicates it is up, while red indicates a subsystem in a stopped or problem state. SDF can be tailored to present the status of system components in a hierarchical manner.

**Note:** SDF works only with MVS systems and resources.

#### Types of SDF Panels

Figure 51 on page 244 shows several SDF screens for system CHI01. This figure shows the main types of panels used in SDF:

- The *root component*
- The *status component*
- The *detail status display*

In addition to these panel types, you can create other types of panels according to your system requirements and the applications you are monitoring.

## Overview of the Status Display Facility

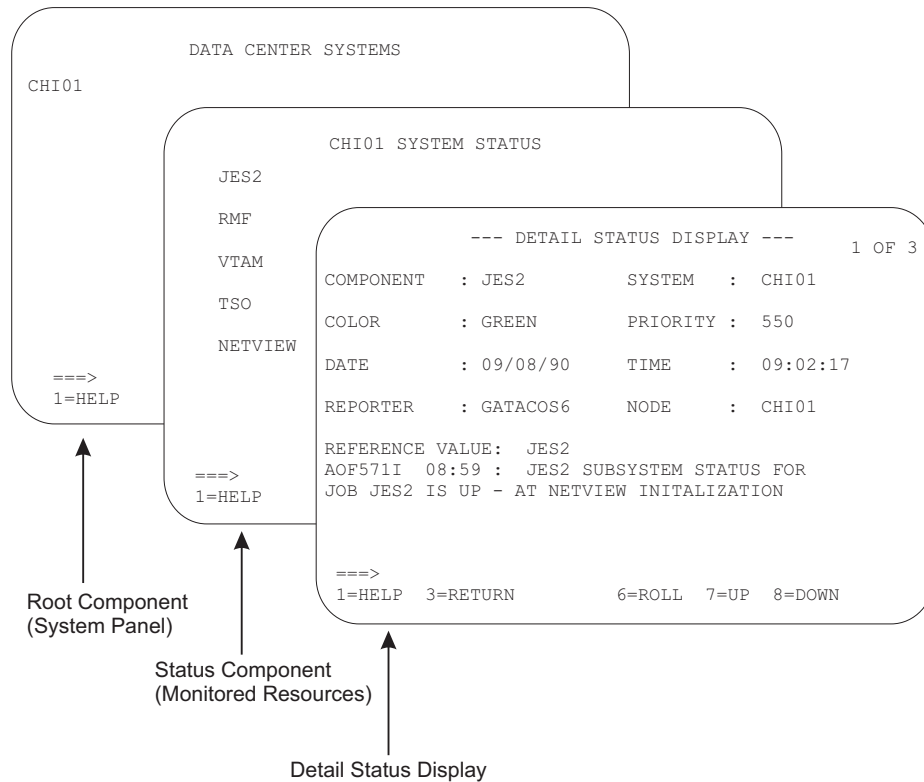


Figure 51. Example SDF Panels

### Root Component

The root component is typically an element appearing on the first screen displayed when SDF is started. In Figure 51, the CHI01 system is the root component.

### Status Component

Resources monitored by SDF are called *status components*. In Figure 51, system CHI01 has JES2, RMF™, VTAM, TSO, and NetView status components, as shown on the CHI01 System Status panel. The status component panel displays all monitored resources in a system. Each monitored resource is shown in the color of its current status. For example, JES2 is shown in green if it is up.

### Detail Status Display

A detail status display is built from information in a status descriptor (see “Status Descriptors”). This panel is displayed by tabbing to the appropriate resource on the status component panel and pressing the detail PF key. Each status component can have one or more status descriptors, or detail records, associated with it.

Figure 51 shows an example detail status display for a JES2 status descriptor. The 1 of 3 on the panel indicates that JES2 currently has three status descriptors, and therefore three detail status displays, associated with it.

## Status Descriptors

A *status descriptor* is a detailed record of information about a resource status. In its raw form, a status descriptor is a multiline SA z/OS message containing information such as:

- Root component and status component to which the status descriptor applies

- Priority, color, and highlighting associated with the status descriptor (see “How Status Descriptors Affect SDF” on page 246 for more information)
- Date and time the status descriptor was generated
- Actual resource status information; for example, an SA z/OS message indicating the resource is up

SDF uses information in a status descriptor to generate a detail status display (see “Detail Status Display” on page 244). You do not usually look directly at a status descriptor; rather, you look at portions of it through a detail status display. For example, in Figure 51 on page 244, the detail status display presents information from a status descriptor for status component JES2. The 1 of 3 on the panel indicates that JES2 currently has three status descriptors associated with it.

SDF generates, displays, and deletes status descriptors.

### SDF Tree Structures

SDF uses *tree structures* to set up the hierarchy of monitored resources displayed on SDF status panels. An SDF tree structure always starts with the system name as the root node and has a level number of one. Tree structure levels subordinate to the root node are the monitored resources. The level numbers of these resources reflect their dependency on each other.

You define SDF tree structures in NetView DSIPARM data set member AOFTREE.

Figure 52 shows an example SDF tree structure. Figure 51 on page 244 shows how these statements result in a tree structure.

```
1 SY1
  2 SYSTEM
    3 WTOR
    3 APPLIC
      4 AOFAPPL
        5 AOFSSI
      4 JES
      4 VTAM
    3 TSO
    3 RMF
  2 GATEWAY
  2 MONITOR
  2 APG
    3 GROUP
```

Figure 52. Example SDF Tree Structure

SA z/OS supplies a sample SDF tree structure in the SA z/OS sample library. This tree structure is referenced by a %INCLUDE statement in member AOFTREE in the NetView DSIPARM data set. You can customize this sample tree structure to meet your requirements. This order of dependency does *not* have to be the same as that used for system startup or shutdown using SA z/OS. System symbols are supported for the tree structure. This can help reduce both customization work and errors.

For example, using the tree structure in Figure 52, if there is a problem with TSO, it is not desirable to also change the VTAM status color, because VTAM is not having any problems. In contrast, in the SA z/OS startup and shutdown procedures, TSO is dependent on VTAM.

## Overview of the Status Display Facility

More details on SDF tree structure definitions are in “Step 1: Defining SDF Hierarchy” on page 253.

### How Status Descriptors Affect SDF

Status descriptors are the main units of information SDF uses. The information in status descriptors determines how your SDF status displays look at any point in time. This section explains how SDF uses status descriptors.

#### Priority and Color Assignments

Status descriptors are assigned both a priority number and a color. These color and priority assignments determine the colors in which status components are displayed. In SDF, a lower number indicates a higher priority. Status descriptors are connected to the status component in ascending order of priority.

Color and priority assignments for status descriptors are defined in two places:

- In the PRIORITY parameter in the AOFINIT member of the NetView DSIPARM data set. This parameter defines initial priority and color assignments used for status descriptors. The values defined in AOFINIT are used if no further customization is done to priority and color assignments. The default priority ranges and colors used in AOFINIT are:

Priority Range	Color
001 to 199	Red
200 to 299	Pink
300 to 399	Yellow
400 to 499	Turquoise
500 to 599	Green
600 to 699	Blue

White is used as the default status descriptor color (the DCOLOR parameter in member AOFINIT, described in *IBM Tivoli System Automation for z/OS Programmer's Reference*) and as the default color for a status component without a tree structure entry (the ERRCOLOR parameter in member AOFINIT, described in *IBM Tivoli System Automation for z/OS Programmer's Reference*). For more information on the PRIORITY parameter, see *IBM Tivoli System Automation for z/OS Programmer's Reference*.

- In the SDF definitions in the Status Details policy object. These entries define colors, highlighting, and priorities used for particular resource statuses. Color and priority assignments defined in the customization dialog can be used to override assignments in the AOFINIT member.

**Note:** Some of the resource statuses that appear in SDF displays do not directly correspond to resource statuses used in the automation status file. *IBM Tivoli System Automation for z/OS User's Guide* shows the default resource status types, colors, highlighting, and priorities provided with SA z/OS. These settings define to SA z/OS the parameters used when adding status descriptors to SDF.

For more information on the SDF Status Details definition, see “Step 4: (Optional) Defining SDF in the Customization Dialog” on page 258.

#### Chaining of Status Descriptors to Status Components

A resource status change causes a status descriptor to be generated. SDF adds this status descriptor to a chain of status descriptors. Chained status descriptors

## Overview of the Status Display Facility

determine the status and color of status components. The highest-priority status descriptor in a chain determines the initial color in which the status component is displayed. The underlying chained priority numbers determine the color that successive detail status displays are shown in.

Status descriptors are chained off each level of status component in a tree structure. Status descriptors chained to lower-level status components are also chained to a higher-level status component, again in order of priority. Status descriptors are also chained off the root component. These status descriptors are all the status descriptors that currently exist at all levels of the tree structure.

For example, Figure 53 shows status descriptors currently generated for system SY1. The priority for each status descriptor is shown by a number.

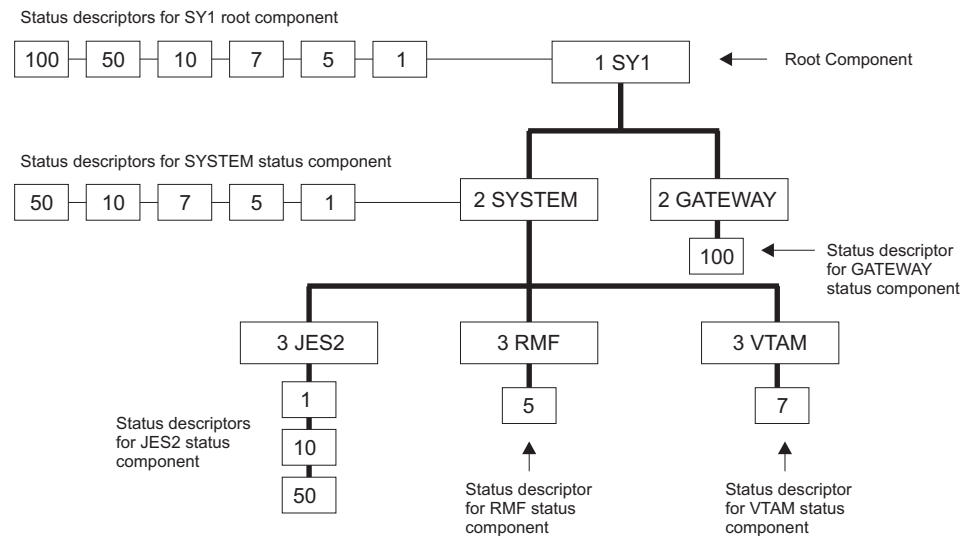


Figure 53. Status Descriptors Chained to Status Components

The status components at the lowest level in this tree structure, JES2, RMF, and VTAM, have status descriptors chained off them. Status component JES2 has three status descriptors chained, with priorities 1, 10, and 50. Because 1 is the highest priority, the status descriptor with priority 1 is organized first in the chain. This highest-priority status descriptor determines the color in which JES2 is displayed on the status panel. If an operator uses the detail PF key to view detail status displays for JES2, the information contained in the status descriptor with priority 1 is displayed first, then the detail status display for the status descriptor with priority 10, and so on.

At the SYSTEM status component level in the tree structure, all status descriptors from the lower-level status components are also chained. Because the status descriptors chained to RMF and VTAM have higher priorities than the priority 10 and 50 status descriptors for JES2, they are organized after the priority 1 status descriptor in the chain. An operator using the detail PF key at the SYSTEM level could view five detail status displays, ranging from priority 1 to priority 50.

Similarly, at the SY1 level in the tree structure, all status descriptors chained to all status components in the tree structure are chained in order of priority. An operator using the detail PF key at the SY1 level could view six detail status displays, ranging from priority 1 to priority 100.

## Overview of the Status Display Facility

If a status component has multiple status descriptors with equal priorities, the status descriptors are chained off the status component in order of arrival time.

When a status descriptor no longer accurately reflects the actual status of a resource, SDF automatically deletes it from status descriptor chains. As an example of how priority determines order of status descriptors, suppose two status descriptors currently exist for status component JES2. If there are two status descriptors for JES2 with priorities of 120 and 140, the status descriptor with priority 120 is displayed first. In both cases, JES displays in red on the SDF status panel.

In SA z/OS, all statuses are defined in the automation control file. When an automation event occurs, the SA z/OS AOCUPDT command scans the automation control file for the SDF entry for that status. SA z/OS issues a request to add the status using the information from the automation control file.

For example, suppose subsystem RMF, shown on the example SDF panels in Figure 51 on page 244, is set to a STOPPING state. The SA z/OS AOCUPDT command scans the automation control file for the STOPPING state entry for SDF and generates a status descriptor, specifying a priority of 330. SDF adds the status descriptor to the RMF status component. RMF appears as yellow and blinking on the status panel. Once RMF is in a stopped state, the AOCUPDT command scans the automation control file for the STOPPED state SDF entry and generates a status descriptor with priority 130. SDF adds this new status descriptor to the RMF status component. Now, RMF appears in red on the SDF status panel.

### Propagating Status Descriptors Upward and Downward in a Tree Structure

Based on the order of dependencies defined in a tree structure, status descriptors can be *propagated* upward or downward to status components in a tree structure. This propagation of status descriptors affects the color in which status components are displayed, as well as the detail status displays operators can view by using the detail PF key on a particular status component.

Propagation of status upward and downward in a tree structure is defined by the PROPUP and PROPDOWN parameter in the AOFINIT member (see *IBM Tivoli System Automation for z/OS Programmer's Reference* for descriptions).

The SA z/OS-provided defaults for status propagation in the AOFINIT member are to propagate status upward (PROPUP=YES) but not downward (PROPDOWN=NO).

When status is propagated upward in a tree structure, if a status descriptor is added or deleted at a lower level in the tree structure, it is also added or deleted from the cumulative chain of status descriptors at a higher-level node in the tree structure.

Propagation of status upward in a tree structure consolidates the status of all monitored resources in the system at the root node. In this way, the color of the root node reflects the most important or critical status in a computer operations center. For example, in Figure 52 on page 245, any color changes for AOFSSI are reflected in AOFAPPL, APPLIC, SYSTEM, and SY1, if SDF propagates status changes upward in the tree structure. In Figure 51 on page 244, if all monitored resources are green, the root node CHI01 on the Data Center Systems panel is also shown in green.



When status is propagated downward in a tree structure, if a status change occurs at a higher level in a tree structure, the changes are sent downward in the tree structure. This propagating downward could cause status descriptors at lower levels in the tree structure to be added or deleted.

Propagating status downward can be useful when an entire system is down. In such a case, you want SDF status panels to accurately reflect the system status. You do not want status components lower in the tree structure to retain previously generated status descriptors indicating that the components are up and running, because these status descriptors do not accurately reflect the status of the components. You can configure your SDF implementation to propagate status downward, and remove all status descriptors from all status components in a tree structure. If an operator tries displaying detailed status about any of the status components lower in the tree structure, they receive "NO DETAIL INFO AVAILABLE" messages. The empty chain color, defined by the EMPTYCOLOR parameter in member AOFINIT with a default color of blue, is also used to indicate that no detail information is available. See *IBM Tivoli System Automation for z/OS Programmer's Reference* for the EMPTYCOLOR description.

### How SDF Helps Operations to Focus on Specific Problems

SDF structure and processing allows the program identifying a problem to be concerned only with the specific problem.

For example, suppose an application program detects a warning message for status component JES on CHI01. The following processing steps occur:

1. The application program issues a request to SDF to add a status descriptor for JES.
2. The status entry for JES on system CHI01 now indicates there is a problem with JES. If the SDF is configured to propagate status up the hierarchical tree structure, the status for system CHI01 also reflects the problem state. See *IBM Tivoli System Automation for z/OS Programmer's Reference* for details on the PROPUP SDF initialization parameter.
3. Now, suppose another more serious problem occurs. The application program which detects this new problem issues another request to SDF to add a status descriptor having a lower priority number than the status descriptor for the first problem.
4. Because status descriptors are chained in order of priority, the JES status now reflects the status descriptor color of the more serious problem.
5. When the more serious problem is resolved, the application program detecting the problem resolution issues a request to SDF to remove the status descriptor for this problem from the chain of JES status descriptors.
6. The status panel is updated to reflect the first problem.

### How SDF Panels Are Defined

All SDF status panels, apart from detail status display panels, are defined in the AOFFNLS member of the NetView DSIPARM data set.

Member AOFFNLS can contain either one or both of the following:

- %INCLUDE statements referencing other NetView DSIPARM members containing definitions of panels. The %INCLUDE statement causes the named panel definition member to be loaded. This is the recommended method, and

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the method used in the SA z/OS-provided version of AOFPNLS. System symbols are supported for the %INCLUDE statements. This can help reduce both customization work and errors.

- Panel structure definitions for all SDF panels.

Panel members defined or referenced in AOFPNLS are loaded into system memory, and may be deleted, replaced, or temporarily made resident using the SDFPANEL command (see *IBM Tivoli System Automation for z/OS Programmer's Reference* for command description).

Panels that are to be dynamically loaded as needed (see “Dynamically Loading Tree Structure and Panel Definition Members”) must be defined in a NetView DSIPARM member having the same member name as the panel itself.

It is recommended that you include only frequently used panels in AOFPNLS, to conserve system memory. Other panels can be dynamically loaded when needed, either by pressing a SDF function key or by using the SCREEN command.

**Note:** Dynamic refresh only works with panels that are defined in AOFPNLS.

SDF internally formats and builds detail status display panels from the information in a status descriptor. You do not have to define and format detail status display panels. Status components defined in the panel definitions must also be defined in the corresponding tree structure. However, not all status components defined in the tree structure require a corresponding entry on the SDF status panel. For example, in Figure 52 on page 245, the APPLIC status component is only a pseudo-entry and may not actually be displayed on any SDF status display panel.

SDF status panels can be customized to reflect any environment. For example, you can define a panel to show the status of all JES subsystems on all processors in a computer operations center. The JES operator can view the panel to determine the status of any JES subsystem in the complex.

For detailed information on defining SDF panels, see “Step 2: Defining SDF Panels” on page 254.

## Dynamically Loading Tree Structure and Panel Definition Members

Using %INCLUDE statements in the main SDF tree structure and panel definition members allows you to dynamically load tree structure and panel definition members without restarting SDF (see *IBM Tivoli System Automation for z/OS Programmer's Reference*). The SDFTREE command loads a tree structure definition member. The SDFPANEL command loads a panel definition member. You can dynamically reload members AOFTREE and AOFPNLS themselves.

The RESYNC SDFDEFS command generates the SDF panels using the advanced automation option (AAO) AOF\_AAO\_SDFROOT\_LISTn for the SDF root names that are to be applied. (See *IBM Tivoli System Automation for z/OS Operator's Commands*).

Refer to the "Status Component Panel Definition" in *IBM Tivoli System Automation for z/OS Programmer's Reference* for the setup of AOF\_AAO\_SDFROOT\_LISTn variables.

## Using SDF for Multiple Systems

You can configure SDF so that multiple systems in an automation network can forward their resource status information to the SDF on the focal point system. In a multiple-system environment, the following must be defined:

- The tree structure for each system must be defined in the AOFTREE member of NetView DSIPARM on the focal point system SDF. The root name must be unique for each system tree structure.
- For target system SDF status update to occur on a focal point SDF, SA z/OS focal point services must already be implemented.

Because each root name must be unique in a multiple-system environment, any status component on any system defined to the focal point SDF can be uniquely addressed by prefixing the status component with the root component name:

ROOT\_COMPONENT.STATUS\_COMPONENT

For example:

SY1.JES2

Similarly, any SDF status descriptors forwarded from the target system to the focal point SDF are prefixed with the root name of the target system by SA z/OS routines.

