

z/OS Communications Server  
2.5

*New Function Summary*



**Note:**

Before using this information and the product it supports, be sure to read the general information under [“Notices” on page 167](#).

This edition applies to Version 2 Release 5 of z/OS® (5650-ZOS), and to subsequent releases and modifications until otherwise indicated in new editions.

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## About this document

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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 5 Communications Server (z/OS Communications Server). It also includes the exploitation considerations of z/OS V2R4 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

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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

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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.
- Chapter 2, “Roadmap to functions,” on page 19 provides a roadmap of the functional enhancements introduced in z/OS V2R5 Communications Server and z/OS V2R4 Communications Server. Each entry indicates whether enabling actions are required.
- Chapter 3, “V2R5 new function summary,” on page 21 summarizes the functions and migration considerations of z/OS V2R5 Communications Server.
- Chapter 5, “V2R4 new function summary,” on page 77 summarizes the functions and migration considerations of z/OS V2R4 Communications Server.
- Appendix A, “Related protocol specifications,” on page 141 lists the related protocol specifications for TCP/IP.
- Appendix B, “Architectural specifications,” on page 161 lists documents that provide architectural specifications for the SNA Protocol.

- [Appendix D, “Accessibility,” on page 165](#) describes accessibility features to help users with physical disabilities.
- [“Notices” on page 167](#) contains notices and trademarks used in this document.
- [“Bibliography” on page 171](#) contains descriptions of the documents in the z/OS Communications Server library.

## How to use this document

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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

## How to contact IBM service

For immediate assistance, visit this website: <https://www.ibm.com/mysupport>

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 179](#).

## Conventions and terminology that are used in this information

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Commands in this information 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 information are *installation-wide exit routines*. The installation-wide exit routines also called installation-wide exits, exit routines, and exits throughout this information.

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 information might not be updated for each release. Evaluate a sample carefully before applying it to your system.

z/OS no longer supports mounting HFS data sets (The POSIX style file system). Instead, a z/OS File System (ZFS) can be implemented. The term hierarchical file system, abbreviated as HFS, is defined as a data structure that has a hierarchical nature with directories and files. References to hierarchical file systems or HFS might still be in use in z/OS Communications Server publications.

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

- RoCE Express®, which is a generic term representing IBM 10 GbE RoCE Express, IBM 10 GbE RoCE Express2, and IBM 25 GbE RoCE Express2 feature capabilities. When this term is used in this information, the processing being described applies to all of these features. If processing is applicable to only one feature, the full terminology, for instance, IBM 10 GbE RoCE Express will be used.
- RoCE Express2, which is a generic term representing an IBM RoCE Express2® feature that might operate in either 10 GbE or 25 GbE link speed. When this term is used in this information, the processing being described applies to either link speed. If processing is applicable to only one link speed, the full terminology, for instance, IBM 25 GbE RoCE Express2 will be used.
- RDMA network interface card (RNIC), which is used to refer to the IBM 10 GbE RoCE Express, IBM® 10 GbE RoCE Express2, or IBM 25 GbE RoCE Express2 feature.
- Shared RoCE environment, which means that the "RoCE Express" feature can be used concurrently, or shared, by multiple operating system instances. The feature is considered to operate in a shared RoCE environment even if you use it with a single operating system instance.

## Clarification of notes

Information traditionally qualified as Notes is further qualified as follows:

### Attention

Indicate the possibility of damage

### Guideline

Customary way to perform a procedure

### Note

Supplemental detail

### 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

### Tip

Offers shortcuts or alternative ways of performing an action; a hint

## Prerequisite and related information

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z/OS Communications Server function is described in the z/OS Communications Server library. Descriptions of those documents are listed in [“Bibliography” on page 171](#), 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.

Titles	Description
<i>IBM Z Redbooks</i>	The IBM Z <sup>®</sup> subject areas range from e-business application development and enablement to hardware, networking, Linux <sup>®</sup> , solutions, security, parallel sysplex, and many others. For more information about the Redbooks <sup>®</sup> publications, see <a href="http://www.redbooks.ibm.com/">http://www.redbooks.ibm.com/</a> and <a href="http://www.ibm.com/systems/z/os/zos/zfavorites/">http://www.ibm.com/systems/z/os/zos/zfavorites/</a> .

