New Function Summary

Version 2 Release 2
Before using this information and the product it supports, be sure to read the general information under "Notices" on page 143.

This edition applies to Version 2 Release 2 of z/OS (5650-ZOS), and to subsequent releases and modifications until otherwise indicated in new editions.

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### Chapter 4. V2R1 new function summary

#### Support considerations in V2R1

**Security**
- Enhanced IDS IP fragment attack detection
- Improve auditing of NetAccess rules
- AT-TLS support for TLS v1.2 and related features
- Improved FIPS 140 diagnostics
- Limit defensive filter logging
- QDIO outbound flood prevention
- TN3270 client-bound data queueing limit
- AT-TLS enablement for DCAS
- Network security enhancements for SNMP
- TLS security enhancements for Policy Agent
- TLS security enhancements for sendmail
- VTAM 3270 intrusion detection services
- IBM Health Checker for z/OS SNMP agent public community name

**Simplification**
- z/OS V2R1 Communications Server: IBM Health Checker for TFTP daemon
- Configuration Assistant performance improvements and enhanced user interface
- Improve translation of special characters in linemode for TSO/VTAM
- Resolver initialization resiliency
- Enterprise Extender IPv6 address configuration
- Simplified configuration for progressive mode ARB
- Check TCP/IP profile syntax without applying configuration changes
- User control of Ephemeral Port Ranges
- IPv4 INTERFACE statement for HiperSockets and Static VIPAs
- IBM Health Checker for z/OS GATEWAY statement
- IBM Health Checker for additional z/OS legacy device types
- IBM Health Checker for z/OS legacy device types
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About this document

The purpose of this document is to describe the exploitation considerations of the new functions for the TCP/IP and SNA components of z/OS® Version 2 Release 2 Communications Server (z/OS Communications Server). It also includes the exploitation considerations of z/OS V2R1 Communications Server.

The information in this document supports both IPv6 and IPv4. Unless explicitly noted, information describes IPv4 networking protocol. IPv6 support is qualified within the text.

z/OS Communications Server exploits z/OS UNIX services even for traditional MVS™ environments and applications. Therefore, before using TCP/IP services, your installation must establish a full-function mode z/OS UNIX environment—including a Data Facility Storage Management Subsystem (DFSMSdfp), a hierarchical file system, and a security product (such as Resource Access Control Facility, or RACF®)—before z/OS Communications Server can be started successfully. Refer to z/OS UNIX System Services Planning for more information.

Throughout this document when the term RACF is used, it means RACF or an SAF-compliant security product.

This document refers to Communications Server data sets by their default SMP/E distribution library name. Your installation might, however, have different names for these data sets where allowed by SMP/E, your installation personnel, or administration staff. For instance, this document refers to samples in SEZAINST library as simply in SEZAINST. Your installation might choose a data set name of SYS1.SEZAINST, CS390.SEZAINST or other high-level qualifiers for the data set name.

Who should read this document

This document is designed for planners, system programmers, and network administrators who are planning to install z/OS Communications Server and who want to learn more about its new and enhanced features.

To use the IP functions described in this document, you need to be familiar with Transmission Control Protocol/Internet Protocol (TCP/IP) and the z/OS platform.

To use the SNA functions described in this document, you need to be familiar with the basic concepts of telecommunication, SNA, VTAM®, and the z/OS platform.

How this document is organized

This document contains these topics:

- [Chapter 1, “Planning to use new functions,” on page 1](#) includes a brief introduction to z/OS Communications Server, information about hardware requirements, references to documents that will help you if you are migrating, information about the IP encryption features, a planning checklist, and data set information.
How to use this document

Use this document as a brief introduction to z/OS Communications Server and as an introduction to every function and enhancement of the current and most recent releases of z/OS Communications Server.

The roadmap shows you a list of the functions of the current and most recent releases. Use the roadmap to see a release at a glance and to determine which functions have tasks that are necessary to use the functions.

Use the function summary topics to learn about this information:

- A brief description of the function or enhancement
- Identification of the area that the function is designed to improve, such as customization or diagnosis
- Restrictions of the function, if any
- A task table identifying the actions necessary to use the function
- References to the documents that contain more detailed information

Determining whether a publication is current

As needed, IBM updates its publications with new and changed information. The following information describes how to determine if you are looking at the most current copy of a publication:

- At the end of a publication's order number there is a dash followed by two digits, often referred to as the dash level. A publication with a higher dash level is more current than one with a lower dash level. For example, in the publication order number GC28-1747-07, the dash level 07 means that the publication is more current than previous levels, such as 05 or 04.
- If a hardcopy publication and a softcopy publication have the same dash level, it is possible that the softcopy publication is more current than the hardcopy publication. Check the dates shown in the Summary of Changes. The softcopy publication might have a more recently dated Summary of Changes than the hardcopy publication.
- To compare softcopy publications, you can check the last 2 characters of the publication's file name (also called the book name). The higher the number, the
more recent the publication. Also, next to the publication titles in the CD-ROM booklet and the readme files, there is an asterisk (*) that indicates whether a publication is new or changed.

**How to contact IBM service**


Most problems can be resolved at this website, where you can submit questions and problem reports electronically, and access a variety of diagnosis information.

For telephone assistance in problem diagnosis and resolution (in the United States or Puerto Rico), call the IBM Software Support Center anytime (1-800-IBM-SERV). You will receive a return call within 8 business hours (Monday – Friday, 8:00 a.m. – 5:00 p.m., local customer time).

Outside the United States or Puerto Rico, contact your local IBM representative or your authorized IBM supplier.

If you would like to provide feedback on this publication, see "Communicating your comments to IBM" on page 159.

**Conventions and terminology that are used in this document**

Commands in this book that can be used in both TSO and z/OS UNIX environments use the following conventions:

- When describing how to use the command in a TSO environment, the command is presented in uppercase (for example, NETSTAT).
- When describing how to use the command in a z/OS UNIX environment, the command is presented in bold lowercase (for example, netstat).
- When referring to the command in a general way in text, the command is presented with an initial capital letter (for example, Netstat).

All the exit routines described in this document are *installation-wide exit routines*. The installation-wide exit routines also called installation-wide exits, exit routines, and exits throughout this document.

The TPF logon manager, although included with VTAM, is an application program; therefore, the logon manager is documented separately from VTAM.

Samples used in this book might not be updated for each release. Evaluate a sample carefully before applying it to your system.

**Note:** In this information, you might see the following Shared Memory Communications over Remote Direct Memory Access (SMC-R) terminology:

- RDMA network interface card (RNIC), which is used to refer to the IBM® 10 GbE RoCE Express® feature.
- Shared RoCE environment, which means that the 10 GbE RoCE Express feature operates on an IBM z13™ (z13) or later system, and that the feature can be used concurrently, or shared, by multiple operating system instances. The RoCE Express feature is considered to operate in a shared RoCE environment even if you use it with a single operating system instance.
For definitions of the terms and abbreviations that are used in this document, you can view the latest IBM terminology at the IBM Terminology website.

Clarification of notes

Information traditionally qualified as Notes is further qualified as follows:

- **Note**: Supplemental detail
- **Tip**: Offers shortcuts or alternative ways of performing an action; a hint
- **Guideline**: Customary way to perform a procedure
- **Rule**: Something you must do; limitations on your actions
- **Restriction**: Indicates certain conditions are not supported; limitations on a product or facility
- **Requirement**: Dependencies, prerequisites
- **Result**: Indicates the outcome

Prerequisite and related information

z/OS Communications Server function is described in the z/OS Communications Server library. Descriptions of those documents are listed in “Bibliography” on page 153, in the back of this document.

Required information

Before using this product, you should be familiar with TCP/IP, VTAM, MVS, and UNIX System Services.

Softcopy information

Softcopy publications are available in the following collection.

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<td>The IBM Redbooks® publications selected for this CD series are taken from the IBM Redbooks inventory of over 800 books. All the Redbooks publications that are of interest to the System z® platform professional are identified by their authors and are included in this collection. The System z subject areas range from e-business application development and enablement to hardware, networking, Linux, solutions, security, parallel sysplex, and many others. For more information about the Redbooks publications, see <a href="http://www-03.ibm.com/systems/z/os/zos/zfavorites/">http://www-03.ibm.com/systems/z/os/zos/zfavorites/</a></td>
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Other documents

This information explains how z/OS references information in other documents.

When possible, this information uses cross-document links that go directly to the topic in reference using shortened versions of the document title. For complete titles and order numbers of the documents for all products that are part of z/OS,
see [z/OS Information Roadmap](SA23-2299). The Roadmap describes what level of documents are supplied with each release of z/OS Communications Server, and also describes each z/OS publication.

To find the complete z/OS library, visit the [z/OS library](https://www.ibm.com/support/knowledgecenter/SSLTBW/welcome) in IBM Knowledge Center.

Relevant RFCs are listed in an appendix of the IP documents. Architectural specifications for the SNA protocol are listed in an appendix of the SNA documents.

The following table lists documents that might be helpful to readers.

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</tr>
<tr>
<td>zEnterprise System and System z10 OSA-Express Customer's Guide and Reference</td>
<td>SA22-7935</td>
</tr>
</tbody>
</table>

**Redbooks publications**

The following Redbooks publications might help you as you implement z/OS Communications Server.

About this document xvii
Where to find related information on the Internet

z/OS
This site provides information about z/OS Communications Server release availability, migration information, downloads, and links to information about z/OS technology
http://www.ibm.com/systems/z/os/zos/

z/OS Internet Library
Use this site to view and download z/OS Communications Server documentation
www.ibm.com/systems/z/os/zos/bkserv/

IBM Communications Server product
The primary home page for information about z/OS Communications Server

IBM Communications Server product support
Use this site to submit and track problems and search the z/OS Communications Server knowledge base for Technotes, FAQs, white papers, and other z/OS Communications Server information

IBM Communications Server performance information
This site contains links to the most recent Communications Server performance reports.
http://www.ibm.com/support/docview.wss?uid=swg27005524

IBM Systems Center publications
Use this site to view and order Redbooks publications, Redpapers™, and Technotes

http://www.redbooks.ibm.com/

IBM Systems Center flashes

Search the Technical Sales Library for Techdocs (including Flashes, presentations, Technotes, FAQs, white papers, Customer Support Plans, and Skills Transfer information)

http://www.ibm.com/support/techdocs/atsmastr.nsf

Tivoli® NetView® for z/OS

Use this site to view and download product documentation about Tivoli NetView for z/OS

http://www.ibm.com/support/knowledgecenter/SSZJDU/welcome

RFCs

Search for and view Request for Comments documents in this section of the Internet Engineering Task Force website, with links to the RFC repository and the IETF Working Groups web page

http://www.ietf.org/rfc.html

Internet drafts

View Internet-Drafts, which are working documents of the Internet Engineering Task Force (IETF) and other groups, in this section of the Internet Engineering Task Force website

http://www.ietf.org/ID.html

Information about web addresses can also be found in information APAR II11334.

Note: Any pointers in this publication to websites are provided for convenience only and do not serve as an endorsement of these websites.

DNS websites

For more information about DNS, see the following USENET news groups and mailing addresses:

USENET news groups
comp.protocols.dns.bind

BIND mailing lists

https://lists.isc.org/mailman/listinfo

BIND Users

• Subscribe by sending mail to bind-users-request@isc.org.
• Submit questions or answers to this forum by sending mail to bind-users@isc.org.

BIND 9 Users (This list might not be maintained indefinitely.)

• Subscribe by sending mail to bind9-users-request@isc.org.
• Submit questions or answers to this forum by sending mail to bind9-users@ isc.org.
The z/OS Basic Skills Information Center

The z/OS Basic Skills Information Center is a web-based information resource intended to help users learn the basic concepts of z/OS, the operating system that runs most of the IBM mainframe computers in use today. The Information Center is designed to introduce a new generation of Information Technology professionals to basic concepts and help them prepare for a career as a z/OS professional, such as a z/OS systems programmer.

Specifically, the z/OS Basic Skills Information Center is intended to achieve the following objectives:
• Provide basic education and information about z/OS without charge
• Shorten the time it takes for people to become productive on the mainframe
• Make it easier for new people to learn z/OS

To access the z/OS Basic Skills Information Center, open your web browser to the following website, which is available to all users (no login required):
Summary of changes for New Function Summary

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

Changes made in z/OS Version 2 Release 2, as updated June 2017

This document contains information previously presented in z/OS Communications Server: New Function Summary, GC27-3664-05, which supported z/OS Version 2 Release 2.

New information

Chapter 3, “V2R2 new function summary,” on page 27 includes descriptions for the new functions and enhancements introduced in this release and explains how to use them. Entries for the new functions and enhancements are added to Chapter 2, “Roadmap to functions,” on page 23.

Changes made in z/OS Version 2 Release 2, as updated September 2016

This document contains information previously presented in z/OS Communications Server: New Function Summary, GC27-3664-05, which supported z/OS Version 2 Release 2.

New information

Chapter 3, “V2R2 new function summary,” on page 27 includes descriptions for the new functions and enhancements introduced in this release and explains how to use them. Entries for the new functions and enhancements are added to Chapter 2, “Roadmap to functions,” on page 23.

Changes made in z/OS Version 2 Release 2, as updated March 2016

This document contains information previously presented in z/OS Communications Server: New Function Summary, GC27-3664-04, which supported z/OS Version 2 Release 2.

New information

Chapter 3, “V2R2 new function summary,” on page 27 includes descriptions for the new functions and enhancements introduced in this release and explains how to use them. Entries for the new functions and enhancements are added to Chapter 2, “Roadmap to functions,” on page 23.
Changes made in z/OS Version 2 Release 2

This document contains information previously presented in z/OS Communications Server: New Function Summary, GC27-3664-03, which supported z/OS Version 2 Release 1.

New information

Chapter 3, “V2R2 new function summary,” on page 27 includes descriptions for the new functions and enhancements introduced in this release and explains how to use them. Entries for the new functions and enhancements are added to Chapter 2, “Roadmap to functions,” on page 23.

Changes made in z/OS Version 2 Release 1, as updated February 2015

This document contains information previously presented in z/OS Communications Server: New Function Summary, GC27-3664-02, which supported z/OS Version 2 Release 1.

Changes made in z/OS Version 2 Release 1, as updated September 2014

This document contains information previously presented in z/OS Communications Server: New Function Summary, GC27-3664-01, which supported z/OS Version 2 Release 1.

Changes made in z/OS Version 2 Release 1, as updated December 2013

This document contains information previously presented in z/OS Communications Server: New Function Summary, GC27-3664-00, which supported z/OS Version 2 Release 1.

New information

Chapter 4, “V2R1 new function summary,” on page 69 includes descriptions for the new functions and enhancements introduced in this release and explains how to use them. Entries for the new functions and enhancements are added to Chapter 2, “Roadmap to functions,” on page 23.

Summary of changes for z/OS Version 2 Release 1

For specifics on the enhancements for z/OS Version 2, Release 1, see the following publications:

- z/OS Summary of Message and Interface Changes
- z/OS Introduction and Release Guide
- z/OS Planning for Installation
- z/OS Migration
Chapter 1. Planning to use new functions

These topics help you plan to use new functions:

- "Introduction to z/OS Communications Server"
- "Determining which documents to use when migrating" on page 2
- "IP encryption features" on page 2
- "Planning checklist" on page 3
- "TCP/IP packaging process" on page 4
- "Defining SNA data sets" on page 7

Introduction to z/OS Communications Server

z/OS Communications Server is a network communication access method. It provides both Systems Network Architecture (SNA) and Transmission Control Protocol/Internet Protocol (TCP/IP) networking protocols for z/OS.

The TCP/IP protocol suite (also called stack), includes associated applications, transport- and network-protocol layers, and connectivity and gateway functions. See z/OS Communications Server: IP Configuration Guide for more information about z/OS Communications Server IP protocols.

The SNA protocols are provided by VTAM and include Subarea, Advanced Peer-to-Peer Networking (APPN), and High Performance Routing protocols. z/OS Communications Server provides the interface between application programs residing in a host processor, and resources residing in an SNA network; it also links peer users in the network. See z/OS Communications Server: SNA Network Implementation Guide for more information about z/OS Communications Server SNA protocols.

For the purposes of this library, the following descriptions apply:

- The IBM z Systems™ product line consists of the IBM z13 (z13).
- The IBM zEnterprise® System (zEnterprise) product line consists of the IBM zEnterprise EC12 (zEC12), the IBM zEnterprise BC12 (zBC12), the IBM zEnterprise 196 (z196), and the IBM zEnterprise 114 (z114).
- The IBM System z10™ product line includes IBM System z10 Enterprise Class (z10 EC) and the IBM System z10 Business Class (z10 BC).
- The IBM System z9® product line includes IBM System z9 Enterprise Class (z9® EC) (formerly known as the IBM System z9 109 [z9-109]), and the IBM System z9 Business Class (z9 BC).
- The IBM eServer™ zSeries product line includes the IBM eServer zSeries 990 (z990), and 890 (z890).
- The IBM System 390 (S/390®) product line includes the IBM S/390 Parallel Enterprise Server Generation 5 (G5) and Generation 6 (G6), and the IBM S/390 Multiprise 3000 Enterprise Server.

The z13, zEC12, zBC12, z196, z114, z10 EC, z10 BC, z9 EC (formerly z9-109), z9 BC, z990, and z890 servers are also known as z/Architecture® servers. z/OS V2R2 Communications Server runs only in z/Architecture mode on IBM z Systems, IBM zEnterprise, and the IBM System z10® servers.
Determining which documents to use when migrating

This table helps you determine which documents to use as you migrate.

Table 1. Comparing documents used in migration

<table>
<thead>
<tr>
<th>Document name</th>
<th>Descriptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>z/OS Planning for Installation</td>
<td>This document helps you prepare to install z/OS by giving you information that you need to write an installation plan. To install means to perform the tasks necessary to make the system operational, starting with a decision to either install for the first time or upgrade, and ending when the system is ready for production. An installation plan is a record of the actions you need to take to install z/OS. Recommendation: It is recommended that you read this document. Use this document as you prepare to install z/OS.</td>
</tr>
<tr>
<td>z/OS Migration</td>
<td>This document describes how to migrate (convert) from release to release. After a successful migration, the applications and resources on your new z/OS system will function the same way they did previously. Use this document as a reference in keeping all z/OS applications working as they did in previous releases.</td>
</tr>
<tr>
<td>z/OS Introduction and Release Guide</td>
<td>This document provides an overview of z/OS and lists the enhancements in each release. Use this document to determine whether to obtain a new release and to decide which new functions to implement.</td>
</tr>
<tr>
<td>z/OS Summary of Message and Interface Changes</td>
<td>This document describes the changes to interfaces for individual elements and features of z/OS. Use this document as a reference to the new and changed commands, macros, panels, exit routines, data areas, messages, and other interfaces of individual elements and features of z/OS.</td>
</tr>
<tr>
<td>z/OS Communications Server: New Function Summary</td>
<td>This document includes function summary topics to describe all the functional enhancements for the IP and SNA components of Communications Server, including task tables that identify the actions necessary to exploit new function. Use this document as a reference to using all the enhancements of z/OS Communications Server.</td>
</tr>
</tbody>
</table>

For an overview and map of the documentation available for z/OS, see the [z/OS Information Roadmap](#).

**IP encryption features**

Encryption features are available for IP at no additional cost. Communications Server Security Level 3 is an optional unpriced feature and must be ordered.

The encryption features include these capabilities:

**Level 1**

This level of encryption is included in the base of z/OS Communications Server.

**Level 2**

This level of encryption is included in the base of z/OS Communications Server and offers IP security protocol (IPSec) DES and SNMPv3 56-bit DES.
Level 3

This level of encryption is included in the Communications Server Security Level 3 optional unpriced feature and offers IPSec Triple Data Encryption Standard (DES) and Advanced Encryption Standard (AES). AES includes the AES cipher-block chaining (AES-CBC) and AES Galois Counter (AES-GCM) modes.

Planning checklist

Migrating a z/OS Communications Server system from a previous release involves considerable planning. To familiarize yourself with the migration process, review this checklist. Tailor the checklist to meet the specific requirements of your installation.

Procedure

1. Understand your network topology, including the hardware and software in your network and your network configuration.

2. Understand that z/OS Communications Server is a base element of z/OS. Use the appropriate documents as you plan, migrate, and install:
   - For information about migration and writing an installation plan, see “Determining which documents to use when migrating,” on page 2.
   - For information about installation, see these documents:
     - [z/OS Program Directory](#)
     - Preventative Service Planning (PSP) bucket (available by using IBMLINK)
     - Softcopy Installation Memo (for Bookmanager publications)
     - ServerPac: Installing Your Order, if you use the ServerPac method to install z/OS
   - For information about storage requirements, see the [z/OS Program Directory](#), IBMLINK, or [z/OS Communications Server Support](#). You can also see the storage estimate worksheets in [z/OS Communications Server: SNA Network Implementation Guide](#).

3. Develop your education plan.
   a. Evaluate the z/OS V2R2 Communications Server features and enhancements by reading the new function summary topics in this document.
   b. Plan which new functions will be incorporated into your system.

4. Review and apply the Program Temporary Fixes (PTFs), including Recommended Service Upgrades (RSUs), for the current-minus-3 month plus all hipers and PEs. The PTFs are available monthly through the period for which the release is current and can be obtained by using IBMLINK. RSU integration testing for a release will be performed for five quarters after the general availability date for that release.

5. Get acquainted with the helpful information found at [z/OS Communications Server Support](#).

6. In writing a test plan for z/OS, include test cases for these items:
   - TCP/IP applications
   - Key or critical SNA applications and Original Equipment Manufacturer (OEM) software products.
• User-written applications such as: Customer Information Control System (CICS®) sockets, Information Management System (IMS™) sockets, REXX sockets, Sockets Extended, UNIX System Services sockets, and Macro Sockets
• Operator commands
• Your terminal and printer types

7. Back up your user exits and user modifications for later restore.

8. Install z/OS Communications Server with the other elements and features of z/OS. IBM has defined the appropriate product enablement settings in the IFAPRD00 member of SYS1.IBM.PARMLIB. For information about dynamic enablement, see z/OS Planning for Installation.

9. Complete post-installation activities:
   • Use z/OS Communications Server: IP Configuration Guide to customize your TCP/IP system.
   • Use the following information to customize your SNA system:
     – z/OS Communications Server: SNA Customization
     – z/OS Communications Server: SNA Network Implementation Guide
     – z/OS Communications Server: SNA Resource Definition Reference
   • Use z/OS Migration to determine migration actions.
   • Reinstall user exits.
   • Reinstall user modifications.
   • Update operating procedures and automation routines.
   • Activate new functions.


TCP/IP packaging process

As a result of the installation process for z/OS V2R2 Communications Server, the product is installed in both traditional MVS data sets and in files in the z/OS UNIX file system. For details on changes in the MVS data sets, see “MVS data sets.” For details on requirements for hierarchical file system files, see “File system files” on page 7.

MVS data sets

Table 2 lists the distribution library data sets required by z/OS V2R2 Communications Server.

<table>
<thead>
<tr>
<th>Data set</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AEZADBR1</td>
<td>Database Request Module (DBRM) members</td>
</tr>
<tr>
<td>AHELP</td>
<td>TSO help files</td>
</tr>
<tr>
<td>AEZAMAC1</td>
<td>Assembler macros</td>
</tr>
<tr>
<td>AEZAMAC2</td>
<td>C header files</td>
</tr>
<tr>
<td>AEZAMAC3</td>
<td>Pascal include files</td>
</tr>
<tr>
<td>AEZAMODS</td>
<td>Distribution library for base link-edit modules</td>
</tr>
<tr>
<td>AEZARNT1</td>
<td>Reentrant object module for SEZAX11L, SEZAXTLB, SEZAOLDX, and SOCKETS</td>
</tr>
<tr>
<td>AEZARNT2</td>
<td>Reentrant object module for SEZAXAWL</td>
</tr>
</tbody>
</table>
Table 2. Distribution library data sets (continued)

<table>
<thead>
<tr>
<th>Data set</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AEZARNT3</td>
<td>Reentrant object module for SEZAXMLB</td>
</tr>
<tr>
<td>AEZAROE2</td>
<td>Reentrant object module for SEZAXAWL (z/OS UNIX support)</td>
</tr>
<tr>
<td>AEZAROE3</td>
<td>Reentrant object module for SEZAXMLB (z/OS UNIX support)</td>
</tr>
<tr>
<td>AEZARNT4</td>
<td>Reentrant object modules for RPC</td>
</tr>
<tr>
<td>AEZAROE1</td>
<td>Reentrant object module for SEZAX11L, SEZAXTLB, and SEZAOLDX (z/OS UNIX support)</td>
</tr>
<tr>
<td>AEZASMP1</td>
<td>Sample source programs, catalog procedures, CLIST, and installation jobs</td>
</tr>
<tr>
<td>AEZAXLTD</td>
<td>Translated default tables</td>
</tr>
<tr>
<td>AEZAXLTK</td>
<td>Translated Kanji, Hangeul, and Traditional Chinese DBCS tables and codefiles</td>
</tr>
<tr>
<td>AEZAXLT1</td>
<td>Translation table SBCS source and DBCS source for Hangeul and Traditional Chinese</td>
</tr>
<tr>
<td>AEZAXLT2</td>
<td>TELNET client translation tables</td>
</tr>
<tr>
<td>AEZAXLT3</td>
<td>Kanji DBCS translation table source</td>
</tr>
<tr>
<td>ABLSCI0</td>
<td>clists, execs, IPCS clists, execs; IPCS messages; IPCS panels, IPCS tables</td>
</tr>
<tr>
<td>ABLMSG0</td>
<td>messages, IPCS clists, execs; IPCS messages; IPCS panels, IPCS tables</td>
</tr>
<tr>
<td>ABLSPLNL0</td>
<td>panels, IPCS clists, execs; IPCS messages; IPCS panels, IPCS tables</td>
</tr>
<tr>
<td>ABLSTBL0</td>
<td>tables, IPCS clists, execs; IPCS messages; IPCS panels, IPCS tables</td>
</tr>
</tbody>
</table>

Table 3 lists the target library data sets required by z/OS V2R2 Communications Server.

Table 3. Target library data sets

<table>
<thead>
<tr>
<th>Data set</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SEZACMAC</td>
<td>Client Pascal macros, C headers, and assembler macros</td>
</tr>
<tr>
<td>SEZACMTX</td>
<td>Load library for linking user modules and programs</td>
</tr>
<tr>
<td>SEZADBCX</td>
<td>Source for the Kanji, Hangeul, and Traditional Chinese DBCS translation tables</td>
</tr>
<tr>
<td>SEZADBRM</td>
<td>DBRM members</td>
</tr>
<tr>
<td>SEZADPIIL</td>
<td>SNMP Distributed Programming Interface library</td>
</tr>
<tr>
<td>SEZADSIL</td>
<td>SNMP command processor and SNMP IU CV subtask for the NetView program, and the SQE SERV module for the SNMP query engine</td>
</tr>
<tr>
<td>SEZADSIM</td>
<td>SNMP messages for the NetView program</td>
</tr>
<tr>
<td>SEZADSIP</td>
<td>SNMP IU CV initialization parameters for the NetView program</td>
</tr>
<tr>
<td>SEZAEEXEC</td>
<td>CLISTS and REXX programs</td>
</tr>
<tr>
<td>SEZAINST</td>
<td>Installation samples and related members</td>
</tr>
<tr>
<td>SEZALIBN</td>
<td>NCS library system library</td>
</tr>
<tr>
<td>SEZALOAD</td>
<td>Executable load modules for concatenation to LINKLIB</td>
</tr>
<tr>
<td>SEZALNK2</td>
<td>LB@ADMIN for the NCS administrator</td>
</tr>
</tbody>
</table>
### Table 3. Target library data sets (continued)

<table>
<thead>
<tr>
<th>Data set</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SEZALPA</td>
<td>Executable load modules for concatenation to LPALST</td>
</tr>
<tr>
<td>SEZAMENU</td>
<td>ISPF messages</td>
</tr>
<tr>
<td>SEZANCLS</td>
<td>NetView SNMP CLISTS</td>
</tr>
<tr>
<td>SEZANMAC</td>
<td>C headers and assembler macros for z/OS UNIX and TCP/IP Services APIs</td>
</tr>
<tr>
<td>SEZANPNL</td>
<td>NetView SNMP panels</td>
</tr>
<tr>
<td>SEZAOLDX</td>
<td>X Window System library (X10 compatibility routines)</td>
</tr>
<tr>
<td>SEZAPENU</td>
<td>ISPF panels</td>
</tr>
<tr>
<td>SEZARNT1</td>
<td>Reentrant object module for SEZAX11L, SEZAXTLB, SEZAO1DLX, and SOCKETS</td>
</tr>
<tr>
<td>SEZARNT2</td>
<td>Reentrant object module for SEZAXAWL</td>
</tr>
<tr>
<td>SEZARNT3</td>
<td>Reentrant object module for SEZAXMLB</td>
</tr>
<tr>
<td>SEZARNT4</td>
<td>Reentrant object modules for RPC</td>
</tr>
<tr>
<td>SEZAROE1</td>
<td>Reentrant object module for SEZAX11L, SEZAXTLB, and SEZAO1DLX (z/OS UNIX support)</td>
</tr>
<tr>
<td>SEZAROE2</td>
<td>Reentrant object module for SEZAXAWL (z/OS UNIX support)</td>
</tr>
<tr>
<td>SEZAROE3</td>
<td>Reentrant object module for SEZAXMLB (z/OS UNIX support)</td>
</tr>
<tr>
<td>SEZARPCL</td>
<td>Remote procedure call library</td>
</tr>
<tr>
<td>SEZATCP</td>
<td>Executable load modules for STEPLIB or LNKLST concatenation</td>
</tr>
<tr>
<td>SEZATCPX</td>
<td>Source for the country SBCS translation tables</td>
</tr>
<tr>
<td>SEZATELX</td>
<td>Source for the TELNET country translation tables</td>
</tr>
<tr>
<td>SEZAXAWL</td>
<td>Athena widget set</td>
</tr>
<tr>
<td>SEZAXLD1</td>
<td>Translated default tables</td>
</tr>
<tr>
<td>SEZAXLD2</td>
<td>Translated Kanji, Hangeul, and Traditional Chinese DBCS default tables and DBCS codefiles for TELNET transform mode</td>
</tr>
<tr>
<td>SEZAXMLB</td>
<td>Motif widget set</td>
</tr>
<tr>
<td>SEZAXTLB</td>
<td>X Window System Toolkit library</td>
</tr>
<tr>
<td>SEZAX11L</td>
<td>X Window System library</td>
</tr>
</tbody>
</table>

Table 4 lists the shared distribution and target library data sets required by z/OS V2R2 Communications Server.

### Table 4. Shared distribution and target library data sets

<table>
<thead>
<tr>
<th>Data set</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SYS1.CSSLIB</td>
<td>Interface routines for accessing callable services</td>
</tr>
<tr>
<td>SYS1.HELP</td>
<td>TSO help files</td>
</tr>
<tr>
<td>SYS1.MIGLIB</td>
<td>z/OS Communications Server formatted dump routines for the interactive problem control system (IPCS) and the z/OS Communications Server VIT Analysis Tool module, ISTRAFT1, which is used for problem diagnosis</td>
</tr>
<tr>
<td>SYS1.MSGENU / SYS1.AMSGENU</td>
<td>English-language message tables used by the MVS message service (MMS)</td>
</tr>
</tbody>
</table>
Table 4. Shared distribution and target library data sets (continued)

<table>
<thead>
<tr>
<th>Data set</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SYS1.NUCLEUS</td>
<td>Resident SVCs, callable services tables, and abnormal termination modules</td>
</tr>
<tr>
<td>SYS1.PARMLIB /SYS1.APARMLIB</td>
<td>IBM-supplied and installation-created members, which contain lists of system parameter values</td>
</tr>
<tr>
<td>SYS1.SAXREXEC</td>
<td>Contains system REXX programs</td>
</tr>
<tr>
<td>SYS1.SBSCLI0</td>
<td>IPCS REXX execs and CLISTs</td>
</tr>
<tr>
<td>SYS1.SBLSKEL0</td>
<td>ISPF skeletons for the IPCS dialog</td>
</tr>
<tr>
<td>SYS1.SBLSMSG0</td>
<td>ISPF messages for the IPCS dialog</td>
</tr>
<tr>
<td>SYS1.SBLSNL0</td>
<td>ISPF panels for the IPCS dialog</td>
</tr>
<tr>
<td>SYS1.SBLSTBL0</td>
<td>ISPF tables for the IPCS dialog</td>
</tr>
</tbody>
</table>

**File system files**

See [z/OS UNIX System Services Planning](https://www.ibm.com/support/knowledgecenter/STXH4A_2.4.1/part1/00h11c01_00h12c01.html) and [z/OS UNIX System Services User's Guide](https://www.ibm.com/support/knowledgecenter/STXH4A_2.4.1/part1/00h14c01_00h15c01.html) for a description of the file system files.

**Defining SNA data sets**

This section describes z/OS data sets that you need to define or modify for z/OS V2R2 Communications Server. Table 5 shows the z/OS data sets that contain information for z/OS V2R2 Communications Server, and Table 6 on page 10 shows the z/OS data sets that contain information for both VTAM and NCP.

Enterprise Extender requires IP data set definitions in addition to the SNA data sets. See [z/OS Communications Server: IP Configuration Guide](https://www.ibm.com/support/knowledgecenter/STXH4A_2.4.1/part1/00h16c01_00h17c01.html) for more information.

These tables show the data sets and the approximate storage requirements for any new data sets and for any existing data sets whose requirements might have changed since your last installation.

**Tip:** The data sets referenced in this section are not necessarily under the SYS1 HLQ. In fact, the entire name for some data sets can be different.

Table 5. z/OS data sets containing information for z/OS Communications Server

<table>
<thead>
<tr>
<th>Name of data set</th>
<th>Contents</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>SYS1.DSDB1</td>
<td>Data files of APPN directory information</td>
<td>Required for APPN directory checkpointing function; must be allocated before z/OS Communications Server initialization. This data set cannot be allowed to span multiple volumes.</td>
</tr>
<tr>
<td>SYS1.DSDB2</td>
<td>Data files of APPN directory information</td>
<td>Required for APPN directory checkpointing function; must be allocated before z/OS Communications Server initialization. This data set cannot be allowed to span multiple volumes.</td>
</tr>
<tr>
<td>Name of data set</td>
<td>Contents</td>
<td>Comments</td>
</tr>
<tr>
<td>---------------------</td>
<td>---------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>SYS1.DSCBCTRL</td>
<td>Current status of SYS1.DSDB1 and SYS1.DSDB2</td>
<td>Required for APPN directory checkpointing function; must be allocated before z/OS Communications Server initialization. This data set cannot be allowed to span multiple volumes.</td>
</tr>
<tr>
<td>SYS1.DUMPxx</td>
<td>Records of SVC DUMP</td>
<td>Required for diagnosis.</td>
</tr>
<tr>
<td>SYS1.LINKLIB</td>
<td>z/OS Communications Server initialization module, ISTINM01, which is used when z/OS Communications Server is started Logon manager load modules</td>
<td>Required.</td>
</tr>
<tr>
<td>SYS1.LOGREC</td>
<td>z/OS Communications Server error records</td>
<td>Required.</td>
</tr>
<tr>
<td>SYS1.LPALIB</td>
<td>z/OS Communications Server load modules and user-written exit routines to be loaded into the shared link pack area</td>
<td>Required.</td>
</tr>
<tr>
<td>SYS1.MACLIB</td>
<td>z/OS Communications Server application program interface macros</td>
<td>Required.</td>
</tr>
<tr>
<td>SYS1.MIGLIB</td>
<td>z/OS Communications Server formatted dump routines for the interactive problem control system (IPCS) and the z/OS Communications Server VIT Analysis Tool module, ISTRAFT1, which is used for problem diagnosis</td>
<td>Required.</td>
</tr>
<tr>
<td>SYS1.NUCLEUS</td>
<td>z/OS Communications Server resident SVCs and abnormal termination modules</td>
<td>Required.</td>
</tr>
<tr>
<td>SYS1.PARMLIB</td>
<td>IBM-supplied and installation-created members, which contain lists of system parameter values</td>
<td>Required. This may also be a data set in the logical parmlib concatenation.</td>
</tr>
<tr>
<td>SYS1.PROCLIB</td>
<td>JCL for started tasks</td>
<td>Required for logon manager.</td>
</tr>
<tr>
<td>SYS1.SBLSCLI0</td>
<td>IPCS REXX execs and CLISTS</td>
<td>Required for z/OS Communications Server dump analysis enhancements and VIT analysis. See z/OS Communications Server: SNA Diagnosis Vol 1, Techniques and Procedures for more information.</td>
</tr>
<tr>
<td>SYS1.SBLSKEL0</td>
<td>ISPF skeletons for the IPCS dialog</td>
<td>Required for z/OS Communications Server dump analysis enhancements and VIT analysis. See z/OS Communications Server: SNA Diagnosis Vol 1, Techniques and Procedures for more information.</td>
</tr>
<tr>
<td>SYS1.SBLSMSG0</td>
<td>ISPF messages for the IPCS dialog</td>
<td>Required for z/OS Communications Server dump analysis enhancements and VIT analysis. See z/OS Communications Server: SNA Diagnosis Vol 1, Techniques and Procedures for more information.</td>
</tr>
<tr>
<td>SYS1.SBLSPNL0</td>
<td>ISPF panels for the IPCS dialog</td>
<td>Required for z/OS Communications Server dump analysis enhancements and VIT analysis. See z/OS Communications Server: SNA Diagnosis Vol 1, Techniques and Procedures for more information.</td>
</tr>
</tbody>
</table>
### Table 5. z/OS data sets containing information for z/OS Communications Server (continued)

<table>
<thead>
<tr>
<th>Name of data set</th>
<th>Contents</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>SYS1.SBLSTBL0</td>
<td>ISPF tables for the IPCS dialog</td>
<td>Required for z/OS Communications Server dump analysis enhancements and VIT analysis.</td>
</tr>
<tr>
<td>SYS1.SISTASGD</td>
<td>ASN.1 and GDMO syntax data sets</td>
<td>Included for reference by CMIP services application programmers.</td>
</tr>
<tr>
<td>SYS1.SISTASN1</td>
<td>Contains two categories of data set members:</td>
<td>Required for CMIP services. See “SYS1.SISTASN1” on page 11 for a description.</td>
</tr>
<tr>
<td></td>
<td>• ACYPRES: List of abstract syntax notation 1 (ASN.1) definition data sets. This is a member of a partitioned data set.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• The members listed in ACYPRES.</td>
<td></td>
</tr>
<tr>
<td>SYS1.SISTCLIB</td>
<td>z/OS Communications Server load modules to be loaded into common service area and extended common service area (CSA/ECSA) storage</td>
<td>Required.</td>
</tr>
<tr>
<td>SYS1.SISTCMIP</td>
<td>Directory definition file. The member name of the directory definition file is ACYDDF.</td>
<td>Required for CMIP services. See “SYS1.SISTCMIP” on page 11 for a description.</td>
</tr>
<tr>
<td>SYS1.SISTDAT1</td>
<td>Online tools</td>
<td>Optional. Use this library only if you intend to use the online information tools included with z/OS Communications Server.</td>
</tr>
<tr>
<td>SYS1.SISTDAT2</td>
<td>Message skeleton file for translation</td>
<td>Required. See z/OS Communications Server: SNA Network Implementation Guide</td>
</tr>
<tr>
<td>SYS1.SISTGDMO</td>
<td>Compiled definitions for the ISO standard, Guidelines for the Definition of Managed Objects (GDMO). This is a partitioned data set consisting of one member, ACYGDMO.</td>
<td>Required for CMIP services. Member name ACYGDMO must be included on the DD statement for SISTGDMO in the VTAM start procedure:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>//ACYGDMO DD SISTGDMO(ACYGDMO),DISP=SHR.</td>
</tr>
<tr>
<td>SYS1.SISTMAC1</td>
<td>z/OS Communications Server macros used to build user tables and parameter lists to build installation exits</td>
<td>Required.</td>
</tr>
<tr>
<td>SYS1.TRACE</td>
<td>GTF trace records</td>
<td>Required to run external trace.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> For information about using multiple SYS1.TRACE data sets, see the z/OS MVS Diagnosis: Tools and Service Aids</td>
<td></td>
</tr>
<tr>
<td>SYS1.TRSDB</td>
<td>Network topology database</td>
<td>Required for APPN topology database checkpointing function; must be allocated before initialization. This data set cannot be allowed to span multiple volumes.</td>
</tr>
<tr>
<td>Dynamic I/O configuration data sets</td>
<td>Dynamically created definitions of devices with all associated LUs</td>
<td>Optional; includes USER1.AUTO.VTAMLST and a catalog entry checkpoint data set. Required for dynamic I/O configuration.</td>
</tr>
</tbody>
</table>

Table 6 on page 10 shows the z/OS data sets that contain VTAM information and NCP information if there is an NCP owned by that VTAM.
Table 6. z/OS data sets containing information for both VTAM and NCP

<table>
<thead>
<tr>
<th>Name of data set</th>
<th>Contents</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>SYS1.ASAMPLIB</td>
<td>Sample of network operator command table and sample JCL for installation</td>
<td>Required for installation. Provided by IBM.</td>
</tr>
<tr>
<td>SYS1.SAMPLIB</td>
<td>Alterable copy of sample network operator command table, sample JCL for installation, and command lists for dynamic I/O</td>
<td>Required for installation. Provided by IBM.</td>
</tr>
<tr>
<td>SYS1.SSPLIB</td>
<td>NCP loader utility program</td>
<td>Required; added when NCP is installed. See “SYS1.SSPLIB” on page 20 for information on SYS1.SSPLIB requirements.</td>
</tr>
<tr>
<td></td>
<td>NCP dump utility program</td>
<td>Required; added when NCP is installed. See “SYS1.SSPLIB” on page 20 for information on SYS1.SSPLIB requirements.</td>
</tr>
<tr>
<td></td>
<td>NCP dump bootstrap program</td>
<td>Required; added when NCP is installed. See “SYS1.SSPLIB” on page 20 for information on SYS1.SSPLIB requirements.</td>
</tr>
<tr>
<td>SYS1.VTAMLIB</td>
<td>• Load modules for z/OS Communications Server</td>
<td>Only z/OS Communications Server load modules are required. Must be listed in an IEAAPFx parmlib member.</td>
</tr>
<tr>
<td></td>
<td>• User-defined tables, default tables, and exit routines</td>
<td></td>
</tr>
<tr>
<td>SYS1.VTAMLST</td>
<td>z/OS Communications Server definition statements and start options</td>
<td>Required; created by user before starting z/OS Communications Server. You can modify this data set, but you need to be very careful about the relationship between z/OS Communications Server and NCP definition statements. For example, changing a VTAMLST member without changing a corresponding NCP definition statement can cause serious errors that are difficult to diagnose.</td>
</tr>
<tr>
<td>Configuration restart data sets</td>
<td>z/OS Communications Server status of minor nodes for each major node</td>
<td>Required if a warm restart is to be used. Created by user before starting z/OS Communications Server.</td>
</tr>
<tr>
<td>SYS1.NODELST</td>
<td>z/OS Communications Server status of major nodes</td>
<td>Required if restart of all previously active major nodes is desired.</td>
</tr>
<tr>
<td>NCP load library</td>
<td>NCP load modules</td>
<td>Each NCP stored as a separate member of library. Created during NCP generation. Must be an APF-authorized library.</td>
</tr>
<tr>
<td>NCP dump data set</td>
<td>Dump records for NCP</td>
<td>Required if z/OS Communications Server is requested to provide a dump of NCP. Created by user before starting z/OS Communications Server.</td>
</tr>
<tr>
<td>SYS1.LDRIOTAB</td>
<td>Dump records for loader channel I/O trace</td>
<td>Required to hold loader channel I/O trace dumps. Created by user before starting z/OS Communications Server.</td>
</tr>
<tr>
<td>CSP and MOSS dump data set</td>
<td>Dump records for CSP and MOSS</td>
<td>Required if z/OS Communications Server is requested to provide a dump of CSP or MOSS and if the user wants to store the CSP or MOSS dump in a unique data set. Created by user before starting z/OS Communications Server.</td>
</tr>
</tbody>
</table>
Data sets containing information for z/OS V2R2 Communications Server

This section describes data sets that contain information for z/OS V2R2 Communications Server.