## SDF Components

SDF consists of the following components:

Table 27. SDF Components

Name	Type	Purpose
AOFTDDF	Task	Initializes SDF and maintains the status database. This initialization is an automated function.
SDF	Command	Starts an SDF operator session.
SDFTREE	Command	Dynamically loads or deletes an SDF tree structure definition member from the NetView DSIPARM data set.
SDFPANEL	Command	Dynamically loads or deletes an SDF panel definition member from the NetView DSIPARM data set.
AOFINIT	Input file	Contains SDF initialization parameters defined with the statements described in <i>IBM Tivoli System Automation for z/OS Programmer's Reference</i> . AOFINIT is in the NetView DSIPARM data set.
AOFTREE	Input file	Contains tree structures described in <i>IBM Tivoli System Automation for z/OS Programmer's Reference</i> . This member usually consists of a list of %INCLUDE statements referencing other members containing tree structures. AOFTREE is in the NetView DSIPARM data set.
AOFPNLS	Input file	Contains SDF panel parameters defined by the statements described in "Step 2: Defining SDF Panels" on page 254. This member usually consists of a list of %INCLUDE statements referencing other members containing panel definitions. AOFPNLS is in the NetView DSIPARM data set.

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Table 27. SDF Components (continued)

Name	Type	Purpose
<i>panel_name</i>	Input file	A DSIPARM member containing the definition of one or more SDF panels or %INCLUDE statements identifying other DSIPARM panel definition members. It is highly recommended that panel definition members contain the definition of a single panel having the same name as the member.
<i>tree_name</i>	Input file	A DSIPARM member containing the definition of one or more tree structures. It is highly recommended that tree definition members contain the definition of a single tree having the same root component name as the member name.

### How the SDF Task Is Started and Stopped

During SA z/OS initialization, the AOFTDDF task loads members defining panel format, panel flow, and tree structures. Member AOFINIT defines parameters common to all SDF panels and basic initialization specifications, such as screen size, default PF keys, and the initial screen displayed when a SDF session is started. These AOFINIT parameters are described in *IBM Tivoli System Automation for z/OS Programmer's Reference*.

#### Starting the SDF Task

In SA z/OS code, the AOFTDDF task is started by the following command:

```
START TASK=AOFTDDF
```

#### Stopping the SDF Task

In SA z/OS code, the AOFTDDF task is stopped by the following command:

```
STOP TASK=AOFTDDF
```

**Note:** When SDF is restarted, all existing SDF status descriptors are lost, as they are kept only in memory.

---

## SDF Definition Process

Use the following procedure to define the panels displayed in an SDF session. Details on each step are provided later in this chapter and in *IBM Tivoli System Automation for z/OS Programmer's Reference*.

1. Define the hierarchy of monitored resources used for your SDF panels, using tree structure statements in NetView DSIPARM data set members. These tree structure definition members should be referenced by %INCLUDE statements in the main SDF tree structure definition member, AOFTREE, in the NetView DSIPARM data set. See *IBM Tivoli System Automation for z/OS Programmer's Reference* for details.
2. Define SDF status panels using panel definition statements in NetView DSIPARM data set members. Panels can either be automatically loaded when SDF starts, or dynamically loaded using the SDFPANEL command. For panels to be automatically loaded, add a %INCLUDE statement specifying the panel definition member to the main panel definition member, AOFPNLS, in the NetView DSIPARM data set. See "Step 2: Defining SDF Panels" on page 254 for details.

Define and customize SDF status panels in the following general order:

- a. Root panel

- b. Status component panel for each entry on the root panel
  - c. Any other customized status panels.
3. Customize the SDF initialization parameters in NetView DSIPARM member AOFINIT, if necessary (optional), or use defaults. See *IBM Tivoli System Automation for z/OS Programmer's Reference* for detailed descriptions of SDF initialization parameters. Using defaults is recommended.
  4. Define SDF resource status, color, highlight and priority values using the customization dialog to edit the SDF Status Display policy object, or use defaults. This step is optional. See *IBM Tivoli System Automation for z/OS Defining Automation Policy* for the description of the Status Display policy object. Using defaults is recommended.

**Notes:**

1. Resources that SA z/OS is not currently automating are not displayed on SDF panels.
2. To display the status of multiple systems and forward status from target systems to SDF on a focal point system, SA z/OS focal point services must already be implemented. See *IBM Tivoli System Automation for z/OS Defining Automation Policy* for details on configuring focal point services.

**Step 1: Defining SDF Hierarchy**

Member AOFTREE in the NetView DSIPARM data set contains a set of definitions that define the propagation hierarchy for status color changes. When the status changes for a component, the corresponding color change is propagated up or down the tree to the next higher or lower level component. The level is determined by the level number assigned to each component. The type of propagation is determined either by the entry in the AOFINIT member or by individual requests to add a status descriptor to a status component.

**Note:** SA z/OS does not use this SDF hierarchy for subsystem shutdown or startup procedures. Instead, SA z/OS uses subsystem entries defined in the automation policy to determine startup and shutdown relationships and hierarchies.

**Tree Structure Definitions**

AOFTREE contains tree structure definitions. To define tree structures, you can:

- Use %INCLUDE statements that reference other members containing definitions for specific tree structures. This is the recommended method, and the method used in the SA z/OS-provided version of AOFTREE.  
On the %INCLUDE statement, the name of the referenced member must be enclosed in parentheses.
- Place all tree structure definitions in AOFTREE.
- Use a combination of both.

System symbols are supported wherever they are used in the AOFTREE, AOFINIT and AOFPNLS members. This can help reduce both customization work and errors.

Figure 54 on page 254 shows a typical tree structure definition:

## SDF Definition Process

```
1 SY1
  2 SYSTEM
    3 WTOR
    3 APPLIC
      4 AOFAPPL
        5 AOFSSI
      4 JES
      4 VTAM
    3 TSO
    3 RMF
  2 GATEWAY
  2 MONITOR
  2 APG
  3 GROUPS
```

Figure 54. Example Tree Structure Definition

In this tree structure, SY1 is the root component. This definition is in a separate member, named SY1. It is referenced by the following statement in the AOFTREE member:

```
%INCLUDE(SY1TREE)
```

**Loading Tree Structures:** All tree structures need not be loaded during initialization. Some can be loaded dynamically after SDF is started. To do this, use AOFTREE to define those tree structure entries that are loaded during initialization, then use the SDFTREE command to load additional tree structures as needed. For more information, see *IBM Tivoli System Automation for z/OS Programmer's Reference*.

Tree structures loaded after SDF is started must be contained in separate members. Each member must be named after the root component for which the tree structure is defined.

## Step 2: Defining SDF Panels

SDF status panels are defined in NetView DSIPARM member AOFPNLS. SA z/OS loads the panel definitions in AOFPNLS when SDF is initialized.

### Panel Definition Methods

To define panels in AOFPNLS, you can:

- Use %INCLUDE statements referencing separate NetView DSIPARM members containing panel definitions. This is the recommended method, and the method used in the SA z/OS-provided version of AOFPNLS. See “%INCLUDE Statement for SDF Panels” on page 257 for details on using the %INCLUDE statement for SDF panel definition members.
- Include actual definitions for all panels.
- Use a combination of both %INCLUDE statements and panel definitions.
- Include a subset of panel entries to load during initialization, so that additional panel definitions can be loaded only when needed (see *IBM Tivoli System Automation for z/OS Programmer's Reference*).

System symbols are supported wherever they are used in the AOFTREE, AOFINIT and AOFPNLS members. This can help reduce both customization work and errors.

### Panel Definition Structure

The structure of each panel definition is as follows:

- Begin panel definition statement (PANEL)

- Status component definition statements, consisting of pairs of the following statements:
  - STATUSFIELD: defines location of a status component on a panel
  - STATUSTEXT: defines the text displayed in the STATUSFIELD
- Text fields and data definition statements, consisting of pairs of the following statements:
  - TEXTFIELD: defines locations and attributes for constant fields on panels
  - TEXTTEXT: defines text displayed in the TEXTFIELD
- Status panel PF key definitions (PFknn)

You should assign the SDFCONF command to the PF4 key. Use the following definition:

```
PFK4=SDFCONF &ROOT,&COMPAPPL,&RV,&SID,&SNODE,&DATE,&TIME,&DA
```

Using SDFCONF to delete a record in SDF is useful because it prompts you for confirmation before performing the actual deletion. If you do not want the prompt panel to appear, then add ",VERIFY=NO" to the end of the SDFCONF command.

You must call SDFCONF to delete exceptional messages, that is, captured messages with the severity Unusual, Important and Critical. The SDFCONF command removes a message entry from the SDF control structure and also from all other interfaces where the message is shown, for example, TEP and NMC.

- End panel statement (ENDPANEL)

Descriptions of these panel definition statements are in *IBM Tivoli System Automation for z/OS Programmer's Reference*.

## Recommended Order for Defining Panels

When defining panels, it is recommended that you define them in the following order:

1. The root panel
2. The status components for each item listed on the root panel
3. Any other customized status panels

**Note:** This order of defining panels is a recommendation only. You can define your SDF panels in any order desired.

## Example Panel Definition

Figure 55 shows how an example SDF panel looks when it is displayed.

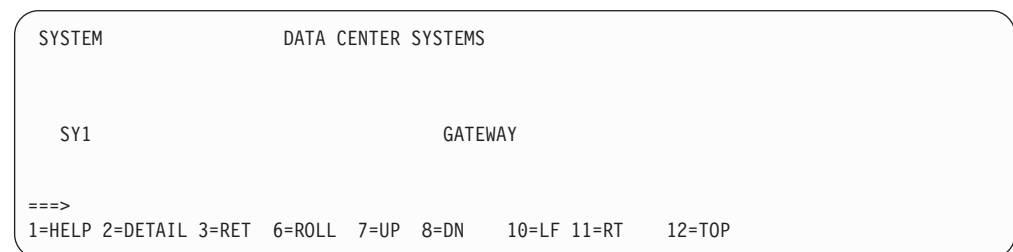


Figure 55. Example SDF Panel

Figure 56 on page 256 shows the panel definition statements required to define the panel in Figure 55.

```

PANEL(SYSTEM,24,80)
TEXTFIELD(01,02,10,WHITE,NORMAL)
TEXTTEXT(SYSTEM)
TF(01,25,57,WHITE,NORMAL)
TT(DATA CENTER SYSTEMS)
STATUSFIELD(SY1,04,04,11,N,,SY1SYS)
STATUSTEXT(SY1)
SF(SY1.GATEWAY,02,40,47,N,,GATEWAY)
ST(GATEWAY)
TF(24,01,79,T,NORMAL)
TT(1=HELP 2=DETAIL 3=RET 6=ROLL 7=UP 8=DN
10=LF 11=RT 12=TOP)
PFK1(AOCHELP SDF)
PFK2(DETAIL)
PFK3(RETURN)
PFK6(ROLL)
PFK7(UP)
PFK8(DOWN)
PFK10(LEFT)
PFK11(RIGHT)
PFK12(TOP)
ENDPANEL

```

Figure 56. Example Panel Definition Entry

In Figure 56, the panel name is SYSTEM. This panel definition can either be in a separate member referenced by a %INCLUDE statement in AOFPNLS or be directly coded in AOFPNLS. The recommended method is to use a separate member and a %INCLUDE statement. If it is in a separate member, the member name is SYSTEM. You do not have to explicitly define every PF key for the panel. PF key definitions not specified are picked up from definitions in NetView DSIPARM member AOFINIT.

Table 28 describes each statement in Figure 56:

Table 28. Panel Definition Entry Description

Statement	Description and Example Value
PANEL(SYSTEM,24,80)	The panel definition statement. The panel name is SYSTEM, the panel length is 24, and the panel width is 80.
TEXTFIELD(01,02,10,WHITE,NORMAL)	The text location statement defining constant panel fields. This field starts on line 01 in position 02 and ends in position 10. The color of the field is white and highlighting is normal.
TEXTTEXT(SYSTEM)	The text data statement specifying the actual data that goes in the text field just defined. This field contains the word SYSTEM.  TEXTFIELD and TEXTTEXT are always grouped in pairs.
TF(01,25,57,WHITE,NORMAL)	Another TEXTFIELD statement for another constant field.
TT(DATA CENTER SYSTEMS)	Another TEXTTEXT statement for the text field just defined.
STATUSFIELD(SY1,04,04,11,N,,SY1SYS)	The location of the status component field. The status component is SY1. This field starts on line 04 in position 04 and ends in position 11. The highlighting level is normal. The next panel displayed when the Down PF key is pressed is SY1SYS.



Table 28. Panel Definition Entry Description (continued)

Statement	Description and Example Value
STATUSTEXT(SY1)	The text data used for the name of the field just defined with the STATUSFIELD statement. In this case, the field name is SY1.  STATUSFIELD and STATUSTEXT statements are grouped in pairs.
SF(SY1.GATEWAY,02,40,47,N,,GATEWAY)	Another STATUSFIELD definition.
ST(GATEWAY)	Another STATUSTEXT definition.
TF(24,01,79,T,NORMAL) TT(1=HELP 2=DETAIL 3=RET 6=ROLL 8=DN 10=LF 11=RT 12=TOP)	Here, TEXTFIELD and TEXTTEXT are used to display PF key definitions. For this panel, these are the default definitions defined in AOFINIT. If you need values differing from the defaults, there is a statement for defining PF keys unique to this panel, DPFKnn. See <i>IBM Tivoli System Automation for z/OS Programmer's Reference</i> for a description of this statement.
PFK1(AOCHHELP SDF) PFK2(DETAIL) PFK3(RETURN) PFK6(ROLL) PFK7(UP) PFK8(DOWN) PFK10(LEFT) PFK11(RIGHT) PFK12(TOP)	PF key definition statements.
ENDPANEL	The end panel statement, indicating that this is the end of definitions for this panel.

## %INCLUDE Statement for SDF Panels

The %INCLUDE statement for SDF has the following features:

- The SDF %INCLUDE statement allows the specification of a list of members rather than a single member only. Each member name in the list represents a DSIPARM member that is to be loaded. Member names in the list are delimited by a comma.
- The SDF %INCLUDE statement requires parentheses around the specified member or members.
- You can specify the option STATIC or DYNAMIC for the SDF %INCLUDE statement. If you specify DYNAMIC, this generates the panel definitions for all of the system names that you specify in AOF\_AAO\_SDFROOT\_LISTn common global variable (see Table 25 on page 230). STATIC is the default.
- The target DSIPARM members may contain only complete panel definitions or additional %INCLUDE statements. Panel definitions must be contained within a single member, and therefore cannot be built using commonly defined segments.

System symbols are supported wherever they are used in the AOF TREE, AOFINIT and AOFPNLS members. This can help reduce both customization work and errors.

### Step 3: (Optional) Customizing SDF Initialization Parameters

Member AOFINIT allows you to define parameters common to all SDF panels and SDF initialization specifications, such as:

- Initial screen shown when SDF is started
- Maximum operator logon limit
- Default PF key definitions
- Detail status display panel PF key definitions
- Detail status display panel PF key descriptions
- Default priorities and colors

These parameters define values for SDF when it is started.

System symbols are supported wherever they are used in the AOFTRREE, AOFINIT and AOFPNLS members. This can help reduce both customization work and errors.

This step of SDF customization is optional. Using SA z/OS-provided default values for these parameters is recommended.

**Note:** User-defined statuses are not saved across a recycle or a monitor cycle. This means the status of a subsystem changes from the user-defined status to an appropriate SA z/OS status.

### Step 4: (Optional) Defining SDF in the Customization Dialog

The SDF entries in the Status Display policy object allow you to define statuses and the priorities assigned to those statuses. These entries are used by SA z/OS commands to gather data for requests to add status descriptors to status components. The format and values used in SDF Status Detail definitions are described in *IBM Tivoli System Automation for z/OS Programmer's Reference*.

This step of SDF customization is optional. Using SA z/OS-provided definitions for SDF is recommended.

---

## Appendix C. How System Operations Coordinates with Automatic Restart Manager

SA z/OS system operations provides coordination with the Automatic Restart Manager. The Automatic Restart Manager (ARM) is a base z/OS component. It is a recovery function that automatically restarts designated applications when:

- The application ends abnormally.
- The system that the application is running on is part of a sysplex, and that system fails. In this case, ARM will attempt to restart the application on another system within the sysplex.

SA z/OS coordinates with ARM to:

- Determine which facility is responsible for restarting a specific application.
- Avoid possible duplications or conflicts in application recovery attempts.
- Allow you to take full advantage of SA z/OS fallback capabilities for applications running on sysplexes. SA z/OS continues to automate an application after it has been moved to a fallback system, provided SA z/OS is installed on that system. If it is not installed on the fallback system, SA z/OS is still aware that the application is active on a system other than its primary one and does not attempt to restart it.

You have to define the Automatic Restart Manager policy using the administrative data utility for ARM policy data (IXCMIAPU) described in *z/OS MVS Setting Up a Sysplex*.

SA z/OS resolves Automatic Restart Manager statuses to SA z/OS statuses, incorporates Automatic Restart Manager-related conditions, and provides one status related to Automatic Restart Manager:

- EXTSTART - The application is being started or restarted externally.

---

### Defining an ARM Element Name

Automatic Restart Manager uses element names to identify the applications with which it works. Each Automatic Restart Manager enabled application must have a unique element name for itself that it uses in all communication with Automatic Restart Manager. Automatic Restart Manager tracks the element name and has its policy defined in terms of element names. If an application moves between systems it **MUST** continue to use the same element name as it did on the original system. For more information on defining Automatic Restart Manager names to SA z/OS, see "Application Entry Type" in *IBM Tivoli System Automation for z/OS Defining Automation Policy*.

All Automatic Restart Manager elements are unregistered initially. Transitions between statuses are caused by:

- IXCARM macro invocations
- Application failures
- System failures
- Timeouts

## Defining an ARM Element Name

A minor resource definition *subsystem.OARM* can be used to tailor automation behaviour during ARM restart processing. As an example, a *subsystem.OARM* minor resource could be specified with a RESTART EXIT enabled to drive a user supplied exit during ARM restart. The user exit would control additional actions to be taken during ARM restart of the subsystem. If the RESTART flag for this minor resource is resolved to 'N', SA z/OS will not allow ARM to attempt a restart of the application.

Rather than use the *subsystem.OARM* minor resource definition, a RESTART EXIT could also be specified against the major resource definition for the application. In this case the exit would be driven for all application restarts, not just ARM.

Other reasons for SA z/OS not to allow ARM to attempt a restart of the application are:

- The application's monitor indicates that the address space is already active.
- The application is involved in a shutdown.
- The application is in status BREAKING, BROKEN, or CTLDOWN.

---

## Defining a MOVE Group for Automatic Restart Manager

All resources with the same ARM element name should be linked to one Sysplex Application Group of nature MOVE (MOVE group).

An application's ARM element name is defined either during creation on the Define New Entry panel for applications or after creation via policy item APPLICATION INFO, in both cases in the **MVS Automatic Restart Management Element Name** field.

In order to ensure an application in a MOVE group has completely deregistered from ARM before the automation manager attempts to restart it, a Prepareavailable/WhenObservedDown (passive) relationship must be defined for each ARMed application in the MOVE group with the MOVE group defined as the supporting resource.

To make sure that the automation manager will start the applications linked to a MOVE group, the applications should not be in a HardDown status. The Start On IPL option should not be set to NO.

For more information on how to define MOVE groups see “Creating a New ApplicationGroup” in *IBM Tivoli System Automation for z/OS Defining Automation Policy*.

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## Appendix D. Message Automation

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### Generic Synonyms: AOFMSGSY

This AOFMSGSY NetView automation table (AT) fragment contains a number of synonyms that must be appropriately set. It is used in most master automation tables to set up the environmental parameters for the other fragments. The AOFMSGSY member is supplied by SA z/OS (in the SINGNPRM data set). You must customize it for each of your systems. The customized copy should be placed in the domain-specific data set for that system.