## 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/docs/en/zos) in *IBM Documentation* (<https://www.ibm.com/docs/en/zos>).

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.

Title	Number
<i>DNS and BIND</i> , Fifth Edition, O'Reilly Media, 2006	ISBN 13: 978-0596100575
<i>Routing in the Internet</i> , Second Edition, Christian Huitema (Prentice Hall 1999)	ISBN 13: 978-0130226471
<i>sendmail</i> , Fourth Edition, Bryan Costales, Claus Assmann, George Jansen, and Gregory Shapiro, O'Reilly Media, 2007	ISBN 13: 978-0596510299
<i>SNA Formats</i>	GA27-3136
<i>TCP/IP Illustrated, Volume 1: The Protocols</i> , W. Richard Stevens, Addison-Wesley Professional, 1994	ISBN 13: 978-0201633467
<i>TCP/IP Illustrated, Volume 2: The Implementation</i> , Gary R. Wright and W. Richard Stevens, Addison-Wesley Professional, 1995	ISBN 13: 978-0201633542
<i>TCP/IP Illustrated, Volume 3: TCP for Transactions, HTTP, NNTP, and the UNIX Domain Protocols</i> , W. Richard Stevens, Addison-Wesley Professional, 1996	ISBN 13: 978-0201634952
<i>TCP/IP Tutorial and Technical Overview</i>	GG24-3376
<i>Understanding LDAP</i>	SG24-4986
<a href="#">z/OS Cryptographic Services System SSL Programming</a>	SC14-7495
<a href="#">z/OS IBM Tivoli Directory Server Administration and Use for z/OS</a>	SC23-6788
<a href="#">z/OS JES2 Initialization and Tuning Guide</a>	SA32-0991
<a href="#">z/OS Problem Management</a>	SC23-6844
<a href="#">z/OS MVS Diagnosis: Reference</a>	GA32-0904
<a href="#">z/OS MVS Diagnosis: Tools and Service Aids</a>	GA32-0905
<a href="#">z/OS MVS Using the Subsystem Interface</a>	SA38-0679
<a href="#">z/OS Program Directory</a>	GI11-9848
<a href="#">z/OS UNIX System Services Command Reference</a>	SA23-2280



<b>Title</b>	<b>Number</b>
<a href="#">z/OS UNIX System Services Planning</a>	GA32-0884
<a href="#">z/OS UNIX System Services Programming: Assembler Callable Services Reference</a>	SA23-2281
<a href="#">z/OS UNIX System Services User's Guide</a>	SA23-2279
<a href="#">z/OS XL C/C++ Runtime Library Reference</a>	SC14-7314
<a href="#">Open Systems Adapter-Express Customer's Guide and Reference</a>	SA22-7935

## Redbooks publications

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

<b>Title</b>	<b>Number</b>
<i>IBM z/OS Communications Server TCP/IP Implementation, Volume 1: Base Functions, Connectivity, and Routing</i>	SG24-8096
<i>IBM z/OS Communications Server TCP/IP Implementation, Volume 2: Standard Applications</i>	SG24-8097
<i>IBM z/OS Communications Server TCP/IP Implementation, Volume 3: High Availability, Scalability, and Performance</i>	SG24-8098
<i>IBM z/OS Communications Server TCP/IP Implementation, Volume 4: Security and Policy-Based Networking</i>	SG24-8099
<i>IBM Communication Controller Migration Guide</i>	SG24-6298
<i>IP Network Design Guide</i>	SG24-2580
<i>Managing OS/390 TCP/IP with SNMP</i>	SG24-5866
<i>Migrating Subarea Networks to an IP Infrastructure Using Enterprise Extender</i>	SG24-5957
<i>SecureWay Communications Server for OS/390 V2R8 TCP/IP: Guide to Enhancements</i>	SG24-5631
<i>SNA and TCP/IP Integration</i>	SG24-5291
<i>TCP/IP in a Sysplex</i>	SG24-5235
<i>TCP/IP Tutorial and Technical Overview</i>	GG24-3376
<i>Threadsafe Considerations for CICS</i>	SG24-6351