SYS1.SISTCLIB
SYS1.SISTCLIB contains the z/OS Communications Server modules to be loaded into common service area and extended common service area (CSA/ECSA) storage.

To prepare the SYS1.SISTCLIB data set, do these steps:
1. Allocate the SYS1.SISTCLIB data set using a utility program, and catalog the data set before SMP/E installation. See the installation JCL sample ISTJEXAL in the [z/OS Program Directory] for a sample job using the IEFBR14 program to allocate SYS1.SISTCLIB.
2. Add a DD card for SYS1.SISTCLIB in the VTAM NET procedure as follows:
   //SISTCLIB DD DSN=SYS1.SISTCLIB,DISP=SHR
3. Define SYS1.SISTCLIB as an authorized library (a library listed in the currently used IEAAPFx).

SYS1.SISTCMIP
SYS1.SISTCMIP contains the IBM-supplied CMIP directory definition file (with the DD name ISTCMIP), which you can edit to restrict access to CMIP services.

The LRECL for this file is 80.

The file is loaded when CMIP services are started and can be reloaded using the MODIFY TABLE command. Start CMIP services using one of these methods:
- Issue the MODIFY VTAMOPTS command with the OSIMGMT=YES operand.
- Start z/OS Communications Server with the OSIMGMT=YES start option.

If CMIP services is active, edit the directory definition file and then load it by issuing the MODIFY TABLE command:
MODIFY proc,TABLE,OPT=LOAD,TYPE=CMIPDDF

SYS1.SISTASN1
The LRECL for this file is 1024.

SYS1.VTAMLST
SYS1.VTAMLST is the z/OS Communications Server definition library, which consists of files containing the definitions for network resources and start options.

It is a required partitioned data set, and you need to allocate it on a direct-access volume before you file z/OS Communications Server network definitions.

This data set can be allocated and cataloged at either of these times:
- Any time before its initial use. Run the IEHPROGM utility program or the IEBUPDTE utility program.
- When the data set is first used. Code the appropriate job control language (JCL).

To prepare the SYS1.VTAMLST data set, do these steps:
1. Allocate space to accommodate the filing of definitions for major nodes and anticipated sets of start options. The amount needed depends on the number of
nodes and operands used and on the number of start options. See [z/OS Communications Server: SNA Network Implementation Guide](#) for more information about start options.

2. Specify the DD name for SYS1.VTAMLST as VTAMLST. You should specify these DCB subparameters:

   
   RECFM=FB, LRECL=80, BLKSIZE=any multiple of 80

3. Code `LABEL=RETPD=0` on all DD statements for SYS1.VTAMLST. If you do not, an operator awareness message requiring a reply might be generated.

4. If you generate a NEWDEFN data set as part of NCP generation processing, ensure that it is loaded into SYS1.VTAMLST prior to activating the NCP. Failure to do so can cause serious problems. z/OS Communications Server uses the NCP source, in addition to the NCP load module and RRT, when loading and activating communication controllers. SYS1.VTAMLST must contain either the source used as input to the NCP generation process, if a NEWDEFN data set was not created, or the NEWDEFN data set, if one was created. For more information about NEWDEFN, see NCP, SSP, and EP Generation and Loading Guide.

5. If you are configuring z/OS Communications Server as an APPN node (or plan to do so in the future), copy the IBM-supplied APPN class of service (COS) definitions and APPN transmission group (TG) profiles from ASAMPLIB into SYS1.VTAMLST. Three sets of IBM-supplied COS definitions are available to enable z/OS Communications Server to select an optimal route for a session:

   - **COSAPPN**
     
     The definitions in COSAPPN are appropriate for most sessions.

   - **ISTACST2**
     
     The definitions in ISTACST2 are most useful for multiple types of connections with different TG characteristics. For example, the definitions are useful when channel-to-channel, token ring network, FDDI LAN, or ATM are used in the network.

   - **ISTACST3**
     
     The definitions in ISTACST3 are designed to enable z/OS Communications Server to select an optimal route for a session when connections used in the network include those with high speed link characteristics such as FICON®, Gigabit Ethernet, and HiperSockets™.

   One of these three sets of APPN COS definitions is required if z/OS Communications Server is configured as an APPN node. To use COSAPPN, ISTACST2, or ISTACST3, you must copy the appropriate set of definitions into SYS1.VTAMLST at z/OS Communications Server installation, and then activate the member in which the definitions reside. You can copy more than one set of definitions into SYS1.VTAMLST, but you can have only one set active at any time. For additional information about selecting and activating the best APPN COS definitions for your network, see the discussion about the IBM-supplied default classes of service in [z/OS Communications Server: SNA Network Implementation Guide](#).

   The IBM-supplied TG profiles are in IBMTGPS in ASAMPLIB. IBMTGPS is not required, but you should include it. You can copy IBMTGPS into SYS1.VTAMLST; it is automatically activated when z/OS Communications Server is initialized.

**Guidelines:**

- Because CP-CP session paths might include subarea VRs, it is also strongly recommended that you update your logon mode tables (including the IBM-supplied logon mode table, ISTINCLM) to include an appropriate COS=...
value on the CPSVCMG and CPSVRMGR mode table entries. Otherwise, a blank COS name will be used to determine the subarea VR and transmission priority that will be used for the VR portion of the CP-CP session path.

- You can modify SYS1.VTAMLST, but you need to be very careful about the relationship between z/OS Communications Server and NCP definition statements. For example, changing a VTAMLST member without changing a corresponding NCP definition statement can cause serious errors that are difficult to diagnose.

**SYS1.VTAMLIB**

SYS1.VTAMLIB is the z/OS Communications Server load module library, which consists of files containing the user tables, exit routines, and replaceable constants. It is a required partitioned data set.

SYS1.VTAMLIB is used to store these user tables:
- Class of service (COS) table
- Communication network management (CNM) routing table

**Restriction:** SYS1.LPALIB can no longer be used to store the CNM routing table.
- Interpret table containing logon descriptions and any installation-coded logon routines in this table
- Logon mode table
- Session awareness (SAW) data filter table
- Unformatted system services table

Code the DD name for SYS1.VTAMLIB as VTAMLIB. You should specify these subparameters on the DCB parameter, with BLKSIZE specified as full-track blocking relative to the capacity of your direct access storage device (DASD):

```
RECFM=U,BLKSIZE=
```

Define SYS1.VTAMLIB as an authorized library (a library listed in the currently used IEAAPFx.xx).

**Parmlib member for communications storage manager (CSM)**

Starting in z/OS V2R2 Communications Server, communications storage manager (CSM) supports storage above the 64-bit address bar.

The IVTPRM00 parmlib member sets parameters for CSM storage. IVTPRM00 is read during CSM initialization as a result of the first issuance of the IVTCSCM REQUEST=CREATE_POOL macro. (z/OS Communications Server issues this macro when started.) These definitions can also be changed without requiring a re-IPL by editing the IVTPRM00 member and issuing the MODIFY CSM command without specifying the parameters on the command.

The parameter member IVTPRM00 can be found in:
- A data set defined by the PARMLIB DD statement in the TSO start procedure
- A data set in the logical parmlib concatenation
- SYS1.PARMLIB

IVTPRM00 has this format:

```
column |...+....1....+....2....+....3....+....4....+...
```
FIXED MAX(*maxfixK1M*)

ECSA MAX(*maxecsaK1M*)

HVCOMM MAX(*maxhvcommM*)

[POOL(*bufsize*, *bufsource*, *initbuf*, *minfree*, *expbuf*)]

**Rules:**

- Each line in IVTPRM00 must start in column one.
- FIXED and MAX or ECSA and MAX keywords must be separated by one or more spaces. It must be completed with its values on the same line.

The first three lines in the CSM parmlib member define the maximum amount of storage to be dedicated to fixed, ECSA, and HVCOMM buffers in CSM. Note that the fixed maximum represents the total fixed storage above and below the 2 GB bar. You can also specify one POOL definition for each CSM buffer pool of a particular *bufsize* and *bufsource* combination. If parameters are not provided for a given CSM buffer pool, the IBM-supplied default values are used unless a program has provided these values on an IVTCSM REQUEST=CREATE_POOL macro.

This describes the variable fields in the CSM parmlib member:

**maxfix**

A decimal integer specifying the maximum bytes of fixed storage to be dedicated for use by CSM. The range is from 1024 KB to 30720 MB. The default value is 200 MB.

**maxecsa**

A decimal integer specifying the maximum bytes of ECSA storage to be dedicated for use by CSM. The range is from 1024 KB to 2048 MB. The default is 100 MB.

**Restriction:** The *maxecsa* value should be less than 90% of the ECSA available on the z/OS system. CSM adjusts the *maxecsa* value to 90% of the system ECSA value and issues the message IVT5590I when the *maxecsa* value configured is larger than 90% of the ECSA available on the system.

**maxhvcomm**

A decimal integer specifying the maximum bytes of HVCOMM storage to be dedicated for use by CSM. The range is from 100 MB to 999999 MB. The default value is 2000 MB.

**KB** Denotes size in kilobytes

**MB** Denotes size in megabytes.

**bufsize**

Specifies the size of the buffers in the pool to be created. Valid pool sizes are 4 KB, 16 KB, 32 KB, 60 KB, and 180 KB. *bufsize* is required for each POOL definition.

**bufsource**

Specifies the storage source from which buffers are allocated. The values for *bufsource* are:

**ECSA**

Buffers are allocated from ECSA storage.
Buffers are allocated from data space storage.

Buffers are allocated from high virtual common storage.

The `bufsource` variable is required for each POOL definition.

Specifies the number of buffers by which the pool is expanded when the number of free buffers falls below the `minfree` value. The valid ranges for each CSM buffer pool size are as follows:

---

**Bufsize**

- **Range for `expbuf` for ECSA and data space pools**
  - 4 KB: 1 - 256
  - 16 KB: 1 - 256
  - 32 KB: 1 - 128
  - 60 KB: 1 - 68
  - 180 KB: 1 - 22

---

**Bufsize**

- **Range for `expbuf` for HVCOMM pools**
  - 4 KB: 1 - 1024
  - 16 KB: 1 - 512
  - 32 KB: 1 - 256
  - 60 KB: 1 - 136
  - 180 KB: 1 - 45

The `expbuf` variable is required for each POOL definition.

Specifies the initial number of buffers to be created in the pool when the first IVTCSM REQUEST=CREATE_POOL macro is issued by an application. If this value is specified as 0, only the base pool structure is created. In this case, the pool will be expanded on the first IVTCSM REQUEST=GET_BUFFER based on the specification for `expbuf`. The pool will not contract below the level specified by either `initbuf` or `expbuf`, whichever is higher.

The range for `initbuf` is 0 - 9999. If `initbuf` is omitted, the IBM-supplied default value is used unless overridden by an application's CREATE_POOL request.

Specifies the minimum number of buffers to be free in the pool at any time. The storage pool will be expanded if the number of free buffers falls below this limit. The range for `minfree` is 0 - 9999. If `minfree` is omitted, the IBM-supplied default value is used unless overridden by an application's CREATE_POOL request.
Table 7 and Table 8 show the IBM-supplied default values for `expbuf`, `initbuf`, and `minfree` for the CSM buffer pools.

**Table 7. IBM-supplied default values for CSM buffer pools for ECSA and data space**

<table>
<thead>
<tr>
<th>Bufsize</th>
<th>4 KB</th>
<th>16 KB</th>
<th>32 KB</th>
<th>60 KB</th>
<th>180 KB</th>
</tr>
</thead>
<tbody>
<tr>
<td>EXPBUF</td>
<td>16</td>
<td>8</td>
<td>4</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>INITBUF</td>
<td>64</td>
<td>32</td>
<td>16</td>
<td>16</td>
<td>2</td>
</tr>
<tr>
<td>MINFREE</td>
<td>8</td>
<td>4</td>
<td>2</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

**Table 8. IBM-supplied default values for CSM buffer pools for HVCOMM**

<table>
<thead>
<tr>
<th>Bufsize</th>
<th>4 KB</th>
<th>16 KB</th>
<th>32 KB</th>
<th>60 KB</th>
<th>180 KB</th>
</tr>
</thead>
<tbody>
<tr>
<td>EXPBUF</td>
<td>256</td>
<td>64</td>
<td>32</td>
<td>17</td>
<td>5</td>
</tr>
<tr>
<td>INITBUF</td>
<td>256</td>
<td>64</td>
<td>32</td>
<td>17</td>
<td>5</td>
</tr>
<tr>
<td>MINFREE</td>
<td>32</td>
<td>8</td>
<td>4</td>
<td>4</td>
<td>2</td>
</tr>
</tbody>
</table>

z/OS system symbols can be used in IVTPRM00. See z/OS Communications Server: SNA Network Implementation Guide for more information about this function.

IBM Health Checker for z/OS can be used to check whether appropriate values are defined for the maximum amount of storage to be dedicated to fixed buffers and ECSA buffers in CSM. For more details about IBM Health Checker for z/OS, see IBM Health Checker for z/OS: User’s Guide.

**Table 9. 64 bit enablement of CSM**

<table>
<thead>
<tr>
<th>Task</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Optionally update the IVTPRM00 parmlib member to specify the parameters to use when you allocate storage for CSM buffer use above the bar.</td>
<td>z/OS Communications Server: New Function Summary</td>
</tr>
<tr>
<td>Issue the D CSM command to monitor the use of storage above the bar that is managed by CSM.</td>
<td>z/OS Communications Server: SNA Operation</td>
</tr>
<tr>
<td>Issue the MODIFY CSM command to update values for storage above the bar that is managed by CSM.</td>
<td>z/OS Communications Server: SNA Operation</td>
</tr>
</tbody>
</table>

**APPN checkpointing data sets**

These data sets are used when z/OS Communications Server is defined as a network node or interchange node, and are required for the APPN checkpointing function. These data sets cannot be allowed to span multiple volumes.

- SYS1.DSDB1
- SYS1.DSDB2
- SYS1.DSDBCTRL
- SYS1.TRSDB

SYS1.DSDB1 and SYS1.DSDB2 contain APPN directory information that is used to initialize the directory database when z/OS Communications Server is restarted.

Directory database information is stored alternately between SYS1.DSDB1 and SYS1.DSDB2. The directory database information is written to one of the data sets whenever a MODIFY CHKPT TYPE=ALL or TYPE=DIR, HALT, or HALT QUICK command is issued.
Not all of the resources from the directory database are written to the data sets when there is a checkpoint. The resources that are written to the data sets are those that satisfy these requirements:

- Targeted by a search
- Have a dynamic entry type that is not registered
- Updated within a period of time specified by the DIRTIME start option

The resources that are registered to the database at startup through resource registration and definition are not included in the checkpointed information.

SYS1.DSDBCTRL contains the current status of SYS1.DSDB1 and SYS1.DSDB2. It is read by z/OS Communications Server during initialization to determine whether SYS1.DSDB1 or SYS1.DSDB2 will be used to load the APPN directory database.

SYS1.TRSDB is required for checkpointing the network topology database. The information in this data set is used to initialize the network topology database whenever z/OS V2R2 Communications Server is restarted. The network topology database is written to this file whenever a `MODIFY CHKPT TYPE=TOPO` or `TYPE=ALL, HALT,` or `HALT QUICK` command is issued.

The APPN checkpointing data sets should be allocated and cataloged prior to z/OS Communications Server initialization. To prepare the APPN checkpointing data sets, do these tasks:

- Specify the DD name for SYS1.DSDB1 as DSDB1, for SYS1.DSDB2 as DSDB2, for SYS1.DSDBCTRL as DSDBCTRL, and SYS1.TRSDB as TRSDB.
- Specify these DCB subparameters for SYS1.DSDB1, SYS1.DSDB2, and SYS1.TRSDB:
  
  | RECFM=FB, LRECL=1000, BLKSIZE=any multiple of 1000, DSORG=PS |

- Specify these DCB subparameters for SYS1.DSDBCTRL:
  
  | RECFM=FB, LRECL=20, BLKSIZE=20, DSORG=PS |

**Rule:** Do not modify any of the foregoing data sets.

**Guidelines:**

- The DSDBCTRL is a fixed, 20-byte file; it requires a 20-byte block.
  
  Regarding DSDB1 and DSDB2: Every thousand resources to be checkpointed occupies 35 logical records, or six 6KB blocks of space; the only resources to be checkpointed are the cache DLU entries found during the search.

- z/OS Communications Server fails the initial load of the network topology database if the checkpointed data set of another node is used, or the SSCPNAME operand is changed between the two IPLs. Should the initial load fail, z/OS Communications Server can acquire the information dynamically using TDUs.

**Using configuration restart data sets**

To use the z/OS Communications Server configuration restart facility, define configuration restart Virtual Storage Access Method (VSAM) data sets.

**Procedure**

To set up data sets for the major nodes that you will be using with configuration restart, perform the following steps. See the z/OS Communications Server: SNA Network Implementation Guide for a description of the configuration restart support.
1. Use a DD statement to define a configuration restart VSAM data set for each major node. The ddname must match the ddname on the CONFGDS operand of either the PCCU definition statement for the associated NCP or the VBUILD definition statement for the associated major node. There are no z/OS Communications Server restrictions on this data set name. This example defines a catalog entry to allocate space for a VSAM data set to contain the configuration restart data:

```define
cluster(name(restart) -
  vol(public) -
  keys(18 0) -
  data(name(restart.data) -
    records(200 20) -
    recordsize(46 158)) -
  index(name(restarti.index) -
    tracks(1))
```

2. Code the INDEX operand on the DEFINE command, or let it default. (See the sample DEFINE command.) The data set must be indexed.

3. Code KEYS (18 0). A key length of 18 bytes and an offset of 0 bytes are required.

4. Code RECORDSIZE (46 158). The average record size must be 46 bytes, and the maximum record size must be 158 bytes.

5. Make sure that the number of records in the file is equal to the number of minor nodes defined in the major node. When you choose the number of records for a switched major node, include each PATH definition statement. Therefore, the primary allocation should be the number of minor nodes in the major node, and the secondary allocation should be about 0.1 times the number of minor nodes.

6. When you change a major node definition in SYS1.VTAMLST, do not use the WARM start option when activating the new definition for the first time.

### Dynamically configuring data sets for channel-attached devices

You can dynamically configure channel-attached devices in your network.

**Procedure**

To prepare your system to support dynamic configuration of channel-attached devices, perform the following steps during your installation. See z/OS Communications Server: SNA Network Implementation Guide for a full description of this support.

1. Define USER1.AUTO.VTAMLST as a partitioned data set. You can customize the name of the data set by altering its name in the ISTDEFIN command list. A sample of ISTDEFIN is found in SYS1.SAMPLIB.

2. Concatenate the USER1.AUTO.VTAMLST data set to the SYS1.VTAMLST data set as defined on the VTAMLST DD statement in the z/OS Communications Server start procedure. You also need to code the AUTO.VTAMLST data set as shared (DISP=SHR):

```
... //VTAMLST DD DSN=SYS1.VTAMLST,DISP=SHR
    DD DSN=USER1.AUTO.VTAMLST,DISP=SHR
...
```

USER1.AUTO.VTAMLST is used by ISTDEFIN for storing automatically generated major nodes. Each member of USER1.AUTO.VTAMLST representing a data host will then contain the definition for just one device. A local SNA major node will also include any of its associated LUs.
3. Set the data set control block (DCB) information for this data set with the same values as for the other VTAMLST data sets.

4. Define a catalog entry checkpoint data set (AUTOCKPT) for dynamic configuration support:

   ```
   DEFINE
   CLUSTER(NAME('VSAM.AUTOCKPT') -
     VOL(PUBLIC) -
     KEYS(4 0) -
     DATA(NAME('VSAM.AUTOCKPT.DATA') -
       RECORDS(200 20) -
       RECORDSIZE(24 136)) -
     INDEX(NAME(VSAM.AUTOCKPT.INDEX) -
       TRACKS(1))
   ```

5. Add this data set using the AUTOCKPT DD statement in the z/OS Communications Server start procedure:

   ```
   //AUTOCKPT DD DSN=VSAM.AUTOCKPT,AMP=AMORG,DISP=OLD
   ```

**First Failure Support Technology**

First Failure Support Technology™ (FFST™) helps you diagnose software problems by capturing information about a potential problem when it occurs.

**Defining a NODELST data set**

You can define a NODELST data set to maintain a list of major nodes that are active at one time. If you use the NODELST facility, you need to define VSAM data sets.

**Procedure**

To define a NODELST data set, perform the following steps. See z/OS Communications Server: SNA Network Implementation Guide for more information on how NODELST is used.

1. Use the `DEFINE` command to define a catalog entry and allocate space for an indexed cluster:

   ```
   DEFINE
   CLUSTER(NAME(NODLST1) -
     VOL(PUBLIC) -
     KEYS(2 0) -
     DATA(NAME(NODLST1.DATA) -
       RECORDS(120 20) -
       RECORDSIZE(10 10)) -
     INDEX(NAME(NODLST1.INDEX) -
       TRACKS(1))
   ```

2. Code the `INDEX` operand on the `DEFINE` command, or let it default. (See the preceding sample `DEFINE` command.) The data set must be indexed.

3. Code `KEYS (2 0)`. A key length of 2 bytes and an offset of 0 bytes are required.

4. Code `RECORDSIZE (10 10)`. The average record and the maximum record must each have a length of 10 bytes.

5. Make sure that the number of records in the file is equal to the number of major node and dynamic reconfiguration data set (DRDS) file activations that occur from the time z/OS Communications Server is started until it is halted. This includes major nodes that are reactivated. The primary allocation should be about 1.2 times the total number of major nodes and DRDS files in the network, and the secondary allocation should be about 0.2 times the total number.
Results

You can use defaults for all other data characteristics.

Data sets containing information for NCP

This section describes some of the data sets that contain information for NCP. You might need to define these data sets for your communication controller.

NCP load library

The NCP load library contains the NCP and the resource resolution table (RRT) load modules.

To load NCP, create an NCP load module data set to allocate space. Cataloging the data set is optional. To activate the NCP, the NCP load library must also be available so that the RRT can be accessed.

Figure 1 shows the correlation between the DD statement for the NCP load module data set and the NCP BUILD definition statement.

Figure 1. Correlation between DD statement and NCP definition statement

NCP load module data sets must be in an authorized program facility (APF) library. Because z/OS Communications Server must be loaded from an authorized library, the system verifies that all modules subsequently loaded by z/OS Communications Server be contained in authorized libraries. If the NCP load library is not APF authorized, an ABEND306 may occur when z/OS Communications Server attempts to load the NCP RRT during an NCP activation.

An NCP load module data set can contain more than one NCP.

SYS1.SSPLIB

SYS1.SSPLIB contains the System Support Program (SSP) utilities used by NCP. SYS1.SSPLIB is a required partitioned data set and is added when NCP is installed. It must be in one of these places:

- SYS1.LINKLIB
- A concatenation of SYS1.LINKLIB (a library listed in the currently used LNKLSTxx parmlib member)
A STEPLIB in the start procedure, to specify an authorized program facility (APF) library

NCP dump
The NCP dump data set receives the NCP dump output (one data set for each host z/OS Communications Server). To dump NCP, you need to allocate space for this data set. You can also catalog this data set. The name of the NCP dump data set is defined when NCP is coded.

This dump data set must accommodate a dump of the entire communication controller storage. The size of communication controller storage depends on the model number.

The DD statement defines the dump data set for the communication controller. The ddname must match the ddname on the DUMPDS operand of the PCCU definition statement for the associated NCP. z/OS Communications Server has no restrictions on the data set name.

z/OS Communications Server dump processing fails if the SSP modules that need to be loaded to process the dump are not accessible to z/OS Communications Server. See "SYS1.SSPLIB" on page 20 for information on SYS1.SSPLIB requirements.

For more information about the NCP dump data set, see the NCP, SSP, and EP Diagnosis Guide.

Loader channel I/O trace
The loader channel I/O trace data set (LDRIOTAB) receives communication controller channel information if a load of an NCP fails. The information collected includes channel control words, channel status words, and the first 20 bytes of any data associated with a WRITE, WRITE IPL, or WRITE BRK channel command.

The DD statement defines the trace data set for the SSP load utility. The ddname must be LDRIOTAB, but there are no restrictions on the data set name. The data requires only one track of DASD storage and should have a blocksize and logical record length of 121. The data set must be allocated before it is defined in the z/OS Communications Server start procedure.

Set the disposition of the data set as share, pass, and keep in the z/OS Communications Server start procedure.

See NCP, SSP, and EP Trace Analysis Handbook for more information about the loader channel I/O trace data set.

CSP and MOSS dump (IBM 3720, 3725, and 3745 only)
The communication scanner processor (CSP) and maintenance and operator subsystem (MOSS) dump data sets, which apply only to the IBM 3720, 3725, and 3745 Communication Controllers, are used for traces of the CSP and MOSS. To dump the CSP and MOSS microcode for problem determination, create one data set for the dump of each component. These data sets can be cataloged. The names of these data sets are defined to z/OS Communications Server in the start procedure.

The DD statement for each dump data set defines it for the NCP utility used to dump the communication controller. The ddname must match the ddname on the
CDUMPDS (for a CSP dump) or MDUMPDS (for a MOSS dump) operand of the PCCU definition statement for the appropriate NCP. z/OS Communications Server has no restrictions on the data set name.
Chapter 2. Roadmap to functions

This topic includes a roadmap table to all of the functions and enhancements that were introduced in z/OS V2R2 Communications Server and z/OS V2R1 Communications Server.

The **Exploitation actions** column indicates whether tasks are required to either use the functional enhancement or to satisfy incompatibilities or dependencies.

### Table 10. Roadmap to functions

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<th>Exploitation actions</th>
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<td>For all V2R2 new function APARs, see <a href="#">z/OS Communications Server V2R2 New Function APAR Summary</a></td>
<td></td>
</tr>
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<td>“AT-TLS certificate processing enhancements” on page 28</td>
<td>Yes</td>
</tr>
<tr>
<td>“AT-TLS enablement for DCAS” on page 28</td>
<td>Yes</td>
</tr>
<tr>
<td>“IBM Health Checker for z/OS SMTPD MAIL RELAY” on page 31 with TCP/IP</td>
<td>Yes</td>
</tr>
<tr>
<td>APAR PI51640 and SNA APAR OA50122</td>
<td></td>
</tr>
<tr>
<td>“IBM Health Checker for z/OS MVROSHD RHOSTS DATA” on page 30 with TCP/IP</td>
<td>Yes</td>
</tr>
<tr>
<td>APAR PI51640 and SNA APAR OA50122</td>
<td></td>
</tr>
<tr>
<td>“IBM Health Checker for z/OS SNMP agent public community name” on page 31 with APAR</td>
<td>Yes</td>
</tr>
<tr>
<td>PI51640 and SNA APAR OA50122</td>
<td></td>
</tr>
<tr>
<td>“Network security enhancements for SNMP” on page 32</td>
<td>Yes</td>
</tr>
<tr>
<td>“Simplified access permissions to ICSF cryptographic functions for IPSec” on page</td>
<td>Yes</td>
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<td>“SMF 119 TCP connection termination record (subtype 2) enhanced to provide IP filter</td>
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<tr>
<td>information” on page 34 with TCP/IP APAR Pl69920</td>
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<tr>
<td>“TCP/IP profile IP security filter enhancements” on page 35</td>
<td>Yes</td>
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<tr>
<td>“TLS security enhancements for Policy Agent” on page 35</td>
<td>Yes</td>
</tr>
<tr>
<td>“TLS security enhancements for sendmail” on page 36</td>
<td>Yes</td>
</tr>
<tr>
<td>“TLS session reuse support for FTP and AT-TLS applications (AT-TLS)” on page 36</td>
<td>Yes</td>
</tr>
<tr>
<td>“TLS session reuse support for FTP and AT-TLS applications (FTP)” on page 37</td>
<td>Yes</td>
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<tr>
<td>“VTAM 3270 intrusion detection services” on page 38 with APAR OA49911</td>
<td>Yes</td>
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<tr>
<td>“IBM Health Checker for additional z/OS legacy device types” on page 41 with TCP/IP APAR</td>
<td>Yes</td>
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<tr>
<td>PI49962 and SNA APAR OA49071</td>
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<tr>
<td>“IBM Health Checker for TFTP daemon” on page 42 with TCP/IP APAR Pl61806 and SNA APAR</td>
<td>Yes</td>
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<td>OA50445</td>
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<tr>
<td>“z/OS Configuration Assistant for Communications Server support for import of TCP/IP</td>
<td>Yes</td>
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<tr>
<td>configuration” on page 43 with Configuration Assistant APAR Pl66143 and TCP/IP APAR Pl6</td>
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<td>3449</td>
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<td>“Activate Resolver trace without restarting applications” on page 44</td>
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<td>“CICS transaction tracking support for CICS TCP/IP IBM Listener” on page 47</td>
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<td>“CSSMTP migration enablement” on page 48</td>
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<td>Functional enhancement</td>
<td>Exploitation actions</td>
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<tr>
<td>“CSSMTP customizable ATSIGN character for mail addresses” on page 49 with APAR PI52704</td>
<td>Yes</td>
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<tr>
<td>“Improved CSSMTP code page compatibility with target servers” on page 50 with APAR PI73909</td>
<td>Yes</td>
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<tr>
<td>“Improved CSSMTP TLS compatibility with mail servers” on page 51 with APAR PI56614</td>
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</tr>
<tr>
<td>“sendmail to CSSMTP bridge” on page 52 with APAR PI71175</td>
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</tr>
<tr>
<td>“Enhanced Enterprise Extender scalability” on page 54</td>
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<tr>
<td>“IBM Health Checker for z/OS FTP ANONYMOUS JES” on page 54 with APAR PI47637 and OA49668</td>
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<td>“Enhanced IKED Scalability” on page 54</td>
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<tr>
<td>“Increase single stack DVIPA limit to 4096” on page 54</td>
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<td>“Shared Memory Communications - Direct Memory Access” on page 55 with TCP/IP APAR PI45028 and VTAM APAR OA48411</td>
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<td>“Shared Memory Communications over RDMA adapter (RoCE) virtualization” on page 60</td>
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<tr>
<td>“Shared Memory Communications over RDMA enhancements” on page 61</td>
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<td>“SMC Applicability Tool (SMCAT)” on page 62</td>
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<td>“TCP autonomic tuning enhancements” on page 63</td>
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<td>“VIPAROUTE fragmentation avoidance” on page 64</td>
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<tr>
<td>“64-bit enablement of the TCP/IP stack” on page 65</td>
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<td>“Improved control over default VTAM VIT options” on page 66 with APAR OA50271</td>
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<td><strong>Enhancements introduced in z/OS V2R1 Communications Server</strong></td>
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<td>For all V2R1 new function APARs, see <a href="#">z/OS Communications Server V2R1 New Function APAR Summary</a></td>
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<tr>
<td>“Enhanced IDS IP fragment attack detection” on page 70</td>
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<td>“Improve auditing of NetAccess rules” on page 70</td>
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<td>“AT-TLS support for TLS v1.2 and related features” on page 71</td>
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<td>“Improved FIPS 140 diagnostics” on page 72</td>
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<td>“Limit defensive filter logging” on page 73</td>
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<td>“QDIO outbound flood prevention” on page 73</td>
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<td>“TN3270 client-bound data queueing limit” on page 74</td>
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<td>“Network security enhancements for SNMP” on page 76 with APAR PM96901</td>
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<td>“TLS security enhancements for Policy Agent” on page 76 with APAR PM96891</td>
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<td>“TLS security enhancements for sendmail” on page 77 with APAR PM96896</td>
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<td>“Improve translation of special characters in linemode for TSO/VTAM” on page 81</td>
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<td>“Enterprise Extender IPv6 address configuration” on page 82</td>
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<td>“Simplified configuration for progressive mode ARB” on page 83</td>
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<td>“Check TCP/IP profile syntax without applying configuration changes” on page 84</td>
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<td>“User control of Ephemeral Port Ranges” on page 85</td>
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<td>“IPv4 INTERFACE statement for HiperSockets and Static VIPAs” on page 86</td>
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<tr>
<td>“IBM Health Checker for additional z/OS legacy device types” on page 88 with TCP/IP APAR PI49962 and SNA APAR OA49071</td>
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<td>“IBM Health Checker for z/OS GATEWAY statement” on page 88</td>
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<td>“CSSMTP mail message date header handling option” on page 90</td>
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<td>“Socket establishment time for Netstat ALL/-A” on page 90</td>
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<td>“Sysplex-wide security associations for IPv6” on page 91</td>
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<td>“HPR PSRETRY Enhancement” on page 92</td>
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<td>“RPCBIND recycle notification” on page 92</td>
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<td>“TCP/IP serviceability enhancements” on page 93</td>
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<td>“API to locate SYLOGD configuration file” on page 94</td>
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<td>“CSSMTP customizable ATSIGN character for mail addresses” on page 94 with APAR PI52704</td>
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<td>“Improved CSSMTP code page compatibility with target servers” on page 95 with APAR PI73909</td>
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<td>“Simplify FTP transfer of data sets between z/OS systems” on page 98</td>
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<td>“Enable DHCP clients on OSA interfaces” on page 99</td>
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<tr>
<td>“CSSMTP migration enablement” on page 101 with TCP/IP APAR PI40204 and SNA APAR OA47735</td>
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<td>“sendmail to CSSMTP bridge” on page 102 with APAR PI71175</td>
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<td>“QDIO acceleration coexistence with IP filtering” on page 103</td>
<td>Yes</td>
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<td>“TCP support for selective acknowledgments” on page 104</td>
<td>Yes</td>
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<td>“Shared Memory Communications over RDMA enhancements” on page 104</td>
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<td>“Shared Memory Communications over RDMA adapter (RoCE) virtualization” on page 105 with TCP/IP APAR PI12223 and SNA APAR OA44576</td>
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<td>“Shared Memory Communications over Remote Direct Memory Access” on page 106</td>
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<td>“SMC Applicability Tool (SMCAT)” on page 108 with APAR PI29165 and PI39612</td>
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<td>“Connection termination notification for sockets” on page 108</td>
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<td>“IPv6 support for policy-based routing” on page 109</td>
<td>Yes</td>
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<td>“Affinity for application-instance DVIPAs” on page 110</td>
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<th>Exploitation actions</th>
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<td>“Enhanced TCP protocol configuration options and default settings” on page 111</td>
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<tr>
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<td>Yes</td>
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<td>“VIPAROUTE fragmentation avoidance” on page 112 with APAR PI39519</td>
<td>Yes</td>
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<tr>
<td>“Improved control over default VTAM VIT options” on page 113 with APAR OA50271</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Chapter 3. V2R2 new function summary

This information contains topics about every function or enhancement introduced in z/OS V2R2 Communications Server. The topics describe each function and present the following information, if applicable:

- Restrictions, dependencies, and coexistence considerations for the function
- A task table that identifies the actions necessary to use the function
- References to the documents that contain more detailed information

See Table 10 on page 23 for a complete list of the functional enhancements.