Note that many values in this table fragment are enclosed in triple single quotation marks. This means that the value of the synonym is the value entered surrounded by a single set of single quotation marks. This is necessary so that the value is treated as a literal and not an automation table variable.

Synonym	Usage and Default
%AOFALWAYSACTION%	<p>This synonym contains the action statement used for all the messages within a Begin-End block that SA z/OS does not trigger any action for.</p> <p><b>Default:</b> NULL</p> <p>The default is that <i>no</i> action is taken and the message does not continue to search for further matches within the same AT.</p>
%AOFDOM%	<p>This synonym should contain the domain ID of the SA z/OS NetView on the system that it is automating. The synonym is used to screen messages to prevent the SA z/OS on this machine from reacting to a message that originated on another machine. If not set correctly, your automation fails.</p> <p><b>Default:</b> &amp;DOMAIN.</p> <p>This is a default domain name used in a number of the samples.</p>
%AOFSYS%	<p>This synonym should contain the system name used in the last IPL of the system. It is used to screen messages to prevent the SA z/OS on this machine from reacting to events that have occurred on other machines. It is important if you are running on a JES3 global or in a sysplex with EMCS consoles. If not set correctly, your automation fails.</p> <p><b>Default:</b> &amp;SYSNAME.</p> <p>This is a default system name used in a number of the samples.</p>
%AOFARMPPI%	<p>This synonym should contain the name of the NetView autotask that is running the PPI interface from SA z/OS to z/OS. It is used to route commands from the NetView automation table to the autotask.</p> <p><b>Default:</b> AOFARCAT</p>

## Generic Synonyms: AOFMSGSY

Synonym	Usage and Default
%AOFGMFHSWAIT%	<p>The time interval SA z/OS waits after GMFHS initialization is complete before issuing the command to update the RODM with the current application automation states. Following the issuing of message DUI4003I GMFHS NETWORK CONFIGURATION INITIALIZED SUCCESSFULLY, GMFHS resets the color of all SA z/OS icons to grey (unknown). To set the SA z/OS icons' color to the current automation states after the initialization of GMFHS, SA z/OS must wait and issue the update command AFTER GMFHS has reset the colors to grey.</p> <p><b>Default:</b> 00:02:00</p>

## SA z/OS Message Presentation: AOFMSGSY

The presentation of SA z/OS messages (prefixed with AOF, ING, HSA, EVJ, EVE and EVI) under NetView is controlled by the automation table. This uses a number of synonyms and task globals indicating your message display characteristics. The following synonyms determine the display characteristics for each type of message. There is one set for the normal presentation of the message (AOFNORMx) and a second set for the held presentation (AOFHOLDx).

Synonym	Usage and Default
%AOFHOLDI%	<p>This synonym defines the actions taken for SA z/OS information (type I) messages that are held on your NCCF console.</p> <p><b>Default:</b> HOLD(Y) COLOR(GRE) XHILITE(REV)</p> <p>This:</p> <ul style="list-style-type: none"> <li>• Ensures that the message is held</li> <li>• Causes the message to be displayed in reverse video green</li> </ul>
%AOFHOLDA%	<p>This synonym defines the actions taken for SA z/OS immediate action (type A) messages that are held on your NCCF console. As a rule, you should specify HOLD(Y) in the action.</p> <p><b>Default:</b> HOLD(Y) COLOR(RED) XHILITE(REV) BEEP(Y)</p> <p>This:</p> <ul style="list-style-type: none"> <li>• Ensures that the message is held</li> <li>• Causes the message to be displayed in reverse video red</li> <li>• Sounds the terminal alarm when the message is displayed</li> </ul>
%AOFHOLDD%	<p>This synonym defines the actions taken for SA z/OS decision (type D) messages that are held on your NCCF console. As a rule, you should specify HOLD(Y) in the action.</p> <p><b>Default:</b> HOLD(Y) COLOR(WHI) XHILITE(REV) BEEP(Y)</p> <p>This:</p> <ul style="list-style-type: none"> <li>• Ensures that the message is held</li> <li>• Causes the message to be displayed in reverse video white</li> <li>• Sounds the terminal alarm when the message is displayed</li> </ul>

## SA z/OS Message Presentation: AOFMSGSY

Synonym	Usage and Default
%AOFHOLDE%	<p>This synonym defines the actions taken for SA z/OS eventual action (type E) messages that are held on your NCCF console. As a rule, you should specify HOLD(Y) in the action.</p> <p><b>Default:</b> HOLD(Y) COLOR(YEL) XHILITE(REV) BEEP(Y)</p> <p>This:</p> <ul style="list-style-type: none"> <li>• Ensures that the message is held</li> <li>• Causes the message to be displayed in reverse video yellow</li> <li>• Sounds the terminal alarm when the message is displayed</li> </ul>
%AOFHOLDW%	<p>This synonym defines the actions taken for SA z/OS wait state (type W) messages that are held on your NCCF console. As a rule, you should specify HOLD(Y) in the action.</p> <p><b>Default:</b> HOLD(Y) COLOR(PIN) XHILITE(REV) BEEP(Y)</p> <p>This:</p> <ul style="list-style-type: none"> <li>• Ensures that the message is held</li> <li>• Causes the message to be displayed in reverse video pink</li> <li>• Sounds the terminal alarm when the message is displayed</li> </ul>
%AOFNORMI%	<p>This synonym defines the actions taken for SA z/OS information (type I) messages that are not held on your NCCF console. As a rule, you should not specify HOLD(Y) in the action.</p> <p><b>Default:</b> COLOR(GRE)</p> <p>This:</p> <ul style="list-style-type: none"> <li>• Ensures that the message is not held</li> <li>• Causes the message to be displayed in green</li> </ul>
%AOFNORMA%	<p>This synonym defines the actions taken for SA z/OS Immediate Action (type A) messages that are held on your NCCF console. As a rule, you should not specify HOLD(Y) in the action.</p> <p><b>Default:</b> COLOR(YEL) XHILITE(REV) BEEP(Y)</p> <p>This:</p> <ul style="list-style-type: none"> <li>• Ensures that the message is held</li> <li>• Causes the message to be displayed in yellow</li> <li>• Sounds the terminal alarm when the message is displayed</li> </ul>
%AOFNORMD%	<p>This synonym defines the actions taken for SA z/OS Decision (type D) messages that are held on your NCCF console. You may find it beneficial to force these messages to be held.</p> <p><b>Default:</b> COLOR(WHI) XHILITE(BLI)</p> <p>This:</p> <ul style="list-style-type: none"> <li>• Ensures that the message is held</li> <li>• Causes the message to be displayed in blinking white</li> </ul>

## SA z/OS Message Presentation: AOFMSGSY

Synonym	Usage and Default
%AOFNORME%	<p>This synonym defines the actions taken for SA z/OS Eventual Action (type E) messages that are not held on your NCCF console. As a rule, you should not specify HOLD(Y) in the action.</p> <p><b>Default:</b> COLOR(YEL)</p> <p>This:</p> <ul style="list-style-type: none"> <li>• Ensures that the message is not held</li> <li>• Causes the message to be displayed in yellow</li> </ul>
%AOFNORMW%	<p>This synonym defines the actions taken for SA z/OS Wait State (type W) messages that are held on your NCCF console. You may find it beneficial to force these messages to be held.</p> <p><b>Default:</b> HOLD(Y) COLOR(PIN) XHILITE(REV) BEEP(Y)</p> <p>This:</p> <ul style="list-style-type: none"> <li>• Ensures that the message is held</li> <li>• Causes the message to be displayed in reverse video pink</li> <li>• Sounds the terminal alarm when the message is displayed</li> </ul>

## Operator Cascades: AOFMSGSY

The next set of synonyms defines a series of *operator cascades*. A cascade is basically a list of automation operators used in many of the fragments to route commands. If %CASCADE% is defined as a synonym for 'AUTMON AUTOBASE AUTO1' and you route a command to it with ROUTE (ONE %CASCADE%) on an EXEC statement, the command is run on the first autotask in the cascade that is logged on. This provides you with a flexible, controllable means of providing backup processing tasks in case one of your normal tasks is unavailable.

Synonym	Usage and Default
%AOFLOPAUTOx%	<p>This cascade defines the actions taken for SA z/OS information (type I) messages that are being held on your NCCF console. Given the number of informational messages that SA z/OS produces you may find it beneficial HOLD(N) to stop them from being held even if the user has asked for them to be held.</p> <p><b>Default:</b> ' 'AUTOx' '</p>
%AOFOPAUTO1%	<p>This cascade is used to route commands to AUTO1. If you have renamed AUTO1 you must change the synonym.</p> <p><b>Default:</b> AUTO1</p> <p>There is no backup for AUTO1. If it fails when it is needed, many other things will probably fail as well.</p>
%AOFOPAUTO2	<p>This cascade is used to route commands to AUTO2. If you have renamed AUTO2 you must change this synonym.</p> <p><b>Default:</b> AUTO2 AUTO1</p> <p>If AUTO2 is not active, AUTO1 does its work.</p>



## Operator Cascades: AOFMSGSY

Synonym	Usage and Default
%AOFOPBASEOPER%	<p>This cascade is used to send commands to BASEOPER. If you are not using the standard names for SA z/OS autotasks you must change this synonym. BASEOPER is mainly defined as a fallback operator and has very little work directly routed to it.</p> <p><b>Default:</b> AUTOBASE AUTO1</p> <p>AUTOBASE is the operator ID that SA z/OS uses for BASEOPER in its other samples. If AUTOBASE is not active, AUTO1 is tried.</p>
%AOFOPRPCOPER%	<p>This cascade is used for XCF communication management. If you are not using the standard names for SA z/OS autotasks you must change this synonym.</p> <p><b>Default:</b> AUTRPC AUTSYS AUTOBASE AUTO1</p>
%AOFOPSYSOPER%	<p>This cascade is used to send commands to SYSOPER. If you are not using the standard names for SA z/OS autotasks you must change this synonym. SYSOPER is mainly defined as a fallback operator and has very little work directly routed to it.</p> <p><b>Default:</b> AUTSYS AUTOBASE AUTO1</p> <p>AUTSYS is the operator ID that SA z/OS uses for SYSOPER in its other samples.</p>
%AOFOPMSGOPER%	<p>This cascade is used to send commands to MSGOPER. If you are not using the standard names for SA z/OS autotasks you must change this synonym. MSGOPER is mainly defined to respond to miscellaneous messages.</p> <p><b>Default:</b> AUTMSG AUTSYS AUTOBASE AUTO1</p> <p>AUTMSG is the operator ID that SA z/OS uses for MSGOPER in its other samples.</p>
%AOFOPNETOPER%	<p>This cascade is used to send commands to NETOPER. If you are not using the standard names for SA z/OS autotasks you must change this synonym. NETOPER is defined for VTAM automation.</p> <p><b>Default:</b> AUTNET1 AUTNET2 AUTSYS AUTOBASE AUTO1</p> <p>AUTNET1 and AUTNET2 are the operator IDs that SA z/OS uses for NETOPER in its other samples. NETOPER is the only sample automation function to have a backup defined in the samples.</p>
%AOFOPJESOPER%	<p>This cascade is used to send commands to JESOPER. If you are not using the standard names for SA z/OS autotasks you must change this synonym. JESOPER is mainly defined for JES automation.</p> <p><b>Default:</b> AUTJES AUTSYS AUTOBASE AUTO1</p> <p>AUTJES is the operator ID that SA z/OS uses for JESOPER in its other samples.</p>

## Operator Cascades: AOFMSGSY

Synonym	Usage and Default
%AOFOPMONOPER%	<p>This cascade is used to send commands to MONOPER. If you are not using the standard names for SA z/OS autotasks you must change this synonym. MONOPER is used for regular monitoring and subsystem startups.</p> <p><b>Default:</b> AUTMON AUTSYS AUTOBASE AUTO1</p> <p>AUTMON is the operator ID that SA z/OS uses for MONOPER in its other samples.</p>
%AOFOPRECOOPER%	<p>This cascade is used to send commands to RECOOPER. If you are not using the standard names for SA z/OS autotasks you must change this synonym. RECOOPER is used for recovery processing.</p> <p><b>Default:</b> AUTREC AUTSYS AUTOBASE AUTO1</p> <p>AUTREC is the operator ID that SA z/OS uses for RECOOPER in its other samples.</p>
%AOFOPSHUTOOPER%	<p>This cascade is used to send commands to SHUTOOPER. If you are not using the standard names for SA z/OS autotasks you must change this synonym. SHUTOOPER coordinates automated shutdowns.</p> <p><b>Default:</b> AUTSHUT AUTSYS AUTOBASE AUTO1</p> <p>AUTSHUT is the operator ID that SA z/OS uses for SHUTOOPER in its other samples.</p>
%AOFOPGSSOPER%	<p>This cascade is used to send commands to GSSOPER. If you are not using the standard names for SA z/OS autotasks you must change this synonym. GSSOPER is used for generic subsystem automation.</p> <p><b>Default:</b> * AUTGSS AUTSYS AUTOBASE AUTO1</p> <p>AUTGSS is the operator ID that SA z/OS uses for GSSOPER in its other samples.</p> <p>If you want to turn off the "ASSIGN BY JOBNAME" feature, that is, the advanced automation CGLOBAL variable <i>AOF_ASSIGN_JOBNAME</i> (see Appendix A, "Global Variables," on page 229) has been set to 0, you must remove the asterisk (*), because this may cause serialization problems.</p> <p><b>Note:</b> NetView's ASSIGN-BY-JOBNAME command that occurs before automation table processing only affects messages that are associated with an MVS job name.</p>
%AOFOPWTORS%	<p>This cascade is used to route commands concerning WTORS. If you are not using the standard names for SA z/OS autotasks you must change this synonym. Its use ensures that all WTOR processing is done on the same task and this is serialized.</p> <p><b>Default:</b> * AUTGSS AUTSYS AUTOBASE AUTO1</p> <p>This specifies that AUTSYS is to do all the WTOR processing.</p>

Synonym	Usage and Default
%AOFOPGATOPER%	<p>This cascade is used to route commands to this domain's gateway autotask. Because the autotask name contains the domain ID you must modify this synonym.</p> <p><b>Default:</b> <i>GATRdomain</i>.</p> <p>AOF01 is the default domain used in the other samples. There is no backup as the gateway CLISTs expect to be running on GATOPER.</p>

## SA z/OS Topology Manager for NMC: AOFMSGST

These synonyms are used and defined in the AOFMSGST fragment.

Synonym	Usage and Default
%AOFOPTOPOMGR%	<p>This is the name of the autotask that the SA z/OS topology manager runs on this system.</p> <p><b>Default:</b> &amp;DOMAIN.TPO</p>
%AOFINITOPOCMD%	<p>This is the command issued to initialize the SA z/OS topology manager.</p> <p><b>Default:</b> INGTPO INIT &amp;DOMAIN.TPO</p>
%AOFOPHB%	<p>This is the name of the heart beat task needed on focal point.</p> <p><b>Default:</b> AUTHB</p>



---

## Appendix E. TSO User Monitoring

Active TSO users can be monitored in NMC and SDF using the SA z/OS command DFTSOU (EVJETSOU). To enable TSO user monitoring add the following entry to user AT include fragment INGMSGU1 (or to your own user message table):

```
IF (MSGID='IEF125I' | MSGID='IEF126I' | MSGID='IEF450I')
  THEN EXEC(CMD('DFTSOU UPDATE') ROUTE(ALL *))
  DISPLAY(N) NETLOG(N) CONTINUE(Y);
```

Also, put 'DFTSOU SCAN' in the ACORESTART message for the TSO subsystem.

When DFTSOU is called with the UPDATE parameter then:

- For IEF125I, an ADD request is sent to SDF and NMC for the TSO user that produces the message.
- For IEF126I, a DELETE request is sent to SDF and NMC for the TSO user that produces the message.
- For IEF450I, a DELETE request is sent to SDF and NMC for the failing TSO user. When IEF450I is specified, and the trap is coded in INGMSGU1, then CONTINUE(Y) must also be coded.

When DFTSOU is called with the SCAN parameter, an MVS D TS,L command is issued to identify all currently active TSO users. This data is then passed to SDF and NMC.

NMC updates are associated with NMC object TSO. SDF updates are associated with SDF tree entry TSOUSERS.



---

## Appendix F. Autodiscovery Mapper Files and Report Formats

---

### Mapper Files

The mapping files all conform to the same set of syntax rules.

- The first line is a version indicator.
- Comments are prefixed by a hash ('#') sign.
- Data lines are tabular, with the layout of the columns being fixed for each mapping file. If the data gets out of alignment the mappings will not work.
- The columns in each mapping file are split into input and output columns. The input columns are used to search the data table, and the resulting output columns are applied to the data. In most of the files only the first match is used – and the user data is searched before the System Automation (SA) data. A match in the user data will prevent the SA data from being searched. The exception is the variable mapping file, where all matching data lines are processed and the SA data is processed before the user data. This allows the user data to overwrite values generated by the SA data.
- The values specified in the columns can be exact matches or can use the following wildcards:
  - An asterisk (\*) will match any number of characters, including none.
  - A percentage sign (%) will match a single, required character.
  - You can use a backward slash (\) as an escape character, causing the following wildcard character to be treated as a literal character – so \`*` would match an `*` in the input data.

For example, to match a string of 4 or more characters followed by IPC, you would need to specify `%%%%*IPC`. The four percent signs require that there are at least 4 characters before the IPC, the `*` matches whatever character(s), if any, come next and the 'IPC' constant is required at the end. It will match ABCDIPC, ABCDEIPC or ABCDEFGHIIPC.

- In almost all cases the width of the input column is the maximum length of the data value. The exceptions are single character values where you need to use an escape character. These are 2 characters wide to allow for the escape character and the match value (a \`*`).

### Functions

Some mapping files support the entry of formulas into their output columns. When entering these you need to follow these rules:

- Functions and constants follow REXX syntax, and you can use the full set of REXX functions.
- Constants need to be delimited by single quotes.
- Symbols can be substituted in using `&symbol.` syntax. For example `&JOBNAME.'@'&AOCCLONE9.` would produce the jobname for the address space followed by an @ followed by the value of `&AOCCLONE9` – for example, `NET@IPCS`.
- There are some columns that support the entry of formulas with unresolved `&AOCCLONEx.` values. These values get resolved later at SA load time, and allow the same APL to be used with `&AOCCLONE` values from different systems, dynamically generating different values. When entering a formula into these, care must be taken, as you cannot use a REXX function on an unresolved

## Mapper Files

&AOCCLONEx. value. The workaround is to establish the value you want to use in the variable mapping file and use that in the formula in the policy file. Note however that the value will be fixed and not dynamic like the &AOCCLONEx. values.

### Address Space Identification Mapping File ( INGSMAID / INGSMAIU)

This file contains rules to identify address spaces from their discovery data. To see data about the Address Spaces that have been discovered and how they have been identified, see the "ASDETAIL Report" on page 283.

Table 29. Input Columns for Address Space Identification Mapping File

Input Column	Number of Characters	Values Used
SYSPLEX	8 chars	
SYSTEM	8 chars	
AS TYPE	2 chars	A, I, J, M, S, U, * or blank
JOB PREFIX	1 char	T, S, J or blank
JOB NAME	8 chars	
PROC NAME	8 chars	
STEP NAME	8 chars	
USERID	8 chars	
CMD PREFIX	8 chars	
SUBSYS NAME	8 chars	
PRIMARY SUBSYS?	1 char	P or blank
ASC SUBSYS NAME	8 chars	
SCHED SUBSYS NAME	8 chars	
PREVIOUS ID	24 chars	
PROG NAME	8 chars	
PROG PARMS	100 chars	

Table 30. Output columns for Address Space Identification Files

Column Name	Number of Characters
NEW ID	24 chars

The data searched against the table is the raw discovery data before any other identification has been performed. The PREVIOUS ID value will either be a value from the discovery engine or blank. The value in the NEW ID column overwrites the PREVIOUS ID value for the Address Space.