## 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

<http://www.ibm.com/systems/z/os/zos/library/bkserv/>

## **z/OS Communications Server product**

The page contains z/OS Communications Server product introduction

<https://www.ibm.com/products/zos-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

<https://www.ibm.com/mysupport>

## **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/>

## **z/OS Support Community**

Search the z/OS Support Community Library for Techdocs (including Flashes, presentations, Technotes, FAQs, white papers, Customer Support Plans, and Skills Transfer information)

[z/OS Support Community](#)

## **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](mailto:bind-users-request@isc.org).
- Submit questions or answers to this forum by sending mail to [bind-users@isc.org](mailto:bind-users@isc.org).

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

- Subscribe by sending mail to [bind9-users-request@isc.org](mailto:bind9-users-request@isc.org).
- Submit questions or answers to this forum by sending mail to [bind9-users@isc.org](mailto: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): <https://www.ibm.com/support/knowledgecenter/zosbasics/com.ibm.zos.zbasics/homepage.html?cp=zosbasics>



# Summary of changes for New Function Summary

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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 5

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This document contains information previously presented in z/OS Communications Server: New Function Summary, which supported z/OS Version 2 Release 4.

### New information

The following information is new.

#### December 2021 refresh

- [“IBM Health Checker for the removal of VTAM LSA Architecture” on page 21](#) with APAR OA62208
- [“IBM Health Checker for the removal of DEVICE, LINK, and HOME for OSA-Express connectivity” on page 22](#) with APARs OA62208 and PH40875

#### Prior to December 2021 refresh

[Chapter 3, “V2R5 new function summary,” on page 21](#) 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 19](#).

## Changes made in z/OS Version 2 Release 4

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This document contains information previously presented in z/OS Communications Server: New Function Summary, which supported z/OS Version 2 Release 3.

### New

The following information is new.

#### January 2021

- [“zERT Aggregation recording interval” on page 87](#)

#### August 2020 refresh

- [“Shared Memory Communications multiple IP subnet support \(SMCv2\)” on page 79](#)

#### July 2020 refresh

- [“IBM Health Checker for use of native TLS/SSL support for the FTP server” on page 96](#) with TCP/IP APAR PH24732 and SNA APAR OA59490

#### Prior to July 2020 refresh

- [“IBM Health Checker for use of native TLS/SSL support for DCAS” on page 95](#) with TCP/IP APAR PH16144 and SNA APAR OA58255
- [“IBM Health Checker for use of native TLS/SSL support for the FTP server” on page 96](#) with TCP/IP APAR PH21573 and SNA APAR OA59022
- [“IBM Health Checker for use of native TLS/SSL support for the TN3270 server” on page 98](#) with TCP/IP APAR PH16144 and SNA APAR OA58255
- [IBM zERT Network Analyzer database administration enhancements](#) with APAR PH16223

- [“Inbound Workload Queueing \(IWQ\) support for IBM z/OS Container Extensions” on page 89](#) with VTAM APAR OA58300 and TCP/IP APAR PH16581
- [Sysplex Autonomics for IPSec with APAR PH12788](#)
- [“SMTPD compatibility enhancements for CSSMTP” on page 111](#) with APAR PH18237

Chapter 5, “V2R4 new function summary,” on page 77 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 19](#).

## Changed information

The following information is changed.