See z/OS Migration for information about how to migrate and maintain the functional behavior of previous releases.

See z/OS Summary of Message and Interface Changes for information about new and changed messages and interfaces.

See z/OS Communications Server V2R2 New Function APAR Summary for all V2R2 new function APARs.

Support considerations in V2R2

z/OS V2R2 Communications Server removes support for the following functions:

- Several TCP/IP device drivers
  - Asynchronous Transfer Mode (ATM)
  - Common Link Access To Workstation (CLAW)
  - HYPERChannel
  - Channel Data Link Control (CDLC)
  - SNALINK (both LU0 and LU6.2)
  - X.25

Note: Support for SNA device drivers is not affected.

- GATEWAY profile statement.

Support considerations in V2R2 for all V2R2 new function APARs.

See z/OS Migration for detailed information about all the z/OS V2R2 Communications Server support considerations.

Security

The following topics describe enhancements for security:

- “IBM Health Checker for z/OS FTP ANONYMOUS JES” on page 54
- “IBM Health Checker for z/OS MVRSHD RHOSTS DATA” on page 30
- “IBM Health Checker for z/OS SMTPD MAIL RELAY” on page 31
- “IBM Health Checker for z/OS SNMP agent public community name” on page 31
- “AT-TLS certificate processing enhancements” on page 28
- “AT-TLS enablement for DCAS” on page 28
- “Network security enhancements for SNMP” on page 32
AT-TLS certificate processing enhancements

z/OS V2R2 Communications Server enhances Application Transparent TLS (AT-TLS) to support the following features that System SSL provides.

AT-TLS supports the following features provided by System SSL:
- RFC 5280 Public-Key Infrastructure using X.509 (PKIX) certificate and Certificate Revocation List (CRL) profile. With this support, you can perform certificate validation according to RFC 5280.
- Enhanced certificate revocation capabilities:
  - Retrieval of revocation information through the Online Certificate Status Protocol (OCSP)
  - Retrieval of Certificate Revocation Lists (CRLs) over HTTP
  - More flexible processing of CRLs through LDAP

Using AT-TLS certificate processing enhancements

To enable the AT-TLS certificate processing enhancements, complete the appropriate tasks in Table 11.

<table>
<thead>
<tr>
<th>Task</th>
<th>Reference</th>
</tr>
</thead>
</table>
| Enable the new AT-TLS support by using the Configuration Assistant or manual configuration. | • Configuration Assistant, What's New in V2R2, Help information for AT-TLS configuration.  
  • AT-TLS policy statements in z/OS Communications Server: IP Configuration Reference |
| Optionally, display the new policy-based networking parameters and values. Use the `pasearch` command to display AT-TLS policies. | The z/OS UNIX `pasearch` command in z/OS Communications Server: IP System Administrator's Commands |
| Display AT-TLS information by using the `Netstat` command. | `Netstat TTLS/-x` report in z/OS Communications Server: IP System Administrator's Commands |

AT-TLS enablement for DCAS

z/OS V2R2 Communications Server enhances the Digital Certificate Access Server (DCAS) to use Application Transparent Transport Layer Security (AT-TLS). To use TLSv1.2 to secure the connection, you must define AT-TLS policies for the DCAS. The Configuration Assistant for z/OS Communications Server provides a default AT-TLS policy to simplify defining the AT-TLS policy for DCAS.
Migrate to AT-TLS to allow the DCAS to use the latest support for SSL/TLS.
Configuring TLS/SSL by using the DCAS configuration file is supported, but such support is deprecated and will no longer be enhanced.

Dependency: The Policy Agent must be active.

Using AT-TLS enablement for DCAS

To use this DCAS enhancement, perform the appropriate tasks in Table 12.

Table 12. AT-TLS enablement for DCAS

<table>
<thead>
<tr>
<th>Task/Procedure</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enable Transparent Transport Layer Security (T TLS) in the TCP/IP stack by specifying the TTLS parameter on the TCPCONFIG statement in the TCPIP profile.</td>
<td>• Application Transparent Transport Layer Security data protection in z/OS Communications Server: IP Configuration Guide&lt;br&gt;• TCPCONFIG statement in z/OS Communications Server: IP Configuration Reference</td>
</tr>
<tr>
<td>Set up authorization for the pasearch command if the command is not issued from a superuser. To set authorization for the pasearch command, create a SERVAUTH profile of EZB.PAGENT.sysname.TcpImage.pctype. The ptype value can be set to TTLS or a wildcard value.</td>
<td>• Steps for configuring the Policy Agent in z/OS Communications Server: IP Configuration Guide&lt;br&gt;• z/OS Security Server RACF Security Administrator's Guide</td>
</tr>
<tr>
<td>Enable AT-TLS configuration for the Policy Agent by specifying CommonTTLSConfig, TLSConfig, or both statements in the Policy configuration file for each stack.</td>
<td>• Policy-based networking and Application Transparent Transport Layer Security data protection in z/OS Communications Server: IP Configuration Guide&lt;br&gt;• CommonTTLSConfig statement and TLSConfig statement in z/OS Communications Server: IP Configuration Reference</td>
</tr>
<tr>
<td>Define the AT-TLS policies by specifying the policies in the configuration files that are identified with the CommonTTLSConf and TTLSConf statements.</td>
<td>Specify the AT-TLS policies in the configuration files that are identified with the CommonTTLSConfig and TTLSConfig statements. Use one of the following methods to create the AT-TLS Policy Agent configuration files: • Use the IBM Configuration Assistant for z/OS Communications Server. Through a series of wizards and online help panels, you can use a GUI to produce the Policy Agent configuration files for any number of TCP/IP stacks. Using the GUI can reduce the amount of time that is required to produce configurations and reduce chances of configuration errors. • Code the required statements into a z/OS UNIX file or MVS data set.</td>
</tr>
</tbody>
</table>
Table 12. AT-TLS enablement for DCAS (continued)

<table>
<thead>
<tr>
<th>Task/Procedure</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Display policy-based networking information by using the z/OS UNIX System Services (USS) <code>pasearch</code> command to query information from the z/OS UNIX Policy Agent. The command is issued from the USS shell.</td>
<td>Displaying policy-based networking information in z/OS Communications Server: IP System Administrator’s Commands</td>
</tr>
<tr>
<td>Enable AT-TLS in the DCAS configuration file by setting <code>TLSMECHANISM</code> to ATTLS.</td>
<td>Customizing DCAS for TLS/SSL in z/OS Communications Server: IP Configuration Guide</td>
</tr>
</tbody>
</table>

IBM Health Checker for z/OS MVRSHD RHOSTS DATA

z/OS V2R2 Communications Server, with TCP/IP APAR PI51640 and SNA APAR OA50122, provides a new IBM Health Checker for z/OS application health check to help determine whether your MVRSHD server is active and whether RSH clients are using RHOSTS.DATAt sets datasets for authentication. The MVRSHD server supports the RSH and REXEC protocols which transfer user ID and password information in the clear. There is also the potential of weak authentication for RSH clients using RHOSTS.DATAt sets datasets. This authentication method allows remote command execution without requiring the RSH client to supply a password.

Dependency: You must install TCP/IP APAR PI51640 and SNA APAR OA50122 and start the IBM Health Checker for z/OS to use the new application health check.

Using the IBM Health Checker for z/OS MVRSHD RHOSTS DATA

To use the IBM Health Checker for z/OS MVRSHD RHOSTS DATA, perform the appropriate tasks in Table 13.

Table 13. IBM Health Checker for z/OS MVRSHD RHOSTS DATA

<table>
<thead>
<tr>
<th>Task</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>To use the IBM Health Checker for z/OS application check support, take the following steps:</td>
<td>See the following topics in IBM Health Checker for z/OS: User’s Guide:</td>
</tr>
<tr>
<td>1. Configure and start the IBM Health Checker for z/OS.</td>
<td>• Setting up IBM Health Checker for z/OS</td>
</tr>
<tr>
<td>2. Review the CSAPP_MVRSHD_RHOSTS_DATA health check output.</td>
<td>• Working with check output</td>
</tr>
<tr>
<td></td>
<td>• Managing checks</td>
</tr>
</tbody>
</table>

To find all related topics about IBM Health Checker for z/OS MVRSHD RHOSTS DATA, see Table 14.

Table 14. All related topics about IBM Health Checker for z/OS MVRSHD RHOSTS DATA

<table>
<thead>
<tr>
<th>Book name</th>
<th>Topics</th>
</tr>
</thead>
<tbody>
<tr>
<td>z/OS Communications Server: IP Configuration Guide</td>
<td>Step 3: Permit remote users to access MVS resources (optional)</td>
</tr>
<tr>
<td>z/OS Communications Server: IP Configuration Reference</td>
<td>Remote execution server parameters</td>
</tr>
<tr>
<td>z/OS Communications Server: IP Diagnosis Guide</td>
<td>IBM Health Checker for z/OS</td>
</tr>
</tbody>
</table>
Table 14. All related topics about IBM Health Checker for z/OS MVRSHD RHOSTS DATA (continued)

<table>
<thead>
<tr>
<th>Book name</th>
<th>Topics</th>
</tr>
</thead>
<tbody>
<tr>
<td>z/OS Communications Server: IP Messages Volume 1 (EZA)</td>
<td>EZA4443I</td>
</tr>
<tr>
<td>z/OS Communications Server: SNA Messages</td>
<td>ISTH029I</td>
</tr>
<tr>
<td></td>
<td>ISTH030E</td>
</tr>
</tbody>
</table>

**IBM Health Checker for z/OS SMTPD MAIL RELAY**

z/OS V2R2 Communications Server, with TCP/IP APAR PI51640 and SNA APAR OA50122, provides a new IBM Health Checker for z/OS application health check to help determine whether your SMTP server is configured as a mail relay. Specifying the INBOUNDOPENLIMIT statement to a valid non-zero value or allowing it to default to the value of 256 causes the SMTP server to open a listening port and implicitly become exploitable by remote users as a mail relay.

**Dependency:** You must install TCP/IP APAR PI51640 and SNA APAR OA50122 and start the IBM Health Checker for z/OS to use the new application health check.

**Using the IBM Health Checker for z/OS SMTPD MAIL RELAY**

To use the IBM Health Checker for z/OS SMTPD MAIL RELAY, perform the appropriate tasks in Table 15.

**Table 15. IBM Health Checker for z/OS SMTPD MAIL RELAY**

<table>
<thead>
<tr>
<th>Task</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>To use the IBM Health Checker for z/OS application check support, take the following steps: 1. Configure and start the IBM Health Checker for z/OS. 2. Review the CSAPP_SMTPD_MAIL_RELAY health check output.</td>
<td>See the following topics in IBM Health Checker for z/OS: User's Guide:  • Setting up IBM Health Checker for z/OS  • Working with check output  • Managing checks</td>
</tr>
</tbody>
</table>

**IBM Health Checker for z/OS SNMP agent public community name**

z/OS V2R2 Communications Server, with TCP/IP APAR PI51640 and SNA APAR OA50122, provides a new IBM Health Checker for z/OS application health check to help determine whether your SNMP agent is configured with a community name of public. Because the SNMP community name of public is a well-known name, it should not be used with community-based security due to security considerations.

**Dependency:** You must install TCP/IP APAR PI51640 and SNA APAR OA50122 and start the IBM Health Checker for z/OS to use the new application health check.
Using the IBM Health Checker for z/OS SNMP agent public community name

To use the IBM Health Checker for z/OS SNMP agent public community name, perform the appropriate tasks in Table 16.

Table 16. IBM Health Checker for z/OS SNMP agent public community name

<table>
<thead>
<tr>
<th>Task</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>To use the IBM Health Checker for z/OS application check support, take the following steps: 1. Configure and start the IBM Health Checker for z/OS. 2. Review the <code>CSAPP_SNMPAGENT_PUBLIC_COMMUNITY</code> health check output.</td>
<td>See the following topics in IBM Health Checker for z/OS: User’s Guide:  • Setting up IBM Health Checker for z/OS  • Working with check output  • Managing checks</td>
</tr>
</tbody>
</table>

To find all related topics about IBM Health Checker for z/OS SNMP agent public community name, see Table 17.

Table 17. All related topics about IBM Health Checker for z/OS SNMP agent public community name

<table>
<thead>
<tr>
<th>Book name</th>
<th>Topics</th>
</tr>
</thead>
<tbody>
<tr>
<td>z/OS Communications Server: IP Configuration Guide</td>
<td>• Provide community name information  • Provide community-based and user-based security and notification destination information</td>
</tr>
<tr>
<td>z/OS Communications Server: IP Configuration Reference</td>
<td>• OSNMPD parameters  • PWSRC statement syntax  • COMMUNITY entry</td>
</tr>
<tr>
<td>z/OS Communications Server: IP Diagnosis Guide</td>
<td>IBM Health Checker for z/OS</td>
</tr>
<tr>
<td>z/OS Communications Server: SNA Messages</td>
<td>• ISTH033I  • ISTH034E</td>
</tr>
<tr>
<td>IBM Health Checker for z/OS: User’s Guide</td>
<td><code>CSAPP_SNMPAGENT_PUBLIC_COMMUNITY</code></td>
</tr>
</tbody>
</table>

Network security enhancements for SNMP

z/OS V2R2 Communications Server enhances the SNMP Agent, the z/OS UNIX `snmp` command, and the SNMP manager API to support the Advanced Encryption Standard (AES) 128-bit cipher algorithm as an SNMPv3 privacy protocol for encryption. The AES 128-bit cipher algorithm is a stronger encryption protocol than the current Data Encryption Standard (DES) 56-bit algorithm. AES is a symmetric cipher algorithm that the National Institute of Standards (NIST) selects to replace DES. RFC 3826, The Advanced Encryption Standard (AES) Cipher Algorithm in the SNMP User-based Security Model (USM), specifies that Cipher Feedback Mode (CFB) mode is to be used with AES encryption. See Appendix A, “Related protocol specifications,” on page 115 for information about accessing RFCs.

Dependency: To use AES 128-bit encryption, the z/OS Integrated Cryptographic Services Facility (ICSF) must be configured and started.
Using network security enhancements for SNMP

To use this SNMP enhancement, perform the appropriate tasks in Table 18.

Table 18. Network security enhancements for SNMP

<table>
<thead>
<tr>
<th>Task/Procedure</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Configure and start the z/OS Integrated Cryptographic Services Facility (ICSF).</td>
<td>For detailed information about configuring ICSF, see z/OS Cryptographic Services ICSF Administrator's Guide.</td>
</tr>
<tr>
<td>For the SNMP Agent, configure an SNMPv3 user to use AES 128-bit encryption by specifying a USM_USER entry with the privProto field set to AESCFB128.</td>
<td>For detailed information about the privProto parameter, see the following references:</td>
</tr>
<tr>
<td></td>
<td>• Overview of SNMP security models in z/OS Communications Server: IP Configuration Guide</td>
</tr>
<tr>
<td></td>
<td>• Coding the SNMPD.CONF entries in z/OS Communications Server: IP Configuration Reference</td>
</tr>
<tr>
<td>For the z/OS UNIX snmp command, configure an SNMPv3 user to use AES 128-bit encryption by specifying a configuration statement with the privProto field set to AESCFB128.</td>
<td>For detailed information about the privProto parameter, see the following references:</td>
</tr>
<tr>
<td></td>
<td>• Overview of SNMP security models in z/OS Communications Server: IP Configuration Guide</td>
</tr>
<tr>
<td></td>
<td>• Coding the SNMPD.CONF entries in z/OS Communications Server: IP Configuration Reference</td>
</tr>
<tr>
<td>For the SNMP Manager API, configure an SNMPv3 user to use AES 128-bit encryption by specifying a configuration statement with the privProto field set to AESCFB128.</td>
<td>SNMP manager API configuration file in z/OS Communications Server: IP Programmer's Guide and Reference</td>
</tr>
</tbody>
</table>

Simplified access permissions to ICSF cryptographic functions for IPSec

In prior releases, network applications that are sending or receiving IPSec protected traffic were required to be permitted to certain SAF resource profiles in the CSFSERV class when protection of the ICSF cryptographic operations was requested. z/OS V2R2 Communications Server is enhanced to eliminate this requirement. You are no longer required to permit all network applications that are sending or receiving IPSec protected traffic to the relevant SAF resources in the CSFSERV class. Only the user ID that is associated with the TCP/IP stack must be permitted to the SAF resource profiles.

Using simplified access permissions to ICSF cryptographic functions for IPSec

To use the enhanced IPSec support for ICSF CSFACEE function, complete the appropriate task in Table 19 on page 34.
SMF 119 TCP connection termination record (subtype 2) enhanced to provide IP filter information

z/OS V2R2 Communications Server, with TCP/IP APAR PI69920, provides IP filter information in the SMF 119 TCP connection termination record (subtype 2). The name of the IP filter rules associated with inbound and outbound traffic for a connection are included in a new section of the record, if IP filtering is being done for a connection.

The data is also available through the SYSTCPCN real-time network monitoring interface (NMI).

Restrictions:

The IP filter section is included if IP filtering is active and an IP filter rule applies to the traffic. The IP filter section is not included for intra-host connections because IP filtering is not done for those connections.

The filter rule information reflects the IP filter rules in place at the time that the connection is terminated. If IP filter policy changes while a connection is active, only the names of the IP filter rules in place at the time of the termination are included.

Dependency:

SMF configuration option TCPTERM must be configured on the SMFCONFIG TCP/IP profile statement for the SMF 119 TCP connection termination record (subtype 2) to be generated.

The TCPCONNSERVICE parameter must be configured on the NETMONITOR TCP/IP profile statement for the SMF 119 TCP connection termination data to be available through the SYSTCPCN real-time NMI interface.

Using SMF 119 TCP connection termination record (subtype 2) enhanced to provide IP filter information

To use SMF 119 TCP connection termination record (subtype 2), perform the appropriate tasks in Table 20.

Table 20. SMF 119 TCP connection termination record (subtype 2) enhanced to provide IP filter information

<table>
<thead>
<tr>
<th>Task/Procedure</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enable the recording of SMF 119 TCP connection termination records by specifying the TCPTERM option on the SMFCONFIG TCP/IP profile statement.</td>
<td>SMFCONFIG statement in z/OS Communications Server: IP Configuration Reference</td>
</tr>
</tbody>
</table>
Table 20. SMF 119 TCP connection termination record (subtype 2) enhanced to provide IP filter information (continued)

<table>
<thead>
<tr>
<th>Task/Procedure</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enable the recording of the SMF 119 TCP connection termination data to the SYSTCPCN real-time NMI interface by specifying the TCPCONNSERVICE parameter on the NETMONITOR TCP/IP profile statement.</td>
<td>NETMONITOR statement in z/OS Communications Server: IP Configuration Reference</td>
</tr>
<tr>
<td>Display SMFCONFIG and NETMONITOR settings by issuing the Netstat CONFIG/-f command.</td>
<td>Netstat CONFIG/-f report in z/OS Communications Server: IP System Administrator’s Commands</td>
</tr>
</tbody>
</table>

To find all related topics about SMF 119 TCP connection termination record (subtype 2) enhancement to provide IP filter information, see Table 21.

Table 21. All related topics about SMF 119 TCP connection termination record (subtype 2) enhanced to provide IP filter information

<table>
<thead>
<tr>
<th>Book name</th>
<th>Topics</th>
</tr>
</thead>
<tbody>
<tr>
<td>z/OS Communications Server: IP Programmer’s Guide and Reference</td>
<td>TCP connection termination record (subtype 2)</td>
</tr>
</tbody>
</table>

TCP/IP profile IP security filter enhancements

z/OS V2R2 Communications Server enhances the default IP filters as defined in the TCP/IP profile data set to support traffic direction specifications, address ranges, port ranges, ranges on relevant type and code values, and MIPv6 and Opaque protocol types.

Using TCP/IP profile IP security filter enhancements

To use TCP/IP profile IP security filter enhancements, complete the appropriate tasks in Table 22.

Table 22. TCP/IP profile IP security filter enhancements

<table>
<thead>
<tr>
<th>Task</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Code new IPSECRULE or IPSEC6RULE statements or update existing statements with the new parameters.</td>
<td>IPSEC statement in z/OS Communications Server: IP Configuration Reference</td>
</tr>
<tr>
<td>Refresh the TCP/IP profile by recycling the TCP/IP stack or using the VARY TCPIP,,OBEYFILE command.</td>
<td>VARY TCPIP,,OBEYFILE in z/OS Communications Server: IP System Administrator’s Commands</td>
</tr>
</tbody>
</table>

TLS security enhancements for Policy Agent

z/OS V2R2 Communications Server enables centralized Policy Agent to support TLSv1.1 and TLSv1.2 with a new set of TLSv1.2 2-byte specific ciphers. In addition, the import services between the Policy Agent and IBM Configuration Assistant for z/OS Communications Server allow user-defined AT-TLS policies to create a secure SSL connection.

Using TLS security enhancements for Policy Agent

To update SSL/TLS support in the centralized Policy Agent and import services, perform the appropriate tasks in Table 23 on page 36.
Table 23. TLS security enhancements for Policy Agent

<table>
<thead>
<tr>
<th>Task/Procedure</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>If System SSL needs to access ICSF for new TLSv1.2 ciphers, ICSF must be started before starting Policy Agent.</td>
<td><a href="#">z/OS Cryptographic Services System SSL Programming for information about using hardware Cryptographic Features with System SSL</a></td>
</tr>
<tr>
<td>In the Policy Agent configuration file (<em>/etc/pagent.conf</em>), you can update ServerConnection/ServerSSLV3CipherSuites to use the TLSv1.1 or TLSv1.2 new 2-byte ciphers for centralized Policy Agent support.</td>
<td><a href="#">ServerSSLV3CipherSuites</a> under <a href="#">Policy Agent general configuration file statements in z/OS Communications Server: IP Configuration Reference</a></td>
</tr>
<tr>
<td>In the Policy Agent configuration file (<em>/etc/pagent.conf</em>), you can set ServicesConnection to Security Basic and use a default unsecure connection, or you can define AT-TLS policies to protect this import services connection with SSL/TLS.</td>
<td><a href="#">Security Basic</a> in ServicesConnection under Policy Agent general configuration file statements in z/OS Communications Server: IP Configuration Reference</td>
</tr>
</tbody>
</table>

TLS security enhancements for sendmail

z/OS V2R2 Communications Server enables z/OS UNIX sendmail to support TLSv1.1 and TLSv1.2 with a new set of TLSv1.2 2-byte specific ciphers.

Using TLS security enhancements for sendmail

To enable TLSv1.2 with 2-byte ciphers, perform the task in Table 24.

Table 24. TLS security enhancements for sendmail

<table>
<thead>
<tr>
<th>Task/Procedure</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>If System SSL needs to access ICSF for new TLSv1.2 ciphers, ICSF must be started before starting sendmail.</td>
<td><a href="#">z/OS Cryptographic Services System SSL Programming for information about using hardware Cryptographic Features with System SSL</a></td>
</tr>
<tr>
<td>In the sendmail z/OS specific configuration file (<em>/etc/mail/zOS.cf</em>), update the CipherLevel to use new 2-byte ciphers available with TLSv1.2.</td>
<td><a href="#">The CipherLevel statement in Creating the z/OS-specific file in z/OS Communications Server: IP Configuration Guide</a></td>
</tr>
</tbody>
</table>

TLS session reuse support for FTP and AT-TLS applications (AT-TLS)

z/OS V2R2 Communications Server enhances the SIOCTTLSCTL ioctl system call to perform the following actions:

- AT-TLS applications can retrieve the session ID for the secure socket.
- AT-TLS applications can request that a session is reused on a socket by retrieving and setting the session token.

Using TLS session reuse support for FTP and AT-TLS applications (AT-TLS)

To enable the SIOCTTLSCTL ioctl system call to allow AT-TLS applications to retrieve session ID or request a reused session, complete the appropriate tasks in Table 25 on page 37.
Table 25. TLS session reuse support for FTP and AT-TLS applications (AT-TLS)

<table>
<thead>
<tr>
<th>Task</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>To retrieve the session ID for a secure socket, take the following</td>
<td>Coding the SIOCTTLSCTL ioctl in z/OS Communications Server: IP Programmer's Guide and Reference</td>
</tr>
<tr>
<td>steps:</td>
<td></td>
</tr>
<tr>
<td>1. Use the TTLSHeader structure to request the session ID.</td>
<td></td>
</tr>
<tr>
<td>2. Set the TTLSi_Version value to 2.</td>
<td></td>
</tr>
<tr>
<td>3. Issue the SIOCTTLSCTL ioctl system call to retrieve the session</td>
<td>Coding the SIOCTTLSCTL ioctl in z/OS Communications Server: IP Programmer’s Guide and Reference</td>
</tr>
<tr>
<td>ID after the secure connection is established.</td>
<td></td>
</tr>
</tbody>
</table>

Retrieve and set the session token for a secure connection:         
1. Use the TTLSHeader structure to retrieve the session token on a secure connection with the SIOCTTLSCTL ioctl system call.
2. Use the TTLSHeader structure to set the session token with the TTLS_INIT_CONNECTION parameter on the SIOCTTLSCTL ioctl.

Obtain the session ID for a connection that is secured with AT-TLS by using one of the following methods:
- Use the SMF type 119 TCP connection termination (subtype 2) record fields, SMF119AP_TTTTLSSESSID and SMF119AP_TTTTLSSESSIDLEN.
- Use NWMTcpConnType NMI to obtain information from the NWMCmTTLSSessID and NWMCmTTLSSessIDLen fields.
- Use SNMP to obtain information from the ibmMvsTcpConnectionTtlsSessionID MIB object.

<table>
<thead>
<tr>
<th>Task</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Configure the FTP for TLS or AT-TLS</td>
<td>Transferring files using FTP in z/OS Communications Server: IP Configuration Guide</td>
</tr>
<tr>
<td>Configure the FTP.DATA statement</td>
<td>File Transfer Protocol in z/OS Communications Server: IP Configuration Reference</td>
</tr>
<tr>
<td>SECURE_SESSION_REUSE for both FTP server and FTP client</td>
<td></td>
</tr>
</tbody>
</table>
VTAM 3270 intrusion detection services

With APAR OA49911 installed, z/OS V2R2 Communications Server enables 3270 data stream intrusion detection services (IDS) that detect and act on violations of the 3270 data stream protocol.

The 3270 IDS function monitors 3270 data streams for primary logical units (PLUs) that are connected to the z/OS VTAM instance. Specific types of 3270 sessions can be exempted from IDS monitoring at the VTAM or application major node level if IDS monitoring is not needed for those sessions.

The 3270 IDS function monitors 3270 data streams for any attempt to write past the end of input fields or to modify protected fields. When these types of events are detected, appropriate actions are taken according to the VTAM configuration. The possible actions include logging the event, tracing the relevant inbound and outbound PIUs for later analysis, notifying the PLU of the event with a sense code, and even terminating the SNA session.

The 3270 IDS function writes GTF type F90 records and SMF type 119 (subtype 81) records for each incident.

**Restriction:** This function is not supported for VTAM's APPCCMD programming interface.

Using VTAM 3270 IDS

VTAM 3270 IDS is disabled by default. To enable this function, perform the appropriate tasks in Table 27.

**Table 27. VTAM 3270 IDS**

<table>
<thead>
<tr>
<th>Task/Procedure</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assess your need to use the 3270 data stream monitoring function</td>
<td>3270 IDS considerations and assessment in z/OS Communications Server: SNA Network Implementation Guide</td>
</tr>
<tr>
<td>Enable 3270 data stream monitoring at the VTAM level by using the DSMONITR VTAM start option.</td>
<td>DSMONITR VTAM start option in z/OS Communications Server: SNA Resource Definition Reference</td>
</tr>
<tr>
<td>Optionally enable or disable 3270 data stream monitoring at the application major node level by using the DSMONITR operand of the APPL or GROUP statement.</td>
<td>DSMONITR operand of the APPL and GROUP statements in z/OS Communications Server: SNA Resource Definition Reference</td>
</tr>
<tr>
<td>Optionally specify the actions to be taken at the VTAM level when a 3270 data stream protocol violation is detected by using the DSACTION VTAM start option.</td>
<td>DSACTION VTAM start option in z/OS Communications Server: SNA Resource Definition Reference</td>
</tr>
<tr>
<td>Optionally specify the actions to be taken at the application major node level when a 3270 data stream protocol violation is detected by using the DSACTION operand of the APPL or GROUP statement.</td>
<td>DSACTION operand of the APPL and GROUP statements in z/OS Communications Server: SNA Resource Definition Reference</td>
</tr>
<tr>
<td>Optionally exempt specific types of 3270 traffic from monitoring at the VTAM level by using the DSTRUST VTAM start option.</td>
<td>DSTRUST VTAM start option in z/OS Communications Server: SNA Resource Definition Reference</td>
</tr>
<tr>
<td>Task/Procedure</td>
<td>Reference</td>
</tr>
<tr>
<td>-------------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Optionally exempt specific types of 3270 traffic from monitoring at the application major node level using the DISTRUST operand of the APPL or GROUP statement.</td>
<td>DISTRUST operand of the APPL and GROUP statements in z/OS Communications Server: SNA Resource Definition Reference</td>
</tr>
<tr>
<td>Display 3270 IDS configuration settings at the VTAM level.</td>
<td>DISPLAY VTAMOPTS,FUNCTION=SECURITY command in z/OS Communications Server: SNA Operation</td>
</tr>
<tr>
<td>Display 3270 IDS configuration settings and statistics at the application level.</td>
<td>DISPLAY ID command in z/OS Communications Server: SNA Operation</td>
</tr>
<tr>
<td>Display 3270 IDS statistics at the VTAM level</td>
<td>DISPLAY STATS command in z/OS Communications Server: SNA Operation</td>
</tr>
<tr>
<td>Display 3270 IDS statistics for a specific session</td>
<td>DISPLAY SESSION,SID= command in z/OS Communications Server: SNA Operation</td>
</tr>
<tr>
<td>Modify the 3270 IDS configuration settings at the VTAM level</td>
<td>MODIFY VTAMOPTS command in z/OS Communications Server: SNA Operation</td>
</tr>
<tr>
<td>Enable capture of relevant SNA PIUs to the Generalized Trace Facility (GTF)</td>
<td>• DISCOUNT VTAM start option in z/OS Communications Server: SNA Resource Definition Reference</td>
</tr>
<tr>
<td></td>
<td>• DISTRUST operand of the APPL and GROUP statements in z/OS Communications Server: SNA Resource Definition Reference</td>
</tr>
<tr>
<td></td>
<td>• Using Traces in z/OS Communications Server: SNA Diagnosis Vol 1, Techniques and Procedures</td>
</tr>
<tr>
<td>Display the 3270 IDS data areas from a dump</td>
<td>VTAMMAP SES or VTAMMAP VTAM command in z/OS Communications Server: SNA Diagnosis Vol 1, Techniques and Procedures</td>
</tr>
<tr>
<td>Analyze potential 3270 protocol violations</td>
<td>• z/OS Communications Server: SNA Diagnosis Vol 1, Techniques and Procedures</td>
</tr>
<tr>
<td></td>
<td>• z/OS Communications Server: SNA Diagnosis Vol 2, FFST Dumps and the VITI</td>
</tr>
<tr>
<td>Update the SMFPRMxx member of SYS1.PARMLIB to write SMF type 119 subtype 81 records.</td>
<td>z/OS MVS Initialization and Tuning Reference</td>
</tr>
<tr>
<td>Read the SMF type 119 subtype 81 records.</td>
<td>Type 119 SMF records in z/OS Communications Server: IP Programmer’s Guide and Reference</td>
</tr>
</tbody>
</table>

To find all related topics about VTAM 3270 IDS, see Table 28 on page 40.
<table>
<thead>
<tr>
<th>Book name</th>
<th>Topics</th>
</tr>
</thead>
</table>
| z/OS Communications Server: IP Programmer’s Guide and Reference | • SMF 119 record subtypes  
• Common TCP/IP identification section  
• SNA 3270 Intrusion Detection Service record (subtype 81) |
| z/OS Communications Server: IP and SNA Codes | • Sense code 082B  
• Session status modifiers (positions 6-8) |
| z/OS Communications Server: SNA Operation | • DISPLAY ID command  
• DISPLAY SESSIONS command  
• DISPLAY STATS command  
• DISPLAY STORUSE command  
• DISPLAY VTAMOPTS command  
• MODIFY VTAMOPTS command |
| z/OS Communications Server: SNA Network Implementation Guide | 3270 Intrusion Detection Services |
| z/OS Communications Server: SNA Diagnosis Vol 1, Techniques and Procedures | • Missing VTAM trace records  
• SPANC  
• STORAGE  
• Traces provided by VTAM  
  – Formatting and printing trace records  
  – Using IPCS with the GTF trace option  
  – VTAM trace record formats  
  – Buffer contents trace for 3270 IDS incidents  
  – 3270 data stream formatting |
| z/OS Communications Server: SNA Diagnosis Vol 2, FFST Dumps and the VIT | • Trace options for the VIT  
• FB64 entry for FREEB64 macro  
• GB64 entry for GETB64 macro  
• 3270 entry for 3270 Intrusion Detection Services  
• 3271 entry for 3270 Intrusion Detection Services |
| z/OS Communications Server: SNA Resource Definition Reference | • APPL (Application program major node full syntax)  
• Application program major node operand descriptions  
  – DSACTION  
  – DSCOUNT  
  – DSMONITR  
  – DSTRUST  
• Start options syntax diagrams  
• Session security start options  
• DSACTION start option  
• DSCOUNT start option  
• DSMONITR start option  
• DSTRUST start option |
### Simplification

The following topic describes enhancements for simplification:

- “IBM Health Checker for additional z/OS legacy device types”
- “IBM Health Checker for TFTP daemon” on page 42
- “Removed support for the GATEWAY statement in the TCP/IP profile” on page 43

### IBM Health Checker for additional z/OS legacy device types

z/OS V2R2 Communications Server, with TCP/IP APAR PI49962 and SNA APAR OA49071, provides a new migration health check to use with the IBM Health Checker for z/OS function. The new migration health check determines whether you are using legacy device type configuration statements in your TCP/IP profile.

DEVICE and LINK profile statements for the following TCP/IP legacy device types will not be supported in a future release of IBM z/OS Communications Server:

- FDDI and Token Ring (LCS with LINKs FDDI and IBMTR)
- Token Ring (MPCIPA with LINK IPAQTR)
- Ethernet and FDDI (MPCOSA with LINKs OSAENET and OSAFDDI)
When the TCP/IP stack processes a legacy device type profile statement, it issues message EZZ0717I. See this message, and the associated profile processing messages, for information about the profile data set that contains the statements.

**Dependency:** You must install TCP/IP APAR PI49962 and SNA APAR OA49071 and start the IBM Health Checker for z/OS to use the new migration health check.

**Using the IBM Health Checker for additional z/OS legacy device types**

To use the IBM Health Checker for z/OS migration health check support, complete the task in Table 29.

| Table 29. IBM Health Checker for additional z/OS legacy device types |
|---------------------------------|------------------|
| **Task**                        | **Reference**    |
| To use the new migration health check, take the following steps: | See the following topics in IBM Health Checker for z/OS: User’s Guide |
| 1. Configure and start the IBM Health Checker for z/OS. |   * Setting up IBM Health Checker for z/OS |
| 2. Activate the ZOSMIGV2R2_NEXT_CS_LEGACYDEVICE migration health check. |   * Working with check output |
| 3. Review health check output for potential migration actions. Use the TCP/IP EZZ0717I message to locate the profile data sets containing the legacy device type statements. |   * Managing checks |

**IBM Health Checker for TFTP daemon**

z/OS V2R2 Communications Server, with TCP/IP APAR PI61806 and SNA APAR OA50445, provides a new Health Checker for z/OS migration health check to help determine whether you are using the Trivial File Transfer Protocol daemon (TFTPD). Support for the TFTPD is removed in z/OS V2R3.

**Dependency:** You must install TCP/IP APAR PI61806 and SNA APAR OA50445 and start the IBM Health Checker for z/OS to use the new migration health check.

**IBM Health Checker for TFTP daemon**

To use IBM Health Checker for TFTP daemon, perform the appropriate tasks in Table 30.

| Table 30. IBM Health Checker for TFTP daemon |
|---------------------------------|------------------|
| **Task/Procedure**              | **Reference**    |
| To use the IBM Health Checker for z/OS migration check support, take the following steps: | See the following topics in IBM Health Checker for z/OS: User’s Guide |
| 1. Configure and start the IBM Health Checker for z/OS. |   * Setting up IBM Health Checker for z/OS |
| 2. Activate the ZOSMIGV2R2_NEXT_CS_TFTP migration check. |   * Working with check output |
| 3. Review health check output for potential migration actions. |   * Managing checks |
Removed support for the GATEWAY statement in the TCP/IP profile

Starting in z/OS V2R2 Communications Server, the GATEWAY profile statement cannot be used to configure IPv4 static routes to the TCP/IP stack. You can use the BEGINROUTES profile statement to configure your IPv4 static routes. The BEGINROUTES statement provides more functionality than the GATEWAY statement and the statement syntax is easier to use.

Removing support for the GATEWAY statement in the TCP/IP profile

To convert the GATEWAY profile statements to the BEGINROUTES profile statements, complete the appropriate task in Table 31.

Table 31. Removed Support for the GATEWAY statement in the TCP/IP profile

<table>
<thead>
<tr>
<th>Task</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>If you are using GATEWAY profile statements, take the following steps to convert these statements to the BEGINROUTES profile statements:</td>
<td>BEGINROUTES statement in z/OS Communications Server: IP Configuration Reference</td>
</tr>
<tr>
<td>1. Obtain a dump of the TCP/IP stack address space on a z/OS CS V2R1 or earlier system.</td>
<td>TCPIPCS PROFILE in z/OS Communications Server: IP Diagnosis Guide</td>
</tr>
<tr>
<td>2. Use the TCPIPCS PROFILE command against the dump. The command formats all configured static routes as the BEGINROUTES profile statements.</td>
<td></td>
</tr>
<tr>
<td>3. Use the BEGINROUTES profile statements from the TCPIPCS PROFILE command output to replace the GATEWAY statements in your TCP/IP stack profile.</td>
<td></td>
</tr>
</tbody>
</table>

z/OS Configuration Assistant for Communications Server support for import of TCP/IP configuration

The z/OS V2R2 Configuration Assistant for Communications Server includes TCP/IP technology, with which you can create and manage TCP/IP profiles. With Configuration Assistant APAR PI66143 and TCP/IP APAR PI63449, you can import your current TCP/IP stack profiles into the Configuration Assistant, to help you transition to using the Configuration Assistant for your TCP/IP profile management.

To prepare a TCP/IP stack profile for import into the Configuration Assistant, use the Communications Server VARY TCPIP,EXPORTPROF command to export the profile.

Restrictions: For more information about restrictions on which TCP/IP profile statements and parameters can be imported to the Configuration Assistant, see VARY TCPIP,EXPORTPROF in z/OS Communications Server: IP System Administrator’s Commands.

Dependencies: z/OSMF is required to be installed and running in your network, with the Configuration Assistant for z/OS Communications Server plug-in installed.