Table 31. Job Prefix Values

Value	Job name
J	Job
S	Started Task
T	TSO User
blank	Unknown



Table 32. Address Space Type Values

Value	Address Space Type
A	ATX (APPC Transaction)
I	Initiator
J	Job
M	Mount job
S	Started Task
U	TSO User
*	System (use \* to match)

### **XCF Group Identification Mapping File ( INGSMGRP / INGSMGRU)**

This file contains rules to identify established XCF Groups. To see details of the XCF Groups discovered and how they have been identified, see the “XCFGROUP Report” on page 281.

Table 33. Input Columns for XCF Group Identification Mapping File

Input Column Name	Number of Characters
SYSPLEX	8 chars
SYSTEM	8 chars
XCF GROUP NAME	8 chars

Table 34. Output Columns for XCF Group Identification Mapping File

Column Name	Number of Characters
GROUP TYPE	24 chars

While the SA provided file contains identification rules for some applications with hard-coded XCF Group names – SA itself, for example, always names its main group INGXSgxx – there are a number of other applications – such as Tivoli Workload Scheduler – that leave the entire construction of the name up to you. Entries for such applications need to be made in your user mapping file, reflecting the naming conventions used within the target sysplex. The GROUP TYPE values listed in the SA provided file are the only SA defined values in the group identification space. Currently they only have to correspond with GROUP TYPE entries in the XCF Group Member Mapping files.

### XCF Group Member Identification Mapping File (INGSMGMB / INGSMGMU)

This file contains rules for identifying members of XCF groups. To see details of the XCF Groups and their Members that were discovered and how they have been identified, refer to the “XCFGROUP Report” on page 281.

Table 35. Input Columns for XCF Group Member Identification Mapping File

Input Column Name	Number of Characters
SYSPLEX	8 chars
SYSTEM	8 chars
XCF GROUP TYPE	24 chars
XCF MEMBER NAME	16 chars
XCF MEMBER JOBNAME	8 chars

Table 36. Output Columns for XCF Group Member Identification Mapping File

Output Column Name	Number of Characters
Address Space Type	24 chars

The XCF GROUP TYPE comes from the XCF GROUP identification mapping file. The Address Space ID replaces any previous identification of the address space by the discovery engine or the Address Space Identification mapping file. In some cases, simple membership of an XCF Group implies the nature of the members. In other cases, there is a specific naming convention that can be used to determine the role. Trackers for Tivoli Workload Scheduler may join the group with a TRK suffix,

while controllers may join with a CTL suffix, but this is up to your local naming conventions. In some cases the XCF group member name is the only way to distinguish the application instances.

## USS Process Identification Mapping File (INGSMUID / INGSMIU)

This file contains rules for identifying USS Processes. It is applied after the Address Space Identification rules and the XCF Group Member Identification rules. The USS data for the processes has been linked to the z/OS aspect of those processes through matching ASID values. To see the USS Process details that have been discovered, look in the “ASDETAIL Report” on page 283.

*Table 37. Input Columns for USS Process Identification Mapping File*

Input Column Name	Number of Characters
SYSPLEX	8 chars
SYSTEM	8 chars
JOB NAME	8 chars
z/OS USERID	8 chars
USS USERID	8 chars
PREVIOUS ID	24 chars
z/OS PROG NAME	8 chars
USS COMMAND	256 chars

*Table 38. Output Columns for USS Process Identification Mapping File*

Output Column Name	Number of Characters
NEW ID	24 chars

The z/OS values come from the automated Address Space data rather than from the discovered USS data. This file is useful for identifying applications that run under USS, many of which can be indistinguishable just by looking at the z/OS side of the discovered data.

## Policy Mapping File (INGSMPULU / INGSMPULY)

This file contains records that perform three tasks. The first is to select which Address Spaces are to be modelled in SA policy and which are not. This is controlled by the Model Location field. A value of X will exclude the address space from the model, while values of U or S will cause it to be included. The second is to select the model that will be used to represent the address space. This is done via the Model Entry Type and Model Entry Name fields. At present only entries of type APL may be modelled. If these fields are blank, no model will be used and just a basic APL entry will be created for the address space (which will require manual completion before it can be used successfully for automation). If they are not, they indicate an APL entry in either the SA KB (Model Location: S) or the User KB (Model Location: U) that will be used as a model for the APL entry that is created for the address space. The third is to provide non-default values for some attributes of the APL entry that will be created. Note that the Jobname and ARM Element Name fields support delayed resolution of &AOCCLONE values in their formula. You may not use REXX functions on &AOCCLONE values in these fields.

## Mapper Files

Table 39. Input Columns for Policy Mapping File

Input Column Name	Number of characters
SYSPLEX	8 chars
SYSTEM	8 chars
ADDRESS SPACE ID	24 chars
JOBNAME	8 chars
PROCNAME	8 chars

Table 40. Output Columns for Policy Mapping File

Output Column Name	Number of characters	Values Used
MODEL LOCATION	1 char	S, U, or X
MODEL ENTRY TYPE	3 chars	APL
MODEL ENTRY NAME	20 chars	
ENTRY NAME	40 chars	(Formula - 20 chars)
AUTOMATION NAME	40 chars	(Formula - 11 chars)
JOBNAME	40 chars	(Formula - 8 chars*)
ARM ELEMENT NAME	40 chars	(Formula - 16 chars*)
APL TYPE	12 chars	
APL SUBTYPE	12 chars	
CLASS	40 chars	(Formula - 20 chars)

The Entry name defaults first to the jobname. If this is not unique, it is suffixed with the sysplex name. If this is still not unique, it is suffixed with a sequential number. If you specify a specific entry name it will still be subject to the same uniqueness checking as the jobname. If you do not like the entry name you can use the customization dialog facilities to rename it. This will not cause a second copy to appear if you rerun the discovery, preload and import process.

The Automation Name defaults to the jobname, because this is the name your operators will use to interact with the application under SA's control and it is a name that they are already familiar with. The jobname should be unique on each system, so we should not get naming clashes.

The jobname defaults to the jobname, but we allow you to enter a formula for it if you wish to add an AOCCLONE value into it. This will not be reflected in the Automation Name. The formula must evaluate to the discovered value.

The ARM Element Name also defaults to the discovered value and, again, we have provided you with a way of overriding it with a formula including an &AOCCLONE value. The formula must evaluate to the discovered value.

Some Address Space specific symbols are available to use in the formulas:

```

|      &JOBNAME.
|      &PROCNAME.
|      &CMDPREFIX.
|      &ARM_ELEMENT.
|      &SCHED_SUB.

```

If you open up the SA KB, you can inspect the APL models that SA provides. Do not change the contents of this PDB as it can be updated by APAR, which would overwrite your changes. To create your own user models, you need to define your User KB PDB and create/copy entries into it. SA provides a sample PDB you can use to seed it which contains a class for a generic APL that is automated by IEF403 and 404 messages only. While it is far from the best model for most APLs, it is a good starting point. You can also copy and modify samples from the SA KB PDB. If you copy an entry into the User KB PDB, you should copy the entry from the SA Policy Mapping File into your User Policy Mapping File and edit it to point to the model you have created in your User KB.

The use of classes in the KB is strongly recommended and SA will copy them over if a model requires them – but note that once they have been copied, it will not recopy them. This is to protect any changes that you may have manually made to the class after it was copied out of the KB.

## Variable Mapping File (INGSMVRS / INGSVMRU)

This file contains rules defining symbols that can be used in formulas.

*Table 41. Input Columns for Variable Mapping File*

Input Column Name	Number of Characters
SYSPLEX	8 chars
SYSTEM	8 chars

*Table 42. Output Columns for Variable Mapping File*

Output Column Name	Number of Characters
VAR NAME	16 chars
VAR FORMULA	48 chars

Note that any variables called AOCCLONE, or AOCCLONEx (where x is 0-9, A-Z) will end up in the customization dialogs set as an AOCCLONE value on the system being discovered.

---

## Preloader Reports

The reports generated by the preloader are:

### SUMMARY

An overview of the import process.

### XCFGROUP

Details of XCF groups found and identified, along with members found and identified. You need the data from this report to construct your own XCF Group and Member identification records.

### ARMGROUP

Details of Automatic Restart Groups and Elements that were discovered.

## Preloader Reports

### ASDETAIL

Details of Address Spaces found and Identified, along with all of their discovery data. You need the information from this report to construct your own Address Space identification and Policy mapping records.

### EXCLUDE

This contains the results of running the identified address spaces through the policy mapping file. It shows which address spaces have been included in the policy and which have been excluded.

### CONSTRUCT

This contains information about how the flatfile was constructed. For each address space it will indicate whether or a new APL was constructed or an existing one was relinked. It indicates which sample policy (if any) was copied from the KB and which classes (if any) were also copied.

### SYMBOLS

This contains information about the list of symbolic values that were discovered on the target system, along with data about any variables defined in the variable mapping files.

### KBIMPORT

This contains information about which entries were imported from the SA and User KBS.

### KBMAP

This is an 'index' for the SA and User KBs, listing which entries are in which KB.

### SUBSYS

This lists the z/OS subsystems that were identified, which address space is providing them, which other address spaces are associated with it and which address spaces are being scheduled under it. The following section describes the reports in detail. Note that it is not possible for you to add additional reports or to customize the existing reports.

## Summary Report

This report contains basic information summarizing the preloader process – elapsed times for various steps and counts of things discovered, excluded, included and so forth. The phases of the discovery data import are:

### Parameter Review

The first phase resolves the mapping files and the report that will be used.

### Discovery Import

The raw snapshot file is read in, the variable and ID mapping files are consulted and the address spaces are identified. It generates the ASDETAIL, XCFGROUP and SYMBOLS reports.

### PDB Import

The extract of the Target PDB is read in and analyzed. Entries for the read entities are output into the CONSTRUCT report.

### Generation Phase

The policy mapping file is read and applied. This is where the decision is made as to whether an Address Space is a new APL or a previously known one. It produces the EXCLUDE report and the second part of the CONSTRUCT report.

### KB Import

The extracts of the two KB PDBs are read in and analyzed.

### KB Xref

A second pass through the KB data to resolve dependencies between instances.

### Output Phase

The flat file is assembled and output. This produces the second part of the CONSTRUCT report.

The SUMMARY report gives an overview of activity in these phases.

## Preloader Reports

```
System Automation for z/OS V3R4 Discovery Import
-----
Parameters
SA Mapping file.....: KEY.DRIVER.AINGIMAP
Installation mapping file: KEY.DRIVER.AINGIMAP
Report File.....: MIK.DISCO.REPORT.LOAD1

Generated: 24 Feb 2011 08:30:06

-----
Start of Discovery Import Phase

Data is for KEY1PLEX.KEY1

Discovered 104 address spaces.

Discovery Import Phase complete - 0.851825 seconds
-----
Starting PDB Import Phase

Loaded from target PDB:
1 Group(s)
1 System(s)
1 Application Group(s)
16 Application(s)

PDB Import Phase Complete - 0.278650 seconds
-----
Starting Policy Generation Phase

Generating policy for KEY1PLEX.KEY1

Policy mapping results:
  91 Address spaces excluded by policy mapping rules.
  13 Address spaces included.
```

*Figure 57. The SUMMARY Report*



## XCFGROUP Report

This report contains details of the XCF groups located, their identification, the associated members and their identification. Note that only members on the system being modelled will be identified in the report.

```
System Automation for z/OS V3R4 Discovery Import
-----
Parameters

SA Mapping file.....: KEY.DRIVER.AINGIMAP
Installation mapping file: KEY.DRIVER.AINGIMAP
Report File.....: MIK.DISCO.REPORT.LOAD1

Generated: 24 Feb 2011 08:30:06

XCF Groups and members:

XCF Group: SYSXCF
Id : GROUP_JES2_XCF
Members:
KEY1 KEY1.XCFAS - SYSTEM_XCFAS
KEY2 KEY2.XCFAS
KEY3 KEY3.XCFAS
KEY4 KEY4.XCFAS

XCF Group: SYSGRS
Id : GROUP_SYSTEM_GRS
Members:
KEY1 KEY1.GRS - SYSTEM_GRS
KEY2 KEY2.GRS
KEY3 KEY3.GRS
KEY4 KEY4.GRS
```

Figure 58. The XCFGROUP Report

## ARMGROUP Report

This report contains details of Automatic Restart Management Groups and Elements that were discovered. Note that it does not contain any details about which systems, if any, each element could be moved to.

```
System Automation for z/OS V3R4 Discovery Import
-----
Parameters

SA Mapping file.....: KEY.DRIVER.AINGIMAP
Installation mapping file: KEY.DRIVER.AINGIMAP
Report File.....: MIK.DISCO.REPORT.LOAD1

Generated: 10 Mar 2011 07:47:46

Extracting Automatic Restart Management data

Groups and members:

Group : DEFAULT
Members:
SYS_RRS_KEY1 NET@IPSVM EZAY1TCPIP M8SGN801001
M9SGN901001 N913001 M9DGN90D001 HSAAM_KEY1$$$1
DB2$D911 I911001 OPCKEY10PCI DBNASNA1
OPCKEY10PC8 DXNAINA1001

Elements:

Element: SYS_RRS_KEY1
Jobname: RRS
Group : DEFAULT
Systems: KEY1 -> KEY1
Level : 2

Element: NET@IPSVM
Jobname: NET
Group : DEFAULT
Systems: KEY1 -> KEY1
Level : 1

Element: EZAY1TCPIP
Jobname: TCPIP
Group : DEFAULT
Systems: KEY1 -> KEY1
Level : 1
```

Figure 59. The ARM Group Report

## ASDETAIL Report

This report contains details of the address spaces discovered, united with their USS data, Automatic Restart Management data and after the advanced identification heuristics have been run. This data is the input into the policy mapping phase.

```

System Automation for z/OS V3R4 Discovery Import
-----
Parameters

SA Mapping file.....: KEY.DRIVER.AINGIMAP
Installation mapping file: KEY.DRIVER.AINGIMAP
Report File.....: MIK.DISCO.REPORT.LOAD1

Generated: 24 Feb 2011 08:30:06

Address space: - ALLOCAS - 0012
Id      : SYSTEM_ALLOCAS
Proc   : Step   : ALLOCAS
Prog   : Parms  :
Subsys : Assoc  :
User   : Type   : *
Prefix : Job px:
Primary: Sched  :
ARM Ele:
ARM Grp:
ARM Lvl: Local  :
USS Data : <-
Jobname: User   :
Command:

Address space: - ANTAS000 - 000C
Id      : SYSTEM_ANTAS
Proc   : IEFPROC Step : ANTAS000
Prog   : ANTXAINI Parms :
Subsys : Assoc  :
User   : Type   : *
Prefix : Job px:
Primary: Sched  : MSTR
ARM Ele:
ARM Grp:
ARM Lvl: Local  :
USS Data : <-
Jobname: User   :
Command:

```

Figure 60. The ASDETAIL Report

## EXCLUDE Report

This report contains details of all address spaces and whether or not they were included in the flat file, along with an identification of the rule in the policy mapping file that excluded them (or an indication that they did not match any of the rules in the policy mapping files).

```
System Automation for z/OS V3R4 Discovery Import
```

```
-----  
Parameters
```

```
SA Mapping file.....: KEY.DRIVER.AINGIMAP  
Installation mapping file: KEY.DRIVER.AINGIMAP  
Report File.....: MIK.DISCO.REPORT.LOAD1
```

```
Generated: 24 Feb 2011 08:30:06
```

```
Exclusion report
```

```
ALLOCAS Excluded by mapping (23)  
ANTAS000 Excluded by mapping (23)  
ANTMAIN Excluded by mapping (23)  
APPC Excluded by mapping (23)  
ASCH Excluded by mapping (23)  
AUXMON Excluded by mapping (23)  
AXR Excluded by mapping (23)  
AXR02 Excluded by mapping (23)  
BPXOINIT Excluded by mapping (23)  
CATALOG Excluded by mapping (23)  
CAZ0 Excluded by mapping (23)  
CEA Excluded by mapping (23)  
EYUX310 Excluded by mapping (23)  
FFST Excluded by mapping (23)  
FTPS1 Excluded by mapping (23)  
GEOXHSWP Included by mapping (12)  
GRS Excluded by mapping (23)  
GRSMON Excluded by mapping (23)  
HSM Excluded by mapping (23)  
IEFSCHAS Excluded by mapping (23)
```

Figure 61. The EXCLUDE Report

## CONSTRUCT Report

This report contains three distinct sections. The first section describes the loading of data from the Target PDB Extract. This shows all GRPs, SYSs, APGs and APLs loaded.

```

Loading data from Target PDB

Entry for sysplex GRP: KEY1PLEX
Signature : GRP-KEY1PLEX
Loaded GRP: KEY1PLEX (Index: 1)

Entry for system SYS: KEY1PLEX.KEY2
Signature : SYS-KEY2
Loaded SYS: KEY2 (Index: 1)
...linked to GRP KEY1PLEX

Entry for APL BPX0INIT
Signature : APL-USS-BPX0INIT-0-0
Loaded APL: BPX0INIT (Index: 1)

```

Figure 62. The CONSTRUCT Report

The second section describes the processing of the discovered data, seeing which existing entries can be reused and deciding if new entries need to be created. At the end of this section, the preloader has the PDB delta information in storage.

```

Generating policy for KEY1PLEX.KEY1

Entry for sysplex GRP: KEY1PLEX
Signature: GRP-KEY1PLEX
...mapped to GRP KEY1PLEX (index: 1)

Entry for system SYS: KEY1PLEX.KEY1
Signature : SYS-KEY1
Creating New SYS: KEY1 (Index: 2)
...linked to GRP KEY1PLEX

Entry for APG LK_KEY1PLEX_KEY1
Signature : APG-SYSTEM-BASIC--LK_KEY1PLEX_KEY1
Creating New APG: LK_KEY1PLEX_KEY1 (Index: 2)
...linked to SYS KEY1

Address space: 001F - GEOXHSWP
Entry for APL GEOXHSWP
Signature : APL-zOS--GEOXHSWP-HIPER-MSTR-
...sig mapped to APL GEOXHSWP (index: 6)
...linked to AGP: LK_KEY1PLEX_KEY1

```

Figure 63. The CONSTRUCT Report (second section)

The third section describes the creation of the flat file to hold the update, including the editing of the model policy, the cross referencing of model resources to real resources for relationships and the inclusion of classes from the KBs.

## Preloader Reports

```
Constructing flat file for: KEY1PLEX.KEY1
```

```
NEW SYS KEY1  
--> GRP KEY1PLEX
```

```
NEW APG LK_KEY1PLEX_KEY1  
--> SYS KEY1
```

```
UPD APL GEOXHSWP  
--> APG LK_KEY1PLEX_KEY1
```

```
UPD APL JES2  
--> APG LK_KEY1PLEX_KEY1
```

```
UPD APL LLA  
--> APG LK_KEY1PLEX_KEY1
```

*Figure 64. The CONSTRUCT Report (third section)*

## SYMBOLS Report

This report has three sections. The first section shows the symbols that were discovered on the target system and their values:

```

Discovered symbols:

&BACKFPT. = IPSFO
&BPXPARM. = 10,LO
&BPXSHARE. =
&CLOCK. = ET
&CLOCKEV. =
&CNMNETID. = DEIBMIPS
&CNMPRTCT. = IPSFN
&CNMRODM. = EKGXRODM
&CNMTCPN. = TCPIP
&COUPLE. = SY
&EKGYRODM. = EKGYRODM
&FOCALPT. = IPUNM
&FSTYPE. = HFS
  
```

Figure 65. The SYMBOLS Report

The second section shows additional variables that were defined in the INGSMVRU and INGSMVRS mapping files:

```

Loading VAR Formulas from: KEY.DRIVER.AINGIMAP(INGSMVRS)

Loaded variables:

Loading VAR Formulas from: KEY.DRIVER.AINGIMAP(INGSMVRU)

Loaded variables:

AOCCLONE1 &SYSCclone. Y2
AOCCLONE2 RIGHT(&SYSNAME.,1) 2
AOCCLONE3 RIGHT(&SYSNAME.,2) Y2
  
```

Figure 66. The SYMBOLS Report (second section)

The third section shows any errors that occurred in processing formulas using these symbols.