### Prior to 2020 refresh

- zERT Aggregation recording interval (APAR PH25049), see the following topics:
  - [“z/OS Encryption Readiness Technology \(zERT\) aggregation” on page 105](#)
  - [“IBM zERT Network Analyzer” on page 108](#)

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# Chapter 1. Planning to use new functions

These topics help you plan to use new functions:

- [“Introduction to z/OS Communications Server” on page 1](#)
- [“Determining which documents to use when upgrading” on page 1](#)
- [“IP encryption features” on page 3](#)
- [“Planning checklist” on page 3](#)
- [“TCP/IP packaging process” on page 4](#)
- [“Defining SNA data sets” on page 7](#)

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## 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® product line consists of the IBM z13® (z13), IBM z13s® (z13s), IBM z14 (z14), and IBM z15™ (z15).
- 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 z15, z14, z13s, 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 V2R5 Communications Server runs only in z/Architecture mode on IBM Z®.

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## Determining which documents to use when upgrading

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

Table 1. Comparing documents used in migration	
Document name	Descriptions
<a href="#">z/OS Planning for Installation</a>	<p>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.</p> <p><b>Recommendation:</b> It is recommended that you read this document.</p> <p><b>Use this document as you prepare to install z/OS.</b></p>
<a href="#">Upgrading to z/OS V2R5</a>	<p>IBM no longer provides the <i>z/OS Migration</i> publication, GA32-0889, in a publication format. Since z/OS V2R2, the preferred method for learning about migration actions has been the z/OS Migration Workflow. Discovering, performing, and verifying many migration actions through the z/OSMF Workflows task instead of a more traditional book format allows for a tailored and specific upgrade path that is associated with a particular system. Beginning with z/OS V2R4, IBM provides migration tasks in a z/OSMF workflow, as well as a single exported file. By providing the migration materials in both formats, users still can enjoy the advantages of a z/OSMF workflow and be able to search, browse, and print in a more traditional format.</p> <p>It is strongly recommended that you plan for your next upgrade by having z/OSMF ready to use in at least one location in your enterprise. Notice that the exported format of the z/OS migration materials that can be read or printed for those without any z/OSMF capabilities will not be tailored for any environment.</p> <p>The z/OS Upgrade Workflow is provided in the <a href="#">git repository</a> for IBM/IBM-Z-zOS, which already hosts the z/OS migration workflows for previous releases.</p>
<a href="#">z/OS Introduction and Release Guide</a>	<p>This document provides an overview of z/OS and lists the enhancements in each release.</p> <p><b>Use this document to determine whether to obtain a new release and to decide which new functions to implement.</b></p>
<a href="#">z/OS Release Upgrade Reference Summary</a>	<p>This document describes the changes to interfaces for individual elements and features of z/OS.</p> <p><b>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.</b></p>
<a href="#">z/OS Communications Server: New Function Summary</a>	<p>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.</p> <p><b>Use this document as a reference to using all the enhancements of z/OS Communications Server.</b></p>

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



## IP encryption features

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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

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Upgrading 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, upgrade, and install:
  - For information about migration and writing an installation plan, see [“Determining which documents to use when upgrading”](#) on page 1.
  - For information about installation, see these documents:
    - *z/OS Program Directory*
    - Preventative Service Planning (PSP) bucket (available by using IBMLINK)
    - *ServerPac: Installing Your Order*, if you use the ServerPac method to install z/OS
  - For information about storage requirements, see *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 V2R5 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 Upgrade Workflow](#) to determine migration actions.
    - Reinstall user exits.
    - Reinstall user modifications.
    - Update operating procedures and automation routines.
    - Activate new functions.
  10. Complete functional and stress tests.

## TCP/IP packaging process

As a result of the installation process for z/OS V2R5 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” on page 4. For details on requirements for hierarchical file system files, see “File system files” on page 7.

## MVS data sets

Table 2 on page 4 lists the distribution library data sets required by z/OS V2R5 Communications Server.