To enable the z/OS Configuration Assistant for Communications Server support for import of TCP/IP configuration, complete the appropriate tasks in Table 32 on page 44.
Table 32. Task topics to enable z/OS Configuration Assistant for Communications Server support for import of TCP/IP configuration

<table>
<thead>
<tr>
<th>Task</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use the Configuration Assistant for z/OS Communications Server to manage your TCP/IP profile.</td>
<td>Getting Started Tutorial - TCP/IP</td>
</tr>
<tr>
<td>Control which users have access to the VARY TCPIP,EXPORTPROF command.</td>
<td>VARY TCPIP,EXPORTPROF</td>
</tr>
<tr>
<td>Export a TCP/IP profile into a format readable by the Configuration Assistant for z/OS Communications Server</td>
<td>VARY TCPIP,EXPORTPROF</td>
</tr>
<tr>
<td>Import a formatted TCP/IP profile into the Configuration Assistant for z/OS Communications Server</td>
<td>Importing formatted TCP/IP configuration</td>
</tr>
</tbody>
</table>

To find all new and updated topics about z/OS Configuration Assistant for Communications Server support for import of TCP/IP configuration, see Table 33.

Table 33. All new and updated topics about z/OS Configuration Assistant for Communications Server support for import of TCP/IP configuration

<table>
<thead>
<tr>
<th>Book name</th>
<th>Topics</th>
</tr>
</thead>
<tbody>
<tr>
<td>z/OS Communications Server: IP System Administrator's Commands</td>
<td>VARY TCPIP,EXPORTPROF</td>
</tr>
<tr>
<td>z/OS Communications Server: IP Messages Volume 4 (EZZ, SNM)</td>
<td>EZZ0059I</td>
</tr>
<tr>
<td></td>
<td>EZZ0067I</td>
</tr>
<tr>
<td></td>
<td>EZZ0068I</td>
</tr>
<tr>
<td></td>
<td>EZZ0069I</td>
</tr>
<tr>
<td></td>
<td>EZZ0070I</td>
</tr>
<tr>
<td></td>
<td>EZZ0139I</td>
</tr>
<tr>
<td></td>
<td>EZZ0312I</td>
</tr>
<tr>
<td></td>
<td>EZZ0358I</td>
</tr>
<tr>
<td></td>
<td>EZZ0405I</td>
</tr>
</tbody>
</table>

Availability and business resilience

The following topics describe enhancements for availability:

- “Activate Resolver trace without restarting applications”
- “Reordering of cached Resolver results” on page 46

Activate Resolver trace without restarting applications

z/OS V2R2 Communications Server provides the Resolver CTRACE TRACERES option to collect Trace Resolver output as Resolver CTRACE records. You can use the Resolver CTRACE TRACERES option to dynamically enable or disable collection of Trace Resolver output for one or more applications without stopping and then restarting the application. You can also use the Resolver CTRACE TRACERES option to trace Resolver activity in address spaces that have multiple tasks or address spaces that generate many Resolver API calls. You can use IPCS CTRACE subcommand processing to view the formatted component trace data from a dump, or from an external ctrace data set.
**Activating Resolver trace without restarting applications**

To activate Resolver trace dynamically, complete the tasks in Table 34.

<table>
<thead>
<tr>
<th>Table 34. Activate Resolver trace without restarting applications</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Task</strong></td>
</tr>
</tbody>
</table>
| Enable collection of Trace Resolver output as Resolver CTRACE records by using one of the following methods: | • [CTRACE - RESOLVER](https://www.ibm.com) in *z/OS Communications Server: IP Diagnosis Guide*  
• [TRACE Command](https://www.ibm.com) in *z/OS MVS System Commands* |
| • Take the following steps to activate collection when you start the Resolver: | |
| 1. Specify the CTRACE TRACERES option in the ctrace PARMLIB member. | |
| 2. Start the Resolver with the PARMS keyword. For example, `S resolver jobname,PARMS='ctrace parmlib member'`. | |
| • Take the following steps to activate collection after the Resolver is started: | |
| 1. Issue the `TRACE CT,ON` command and specify the CTRACE TRACERES option. For example: | |
| `TRACE CT,ON,COMP=SYSTCPRE,SUB=(resolver jobname)` | |
| `R xx,OPTIONS=(TRACERES),END` | |
| 2. To collect CTRACE information for a subset of applications, specify the JOBNAME, or ASID, or both options as filters. For example: | |
| `TRACE CT,ON,COMP=SYSTCPRE,SUB=(resolver jobname)` | |
| `R xx,OPTIONS=(TRACERES),JOBNAME=(...),ASID=(...),END` | |

| Disable collection of Trace Resolver output as Resolver CTRACE records by issuing the `TRACE CT,ON,COMP=SYSTCPRE,SUB=(resolver jobname)` command and using one of the following responses: | • [CTRACE - RESOLVER](https://www.ibm.com) in *z/OS Communications Server: IP Diagnosis Guide*  
• [TRACE Command](https://www.ibm.com) in *z/OS MVS System Commands* |
| • If the Resolver CTRACE function was enabled without filters, respond with `R xx,OPTIONS=(),END` to restore the default CTRACE options. | |
| • If the Resolver CTRACE function was enabled by using filtering, use one of the following responses to restore the default CTRACE options and remove the filter setting: | |
| 1. If you filter by using the JOBNAME option, respond with `R xx,OPTIONS=(),JOBNAME=(...),END`. | |
| 2. If you filter by using the ASID option, respond with `R xx,OPTIONS=(),ASID=(...),END`. | |
| 3. If you filter by using both JOBNAME and ASID options, respond with `R xx,OPTIONS=(),JOBNAME=(...),ASID=(...),END`. | |

**Guideline:** In all cases, you can substitute OPTIONS=(MINIMUM) or OPTIONS=(ALL) for the OPTIONS=() response to disable the CTRACE TRACERES processing. |

| Display the current settings for the Resolver CTRACE component (SYSTCPRE) by issuing the `D TRACE,COMP=SYSTCPRE,SUB=(resolver jobname)` command. | • [CTRACE - RESOLVER](https://www.ibm.com) in *z/OS Communications Server: IP Diagnosis Guide*  
• [TRACE Command](https://www.ibm.com) in *z/OS MVS System Commands* |
Table 34. Activate Resolver trace without restarting applications (continued)

<table>
<thead>
<tr>
<th>Task</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>View the formatted Trace Resolver output in the Resolver CTRACE component (SYSTCPRE) by using the IPCS CTRACE subcommand. Use the IPCS CTRACE,FULL command to format the information in a similar manner to how Trace Resolver is formatted. The Resolver CTRACE information can be examined in a dump or by using an external CTRACE data set.</td>
<td>• Obtaining component trace data with a dump in z/OS Communications Server: IP Diagnosis Guide&lt;br&gt;• Steps for obtaining component trace data with an external writer in z/OS Communications Server: IP Diagnosis Guide</td>
</tr>
</tbody>
</table>

Reordering of cached Resolver results

z/OS V2R2 Communications Server enhances the cache support provided by the system resolver. You can configure the resolver to enable reordering of a cached list of IP addresses that is returned in response to a host name resolution request. You can also disable the reordering function on a system-wide basis, or on an individual application basis.

Enabling the reordering of cached Resolver results

To enable or disable the reordering of the list of IP addresses that are associated with a cached host name, complete the tasks in Table 35.

Table 35. Reordering of cached Resolver results

<table>
<thead>
<tr>
<th>Task</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enable resolver cache reordering by performing the following steps:&lt;br&gt;1. Specify the CACHEREORDER statement in the resolver setup file.&lt;br&gt;2. Issue the MODIFY RESOLVER,REFRESH,SETUP=&lt;file name&gt; command.</td>
<td>CACHEREORDER NOCACHEREORDER statements in z/OS Communications Server: IP Configuration Reference</td>
</tr>
<tr>
<td>Disable system-wide resolver cache reordering by performing the following steps:&lt;br&gt;1. Use the default setting or specify the NOCACHEORDER statement in the resolver setup file.&lt;br&gt;2. Issue the MODIFY RESOLVER,REFRESH,SETUP=&lt;resolver setup file name&gt; command.</td>
<td>CACHEREORDER NOCACHEORDER statements in z/OS Communications Server: IP Configuration Reference&lt;br&gt;NOCACHEORDER statement (TCPIP.DATA statement) in z/OS Communications Server: IP Configuration Reference</td>
</tr>
<tr>
<td>Disable resolver cache reordering for an application by performing the following steps:&lt;br&gt;1. Specify the NOCACHEORDER statement in the TCPIP.DATA file that this application uses.&lt;br&gt;2. Issue the MODIFY RESOLVER,REFRESH command or restart the application.</td>
<td></td>
</tr>
</tbody>
</table>
Table 35. Reordering of cached Resolver results (continued)

<table>
<thead>
<tr>
<th>Task</th>
<th>Reference</th>
</tr>
</thead>
</table>
| Determine whether system-wide cache reordering is in effect by issuing the MODIFY RESOLVER,DISPLAY command: | To determine whether system-wide cache reordering is in effect, issue the MODIFY RESOLVER,DISPLAY command. The command syntax is as follows:  
```
MODIFY RESOLVER,DISPLAY
```
| • Cache reordering is enabled when EZZ9304I CACHEREORDER is displayed. | MODIFY command – Resolver address space in z/OS Communications Server: IP System Administrator’s Commands |
| • Cache reordering is disabled when either EZZ9304I NOCACHE is displayed or EZZ9304I NOCACHEREORDER is displayed. The cache reordering function is disabled by default whenever caching is disabled. | **TRACE RESOLVER** in z/OS Communications Server: IP Diagnosis Guide |

Determine whether cache reordering is in effect for an application or a resolver query request by performing the following steps:

1. Enable the trace resolver function.
2. Start the application.
3. Issue the resolver query request.
4. Check the trace resolver res_init( ) information to determine whether the CacheReorder or NoCacheReorder value is specified.

Application, middleware, and workload enablement

The following topics describe enhancements for application, middleware, and workload enablement:

- “CICS transaction tracking support for CICS TCP/IP IBM Listener”
- “CSSMTP migration enablement” on page 48
- “CSSMTP SMTP command editing option” on page 49
- “CSSMTP customizable ATSIGN character for mail addresses” on page 49
- Improved CSSMTP code page compatibility with target servers
- Improved CSSMTP TLS compatibility with mail servers
- sendmail to CSSMTP bridge

CICS transaction tracking support for CICS TCP/IP IBM Listener

z/OS V2R2 Communications Server enhances the CICS Sockets Listener to provide to CICS the IP addresses and port numbers of the local and remote session partners for use by the CICS Explorer® or Session Monitor.

**Restriction:** CICS Transaction Server must be V4R2 or higher.

**Dependency:** CICS Transaction Server V4R2 or V5R1 must be active.

Using CICS transaction tracking support for CICS TCP/IP IBM Listener

To use CICS transaction tracking support for CICS TCP/IP IBM Listener, complete the appropriate task in Table 36 on page 48.
CSSMTP migration enablement

/z/OS V2R2 Communications Server provides new/z/OS Health Checker for/z/OS migration health checks to help determine whether you are using any of the following functions on the system:

- sendmail client
- sendmail daemon
- sendmail mail submission agent (sendmail MSA)
- sendmail mail transfer agent (sendmail MTA)
- SMPTD daemon
- SMTPD mail transfer agent (SMPTD MTA)

Support for these functions is removed in/z/OS V2R3.

Using CSSMTP migration enablement

To use CSSMTP migration enablement, complete the appropriate task in Table 37.

Table 37. CSSMTP migration enablement

<table>
<thead>
<tr>
<th>Task</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>To use the IBM Health Checker for/z/OS migration check support, take the following steps:</td>
<td>See the following topics in IBM Health Checker for/z/OS: User’s Guide</td>
</tr>
<tr>
<td>1. Configure and start the IBM Health Checker for/z/OS.</td>
<td>Setting up IBM Health Checker for/z/OS</td>
</tr>
<tr>
<td>2. Activate the following health checks:</td>
<td>Working with check output</td>
</tr>
<tr>
<td>- ZOSMIGV2R2_Next_CS_SENDMAILDAEMN</td>
<td>Managing checks</td>
</tr>
<tr>
<td>- ZOSMIGV2R2_Next_CS_SENDMAILCLIEN</td>
<td></td>
</tr>
<tr>
<td>- ZOSMIGV2R2_Next_CS_SENDMAILMTA</td>
<td></td>
</tr>
<tr>
<td>- ZOSMIGV2R2_Next_CS_SENDMAILMSA</td>
<td></td>
</tr>
<tr>
<td>- ZOSMIGV2R2_Next_CS_SMTPDDAEMON</td>
<td></td>
</tr>
<tr>
<td>- ZOSMIGV2R2_Next_CS_SMTPDMTA</td>
<td></td>
</tr>
<tr>
<td>3. Review health check output for potential migration actions.</td>
<td></td>
</tr>
</tbody>
</table>

/z/OS V2R2 Communications Server provides support to help you prepare for the removal of SMTPD and sendmail from/z/OS. CSSMTP is enhanced to reduce TLS negotiation overhead when you use TLS to connect to mail gateways.

- A new test mode is provided for CSSMTP. In this mode, CSSMTP analyzes JES mail messages for compatibility but does not send them. To enable CSSMTP to run in test mode while SMTPD processes mail workload as usual, EZBMCOPY is provided to create copies of mail workload for both SMTPD and CSSMTP.
You can configure CSSMTP to tolerate longer lines than allowed by the standard mail architecture.

You can configure CSSMTP to keep connections with mail gateways after the last mail message in a spool file is sent. This reduces the TLS negotiation burden when TLS is used for these connections.

**Incompatibilities:** Configure CSSMTP to tolerate longer lines than the standard mail architecture allows only if the workload that generates the mail message cannot be fixed. This function does not prevent other mail gateways and servers with the mail delivery path from rejecting these mail messages. See RFC 2821 for details.

**Using CSSMTP migration enablement**

To enable CSSMTP migration, complete the appropriate task in **Table 38**.

<table>
<thead>
<tr>
<th>Task</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Run CSSMTP in compatibility test mode.</td>
<td>TestMode parameter on Options statement in Z/OS Communications Server: IP Configuration Reference</td>
</tr>
<tr>
<td>Configure and use EZBMCOPY to make copies of mail message files from the JES spool so that they can be processed by both CSSMTP in test mode and SMTPD that run in production.</td>
<td>Withdrawal of SMTPD and sendmail in Z/OS Communications Server: IP Configuration Guide</td>
</tr>
<tr>
<td>Configure CSSMTP to tolerate data lines in mail messages longer than the limit specified by RFC 2821.</td>
<td>DataLineTrunc parameter on Options statement in Z/OS Communications Server: IP Configuration Reference</td>
</tr>
<tr>
<td>Configure CSSMTP to keep connections with mail gateways for a specific time after the last mail message in a spool file is processed.</td>
<td>ConnectIdle parameter on TIMEOUT statement in Z/OS Communications Server: IP Configuration Reference</td>
</tr>
</tbody>
</table>

**CSSMTP SMTP command editing option**

In z/OS V2R2 Communications Server, you can configure the Communications Server Simple Mail Transfer Protocol (CSSMTP) to remove the trailing nulls from SMTP Commands (**EHLO**, **HELO**, **STARTTLS**, **FROM**, **RCPT**, and **DATA**).

**Using the CSSMTP SMTP command editing option**

To use the CSSMTP mail message date header handling option, complete the task in **Table 39**.

<table>
<thead>
<tr>
<th>Task</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specify NullTrnc Yes on the CSSMTP configuration Options statement to remove trailing null characters from SMTP commands.</td>
<td>CSSMTP Options statement in Z/OS Communications Server: IP Configuration Reference</td>
</tr>
</tbody>
</table>

**CSSMTP customizable ATSIGN character for mail addresses**

The function adds an ATSIGN option to the CSSMTP configuration file.
With APAR PI52704 installed, z/OS V2R2 Communications Server enables the Communications Server SMTP (CSSMTP) application to recognize a different character as the industry standard at sign (@) symbol in a mail address. The specified character is recognized as the at sign symbol only in the SMTP commands and headers in mail messages. This enhancement simplifies migration from SMTPD to CSSMTP for customers that use a code page other than the default IBM-1047 and that have modified mail generation programs to generate mail addresses with an at sign character other than @.

**CSSMTP customizable ATSIGN character for mail addresses**

To enable the CSSMTP customizable ATSIGN character for mail addresses, perform the appropriate tasks in Table 40.

<table>
<thead>
<tr>
<th>Task/Procedure</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Options</td>
<td>• AtSign parameter on Options statement in z/OS Communications Server: IP Configuration Reference</td>
</tr>
<tr>
<td>ATSIGN symbol (@ is the default)</td>
<td>Configure CSSMTP to use a character that represents the at sign (@) symbol in the mail address of the SMTP commands and headers.</td>
</tr>
</tbody>
</table>

To find all related topics about CSSMTP customizable ATSIGN character for mail addresses, see Table 41.

<table>
<thead>
<tr>
<th>Book name</th>
<th>Topics</th>
</tr>
</thead>
<tbody>
<tr>
<td>z/OS Communications Server: IP Configuration Reference</td>
<td>• CSSMTP configuration statements</td>
</tr>
<tr>
<td></td>
<td>• Options statement</td>
</tr>
<tr>
<td>z/OS Communications Server: IP Programmer’s Guide and Reference</td>
<td>CSSMTP configuration record (CONFIG subtype 48)</td>
</tr>
<tr>
<td>z/OS Communications Server: IP System Administrator’s Commands</td>
<td>MODIFY command: Communications Server SMTP application (CSSMTP)</td>
</tr>
</tbody>
</table>

**Improved CSSMTP code page compatibility with target servers**

With APAR PI73909 installed, z/OS V2R2 Communications Server enables the Communications Server SMTP (CSSMTP) application to use a code page other than the standard ISO8859-1 code page to send mail messages to a target server. With this support, CSSMTP can send mail messages with special characters, such as the Euro sign (€), embedded in the body of the mail message in the code page expected by the mail server.

**Restriction:** The commands and headers of a mail message are first translated to code page IBM-1047 and then to the code page that is configured for the target server. Characters in the headers might not be translated correctly.

To enable improved CSSMTP code page compatibility with target servers, perform the task in Table 42 on page 51.
Table 42. Improved CSSMTP code page compatibility with target servers

<table>
<thead>
<tr>
<th>Task/Procedure</th>
<th>Reference</th>
</tr>
</thead>
</table>
| Configure the code page that is used to translate and send mail messages to the target servers. | • Charset parameter on the [TargetServer statement] in [z/OS Communications Server: IP Configuration Reference]  
• Steps for creating mail on the JES spool data set for CSSMTP in [z/OS Communications Server: IP Configuration Guide] |

To find all new and updated topics about improved CSSMTP code page compatibility with target servers, see Table 43.

Table 43. All related topics about improved CSSMTP code page compatibility with target servers

<table>
<thead>
<tr>
<th>Book name</th>
<th>Topics</th>
</tr>
</thead>
<tbody>
<tr>
<td>z/OS Communications Server: IP Configuration Guide</td>
<td>Steps for creating mail on the JES spool data set for CSSMTP</td>
</tr>
</tbody>
</table>
| z/OS Communications Server: IP Configuration Reference | • CSSMTP configuration statements  
• TargetServer statement  
• TRANSLATE statement |
| z/OS Communications Server: IP Diagnosis Guide | Bad character translations |
| z/OS Communications Server: IP System Administrator’s Commands | MODIFY command: Communications Server SMTP application (CSSMTP) |

Improved CSSMTP TLS compatibility with mail servers

z/OS V2R2 Communications Server, with TCP/IP APAR PI56614, enables the Communications Server SMTP (CSSMTP) application to optionally send an EHLO command after a successful TLS negotiation. RFC 3207 (SMTP Service Extension for Secure SMTP over Transport Layer Security) specifies that sending an EHLO command is optional for a SMTP client after a successful TLS negotiation. However, some SMTP servers require an EHLO command after a successful TLS negotiation. To accommodate these servers, a configuration option is provided to enable the sending of an EHLO command after a successful TLS negotiation.

Improved CSSMTP TLS compatibility with mail servers

To enable the sending of an EHLO command after a successful TLS negotiation, perform the appropriate tasks in Table 44.

Table 44. Improved CSSMTP TLS compatibility with mail servers

<table>
<thead>
<tr>
<th>Task/Procedure</th>
<th>Reference</th>
</tr>
</thead>
</table>
| Specify TLS Ehlo Yes on the CSSMTP configuration Options statement to request CSSMTP to send an EHLO command after a successful TLS negotiation. | • TLS Ehlo parameter on Options statement in [z/OS Communications Server: IP Configuration Reference]  

To find all related topics about Improved CSSMTP TLS compatibility with mail servers, see Table 45 on page 52.
Table 45. All related topics about Improved CSSMTP TLS compatibility with mail servers

<table>
<thead>
<tr>
<th>Book name</th>
<th>Topics</th>
</tr>
</thead>
<tbody>
<tr>
<td>z/OS Communications Server: IP Configuration Guide</td>
<td>Steps for using Transport Layer Security for CSSMTP</td>
</tr>
<tr>
<td>z/OS Communications Server: IP Configuration Reference</td>
<td>CSSMTP configuration statements</td>
</tr>
<tr>
<td>z/OS Communications Server: IP Configuration Reference</td>
<td>Options statement</td>
</tr>
<tr>
<td>z/OS Communications Server: IP Programmer’s Guide and Reference</td>
<td>CSSMTP configuration record (CONFIG subtype 48)</td>
</tr>
<tr>
<td>z/OS Communications Server: IP Diagnosis Guide</td>
<td>Bad sequence of commands</td>
</tr>
<tr>
<td>z/OS Communications Server: IP System Administrator’s Commands</td>
<td>MODIFY command: Communications Server SMTP application (CSSMTP)</td>
</tr>
<tr>
<td>z/OS Summary of Message and Interface Changes</td>
<td>CSSMTP records</td>
</tr>
<tr>
<td></td>
<td>General updates for the non-PROFILE.TCPIP IP configuration files</td>
</tr>
<tr>
<td></td>
<td>General updates of IP operator commands</td>
</tr>
</tbody>
</table>

sendmail to CSSMTP bridge

z/OS V2R2 Communications Server is planned to be the last release to support z/OS UNIX sendmail. The z/OS sendmail to CSSMTP bridge (sendmail bridge) included with APAR PI71175 provides a compatible subset of sendmail functions so that z/OS UNIX users can still use the sendmail command to send mail messages. The sendmail bridge parses input options from the command line, reads the mail message from the UNIX System Services file, and processes the mail message. The input mail message is updated by adding SMTP commands and SMTP headers if there is no header specified in the input mail message. The updated mail message is transmitted to the JES spool data set for the Communications Server SMTP (CSSMTP) application to process.

sendmail to CSSMTP bridge

Dependency: CSSMTP must be configured and running.

Restriction: No replacement function in z/OS Communications Server supports using sendmail as a SMTP server for receiving mail for delivery to local TSO/E or z/OS UNIX System Services user mailboxes, or for forwarding mail to other destinations.

To use this sendmail bridge support, perform the appropriate tasks in Table 46.

Table 46. sendmail to CSSMTP bridge

<table>
<thead>
<tr>
<th>Task/Procedure</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Configure and start CSSMTP if CSSMTP is not started</td>
<td>Mail on z/OS - Configuring the CSSMTP application in z/OS Communications Server: IP Configuration Guide</td>
</tr>
<tr>
<td></td>
<td>Communications Server SMTP application in z/OS Communications Server: IP Configuration Reference</td>
</tr>
<tr>
<td>Set up the sendmail to CSSMTP bridge</td>
<td>sendmail to CSSMTP bridge in z/OS Communications Server: IP Configuration Reference</td>
</tr>
<tr>
<td>Invoke sendmail bridge command</td>
<td>For syntax, see Sending email using the sendmail to CSSMTP bridge in z/OS Communications Server: IP User’s Guide and Commands</td>
</tr>
</tbody>
</table>
Table 46. sendmail to CSSMTP bridge (continued)

<table>
<thead>
<tr>
<th>Task/Procedure</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use sendmail bridge for existing users who have used z/OS sendmail in previous releases</td>
<td>sendmail bridge in z/OS Communications Server: IP Configuration Guide</td>
</tr>
<tr>
<td>Diagnose problems using the sendmail to CSSMTP bridge</td>
<td>Diagnosing sendmail to CSSMTP bridge problems in z/OS Communications Server: IP Diagnosis Guide</td>
</tr>
</tbody>
</table>

To find all related topics about sendmail to CSSMTP bridge, see Table 47

Table 47. All related topics about sendmail to CSSMTP bridge

<table>
<thead>
<tr>
<th>Book name</th>
<th>Topics</th>
</tr>
</thead>
<tbody>
<tr>
<td>z/OS Communications Server: IP Configuration Guide</td>
<td>- Steps for creating mail on the JES spool data set for CSSMTP</td>
</tr>
<tr>
<td></td>
<td>- sendmail to CSSMTP bridge</td>
</tr>
<tr>
<td></td>
<td>- Setting up sendmail bridge</td>
</tr>
<tr>
<td></td>
<td>- Steps for creating and customizing the configuration file</td>
</tr>
<tr>
<td></td>
<td>- Security considerations for sendmail bridge</td>
</tr>
<tr>
<td>z/OS Communications Server: IP Configuration Reference</td>
<td>- TCP/IP configuration data sets</td>
</tr>
<tr>
<td></td>
<td>- sendmail to CSSMTP bridge</td>
</tr>
<tr>
<td></td>
<td>- sendmail bridge environment variable</td>
</tr>
<tr>
<td></td>
<td>- General syntax rules for sendmail bridge</td>
</tr>
<tr>
<td></td>
<td>- sendmail bridge configuration file</td>
</tr>
<tr>
<td></td>
<td>- sendmail bridge configuration statements</td>
</tr>
<tr>
<td></td>
<td>- D statement</td>
</tr>
<tr>
<td></td>
<td>- O statement</td>
</tr>
<tr>
<td></td>
<td>- W statement</td>
</tr>
<tr>
<td>z/OS Communications Server: IP Diagnosis Guide</td>
<td>Diagnosing sendmail to CSSMTP bridge problems</td>
</tr>
<tr>
<td>z/OS Communications Server: IP User's Guide and Commands</td>
<td>- Sending mail</td>
</tr>
<tr>
<td></td>
<td>- Sending email using the sendmail to CSSMTP bridge</td>
</tr>
</tbody>
</table>

**Economics and platform efficiency**

The following topics describe enhancements for economics and platform efficiency:
- “Enhanced Enterprise Extender scalability” on page 54
- “Enhanced IKED Scalability” on page 54
- “Increase single stack DVIPA limit to 4096” on page 54
- “Shared Memory Communications - Direct Memory Access” on page 55
- “Shared Memory Communications over RDMA adapter (RoCE) virtualization” on page 60
- “64-bit enablement of the TCP/IP stack” on page 65
Enhanced Enterprise Extender scalability

z/OS V2R2 Communications Server improves the scalability of Enterprise Extender connections. The overall performance is improved when there are large numbers of Enterprise Extender connections.

Enhanced IKED Scalability

z/OS V2R2 Communications Server improves Internet Key Exchange daemon (IKE daemon) scalability. Performance is improved when large numbers of IKE peers attempt to negotiate IPSec SAs with z/OS IKE daemon concurrently. The IkeSyslogLevel configuration parameter in iked.conf is updated and a thread identifier that precedes every IKE daemon message written through syslogd is included.

IBM Health Checker for z/OS FTP ANONYMOUS JES

With TCP/IP APAR PI47637 and SNA APAR OA49668, z/OS V2R2 Communications Server provides a new IBM Health Checker for z/OS application health check to help determine whether your FTP server allows anonymous users to submit jobs. When ANONYMOUS is enabled, it is recommended that ANONYMOUSLEVEL be set to 3 and ANONYMOUSFILETYPEJES be set to FALSE. Otherwise, anonymous users can submit jobs to run on the system.

Dependency: You must install TCP/IP APAR PI47637 and SNA APAR OA49668 and start the IBM Health Checker for z/OS to use the new application health check.

IBM Health Checker for z/OS FTP ANONYMOUS JES

To use the IBM Health Checker for z/OS FTP ANONYMOUS JES, perform the appropriate tasks in Table 48.

<table>
<thead>
<tr>
<th>Task/Procedure</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>To use the IBM Health Checker for z/OS application check support, take the following steps:</td>
<td>See the following topics in IBM Health Checker for z/OS: User's Guide</td>
</tr>
<tr>
<td>1. Configure and start the IBM Health Checker for z/OS.</td>
<td>Setting up IBM Health Checker for z/OS</td>
</tr>
<tr>
<td>2. Review the CSAPP_FTPD_ANONYMOUS_JES health check output.</td>
<td>Working with check output, Managing checks</td>
</tr>
</tbody>
</table>

Increase single stack DVIPA limit to 4096

z/OS V2R2 Communications Server increases the limit of total DVIPAs on a single stack from 1024 to 4096. This allows more than 1024 application instance DVIPAs that are defined by VIPARANGE to be defined on a single TCP/IP stack.

Restriction: The number of DVIPAs that are defined through VIPADEFINE and VIPABACKUP configuration statements is still limited to 1024.

Increasing single stack DVIPA limit to 4096

To increase single stack DVIPA limit to 4096, complete the appropriate tasks in Table 49 on page 55.
Table 49. Increase single stack DVIPA limit to 4096

<table>
<thead>
<tr>
<th>Task</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Create additional unique application-instance DVIPAs.</td>
<td>Configuring the unique application-instance scenario in z/OS Communications Server: IP Configuration Guide</td>
</tr>
<tr>
<td>If the number of DVIPAs increases beyond 1024, you might need to increase the output buffer size for any application that uses the callable NMI to retrieve DVIPA information.</td>
<td>z/OS Communications Server: IP Programmer’s Guide and Reference</td>
</tr>
</tbody>
</table>

Shared Memory Communications - Direct Memory Access

z/OS V2R2 Communications Server, with TCP/IP APAR PI45028 and SNA APAR OA48411, provides significant performance improvements for TCP protocol workloads that are deployed on the same System z CPC. This solution uses Shared Memory Communications - Direct Memory Access (SMC-D) for TCP connections to local peers which also support this function.

**Incompatibilities:** This function does not support IPAQENET and IPAQIDIO interfaces that are defined by using the DEVICE, LINK, and HOME statements. Convert your IPAQENET and IPAQIDIO definitions to use the INTERFACE statement to enable this support.

**Dependencies:**
- This function requires an IBM z13™ GA2 level of hardware.
- This function requires at least one Internal Shared Memory (ISM) device configured in the Hardware Configuration Definition (HCD) with two or more Peripheral Component Interconnect Express (PCIe) function IDs (PFIDs).

To enable the SMC-D, complete the appropriate tasks in Table 50.

Table 50. Task topics to enable SMC-D

<table>
<thead>
<tr>
<th>Task</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>If you are using IPv4 QDIO interfaces that are defined with the DEVICE, LINK, and HOME statements, and want to use SMC-D for traffic over these interfaces, convert those definitions to use the IPAQENET INTERFACE statement.</td>
<td>Steps for converting from IPv4 IPAQENET DEVICE, LINK, and HOME definitions to the IPv4 IPAQENET INTERFACE statement in z/OS Communications Server: IP Configuration Guide</td>
</tr>
<tr>
<td>If you are using IPv4 HiperSockets interfaces that are defined with the DEVICE, LINK, and HOME statements, and want to use SMC-D for traffic over these interfaces, convert those definitions to use the IPAQIDIO INTERFACE statement.</td>
<td>Steps for converting from IPv4 IPAQIDIO DEVICE, LINK, and HOME definitions to the IPv4 IPAQIDIO INTERFACE statement in z/OS Communications Server: IP Configuration Guide</td>
</tr>
<tr>
<td>Configure at least one ISM device in HCD.</td>
<td>z/OS Hardware Configuration Definition (HCD) Reference Summary</td>
</tr>
<tr>
<td>Select a unique physical network (PNet) ID for each of the networks. Configure the appropriate PNet ID in HCD for each OSD and/or IQD CHPID on a network and configure the PNet ID on the ISM device to be used on that network.</td>
<td>z/OS Hardware Configuration Definition (HCD) Reference Summary</td>
</tr>
<tr>
<td>Configure SMC-D on the GLOBALCONFIG statement in the TCP/IP profile.</td>
<td>GLOBALCONFIG statement in z/OS Communications Server: IP Configuration Reference</td>
</tr>
</tbody>
</table>
### Table 50. Task topics to enable SMC-D (continued)

<table>
<thead>
<tr>
<th>Task</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>For each IPv4 interface to be used for SMC-D, configure a nonzero subnet mask on the INTERFACE statement in the TCP/IP profile and use the same subnet value as the peer stack that resides on the same System z CPC.</td>
<td>Shared Memory Communications in z/OS Communications Server: IP Configuration Guide</td>
</tr>
<tr>
<td>For each IPv6 interface to be used for SMC-D, ensure that the interface has at least one associated prefix in common with the peer stack that resides on the same System z CPC.</td>
<td>PORT statement and PORTRANGE statement in z/OS Communications Server: IP Configuration Reference</td>
</tr>
<tr>
<td>Optionally, restrict SMC from being used by certain server applications by coding the NOSMC option on the PORT or PORTRANGE statement that defines the server port.</td>
<td>PORT statement and PORTRANGE statement in z/OS Communications Server: IP Configuration Reference</td>
</tr>
<tr>
<td>Display whether the stack is enabled for SMC-D by issuing the Netstat CONFIG/-f command.</td>
<td>Netstat: CONFIG/-f report in z/OS Communications Server: IP System Administrator’s Commands</td>
</tr>
<tr>
<td>Display the status of the ISM PFIDs.</td>
<td>D PCIE command in z/OS MVS System Commands</td>
</tr>
<tr>
<td>Display information about the dynamic ISM TRLEs by issuing the D NET,ID=trle, or D NET,TTRL,TRLE=trle command.</td>
<td>DISPLAY ID command and DISPLAY TRL command in z/OS Communications Server: SNA Operation</td>
</tr>
</tbody>
</table>
| Display information about an ISM interface by issuing the Netstat DEvlinks/-d command for the ISM interface. | See the following topics:  
  • DISPLAY ID command and DISPLAY TRL command in z/OS Communications Server: SNA Operation  
  • Netstat DEvlinks/-d report in z/OS Communications Server: IP System Administrator’s Commands |
| Display the PNet ID for an active OSD, IQD, or ISM interface using the netstat DEvlinks /-d command or by issuing the D NET,ID=trle or D NET,TTRL,TRLE=trle command. | See the following topics:  
  • DISPLAY ID command and DISPLAY TRL command in z/OS Communications Server: SNA Operation  
  • Netstat DEvlinks/-d report in z/OS Communications Server: IP System Administrator’s Commands |
| Display information about the number of sends, receives, and bytes that went over an ISM interface by issuing the Netstat DEvlinks/-d report in z/OS Communications Server: IP System Administrator’s Commands |
| Display how many TCP connections are using SMC-D by issuing the Netstat STATS/-S command. | Netstat STATS /-S report in z/OS Communications Server: IP System Administrator’s Commands |
| Display information about storage that is being used by TCP/IP for SMC-D by issuing the D TCPIP,STOR command. | D TCPIP,STOR command in z/OS Communications Server: IP System Administrator’s Commands |
| Display information about SMC-D links by issuing the Netstat DEvlinks/-d command with the SMC parameter. | Netstat DEvlinks/-d report in z/OS Communications Server: IP System Administrator’s Commands |
| Display information about interfaces by issuing the Netstat DEvlinks/-d command using the PNETID modifier. | Netstat DEvlinks/-d report in z/OS Communications Server: IP System Administrator’s Commands |

To find all related topics about Shared Memory Communications - Direct Memory Access, see Table 51.

### Table 51. All related topics about Shared Memory Communications - Direct Memory Access

<table>
<thead>
<tr>
<th>Book name</th>
<th>Topics</th>
</tr>
</thead>
<tbody>
<tr>
<td>z/OS Communications Server: IP Configuration Guide</td>
<td>Shared Memory Communications</td>
</tr>
</tbody>
</table>

56 z/OS V2R2.0 Communications Server: New Function Summary
<table>
<thead>
<tr>
<th>Book name</th>
<th>Topics</th>
</tr>
</thead>
<tbody>
<tr>
<td>z/OS Communications Server: IP Configuration</td>
<td>- GLOBALCONFIG statement</td>
</tr>
<tr>
<td>and Reference</td>
<td>- INTERFACE - IPAQENET OSA-Express QDIO interfaces statement</td>
</tr>
<tr>
<td></td>
<td>- INTERFACE - IPAQIDIO HiperSockets interfaces statement</td>
</tr>
<tr>
<td></td>
<td>- INTERFACE - IPAQENET6 OSA-Express QDIO interfaces statement</td>
</tr>
<tr>
<td></td>
<td>- INTERFACE - IPAQIDIO6 HiperSockets interfaces statement</td>
</tr>
<tr>
<td></td>
<td>- IPCONFIG statement</td>
</tr>
<tr>
<td></td>
<td>- IPCONFIG6 statement</td>
</tr>
<tr>
<td></td>
<td>- PORT statement</td>
</tr>
<tr>
<td></td>
<td>- PORTRANGE statement</td>
</tr>
<tr>
<td>z/OS Communications Server: IP Programmer’s</td>
<td>- TCP/IP callable NMI (EZBNMIFR)</td>
</tr>
<tr>
<td>Guide and Reference</td>
<td>- EZBNMIFR: Poll-type requests</td>
</tr>
<tr>
<td></td>
<td>- Format and details for poll-type requests</td>
</tr>
<tr>
<td></td>
<td>- Filter request section</td>
</tr>
<tr>
<td></td>
<td>- TCP/IP NMI response format</td>
</tr>
<tr>
<td></td>
<td>- TCP/IP profile event record (subtype 4)</td>
</tr>
<tr>
<td></td>
<td>- TCP/IP profile record IPv4 configuration section</td>
</tr>
<tr>
<td></td>
<td>- TCP/IP profile record IPv6 configuration section</td>
</tr>
<tr>
<td></td>
<td>- TCP/IP profile record Global configuration section</td>
</tr>
<tr>
<td></td>
<td>- TCP/IP profile record interface section</td>
</tr>
<tr>
<td>z/OS Communications Server: IP Diagnosis</td>
<td>- OPTIONS keywords</td>
</tr>
<tr>
<td>Guide</td>
<td>- Diagnosing problems with Shared Memory Communications</td>
</tr>
<tr>
<td>z/OS Communications Server: IP System</td>
<td>- DISPLAY TCPIP,NETSTAT</td>
</tr>
<tr>
<td>Administrator’s Commands</td>
<td>- D TCPIP,STOR command</td>
</tr>
<tr>
<td></td>
<td>- The TSO NETSTAT command syntax</td>
</tr>
<tr>
<td></td>
<td>- The z/OS UNIX netstat command syntax</td>
</tr>
<tr>
<td></td>
<td>- The Netstat command filter</td>
</tr>
<tr>
<td></td>
<td>- Netstat ALL/-A report</td>
</tr>
<tr>
<td></td>
<td>- Netstat ALLConn/-a report</td>
</tr>
<tr>
<td></td>
<td>- Netstat: CONFIG/-f report</td>
</tr>
<tr>
<td></td>
<td>- Netstat CONn/-c report</td>
</tr>
<tr>
<td></td>
<td>- Netstat DEvlinks/-d report</td>
</tr>
<tr>
<td></td>
<td>- Netstat HELP/-? report</td>
</tr>
<tr>
<td></td>
<td>- Netstat PORTList/-o report</td>
</tr>
<tr>
<td></td>
<td>- Netstat STATS /-S report</td>
</tr>
<tr>
<td></td>
<td>- z/OS UNIX and TSO Netstat option comparison</td>
</tr>
<tr>
<td>z/OS Communications Server: IP and SNA Codes</td>
<td>- Data link control (DLC) status codes</td>
</tr>
<tr>
<td>Book name</td>
<td>Topics</td>
</tr>
<tr>
<td>-----------</td>
<td>--------</td>
</tr>
</tbody>
</table>
| z/OS Communications Server: SNA Operation | • DISPLAY ID command  
 • DISPLAY INOPDUMP command  
 • DISPLAY TRL command  
 • DISPLAY VTAMOPTS command  
 • MODIFY INOPDUMP command  
 • MODIFY TNSTAT command  
 • MODIFY TRACE command  
 • MODIFY VTAMOPTS command  
 • START command |
| z/OS Communications Server: SNA Network Implementation Guide | • Resources automatically activated by VTAM  
 • Gathering tuning statistics |
| z/OS Communications Server: SNA Diagnosis Vol 1, Techniques and Procedures | • I/O trace |
| z/OS Communications Server: SNA Diagnosis Vol 2, FFST Dumps and the VIT | • Trace options for the VIT  
 • AFSM entry for altering an FSM state  
 • ICR entry for a control register operation  
 • ICR2 entry for a control register operation (part 2)  
 • ICR3 entry for a control register operation (part 3)  
 • IOSP entry for invoking a Peripheral Component Interconnect Express (PCIe) service (Part 1)  
 • IOS2 entry for invoking a Peripheral Component Interconnect Express (PCIe) service (Part 2)  
 • IOS3 entry for invoking a Peripheral Component Interconnect Express (PCIe) service (Part 3)  
 • IPLx entry for an internal shared memory (ISM) polling operation  
 • IPLA entry for an internal shared memory (ISM) polling operation (part 2)  
 • ISPx entry for invoking an Internal Shared Memory (ISM) Verb (part 1)  
 • ISP2 entry for invoking an Internal Shared Memory (ISM) Verb (part 2)  
 • ISP3 entry for invoking an Internal Shared Memory (ISM) Verb (part 3)  
 • IUTX mapping and field descriptions  
 • IUT6 mapping and field descriptions  
 • PCIX entry for program-controlled or suspend interrupt  
 • PCIR and PCII mapping and field descriptions  
 • QSRB entry for Queue Service Request Block (SRB) event |
| z/OS Communications Server: SNA Resource Definition Reference | • Start options syntax diagrams  
 • AIMON start option  
 • INOPDUMP start option |
## Table 51. All related topics about Shared Memory Communications - Direct Memory Access (continued)

<table>
<thead>
<tr>
<th>Book name</th>
<th>Topics</th>
</tr>
</thead>
</table>
| **z/OS Communications Server: Quick Reference** | • D TRL command  
• F VTAMOPTS command  
• Start options |
| **z/OS Communications Server: IP Messages Volume 4 (EZZ, SNM)** | • EZZ0378I  
• EZZ84531 |
| **z/OS Communications Server: SNA Messages** | • IST087I  
• IST1221I  
• IST1314I  
• IST14511  
• IST1717I  
• IST1865I  
• IST1904I  
• IST2337I  
• IST2390I  
• IST2391I  
• IST2392I  
• IST2393I  
• IST2407I  
• IST2409I  
• IST2411I  
• IST2417I  
• IST2418I  
• IST2419I  
• IST2420I  
• IST2421I  
• IST2422I  
• IST2423I |
| **z/OS Summary of Message and Interface Changes** | • PROFILE.TCPIP statement and parameter changes  
• Netstat operator commands (DISPLAY TCP/IP,NETSTAT)  
• General updates of IP operator commands  
• NETSTAT TSO commands  
• Netstat UNIX commands  
• TCP/IP callable NMI (EZBNMIFR)  
• TCP/IP stack records  
• SNA start options behavior changes  
• SNA commands  
• SNA command behavior changes  
• VTAM internal trace entries |
| **z/OS MVS System Commands** | • D PCIE command |
Shared Memory Communications over RDMA adapter (RoCE) virtualization

This function extends the Shared Memory Communications over Remote Direct Memory Access (SMC-R) function to allow TCP/IP stacks on different LPARs within the same central processor complex (CPC) to share the same physical IBM 10 GbE RoCE Express feature.