## KBIMPORT Report

This report first lists the data imported from the SA KB and then the data imported from the User KB.

```
Loading KB Data from: INGSQRY as S

Loaded: S GRP SYSPLEX1 - 7 records
Loaded: S SYS SYS1 - 77 records
Loaded: S SYS SYS2 - 77 records
Loaded: S SYS SYS3 - 77 records
Loaded: S APG AM_X - 23 records
Loaded: S APG BASE_APPL - 23 records
Loaded: S APG BASE_SUPP - 23 records
Loaded: S APG BASE_SYS - 23 records
Loaded: S APG BASE_USS - 46 records
Loaded: S APG BBO_ADMIN - 23 records
Loaded: S APG BBO_CELL - 23 records
Loaded: S APG BBO_DMGR - 23 records
Loaded: S APG BBO_DMN - 23 records
...
Loaded: S APL ASCH - 64 records
Loaded: S APL BBO_CLASS - 79 records
Loaded: S APL BLSJPRMI - 52 records
Loaded: S APL BIAGT - 74 records
Loaded: S APL BIDMGR - 74 records
Loaded: S APL BIDMN - 98 records
Loaded: S APL BISR1 - 74 records
Loaded: S APL C_AM - 106 records
Loaded: S APL C_APPL - 73 records
Loaded: S APL C_CICS - 298 records
Loaded: S APL C_CICS_CMAS - 81 records
Loaded: S APL C_CICS_SHAREDSERVERS - 82 records
Loaded: S APL C_CICS_TG - 79 records
...
```

Figure 67. The KBIMPORT Report



## KBMAP Report

This report is a compiled 'index' of the SA and User KBs. It lists the entries found for each type (APL, APG, and so on) along with an indication of which KB they were found in.

```

Entries for type: APL

S U APL AM      SA Automation Manager
S   APL AM2     Spare SA Automation Manager
S U APL APPC    Advanced Peer-to-Peer Communication
S U APL ASCH    APPC Scheduler
S   APL BBO_CLASS  WebSphere class with general definitions
S   APL BLSJPRMI  Build SNAP Tables for IPCS
S   APL BIAGT     WAS V7 Node Agent
S   APL BIDMGR    WAS V7 Deployment Manager
S   APL BIDMN     WAS V7 Daemon
S   APL BISRI     WAS V7 Application Server
S   APL C_AM      Class for Automation Manager Definitions
S   APL C_APPL    Class for general APL definitions
S   APL C_CICS    Class for CICS
S   APL C_CICS_CMAS  Class for CICS CPSMCMAS
...
S   APL TWSTRKR  TWS/OPC Tracker
S U APL VLF      Virtual Lookaside Facility
S U APL VTAM     Virtual Telecommunication Access Method
S   APL WEBSRV   IBM HTTP Server
S   APL ZFS      z/OS File System
U   APL AADUMMY  Used for checking policy defs
U   APL ABC      XPCS Test
U   APL ABC2     XPCS Test
U   APL AM1      Automation manager...
U   APL BOBHTST1  as
U   APL BOBHTST2  test scheduler workitems

```

Figure 68. The KBMAP Report

## SUBSYS Report

This report gives a list of all of the z/OS subsystems that were discovered, and identifies the address space providing the subsystem, any other address spaces that are associated with it and any address spaces that are scheduled under it.

```

Subsystem : JES2
Provider : JES2 - SYSTEM_JES
Schedules : EYUCAS1B GRSMON IMS921I1 IMS9210M IMS921SI IMS922I1
IMS9220M IMS922SI IMS923I1 JES2AUX MIKDISC2 NET
NETBTST2 OAM OPCH OPC1 OPC82S OPC85S
PCAUTH PORTMAP Q3E1MSTR RASP SDSF SMS
SMSPDSE SNA2DBM1 SNA2DIST SNA2IRLM SNA2MSTR SYSLOGD1
TCP/IP TNF TN3270 TN3270F TN3270N TRACE
TSO VMCF YWHITAM2

Subsystem : MSTR
Provider : -
Schedules : ANTA000 ANTMAIN APPC ASCH AXR BPX0INIT
CATALOG CEA DEVMAN DFSZFS DUMPSRV FFST
GEOXSWP IOSAS JESXCF JES2 JES2MON LLA
MVSNFSCS NETBSSI5 OMVS RACF RESOLVER RRS
SMF VLF WLM XCFAS

Subsystem : SNA2
Provider : SNA2MSTR - DB2_MSTR
Associated: SNA2DBM1 SNA2DIST
    
```

Figure 69. The SUBSYS Report

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## Glossary

This glossary includes terms and definitions from:

- The *IBM Dictionary of Computing* New York: McGraw-Hill, 1994.
- The *American National Standard Dictionary for Information Systems*, ANSI X3.172-1990, copyright 1990 by the American National Standards Institute (ANSI). Copies can be purchased from the American National Standards Institute, 1430 Broadway, New York, New York 10018. Definitions are identified by the symbol (A) after the definition.
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The following cross-references are used in this glossary:

**Contrast with.** This refers to a term that has an opposed or substantively different meaning.

**Deprecated term for.** This indicates that the term should not be used. It refers to a preferred term, which is defined in its proper place in the glossary.

**See.** This refers the reader to multiple-word terms in which this term appears.

**See also.** This refers the reader to terms that have a related, but not synonymous, meaning.

**Synonym for.** This indicates that the term has the same meaning as a preferred term, which is defined in the glossary.

**Synonymous with.** This is a backward reference from a defined term to all other terms that have the same meaning.

## A

**ACF.** See automation configuration file.

**ACF/NCP.** Advanced Communications Function for the Network Control Program. See Advanced Communications Function and Network Control Program.

**ACF/VTAM.** Advanced Communications Function for the Virtual Telecommunications Access Method. Synonym for VTAM. See Advanced Communications Function and Virtual Telecommunications Access Method.

**active monitoring.** In SA z/OSautomation control file, the acquiring of resource status information by soliciting such information at regular, user-defined intervals. See also passive monitoring.

**adapter.** Hardware card that enables a device, such as a workstation, to communicate with another device, such as a monitor, a printer, or some other I/O device.

**adjacent hosts.** Systems connected in a peer relationship using adjacent NetView sessions for purposes of monitoring and control.

**adjacent NetView.** In SA z/OS, the system defined as the communication path between two SA z/OS systems that do not have a direct link. An adjacent NetView is used for message forwarding and as a communication link between two SA z/OS systems. For example, the adjacent NetView is used when sending responses from a focal point to a remote system.

**Advanced Communications Function (ACF).** A group of IBM licensed programs (principally VTAM, TCAM, NCP, and SSP) that use the concepts of Systems Network Architecture (SNA), including distribution of function and resource sharing.

**advanced program-to-program communication (APPC).** A set of inter-program communication services that support cooperative transaction processing in a Systems Network Architecture (SNA) network. APPC is the implementation, on a given system, of SNA's logical unit type 6.2.

**alert.** (1) In SNA, a record sent to a system problem management focal point or to a collection point to communicate the existence of an alert condition. (2) In NetView, a high-priority event that warrants immediate attention. A database record is generated for certain event types that are defined by user-constructed filters.

**alert condition.** A problem or impending problem for which some or all of the process of problem determination, diagnosis, and resolution is expected to require action at a control point.

**alert focal-point system.** See NPDA focal point system.

**alert threshold.** An application or volume service value that determines the level at which SA z/OS changes the associated icon in the graphical interface to the alert color. SA z/OS may also issue an alert. See warning threshold.

**AMC.** (1) See Automation Manager Configuration. (2) The Auto Msg Classes entry type.

### **American Standard Code for Information Interchange (ASCII).**

A standard code used for information exchange among data processing systems, data communication systems, and associated equipment. ASCII uses a coded character set consisting of 7-bit coded characters (8-bit including parity check). The ASCII set consists of control characters and graphic characters. See also Extended Binary Coded Decimal Interchange Code.

**APF.** See authorized program facility.

**API.** See application programming interface.

**APPC.** See advanced program-to-program communication.

**application.** In SA z/OS, applications refer to z/OS subsystems, started tasks, or jobs that are automated and monitored by SA z/OS. On SNMP-capable processors, application can be used to refer to a subsystem or process.

**Application entry.** A construct, created with the customization dialogs, used to represent and contain policy for an application.

**application group.** A named set of applications. An application group is part of an SA z/OS enterprise definition and is used for monitoring purposes.

**application program.** (1) A program written for or by a user that applies to the user's work, such as a program that does inventory or payroll. (2) A program used to connect and communicate with stations in a network, enabling users to perform application-oriented activities.

**application programming interface (API).** An interface that allows an application program that is written in a high-level language to use specific data or functions of the operating system or another program.

**ApplicationGroup entry.** A construct, created with the customization dialogs, used to represent and contain policy for an application group.

**ARM.** See automatic restart management.

**ASCB.** Address space control block.

**ASCB status.** An application status derived by SA z/OS running a routine (the ASCB checker) that searches the z/OS address space control blocks (ASCBs) for address spaces with a particular job name. The job name used by the ASCB checker is the job name defined in the customization dialog for the application.

**ASCII.** See American Standard Code for Information Interchange.

**ASF.** See automation status file.

**authorized program facility (APF).** A facility that permits identification of programs that are authorized to use restricted functions.

**automated console operations (ACO).** The use of an automated procedure to replace or simplify the action that an operator takes from a console in response to system or network events.

**automated function.** SA z/OS automated functions are automation operators, NetView autotasks that are assigned to perform specific automation functions. However, SA z/OS defines its own synonyms, or *automated function names*, for the NetView autotasks, and these function names are referred to in the sample policy databases provided by SA z/OS. For example, the automation operator AUTBASE corresponds to the SA z/OS automated function BASEOPER.

**automatic restart management (ARM).** A z/OS recovery function that improves the availability of specified subsystems and applications by automatically restarting them under certain circumstances. Automatic restart management is a function of the Cross-System Coupling Facility (XCF) component of z/OS.

**automatic restart management element name.** In MVS 5.2 or later, z/OS automatic restart management requires the specification of a unique sixteen character name for each address space that registers with it. All automatic restart management policy is defined in terms of the element name, including SA z/OS's interface with it.

**automation.** The automatic initiation of actions in response to detected conditions or events. SA z/OS provides automation for z/OS applications, z/OS components, and remote systems that run z/OS. SA z/OS also provides tools that can be used to develop additional automation.

**automation agent.** In SA z/OS, the automation function is split up between the automation manager and the automation agents. The observing, reacting and doing parts are located within the NetView address space, and are known as the *automation agents*. The automation agents are responsible for:

- Recovery processing
- Message processing

- Active monitoring: they propagate status changes to the automation manager

**automation configuration file.** The SA z/OS customization dialogs must be used to build the automation configuration file. It consists of:

- The automation manager configuration file (AMC)
- The NetView automation table (AT)
- The NetView message revision table (MRT)
- The MPFLSTSA member

**automation control file (ACF).** In SA z/OS, a file that contains system-level automation policy information. There is one master automation control file for each NetView system that SA z/OS is installed on. Additional policy information and all resource status information is contained in the policy database (PDB). The SA z/OS customization dialogs must be used to build the automation control files. They must not be edited manually.

**automation flags.** In SA z/OS, the automation policy settings that determine the operator functions that are automated for a resource and the times during which automation is active. When SA z/OS is running, automation is controlled by automation flag policy settings and override settings (if any) entered by the operator. Automation flags are set using the customization dialogs.

**automation manager.** In SA z/OS, the automation function is split up between the automation manager and the automation agents. The coordination, decision making and controlling functions are processed by each sysplex's *automation manager*.

The automation manager contains a model of all of the automated resources within the sysplex. The automation agents feed the automation manager with status information and perform the actions that the automation manager tells them to.

The automation manager provides *sysplex-wide* automation.

**Automation Manager Configuration.** The Automation Manager Configuration file (AMC) contains an image of the automated systems in a sysplex or of a standalone system. See also "automation configuration file."

**Automation NetView.** In SA z/OS the NetView that performs routine operator tasks with command procedures or uses other ways of automating system and network management, issuing automatic responses to messages and management services units.

**automation operator.** NetView automation operators are NetView autotasks that are assigned to perform specific automation functions. See also automated function. NetView automation operators may receive messages and process automation procedures. There are no logged-on users associated with automation

operators. Each automation operator is an operating system task and runs concurrently with other NetView tasks. An automation operator could be set up to handle JES2 messages that schedule automation procedures, and an automation statement could route such messages to the automation operator. Similar to *operator station task*. SA z/OS message monitor tasks and target control tasks are automation operators.

**automation policy.** The policy information governing automation for individual systems. This includes automation for applications, z/OS subsystems, z/OS data sets, and z/OS components.

**automation policy settings.** The automation policy information contained in the automation control file. This information is entered using the customization dialogs. You can display or modify these settings using the customization dialogs.

**automation procedure.** A sequence of commands, packaged as a NetView command list or a command processor written in a high-level language. An automation procedure performs automation functions and runs under NetView.

| **automation routines.** In SA z/OS, a set of  
| self-contained automation routines that can be called  
| from the NetView automation table, or from  
| user-written automation procedures.

**automation status file (ASF).** In SA z/OS, a file containing status information for each automated subsystem, component or data set. This information is used by SA z/OS automation when taking action or when determining what action to take. In Release 2 and above of AOC/MVS, status information is also maintained in the operational information base.

**automation table (AT).** See NetView automation table.

**autotask.** A NetView automation task that receives messages and processes automation procedures. There are no logged-on users associated with autotasks. Each autotask is an operating system task and runs concurrently with other NetView tasks. An autotask could be set up to handle JES2 messages that schedule automation procedures, and an automation statement could route such messages to the autotasks. Similar to *operator station task*. SA z/OS message monitor tasks and target control tasks are autotasks. Also called *automation operator*.

**available.** In VTAM programs, pertaining to a logical unit that is active, connected, enabled, and not at its session limit.

## B

**Base Control Program (BCP).** A program that provides essential services for the MVS and z/OS operating systems. The program includes functions that

manage system resources. These functions include input/output, dispatch units of work, and the z/OS UNIX System Services kernel. See also Multiple Virtual Storage and z/OS.

**basic mode.** A central processor mode that does not use logical partitioning. Contrast with logically partitioned mode.

**BCP.** See Base Control Program.

**BCP Internal Interface.** Processor function of CMOS-390 and System z processor families. It allows for communication between basic control programs such as z/OS and the processor support element in order to exchange information or to perform processor control functions. Programs using this function can perform hardware operations such as ACTIVATE or SYSTEM RESET.

**beaconing.** The repeated transmission of a frame or messages (beacon) by a console or workstation upon detection of a line break or outage.

| **blade.** A hardware unit that provides  
| application-specific services and components. The  
| consistent size and shape (or form factor) of each blade  
| allows it to fit in a BladeCenter chassis.

| **BladeCenter chassis.** A modular chassis that can  
| contain multiple blades, allowing the individual blades  
| to share resources such as management, switch, power,  
| and blower modules.

**BookManager®.** An IBM product that lets users view softcopy documents on their workstations.

## C

**central processor (CP).** The part of the computer that contains the sequencing and processing facilities for instruction execution, initial program load (IPL), and other machine operations.

**central processor complex (CPC).** A physical collection of hardware that consists of central storage, one or more central processors, timers, and channels.

**central site.** In a distributed data processing network, the central site is usually defined as the focal point for alerts, application design, and remote system management tasks such as problem management.

**CFR/CFS and ISC/ISR.** I/O operations can display and return data about integrated system channels (ISC) connected to a coupling facility and coupling facility receiver (CFR) channels and coupling facility sender (CFS) channels.

**channel.** A path along which signals can be sent; for example, data channel, output channel. See also link.

**channel path identifier.** A system-unique value assigned to each channel path.

**channel-attached.** (1) Attached directly by I/O channels to a host processor (for example, a channel-attached device). (2) Attached to a controlling unit by cables, rather than by telecommunication lines. Contrast with link-attached. Synonymous with local.

**CHPID.** In SA z/OS, channel path ID; the address of a channel.

**CHPID port.** A label that describes the system name, logical partitions, and channel paths.

**CI.** See console integration.

**CICS/VS.** Customer Information Control System for Virtual Storage. See Customer Information Control System.

**CLIST.** See command list.

**clone.** A set of definitions for application instances that are derived from a basic application definition by substituting a number of different system-specific values into the basic definition.

**clone ID.** A generic means of handling system-specific values such as the MVS SYSCLONE or the VTAM subarea number. Clone IDs can be substituted into application definitions and commands to customize a basic application definition for the system that it is to be instantiated on.

**CNC.** A channel path that transfers data between a host system image and an ESCON® control unit. It can be point-to-point or switchable.

**command.** A request for the performance of an operation or the execution of a particular program.

**command facility.** The component of NetView that is a base for command processors that can monitor, control, automate, and improve the operation of a network. The successor to NCCF.

**command list (CLIST).** (1) A list of commands and statements, written in the NetView command list language or the REXX language, designed to perform a specific function for the user. In its simplest form, a command list is a list of commands. More complex command lists incorporate variable substitution and conditional logic, making the command list more like a conventional program. Command lists are typically interpreted rather than being compiled. (2) In SA z/OS, REXX command lists that can be used for automation procedures.

**command procedure.** In NetView, either a command list or a command processor.



**command processor.** A module designed to perform a specific function. Command processors, which can be written in assembler or a high-level language (HLL), are issued as commands.

**command processor control block.** An I/O operations internal control block that contains information about the command being processed.

**Command Tree/2.** An OS/2-based program that helps you build commands on an OS/2 window, then routes the commands to the destination you specify (such as a 3270 session, a file, a command line, or an application program). It provides the capability for operators to build commands and route them to a specified destination.

**common commands.** The SA z/OS subset of the CPC operations management commands.

**Common User Access (CUA) architecture.** Guidelines for the dialog between a human and a workstation or terminal.

**communication controller.** A type of communication control unit whose operations are controlled by one or more programs stored and executed in the unit or by a program executed in a processor to which the controller is connected. It manages the details of line control and the routing of data through a network.

**communication line.** Deprecated term for telecommunication line.

**connectivity view.** In SA z/OS, a display that uses graphic images for I/O devices and lines to show how they are connected.

**console automation.** The process of having NetView facilities provide the console input usually handled by the operator.

**console connection.** In SA z/OS, the 3270 or ASCII (serial) connection between a PS/2 computer and a target system. Through this connection, the workstation appears (to the target system) to be a console.

**console integration (CI).** A hardware facility that if supported by an operating system, allows operating system messages to be transferred through an internal hardware interface for display on a system console. Conversely, it allows operating system commands entered at a system console to be transferred through an internal hardware interface to the operating system for processing.

**consoles.** Workstations and 3270-type devices that manage your enterprise.

**Control units.** Hardware units that control I/O operations for one or more devices. You can view information about control units through I/O

operations, and can start or stop data going to them by blocking and unblocking ports.