<i>Table 2. Distribution library data sets</i>	
<b>Data set</b>	<b>Description</b>
AEZADBR1	Database Request Module (DBRM) members
AHELP	TSO help files
AEZAMAC1	Assembler macros
AEZAMAC2	C header files
AEZAMAC3	Pascal include files
AEZAMODS	Distribution library for base link-edit modules
AEZARNT1	Reentrant object module for SEZAX11L, SEZAXTLB, SEZAOLDX, and SOCKETS
AEZARNT2	Reentrant object module for SEZAXAWL
AEZARNT3	Reentrant object module for SEZAXMLB
AEZAROE2	Reentrant object module for SEZAXAWL (z/OS UNIX support)

<i>Table 2. Distribution library data sets (continued)</i>	
<b>Data set</b>	<b>Description</b>
AEZAROE3	Reentrant object module for SEZAXMLB (z/OS UNIX support)
AEZARNT4	Reentrant object modules for RPC
AEZAROE1	Reentrant object module for SEZAX11L, SEZAXTLB, and SEZAOLDX (z/OS UNIX support)
AEZASMP1	Sample source programs, catalog procedures, CLIST, and installation jobs
AEZAXLTD	Translated default tables
AEZAXLTK	Translated Kanji, Hangeul, and Traditional Chinese DBCS tables and codefiles
AEZAXLT1	Translation table SBCS source and DBCS source for Hangeul and Traditional Chinese
AEZAXLT2	TELNET client translation tables
AEZAXLT3	Kanji DBCS translation table source
ABLSCLI0	clists, execs, IPCS clists, execs; IPCS messages; IPCS panels, IPCS tables
ABLMSG0	messages, IPCS clists, execs; IPCS messages; IPCS panels, IPCS tables
ABLSPNLO	panels, IPCS clists, execs; IPCS messages; IPCS panels, IPCS tables
ABLSTBL0	tables, IPCS clists, execs; IPCS messages; IPCS panels, IPCS tables

Table 3 on page 5 lists the target library data sets required by z/OS V2R5 Communications Server.

<i>Table 3. Target library data sets</i>	
<b>Data set</b>	<b>Description</b>
SEZACMAC	Client Pascal macros, C headers, and assembler macros
SEZACMTX	Load library for linking user modules and programs
SEZADBCX	Source for the Kanji, Hangeul, and Traditional Chinese DBCS translation tables
SEZADBRM	DBRM members
SEZADPIL	SNMP Distributed Programming Interface library
SEZADSIL	SNMP command processor and SNMPIUCV subtask for the NetView program, and the SQESERV module for the SNMP query engine
SEZADSIM	SNMP messages for the NetView program
SEZADSIP	SNMPIUCV initialization parameters for the NetView program
SEZAEXEC	CLISTs and REXX programs
SEZAINST	Installation samples and related members
SEZALIBN	NCS library system library
SEZALOAD	Executable load modules for concatenation to LINKLIB
SEZALNK2	LB@ADMIN for the NCS administrator
SEZALPA	Executable load modules for concatenation to LPAIST
SEZAMENU	ISPF messages
SEZANCLS	NetView SNMP CLISTs

<i>Table 3. Target library data sets (continued)</i>	
<b>Data set</b>	<b>Description</b>
SEZANMAC	C headers and assembler macros for z/OS UNIX and TCP/IP Services APIs
SEZANPNL	NetView SNMP panels
SEZAOLDX	X Window System library (X10 compatibility routines)
SEZAPENU	ISPF panels
SEZARNT1	Reentrant object module for SEZAX11L, SEZAXTLB, SEZAOLDX, and SOCKETS
SEZARNT2	Reentrant object module for SEZAXAWL
SEZARNT3	Reentrant object module for SEZAXMLB
SEZARNT4	Reentrant object modules for RPC
SEZAROE1	Reentrant object module for SEZAX11L, SEZAXTLB, and SEZAOLDX (z/OS UNIX support)
SEZAROE2	Reentrant object module for SEZAXAWL (z/OS UNIX support)
SEZAROE3	Reentrant object module for SEZAXMLB (z/OS UNIX support)
SEZARPCL	Remote procedure call library
SEZATCP	Executable load modules for STEPLIB or LNKLST concatenation
SEZATCPX	Source for the country SBCS translation tables
SEZATELX	Source for the TELNET country translation tables
SEZAXAWL	Athena widget set
SEZAXLD1	Translated default tables
SEZAXLD2	Translated Kanji, Hangeul, and Traditional Chinese DBCS default tables and DBCS codefiles for TELNET transform mode
SEZAXMLB	Motif widget set
SEZAXTLB	X Window System Toolkit library
SEZAX11L	X Window System library

Table 4 on page 6 lists the shared distribution and target library data sets required by z/OS V2R5 Communications Server.