Restriction:
- Each TCP/IP stack that shares the same physical 10 GbE RoCE Express feature must use a unique function ID (FID) and virtual function number (VFN) to represent the feature. Define the FID and VFN values in the Hardware Configuration Definition (HCD).

Dependencies:
- This function requires IBM z13 (z13) or later systems.
- This function requires at least one IBM 10 GbE RoCE Express feature configured in the HCD with a FID and a VFN value.

Using Shared Memory Communications over RDMA adapter (RoCE) virtualization

To exploit the Shared Memory Communications over RDMA Adapter (RoCE) virtualization function, complete the tasks in Table 52.

<table>
<thead>
<tr>
<th>Task</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Configure at least one IBM 10 GbE RoCE Express feature in HCD. If you have existing 10 GbE RoCE Express definitions, update the definition to include a VFN value. For each unique combination of PCHID and VFN values, configure a unique function ID (FID) value.</td>
<td>z/OS Hardware Configuration Definition (HCD) Reference Summary</td>
</tr>
</tbody>
</table>
| Configure or update the GLOBALCONFIG SMCR statement in the TCP/IP profile.  
  - If you have existing PFID definitions on the GLOBALCONFIG statement and you changed the FID value in the HCD for the 10 GbE RoCE Express feature, update the existing GLOBALCONFIG PFID values to specify the new FID value.  
  - If you define PFID values, choose PFID values that represent physically different 10 GbE RoCE Express features to provide full redundancy support. | GLOBALCONFIG statement in z/OS Communications Server: IP Configuration Reference, Shared Memory Communications over Remote Direct Memory Access in z/OS Communications Server: IP Configuration Guide |
| Verify the GLOBALCONFIG SMCR settings by issuing the Netstat CONFIG/-f command. | Netstat CONFIG/-f report in z/OS Communications Server: IP System Administrator's Commands |
| Display the status of the 10 GbE RoCE Express feature by issuing the D PCE1 command. | Displaying PCIE information in z/OS MVS System Commands |
| Verify that the correct VFN and PNetID values are assigned to the dynamic 10 GbE RoCE Express TRLEs by issuing the D NET,ID=trle, or D NET,TRL,TRL=trle command. | DISPLAY ID command and DISPLAY TRL command in z/OS Communications Server: SNA Operation |
| Display information about a 10 GbE RoCE Express interface by issuing the Netstat DEvlinks/-d command and specifying the 10 GbE RoCE Express interface. | Netstat DEvlinks/-d report in z/OS Communications Server: IP System Administrator's Commands |
**Shared Memory Communications over RDMA enhancements**

*z/OS V2R2 Communications Server supports a maximum transmission unit (MTU) value of 4096 and enhances autonomics performance for Shared Memory Communications over Remote Direct Memory Access (SMC-R).**

**Add 4096 MTU support for SMC-R Communications**

Previously, MTU values of 1024 and 2048 were supported. *z/OS V2R2 Communications Server supports a new MTU value of 4096 for SMC-R. For more information about the SMC-R MTU, see [z/OS Communications Server: IP Configuration Guide](#).*

If you set the MTU size to 4096, you must also enable jumbo frames on all switches in the network path for all peer hosts.

**Adding 4096 MTU support for SMC-R Communications**

To add 4096 MTU support for SMC-R Communications, complete the appropriate tasks in Table 53.

<table>
<thead>
<tr>
<th>Task</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Configure the TCP/IP stack to use an MTU size of 4096 for SMCR by using one of the following methods:</td>
<td>GLOBALCONFIG statement in <a href="#">z/OS Communications Server: IP Configuration Reference</a></td>
</tr>
<tr>
<td>• If you have GLOBALCONFIG SMCR definitions in your TCP/IP profile, add MTU 4096 to each PFID definition that you want to use the new MTU setting.</td>
<td></td>
</tr>
<tr>
<td>• If you do not have GLOBALCONFIG SMCR definitions, add the necessary SMCR PFID definitions to the TCP/IP profile, and specify MTU 4096 for each PFID definition that you want to use the new MTU setting.</td>
<td></td>
</tr>
<tr>
<td>Display whether the SMCR PFID was configured with MTU 4096 by issuing the <code>Netstat CONFIG/-f</code> command.</td>
<td>Netstat CONFIG/-f report in <a href="#">z/OS Communications Server: IP System Administrator’s Commands</a></td>
</tr>
<tr>
<td>Display the MTU used by SMC-R links by issuing the <code>Netstat DEvlinks/-d</code> command with the SMC parameter.</td>
<td>Netstat DEvlinks/-d report in <a href="#">z/OS Communications Server: IP System Administrator’s Commands</a></td>
</tr>
</tbody>
</table>

**SMC-R autonomics**

In *z/OS V2R2 Communications Server, SMC-R autonomics provides the following performance enhancements:**

- **SMCGLOBAL AUTOCACHE**
  
  You can configure the TCP/IP stack to maintain statistics related to failed attempts to use SMC-R communications to specific destination IP addresses. When appropriate, the TCP/IP stack will direct future connections to those destination IP addresses to use TCP protocols instead of SMC-R, avoiding the overhead of unproductive attempts to establish an SMC-R link. This option is enabled by default.

- **SMCGLOBAL AUTOSMC**
  
  You can configure the TCP/IP to analyze incoming TCP connections and dynamically determine whether SMC-R is beneficial to use for the connection. You can use this monitoring function to influence whether TCP connections to a
particular server (port) use SMC-R, and to ensure that TCP connections use the most appropriate communications protocol (TCP or SMC-R). This option is enabled by default.

For more information about SMCGLOBAL, see z/OS Communications Server: IP Configuration Reference.

Using SMC-R autonomies

To use the performance enhancements that SMC-R autonomies provides, complete the appropriate tasks in Table 54.

Table 54. SMC-R autonomies

<table>
<thead>
<tr>
<th>Task</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enable the collection of statistics to avoid unnecessary SMC-R link activation attempts by specifying SMCGLOBAL AUTOCACHE on the GLOBALCONFIG statement in the TCP/IP profile.</td>
<td>GLOBALCONFIG statement in z/OS Communications Server: IP Configuration Reference</td>
</tr>
<tr>
<td>Enable the monitoring of the usefulness of SMC-R communications for individual local server applications by specifying SMCGLOBAL AUTOSMC on the GLOBALCONFIG statement in the TCP/IP profile.</td>
<td>GLOBALCONFIG statement in z/OS Communications Server: IP Configuration Reference</td>
</tr>
<tr>
<td>Display whether SMCGLOBAL AUTOCACHE or SMCGLOBAL AUTOSMC was configured by issuing the Netstat CONFIG/-f command.</td>
<td>Netstat CONFIG/-f report in z/OS Communications Server: IP System Administrator's Commands</td>
</tr>
<tr>
<td>View the results of AUTOSMC monitoring for a server by issuing the netstat ALL/-A command and querying the value of UseSMC.</td>
<td>Netstat ALL/-A report in z/OS Communications Server: IP System Administrator's Commands</td>
</tr>
</tbody>
</table>

SMC Applicability Tool (SMCAT)

z/OS V2R2 Communications Server provides the SMC Applicability Tool (SMCAT) that provides the ability to monitor and evaluate TCP/IP network traffic. You can use the evaluation to determine the applicability of SMC (over Remote Memory Access (SMC-R) or using Direct Memory Access (SMC-D)) to your network environment. You do not need to enable the SMC function on any system, or enable any 10 GbE RoCE Express features, to use the SMC Applicability Tool.

You can use SMCAT to monitor a TCP/IP stack for a set of configured destination IP addresses or subnets, and to provide a report in the TCP/IP stack job log. The report provides details of the amount of TCP workload that can potentially use SMC if SMC is available. For more information about the SMC Applicability Tool, see z/OS Communications Server: IP System Administrator's Commands.

Enabling the SMC Applicability Tool (SMCAT)

To enable the SMCAT, complete the appropriate tasks in Table 55.

Table 55. SMC Applicability Tool (SMCAT)

<table>
<thead>
<tr>
<th>Task</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Configure the SMCAT data set with the SMCATCFG statement.</td>
<td>VARY,,SMCAT in z/OS Communications Server: IP System Administrator's Commands</td>
</tr>
<tr>
<td>Issue the VARY TCPIP,procname,SMCAT,datasetname command.</td>
<td>VARY,,SMCAT in z/OS Communications Server: IP System Administrator's Commands</td>
</tr>
</tbody>
</table>
TCP autonomic tuning enhancements

z/OS Communications Server makes the following enhancements to automatically tune resources that are related to TCP connections. The enhancements are based on real-time data and can improve overall performance of TCP connections.

- Dynamic Right-Sizing (DRS) and Outbound Right-Sizing (ORS) autonomies
  DRS and ORS are z/OS Communications Server optimizations that improve overall performance for certain high latency streaming workloads. z/OS Communications Server V2R2 lifts restrictions on which workloads and applications are eligible for each optimization and makes each optimization more sensitive to connection and CSM ECSA storage conditions. In addition, TCP/IP can stop and restart the DRS optimization dynamically for each connection based on the current system or application responsiveness.

- Delayed transmission of acknowledgment autonomies
  z/OS Communications Server delays the transmission of acknowledgments on a TCP connection based on user configuration settings. z/OS Communications Server V2R2 provides autonomic capability to monitor the effectiveness of delaying the transmission of acknowledgments on a connection and a listener level. In addition, TCP/IP can stop and restart the delaying transmission of acknowledgments for each connection based on workload and application characteristics.

- Fast Retransmit, Fast Recovery (FRR) autonomies
  z/OS Communications Server V2R2 extends the detection of out-of-order packets to lost packets during FRR recovery. When FRR recovery processing completes and no lost packets are detected, TCP/IP restores the transmission rates that were allowed before FRR recovery processing.

Enhancing TCP autonomic tuning

To automatically tune resources that are related to TCP connections, complete the tasks in Table 56.
Table 56. Enhance TCP autonomic tuning (continued)

<table>
<thead>
<tr>
<th>Task/Procedure</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Issue the Netstat ALL/-A command to determine the following information about a specific TCP connection:</td>
<td>Netstat ALL/-A report in [z/OS Communications Server: IP System Administrator’s Commands]</td>
</tr>
<tr>
<td>• Whether the connection is eligible for delayed transmission of acknowledgments, and if the connection is eligible, whether acknowledgments are delayed.</td>
<td></td>
</tr>
<tr>
<td>• Whether the connection is eligible for DRS optimization, and if the connection is eligible, whether the DRS optimization is performed.</td>
<td></td>
</tr>
<tr>
<td>• Whether the connection is eligible for ORS optimization, and if the connection is eligible, whether the ORS optimization is performed.</td>
<td></td>
</tr>
<tr>
<td>• Whether new TCP connections to the listener application are started by using delayed transmission of acknowledgments.</td>
<td></td>
</tr>
<tr>
<td>Issue the Netstat CONFIG/-f command to identify whether the stack can automatically control the delayed transmission of acknowledgments for TCP connections.</td>
<td>Netstat CONFIG/-f report in [z/OS Communications Server: IP System Administrator’s Commands]</td>
</tr>
</tbody>
</table>

VIPAROUTE fragmentation avoidance

z/OS V2R2 Communications Server adds a TCP/IP profile GLOBALCONFIG parameter, ADJUSTDVIPAMSS to adjust the TCP Maximum Segment Size (MSS). Sysplex Distributor traffic that is routed by using VIPAROUTE adds a Generic Routing Encapsulation (GRE) header to the packet. Thus, the packet might be fragmented from the distributor to the target stack. The new function takes the GRE header into account when specifying the MSS value. It eliminates fragmentation by the distributor that would have been caused by the addition of the GRE header.

Eliminating VIPAROUTE fragmentation

To eliminate the fragmentation, complete the appropriate tasks in Table 57.

Table 57. VIPAROUTE fragmentation avoidance

<table>
<thead>
<tr>
<th>Task</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Because the new function is enabled by default, no actions are required to use the new function.</td>
<td>GLOBALCONFIG statement in [z/OS Communications Server: IP Configuration Reference]</td>
</tr>
<tr>
<td>Determine the value of the new ADJUSTDVIPAMSS parameter:</td>
<td>Netstat CONFIG/-f report in [z/OS Communications Server: IP Diagnosis Guide]</td>
</tr>
<tr>
<td>• Issue the Netstat CONFIG/-f command.</td>
<td></td>
</tr>
<tr>
<td>• Update your network management application to use the information that is returned by the GetProfile callable NMI.</td>
<td></td>
</tr>
<tr>
<td>• Use the information that is returned in the SMF 119 subtype 4 event records that provide TCP/IP profile information.</td>
<td></td>
</tr>
</tbody>
</table>
64-bit enablement of the TCP/IP stack

z/OS V2R2 Communications Server enables the TCP/IP stack and the DLCs for OSA-Express in QDIO mode, HiperSockets, and RoCE-Express to fully use 64-bit virtual memory. These components run in AMODE64 and use virtual memory above the 2 GB bar, which significantly reduces the usage of data space, ECSA and private virtual storage below the 2 GB bar. The z/OS V2R2 TCP/IP stack 64-bit virtual memory support also improves networking scalability because TCP/IP's usage of data space, ECSA, and private virtual storage is not significantly affected by the scale of networking activity.

In the following use cases, the z/OS V2R2 TCP/IP stack 64-bit virtual memory support might not provide the same level of performance as previous releases provide:

• 31-bit network connectivity:
Communications Server software that is related to OSA-Express in QDIO mode, HiperSockets, and RoCE-Express is updated to fully use 64-bit virtual memory. All other types of TCP/IP network connectivity, for example XCF, MPCPTP, LCS, or CTC, are 31-bit types and are updated to provide 64-bit stack compatibility. These drivers do not provide 64-bit exploitation. When you use the 31-bit types of network connectivity, your network performance and CPU cost might not be as efficient as it was in previous releases because extra data copies might be required.

When 31-bit network connectivity is used for network traffic patterns going through z/OS, the impact might be more significant. Examples of these patterns include standard IP forwarding that is enabled by using IPCONFIG DATAGRAMFWD and sysplex distributor forwarding.

Tip: Use VIPAROUTE over OSA-Express QDIO or HiperSockets for sysplex distributor forwarding to avoid using 31-bit network connectivity.

The impact is based on the characteristics of your specific workloads such as message size and patterns, and environment. This is primarily an issue for streaming or bulk workloads.

• Enterprise Extender (EE) support when 31-bit network connectivity is used:
The z/OS Communications Server SNA (APPN) support for EE does not fully use 64-bit virtual memory. EE outbound processing is not affected. However, if inbound processing is connected to the network that uses 31-bit connectivity types, an extra copy of the inbound data might be required.

Result: When you use OSA-Express in QDIO mode or HiperSockets for inbound EE processing, no additional data copies are required compared to V2R1.

Tip: OSA-Express Inbound Workload Queueing (IWQ) support optimizes EE inbound traffic and further reduces the copies that are required.

• Application socket APIs using CSM:
Applications that use socket API semantics using Communications Storage Manager (CSM) managed memory can pass CSM data space or ECSA memory directly across the sockets API by using the UNIX System Services sxr_np (BPX1SRX, BPX4SRX) callable services. The callable services continue to be supported without semantic changes. These services allowed data copies within the stack to be minimized, which reduces the stack send and receive processing cost.

With the V2R2 64-bit virtual memory support, the performance benefits of the services are diminished. When you use the callable services, the TCP/IP stack
copies the data between CSM buffers to 64-bit memory. The performance
characteristics are similar to the sockets API with memory buffers provided by
applications. In V2R2, you can continue to use applications that use the srx_np
(BPX1SRX/BPX4SRX) services. Do not use these services for new applications.

**Using 64-bit enablement of the TCP/IP stack**

To use 64-bit virtual memory support of the 64-bit Enablement of the TCP/IP
stack, complete the appropriate tasks in **Table 58**

**Table 58. 64-bit enablement of the TCP/IP stack**

<table>
<thead>
<tr>
<th>Task</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enable the TCP/IP stack and the OSA-Express QDIO, HiperSockets, and RoCE Express DLCs for full 64-bit virtual memory exploitation.</td>
<td>No action is required. This function is automatically enabled and cannot be disabled.</td>
</tr>
<tr>
<td>Optionally, use Inbound Workload Queueing (IWQ) to optimize OSA-Express QDIO inbound Enterprise Extender traffic processing.</td>
<td>INTERFACE - IPAQENET OSA-Express QDIO interfaces statement and INTERFACE - IPAQENET6 OSA-Express QDIO interfaces statement in z/OS Communications Server: IP Configuration Reference</td>
</tr>
<tr>
<td>Use <strong>DISPLAY TCPIP,STOR</strong> to examine the usage of above the 2 GB bar storage by z/OS Communications Server.</td>
<td>DISPLAY TCPIP,STOR in z/OS Communications Server: IP System Administrator's Commands</td>
</tr>
</tbody>
</table>

**Scalability and performance**

The following topic describes enhancements for scalability and performance:

- "Improved control over default VTAM VIT options"

**Improved control over default VTAM VIT options**

z/OS V2R2 Communications Server, with SNA APAR OA50271, provides two levels of operator control for managing VTAM Internal Trace (VIT) internal mode record collection:

- You can use “Full VIT control” to control the use of all VIT options, at any time, using VTAM start options or the MODIFY TRACE and MODIFY NOTRACE commands. This includes the ability to disable all internal mode VIT recording, with the exception of when a CSDUMP message or code trigger is active. In this condition the VIT MSG option cannot be disabled. The DISPLAY TRACE command always displays the current settings of all VIT options.

- You can use “Base VIT control” to allow VTAM to enforce that certain VIT options (API, CIO, MSG, NRM, PIU and SSCP) remain active at all times. The DISPLAY TRACE command displays the settings of these VIT options only if you have explicitly enabled the options, otherwise the settings are not displayed. This is the default behavior, and this was the only level of VIT control provided originally.

**Restriction:** The two levels of VIT control apply to internal mode recording only. External mode recording of VIT records is unchanged regardless of the level of VIT control used for internal mode recording.

To enable the improved control over default VTAM VIT options, complete the appropriate tasks in **Table 59 on page 67**
### Table 59. Task topics to enable improved control over default VTAM VIT options

<table>
<thead>
<tr>
<th>Task</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specify the VITCTRL=FULL start option on the VTAM START command to enable “Full VIT control” mode when VTAM is activated.</td>
<td>VTAM Start Options in z/OS Communications Server: SNA Resource Definition Reference</td>
</tr>
<tr>
<td>Specify the VITCTRL=BASE start option, or take the default setting, on the VTAM START command to enable “Base VIT control” mode when VTAM is activated.</td>
<td>VTAM Start Options in z/OS Communications Server: SNA Resource Definition Reference</td>
</tr>
<tr>
<td>Issue the MODIFY VTAMOPTS,VITCTRL=FULL command to dynamically activate “Full VIT control” mode.</td>
<td>MODIFY VTAMOPTS in z/OS Communications Server: SNA Operation</td>
</tr>
<tr>
<td>Issue the MODIFY VTAMOPTS,VITCTRL=BASE command to dynamically activate “Base VIT control” mode.</td>
<td>MODIFY VTAMOPTS in z/OS Communications Server: SNA Operation</td>
</tr>
</tbody>
</table>

If you are operating in “Full VIT control” mode, use the follow commands to control or display VIT options:
- Issue MODIFY NOTRACE,TYPE=VTAM,MODE=INT, OPTION=(options) to disable one or more VIT options. Specifying OPTION=ALL or OPTION=END disables all internal mode VIT recording.
- Issue MODIFY TRACE,TYPE=VTAM,MODE=INT, OPTION=(options) to enable one or more VIT options.
- Issue DISPLAY TRACES to display the current settings of all VIT options.

<table>
<thead>
<tr>
<th>See the following topics:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>DISPLAY TRACES in z/OS Communications Server: SNA Operation</td>
<td></td>
</tr>
<tr>
<td>MODIFY TRACE in z/OS Communications Server: SNA Operation</td>
<td></td>
</tr>
<tr>
<td>MODIFY NOTRACE in z/OS Communications Server: SNA Operation</td>
<td></td>
</tr>
</tbody>
</table>

### Table 60. All new and updated topics about improved control over default VTAM VIT options

<table>
<thead>
<tr>
<th>Book name</th>
<th>Topics</th>
</tr>
</thead>
<tbody>
<tr>
<td>z/OS Communications Server: SNA Operation</td>
<td>• DISPLAY TRACES &lt;br&gt; • MODIFY NOTRACE &lt;br&gt; • MODIFY TRACE &lt;br&gt; • MODIFY VTAMOPTS &lt;br&gt; • START command</td>
</tr>
<tr>
<td>z/OS Communications Server: SNA Diagnosis Vol 2, FFST Dumps and the VIT</td>
<td>• VIT control levels &lt;br&gt; • Selecting the level of VIT Control &lt;br&gt; • Interaction of VIT option sets and &quot;Full&quot; VIT Control mode processing &lt;br&gt; • Example behavior &lt;br&gt; • Using the VTAM internal trace &lt;br&gt; • Activating the VIT &lt;br&gt; • Trace options for the VIT &lt;br&gt; • Internal and external trace recording for the VIT &lt;br&gt; • Deactivating the VIT</td>
</tr>
<tr>
<td>z/OS Communications Server: SNA Resource Definition Reference</td>
<td>• VITCTRL start option &lt;br&gt; • Start options syntax diagrams &lt;br&gt; • Traces and dumps start options &lt;br&gt; • CSDUMP start option &lt;br&gt; • TRACE for MODULE, STATE (with OPTION), or VTAM internal trace</td>
</tr>
</tbody>
</table>
Table 60. All new and updated topics about improved control over default VTAM VIT options (continued)

<table>
<thead>
<tr>
<th>Book name</th>
<th>Topics</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>z/OS Communications Server: Quick Reference</code></td>
<td>• F NOTRACE command</td>
</tr>
<tr>
<td></td>
<td>• F TRACE command</td>
</tr>
<tr>
<td></td>
<td>• F VTAMOPTS command</td>
</tr>
<tr>
<td></td>
<td>• Start options</td>
</tr>
<tr>
<td><code>z/OS Communications Server: SNA Messages</code></td>
<td>• IST315I</td>
</tr>
<tr>
<td></td>
<td>• IST2445I</td>
</tr>
<tr>
<td></td>
<td>• IST2446I</td>
</tr>
</tbody>
</table>
Chapter 4. V2R1 new function summary

This information contains topics about every function or enhancement introduced in z/OS V2R1 Communications Server. The topics describe each function and present the following information, if applicable:

- Restrictions, dependencies, and coexistence considerations for the function
- A task table that identifies the actions necessary to use the function
- References to the documents that contain more detailed information

See Table 10 on page 23 for a complete list of the functional enhancements.

See z/OS Migration for information about how to migrate and maintain the functional behavior of previous releases.

See z/OS Summary of Message and Interface Changes for information about new and changed messages and interfaces.

See z/OS Communications Server V2R1 New Function APAR Summary for all V2R1 new function APARs.

Support considerations in V2R1

z/OS V2R1 Communications Server discontinues support of Berkeley Internet Name Domain 9.2.0 (BIND 9.2.0) DNS server function. If you used the z/OS BIND 9.2.0 function as a caching-only name server, use the z/OS resolver DNS caching function to cache DNS responses. If you used the z/OS BIND 9.2.0 function as a primary or secondary authoritative name server, investigate using BIND on Linux for System z® or BIND on an IBM blade in a zBX.

Starting in z/OS V2R1 Communications Server, IBM Configuration Assistant for z/OS Communications Server will no longer be offered as a stand-alone application that runs on the Windows operating system. IBM Configuration Assistant for z/OS Communications Server is available as a fully supported task in the z/OS Management Facility (z/OSMF) product.

See z/OS Migration for detailed information about all the z/OS V2R1 Communications Server support considerations.

Security

The following topics describe enhancements for security:

- “Enhanced IDS IP fragment attack detection” on page 70
- “Improve auditing of NetAccess rules” on page 70
- “AT-TLS support for TLS v1.2 and related features” on page 71
- “Improved FIPS 140 diagnostics” on page 72
- “Limit defensive filter logging” on page 73
- “QDIO outbound flood prevention” on page 73
- “TN3270 client-bound data queueing limit” on page 74
- “AT-TLS enablement for DCAS” on page 74
- “Network security enhancements for SNMP” on page 76
Enhanced IDS IP fragment attack detection

z/OS V2R1 Communications Server enhances the Intrusion Detection Services (IDS) IP fragment attack type to detect fragment overlays that change the data in the packet. In addition, the IP fragment attack detection is extended to IPv6 traffic.

Enabling the IDS IP fragment attack detection

To enable the IDS IP fragment attack detection, perform the appropriate task in Table 61.

<table>
<thead>
<tr>
<th>Task</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enable the IDS IP fragment attack by using one of the following options:</td>
<td>See the following topics:</td>
</tr>
<tr>
<td>• Use the IBM Configuration Assistant for z/OS to enable the Fragment Attack in the IDS requirement map.</td>
<td>• Intrusion detection services in z/OS Communications Server: IP Configuration Guide</td>
</tr>
<tr>
<td>• Manually configure the IP_Fragment attack in the IDS policy file.</td>
<td>• IBM Configuration Assistant for z/OS Communications Server online help</td>
</tr>
<tr>
<td></td>
<td>• IP_FRAGMENT attack type in z/OS Communications Server: IP Configuration Reference</td>
</tr>
</tbody>
</table>

Improve auditing of NetAccess rules

z/OS V2R1 Communications Server introduces control over the level of caching that is used for network access control checks. You can reduce the level of caching to pass more network access control checks to the System Authorization Facility (SAF). Passing more network access control checks to SAF allows the security server product to provide more meaningful auditing of access control checks.

z/OS V2R1 Communications Server enhances the log string provided to the security server product on each network access control check to include the IP address that the user is attempting to access.

Improving the auditing of NetAccess rules

To improve the auditing of NetAccess rules, perform the appropriate tasks in Table 62.

<table>
<thead>
<tr>
<th>Task</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Set the level of caching that is used for network access control checks by using the CACHEALL, CACHEPERMIT, or CACHESAME keyword on the TCP/IP stack NETACCESS profile statement.</td>
<td>NETACCESS statement in z/OS Communications Server: IP Configuration Reference</td>
</tr>
<tr>
<td>Display the level of caching in effect for network access control checks.</td>
<td>DISPLAY TCPIP,NETSTAT,ACCESS,NETWORK in z/OS Communications Server: IP System Administrator’s Commands</td>
</tr>
</tbody>
</table>
AT-TLS support for TLS v1.2 and related features

z/OS V2R1 Communications Server supports Application Transparent TLS (AT-TLS) currency with z/OS System SSL. Support is added for the following functions that are provided by System SSL:

- Renegotiation (RFC 5746) in z/OS V1R12
- Elliptic Curve Cryptography (RFC 4492 and RFC 5480) in z/OS V1R13
- TLSv1.2 (RFC 5246) in z/OS V2R1
- AES GCM Cipher Suites (RFC 5288) in z/OS V2R1
- Suite B Profile (RFC 5430) in z/OS V2R1
- ECC and AES GCM with SHA-256/384 (RFC 5289) in z/OS V2R1

**Dependency:** Elliptic Curve ciphers and ciphers that use AES-GCM require Integrated Cryptographic Services Facility (ICSF) to be active. If the CSFSERV class is defined, the application user ID must have READ access to certain resources in the CSFSERV class.

### Using the AT-TLS support for TLS v1.2 and related features

To use the AT-TLS support for TLS v1.2 and related features, perform the appropriate tasks in Table 63.

<table>
<thead>
<tr>
<th>Task</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enable new AT-TLS policies by using the Configuration Assistant or manual configuration:</td>
<td>See the following topics:</td>
</tr>
<tr>
<td>- If using IBM Configuration Assistant for z/OS Communications Server, migrate your current backing store to V2R1.</td>
<td>- IBM Configuration Assistant for z/OS Communications Server online helps</td>
</tr>
<tr>
<td>- Use new AT-TLS statements or parameters as needed in the AT-TLS environment or connection actions.</td>
<td>- AT-TLS policy statements in z/OS Communications Server: IP Configuration Reference</td>
</tr>
<tr>
<td>Optionally, display the policy-based networking information. Use the pasearch command to display AT-TLS policies.</td>
<td>The z/OS UNIX pasearch command in z/OS Communications Server: IP System Administrator's Commands</td>
</tr>
<tr>
<td>Before you use Elliptic Curve Cryptography (ECC) ciphers, perform the following steps:</td>
<td>Using Cryptographic Features with System SSL in Cryptographic Services System Secure Sockets Layer programming (SC24-5901-11)</td>
</tr>
<tr>
<td>1. Start ICSF.</td>
<td></td>
</tr>
<tr>
<td>2. If the CSFSERV class is defined, give the user ID that runs the AT-TLS application READ access to the following resources in that class:</td>
<td></td>
</tr>
<tr>
<td>- CSFITRC</td>
<td></td>
</tr>
<tr>
<td>- CSF1PKV</td>
<td></td>
</tr>
<tr>
<td>- CSF1PKS</td>
<td></td>
</tr>
<tr>
<td>- CSF1GKP</td>
<td></td>
</tr>
<tr>
<td>- CSF1GAV</td>
<td></td>
</tr>
<tr>
<td>- CSF1DVK</td>
<td></td>
</tr>
<tr>
<td>- CSFITRD</td>
<td></td>
</tr>
</tbody>
</table>
Table 63. AT-TLS support for TLS v1.2 and related features (continued)

<table>
<thead>
<tr>
<th>Task</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before you use AES GCM ciphers, perform the following steps:</td>
<td>Using Cryptographic Features with System SSL in Cryptographic Services System Secure Sockets Layer programming (SC24-5901-11)</td>
</tr>
<tr>
<td>1. Start ICSF.</td>
<td></td>
</tr>
<tr>
<td>2. If the CSFSERV class is defined, give the user ID that runs the AT-TLS application READ access to the following resources in that class:</td>
<td></td>
</tr>
<tr>
<td>• CSFITRC</td>
<td></td>
</tr>
<tr>
<td>• CSF1SKD</td>
<td></td>
</tr>
<tr>
<td>• CSF1SKE</td>
<td></td>
</tr>
<tr>
<td>• CSFITRD</td>
<td></td>
</tr>
<tr>
<td>If you intend to use any of the new four character cipher suites, you might need to modify applications:</td>
<td></td>
</tr>
<tr>
<td>• Use the TTLSi_Neg_Cipher4 field instead of the TTLSi_Neg_Cipher field on the SIOCTTLSCTL ioctl.</td>
<td></td>
</tr>
<tr>
<td>• Use the Network Management Interface NWMTcpConnType to use the NWMCnnTLSNegCiph4 field instead of the NWMCnnTLSNegCiph field.</td>
<td></td>
</tr>
<tr>
<td>• Process SMF type 119 records:</td>
<td></td>
</tr>
<tr>
<td>– TCP Connection Termination to use the SMF119AP_TTTTLSNC field instead of the SMF119AP_TTTTLSNC field</td>
<td></td>
</tr>
<tr>
<td>– CSSMTP Connection Identification to use the SMF119ML_CN_TLSSNC field instead of the SMF119ML</td>
<td></td>
</tr>
<tr>
<td>– CN_TLSSNC field FTP Client Transfer Complete to use the SMF119FT_FCCipher4 field instead of the SMF119FT_FCCipher field</td>
<td></td>
</tr>
<tr>
<td>– FTP Server Transfer Complete to use the SMF119FT_FSCipher4 field instead of the SMF119FT_FSCipher field</td>
<td></td>
</tr>
<tr>
<td>– FTP Login Failure to use the SMF119FT_FFCipher4 field instead of the SMF119FT_FFCipher field</td>
<td></td>
</tr>
<tr>
<td>Use new SNMP MIB object ibmMvsTcpConnectionTtlsNegCipher4 to retrieve the four-byte cipher in use on a TCP connection using AT-TLS.</td>
<td>TCP/IP subagent in z/OS Communications Server: IP System Administrator’s Commands</td>
</tr>
</tbody>
</table>

**Improved FIPS 140 diagnostics**

z/OS V2R1 Communications Server provides enhanced diagnostics for the IKE and NSS daemons and the AT-TLS function when FIPS 140 processing is required.

Integrated Cryptographic Services Facility (ICSF) is required when FIPS 140 is configured for the IKE or NSS daemons or for an AT-TLS group. Starting in V2R1, these daemons and the AT-TLS groups will fail to initialize if ICSF is not active.

**Dependency:** NSSD, IKED, and AT-TLS Groups in FIPS140 mode require ICSF to be active at startup.
Using improved FIPS 140 diagnostics

To use improved FIPS 140 diagnostics, perform the task in Table 64.

Table 64. Improved FIPS 140 diagnostics

<table>
<thead>
<tr>
<th>Task</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Start NSSD, IKED or a AT-TLS group in FIPS 140 mode.</td>
<td>z/OS Communications Server: IP Configuration Guide</td>
</tr>
</tbody>
</table>

Limit defensive filter logging

The existing defensive filtering function provides a mechanism to install temporary filters to either deny attack packets or log when a packet would have been denied if blocking mode was used. In z/OS V2R1 Communications Server, you can now limit the number of defensive filter messages that are written to syslogd for a blocking or simulate mode filter. You can configure a default limit to be used for all defensive filters that are added to a TCP/IP stack. You can also specify a limit when adding an individual defensive filter with the z/OS UNIX ipsec command.

Limiting defensive filter logging

To limit defensive filter logging, perform the appropriate tasks in Table 65.

Table 65. Limit defensive filter logging

<table>
<thead>
<tr>
<th>Task</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>This task is optional. Configure a default log limit in the Defense Manager Daemon (DMD) configuration file. Use the DefaultLogLimit parameter on the DmStackConfig statement.</td>
<td>• Defense Manager daemon in z/OS Communications Server: IP Configuration Reference • Defensive Filtering in z/OS Communications Server: IP Configuration Guide</td>
</tr>
<tr>
<td>If a default log limit is not added to the DMD configuration file or if you want to override the value in the DMD configuration file, take the following steps:</td>
<td>• The z/OS UNIX ipsec command syntax and the z/OS UNIX ipsec command defensive filter (-F) option in z/OS Communications Server: IP System Administrator's Commands • Defensive Filtering in z/OS Communications Server: IP Configuration Guide</td>
</tr>
</tbody>
</table>
  * Update automation or scripts used to add defensive filters. Add the loglimit parameter to the ipsec -F add invocations.
  * When manually adding defensive filters, include the loglimit parameter on the ipsec -F add command.
  * Use the ipsec -F update command with the loglimit parameter to update the log limit for an existing defensive filter.
| Display log limit information for a defensive filter. Use the z/OS UNIX ipsec command with the -F display option. | See the following topics in z/OS Communications Server: IP System Administrator's Commands
  * The z/OS UNIX ipsec command syntax
  * The z/OS UNIX ipsec command defensive filter (-F) option |

QDIO outbound flood prevention

z/OS V2R1 Communications Server relieves CSM storage constraints when processing ICMP Timestamp requests.

Because the z/OS TCP/IP stack replies to these requests, a flood of such requests can cause problems under the right conditions. Such a flood causes the TCP/IP stack to back up because it cannot get the responses out quickly enough, which results in a constrained CSM condition.
If the constrained CSM condition is not relieved, it might cause a stack outage. This behavior might happen with:

- Other ICMP requests that always generate a response (for example, echo requests)
- UDP requests to an application that behaves in a similar manner

QDIO outbound packets will be dropped when CSM storage is constrained and the outbound queues are congested. This support alleviates these problems.