**controller.** A unit that controls I/O operations for one or more devices.

**converted mode (CVC).** A channel operating in converted (CVC) mode transfers data in blocks and a CBY channel path transfers data in bytes. Converted CVC or CBY channel paths can communicate with a parallel control unit. This resembles a point-to-point parallel path and dedicated connection, regardless whether it passes through a switch.

**couple data set.** A data set that is created through the XCF couple data set format utility and, depending on its designated type, is shared by some or all of the z/OS systems in a sysplex. See also sysplex couple data set and XCF couple data set.

**coupling facility.** The hardware element that provides high-speed caching, list processing, and locking functions in a sysplex.

**CP.** See central processor.

**CPC.** See central processor complex.

**CPC operations management commands.** A set of commands and responses for controlling the operation of System/390<sup>®</sup> CPCs.

**CPC subset.** All or part of a CPC. It contains the minimum *resource* to support a single control program.

**CPCB.** See command processor control block.

**CPU.** Central processing unit. Deprecated term for processor.

**cross-system coupling facility (XCF).** A component of z/OS that provides functions to support cooperation between authorized programs running within a sysplex.

**CTC.** The channel-to-channel (CTC) channel can communicate with a CTC on another host for intersystem communication.

**Customer Information Control System (CICS).** A general-purpose transactional program that controls online communication between terminal users and a database for a large number of end users on a real-time basis.

**customization dialogs.** The customization dialogs are an ISPF application. They are used to customize the enterprise policy, like, for example, the enterprise resources and the relationships between resources, or the automation policy for systems in the enterprise. How to use these dialogs is described in *IBM Tivoli System Automation for z/OS Customizing and Programming*.

**CVC.** See converted mode.

## D

**DataPower X150z.** See IBM Websphere DataPower Integration Appliance X150 for zEnterprise (DataPower X150z).

**DASD.** See direct access storage device.

**data services task (DST).** The NetView subtask that gathers, records, and manages data in a VSAM file or a network device that contains network management information.

**data set.** The major unit of data storage and retrieval, consisting of a collection of data in one of several prescribed arrangements and described by control information to which the system has access.

**data set members.** Members of partitioned data sets that are individually named elements of a larger file that can be retrieved by name.

**DBCS.** See double-byte character set.

**DCCF.** See disabled console communication facility.

**DCF.** See Document Composition Facility.

**DELAY Report.** An RMF report that shows the activity of each job in the system and the hardware and software resources that are delaying each job.

**device.** A piece of equipment. Devices can be workstations, printers, disk drives, tape units, remote systems or communications controllers. You can see information about all devices attached to a particular switch, and control paths and jobs to devices.

**DEVR Report.** An RMF report that presents information about the activity of I/O devices that are delaying jobs.

**dialog.** Interactive 3270 panels.

**direct access storage device (DASD).** A device that allows storage to be directly accessed, such as a disk drive.

**disabled console communication facility (DCCF).** A z/OS component that provides limited-function console communication during system recovery situations.

**disk operating system (DOS).** (1) An operating system for computer systems that use disks and diskettes for auxiliary storage of programs and data. (2) Software for a personal computer that controls the processing of programs. For the IBM Personal Computer, the full name is Personal Computer Disk Operating System (PCDOS).

**display.** (1) To present information for viewing, usually on the screen of a workstation or on a hardcopy device. (2) Deprecated term for panel.

**distribution manager.** The component of the NetView program that enables the host system to use, send, and delete files and programs in a network of computers.

**Document Composition Facility (DCF).** An IBM licensed program used to format input to a printer.

**domain.** (1) An access method and its application programs, communication controllers, connecting lines, modems, and attached workstations. (2) In SNA, a system services control point (SSCP) and the physical units (PUs), logical units (LUs), links, link stations, and associated resources that the SSCP can control with activation requests and deactivation requests.

**double-byte character set (DBCS).** A character set, such as Kanji, in which each character is represented by a 2-byte code.

**DP enterprise.** Data processing enterprise.

**DSIPARM.** This file is a collection of members of NetView's customization.

**DST.** Data Services Task.

## E

**EBCDIC.** See Extended Binary Coded Decimal Interchange Code.

**ECB.** See event control block.

**EMCS.** Extended multiple console support. See also multiple console support.

| **ensemble.** A collection of one or more zEnterprise  
| nodes (including any attached zBX) that are managed  
| as a single logical virtualized system by the Unified  
| Resource Manager, through the Hardware Management  
| Console.

| **ensemble member.** A zEnterprise node that has been  
| added to an ensemble.

**enterprise.** The composite of all operational entities, functions, and resources that form the total business concern and that require an information system.

**enterprise monitoring.** Enterprise monitoring is used by SA z/OS to update the *NetView Management Console (NMC)* resource status information that is stored in the *Resource Object Data Manager (RODM)*. Resource status information is acquired by enterprise monitoring of the *Resource Measurement Facility (RMF) Monitor III* service information at user-defined intervals. SA z/OS stores this information in its operational information base, where it is used to update the information presented to the operator in graphic displays.

**Enterprise Systems Architecture (ESA).** A hardware architecture that reduces the effort required for managing data sets and extends addressability for system, subsystem, and application functions.

**entries.** Resources, such as processors, entered on panels.

**entry type.** Resources, such as processors or applications, used for automation and monitoring.

**environment.** Data processing enterprise.

**error threshold.** An automation policy setting that specifies when SA z/OS should stop trying to restart or recover an application, subsystem or component, or offload a data set.

**ESA.** See Enterprise Systems Architecture.

**eServer™.** Processor family group designator used by the SA z/OS customization dialogs to define a target hardware as member of the System z or 390-CMOS processor families.

**event.** (1) In NetView, a record indicating irregularities of operation in physical elements of a network. (2) An occurrence of significance to a task; for example, the completion of an asynchronous operation, such as an input/output operation. (3) Events are part of a trigger condition, such that if all events of a trigger condition have occurred, a startup or shutdown of an application is performed.

**event control block (ECB).** A control block used to represent the status of an event.

**exception condition.** An occurrence on a system that is a deviation from normal operation. SA z/OS monitoring highlights exception conditions and allows an SA z/OS enterprise to be managed by exception.

**Extended Binary Coded Decimal Interchange Code (EBCDIC).** A coded character set of 256 8-bit characters developed for the representation of textual data. See also American Standard Code for Information Interchange.

**extended recovery facility (XRF).** A facility that minimizes the effect of failures in z/OS, VTAM, the host processor, or high availability applications during sessions between high availability applications and designated terminals. This facility provides an alternate subsystem to take over sessions from the failing subsystem.

## F

**fallback system.** See secondary system.

**field.** A collection of bytes within a record that are logically related and are processed as a unit.

**file manager commands.** A set of SA z/OS commands that read data from or write data to the automation control file or the operational information base. These commands are useful in the development of automation that uses SA z/OS facilities.

**focal point.** In NetView, the focal-point domain is the central host domain. It is the central control point for any management services element containing control of the network management data.

**focal point system.** (1) A system that can administer, manage, or control one or more target systems. There are a number of different focal point systems associated with IBM automation products. (2) **NMC focal point system.** The NMC focal point system is a NetView system with an attached workstation server and LAN that gathers information about the state of the network. This focal point system uses RODM to store the data it collects in the data model. The information stored in RODM can be accessed from any LAN-connected workstation with NetView Management Console installed. (3) **NPDA focal point system.** This is a NetView system that collects all the NPDA alerts that are generated within your enterprise. It is supported by NetView. If you have SA z/OS installed the NPDA focal point system must be the same as your NMC focal point system. The NPDA focal point system is also known as the *alert focal point system*. (4) **SA z/OS Processor Operations focal point system.** This is a NetView system that has SA z/OS host code installed. The SA z/OS Processor Operations focal point system receives messages from the systems and operator consoles of the machines that it controls. It provides full systems and operations console function for its target systems. It can be used to IPL these systems. Note that some restrictions apply to the Hardware Management Console for an S/390® microprocessor cluster. (5) **SA z/OS SDF focal point system.** The SA z/OS SDF focal point system is an SA z/OS NetView system that collects status information from other SA z/OS NetViews within your enterprise. (6) **Status focal point system.** In NetView, the system to which STATMON, VTAM and NLDM send status information on network resources. If you have a NMC focal point, it must be on the same system as the Status focal point. (7) **Hardware Management Console.** Although not listed as a focal point, the Hardware Management Console acts as a focal point for the console functions of an S/390 microprocessor cluster. Unlike all the other focal points in this definition, the Hardware Management Console runs on a LAN-connected workstation,

**frame.** For a System/390 microprocessor cluster, a frame contains one or two central processor complexes (CPCs), support elements, and AC power distribution.

**full-screen mode.** In NetView, a form of panel presentation that makes it possible to display the contents of an entire workstation screen at once.

Full-screen mode can be used for fill-in-the-blanks prompting. Contrast with line mode.

## G

**gateway session.** An NetView-NetView Task session with another system in which the SA z/OS outbound gateway operator logs onto the other NetView session without human operator intervention. Each end of a gateway session has both an inbound and outbound gateway operator.

**generic alert.** Encoded alert information that uses code points (defined by IBM and possibly customized by users or application programs) stored at an alert receiver, such as NetView.

**group.** A collection of target systems defined through configuration dialogs. An installation might set up a group to refer to a physical site or an organizational or application entity.

**group entry.** A construct, created with the customization dialogs, used to represent and contain policy for a group.

**group entry type.** A collection of target systems defined through the customization dialog. An installation might set up a group to refer to a physical site or an organizational entity. Groups can, for example, be of type STANDARD or SYSPLEX.

## H

| **Hardware Management Console (HMC).** A user  
| interface through which data center personnel  
| configure, control, monitor, and manage System z  
| hardware and software resources. The HMC  
| communicates with each central processor complex  
| (CPC) through the Support Element. On an IBM  
| zEnterprise 196 (z196), using the Unified Resource  
| Manager on the HMCs or Support Elements, personnel  
| can also create and manage an ensemble.

**Hardware Management Console Application (HWMCA).** A direct-manipulation object-oriented graphical user interface that provides a single point of control and single system image for hardware elements. The HWMCA provides grouping support, aggregated and real-time system status using colors, consolidated hardware messages support, consolidated operating system messages support, consolidated service support, and hardware commands targeted at a single system, multiple systems, or a group of systems.

**heartbeat.** In SA z/OS, a function that monitors the validity of the status forwarding path between remote systems and the NMC focal point, and monitors the availability of remote z/OS systems, to ensure that status information displayed on the SA z/OS workstation is current.

**help panel.** An online panel that tells you how to use a command or another aspect of a product.

**hierarchy.** In the NetView program, the resource types, display types, and data types that make up the organization, or levels, in a network.

**high-level language (HLL).** A programming language that provides some level of abstraction from assembler language and independence from a particular type of machine. For the NetView program, the high-level languages are PL/I and C.

**HLL.** See high-level language.

**host (primary processor).** The processor that you enter a command at (also known as the *issuing processor*).

**host system.** In a coupled system or distributed system environment, the system on which the facilities for centralized automation run. SA z/OS publications refer to target systems or focal-point systems instead of hosts.

**HWMCA.** See Hardware Management Console Application.

| **Hypervisor.** A program that allows multiple instances  
| of operating systems or virtual servers to run  
| simultaneously on the same hardware device. A  
| hypervisor can run directly on the hardware, can run  
| within an operating system, or can be imbedded in  
| platform firmware. Examples of hypervisors include  
| PR/SM, z/VM, and PowerVM Enterprise Edition.

## I

| **IBM blade.** A customer-acquired, customer-installed  
| select blade to be managed by IBM zEnterprise Unified  
| Resource Manager. One example of an IBM blade is a  
| POWER7 blade.

| **IBM Smart Analyzer for DB2 for z/OS.** An optimizer  
| that processes certain types of data warehouse queries  
| for DB2 for z/OS.

| **IBM System z Application Assist Processor (zAAP).**  
| A specialized processor that provides a Java execution  
| environment, which enables Java-based web  
| applications to be integrated with core z/OS business  
| applications and backend database systems.

| **IBM System z Integrated Information Processor (zIIP).** A specialized processor that provides  
| computing capacity for selected data and transaction  
| processing workloads and for selected network  
| encryption workloads.

| **IBM Websphere DataPower Integration Appliance  
| X150 for zEnterprise (DataPower X150z).** A  
| purpose-built appliance that simplifies, helps secure,  
| and optimizes XML and Web services processing.

| **IBM Enterprise 196 (z196).** The newest generation of System z family of servers built on a new processor chip, with enhanced memory function and capacity, security, and on demand enhancements to support existing mainframe workloads and large scale consolidation.

| **IBM zEnterprise BladeCenter Extension (zBX).** A heterogeneous hardware infrastructure that consists of a BladeCenter chassis attached to an IBM zEnterprise 196 (z196). A BladeCenter chassis can contain IBM blades or optimizers.

| **IBM zEnterprise BladeCenter Extension (zBX) blade.** Generic name for all blade types supported in an IBM zEnterprise BladeCenter Extension (zBX). This term includes IBM blades and optimizers.

| **IBM zEnterprise System (zEnterprise).** A heterogeneous hardware infrastructure that can consist of an IBM zEnterprise 196 (z196) and an attached IBM zEnterprise BladeCenter Extension (zBX) Model 002, managed as a single logical virtualized system by the Unified Resource Manager.

| **IBM zEnterprise Unified Resource Manager.** Licensed Internal Code (LIC), also known as firmware, that is part of the Hardware Management Console. The Unified Resource Manager provides energy monitoring and management, goal-oriented policy management, increased security, virtual networking, and data management for the physical and logical resources of a given ensemble.

**I/O operations.** The part of SA z/OS that provides you with a single point of logical control for managing connectivity in your active I/O configurations. I/O operations takes an active role in detecting unusual conditions and lets you view and change paths between a processor and an I/O device, using dynamic switching (the ESCON director). Also known as I/O Ops.

**I/O Ops.** See I/O operations.

**I/O resource number.** Combination of channel path identifier (CHPID), device number, etc. See internal token.

**images.** A grouping of processors and I/O devices that you define. You can define a single-image mode that allows a multiprocessor system to function as one central processor image.

**IMS.** See Information Management System.

**IMS/VS.** See Information Management System/Virtual Storage.

**inbound.** In SA z/OS, messages sent to the focal-point system from the PC or target system.

**inbound gateway operator.** The automation operator that receives incoming messages, commands, and responses from the outbound gateway operator at the sending system. The inbound gateway operator handles communications with other systems using a gateway session.

**Information Management System (IMS).** Any of several system environments available with a database manager and transaction processing that are capable of managing complex databases and terminal networks.

**Information Management System/Virtual Storage (IMS/VS).** A database/data communication (DB/DC) system that can manage complex databases and networks. Synonymous with Information Management System.

**INGEIO PROC.** The I/O operations default procedure name. It is part of the SYS1.PROCLIB.

**initial microprogram load.** The action of loading microprograms into computer storage.

**initial program load (IPL).** (1) The initialization procedure that causes an operating system to commence operation. (2) The process by which a configuration image is loaded into storage at the beginning of a workday or after a system malfunction. (3) The process of loading system programs and preparing a system to run jobs.

**initialize automation.** SA z/OS-provided automation that issues the correct z/OS start command for each subsystem when SA z/OS is initialized. The automation ensures that subsystems are started in the order specified in the automation control files and that prerequisite applications are functional.

**input/output configuration data set (IOCDs).** A configuration definition built by the I/O configuration program (IOCP) and stored on disk files associated with the processor controller.

**input/output support processor (IOSP).** The hardware unit that provides I/O support functions for the primary support processor and maintenance support functions for the processor controller.

**Interactive System Productivity Facility (ISPF).** An IBM licensed program that serves as a full-screen editor and dialog manager. Used for writing application programs, it provides a means of generating standard screen panels and interactive dialogs between the application programmer and the terminal user. See also Time Sharing Option.

**interested operator list.** The list of operators who are to receive messages from a specific target system.

**internal token.** A *logical token* (LTOK); name by which the I/O resource or object is known; stored in IODF.

**IOCDs.** See input/output configuration data set.

**IOSP.** See input/output support processor.

**IPL.** See initial program load.

**ISPF.** See Interactive System Productivity Facility.

**ISPF console.** You log on to ISPF from this 3270-type console to use the runtime panels for I/O operations and SA z/OS customization panels.

**issuing host.** The base program that you enter a command for processing with. See primary host.

## J

**JCL.** See job control language.

**JES.** See job entry subsystem.

**JES2.** An MVS subsystem that receives jobs into the system, converts them to internal format, selects them for execution, processes their output, and purges them from the system. In an installation with more than one processor, each JES2 processor independently controls its job input, scheduling, and output processing. See also job entry subsystem and JES3

**JES3.** An MVS subsystem that receives jobs into the system, converts them to internal format, selects them for execution, processes their output, and purges them from the system. In complexes that have several loosely coupled processing units, the JES3 program manages processors so that the global processor exercises centralized control over the local processors and distributes jobs to them using a common job queue. See also job entry subsystem and JES2.

**job.** (1) A set of data that completely defines a unit of work for a computer. A job usually includes all necessary computer programs, linkages, files, and instructions to the operating system. (2) An address space.

**job control language (JCL).** A problem-oriented language designed to express statements in a job that are used to identify the job or describe its requirements to an operating system.

**job entry subsystem (JES).** An IBM licensed program that receives jobs into the system and processes all output data that is produced by jobs. In SA z/OS publications, JES refers to JES2 or JES3, unless otherwise stated. See also JES2 and JES3.

## K

**Kanji.** An ideographic character set used in Japanese. See also double-byte character set.

## L

**LAN.** See local area network.

**line mode.** A form of screen presentation in which the information is presented a line at a time in the message area of the terminal screen. Contrast with full-screen mode.

**link.** (1) In SNA, the combination of the link connection and the link stations joining network nodes; for example, a System/370 channel and its associated protocols, a serial-by-bit connection under the control of synchronous data link control (SDLC). See synchronous data link control. (2) In SA z/OS, link connection is the physical medium of transmission.

**link-attached.** Describes devices that are physically connected by a telecommunication line. Contrast with channel-attached.

**Linux on System z.** UNIX-like open source operating system conceived by Linus Torvalds and developed across the internet.

**local.** Pertaining to a device accessed directly without use of a telecommunication line. Synonymous with channel-attached.

**local area network (LAN).** (1) A network in which a set of devices is connected for communication. They can be connected to a larger network. See also token ring. (2) A network that connects several devices in a limited area (such as a single building or campus) and that can be connected to a larger network.

**logical partition (LP).** A subset of the processor hardware that is defined to support an operating system. See also logically partitioned mode.

**logical switch number (LSN).** Assigned with the switch parameter of the CHPID macro of the IOCP.

**logical token (LTOK).** Resource number of an object in the IODF.

**logical unit (LU).** In SNA, a port through which an end user accesses the SNA network and the functions provided by system services control points (SSCPs). An LU can support at least two sessions, one with an SSCP and one with another LU, and may be capable of supporting many sessions with other LUs. See also physical unit and system services control point.

**logical unit 6.2 (LU 6.2).** A type of logical unit that supports general communications between programs in a distributed processing environment. LU 6.2 is characterized by:

- A peer relationship between session partners
- Efficient use of a session for multiple transactions
- A comprehensive end-to-end error processing

- A generic application program interface (API) consisting of structured verbs that are mapped to a product implementation

Synonym for advanced program-to-program communication.

**logically partitioned (LPAR) mode.** A central processor mode that enables an operator to allocate system processor hardware resources among several logical partitions. Contrast with basic mode.

**LOGR.** The sysplex logger.

**LP.** See logical partition.

**LPAR.** See logically partitioned mode.

**LSN.** See logical switch number.

**LU.** See logical unit.

**LU 6.2.** See logical unit 6.2.

**LU 6.2 session.** A session initiated by VTAM on behalf of an LU 6.2 application program, or a session initiated by a remote LU in which the application program specifies that VTAM is to control the session by using the APPCCMD macro. See logical unit 6.2.