**Restriction:** This support applies only to data sent out over OSA-Express QDIO and HiperSockets interfaces.

### TN3270 client-bound data queueing limit

Z/OS V2R1 Communications Server introduces MAXTCPSENDQ, a new parameter in the Telnet profile, to prevent large amounts of storage from being held for data that is destined for an unresponsive Telnet client.

#### Enabling the TN3270 client-bound data queueing limit

To enable the TN3270 client-bound data queueing limit, perform the task in Table 66.

**Table 66. TN3270 client-bound data queueing limit**

<table>
<thead>
<tr>
<th>Task/Procedure</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Limit the queueing of data that is destined for an unresponsive Telnet client by specifying the MAXTCPSENDQ parameter in the Telnet profile.</td>
<td>MAXTCPSENDQ statement in <strong>z/OS Communications Server: IP Configuration Reference</strong></td>
</tr>
</tbody>
</table>

### AT-TLS enablement for DCAS

With APAR PM96898 installed, Z/OS V2R1 Communications Server enhances the Digital Certificate Access Server (DCAS) to use Application Transparent Transport Layer Security (AT-TLS). To use TLSv1.2 to secure the connection, you must define AT-TLS policies for the DCAS. The Configuration Assistant for Z/OS Communications Server provides a default AT-TLS policy to simplify defining the AT-TLS policy for DCAS.

Migrate to AT-TLS to allow the DCAS to use the latest support for SSL/TLS. Configuring TLS/SSL by using the DCAS configuration file is supported, but such support is deprecated and will no longer be enhanced.

**Dependency:** The Policy Agent must be active.

### Using AT-TLS enablement for DCAS

To use this DCAS enhancement, perform the appropriate tasks in Table 67 on page 75.
Table 67. AT-TLS enablement for DCAS

<table>
<thead>
<tr>
<th>Task/Procedure</th>
<th>Reference</th>
</tr>
</thead>
</table>
| Enable Transparent Transport Layer Security (TTLS) in the TCP/IP stack by specifying the **TTLS** parameter on the **TCPCONFIG** statement in the TCPIP profile. | • Application Transparent Transport Layer Security data protection in z/OS Communications Server: IP Configuration Guide  
• TCP CONFIG statement in z/OS Communications Server: IP Configuration Reference                                                                 |
| Set up authorization for the **pasearch** command if the command is not issued from a superuser. To set authorization for the **pasearch** command, create a SERVAUTH profile of EZB.PAGENT.sysname.TcpImage.ptype. The ptype value can be set to TTLS or a wildcard value. | • Steps for configuring the Policy Agent in z/OS Communications Server: IP Configuration Guide  
• z/OS Security Server RACF Security Administrator's Guide                                                                             |
| Enable AT-TLS configuration for the Policy Agent by specifying **CommonTTLSConfig**, **TLSConfig**, or both statements in the Policy configuration file for each stack. | • Policy-based networking and Application Transparent Transport Layer Security data protection in z/OS Communications Server: IP Configuration Guide  
• CommonTTLSConfig statement and TLSConfig statement in z/OS Communications Server: IP Configuration Reference |
| Define the AT-TLS policies by specifying the policies in the configuration files that are identified with the **CommonTTLSConfig** and **TTLSConfig** statements. | Specify the AT-TLS policies in the configuration files that are identified with the **CommonTTLSConfig** and **TTLSConfig** statements.  
Use one of the following methods to create the AT-TLS Policy Agent configuration files:  
• Use the IBM Configuration Assistant for z/OS Communications Server. Through a series of wizards and online help panels, you can use a GUI to produce the Policy Agent configuration files for any number of TCP/IP stacks. Using the GUI can reduce the amount of time that is required to produce configurations and reduce chances of configuration errors.  
• Code the required statements into a z/OS UNIX file or MVS data set. |
| Display policy-based networking information by using the z/OS UNIX System Services (USS) **pasearch** command to query information from the z/OS UNIX Policy Agent. The command is issued from the USS shell. | Displaying policy-based networking information in z/OS Communications Server: IP System Administrator's Commands |
| Enable AT-TLS in the DCAS configuration file by setting **TLSMECHANISM** to ATTLS. | Customizing DCAS for TLS/SSL in z/OS Communications Server: IP Configuration Guide }
Network security enhancements for SNMP

With APAR PM96901 installed, z/OS V2R1 Communications Server enhances the SNMP Agent, the z/OS UNIX snmp command, and the SNMP manager API to support the Advanced Encryption Standard (AES) 128-bit cipher algorithm as an SNMPv3 privacy protocol for encryption. The AES 128-bit cipher algorithm is a stronger encryption protocol than the current Data Encryption Standard (DES) 56-bit algorithm. AES is a symmetric cipher algorithm that the National Institute of Standards (NIST) selects to replace DES. RFC 3826, The Advanced Encryption Standard (AES) Cipher Algorithm in the SNMP User-based Security Model (USM), specifies that Cipher Feedback Mode (CFB) mode is to be used with AES encryption. See Appendix A, “Related protocol specifications,” on page 115 for information about accessing RFCs.

Dependency: To use AES 128-bit encryption, the z/OS Integrated Cryptographic Services Facility (ICSF) must be configured and started.

Using network security enhancements for SNMP

To use this SNMP enhancement, perform the appropriate tasks in Table 68.

Table 68. Network security enhancements for SNMP

<table>
<thead>
<tr>
<th>Task/Procedure</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Configure and start the z/OS Integrated Cryptographic Services Facility (ICSF).</td>
<td>For detailed information about configuring ICSF, see z/OS Cryptographic Services ICSF Administrator’s Guide.</td>
</tr>
</tbody>
</table>
| For the SNMP Agent, configure an SNMPv3 user to use AES 128-bit encryption by specifying a USM_USER entry with the privProto field set to AESCFB128. | For detailed information about the privProto parameter, see the following references:  
  * Overview of SNMP security models in z/OS Communications Server: IP Configuration Guide  
  * Coding the SNMPD.CONF entries in z/OS Communications Server: IP Configuration Reference |
| For the z/OS UNIX snmp command, configure an SNMPv3 user to use AES 128-bit encryption by specifying a configuration statement with the privProto field set to AESCFB128. | For detailed information about the privProto parameter, see the following references:  
  * Overview of SNMP security models in z/OS Communications Server: IP Configuration Guide  
  * Coding the SNMPD.CONF entries in z/OS Communications Server: IP Configuration Reference |
| For the SNMP Manager API, configure an SNMPv3 user to use AES 128-bit encryption by specifying a configuration statement with the privProto field set to AESCFB128. | SNMP manager API configuration file in z/OS Communications Server: IP Programmer’s Guide and Reference |

TLS security enhancements for Policy Agent

With APAR PM96891 installed, z/OS V2R1 Communications Server enables centralized Policy Agent to support TLSv1.1 and TLSv1.2 with a new set of TLSv1.2 2-byte specific ciphers. In addition, the import services between the Policy Agent and IBM Configuration Assistant for z/OS Communications Server allow user-defined AT-TLS policies to create a secure SSL connection.
Using TLS security enhancements for Policy Agent

To update SSL/TLS support in the centralized Policy Agent and import services, perform the appropriate tasks in Table 69.

Table 69. TLS security enhancements for Policy Agent

<table>
<thead>
<tr>
<th>Task/Procedure</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>If System SSL needs to access ICSF for new TLSv1.2 ciphers, ICSF must be started before starting Policy Agent.</td>
<td>z/OS Cryptographic Services System SSL Programming for information about using hardware Cryptographic Features with System SSL</td>
</tr>
<tr>
<td>In the Policy Agent configuration file (/etc/pagent.conf), you can update ServerConnection/ServerSSLV3CipherSuites to use the TLSv1.1 or TLSv1.2 new 2-byte ciphers for centralized Policy Agent support.</td>
<td>ServerSSLV3CipherSuites in ServerConnection under Policy Agent general configuration file statements in z/OS Communications Server: IP Configuration Reference</td>
</tr>
<tr>
<td>In the Policy Agent configuration file (/etc/pagent.conf), you can set ServicesConnection to Security Basic and use a default unsecure connection, or you can define AT-TLS policies to protect this import services connection with SSL/TLS.</td>
<td>Security Basic in ServicesConnection under Policy Agent general configuration file statements in z/OS Communications Server: IP Configuration Reference</td>
</tr>
</tbody>
</table>

TLS security enhancements for sendmail

With APAR PM96896 installed, z/OS V2R1 Communications Server enables z/OS UNIX sendmail to support TLSv1.1 and TLSv1.2 with a new set of TLSv1.2 2-byte specific ciphers.

Using TLS security enhancements for sendmail

To enable TLSv1.2 with 2-byte ciphers, perform the task in Table 70.

Table 70. TLS security enhancements for sendmail

<table>
<thead>
<tr>
<th>Task/Procedure</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>If System SSL needs to access ICSF for new TLSv1.2 ciphers, ICSF must be started before starting sendmail.</td>
<td>z/OS Cryptographic Services System SSL Programming for information about using hardware Cryptographic Features with System SSL</td>
</tr>
<tr>
<td>In the sendmail z/OS specific configuration file (/etc/mail/zOS.cf), update the CipherLevel to use new 2-byte ciphers available with TLSv1.2.</td>
<td>The CipherLevel statement in Creating the z/OS-specific file in z/OS Communications Server: IP Configuration Guide</td>
</tr>
</tbody>
</table>

VTAM 3270 intrusion detection services

With APAR OA48802 installed, z/OS V2R1 Communications Server enables 3270 data stream intrusion detection services (IDS) that detect and act on violations of the 3270 data stream protocol.

The 3270 IDS function monitors 3270 data streams for primary logical units (PLUs) that are connected to the z/OS VTAM instance. Specific types of 3270 sessions can be exempted from IDS monitoring at the VTAM or application major node level if IDS monitoring is not needed for those sessions.
The 3270 IDS function monitors 3270 data streams for any attempt to write past the end of input fields or to modify protected fields. When these types of events are detected, appropriate actions are taken according to the VTAM configuration. The possible actions include logging the event, tracing the relevant inbound and outbound PIUs for later analysis, notifying the PLU of the event with a sense code, and even terminating the SNA session.

The 3270 IDS function writes GTF type F90 records and SMF type 119 (subtype 81) records for each incident.

**Restriction:** This function is not supported for VTAM's APPCCMD programming interface.

### Using VTAM 3270 IDS

VTAM 3270 IDS is disabled by default. To enable this function, perform the appropriate tasks in Table 71.

#### Table 71. VTAM 3270 IDS

<table>
<thead>
<tr>
<th>Task/Procedure</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assess your need to use the 3270 data stream monitoring function</td>
<td>3270 IDS considerations and assessment in z/OS Communications Server: SNA Network Implementation Guide</td>
</tr>
<tr>
<td>Enable 3270 data stream monitoring at the VTAM level by using the DSMONITR VTAM start option.</td>
<td>DSMONITR VTAM start option in z/OS Communications Server: SNA Resource Definition Reference</td>
</tr>
<tr>
<td>Optionally enable or disable 3270 data stream monitoring at the application major node level by using the DSMONITR operand of the APPL or GROUP statement.</td>
<td>DSMONITR operand of the APPL and GROUP statements in z/OS Communications Server: SNA Resource Definition Reference</td>
</tr>
<tr>
<td>Optionally specify the actions to be taken at the VTAM level when a 3270 data stream protocol violation is detected by using the DSACTION VTAM start option.</td>
<td>DSACTION VTAM start option in z/OS Communications Server: SNA Resource Definition Reference</td>
</tr>
<tr>
<td>Optionally specify the actions to be taken at the application major node level when a 3270 data stream protocol violation is detected by using the DSACTION operand of the APPL or GROUP statement.</td>
<td>DSACTION operand of the APPL and GROUP statements in z/OS Communications Server: SNA Resource Definition Reference</td>
</tr>
<tr>
<td>Optionally exempt specific types of 3270 traffic from monitoring at the VTAM level by using the DSTRUST VTAM start option.</td>
<td>DSTRUST VTAM start option in z/OS Communications Server: SNA Resource Definition Reference</td>
</tr>
<tr>
<td>Optionally exempt specific types of 3270 traffic from monitoring at the application major node level using the DSTRUST operand of the APPL or GROUP statement.</td>
<td>DSTRUST operand of the APPL and GROUP statements in z/OS Communications Server: SNA Resource Definition Reference</td>
</tr>
<tr>
<td>Display 3270 IDS configuration settings at the VTAM level.</td>
<td>DISPLAY VTAMOPTS,FUNCTION=SECURITY command in z/OS Communications Server: SNA Operation</td>
</tr>
<tr>
<td>Display 3270 IDS configuration settings and statistics at the application level.</td>
<td>DISPLAY ID command in z/OS Communications Server: SNA Operation</td>
</tr>
<tr>
<td>Display 3270 IDS statistics at the VTAM level</td>
<td>DISPLAY STATS command in z/OS Communications Server: SNA Operation</td>
</tr>
</tbody>
</table>
Table 71. VTAM 3270 IDS (continued)

<table>
<thead>
<tr>
<th>Task/Procedure</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Display 3270 IDS statistics for a specific session</td>
<td>DISPLAY SESSION,SID= command in z/OS Communications Server: SNA Operation</td>
</tr>
<tr>
<td>Modify the 3270 IDS configuration settings at the VTAM level</td>
<td>MODIFY VTAMOPTS command in z/OS Communications Server: SNA Operation</td>
</tr>
<tr>
<td>Enable capture of relevant SNA PIUs to the Generalized Trace Facility (GTF)</td>
<td>• DSCOUNT VTAM start option in z/OS Communications Server: SNA Resource Definition Reference</td>
</tr>
<tr>
<td></td>
<td>• DSCOUNT operand of the APPL and GROUP statements in z/OS Communications Server: SNA Resource Definition Reference</td>
</tr>
<tr>
<td></td>
<td>• Using Traces in z/OS Communications Server: SNA Diagnosis Vol 1, Techniques and Procedures</td>
</tr>
<tr>
<td>Display the 3270 IDS data areas from a dump</td>
<td>VTAMMAP SES or VTAMMAP VTAM command in z/OS Communications Server: SNA Diagnosis Vol 1, Techniques and Procedures</td>
</tr>
<tr>
<td>Analyze potential 3270 protocol violations</td>
<td>• z/OS Communications Server: SNA Diagnosis Vol 1, Techniques and Procedures</td>
</tr>
<tr>
<td></td>
<td>• z/OS Communications Server: SNA Diagnosis Vol 2, FFST Dumps and the VIT</td>
</tr>
<tr>
<td>Update the SMFPRMxx member of SYS1.PARMLIB to write SMF type 119 subtype 81 records.</td>
<td>Z/OS MVS Initialization and Tuning Reference</td>
</tr>
<tr>
<td>Read the SMF type 119 subtype 81 records.</td>
<td>Type 119 SMF records in z/OS Communications Server: IP Programmer’s Guide and Reference</td>
</tr>
</tbody>
</table>

IBM Health Checker for z/OS SNMP agent public community name

z/OS V2R1 Communications Server, with TCP/IP APAR PI51640 and SNA APAR OA50122, provides a new IBM Health Checker for z/OS application health check to help determine whether your SNMP agent is configured with a community name of public. Because the SNMP community name of public is a well-known name, it should not be used with community-based security due to security considerations.

Dependency: You must install TCP/IP APAR PI51640 and SNA APAR OA50122 and start the IBM Health Checker for z/OS to use the new application health check.

Using the IBM Health Checker for z/OS SNMP agent public community name

To use the IBM Health Checker for z/OS SNMP agent public community name, perform the appropriate tasks in Table 72 on page 80.
Table 72. IBM Health Checker for z/OS SNMP agent public community name

<table>
<thead>
<tr>
<th>Task</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>To use the IBM Health Checker for z/OS application check support, take the following steps:</td>
<td></td>
</tr>
<tr>
<td>1. Configure and start the IBM Health Checker for z/OS.</td>
<td>See the following topics in IBM Health Checker for z/OS: User's Guide</td>
</tr>
<tr>
<td>2. Review the CSAPP_SNMPAGENT_PUBLIC_COMMUNITY health check output for potential migration actions.</td>
<td>• Setting up IBM Health Checker for z/OS</td>
</tr>
<tr>
<td></td>
<td>• Working with check output</td>
</tr>
<tr>
<td></td>
<td>• Managing checks</td>
</tr>
</tbody>
</table>

Simplification

The following topics describe enhancements for simplification:

- “Configuration Assistant performance improvements and enhanced user interface” on page 81
- “Improve translation of special characters in linemode for TSO/VTAM” on page 81
- “Resolver initialization resiliency” on page 82
- “Enterprise Extender IPv6 address configuration” on page 82
- “Simplified configuration for progressive mode ARB” on page 83
- “Check TCP/IP profile syntax without applying configuration changes” on page 84
- “User control of Ephemeral Port Ranges” on page 85
- “IPv4 INTERFACE statement for HiperSockets and Static VIPAs” on page 86
- “IBM Health Checker for z/OS GATEWAY statement” on page 88
- “IBM Health Checker for z/OS legacy device types” on page 89
- “CSSMTP mail message date header handling option” on page 90

z/OS V2R1 Communications Server: IBM Health Checker for TFTP daemon

z/OS® V2R1 Communications Server, with TCP/IP APAR PI61806 and SNA APAR OA50445, provides a new Health Checker for z/OS migration health check to help determine whether you are using the Trivial File Transfer Protocol daemon (TFTPD). Support for the TFTPD will be removed in a future release of IBM z™/OS Communications Server.

Dependency: You must install TCP/IP APAR PI61806 and SNA APAR OA50445 and start the IBM® Health Checker for z/OS to use the new migration health check.

IBM Health Checker for TFTP daemon

To use IBM Health Checker for TFTP daemon, perform the appropriate tasks in Table 73 on page 81.
Table 73. IBM Health Checker for TFTP daemon

<table>
<thead>
<tr>
<th>Task/Procedure</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>To use the IBM Health Checker for z/OS migration check support, take the following steps:</td>
<td>See the following topics in IBM Health Checker for z/OS: User’s Guide</td>
</tr>
<tr>
<td>1. Configure and start the IBM Health Checker for z/OS.</td>
<td></td>
</tr>
<tr>
<td>2. Activate the ZOSMIGV2R2_NEXT_CS_TFTP migration check.</td>
<td></td>
</tr>
<tr>
<td>3. Review health check output for potential migration actions.</td>
<td></td>
</tr>
</tbody>
</table>

Configuration Assistant performance improvements and enhanced user interface

z/OS V2R1 Communications Server enhances Configuration Assistant to support a new Web 2.0 design model on z/OSMF. This provides the following improvements to performance and user experience:

- A redesigned user interface that provides an integrated experience with other z/OSMF applications
- Improved performance that reduces the server-side processing on z/OS

Improve translation of special characters in linemode for TSO/VTAM

z/OS V2R1 Communications Server enhances TSO/VTAM to translate Extended English characters for the TPUT macro instruction with the EDIT parameter. For more information about the Extended English translation, see D/T3174 Character Set Reference.

This function provides the following options for the TPUT EDIT translation for terminals that support the Extended English character set:

- Base English translation
- No translation
- Extended English translation

In previous releases, TSO/VTAM translated the Extended English characters of the TPUT EDIT to colons. The colons were then sent to terminals that supported the Extended English character set (Coded Graphic Set Global Identifier (CGCSGID) of X’02B90025’).

Improving translation of special characters in linemode for TSO/VTAM

To improve translation of special characters in linemode for TSO/VTAM, perform the task in Table 74.

Table 74. Improve translation of special characters in linemode for TSO/VTAM

<table>
<thead>
<tr>
<th>Task</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Choose basic English translation, Extended English translation, or no translation for TPUT EDIT to terminals that support the Extended English character set by specifying the parameter ENGTRANS with the appropriate value in the system parmlib member TSOKEY00.</td>
<td>ENGTRANS parameter in TSOKEY00 in z/OS MVS Initialization and Tuning Reference</td>
</tr>
</tbody>
</table>
Resolver initialization resiliency

z/OS V2R1 Communications Server provides enhancements to the system resolver to start regardless of the following conditions:

- The resolver detects one or more errors with the statements in the resolver setup file.
- The resolver setup file does not exist or cannot be accessed by the resolver.
- One or more files that are specified as values on the resolver setup statements, such as GLOBALTCPIPDATA, do not exist or cannot be accessed by the resolver.

The resiliency of the resolver initialization allows your TCP/IP stacks and other applications that are dependent on resolver processing to continue their initialization despite any resolver setup file errors.

Detecting configuration errors during resolver initialization

To determine whether the system resolver detected errors in the resolver setup file during resolver initialization, perform the appropriate tasks in **Table 75**.

<table>
<thead>
<tr>
<th>Task</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Create automation to monitor whether the resolver started with configuration errors. This task is optional.</td>
<td>Customizing the Resolver in z/OS Communications Server: IP Configuration Guide</td>
</tr>
<tr>
<td>Detect that the resolver started with configuration errors by using one of the following approaches:</td>
<td>Customizing the Resolver in z/OS Communications Server: IP Configuration Guide</td>
</tr>
<tr>
<td>- Monitor the operator console for message EZD2038I.</td>
<td></td>
</tr>
<tr>
<td>- Issue the MODIFY RESOLVER,DISPLAY command after system initialization and check for message EZD2039I.</td>
<td></td>
</tr>
<tr>
<td>If necessary, alert systems programmers to take corrective actions.</td>
<td></td>
</tr>
</tbody>
</table>

Enterprise Extender IPv6 address configuration

z/OS V2R1 Communications Server enhances your ability to configure your IPv6 EE connections by allowing you to specify an IPv6 address instead of a hostname. You can specify IPADDR as any of the following items:

- A VTAM start option
- A parameter on the GROUP statement in an XCA major node
- A parameter on the PATH statement in a switched major node

Requirements:

If you are enabling the new IPv6 IPADDR on a GROUP statement in an XCA major node that defines a connection network on z/OS V2R1 Communications Server, you must apply the PTFs for APAR OA38234 on previous releases of z/OS Communications Server. The PTFs for APAR OA38234 are required to allow a previous release to activate or select an HPR pipe over EE to the z/OS V2R1 Communications Server host using an IPv6 IPADDR for a connection network.

**Table 76 on page 83** indicates the PTFs for APAR OA38234 that are required to make the supported releases compatible with V2R1.
Table 76. PTFs for APAR OA38234

<table>
<thead>
<tr>
<th>z/OS Communications Server version</th>
<th>PTF for APAR OA38234</th>
</tr>
</thead>
<tbody>
<tr>
<td>V1R12</td>
<td>UA65031</td>
</tr>
<tr>
<td>V1R13</td>
<td>UA65032</td>
</tr>
</tbody>
</table>

For distributed Communications Servers or other HPR products to use an HPR pipe over EE to the z/OS V2R1 Communications Server host using an IPv6 IPADDR for a connection network, those products must implement the logic that is needed to support receiving an IPv6 address in the RSCV for an HPR pipe using a connection network. If the destination HPR platform does not support receiving an IPv6 address in the RSCV, the HPR pipe activation or selection fails.

The IPv6 address in the RSCV support is made available in the following product:

Communications Server for Data Center Deployment v7

**Configuring an IPv6 address for your EE connections**

To configure an IPv6 address for your EE connections, perform the appropriate tasks in Table 77.

Table 77. Enterprise Extender IPv6 address configuration

<table>
<thead>
<tr>
<th>Task</th>
<th>Reference</th>
</tr>
</thead>
</table>
| Specify an IPv6 address for the IPADDR start option or for the IPADDR operand on the XCA GROUP statement or the Switched EE PATH statement. | See the following topics in z/OS Communications Server: SNA Resource Definition Reference:  
  - IPADDR start option  
  - XCA major node operand IPADDR  
  - Switched major node operand IPADDR  
  or MODIFY VTAMOPTS command in z/OS Communications Server: SNA Operation |
| Display the IPADDR start option. Issue the DISPLAY NET,VTAMOPTS,OPTION=IPADDR or the DISPLAY NET,VTAMOPTS command. | DISPLAY VTAMOPTS cmd in z/OS Communications Server: SNA Operation |
| Display the IPADDR on the XCA GROUP. Issue the DISPLAY NET,ID=group_name command. | DISPLAY ID cmd in z/OS Communications Server: SNA Operation |
| Display the IPADDR on the Switched EE PATH. Issue the DISPLAY NET,PATHS,ID=pu_name command. | DISPLAY PATHS cmd in z/OS Communications Server: SNA Operation |

**Simplified configuration for progressive mode ARB**

z/OS V2R1 Communications Server simplifies the configuration of the progressive-mode adaptive rate-based (ARB) flow control algorithm on predefined EE Physical Units (PUs). This flow control algorithm improves the performance in virtualized or CPU-constrained environments. You can configure HPREEARB on the GROUP definition statement in the switched major node for predefined EE (Enterprise Extender) connections. As usual, you can also specify the HPREEARB parameter on the following items:

- The PU definition statement in the switched or model (DYNTYPE=EE) major nodes
- The connection network GROUP definition statements in the EE XCA major node
Restriction: Progressive-mode ARB applies only to one-hop HPR pipes that traverse EE connections, which includes a single physical hop across a two-hop EE virtual routing node (VRN).

Implementing the progressive-mode ARB flow control algorithm for predefined EE PUs

To implement the progressive-mode ARB flow control algorithm for predefined EE PUs, perform the appropriate tasks in Table 78.

Table 78. Simplified configuration for progressive mode ARB

<table>
<thead>
<tr>
<th>Task</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Designate that progressive-mode ARB is to be used for a predefined EE connection by specifying HPREEARB=PROGRESS on the GROUP or PU definition statement in the switched major node.</td>
<td>Switched major node operand HPREEARB in z/OS Communications Server: SNA Resource Definition Reference</td>
</tr>
<tr>
<td>Designate that progressive-mode ARB is not to be used for a predefined EE connection by specifying HPREEARB=HPRARB on the GROUP or PU definition statement in the switched major node.</td>
<td>Switched major node operand HPREEARB in z/OS Communications Server: SNA Resource Definition Reference</td>
</tr>
<tr>
<td>Determine which ARB mode is being used for a specific HPR pipe by performing the following steps:</td>
<td>See the following topics:</td>
</tr>
<tr>
<td>1. Issue the DISPLAY ID=rtp_pu,HPRDIAG=YES command.</td>
<td>• DISPLAY ID command in z/OS Communications Server: SNA Operation</td>
</tr>
<tr>
<td>2. Locate the ARB information in the HPRDIAG output.</td>
<td>• IST1697I, IST2267I, or IST2395I message in z/OS Communications Server: SNA Messages</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Task</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>You can know the status by checking the messages:</td>
<td></td>
</tr>
<tr>
<td>• If message IST1697I is present, the responsive-mode ARB algorithm is being used.</td>
<td></td>
</tr>
<tr>
<td>• If message IST2267I is present, the progressive-mode ARB algorithm is being used.</td>
<td></td>
</tr>
<tr>
<td>• If message IST2395I is present, the base-mode ARB algorithm is being used.</td>
<td></td>
</tr>
</tbody>
</table>

Check TCP/IP profile syntax without applying configuration changes

z/OS V2R1 Communications Server improves the availability of TCP/IP by providing a method to check the syntax of TCPIP profile statements in an initial profile or in the profile data set that is specified on a VARY TCPIP,OBEYFILE command without activating the profile.

With the VARY TCPIP,SYNTAXCHECK command, you can check the syntax of configuration statements in profile data sets before using the statements to configure TCP/IP.

You do not need to issue the command on the system that will apply the profile; you can check the profile on any system that supports the VARY TCPIP,SYNTAXCHECK command. For example, you can specify a TCP/IP stack on this command that is configured to support only IPv4 to check a profile that contains IPv6 profile statements.

Restriction: The VARY TCPIP,SYNTAXCHECK command makes no attempt to update the active configuration; therefore, it does not detect and report conflicts with the active configuration.
Dependencies:

- TCP/IP must be active before you issue this command.
- For consistent syntax checking, you must issue the VARY TCPIP,SYNTAXCHECK command against a stack that is at the same z/OS release level as the stack that activates the profile.
- If your profile contains MVS system symbols, you must issue the VARY TCPIP,SYNTAXCHECK command against the same stack that activates the profile to ensure consistent resolution of the MVS system symbols.

Checking the TCP/IP profile syntax without applying configuration changes

To check the TCP/IP profile syntax without applying configuration changes, perform the appropriate tasks in Table 79.

<table>
<thead>
<tr>
<th>Task</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control which users have access to the VARY TCPIP,SYNTAXCHECK command.</td>
<td>VARY TCPIP,SYNTAXCHECK in z/OS Communications Server: IP System Administrator’s Commands</td>
</tr>
<tr>
<td>Create or update a data set that contains profile statements.</td>
<td>TCP/IP profile (PROFILE.TCPIP) and configuration statements in z/OS Communications Server: IP Configuration Reference</td>
</tr>
<tr>
<td>Issue the VARY TCPIP,SYNTAXCHECK command to check the syntax of statements in the profile that you have created or updated.</td>
<td>VARY TCPIP,SYNTAXCHECK in z/OS Communications Server: IP System Administrator’s Commands</td>
</tr>
</tbody>
</table>

User control of Ephemeral Port Ranges

z/OS V2R1 Communications Server provides new TCP/IP profile configuration options that allow you to specify the ephemeral port range for use by TCP sockets, UDP sockets, or both. Previously, ephemeral ports were assigned from the range 1024 - 65535. To facilitate port controls on firewalls, you can specify a subset of the 1024 - 65535 range for use as ephemeral ports.

Restriction: You cannot expand the range of ephemeral ports to ports beyond the existing 1024 - 65535 range.

Specifying an ephemeral port range

To specify an ephemeral port range for use by TCP or UDP sockets, perform the appropriate tasks in Table 80 on page 86.
Table 80. User control of Ephemeral Port Ranges

<table>
<thead>
<tr>
<th>Task</th>
<th>Reference</th>
</tr>
</thead>
</table>
| Understand the interactions of the methods of TCP and UDP socket port restriction. | See the parameters INADDRANYPORT and INADDRANYCOUNT of BXPROMxx in z/OS MVS Initialization and Tuning Reference. See the following topics in z/OS Communications Server: IP Configuration Reference:  
* GLOBALCONFIG statement  
* PORT statement  
* PORTRANGE statement  
* TCPCONFIG statement  
* UDPCONFIG statement  
* VIPADYNAMIC – VIPADISTRIBUTE statement |
| Restrict the range of ports to be used as ephemeral ports for TCP sockets. | TCPCONFIG statement in z/OS Communications Server: IP Configuration Reference |
| Restrict the range of ports to be used as ephemeral ports for UDP sockets. | UDPCONFIG statement in z/OS Communications Server: IP Configuration Reference |
| Display the ranges of ports to be used as ephemeral ports for TCP and UDP sockets. | Netstat CONFIG/-f report in z/OS Communications Server: IP System Administrator’s Commands |
| Determine whether the ranges of ports to be used as ephemeral ports for TCP and UDP sockets are sufficient for your application needs. | Netstat STATS/-S report in z/OS Communications Server: IP System Administrator’s Commands |

IPv4 INTERFACE statement for HiperSockets and Static VIPAs

In z/OS V2R1 Communications Server, you can use the INTERFACE statement in the TCP/IP profile to configure IPv4 interfaces for HiperSockets and static VIPAs. This enhancement has the following benefits:

- Simplifies IPv4 configuration for HiperSockets and static VIPA by supporting an INTERFACE statement to replace the DEVICE/LINK/HOME statements.
- Provides a more straightforward way of configuring the source VIPA for IPv4 HiperSockets interfaces.
- Allows you to configure multiple VLANs from the same TCP/IP stack for a single HiperSockets CHPID for both IPv4 and IPv6.

Restrictions:

- z/OS CS supports a maximum of eight VLANs per HiperSockets CHPID per z/OS image per IP version.
- To designate a static VIPA as the source VIPA for an IPv4 interface that is configured using DEVICE and LINK statements, you must configure that static VIPA using DEVICE and LINK statements.

Using the IPv4 INTERFACE statement for HiperSockets and Static VIPAs

To use the IPv4 INTERFACE statement for HiperSockets and Static VIPAs, perform the appropriate tasks in Table 81 on page 87.
Table 81. IPv4 INTERFACE statement for HiperSockets and Static VIPAs

<table>
<thead>
<tr>
<th>Task</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>To use the INTERFACE statement for an IPv4 HiperSockets interface, take the following steps:</td>
<td>INTERFACE statement – IPAQIDIO in z/OS Communications Server: IP Configuration Reference</td>
</tr>
<tr>
<td>1. Configure the INTERFACE statement for IPAQIDIO in the TCPIP profile.</td>
<td></td>
</tr>
<tr>
<td>2. Optionally, specify a source VIPA for this interface by using the SOURCEVIPAINTERFACE parameter.</td>
<td></td>
</tr>
<tr>
<td>3. Activate the interface by using the START statement or VARY TCPIP,START command, and by specifying the interface name.</td>
<td></td>
</tr>
<tr>
<td>To convert existing IPv4 HiperSockets definitions to use the INTERFACE statement, take the following steps:</td>
<td>Steps for converting from IPv4 IPAQIDIO DEVICE, LINK, and HOME definitions to the IPv4 IPAQIDIO INTERFACE statement in z/OS Communications Server: IP Configuration Guide</td>
</tr>
<tr>
<td>1. Replace DEVICE and LINK statements for IPAQIDIO with the new IPv4 INTERFACE statement for IPAQIDIO.</td>
<td>INTERFACE statements - IPAQIDIO and BEGINROUTES in z/OS Communications Server: IP Configuration Reference</td>
</tr>
<tr>
<td>2. Remove the HOME entry and any BSDROUTINGPARMS entry for the interface.</td>
<td></td>
</tr>
<tr>
<td>3. If you are currently using the order of your HOME list to designate the source VIPA to be associated with this interface, specify the name of the appropriate static VIPA on the SOURCEVIPAINTERFACE parameter of the IPAQIDIO INTERFACE statement.</td>
<td></td>
</tr>
<tr>
<td>4. If you are currently configuring any static routes over this interface using the GATEWAY statement, convert the GATEWAY statement to a BEGINROUTES block.</td>
<td></td>
</tr>
<tr>
<td>To use the INTERFACE statements to define an IPv4 static VIPA interface, configure the IPv4 INTERFACE statement for VIRTUAL in the TCPIP profile.</td>
<td>INTERFACE statement - VIRTUAL in z/OS Communications Server: IP Configuration Reference</td>
</tr>
<tr>
<td>To convert existing IPv4 static VIPA definitions to use the INTERFACE statement, take the following steps:</td>
<td>Steps for converting from IPv4 VIRTUAL DEVICE, LINK, and HOME definitions to the IPv4 VIRTUAL INTERFACE statement in z/OS Communications Server: IP Configuration Guide</td>
</tr>
<tr>
<td>• Replace the DEVICE and LINK statements for VIRTUAL with the new IPv4 INTERFACE statement for VIRTUAL.</td>
<td>INTERFACE statement - VIRTUAL in z/OS Communications Server: IP Configuration Reference</td>
</tr>
<tr>
<td>• Remove the HOME entry and any BSDROUTINGPARMS entry for the interface.</td>
<td></td>
</tr>
<tr>
<td>To configure multiple VLANs for a HiperSockets CHPID, take the following steps:</td>
<td>See the following topics in z/OS Communications Server: IP Configuration Reference</td>
</tr>
<tr>
<td>• For IPv4, use the new IPv4 INTERFACE statement for IPAQIDIO. For IPv6, use the existing IPv6 INTERFACE statement for IPAQIDIO6. For each interface, specify the VLAN ID using the VLANID parameter.</td>
<td>INTERFACE statement – IPAQIDIO</td>
</tr>
<tr>
<td>• For each IPv4 interface for this HiperSockets CHPID, configure a unique subnet using the subnet mask specification on the IPADDR parameter.</td>
<td>INTERFACE statement – IPAQIDIO6</td>
</tr>
<tr>
<td>To configure a source VIPA for IPv4 dynamic XCF interfaces, configure the SOURCEVIPAINTERFACE parameter on the IPCONFIG DYNAMICXCF statement in the TCPIP profile.</td>
<td>IPCONFIG statement in z/OS Communications Server: IP Configuration Reference</td>
</tr>
</tbody>
</table>
Table 81. IPv4 INTERFACE statement for HiperSockets and Static VIPAs (continued)

<table>
<thead>
<tr>
<th>Task</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>To display information about IPv4 HiperSockets and static VIPA interfaces that were configured using the INTERFACE statement, issue the Netstat DEvlinks/-d command.</td>
<td>Netstat DEvlinks/-d in z/OS Communications Server: IP System Administrator's Commands</td>
</tr>
<tr>
<td>To limit a Netstat display to only show the interfaces that are associated with a specific HiperSockets TRLE, specify the TRLE name on the INTFName/-K filter when using either the Netstat DEvlinks/-d or HOME/-h command.</td>
<td>See the following topics in z/OS Communications Server: IP System Administrator's Commands • Netstat DEvlinks/-d • Netstat HOME/-h</td>
</tr>
<tr>
<td>To display information about the dynamic HiperSockets TRLEs and the datapath devices, issue the D NET,ID=trle, or D NET,TRL,TRL= command.</td>
<td>See the following topics in z/OS Communications Server: SNA Operation • DISPLAY ID command • DISPLAY TRL command</td>
</tr>
</tbody>
</table>

IBM Health Checker for z/OS GATEWAY statement

z/OS V2R1 Communications Server provides a new z/OS Health Checker for z/OS migration health check to help determine whether you are using the GATEWAY configuration statement in your TCP/IP profile. Support for the GATEWAY statement will be removed in a future z/OS release. If the GATEWAY statement is processed, a warning message EZZ0717I is issued.

Dependency: You must start the IBM Health Checker for z/OS before you can use the IBM Health Checker for z/OS enhancements.

Using the IBM Health Checker for z/OS migration check support

To use the IBM Health Checker for z/OS migration check support, perform the task in Table 82.

Table 82. IBM Health Checker for z/OS migration check support

<table>
<thead>
<tr>
<th>Task</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>To use the IBM Health Checker for z/OS migration check support, take the following steps:</td>
<td>See the following topics in IBM Health Checker for z/OS: User's Guide • Setting up IBM Health Checker for z/OS • Working with check output • Managing checks</td>
</tr>
<tr>
<td>1. Configure and start the IBM Health Checker for z/OS.</td>
<td></td>
</tr>
<tr>
<td>2. Activate the ZOSMIGV2R1_CS_GATEWAY migration check.</td>
<td></td>
</tr>
<tr>
<td>3. Review check output for potential migration actions.</td>
<td></td>
</tr>
</tbody>
</table>

IBM Health Checker for additional z/OS legacy device types

z/OS V2R1 Communications Server, with TCP/IP APAR PI49962 and SNA APAR OA49071, provides a new migration health check to use with the IBM Health Checker for z/OS function. The new migration health check determines whether you are using legacy device type configuration statements in your TCP/IP profile.

DEVICE and LINK profile statements for the following TCP/IP legacy device types will not be supported in a future release of IBM z/OS Communications Server:

• FDDI and Token Ring (LCS with LINKs FDDI and IBMTR)
• Token Ring (MPCIPA with LINK IPAQTR)
Ethernet and FDDI (MPCOSA with LINKs OSAENET and OSAFDDI)

When the TCP/IP stack processes a legacy device type profile statement, it issues message EZZ0717I. See this message, and the associated profile processing messages, for information about the profile data set that contains the statements.

**Dependency:** You must install TCP/IP APAR PI49962 and SNA APAR OA49071 and start the IBM Health Checker for z/OS to use the new migration health check.

**Using the IBM Health Checker for additional z/OS legacy device types**

To use the IBM Health Checker for z/OS migration health check support, complete the task in **Table 83**

<table>
<thead>
<tr>
<th>Table 83. IBM Health Checker for additional z/OS legacy device types</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Task</strong></td>
</tr>
<tr>
<td>To use the new migration health check, take the following steps:</td>
</tr>
<tr>
<td>1. Configure and start the IBM Health Checker for z/OS.</td>
</tr>
<tr>
<td>2. Activate the ZOSMIV2R2_NEXT_CS_LEGACYDEVICE migration health check.</td>
</tr>
<tr>
<td>3. Review health check output for potential migration actions. Use the TCP/IP EZZ0717I message to locate the profile data sets containing the legacy device type statements.</td>
</tr>
</tbody>
</table>

**IBM Health Checker for z/OS legacy device types**

z/OS V2R1 Communications Server, with TCP/IP APAR PI12981 and SNA APAR OA44671, provides a new migration health check to use with the IBM Health Checker for z/OS function. The new migration health check determines whether you are using legacy device type configuration statements in your TCP/IP profile.

Support for the DEVICE and LINK profile statements for the following TCP/IP legacy device types will be eliminated in a future release of IBM z/OS Communications Server:

- ATM
- CDLC
- CLAW
- HYPERchannel
- SNALINK (LU0 and LU6.2)
- X.25

Because support will be eliminated for the ATM device type, the following associated TCP/IP profile statements will no longer be supported:

- ATMARPSV
- ATMLIS
- ATMPVC

When the TCP/IP stack processes a legacy device type profile statement, it issues message EZZ0717I. See this message, and the associated profile processing messages, for information on the profile data set that contains the statements.
Dependency: You must install TCP/IP APAR PI12981 and SNA APAR OA44671 and start the IBM Health Checker for z/OS to use the new migration health check.

Using the IBM Health Checker for z/OS legacy device types

To use the IBM Health Checker for z/OS migration health check support, complete the task in Table 84.

Table 84. IBM Health Checker for z/OS legacy device types

<table>
<thead>
<tr>
<th>Task</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>To use the new migration health check, take the following steps:</td>
<td>See the following topics in IBM Health Checker for z/OS: User’s Guide:</td>
</tr>
<tr>
<td>1. Configure and start the IBM Health Checker for z/OS.</td>
<td>• Setting up IBM Health Checker for z/OS</td>
</tr>
<tr>
<td>2. Activate the ZOSMIGV2R1_CS_LEGACYDEVICE migration health check.</td>
<td>• Working with check output</td>
</tr>
<tr>
<td>3. Review health check output for potential migration actions. Use the TCP/IP EZZ07171 message to locate the profile data sets containing the legacy device type statements.</td>
<td>• Managing checks</td>
</tr>
</tbody>
</table>

CSSMTP mail message date header handling option

In z/OS V2R1 Communications Server, you can configure the Communications Server Simple Mail Transfer Protocol (CSSMTP) to not add the Date header to the mail message when one was not explicitly specified.

Using the CSSMTP mail message date header handling option

To use the CSSMTP mail message date header handling option, perform the task in Table 85.

Table 85. CSSMTP mail message Date header handling option

<table>
<thead>
<tr>
<th>Task</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specify Date No on the CSSMTP configuration Header statement to not add Date header to the mail message if one was not explicitly specified.</td>
<td>CSSMTP Header statement in z/OS Communications Server: IP Configuration Reference</td>
</tr>
</tbody>
</table>

Availability

The following topics describe enhancements for availability:
• “Socket establishment time for Netstat ALL/-A”
• “Sysplex-wide security associations for IPv6” on page 91
• “HPR PSRETRY Enhancement” on page 92
• “RPCBIND recycle notification” on page 92
• “SNA serviceability enhancements” on page 93
• “TCP/IP serviceability enhancements” on page 93

Socket establishment time for Netstat ALL/-A

z/OS V2R1 Communications Server enhances the Netstat ALL/-A report output by adding start date and time information for TCP connections and UDP endpoints.
For TCP connections, the start date and time indicate the occurrence of the following socket functions for the TCP socket:

- Bind
- Listen
- Connection establishment

For UDP endpoints, the start date and time indicate the occurrence of the bind socket function for the UDP socket. The start time information is useful for performance or problem analysis.

**Obtaining the start time of the connection**

To obtain the start time of a connection, perform the task in Table 86.

<table>
<thead>
<tr>
<th>Task</th>
<th>Reference</th>
</tr>
</thead>
</table>
| Display the following information for TCP connections and UDP endpoints:  
  - UDP bind time  
  - TCP bind time  
  - TCP listen time  
  - TCP connection establishment time | Netstat ALL/-A report in **z/OS Communications Server: IP System Administrator’s Commands** |

### Sysplex-wide security associations for IPv6

z/OS V2R1 Communications Server provides the support for IPv6 in a sysplex-wide security association (SWSA) environment. Sysplex distribution provides better workload balancing because it performs the following actions:

- Optimally routes new work to the target system and the server application, based on WLM advice
- Increases the availability of workloads by routing traffic around failed components
- Increases flexibility by adding additional workload in a nondisruptive manner

SWSA adds to the sysplex function, distributing the IPSec cryptographic processing for an IPSec security association (SA) among systems in a sysplex environment. SWSA also allows workloads with IPSec-protected traffic to use the dynamic virtual IP address (DVIPA) takeover function. You can associate IPSec-protected workloads with DVIPAs that can be recovered by other systems in the case of a failure or planned takeover. IPSec SAs are automatically reactivated on another system in the sysplex when a DVIPA takeover occurs.

**Restrictions:**

- All target systems must be at V2R1 or later to distribute workload for IPv6 traffic that is protected by an SA.
- The backup TCP/IP stack must be on a system that is V2R1 or later to take over IPSec-protected workloads with IPv6 DVIPAs.

**Using the support for IPv6 in a sysplex-wide security association (SWSA) environment**

To use the support for IPv6 in a SWSA environment, perform the appropriate tasks in Table 87 on page 92.
**Table 87. Sysplex-wide security associations for IPv6**

<table>
<thead>
<tr>
<th>Task</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learn about SWSA.</td>
<td>Sysplex-wide security associations and IP security in z/OS Communications Server: IP Configuration Guide</td>
</tr>
<tr>
<td>Configure IPCONFIG6 IPSECURITY and IPSEC DVIPSEC in the distributor stack TCP/IP profile to enable IPv6 SWSA.</td>
<td>IPCONFIG6 statement and IPSEC statement in z/OS Communications Server: IP Configuration Reference</td>
</tr>
<tr>
<td>Use the ipsec command to display whether SWSA is enabled.</td>
<td>The ipsec command general report concepts in z/OS Communications Server: IP System Administrator’s Commands</td>
</tr>
</tbody>
</table>

**HPR PSRETRY Enhancement**

z/OS V2R1 Communications Server enhances the HPR PSRETRY function with an additional option to enable the immediate path switch of HPR Rapid Transport Protocol (RTP) pipes. With this option, you can set large PSRETRY values and still have the benefit of immediate searches for preferred session paths when a local link is activated or changes status.

**Enabling the immediate path switch of HPR RTP pipes**

To enable the immediate path switch of HPR RTP pipes when a local link is activated or changed, perform the task in Table 88.

<table>
<thead>
<tr>
<th>Task</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enable immediate PSRETRY path switch function.</td>
<td>PSRETRY start option in z/OS Communications Server: SNA Resource Definition Reference</td>
</tr>
</tbody>
</table>

**RPCBIND recycle notification**

The rpcbind server is improved to provide notifications at strategic points in processing and to enable more effective programming. The rpcbind server sends an ENF signal when the server is starting and when it is stopping.

- The rpcbind server sends an ENF signal when it has started and is prepared to accept registrations from RPC applications. If the rpcbind server is stopped and restarted, RPC applications can monitor this ENF signal and register again with the rpcbind server.
- The rpcbind server sends an ENF signal when it is stopped or cancelled. If the rpcbind server is not available to RPC clients, RPC applications can monitor this ENF signal and take action.

**Enabling RPCBIND recycle notification**

To enable the RPCBIND recycle notification function, perform the task in Table 89 on page 93.
Table 89. RPCBIND recycle notification

<table>
<thead>
<tr>
<th>Task</th>
<th>Reference</th>
</tr>
</thead>
</table>
| Add code to your RPC server to monitor the rpcbind server for ENF signal 80 with qualifier ENF80_RPC_EVENT. Use the EZAENF80 mapping to determine whether the rpcbind server is starting or stopping. | • The section about the Communications Server ENF signal description in Z/OS MVS Programming: Authorized Assembler Services Guide  
• ENFREQ — Listen for system events in Z/OS MVS Programming: Authorized Assembler Services Reference EDT-IXG  
• Using ENF event code 80 to listen for rpcbind events in Z/OS Communications Server: IP Programmer’s Guide and Reference |

SNA serviceability enhancements

z/OS V2R1 Communications Server provides the following SNA serviceability enhancements:

- The APPN route selection trace has been enhanced to provide additional trace entries to diagnose the selection of incorrect routes through the APPN network for LU-LU sessions and for directed searches that are used to locate resources. These trace entries are not in the VTAM internal trace table, but exist in a separate internal route selection trace table. Activate the APPN route selection trace in a Network Node (NN).
- The Coupling Facility Services (CFS) component traces connection-related events in mini-trace tables. You get these traces in the mini-trace tables even if VTAM Internal Trace is not running with the CFS option. Each structure has one mini-trace table, except for the MNPS structure. No action is needed to collect CFS traces in the mini-trace tables.
- A new CPNAME operand is added to the Display NET,EE command. This allows you to display all of the active Enterprise Extender connections to the specified remote CP name.

TCP/IP serviceability enhancements

z/OS V2R1 Communications Server provides the following TCP/IP serviceability enhancements:

- An additional message for configuration errors encountered during device or interface activation is being provided. This new message provides information that easily identifies the reason for the activation failure.
- The FTP client is enhanced with trace messages to assist with the diagnosis of problems that occur when opening files. In addition to the already existing EZA2564W messages documenting a failure, these trace messages will provide additional information about the root cause of the failure. These new messages can be accessed by activating the FTP client's FSC debug option.
- The following OMPROUTE serviceability enhancements are provided:
  - Historical time tables are added to OMPROUTE and the TCP/IP stack to help IBM Support diagnose OMPROUTE unresponsiveness problems related to the sysplex monitoring function.
  - A new OMPROUTE message, EZZ8174I, provides additional information in cases where communication between OMPROUTE and the TCP/IP stack fails.
  - A new OMPROUTE console command that displays the global configuration options is provided.
  - The OMPROUTE_OPTIONS environment variable is ignored. The hello_hi functionality previously provided by the OMPROUTE_OPTIONS environment
variable is always enabled to optimize processing inbound and outbound OSPF hello packets so that potential adjacency failures with neighbors are minimized.

Application, middleware, and workload enablement

The following topics describe enhancements for application, middleware, and workload enablement:

- "API to locate SYSLOGD configuration file"
- "Real-time application-controlled TCP/IP trace NMI" on page 96
- "FTP client security user exits" on page 97
- "Simplify FTP transfer of data sets between z/OS systems" on page 98
- "Enable DHCP clients on OSA interfaces" on page 99
- "NMI and SMF enhancements for TCP/IP applications" on page 99
- "CSSMTP migration enablement" on page 101

API to locate SYSLOGD configuration file

z/OS V2R1 Communications Server enhances syslog daemon (syslogd) processing to provide the syslogd configuration file location and related information. The ability to find syslogd information helps other programs that need to use the information that is written to syslogd.

Using the API to locate SYSLOGD configuration file

To use the API to locate SYSLOGD configuration file, perform the task in Table 90.

Table 90. API to locate SYSLOGD configuration file

<table>
<thead>
<tr>
<th>Task</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Locate the SYSLOGD configuration file from your program.</td>
<td>Syslog daemon name/token pair and ECSA storage mapping in z/OS Communications Server: IP Programmer’s Guide and Reference</td>
</tr>
</tbody>
</table>

CSSMTP customizable ATSIGN character for mail addresses

The function adds an ATSIGN option to the CSSMTP configuration file.

With APAR PI52704 installed, z/OS V2R1 Communications Server enables the Communications Server SMTP (CSSMTP) application to recognize a different character as the industry standard at sign (@) symbol in a mail address. The specified character is recognized as the at sign symbol only in the SMTP commands and headers in mail messages. This enhancement simplifies migration from SMTPD to CSSMTP for customers that use a code page other than the default IBM-1047 and that have modified mail generation programs to generate mail addresses with an at sign character other than @.

CSSMTP customizable ATSIGN character for mail addresses

To enable the CSSMTP customizable ATSIGN character for mail addresses, perform the appropriate tasks in Table 91 on page 95.
### Table 91. CSSMTP customizable ATSIGN character for mail addresses

<table>
<thead>
<tr>
<th>Task/Procedure</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Options</td>
<td>• AtSign parameter on Options statement in <a href="#">Z/OS Communications Server: IP Configuration Reference</a></td>
</tr>
<tr>
<td>ATSIGN symbol (@ is the default)</td>
<td></td>
</tr>
<tr>
<td>Configure CSSMTP to use a character that represents the at sign (@) symbol in the mail address of the SMTP commands and headers.</td>
<td></td>
</tr>
</tbody>
</table>

### Improved CSSMTP code page compatibility with target servers

With APAR PI73909 installed, z/OS V2R1 Communications Server enables the Communications Server SMTP (CSSMTP) application to use a code page other than the standard ISO8859-1 code page to send mail messages to a target server. With this support, CSSMTP can send mail messages with special characters, such as the Euro sign (€), embedded in the body of the mail message in the code page expected by the mail server.

**Restriction:** The commands and headers of a mail message are first translated to code page IBM-1047 and then to the code page that is configured for the target server. Characters in the headers might not be translated correctly.

To enable improved CSSMTP code page compatibility with target servers, perform the task in Table 92.

### Table 92. Improved CSSMTP code page compatibility with target servers

<table>
<thead>
<tr>
<th>Task/Procedure</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Configure the code page that is used to translate and send mail messages to the target servers.</td>
<td>• Charset parameter on the TargetServer statement in <a href="#">Z/OS Communications Server: IP Configuration Reference</a></td>
</tr>
</tbody>
</table>

### Improved CSSMTP TLS compatibility with mail servers

The function adds a TLSEhlo option to the CSSMTP configuration file.

With APAR PI56614 installed, z/OS V2R1 Communications Server enables the SMTP servers that require an EHLO SMTP command after a successful TLS negotiation to send an EHLO command after a successful TLS negotiation. RFC 3207 (SMTP Service Extension for Secure SMTP over Transport Layer Security) specifies that sending an EHLO command is optional for a SMTP client after a successful TLS negotiation. However, some SMTP servers require an EHLO command after a successful TLS negotiation. To accommodate these servers, a configuration option is provided to enable the sending of an EHLO command after a successful TLS negotiation.

### Improved CSSMTP TLS compatibility with mail servers

To enable the sending of an EHLO command after a successful TLS negotiation, perform the appropriate tasks in Table 93 on page 96.
Real-time application-controlled TCP/IP trace NMI

The real-time application-controlled TCP/IP trace network management interface (NMI) is a callable NMI that provides the following information to network management applications based on filters that are set by the application:

- Real-time packet trace information
- Real-time data trace information

Each application that uses the NMI can set its own filters and options to obtain the required data, and the application can request the trace data at any time.

In contrast, the existing real-time TCP/IP network monitoring NMI provides similar trace data based on the global packet trace and data trace settings for the TCP/IP stack. The application has to wait for a token to retrieve the trace data.

To provide access to this NMI and to the information that the NMI provides, you must define new security product resource profiles in the SERVAUTH class. You can use the DISPLAY TCPIP,,TRACE command to display information about the applications that are using this NMI and the resources that are currently being used by the NMI.

**Restriction:** For an application to be able to use the NMI, the new security product resource profiles must be defined and the user ID of the application must be given READ access to the profiles.

Using the real-time application-controlled TCP/IP trace NMI

To use the real-time application-controlled TCP/IP trace NMI, perform the appropriate tasks in Table 94.

### Table 94. Real-time application-controlled TCP/IP trace NMI

<table>
<thead>
<tr>
<th>Task</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Develop or enhance an application to use the real-time application-controlled TCP/IP trace NMI.</td>
<td><a href="#">Real-time application-controlled TCP/IP trace NMI in z/OS Communications Server: IP Programmer’s Guide and Reference</a></td>
</tr>
<tr>
<td>Define the RACF resource profiles and authorize the user IDs of the applications to the profiles.</td>
<td><a href="#">Real-time application-controlled TCP/IP trace NMI in z/OS Communications Server: IP Programmer’s Guide and Reference</a></td>
</tr>
<tr>
<td>Display information about applications that are using the NMI.</td>
<td><a href="#">DISPLAY TCPIP,,TRACE in z/OS Communications Server: IP System Administrator’s Commands</a></td>
</tr>
</tbody>
</table>
FTP client security user exits

In z/OS V2R1 Communications Server, you can control FTP client commands that are sent to the server or monitor the replies that are received from the server by using the following two client user exits:

- FTP command user exit - EZAFCCMD. Use the EZAFCCMD user exit to inspect an FTP command, modify the arguments of an FTP command, reject an FTP command, or end the FTP client address space before the command is sent to the server.

- FTP reply user exit - EZAFCREP. Use the EZAFCREP user exit to inspect the FTP server reply or to end the FTP client address space after the FTP client receives each line of reply that is received from the server.

Restrictions:

FTP client user exits are not supported when the FTP client is invoked in an environment in which the FTP client cannot be executed as an authorized program or command. For example, FTP client user exits are not supported in the dynamic TSO environment that the IKJTSOEV service builds.

The following restrictions are for FTP command user exit EZAFCCMD:

- Some command arguments you can inspect, but not modify. Some command arguments you can modify, but not inspect. Some command arguments you cannot inspect or modify.

- The user exit cannot reject the QUIT command or end the client when the exit processes the QUIT subcommand.

The following restrictions are for the FTP reply user exit EZAFCREP:

- The user exit cannot end the client when the exit processes the QUIT subcommand.

- The user exit cannot end the client for a reply with the reply code in the range of 100 to 199.

Using the FTP client security user exits

To use the FTP client security user exits, perform the appropriate tasks in Table 95.

Table 95. FTP client security user exits

<table>
<thead>
<tr>
<th>Task</th>
<th>Reference</th>
</tr>
</thead>
</table>
| Write the EZAFCCMD or EZAFCREP FTP client user exit. | See the following topics:  
  - Configuring the optional FTP User exits in z/OS Communications Server: IP Configuration Guide  
  - FTP client user exits in z/OS Communications Server: IP Configuration Reference |
| Install the EZAFCCMD or EZAFCREP FTP client user exit. | See the following topics:  
  - Using dynamic exits services in z/OS MVS Programming: Authorized Assembler Services Guide  
  - Dynamic Exits Facility in z/OS MVS Installation Exits |
Interpret messages and client error codes resulting from using the EZAFCCMD and EZAFCREP user exits.

See the following topics:
- Security issues when using FTP and FTP return codes in z/OS Communications Server: IP User's Guide and Commands
- Predefined REXX variables in z/OS Communications Server: IP Programmer's Guide and Reference
- EZA1xxxx messages in z/OS Communications Server: IP Messages Volume 1 (EZA)

Use the FTP client trace to debug user exits.

FTP Client: Setup and FTP client security exits in z/OS Communications Server: IP Diagnosis Guide

Simplify FTP transfer of data sets between z/OS systems

z/OS V2R1 Communications Server for z/OS FTP supports getting the attributes of an MVS data set on the z/OS FTP server using the new FTP command XDSS.

z/OS V2R1 Communications Server for z/OS FTP also introduces two new FTP subcommands, MVSPut and MVSGet. The MVSPut subcommand transfers an MVS data set from a z/OS FTP client to a z/OS FTP server without the client user needing to know the attributes of the client data set. Likewise, the MVSGet subcommand transfers an MVS data set from a z/OS FTP server to a z/OS FTP client without the client user needing to know the attributes of the server data set. In both cases FTP extracts the attributes of the source data set, and applies them to the target host FTP configuration before the transfer.

Restrictions:

Only the following data set types are supported:
- z/OS physical sequential data set
- z/OS partitioned data set or library
- z/OS generation data set reference


Dependency: You must log in to a z/OS V2R1 or later FTP server to use the MVSGet and MVSPut subcommands.

Simplifying FTP transfer of data sets between z/OS systems

To simplify FTP transfer of data sets between z/OS systems, perform the task in Table 96.

<table>
<thead>
<tr>
<th>Task</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use FTP to transfer an MVS data set without knowing the details of its allocation.</td>
<td>FTP subcommands in z/OS Communications Server: IP User's Guide and Commands</td>
</tr>
</tbody>
</table>

Table 96. Simplify FTP transfer of data sets between z/OS systems
Enable DHCP clients on OSA interfaces

Before z/OS V2R1 Communications Server, to define and activate an OSA-Express QDIO interface, you needed to specify an IP address on the INTERFACE statement. This action prevented applications from implementing a DHCP client on z/OS. In z/OS V2R1 Communications Server, you can define and activate an OSA-Express QDIO interface without specifying an IP address. Applications that implement a DHCP client, such as IBM Rational® Developer for System z Unit Test feature (RDz-UT), can communicate with DHCP servers to dynamically obtain an IP address.

Restriction: The TEMPIP parameter is supported only on the INTERFACE statement for IPv4 OSA-Express QDIO interfaces.

Enabling DHCP clients on OSA interfaces

To enable the DHCP clients on OSA interfaces, perform the appropriate tasks in Table 97.

Table 97. Enable DHCP clients on OSA interfaces

<table>
<thead>
<tr>
<th>Task</th>
<th>Reference</th>
</tr>
</thead>
</table>
| Define an interface by using the TEMPIP keyword. | • Interface – IPAQENET OSA-Express QDIO Interfaces statement in z/OS Communications Server: IP Configuration Reference  
• Using TEMPIP interfaces in z/OS Communications Server: IP Configuration Guide |
| Display the interface with the Netstat HOME/-h command. | Netstat HOME/-h report in z/OS Communications Server: IP System Administrator’s Commands |

NMI and SMF enhancements for TCP/IP applications

z/OS V2R1 Communications Server adds two new SMF 119 event records:

- The SMF 119, subtype 71 record contains FTP daemon configuration data. This record is created during the FTP daemon initialization when it listens on the listening port successfully for the first time. A new FTP.DATA statement SMFDCFG is added to control whether to write this SMF record to the SMF data set.

- The SMF 119, subtype 24 record provides the TN3270 server initial profile configuration information, as well as information about replacement of the profile caused by VARY TCPIP,Telnet,OBEYFILE processing. This record is written to the MVS SMF data sets.

In z/OS V2R1 Communications Server, you can obtain FTP daemon configuration data by using the following NMIs:

- The TCP/IP callable NMI, EZBNMIFR, by specifying the new request type, GetFTPDaemonConfig.

- The real-time TCP/IP network monitoring NMI, SYSTCPSM. The SMF type 119, subtype 71 record for FTP daemon configuration data is available to this NMI.

In addition, TN3270 server profile configuration data can be obtained through the following NMIs:

- The TCP/IP callable NMI, EZBNMIFR by specifying the new request type, GetTnProfile.
The real-time TCP/IP network monitoring NMI, SYSTCPSM. The SMF type 119, subtype 24 record for TN3270 server profile configuration data is available to this NMI.

The new SMF 119 event record is subtype 24 and is written to the MVS SMF data sets. The event record can also be obtained from the real-time TCP/IP network monitoring NMI (SYSTCPSM). The new SMF record provides the initial profile and information about replacement of the profile caused by VARY TCPIP,Telnet,OBEYFILE processing.

The new GetTnProfile request for the TCP/IP Callable NMI, EZBNMIFR, provides complete profile information. Network management applications can use a combination of the GetTnProfile request and the new SMF 119 event records that are created during the VARY TCPIP,Telnet,OBEYFILE command processing to monitor replacements of the Telnet profile settings.

**Using NMI and SMF enhancements for TCP/IP applications**

To obtain FTP daemon configuration data, perform the appropriate tasks in Table 98.

<table>
<thead>
<tr>
<th>Task</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Obtain FTP daemon configuration data from the TCP/IP Callable NMI by developing or enhancing an application to use the new TCP/IP callable NMI request, GetFTPDaemonConfig.</td>
<td>Network management interfaces in z/OS Communications Server: IP Programmer's Guide and Reference</td>
</tr>
<tr>
<td>Interpret return values, return codes, and reason codes that result from calling the TCP/IP callable NMI EZBNMIFR.</td>
<td>Network management interfaces in z/OS Communications Server: IP Programmer's Guide and Reference</td>
</tr>
<tr>
<td>Configure SMFDCFG statement in server FTP.DATA to write type 119 SMF record for FTP daemon configuration data into SMF data sets. The statement has no effect on whether the new SMF record is available to the real-time SMF data NMI or not.</td>
<td>File Transfer Protocol in z/OS Communications Server: IP Configuration Reference</td>
</tr>
<tr>
<td>Optionally, configure the real-time TCP/IP network monitoring NMI (SYSTCPSM) to support the SMF 119 subtype 71 event records by specifying NETMONITOR SMFSERVICE PROFILE in the PROFILE.TCPIP configuration file.</td>
<td>NETMONITOR statement in z/OS Communications Server: IP Configuration Reference</td>
</tr>
<tr>
<td>Enable applications to obtain the SMF 119 subtype 71 event records from the real-time TCP/IP network monitoring NMI (SYSTCPSM) by configuring the user IDs that are associated with applications to access the SYSTCPSM NMI interface.</td>
<td>Real-time TCP/IP network monitoring NMI: Configuration and enablement in z/OS Communications Server: IP Programmer's Guide and Reference</td>
</tr>
</tbody>
</table>

To obtain TN3270 server profile configuration data, perform the appropriate tasks in Table 99.

<table>
<thead>
<tr>
<th>Task</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Configure the creation of the SMF 119 subtype 24 event records that provide TN3270 server profile information by specifying SMFCONFIG in the PROFILE.TELNET configuration file.</td>
<td>SMFCONFIG statement in z/OS Communications Server: IP Configuration Reference</td>
</tr>
</tbody>
</table>
Table 99. NMI and SMF enhancements for TCP/IP applications about TN3270 server profile configuration data (continued)

<table>
<thead>
<tr>
<th>Task</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Optionally, configure the real-time TCP/IP network monitoring NMI (SYSTCPSM) to support the SMF 119 subtype 24 event records by specifying NETMONITOR SMFSERVICE PROFILE in the PROFILE.TCPIP configuration file.</td>
<td>NETMONITOR statement in z/OS Communications Server: IP Configuration Reference</td>
</tr>
<tr>
<td>Enable applications to obtain the SMF 119 subtype 24 event records from the real-time TCP/IP network monitoring NMI (SYSTCPSM) by configuring the user IDs that are associated with applications to access the SYSTCPSM NMI interface.</td>
<td>Real-time TCP/IP network monitoring NMI: Configuration and enablement in z/OS Communications Server: IP Programmer’s Guide and Reference</td>
</tr>
<tr>
<td>Obtain TN3270 server profile information from the TCP/IP Callable NMI by developing or enhancing an application to use the new TCP/IP Callable NMI request, GetTnProfile.</td>
<td>TCP/IP callable NMI (EZBNMIFR) in z/OS Communications Server: IP Programmer’s Guide and Reference</td>
</tr>
</tbody>
</table>

CSSMTP migration enablement

z/OS V2R1 Communications Server, with TCP/IP APAR PI40204 and SNA APAR OA47735, provides new z/OS Health Checker for z/OS migration health checks to help determine whether you are using any of the following functions on the system:

- sendmail client
- sendmail daemon
- sendmail mail submission agent (sendmail MSA)
- sendmail mail transfer agent (sendmail MTA)
- SMPTD daemon
- SMTPD mail transfer agent (SMPTD MTA)

Support for these functions will be removed in a future z/OS release.

Using CSSMTP migration enablement

To use CSSMTP migration enablement, complete the appropriate task in Table 100 on page 102.
To use the IBM Health Checker for z/OS migration check support, take the following steps:

1. Configure and start the IBM Health Checker for z/OS.
2. Activate the following health checks:
   - ZOSMIGV2R2_Next_CS_SENDMAILDAEMON
   - ZOSMIGV2R2_Next_CS_SENDMAILCLIENT
   - ZOSMIGV2R2_Next_CS_SENDMAILMTA
   - ZOSMIGV2R2_Next_CS_SENDMAILMSA
   - ZOSMIGV2R2_Next_CS_SMTPDQUEUE
   - ZOSMIGV2R2_Next_CS_SMTPDMTA
3. Review health check output for potential migration actions.

**sendmail to CSSMTP bridge**

z/OS V2R2 Communications Server is planned to be the last release to support z/OS UNIX sendmail. The z/OS sendmail to CSSMTP bridge (sendmail bridge) included with APAR PI71175 provides a compatible subset of sendmail functions so that z/OS UNIX users can still use the sendmail command to send mail messages. The sendmail bridge parses input options from the command line, reads the mail message from the UNIX System Services file, and processes the mail message. The input mail message is updated by adding SMTP commands and SMTP headers if there is no header specified in the input mail message. The updated mail message is transmitted to the JES spool data set for the Communications Server SMTP (CSSMTP) application to process.

**sendmail to CSSMTP bridge**

**Dependency:** CSSMTP must be configured and running.

**Restriction:** No replacement function in z/OS Communications Server supports using sendmail as a SMTP server for receiving mail for delivery to local TSO/E or z/OS UNIX System Services user mailboxes, or for forwarding mail to other destinations.

To use this sendmail bridge support, perform the appropriate tasks in Table 101.

**Table 101. sendmail to CSSMTP bridge**

<table>
<thead>
<tr>
<th>Task/Procedure</th>
<th>Reference</th>
</tr>
</thead>
</table>
| Configure and start CSSMTP if CSSMTP is not started | - Mail on z/OS - Configuring the CSSMTP application in z/OS Communications Server: IP Configuration Guide  
- Communications Server SMTP application in z/OS Communications Server: IP Configuration Reference |
| Set up the sendmail to CSSMTP bridge | sendmail to CSSMTP bridge in z/OS Communications Server: IP Configuration Reference |
| Invoke sendmail bridge command | For syntax, see Sending email using the sendmail to CSSMTP bridge in z/OS Communications Server: IP User's Guide and Commands |
Table 101. sendmail to CSSMTP bridge (continued)

<table>
<thead>
<tr>
<th>Task/Procedure</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use sendmail bridge for existing users who have used</td>
<td>sendmail bridge in z/OS Communications Server: IP Configuration Guide</td>
</tr>
<tr>
<td>z/OS sendmail in previous releases</td>
<td></td>
</tr>
<tr>
<td>Diagnose problems using the sendmail to CSSMTP</td>
<td>Diagnosing sendmail to CSSMTP bridge problems in z/OS Communications Server: IP Diagnosis Guide</td>
</tr>
<tr>
<td>bridge</td>
<td></td>
</tr>
</tbody>
</table>

Economics and platform efficiency

The following topics describe enhancements for economics and platform efficiency:

- "QDIO acceleration coexistence with IP filtering"
- “TCP support for selective acknowledgments” on page 104
- “Shared Memory Communications over RDMA enhancements” on page 104
- “Shared Memory Communications over RDMA adapter (RoCE) virtualization” on page 105
- “Shared Memory Communications over Remote Direct Memory Access” on page 106
- “SMC Applicability Tool (SMCAT)” on page 108
- “Connection termination notification for sockets” on page 108
- “IPv6 support for policy-based routing” on page 109
- “Affinity for application-instance DVIPAs” on page 110
- “Enhanced Fast Path socket support” on page 110
- “Enhanced TCP protocol configuration options and default settings” on page 111
- “VIPAROUTE fragmentation avoidance” on page 112

QDIO acceleration coexistence with IP filtering

z/OS V2R1 Communications Server allows the QDIO Accelerator function, which provides accelerated forwarding of packets, to be enabled when IP Security is enabled. In previous releases, QDIO Accelerator could not be enabled if IP Security was enabled.

Restrictions:

- If your IP filter rules and defensive filter rules do not explicitly permit all routed traffic, QDIO Accelerator forwards only Sysplex Distributor traffic. In this case, routed traffic is processed by the forwarding stack.
- If your IP filter rules or defensive filter rules permit all routed traffic but require routed traffic to be logged, QDIO Accelerator forwards only Sysplex Distributor traffic. In this case, routed traffic is processed by the forwarding stack.
- The QDIO Accelerator function is available for IPv4 traffic only.

Allowing QDIO acceleration to coexist with IP filtering

To allow QDIO acceleration to coexist with IP filtering, perform the appropriate tasks in Table 102.

Table 102. QDIO acceleration coexistence with IP filtering

<table>
<thead>
<tr>
<th>Task</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enable QDIO Accelerator with IP security.</td>
<td>IPCONFIG statement in z/OS Communications Server: IP Configuration Reference</td>
</tr>
</tbody>
</table>
TCP support for selective acknowledgments

z/OS V2R1 Communications Server provides the following TCP support for selective acknowledgments:

- Generation of TCP selective acknowledgments as defined in RFC 2018
- Exploitation of incoming TCP selective acknowledgments to improve TCP retransmission processing as defined in RFC 3517

A TCP connection might experience poor performance when multiple packets are lost from one window of data. With the limited information available from cumulative acknowledgments, a TCP sender can learn about only a single lost packet per round-trip time. A Selective Acknowledgment (SACK) mechanism, combined with a selective repeat retransmission policy, can help to overcome these limitations. The receiving TCP sends back SACK packets to the sender informing the sender of data that has been received. The sending TCP can then retransmit only the missing data segments.

Using the TCP support for selective acknowledgments

To use the TCP support for selective acknowledgments, perform the appropriate tasks in Table 103.

Table 103. TCP support for selective acknowledgments

<table>
<thead>
<tr>
<th>Task</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disable the exchange of selective acknowledgments.</td>
<td>NOSELECTIVEACK configuration option on the TCPCONFIG statement in z/OS Communications Server: IP Configuration Reference</td>
</tr>
<tr>
<td>Determine whether the selective acknowledgment function is enabled:</td>
<td>• Netstat CONFIG/-f report in z/OS Communications Server: IP System Administrator’s Commands</td>
</tr>
<tr>
<td>• Issue the Netstat CONFIG/-f command.</td>
<td>• GetProfile request in z/OS Communications Server: IP Programmer’s Guide and Reference</td>
</tr>
<tr>
<td>• Update your network management application to use the information</td>
<td>• SMFCOMMAND statement in z/OS Communications Server: IP Configuration Reference</td>
</tr>
<tr>
<td>that is returned by the GetProfile callable NMI.</td>
<td></td>
</tr>
<tr>
<td>Configure the creation of the SMF 119 subtype 4 event records that</td>
<td></td>
</tr>
<tr>
<td>provide TCP/IP profile information.</td>
<td></td>
</tr>
</tbody>
</table>

Shared Memory Communications over RDMA enhancements

z/OS V2R1 Communications Server can display the amount of 64-bit storage that VTAM has allocated by using the D NET, BFRUSE command.

Using Shared Memory Communications over RDMA enhancements

To display how much 64-bit storage is allocated, complete the task in Table 104 on page 105.
Shared Memory Communications over RDMA adapter (RoCE) virtualization

This function extends the Shared Memory Communications over Remote Direct Memory Access (SMC-R) function to allow TCP/IP stacks on different LPARs within the same central processor complex (CPC) to share the same physical IBM 10 GbE RoCE Express feature.

Restriction:
- Each TCP/IP stack that shares the same physical 10 GbE RoCE Express feature must use a unique function ID (FID) and virtual function number (VFN) to represent the feature. Define the FID and VFN values in the Hardware Configuration Definition (HCD).

Dependencies:
- This function requires IBM z13 (z13) or later systems.
- This function requires at least one IBM 10 GbE RoCE Express feature configured in the HCD with a FID and a VFN value.
- The PTFs for APARs OA44576 and PI12223 must be applied.

Using Shared Memory Communications over RDMA adapter (RoCE) virtualization

To exploit the Shared Memory Communications over RDMA Adapter (RoCE) virtualization function, complete the tasks in Table 105.

### Table 105. Shared Memory Communications over RDMA adapter (RoCE) virtualization

<table>
<thead>
<tr>
<th>Task</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Configure at least one IBM 10 GbE RoCE Express feature in HCD. If you have existing 10 GbE RoCE Express definitions, update the definition to include a VFN value. For each unique combination of PCHID and VFN values, configure a unique function ID (FID) value.</td>
<td>z/OS Hardware Configuration Definition (HCD) Reference Summary</td>
</tr>
</tbody>
</table>
| Configure or update the GLOBALCONFIG SMCR statement in the TCP/IP profile.  
  - If you have existing PFID definitions on the GLOBALCONFIG statement and you changed the FID value in the HCD for the 10 GbE RoCE Express feature, update the existing GLOBALCONFIG PFID values to specify the new FID value.  
  - If you define PFID values, choose PFID values that represent physically different 10 GbE RoCE Express features to provide full redundancy support. | GLOBALCONFIG statement in z/OS Communications Server: IP Configuration Reference |
| Verify the GLOBALCONFIG SMCR settings by issuing the Netstat CONFIG/-f command. | Netstat CONFIG/-f report in z/OS Communications Server: IP System Administrator’s Commands |
| Display the status of the 10 GbE RoCE Express feature by issuing the D PCIE command. | Displaying PCIE information in z/OS MVS System Commands |
Table 105. Shared Memory Communications over RDMA adapter (RoCE) virtualization (continued)

<table>
<thead>
<tr>
<th>Task</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Verify that the correct VFN and PNetID values are assigned to the</td>
<td>DISPLAY ID command and DISPLAY TRL command in z/OS Communications Server: SNA Operation</td>
</tr>
<tr>
<td>dynamic 10 GbE RoCE Express TRLEs by issuing the D NET,ID=trle, or</td>
<td></td>
</tr>
<tr>
<td>D NET,TRL,TRL=trle command.</td>
<td></td>
</tr>
<tr>
<td>Display information about a 10 GbE RoCE Express interface by issuing</td>
<td>Netstat Devlinks/-d report in z/OS Communications Server: IP System Administrator’s Commands</td>
</tr>
<tr>
<td>the Netstat Devlinks/-d command and specifying the 10 GbE RoCE</td>
<td></td>
</tr>
<tr>
<td>Express interface.</td>
<td></td>
</tr>
</tbody>
</table>

Shared Memory Communications over Remote Direct Memory Access

z/OS V2R1 Communications Server provides significant performance improvements for TCP protocol workloads on external networks. This solution uses Shared Memory Communications over Remote Direct Memory Access (SMC-R) for TCP connections to remote peers on external networks that also support this function.

Restrictions:
- This function does not support external networks that contain a mix of interfaces, where some interfaces specify a VLAN ID and some interfaces do not specify a VLAN ID.

Incompatibilities: This function does not support IPAQENET interfaces that are defined by using the DEVICE, LINK, and HOME statements. Convert your IPAQENET definitions to use the INTERFACE statement to enable this support.

Dependencies:
- This function requires the IBM zEnterprise EC12 (zEC12) with driver 15, the IBM zEnterprise BC12 (zBC12), or later.
- This function requires at least one IBM 10 GbE RoCE Express feature that is configured in the hardware configuration definition (HCD) with a Peripheral Component Interconnect Express (PCIe) function ID (PFID).

Using Shared Memory Communications over Remote Direct Memory Access

To use Shared Memory Communications over Remote Direct Memory Access, perform the appropriate tasks in Table 106.