**LU-LU session.** In SNA, a session between two logical units (LUs) in an SNA network. It provides communication between two end users, or between an end user and an LU services component.

## M

**MAT.** Deprecated term for NetView automation table.

**MCA.** See Micro Channel architecture.

**MCS.** See multiple console support.

**member.** A specific function (one or more modules or routines) of a multisystem application that is defined to XCF and assigned to a group by the multisystem application. A member resides on one system in the sysplex and can use XCF services to communicate (send and receive data) with other members of the same group.

**message automation table (MAT).** Deprecated term for NetView automation table.

**message class.** A number that SA z/OS associates with a message to control routing of the message. During automated operations, the classes associated with each message issued by SA z/OS are compared to the classes assigned to each notification operator. Any operator with a class matching one of the message's classes receives the message.

**message forwarding.** The SA z/OS process of sending messages generated at an SA z/OS target system to the SA z/OS focal-point system.

**message group.** Several messages that are displayed together as a unit.

**message monitor task.** A task that starts and is associated with a number of communications tasks. Message monitor tasks receive inbound messages from a communications task, determine the originating target system, and route the messages to the appropriate target control tasks.

**message processing facility (MPF).** A z/OS table that screens all messages sent to the z/OS console. The MPF compares these messages with a customer-defined list of messages on which to automate, suppress from the z/OS console display, or both, and marks messages to automate or suppress. Messages are then broadcast on the subsystem interface (SSI).

**message suppression.** The ability to restrict the amount of message traffic displayed on the z/OS console.

**Micro Channel architecture.** The rules that define how subsystems and adapters use the Micro Channel bus in a computer. The architecture defines the services that each subsystem can or must provide.

**microprocessor.** A processor implemented on one or a small number of chips.

**migration.** Installation of a new version or release of a program to replace an earlier version or release.

**MP.** Multiprocessor.

**MPF.** See message processing facility.

**MPFLSTSA.** The MPFLST member that is built by SA z/OS.

**multi-MVS environment.** physical processing system that is capable of operating more than one MVS image. See also MVS image.

**multiple console support (MCS).** A feature of MVS that permits selective message routing to multiple consoles.

**Multiple Virtual Storage (MVS).** An IBM operating system that accesses multiple address spaces in virtual storage. The predecessor of z/OS.

**multiprocessor (MP).** A CPC that can be physically partitioned to form two operating processor complexes.

**multisystem application.** An application program that has various functions distributed across z/OS images in a multisystem environment.

**multisystem environment.** An environment in which two or more systems reside on one or more processors. Or one or more processors can communicate with programs on the other systems.

**MVS.** See Multiple Virtual Storage.

**MVS image.** A single occurrence of the MVS operating system that has the ability to process work. See also multi-MVS environment and single-MVS environment.

**MVS/ESA.** Multiple Virtual Storage/Enterprise Systems Architecture. See z/OS.

**MVS/JES2.** Multiple Virtual Storage/Job Entry System 2. A z/OS subsystem that receives jobs into the system, converts them to an internal format, selects them for execution, processes their output, and purges them from the system. In an installation with more than one processor, each JES2 processor independently controls its job input, scheduling, and output processing.

## N

**NAU.** (1) See network addressable unit. (2) See network accessible unit.

**NCCF.** See Network Communications Control Facility.

**NCP.** (1) See network control program (general term). (2) See Network Control Program (an IBM licensed program). Its full name is Advanced Communications Function for the Network Control Program. Synonymous with ACF/NCP.

**NCP/token ring interconnection.** A function used by ACF/NCP to support token ring-attached SNA devices. NTRI also provides translation from token ring-attached SNA devices (PUs) to switched (dial-up) devices.

**NetView.** An IBM licensed program used to monitor a network, manage it, and diagnose network problems. NetView consists of a command facility that includes a presentation service, command processors, automation based on command lists, and a transaction processing structure on which the session monitor, hardware monitor, and terminal access facility (TAF) network management applications are built.

**NetView (NCCF) console.** A 3270-type console for NetView commands and runtime panels for system operations and processor operations.

**NetView automation procedures.** A sequence of commands, packaged as a NetView command list or a command processor written in a high-level language. An automation procedure performs automation functions and runs under the NetView program.

**NetView automation table (AT).** A table against which the NetView program compares incoming

messages. A match with an entry triggers the specified response. SA z/OS entries in the NetView automation table trigger an SA z/OS response to target system conditions. Formerly known as the message automation table (MAT).

**NetView command list language.** An interpretive language unique to NetView that is used to write command lists.

**NetView Graphic Monitor Facility (NGMF).** Deprecated term for NetView Management Console.

**NetView hardware monitor.** The component of NetView that helps identify network problems, such as hardware, software, and microcode, from a central control point using interactive display techniques. Formerly called *network problem determination application*.

**NetView log.** The log that NetView records events relating to NetView and SA z/OS activities in.

**NetView Management Console (NMC).** A function of the NetView program that provides a graphic, topological presentation of a network that is controlled by the NetView program. It provides the operator different views of a network, multiple levels of graphical detail, and dynamic resource status of the network. This function consists of a series of graphic windows that allows you to manage the network interactively. Formerly known as the NetView Graphic Monitor Facility (NGMF).

**NetView message table.** See NetView automation table.

**NetView paths via logical unit (LU 6.2).** A type of network-accessible port (VTAM connection) that enables end users to gain access to SNA network resources and communicate with each other. LU 6.2 permits communication between processor operations and the workstation. See logical unit 6.2.

**NetView-NetView task (NNT).** The task that a cross-domain NetView operator session runs under. Each NetView program must have a NetView-NetView task to establish one NNT session. See also operator station task.

**NetView-NetView task session.** A session between two NetView programs that runs under a NetView-NetView task. In SA z/OS, NetView-NetView task sessions are used for communication between focal point and remote systems.

**network.** (1) An interconnected group of nodes. (2) In data processing, a user application network. See SNA network.

**network accessible unit (NAU).** In SNA networking, any device on the network that has a network address, including a logical unit (LU), physical unit (PU), control point (CP), or system services control point (SSCP). It is



the origin or the destination of information transmitted by the path control network. Synonymous with network addressable unit.

**network addressable unit (NAU).** Synonym for network accessible unit.

**Network Communications Control Facility (NCCF).** The operations control facility for the network. NCCF consists of a presentation service, command processors, automation based on command lists, and a transaction processing structure on which the network management applications NLDM and NPDA are built. NCCF is a precursor to the NetView command facility.

**Network Control Program (NCP).** An IBM licensed program that provides communication controller support for single-domain, multiple-domain, and interconnected network capability. Its full name is Advanced Communications Function for the Network Control Program.

**network control program (NCP).** (1) A program that controls the operation of a communication controller. (2) A program used for requests and responses exchanged between physical units in a network for data flow control.

**Network Problem Determination Application (NPDA).** An NCCF application that helps you identify network problems, such as hardware, software, and microcode, from a central control point using interactive display methods. The alert manager for the network. The precursor of the NetView hardware monitor.

**Networking NetView.** In SA z/OS the NetView that performs network management functions, such as managing the configuration of a network. In SA z/OS it is common to also route alerts to the Networking NetView.

**NGMF.** Deprecated term for NetView Management Console.

**NGMF focal-point system.** Deprecated term for NMC focal point system.

**NIP.** See nucleus initialization program.

**NMC focal point system.** See focal point system

**NMC workstation.** The NMC workstation is the primary way to dynamically monitor SA z/OS systems. From the windows, you see messages, monitor status, view trends, and react to changes before they cause problems for end users. You can use multiple windows to monitor multiple views of the system.

**NNT.** See NetView-NetView task.

**notification message.** An SA z/OS message sent to a human notification operator to provide information

about significant automation actions. Notification messages are defined using the customization dialogs.

**notification operator.** A NetView console operator who is authorized to receive SA z/OS notification messages. Authorization is made through the customization dialogs.

**NPDA.** See Network Problem Determination Application.

**NPDA focal-point system.** See focal point system.

**NTRI.** See NCP/token ring interconnection.

**nucleus initialization program (NIP).** The program that initializes the resident control program; it allows the operator to request last-minute changes to certain options specified during system generation.

## O

**objective value.** An average Workflow or Using value that SA z/OS can calculate for applications from past service data. SA z/OS uses the objective value to calculate warning and alert thresholds when none are explicitly defined.

**OCA.** In SA z/OS, operator console A, the active operator console for a target system. Contrast with OCB.

**OCB.** In SA z/OS, operator console B, the backup operator console for a target system. Contrast with OCA.

**OCF.** See operations command facility.

**OCF-based processor.** A central processor complex that uses an operations command facility for interacting with human operators or external programs to perform operations management functions on the CPC.

**OPC/A.** See Operations Planning and Control/Advanced.

**OPC/ESA.** See Operations Planning and Control/Enterprise Systems Architecture.

**Open Systems Adapter (OSA).** I/O operations can display the Open System Adapter (OSA) channel logical definition, physical attachment, and status. You can configure an OSA channel on or off.

**operating system (OS).** Software that controls the execution of programs and that may provide services such as resource allocation, scheduling, input/output control, and data management. Although operating systems are predominantly software, partial hardware implementations are possible. (T)

**operations.** The real-time control of a hardware device or software function.

**operations command facility (OCF).** A facility of the central processor complex that accepts and processes operations management commands.

**Operations Planning and Control/Advanced (OPC/A).** A set of IBM licensed programs that automate, plan, and control batch workload. OPC/A analyzes system and workload status and submits jobs accordingly.

**Operations Planning and Control/Enterprise Systems Architecture (OPC/ESA).** A set of IBM licensed programs that automate, plan, and control batch workload. OPC/ESA analyzes system and workload status and submits jobs accordingly. The successor to OPC/A.

**operator.** (1) A person who keeps a system running. (2) A person or program responsible for managing activities controlled by a given piece of software such as z/OS, the NetView program, or IMS. (3) A person who operates a device. (4) In a language statement, the lexical entity that indicates the action to be performed on operands.

**operator console.** (1) A functional unit containing devices that are used for communications between a computer operator and a computer. (T) (2) A display console used for communication between the operator and the system, used primarily to specify information concerning application programs and I/O operations and to monitor system operation. (3) In SA z/OS, a console that displays output from and sends input to the operating system (z/OS, LINUX, VM, VSE). Also called *operating system console*. In the SA z/OS operator commands and configuration dialogs, OC is used to designate a target system operator console.

**operator station task (OST).** The NetView task that establishes and maintains the online session with the network operator. There is one operator station task for each network operator who logs on to the NetView program.

**operator view.** A set of group, system, and resource definitions that are associated together for monitoring purposes. An operator view appears as a graphic display in the graphical interface showing the status of the defined groups, systems, and resources.

**OperatorView entry.** A construct, created with the customization dialogs, used to represent and contain policy for an operator view.

| **optimizer.** A special-purpose hardware component or  
| appliance that can perform a limited set of specific  
| functions with optimized performance when compared  
| to a general-purpose processor. Because of its limited  
| set of functions, an optimizer is an integrated part of a  
| processing environment, rather than a stand-alone unit.  
| One example of an optimizer is the IBM Smart  
| Analytics Optimizer for DB2 for z/OS.

**OS.** See operating system.

**OSA.** See Open Systems Adapter.

**OST.** See operator station task.

**outbound.** In SA z/OS, messages or commands from the focal-point system to the target system.

**outbound gateway operator.** The automation operator that establishes connections to other systems. The outbound gateway operator handles communications with other systems through a gateway session. The automation operator sends messages, commands, and responses to the inbound gateway operator at the receiving system.

## P

**page.** (1) The portion of a panel that is shown on a display surface at one time. (2) To transfer instructions, data, or both between real storage and external page or auxiliary storage.

**panel.** (1) A formatted display of information that appears on a terminal screen. Panels are full-screen 3270-type displays with a monospaced font, limited color and graphics. (2) By using SA z/OS panels you can see status, type commands on a command line using a keyboard, configure your system, and passthru to other consoles. See also help panel. (3) In computer graphics, a display image that defines the locations and characteristics of display fields on a display surface. Contrast with screen.

**parallel channels.** Parallel channels operate in either byte (BY) or block (BL) mode. You can change connectivity to a parallel channel operating in block mode.

**parameter.** (1) A variable that is given a constant value for a specified application and that may denote the application. (2) An item in a menu for which the user specifies a value or for which the system provides a value when the menu is interpreted. (3) Data passed to a program or procedure by a user or another program, specifically as an operand in a language statement, as an item in a menu, or as a shared data structure.

**partition.** (1) A fixed-size division of storage. (2) In VSE, a division of the virtual address area that is available for program processing. (3) On an IBM Personal Computer fixed disk, one of four possible storage areas of variable size; one can be accessed by DOS, and each of the others may be assigned to another operating system.

**partitionable CPC.** A CPC that can be divided into 2 independent CPCs. See also physical partition, single-image mode, MP, and side.

**partitioned data set (PDS).** A data set in direct access storage that is divided into partitions, called *members*, each of which can contain a program, part of a program, or data.

**passive monitoring.** In SA z/OS, the receiving of unsolicited messages from z/OS systems and their resources. These messages can prompt updates to resource status displays. See also active monitoring

**PCE.** A processor controller. Also known as the support processor or service processor in some processor families.

**PDB.** See policy database.

**PDS.** See partitioned data set.

**physical partition.** Part of a CPC that operates as a CPC in its own right, with its own copy of the operating system.

**physical unit (PU).** In SNA, the component that manages and monitors the resources (such as attached links and adjacent link stations) of a node, as requested by a system services control point (SSCP) through an SSCP-PU session. An SSCP activates a session with the physical unit to indirectly manage, through the PU, resources of the node such as attached links.

**physically partitioned (PP) configuration.** A mode of operation that allows a multiprocessor (MP) system to function as two or more independent CPCs having separate power, water, and maintenance boundaries. Contrast with single-image mode.

**POI.** See program operator interface.

**policy.** The automation and monitoring specifications for an SA z/OS enterprise. See *IBM Tivoli System Automation for z/OS Defining Automation Policy*.

**policy database.** The automation definitions (automation policy) that the automation programmer specifies using the customization dialog is stored in the policy database. Also known as the PDB. See also automation policy.

**POR.** See power-on reset.

**port.** (1) System hardware that the I/O devices are attached to. (2) In an ESCON switch, a port is an addressable connection. The switch routes data through the ports to the channel or control unit. Each port has a name that can be entered into a switch matrix, and you can use commands to change the switch configuration. (3) An access point (for example, a logical unit) for data entry or exit. (4) A functional unit of a node that data can enter or leave a data network through. (5) In data communication, that part of a data processor that is dedicated to a single data channel for the purpose of receiving data from or transmitting data to one or more external, remote devices.

**power-on reset (POR).** A function that re-initializes all the hardware in a CPC and loads the internal code that enables the CPC to load and run an operating system. See initial microprogram load.

**PP.** See physical partition.

**PPI.** See program to program interface.

**PPT.** See primary POI task.

**PR/SM.** See Processor Resource/Systems Manager.

**primary host.** The base program that you enter a command for processing at.

**primary POI task (PPT).** The NetView subtask that processes all unsolicited messages received from the VTAM program operator interface (POI) and delivers them to the controlling operator or to the command processor. The PPT also processes the initial command specified to execute when NetView is initialized and timer request commands scheduled to execute under the PPT.

**primary system.** A system is a primary system for an application if the application is normally meant to be running there. SA z/OS starts the application on all the primary systems defined for it.

**problem determination.** The process of determining the source of a problem; for example, a program component, machine failure, telecommunication facilities, user or contractor-installed programs or equipment, environment failure such as a power loss, or user error.

**processor.** (1) A device for processing data from programmed instructions. It may be part of another unit. (2) In a computer, the part that interprets and executes instructions. Two typical components of a processor are a control unit and an arithmetic logic unit.

**processor controller.** Hardware that provides support and diagnostic functions for the central processors.

**processor operations.** The part of SA z/OS that monitors and controls processor (hardware) operations. Processor operations provides a connection from a focal-point system to a target system. Through NetView on the focal-point system, processor operations automates operator and system consoles for monitoring and recovering target systems. Also known as ProcOps.

**Processor Resource/Systems Manager (PR/SM).** The feature that allows the processor to use several operating system images simultaneously and provides logical partitioning capability. See also logically partitioned mode.

**ProcOps.** See processor operations.

**ProcOps Service Machine (PSM).** The PSM is a CMS user on a VM host system. It runs a CMS multitasking application that serves as "virtual hardware" for ProcOps. ProcOps communicates via the PSM with the VM guest systems that are defined as target systems within ProcOps.

**product automation.** Automation integrated into the base of SA z/OS for the products CICS, DB2, IMS, TWS (formerly called *features*).

**program operator interface (POI).** A NetView facility for receiving VTAM messages.

**program to program interface (PPI).** A NetView function that allows user programs to send or receive data buffers from other user programs and to send alerts to the NetView hardware monitor from system and application programs.

**protocol.** In SNA, the meanings of, and the sequencing rules for, requests and responses used for managing the network, transferring data, and synchronizing the states of network components.

**proxy resource.** A resource defined like an entry type APL representing a processor operations target system.

**PSM.** See ProcOps Service Machine.

**PU.** See physical unit.

## R

**RACF.** See Resource Access Control Facility.

**remote system.** A system that receives resource status information from an SA z/OS focal-point system. An SA z/OS remote system is defined as part of the same SA z/OS enterprise as the SA z/OS focal-point system to which it is related.

**requester.** A workstation from that user can log on to a domain from, that is, to the servers belonging to the domain, and use network resources. Users can access the shared resources and use the processing capability of the servers, thus reducing hardware investment.

**resource.** (1) Any facility of the computing system or operating system required by a job or task, and including main storage, input/output devices, the processing unit, data sets, and control or processing programs. (2) In NetView, any hardware or software that provides function to the network. (3) In SA z/OS, any z/OS application, z/OS component, job, device, or target system capable of being monitored or automated through SA z/OS.

**Resource Access Control Facility (RACF).** A program that can provide data security for all your resources. RACF protects data from accidental or deliberate unauthorized disclosure, modification, or destruction.

**resource group.** A physically partitionable portion of a processor. Also known as a *side*.

**Resource Measurement Facility (RMF).** A feature of z/OS that measures selected areas of system activity and presents the data collected in the format of printed reports, System Management Facility (SMF) records, or display reports.

**Resource Object Data Manager (RODM).** In NetView for z/OS, a component that provides an in-memory cache for maintaining real-time data in an address space that is accessible by multiple applications. RODM also allows an application to query an object and receive a rapid response and act on it.

**resource token.** A unique internal identifier of an ESCON resource or resource number of the object in the IODF.

**restart automation.** Automation provided by SA z/OS that monitors subsystems to ensure that they are running. If a subsystem fails, SA z/OS attempts to restart it according to the policy in the automation configuration file.

**Restructured Extended Executor (REXX).** A general-purpose, high-level, programming language, particularly suitable for EXEC procedures or programs for personal computing, used to write command lists.

**return code.** A code returned from a program used to influence the issuing of subsequent instructions.

**REXX.** See Restructured Extended Executor.

**REXX procedure.** A command list written with the Restructured Extended Executor (REXX), which is an interpretive language.

**RMF.** See Resource Measurement Facility.

**RODM.** See Resource Object Data Manager.

## S

**SAF.** See Security Authorization Facility.

**SA IOM.** See System Automation for Integrated Operations Management.

**SAPlex.** SAPlex or "SA z/OS Subplex" is a term used in conjunction with a sysplex. In fact, a SAPlex is a subset of a sysplex. However, it can also be a sysplex. For a detailed description, refer to "Using SA z/OS Subplexes" in *IBM Tivoli System Automation for z/OS Planning and Installation*.