Table 106. Shared Memory Communications over Remote Direct Memory Access

<table>
<thead>
<tr>
<th>Task</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>If you are using IPv4 QDIO interfaces that are defined with the</td>
<td>Steps for converting from IPv4 IPAQENET DEVICE, LINK, and HOME definitions to the IPv4 IPAQENET</td>
</tr>
<tr>
<td>DEVICE, LINK, and HOME statements, convert those definitions to use</td>
<td>INTERFACE statement in z/OS Communications Server: IP Configuration Guide</td>
</tr>
<tr>
<td>the IPAQENET INTERFACE statement.</td>
<td></td>
</tr>
<tr>
<td>Configure at least one 10 GbE RoCE Express feature in HCD.</td>
<td>z/OS Hardware Configuration Definition (HCD) Reference Summary</td>
</tr>
</tbody>
</table>
Table 106. Shared Memory Communications over Remote Direct Memory Access (continued)

<table>
<thead>
<tr>
<th>Task</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Select a unique physical network (PNet) ID for each of the networks. Configure the appropriate PNet ID in HCD for each OSD CHPID on a network and configure the PNet ID on each 10 GbE RoCE Express interface to be used on that network.</td>
<td>z/OS Hardware Configuration Definition (HCD) Reference Summary</td>
</tr>
<tr>
<td>Configure SMCR on the GLOBALCONFIG statement in the TCP/IP profile, and specify the PFID and optionally the port number corresponding to each 10 GbE RoCE Express interface.</td>
<td>GLOBALCONFIG statement in z/OS Communications Server: IP Configuration Reference</td>
</tr>
<tr>
<td>For each IPv4 interface to be used for SMC-R, configure a nonzero subnet mask on the INTERFACE statement in the TCP/IP profile and use the same subnet value as the remote peer stack.</td>
<td>Shared Memory Communications over Remote Direct Memory Access in z/OS Communications Server: IP Configuration Guide</td>
</tr>
<tr>
<td>For each IPv6 interface to be used for SMC-R, ensure that the interface has at least one associated prefix in common with the remote peer stack.</td>
<td></td>
</tr>
<tr>
<td>Optionally, restrict SMC-R from being used by certain server applications by coding the NOSMCR option on the PORT or PORTRANGE statement that defines the server port.</td>
<td>PORT statement and PORTRANGE statement in z/OS Communications Server: IP Configuration Reference</td>
</tr>
<tr>
<td>Display whether the stack is enabled for SMC-R by issuing the Netstat CONFIG/-f command.</td>
<td>Netstat: CONFIG/-f report in z/OS Communications Server: IP System Administrator's Commands</td>
</tr>
<tr>
<td>Display the status of the 10 GbE RoCE Express feature by issuing the D PCIE command.</td>
<td>D PCIE command in z/OS MVS System Commands</td>
</tr>
<tr>
<td>Display information about the dynamic 10 GbE RoCE Express TRLEs by issuing the D NET,ID=trle, or D NET,TRL,TRLE=trle command.</td>
<td>DISPLAY ID command and DISPLAY TRL command in z/OS Communications Server: SNA Operation</td>
</tr>
<tr>
<td>Display information about a 10 GbE RoCE Express interface by issuing the Netstat DEvlinks/-d command for the 10 GbE RoCE Express interface.</td>
<td>Netstat DEvlinks/-d report in z/OS Communications Server: IP System Administrator's Commands</td>
</tr>
<tr>
<td>Display the PNet ID for an active OSD or 10 GbE RoCE Express interface using the Netstat DEvlinks/-d command or by issuing the D NET,ID=trle or D NET,TRL,TRLE=trle command.</td>
<td>See the following topics:</td>
</tr>
<tr>
<td>Display information about the number of sends, receives, and bytes that went over a 10 GbE RoCE Express interface by issuing the Netstat DEvlinks/-d command for the 10 GbE RoCE Express interface or by using VTAM tuning statistics for the 10 GbE RoCE Express interface.</td>
<td>See the following topics:</td>
</tr>
<tr>
<td>Display how many TCP connections are using SMC-R by issuing the Netstat STATS/-S command.</td>
<td>Netstat STATS/-S report in z/OS Communications Server: IP System Administrator's Commands</td>
</tr>
<tr>
<td>Display information about which TCP connections are using SMC-R by issuing the Netstat ALL/-A command.</td>
<td>Netstat ALL/-A report in z/OS Communications Server: IP System Administrator's Commands</td>
</tr>
<tr>
<td>Display information about storage that is being used by TCP/IP for SMC-R by issuing the D TCPIP,STOR command.</td>
<td>D TCPIP,STOR command in z/OS Communications Server: IP System Administrator's Commands</td>
</tr>
</tbody>
</table>
Table 106. Shared Memory Communications over Remote Direct Memory Access (continued)

<table>
<thead>
<tr>
<th>Task</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Display information about SMC-R link groups and the associated SMC-R links by issuing the Netstat DEvlinks/-d command with the SMC parameter. Use this information to verify the redundancy level of each SMC-R link group.</td>
<td>Netstat DEvlinks/-d report in z/OS Communications Server: IP System Administrator’s Commands</td>
</tr>
</tbody>
</table>

**SMC Applicability Tool (SMCAT)**

z/OS V2R1 Communications Server, with APAR PI29165 and PI39612, provides the SMC Applicability Tool (SMCAT) that provides the ability to monitor and evaluate TCP/IP network traffic. You can use the evaluation to determine the applicability of Shared Memory Communications over Remote Direct Memory Access (SMC-R) to your network environment. You do not need to enable the SMC-R function on any system, or enable any 10 GbE RoCE Express features, to use the SMC Applicability Tool.

You can use SMCAT to monitor a TCP/IP stack for a set of configured destination IP addresses or subnets, and to provide a report in the TCP/IP stack job log. The report provides details of the amount of TCP workload that can potentially use SMC-R if SMC-R is available. For more information about the SMC Applicability Tool, see z/OS Communications Server: IP System Administrator’s Commands.

**Enabling the SMC Applicability Tool (SMCAT)**

To enable the SMCAT, complete the appropriate tasks in Table 107.

**Table 107. SMC Applicability Tool (SMCAT)**

<table>
<thead>
<tr>
<th>Task</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Configure the SMCAT data set with the SMCATCFG statement.</td>
<td>VARY,,SMCAT in z/OS Communications Server: IP System Administrator’s Commands</td>
</tr>
<tr>
<td>Issue the VARY TCPIP,,SMCAT command.</td>
<td>VARY,,SMCAT in z/OS Communications Server: IP System Administrator’s Commands</td>
</tr>
<tr>
<td>View the SMCAT Report in the JOBLOG for the TCP/IP stack.</td>
<td>VARY,,SMCAT in z/OS Communications Server: IP System Administrator’s Commands</td>
</tr>
</tbody>
</table>

**Connection termination notification for sockets**

In z/OS V2R1 Communications Server, an application can issue a synchronous or an asynchronous receive socket API call that completes only when a TCP connection is ended.

This support is available on the recv(), recvfrom(), and recvmsg() functions in the z/OS XL C/C++ Runtime Library. The support is also available on the recv(BPX1RCV, BPX4RCV), recvfrom(BPX1RFM, BPX4RFM), recvmsg(BPX2RMS, BPX4RMS), and asyncio(BPX1AIO, BPX4AIO) assembler callable services.

**Restriction:** This enhancement is supported for TCP sockets, but not for UDP or RAW sockets.
Receiving notification of the termination of a socket connection

To receive a notification when a socket connection is terminated, perform the task in Table 108.

Table 108. Connection termination notification for sockets

<table>
<thead>
<tr>
<th>Task</th>
<th>Reference</th>
</tr>
</thead>
</table>
| Issue the receive socket call with the flag value MSG_CONNTERM. | • Recv(), recvfrom(), and recvmsg() in z/OS XL C/C++ Runtime Library Reference  
• Recv(BPX1RCV, BPX4RCV), recvfrom(BPX1RFM, BPX4RFM), and recvmsg(BPX2RMS, BPX4RMS) in z/OS UNIX System Services Programming: Assembler Callable Services Reference  
• Asyncio(BPX1AIO, BPX4AIO), AioCmd=Aio#Recv, AioCmd=Aio#RecvFrom, and AioCmd=Aio#RecvMsg in z/OS UNIX System Services Programming: Assembler Callable Services Reference |

IPv6 support for policy-based routing

With IPv6 policy-based routing, the TCP/IP stack can make IPv6 routing decisions that take into account criteria other than just the destination IP address. The additional criteria can include job name, source port, destination port, protocol type (TCP or UDP), source IP address, NetAccess security zone, and security label.

Restriction: IPv6 policy-based routing applies only to TCP and UDP traffic that originates at the TCP/IP stack. The following two kinds of IPv6 traffic are routed by using the main route table, even when IPv6 policy-based routing is in use.
• IPv6 traffic that uses protocols other than TCP and UDP
• All IPv6 traffic that is being forwarded by the TCP/IP stack

Using IPv6 support for policy-based routing

To use IPv6 support for policy-based routing, perform the appropriate tasks in Table 109.

Table 109. IPv6 policy-based routing

<table>
<thead>
<tr>
<th>Task</th>
<th>Reference</th>
</tr>
</thead>
</table>
| Enable IPv6 policy-based routing by using the IBM Configuration Assistant for z/OS Communications Server or manual configuration. | • Policy-based routing in z/OS Communications Server: IP Configuration Guide  
• IBM Configuration Assistant for z/OS Communications Server online help; see the "What's New in V2R1" help information for IPv6 policy-based routing configuration  
• Policy-based routing policy statements in z/OS Communications Server: IP Configuration Reference |
| Issue the pasearch -R command to display all routing policy rules and actions. | The z/OS UNIX pasearch command: Display policies in z/OS Communications Server: IP System Administrator's Commands |
| Issue the pasearch -T command to display all route tables. | The z/OS UNIX pasearch command: Display policies in z/OS Communications Server: IP System Administrator's Commands |
Affinity for application-instance DVIPAs

z/OS V2R1 Communications Server provides support to create a VIPARANGE DVIPA with affinity to the address space of the application that created it. In previous releases, the SIOCSVIPA and SIOCSVIPA6 IOCTL functions and the MODDVIPA utility supported the define and delete options. In z/OS V2R1 Communications Server, a new define with affinity option is supported. When an application uses the SIOCSVIPA or the SIOCSVIPA6 IOCTL function to create a DVIPA with the address space affinity option, connection requests for this DVIPA are routed to a server that runs in the address space of the application. This behavior is beneficial when there are multiple shareport applications listening on the IPv4 inaddr_any or the IPv6-unspecified address. With this new support, the application that created the DVIPA is preferred over other listeners. If no matching listeners are available, normal shareport load balancing is used to select the best available listener.

Enabling affinity for application-instance DVIPAs

To enable the affinity for application-instance DVIPAs function, perform the appropriate tasks in Table 110.

Table 110. Affinity for application-instance DVIPAs

<table>
<thead>
<tr>
<th>Task</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>To create a VIPARANGE DVIPA with affinity using the SIOCSVIPA or SIOCSVIPA6 ioctl, issue the IOCTL command by using the new DVR_DEFINE_AFFINITY option instead of using DVR_DEFINE.</td>
<td>Using the SIOCSVIPA or SIOCSVIPA6 ioctl command in z/OS Communications Server: IP Configuration Guide</td>
</tr>
<tr>
<td>To create a VIPARANGE DVIPA with affinity by using the MODDVIPA utility, issue the MODDVIPA command with the new -a option instead of using the -c option.</td>
<td>Using the MODDVIPA utility in z/OS Communications Server: IP Configuration Guide</td>
</tr>
</tbody>
</table>

Enhanced Fast Path socket support

z/OS V2R1 Communications Server enhances the performance of the following 6 API calls: recv()/send(), recvfrom()/sendto(), and recvmsg()/sendmsg(). This function is automatically enabled; no tasks are necessary.
Enhanced TCP protocol configuration options and default settings

In z/OS V2R1 Communications Server, the TCP configuration options have the following changes:

- New parameters on the TCPCONFIG statement
- Changes to the default values and limits of existing parameters on the TCPCONFIG and SOMAXCONN statements

Using enhanced TCP protocol configuration options and default settings

To use enhanced TCP protocol configuration options and default settings, perform the appropriate tasks in Table 111.

Table 111. Enhanced TCP protocol configuration options and default settings

<table>
<thead>
<tr>
<th>Task</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specify the number of seconds that a connection remains in TIMEWAIT state.</td>
<td>The TIMEWAITINTERVAL parameter in TCPCONFIG statement in z/OS Communications Server: IP Configuration Reference</td>
</tr>
<tr>
<td>Specify the maximum retransmit interval for TCP connections.</td>
<td>The MAXIMUMRETRANSMITTIME parameter in TCPCONFIG statement in z/OS Communications Server: IP Configuration Reference</td>
</tr>
<tr>
<td>Specify the maximum number of retransmit attempts for TCP connections.</td>
<td>The RETRANSMITATTEMPTS parameter in TCPCONFIG statement in z/OS Communications Server: IP Configuration Reference</td>
</tr>
<tr>
<td>Specify the total amount of time before the initial connection times out.</td>
<td>The CONNECTTIMEOUT parameter in TCPCONFIG statement in z/OS Communications Server: IP Configuration Reference</td>
</tr>
<tr>
<td>Specify the iniital retransmission interval for the connect().</td>
<td>The CONNECTINITINTERVAL parameter in TCPCONFIG statement in z/OS Communications Server: IP Configuration Reference</td>
</tr>
<tr>
<td>Specify whether the Nagle algorithm is disabled globally.</td>
<td>The NAGLE/NONAGLE parameter in TCPCONFIG statement in z/OS Communications Server: IP Configuration Reference</td>
</tr>
<tr>
<td>Specify the maximum number of keep alive probes for TCP connections.</td>
<td>The KEEPALIVEPROBES parameter in TCPCONFIG statement in z/OS Communications Server: IP Configuration Reference</td>
</tr>
<tr>
<td>Specify the interval between keep alive probes for TCP connections.</td>
<td>The KEEPALIVEPROBEINTERVAL parameter in TCPCONFIG statement in z/OS Communications Server: IP Configuration Reference</td>
</tr>
<tr>
<td>Specify a FINWAIT2 time out value less than 60 seconds for TCP connections.</td>
<td>The FINWAIT2 parameter in TCPCONFIG statement in z/OS Communications Server: IP Configuration Reference</td>
</tr>
<tr>
<td>Specify a threshold for engaging TCP outbound serialization.</td>
<td>The QUEUEDRTT parameter in TCPCONFIG statement in z/OS Communications Server: IP Configuration Reference</td>
</tr>
<tr>
<td>Specify the threshold for triggering Fast Retransmit, Fast Recovery processing for TCP connections.</td>
<td>The FRRTHRESHOLD parameter in TCPCONFIG statement in z/OS Communications Server: IP Configuration Reference</td>
</tr>
<tr>
<td>Specify a maximum send buffer size for TCP connections.</td>
<td>The TCPMAXSENDBUFRSIZE parameter in TCPCONFIG statement in z/OS Communications Server: IP Configuration Reference</td>
</tr>
</tbody>
</table>
Table 111. Enhanced TCP protocol configuration options and default settings (continued)

<table>
<thead>
<tr>
<th>Task</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Display the values for the new TCPCONFIG parameters.</td>
<td>Netstat CONFIG/-f report in z/OS Communications Server: IP System Administrator’s Commands</td>
</tr>
<tr>
<td>Display the values for the changed TCPCONFIG parameters.</td>
<td>Netstat CONFIG/-f report in z/OS Communications Server: IP System Administrator’s Commands</td>
</tr>
<tr>
<td>Display the changed SOMAXCONN default value.</td>
<td>Netstat CONFIG/-f report in z/OS Communications Server: IP System Administrator’s Commands</td>
</tr>
</tbody>
</table>

IBM Health Checker for FTP ANONYMOUS JES

With TCP/IP APAR PI47637 and SNA APAR OA49668, z/OS V2R1 Communications Server provides a new IBM Health Checker for z/OS application health check to help determine whether your FTP server allows anonymous users to submit jobs. When ANONYMOUS FTP is allowed on the FTP server, it is recommended that ANONYMOUSLEVEL be set to 3 and ANONYMOUSFILETYPEJES be set to FALSE. Otherwise, anonymous users can submit jobs to run on the system.

**Dependency:** You must install TCP/IP APAR PI47637 and SNA APAR OA49668 and start the IBM Health Checker for z/OS to use the new application health check.

IBM Health Checker for FTP ANONYMOUS JES

To use the IBM Health Checker for FTP ANONYMOUS JES, perform the appropriate tasks in Table 112.

Table 112. IBM Health Checker for FTP ANONYMOUS JES

<table>
<thead>
<tr>
<th>Task/Procedure</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>To use the IBM Health Checker for z/OS application check support, take the following steps:</td>
<td>See the following topics in IBM Health Checker for z/OS: User’s Guide</td>
</tr>
<tr>
<td>1. Configure and start the IBM Health Checker for z/OS.</td>
<td>• Setting up IBM Health Checker for z/OS</td>
</tr>
<tr>
<td>2. Review the CSAPP_FTPD_ANONYMOUS_JES health check output.</td>
<td>• Working with check output</td>
</tr>
<tr>
<td></td>
<td>• Managing checks</td>
</tr>
</tbody>
</table>

VIPAROUTE fragmentation avoidance

z/OS V2R1 Communications Server, with APAR PI39519, adds a TCP/IP profile GLOBALCONFIG parameter, ADJUSTDVIPAMSS to adjust the TCP Maximum Segment Size (MSS). Sysplex Distributor traffic that is routed by using VIPAROUTE adds a Generic Routing Encapsulation (GRE) header to the packet. Thus, the packet might be fragmented from the distributor to the target stack. The new function takes the GRE header into account when specifying the MSS value. It eliminates fragmentation by the distributor that would have been caused by the addition of the GRE header.

**Eliminating VIPAROUTE fragmentation**

To eliminate the fragmentation, complete the appropriate tasks in Table 113 on page 113.
Table 113. VIPAROUTE fragmentation avoidance

<table>
<thead>
<tr>
<th>Task</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Because the new function is enabled by default, no actions are required to use the new function.</td>
<td>GLOBALCONFIG statement in z/OS Communications Server: IP Configuration Reference</td>
</tr>
<tr>
<td>Determine the value of the new ADJUSTDVIPAMSS parameter:</td>
<td>Netstat CONFIG/-f report in z/OS Communications Server: IP Diagnosis Guide</td>
</tr>
<tr>
<td>• Issue the Netstat CONFIG/-f command.</td>
<td>GetProfile request in z/OS Communications Server: IP Diagnosis Guide</td>
</tr>
<tr>
<td>• Update your network management application to use the information that is returned by the GetProfile callable NMI.</td>
<td>SMFCONFIG statement in z/OS Communications Server: IP Configuration Reference</td>
</tr>
<tr>
<td>• Use the information that is returned in the SMF 119 subtype 4 event records that provide TCP/IP profile information.</td>
<td>SMF 119 record subtypes in z/OS Communications Server: IP Diagnosis Guide</td>
</tr>
</tbody>
</table>

Scalability and performance

The following topic describes enhancements for scalability and performance:

• “Improved control over default VTAM VIT options” on page 66

Improved control over default VTAM VIT options

z/OS V2R1 Communications Server, with SNA APAR OA50271, provides two levels of operator control for managing VTAM Internal Trace (VIT) internal mode record collection:

• You can use “Full VIT control” to control the use of all VIT options, at any time, using VTAM start options or the MODIFY TRACE and MODIFY NOTRACE commands. This includes the ability to disable all internal mode VIT recording, with the exception of when a CSDUMP message or code trigger is active. In this condition the VIT MSG option cannot be disabled. The DISPLAY TRACE command always displays the current settings of all VIT options.

• You can use “Base VIT control” to allow VTAM to enforce that certain VIT options (API, CIO, MSG, NRM, PIU and SSCP) remain active at all times. The DISPLAY TRACE command displays the settings of these VIT options only if you have explicitly enabled the options, otherwise the settings are not displayed. This is the default behavior, and this was the only level of VIT control provided originally.

Restriction: The two levels of VIT control apply to internal mode recording only. External mode recording of VIT records is unchanged regardless of the level of VIT control used for internal mode recording.

To enable the improved control over default VTAM VIT options, complete the appropriate tasks in Table 114

Table 114. Task topics to enable improved control over default VTAM VIT options

<table>
<thead>
<tr>
<th>Task</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specify the VITCTRL=FULL start option on the VTAM START command to enable “Full VIT control” mode when VTAM is activated.</td>
<td>VTAM Start Options in z/OS Communications Server: SNA Resource Definition Reference</td>
</tr>
<tr>
<td>Specify the VITCTRL=BASE start option, or take the default setting, on the VTAM START command to enable “Base VIT control” mode when VTAM is activated.</td>
<td>VTAM Start Options in z/OS Communications Server: SNA Resource Definition Reference</td>
</tr>
<tr>
<td>Task</td>
<td>Reference</td>
</tr>
<tr>
<td>------</td>
<td>-----------</td>
</tr>
<tr>
<td>Issue the MODIFY VTAMOPTS,VITCTRL=FULL command to dynamically activate “Full VIT control” mode.</td>
<td>MODIFY VTAMOPTS in z/OS Communications Server: SNA Operation</td>
</tr>
<tr>
<td>Issue the MODIFY VTAMOPTS,VITCTRL=BASE command to dynamically activate “Base VIT control” mode.</td>
<td>MODIFY VTAMOPTS in z/OS Communications Server: SNA Operation</td>
</tr>
</tbody>
</table>
| If you are operating in “Full VIT control” mode, use the follow commands to control or display VIT options:  
• Issue MODIFY NOTRACE,TYPE=VTAM,MODE=INT, OPTION=(options) to disable one or more VIT options. Specifying OPTION=ALL or OPTION=END disables all internal mode VIT recording.  
• Issue MODIFY TRACE,TYPE=VTAM,MODE=INT, OPTION=(options) to enable one or more VIT options.  
• Issue DISPLAY TRACES to display the current settings of all VIT options. | See the following topics:  
• DISPLAY TRACES in z/OS Communications Server: SNA Operation  
• MODIFY TRACE in z/OS Communications Server: SNA Operation  
• MODIFY NOTRACE in z/OS Communications Server: SNA Operation |
Appendix A. Related protocol specifications

This appendix lists the related protocol specifications (RFCs) for TCP/IP. The Internet Protocol suite is still evolving through requests for comments (RFC). New protocols are being designed and implemented by researchers and are brought to the attention of the Internet community in the form of RFCs. Some of these protocols are so useful that they become recommended protocols. That is, all future implementations for TCP/IP are recommended to implement these particular functions or protocols. These become the de facto standards, on which the TCP/IP protocol suite is built.

You can request RFCs through electronic mail, from the automated Network Information Center (NIC) mail server, by sending a message to service@nic.ddn.mil with a subject line of RFC nnnn for text versions or a subject line of RFC nnnn.PS for PostScript versions. To request a copy of the RFC index, send a message with a subject line of RFC INDEX.

For more information, contact nic@nic.ddn.mil or at:

Government Systems, Inc.
Attn: Network Information Center
14200 Park Meadow Drive
Suite 200
Chantilly, VA 22021

Hard copies of all RFCs are available from the NIC, either individually or by subscription. Online copies are available at the following Web address:

http://www.rfc-editor.org/rfc.html

Draft RFCs that have been implemented in this and previous Communications Server releases are listed at the end of this topic.

Many features of TCP/IP Services are based on the following RFCs:

<table>
<thead>
<tr>
<th>RFC</th>
<th>Title and Author</th>
</tr>
</thead>
<tbody>
<tr>
<td>RFC 652</td>
<td>Telnet output carriage-return disposition option D. Crocker</td>
</tr>
<tr>
<td>RFC 653</td>
<td>Telnet output horizontal tabstops option D. Crocker</td>
</tr>
<tr>
<td>RFC 654</td>
<td>Telnet output horizontal tab disposition option D. Crocker</td>
</tr>
<tr>
<td>RFC 655</td>
<td>Telnet output formfeed disposition option D. Crocker</td>
</tr>
<tr>
<td>RFC 657</td>
<td>Telnet output vertical tab disposition option D. Crocker</td>
</tr>
<tr>
<td>RFC 658</td>
<td>Telnet output linefeed disposition D. Crocker</td>
</tr>
<tr>
<td>RFC 698</td>
<td>Telnet extended ASCII option T. Mock</td>
</tr>
</tbody>
</table>
RFC 726  
*Remote Controlled Transmission and Echoing Telnet option*  J. Postel, D. Crocker

RFC 727  
*Telnet logout option*  M.R. Crispin

RFC 732  
*Telnet Data Entry Terminal option*  J.D. Day

RFC 733  
*Standard for the format of ARPA network text messages*  D. Crocker, J. Vittal, K.T. Pogran, D.A. Henderson

RFC 734  
*SUPDUP Protocol*  M.R. Crispin

RFC 735  
*Revised Telnet byte macro option*  D. Crocker, R.H. Gumpertz

RFC 736  
*Telnet SUPDUP option*  M.R. Crispin

RFC 749  
*Telnet SUPDUP—Output option*  B. Greenberg

RFC 765  
*File Transfer Protocol specification*  J. Postel

RFC 768  
*User Datagram Protocol*  J. Postel

RFC 779  
*Telnet send-location option*  E. Killian

RFC 783  
*TFTP Protocol (revision 2)*  K.R. Sollins

RFC 791  
*Internet Protocol*  J. Postel

RFC 792  
*Internet Control Message Protocol*  J. Postel

RFC 793  
*Transmission Control Protocol*  J. Postel

RFC 820  
*Assigned numbers*  J. Postel

RFC 821  
*Simple Mail Transfer Protocol*  J. Postel

RFC 822  
*Standard for the format of ARPA Internet text messages*  D. Crocker

RFC 823  
*DARPA Internet gateway*  R. Hinden, A. Sheltzer

RFC 826  
*Ethernet Address Resolution Protocol: Or converting network protocol addresses to 48.bit Ethernet address for transmission on Ethernet hardware*  D. Plummer

RFC 854  
*Telnet Protocol Specification*  J. Postel, J. Reynolds
RFC 855
Telnet Option Specification J. Postel, J. Reynolds

RFC 856
Telnet Binary Transmission J. Postel, J. Reynolds

RFC 857
Telnet Echo Option J. Postel, J. Reynolds

RFC 858
Telnet Suppress Go Ahead Option J. Postel, J. Reynolds

RFC 859
Telnet Status Option J. Postel, J. Reynolds

RFC 860
Telnet Timing Mark Option J. Postel, J. Reynolds

RFC 861
Telnet Extended Options: List Option J. Postel, J. Reynolds

RFC 862
Echo Protocol J. Postel

RFC 863
Discard Protocol J. Postel

RFC 864
Character Generator Protocol J. Postel

RFC 865
Quote of the Day Protocol J. Postel

RFC 868
Time Protocol J. Postel, K. Harrenstien

RFC 877
Standard for the transmission of IP datagrams over public data networks J.T. Korb

RFC 883
Domain names: Implementation specification P.V. Mockapetris

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RFC 885
Telnet end of record option J. Postel

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Reverse Address Resolution Protocol R. Finlayson, T. Mann, J. Mogul, M. Theimer

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Exterior Gateway Protocol formal specification D. Mills

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Broadcasting Internet Datagrams J. Mogul
RFC 922  
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RFC 927  
TACACS user identification Telnet option B.A. Anderson

RFC 933  
Output marking Telnet option S. Silverman

RFC 946  
Telnet terminal location number option R. Nedved

RFC 950  
Internet Standard Subnetting Procedure J. Mogul, J. Postel

RFC 952  
DoD Internet host table specification K. Harrenstien, M. Stahl, E. Feinler

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File Transfer Protocol J. Postel, J.K. Reynolds

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RFC 974  
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RFC 1002  

RFC 1006  
ISO transport services on top of the TCP: Version 3 M.T. Rose, D.E. Cass

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RFC 1079
Telnet terminal speed option C. Hedrick

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ISO presentation services on top of TCP/IP based internets M.T. Rose

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Appendix B. Architectural specifications

This appendix lists documents that provide architectural specifications for the SNA Protocol.

The APPN Implementers' Workshop (AIW) architecture documentation includes the following architectural specifications for SNA APPN and HPR:

- APPN Architecture Reference (SG30-3422-04)
- APPN Branch Extender Architecture Reference Version 1.1
- APPN Dependent LU Requester Architecture Reference Version 1.5
- APPN Extended Border Node Architecture Reference Version 1.0
- APPN High Performance Routing Architecture Reference Version 4.0
- SNA Formats (GA27-3136-20)
- SNA Technical Overview (GC30-3073-04)


The following RFC also contains SNA architectural specifications:

- RFC 2353 APPN/HPR in IP Networks APPN Implementers' Workshop Closed Pages Document

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Accessibility features help a user who has a physical disability, such as restricted mobility or limited vision, to use software products successfully. The major accessibility features in z/OS enable users to:

- Use assistive technologies such as screen readers and screen magnifier software
- Operate specific or equivalent features using only the keyboard
- Customize display attributes such as color, contrast, and font size

Using assistive technologies

Assistive technology products, such as screen readers, function with the user interfaces found in z/OS. Consult the assistive technology documentation for specific information when using such products to access z/OS interfaces.

Keyboard navigation of the user interface

Users can access z/OS user interfaces using TSO/E or ISPF. See 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.

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Bibliography

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z/OS Communications Server documentation is available in the following forms:
- Online at the z/OS Internet Library web page at www.ibm.com/systems/z/os/zos/bkserv/
- In softcopy on CD-ROM collections. See “Softcopy information” on page xvi.

z/OS Communications Server library updates

An index to z/OS Communications Server book updates is at http://www.ibm.com/support/docview.wss?uid=swg21178966. Updates to documents are also available on RETAIN and in information APARs (info APARs). Go to http://www.ibm.com/software/network/commserver/zos/support to view information APARs.

z/OS Communications Server information

z/OS Communications Server product information is grouped by task in the following tables.

Planning

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<tr>
<td>z/OS Communications Server: New Function Summary</td>
<td>GC27-3664</td>
<td>This document is intended to help you plan for new IP or SNA function, whether you are migrating from a previous version or installing z/OS for the first time. It summarizes what is new in the release and identifies the suggested and required modifications needed to use the enhanced functions.</td>
</tr>
<tr>
<td>z/OS Communications Server: IPv6 Network and Application Design Guide</td>
<td>SC27-3663</td>
<td>This document is a high-level introduction to IPv6. It describes concepts of z/OS Communications Server's support of IPv6, coexistence with IPv4, and migration issues.</td>
</tr>
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Resource definition, configuration, and tuning

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<th>Number</th>
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<tbody>
<tr>
<td>z/OS Communications Server: IP Configuration Guide</td>
<td>SC27-3650</td>
<td>This document describes the major concepts involved in understanding and configuring an IP network. Familiarity with the z/OS operating system, IP protocols, z/OS UNIX System Services, and IBM Time Sharing Option (TSO) is recommended. Use this document with the z/OS Communications Server: IP Configuration Reference.</td>
</tr>
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### Title

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<tr>
<th>Title</th>
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| **z/OS Communications Server:** IP Configuration Reference | SC27-3651 | This document presents information for people who want to administer and maintain IP. Use this document with the [z/OS Communications Server: IP Configuration Guide](#). The information in this document includes:  
- TCP/IP configuration data sets  
- Configuration statements  
- Translation tables  
- Protocol number and port assignments |
| **z/OS Communications Server:** SNA Network Implementation Guide | SC27-3672 | This document presents the major concepts involved in implementing an SNA network. Use this document with the [z/OS Communications Server: SNA Resource Definition Reference](#). |
| **z/OS Communications Server:** SNA Resource Definition Reference | SC27-3675 | This document describes each SNA definition statement, start option, and macroinstruction for user tables. It also describes NCP definition statements that affect SNA. Use this document with the [z/OS Communications Server: SNA Network Implementation Guide](#). |
| **z/OS Communications Server:** SNA Resource Definition Samples | SC27-3676 | This document contains sample definitions to help you implement SNA functions in your networks, and includes sample major node definitions. |
| **z/OS Communications Server:** IP Network Print Facility | SC27-3658 | This document is for systems programmers and network administrators who need to prepare their network to route SNA, JES2, or JES3 printer output to remote printers using TCP/IP Services. |
| **z/OS Communications Server:** IP User's Guide and Commands | SC27-3662 | This document describes how to use TCP/IP applications. It contains requests with which a user can log on to a remote host using Telnet, transfer data sets using FTP, send and receive electronic mail, print on remote printers, and authenticate network users. |
| **z/OS Communications Server:** IP System Administrator's Commands | SC27-3661 | This document describes the functions and commands helpful in configuring or monitoring your system. It contains system administrator's commands, such as TSO NETSTAT, PING, TRACERTE and their UNIX counterparts. It also includes TSO and MVS commands commonly used during the IP configuration process. |
| **z/OS Communications Server:** SNA Operation | SC27-3673 | This document serves as a reference for programmers and operators requiring detailed information about specific operator commands. |
| **z/OS Communications Server:** Quick Reference | SC27-3665 | This document contains essential information about SNA and IP commands. |

### Operation

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<tr>
<td><strong>z/OS Communications Server:</strong> IP User's Guide and Commands</td>
<td>SC27-3662</td>
<td>This document describes how to use TCP/IP applications. It contains requests with which a user can log on to a remote host using Telnet, transfer data sets using FTP, send and receive electronic mail, print on remote printers, and authenticate network users.</td>
</tr>
<tr>
<td><strong>z/OS Communications Server:</strong> IP System Administrator's Commands</td>
<td>SC27-3661</td>
<td>This document describes the functions and commands helpful in configuring or monitoring your system. It contains system administrator's commands, such as TSO NETSTAT, PING, TRACERTE and their UNIX counterparts. It also includes TSO and MVS commands commonly used during the IP configuration process.</td>
</tr>
<tr>
<td><strong>z/OS Communications Server:</strong> SNA Operation</td>
<td>SC27-3673</td>
<td>This document serves as a reference for programmers and operators requiring detailed information about specific operator commands.</td>
</tr>
<tr>
<td><strong>z/OS Communications Server:</strong> Quick Reference</td>
<td>SC27-3665</td>
<td>This document contains essential information about SNA and IP commands.</td>
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## Customization

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| z/OS Communications Server: SNA Customization | SC27-3666 | This document enables you to customize SNA, and includes the following information:  
- Communication network management (CNM) routing table  
- Logon-interpret routine requirements  
- Logon manager installation-wide exit routine for the CLU search exit  
- TSO/SNA installation-wide exit routines |

## Writing application programs

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<tr>
<td>z/OS Communications Server: IP Sockets Application Programming Interface Guide and Reference</td>
<td>SC27-3660</td>
<td>This document describes the syntax and semantics of program source code necessary to write your own application programming interface (API) into TCP/IP. You can use this interface as the communication base for writing your own client or server application. You can also use this document to adapt your existing applications to communicate with each other using sockets over TCP/IP.</td>
</tr>
<tr>
<td>z/OS Communications Server: IP CICS Sockets Guide</td>
<td>SC27-3649</td>
<td>This document is for programmers who want to set up, write application programs for, and diagnose problems with the socket interface for CICS using z/OS TCP/IP.</td>
</tr>
<tr>
<td>z/OS Communications Server: IP IMS Sockets Guide</td>
<td>SC27-3653</td>
<td>This document is for programmers who want application programs that use the IMS TCP/IP application development services provided by the TCP/IP Services of IBM.</td>
</tr>
<tr>
<td>z/OS Communications Server: IP Programmer’s Guide and Reference</td>
<td>SC27-3659</td>
<td>This document describes the syntax and semantics of a set of high-level application functions that you can use to program your own applications in a TCP/IP environment. These functions provide support for application facilities, such as user authentication, distributed databases, distributed processing, network management, and device sharing. Familiarity with the z/OS operating system, TCP/IP protocols, and IBM Time Sharing Option (TSO) is recommended.</td>
</tr>
<tr>
<td>z/OS Communications Server: SNA Programming</td>
<td>SC27-3674</td>
<td>This document describes how to use SNA macroinstructions to send data to and receive data from (1) a terminal in either the same or a different domain, or (2) another application program in either the same or a different domain.</td>
</tr>
<tr>
<td>z/OS Communications Server: SNA Programmer’s LU 6.2 Guide</td>
<td>SC27-3669</td>
<td>This document describes how to use the SNA LU 6.2 application programming interface for host application programs. This document applies to programs that use only LU 6.2 sessions or that use LU 6.2 sessions along with other session types. (Only LU 6.2 sessions are covered in this document.)</td>
</tr>
<tr>
<td>z/OS Communications Server: SNA Programmer’s LU 6.2 Reference</td>
<td>SC27-3670</td>
<td>This document provides reference material for the SNA LU 6.2 programming interface for host application programs.</td>
</tr>
<tr>
<td>z/OS Communications Server: CSM Guide</td>
<td>SC27-3647</td>
<td>This document describes how applications use the communications storage manager.</td>
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**Diagnosis**

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<tr>
<td>z/OS Communications Server: IP Diagnosis Guide</td>
<td>GC27-3652</td>
<td>This document explains how to diagnose TCP/IP problems and how to determine whether a specific problem is in the TCP/IP product code. It explains how to gather information for and describe problems to the IBM Software Support Center.</td>
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<tr>
<td>z/OS Communications Server: ACF/TAP Trace Analysis Handbook</td>
<td>GC27-3645</td>
<td>This document explains how to gather the trace data that is collected and stored in the host processor. It also explains how to use the Advanced Communications Function/Trace Analysis Program (ACF/TAP) service aid to produce reports for analyzing the trace data information.</td>
</tr>
<tr>
<td>z/OS Communications Server: SNA Diagnosis Vol 1, Techniques and Procedures and SNA Diagnosis Vol 2, FFST Dumps and the VIT</td>
<td>GC27-3667/general GC27-3668</td>
<td>These documents help you identify an SNA problem, classify it, and collect information about it before you call the IBM Support Center. The information collected includes traces, dumps, and other problem documentation.</td>
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<td>z/OS Communications Server: SNA Data Areas Volume 1 and SNA Data Areas Volume 2</td>
<td>GC31-6852/general GC31-6853</td>
<td>These documents describe SNA data areas and can be used to read an SNA dump. They are intended for IBM programming service representatives and customer personnel who are diagnosing problems with SNA.</td>
</tr>
</tbody>
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**Messages and codes**

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<th>Title</th>
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| z/OS Communications Server: SNA Messages | SC27-3671 | This document describes the ELM, IKT, IST, IUT, IVT, and USS messages. Other information in this document includes:  
- Command and RU types in SNA messages  
- Node and ID types in SNA messages  
- Supplemental message-related information |
| z/OS Communications Server: IP Messages Volume 1 (EZA) | SC27-3654 | This volume contains TCP/IP messages beginning with EZA. |
| z/OS Communications Server: IP Messages Volume 2 (EZB, EZD) | SC27-3655 | This volume contains TCP/IP messages beginning with EZB or EZD. |
| z/OS Communications Server: IP Messages Volume 3 (EZY) | SC27-3656 | This volume contains TCP/IP messages beginning with EZY. |
| z/OS Communications Server: IP Messages Volume 4 (EZZ, SNM) | SC27-3657 | This volume contains TCP/IP messages beginning with EZZ and SNM. |
| z/OS Communications Server: IP and SNA Codes | SC27-3648 | This document describes codes and other information that appear in z/OS Communications Server messages. |
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