**SA z/OS.** See System Automation for z/OS.

**SA z/OS customization dialogs.** An ISPF application through which the SA z/OS policy administrator

defines policy for individual z/OS systems and builds automation control data and RODM load function files.

**SA z/OS customization focal point system.** See focal point system.

**SA z/OS data model.** The set of objects, classes and entity relationships necessary to support the function of SA z/OS and the NetView automation platform.

**SA z/OS enterprise.** The group of systems and resources defined in the customization dialogs under one enterprise name. An SA z/OS enterprise consists of connected z/OS systems running SA z/OS.

**SA z/OS focal point system.** See focal point system.

**SA z/OS policy.** The description of the systems and resources that make up an SA z/OS enterprise, together with their monitoring and automation definitions.

**SA z/OS policy administrator.** The member of the operations staff who is responsible for defining SA z/OS policy.

**SA z/OS satellite.** If you are running two NetViews on an z/OS system to split the automation and networking functions of NetView, it is common to route alerts to the Networking NetView. For SA z/OS to process alerts properly on the Networking NetView, you must install a subset of SA z/OS code, called an *SA z/OS satellite* on the Networking NetView.

**SA z/OS SDF focal point system.** See focal point system.

**SCA.** In SA z/OS, system console A, the active system console for a target hardware. Contrast with SCB.

**SCB.** In SA z/OS, system console B, the backup system console for a target hardware. Contrast with SCA.

**screen.** Deprecated term for panel.

**screen handler.** In SA z/OS, software that interprets all data to and from a full-screen image of a target system. The interpretation depends on the format of the data on the full-screen image. Every processor and operating system has its own format for the full-screen image. A screen handler controls one PS/2 connection to a target system.

**SDF.** See status display facility.

**SDLC.** See synchronous data link control.

**SDSF.** See System Display and Search Facility.

**secondary system.** A system is a secondary system for an application if it is defined to automation on that system, but the application is not normally meant to be

running there. Secondary systems are systems to which an application can be moved in the event that one or more of its primary systems are unavailable. SA z/OS does not start the application on its secondary systems.

**Security Authorization Facility (SAF).** An MVS interface with which programs can communicate with an external security manager, such as RACF.

**server.** A server is a workstation that shares resources, which include directories, printers, serial devices, and computing powers.

**service language command (SLC).** The line-oriented command language of processor controllers or service processors.

**service period.** Service periods allow the users to schedule the availability of applications. A service period is a set of time intervals (service windows), during which an application should be active.

**service processor (SVP).** The name given to a processor controller on smaller System/370 processors.

**service threshold.** An SA z/OS policy setting that determines when to notify the operator of deteriorating service for a resource. See also alert threshold and warning threshold.

**session.** In SNA, a logical connection between two network addressable units (NAUs) that can be activated, tailored to provide various protocols, and deactivated, as requested. Each session is uniquely identified in a transmission header by a pair of network addresses identifying the origin and destination NAUs of any transmissions exchanged during the session.

**session monitor.** The component of the NetView program that collects and correlates session-related data and provides online access to this information. The successor to NLDM.

**shutdown automation.** SA z/OS-provided automation that manages the shutdown process for subsystems by issuing shutdown commands and responding to prompts for additional information.

**side.** A part of a partitionable CPC that can run as a physical partition and is typically referred to as the A-side or the B-side.

**Simple Network Management Protocol (SNMP).** A set of protocols for monitoring systems and devices in complex networks. Information about managed devices is defined and stored in a Management Information Base (MIB).

**single image.** A processor system capable of being physically partitioned that has not been physically partitioned. Single-image systems can be target hardware processors.

**single-MVS environment.** An environment that supports one MVS image. See also MVS image.

**single-image (SI) mode.** A mode of operation for a multiprocessor (MP) system that allows it to function as one CPC. By definition, a uniprocessor (UP) operates in single-image mode. Contrast with physically partitioned (PP) configuration.

**SLC.** See service language command.

**SMP/E.** See System Modification Program/Extended.

**SNA.** See Systems Network Architecture.

**SNA network.** In SNA, the part of a user-application network that conforms to the formats and protocols of systems network architecture. It enables reliable transfer of data among end users and provides protocols for controlling the resources of various network configurations. The SNA network consists of network addressable units (NAUs), boundary function components, and the path control network.

**SNMP.** See Simple Network Management Protocol.

**solicited message.** An SA z/OS message that directly responds to a command. Contrast with unsolicited message.

**SSCP.** See system services control point.

**SSI.** See subsystem interface.

**start automation.** SA z/OS-provided automation that manages and completes the startup process for subsystems. During this process, SA z/OS replies to prompts for additional information, ensures that the startup process completes within specified time limits, notifies the operator of problems, if necessary, and brings subsystems to an UP (or ready) state.

**startup.** The point in time that a subsystem or application is started.

**status.** The measure of the condition or availability of the resource.

**status display facility (SDF).** The system operations part of SA z/OS that displays status of resources such as applications, gateways, and write-to-operator messages (WTORs) on dynamic color-coded panels. SDF shows spool usage problems and resource data from multiple systems.

**status focal-point system.** See focal point system.

**steady state automation.** The routine monitoring, both for presence and performance, of subsystems, applications, volumes and systems. Steady state automation may respond to messages, performance exceptions and discrepancies between its model of the system and reality.

**structure.** A construct used by z/OS to map and manage storage on a coupling facility.

**subgroup.** A named set of systems. A subgroup is part of an SA z/OS enterprise definition and is used for monitoring purposes.

**SubGroup entry.** A construct, created with the customization dialogs, used to represent and contain policy for a subgroup.

| **subplex.** See SAplex.

**subsystem.** (1) A secondary or subordinate system, usually capable of operating independent of, or asynchronously with, a controlling system. (2) In SA z/OS, an z/OS application or subsystem defined to SA z/OS.

**subsystem interface (SSI).** The z/OS interface over which all messages sent to the z/OS console are broadcast.

**support element.** A hardware unit that provides communications, monitoring, and diagnostic functions to a central processor complex (CPC).

**support processor.** Another name given to a processor controller on smaller System/370 processors. See service processor.

**SVP.** See service processor.

**switch identifier.** The switch device number (swchdevn), the logical switch number (LSN) and the switch name

**switches.** ESCON directors are electronic units with ports that dynamically switch to route data to I/O devices. The switches are controlled by I/O operations commands that you enter on a workstation.

**symbolic destination name (SDN).** Used locally at the workstation to relate to the VTAM application name.

**synchronous data link control (SDLC).** A discipline for managing synchronous, code-transparent, serial-by-bit information transfer over a link connection. Transmission exchanges may be duplex or half-duplex over switched or nonswitched links. The configuration of the link connection may be point-to-point, multipoint, or loop. SDLC conforms to subsets of the Advanced Data Communication Control Procedures (ADCCP) of the American National Standards Institute and High-Level Data Link Control (HDLC) of the International Standards Organization.

**SYSINFO Report.** An RMF report that presents an overview of the system, its workload, and the total number of jobs using resources or delayed for resources.

**SysOps.** See system operations.

**sysplex.** A set of z/OS systems communicating and cooperating with each other through certain multisystem hardware components (coupling devices and timers) and software services (couple data sets).

In a sysplex, z/OS provides the coupling services that handle the messages, data, and status for the parts of a multisystem application that has its workload spread across two or more of the connected processors, sysplex timers, coupling facilities, and couple data sets (which contains policy and states for automation).

A Parallel Sysplex is a sysplex that includes a coupling facility.

**sysplex application group.** A sysplex application group is a grouping of applications that can run on any system in a sysplex.

**sysplex couple data set.** A couple data set that contains sysplex-wide data about systems, groups, and members that use XCF services. All z/OS systems in a sysplex must have connectivity to the sysplex couple data set. See also couple data set.

**Sysplex Timer®.** An IBM unit that synchronizes the time-of-day (TOD) clocks in multiple processors or processor sides. External Time Reference (ETR) is the z/OS generic name for the IBM Sysplex Timer (9037).

**system.** In SA z/OS, system means a focal point system (z/OS) or a target system (MVS, VM, VSE, LINUX, or CF).

#### **System Automation for Integrated Operations**

**Management.** (1) An outboard automation solution for secure remote access to mainframe/distributed systems. Tivoli System Automation for Integrated Operations Management, previously Tivoli AF/REMOTE, allows users to manage mainframe and distributed systems from any location. (2) The full name for SA IOM.

**System Automation for OS/390.** The full name for SA OS/390, the predecessor to System Automation for z/OS.

**System Automation for z/OS.** The full name for SA z/OS.

**system console.** (1) A console, usually having a keyboard and a display screen, that is used by an operator to control and communicate with a system. (2) A logical device used for the operation and control of hardware functions (for example, IPL, alter/display, and reconfiguration). The system console can be assigned to any of the physical displays attached to a processor controller or support processor. (3) In SA z/OS, the hardware system console for processor controllers or service processors of processors connected using SA z/OS. In the SA z/OS operator commands and configuration dialogs, SC is used to designate the system console for a target hardware processor.

**System Display and Search Facility (SDSF).** An IBM licensed program that provides information about jobs, queues, and printers running under JES2 on a series of panels. Under SA z/OS you can select SDSF from a pull-down menu to see the resources' status, view the z/OS system log, see WTOR messages, and see active jobs on the system.

**System entry.** A construct, created with the customization dialogs, used to represent and contain policy for a system.

**System Modification Program/Extended (SMP/E).** An IBM licensed program that facilitates the process of installing and servicing an z/OS system.

**system operations.** The part of SA z/OS that monitors and controls system operations applications and subsystems such as NetView, SDSF, JES, RMF, TSO, RODM, ACF/VTAM, CICS, IMS, and OPC. Also known as SysOps.

**system services control point (SSCP).** In SNA, the focal point within an SNA network for managing the configuration, coordinating network operator and problem determination requests, and providing directory support and other session services for end users of the network. Multiple SSCPs, cooperating as peers, can divide the network into domains of control, with each SSCP having a hierarchical control relationship to the physical units and logical units within its domain.

**System/390 microprocessor cluster.** A configuration that consists of central processor complexes (CPCs) and may have one or more integrated coupling facilities.

**Systems Network Architecture (SNA).** The description of the logical structure, formats, protocols, and operational sequences for transmitting information units through, and controlling the configuration and operation of, networks.

## **T**

**TAF.** See terminal access facility.

**target.** A processor or system monitored and controlled by a focal-point system.

**target control task.** In SA z/OS, target control tasks process commands and send data to target systems and workstations through communications tasks. A target control task (a NetView autotask) is assigned to a target system when the target system is initialized.

**target hardware.** In SA z/OS, the physical hardware on which a target system runs. It can be a single-image or physically partitioned processor. Contrast with target system.

**target system.** (1) In a distributed system environment, a system that is monitored and controlled by the focal-point system. Multiple target systems can be controlled by a single focal-point system. (2) In SA z/OS, a computer system attached to the focal-point system for monitoring and control. The definition of a target system includes how remote sessions are established, what hardware is used, and what operating system is used.

**task.** (1) A basic unit of work to be accomplished by a computer. (2) In the NetView environment, an operator station task (logged-on operator), automation operator (autotask), application task, or user task. A NetView task performs work in the NetView environment. All SA z/OS tasks are NetView tasks. See also message monitor task, and target control task.

**telecommunication line.** Any physical medium, such as a wire or microwave beam, that is used to transmit data.

**terminal access facility (TAF).** (1) A NetView function that allows you to log onto multiple applications either on your system or other systems. You can define TAF sessions in the SA z/OS customization panels so you don't have to set them up each time you want to use them. (2) In NetView, a facility that allows a network operator to control a number of subsystems. In a full-screen or operator control session, operators can control any combination of subsystems simultaneously.

**terminal emulation.** The capability of a microcomputer or personal computer to operate as if it were a particular type of terminal linked to a processing unit to access data.

**threshold.** A value that determines the point at which SA z/OS automation performs a predefined action. See alert threshold, warning threshold, and error threshold.

**time of day (TOD).** Typically refers to the time-of-day clock.

**Time Sharing Option (TSO).** An optional configuration of the operating system that provides conversational time sharing from remote stations. It is an interactive service on z/OS, MVS/ESA, and MVS/XA.

**Time-Sharing Option/Extended (TSO/E).** An option of z/OS that provides conversational timesharing from remote terminals. TSO/E allows a wide variety of users to perform many different kinds of tasks. It can handle short-running applications that use fewer sources as well as long-running applications that require large amounts of resources.

**timers.** A NetView command that issues a command or command processor (list of commands) at a specified time or time interval.

**Tivoli Workload Scheduler (TWS).** A family of IBM licensed products that plan, execute and track jobs on several platforms and environments. The successor to OPC/A.

**TOD.** Time of day.

**token ring.** A network with a ring topology that passes tokens from one attaching device to another; for example, the IBM Token-Ring Network product.

**TP.** See transaction program.

**transaction program.** In the VTAM program, a program that performs services related to the processing of a transaction. One or more transaction programs may operate within a VTAM application program that is using the VTAM application program interface (API). In that situation, the transaction program would request services from the applications program using protocols defined by that application program. The application program, in turn, could request services from the VTAM program by issuing the APPCCMD macro instruction.

**transitional automation.** The actions involved in starting and stopping subsystems and applications that have been defined to SA z/OS. This can include issuing commands and responding to messages.

**translating host.** Role played by a host that turns a resource number into a token during a unification process.

**trigger.** Triggers, in combination with events and service periods, are used to control the starting and stopping of applications in a single system or a parallel sysplex.

**TSO.** See Time Sharing Option.

**TSO console.** From this 3270-type console you are logged onto TSO or ISPF to use the runtime panels for I/O operations and SA z/OS customization panels.

**TSO/E.** See Time-Sharing Option/Extended.

**TWS.** See Tivoli Workload Scheduler.

## U

**UCB.** See unit control block.

**unit control block (UCB).** A control block in common storage that describes the characteristics of a particular I/O device on the operating system and that is used for allocating devices and controlling I/O operations.

**unsolicited message.** An SA z/OS message that is not a direct response to a command.

**user task.** An application of the NetView program defined in a NetView TASK definition statement.



**Using.** An RMF Monitor III definition. Jobs getting service from hardware resources (processors or devices) are **using** these resources. The use of a resource by an address space can vary from 0% to 100% where 0% indicates no use during a Range period, and 100% indicates that the address space was found using the resource in every sample during that period.

## V

**view.** In the NetView Graphic Monitor Facility, a graphical picture of a network or part of a network. A view consists of nodes connected by links and may also include text and background lines. A view can be displayed, edited, and monitored for status information about network resources.

| **Virtual Server.** A logical construct that appears to  
| comprise processor, memory, and I/O resources  
| conforming to a particular architecture. A virtual server  
| can support an operating system, associated  
| middleware, and applications. A hypervisor creates and  
| manages virtual servers.

| **Virtual Server Collection.** A set of virtual servers that  
| supports a workload. This set is not necessarily static.  
| The constituents of the collection at any given point are  
| determined by virtual servers involved in supporting  
| the workload at that time.

| **virtual Server Image.** A package containing metadata  
| that describes the system requirements, virtual storage  
| drives, and any goals and constraints for the virtual  
| machine (for example, isolation and availability). The  
| Open Virtual Machine Format (OVF) is a Distributed  
| Management Task Force (DMTF) standard that  
| describes a packaging format for virtual server images.

| **Virtual Server Image Capture.** The ability to store  
| metadata and disk images of an existing virtual server.  
| The metadata describes the virtual server storage,  
| network needs, goals and constraints. The captured  
| information is stored as a virtual server image that can  
| be referenced and used to create and deploy other  
| similar images.

| **Virtual Server Image Clone.** The ability to create an  
| identical copy (clone) of a virtual server image that can  
| be used to create a new similar virtual server.

**Virtual Storage Extended (VSE).** A system that consists of a basic operating system (VSE/Advanced Functions), and any IBM supplied and user-written programs required to meet the data processing needs of a user. VSE and the hardware that it controls form a complete computing system. Its current version is called VSE/ESA.

**Virtual Telecommunications Access Method (VTAM).** An IBM licensed program that controls communication and the flow of data in an SNA network. It provides single-domain, multiple-domain, and interconnected

network capability. Its full name is Advanced Communications Function for the Virtual Telecommunications Access Method. Synonymous with ACF/VTAM.

**VM Second Level Systems Support.** With this function, Processor Operations is able to control VM second level systems (VM guest systems) in the same way that it controls systems running on real hardware.

**VM/ESA®.** Virtual Machine/Enterprise Systems Architecture. Its current version is called z/VM.

**volume.** A direct access storage device (DASD) volume or a tape volume that serves a system in an SA z/OS enterprise.

**VSE.** See Virtual Storage Extended.

**VTAM.** See Virtual Telecommunications Access Method.

## W

**warning threshold.** An application or volume service value that determines the level at which SA z/OS changes the associated icon in the graphical interface to the warning color. See alert threshold.

**workstation.** In SA z/OS workstation means the *graphic workstation* that an operator uses for day-to-day operations.

**write-to-operator (WTO).** A request to send a message to an operator at the z/OS operator console. This request is made by an application and is handled by the WTO processor, which is part of the z/OS supervisor program.

**write-to-operator-with-reply (WTOR).** A request to send a message to an operator at the z/OS operator console that requires a response from the operator. This request is made by an application and is handled by the WTO processor, which is part of the z/OS supervisor program.

**WTO.** See write-to-operator.

**WTOR.** See write-to-operator-with-reply.

**WWV.** The US National Institute of Standards and Technology (NIST) radio station that provides standard time information. A second station, known as WWVB, provides standard time information at a different frequency.

## X

**XCF.** See cross-system coupling facility.

**XCF couple data set.** The name for the sysplex couple data set prior to MVS/ESA System Product Version 5 Release 1. See also sysplex couple data set.

**XCF group.** A set of related members that a multisystem application defines to XCF. A member is a specific function, or instance, of the application. A member resides on one system and can communicate with other members of the same group across the sysplex.

**XRF.** See extended recovery facility.

## Z

**z/OS.** An IBM mainframe operating system that uses 64-bit real storage. See also Base Control Program.

**z/OS component.** A part of z/OS that performs a specific z/OS function. In SA z/OS, component refers to entities that are managed by SA z/OS automation.

**z/OS subsystem.** Software products that augment the z/OS operating system. JES and TSO/E are examples of z/OS subsystems. SA z/OS includes automation for some z/OS subsystems.

**z/OS system.** A z/OS image together with its associated hardware, which collectively are often referred to simply as a system, or z/OS system.

- | **z196.** See IBM Enterprise 196 (z196).
- | **zAAP.** See IBM System z Application Assist Processor (zAAP).
- | **zBX.** See IBM zEnterprise BladeCenter Extension (zBX).
- | **zBX blade.** See IBM zEnterprise BladeCenter Extension (zBX) blade.
- | **zCPC.** The physical collection of main storage, central processors, timers, and channels within a zEnterprise mainframe. Although this collection of hardware resources is part of the larger zEnterprise central processor complex, you can apply energy management policies to zCPC that are different from those that you apply to any attached IBM zEnterprise BladeCenter Extension (zBX) or blades. See also central processor complex.
- | **zIIP.** See IBM System z Integrated Information Processor (zIIP).
- | **zEnterprise.** See IBM zEnterprise System (zEnterprise).

## Numerics

**390-CMOS.** Processor family group designator used in the SA z/OS processor operations documentation and in the online help to identify any of the following

S/390 CMOS processor machine types: 9672, 9674, 2003, 3000, or 7060. SA z/OS processor operations uses the OCF facility of these processors to perform operations management functions. See OCF-based processor.

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