<i>Table 4. Shared distribution and target library data sets</i>	
<b>Data set</b>	<b>Description</b>
SYS1.CSSLIB	Interface routines for accessing callable services
SYS1.HELP	TSO help files
SYS1.MIGLIB	z/OS Communications Server formatted dump routines for the interactive problem control system (IPCS) and the z/OS Communications Server VIT Analysis Tool module, ISTRFT1, which is used for problem diagnosis
SYS1.MSGENU / SYS1.AMSGENU	English-language message tables used by the MVS message service (MMS)
SYS1.NUCLEUS	Resident SVCs, callable services tables, and abnormal termination modules

<i>Table 4. Shared distribution and target library data sets (continued)</i>	
<b>Data set</b>	<b>Description</b>
SYS1.PARMLIB / SYS1.APARMLIB	IBM-supplied and installation-created members, which contain lists of system parameter values
SYS1.SAXREXEC	Contains system REXX programs
SYS1.SBLSCLI0	IPCS REXX execs and CLISTs
SYS1.SBLSKELO	ISPF skeletons for the IPCS dialog
SYS1.SBLSMSG0	ISPF messages for the IPCS dialog
SYS1.SBLSPNLO	ISPF panels for the IPCS dialog
SYS1.SBLSTBLO	ISPF tables for the IPCS dialog

## File system files

See [z/OS UNIX System Services Planning](#) and [z/OS UNIX System Services User's Guide](#) 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 V2R5 Communications Server. [Table 5 on page 7](#) shows the z/OS data sets that contain information for z/OS V2R5 Communications Server, and [Table 6 on page 9](#) shows the z/OS data sets that contain information for VTAM.

Enterprise Extender requires IP data set definitions in addition to the SNA data sets. See [z/OS Communications Server: IP Configuration Guide](#) 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.

<i>Table 5. z/OS data sets containing information for z/OS Communications Server</i>		
<b>Name of data set</b>	<b>Contents</b>	<b>Comments</b>
SYS1.DSDB1	Data files of APPN directory information	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.  In a sysplex, this data set must be unique for each system; it may not be shared.
SYS1.DSDB2	Data files of APPN directory information	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.  In a sysplex, this data set must be unique for each system; it may not be shared.

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

Name of data set	Contents	Comments
SYS1.DSDBCTRL	Current status of SYS1.DSDB1 and SYS1.DSDB2	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.  In a sysplex, this data set must be unique for each system; it may not be shared.
SYS1.DUMPxx	Records of SVC DUMP	Required for diagnosis.
SYS1.LINKLIB	z/OS Communications Server initialization module, ISTINM01, which is used when z/OS Communications Server is started	Required.
	Logon manager load modules	Required for logon manager.
SYS1.LOGREC	z/OS Communications Server error records	Required.
SYS1.LPALIB	z/OS Communications Server load modules and user-written exit routines to be loaded into the shared link pack area	Required.
SYS1.MACLIB	z/OS Communications Server application program interface macros	Required.
SYS1.MIGLIB	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	Required.
SYS1.NUCLEUS	z/OS Communications Server resident SVCs and abnormal termination modules	Required.
SYS1.PARMLIB	IBM-supplied and installation-created members, which contain lists of system parameter values	Required. This may also be a data set in the logical parmlib concatenation.
SYS1.PROCLIB	JCL for started tasks	Required for logon manager.
SYS1.SBLSCLI0	IPCS REXX execs and CLISTs	Required for z/OS Communications Server dump analysis enhancements and VIT analysis. See <a href="#">z/OS Communications Server: SNA Diagnosis Vol 1, Techniques and Procedures</a> for more information.
SYS1.SBLSKELO	ISPF skeletons for the IPCS dialog	Required for z/OS Communications Server dump analysis enhancements and VIT analysis. See <a href="#">z/OS Communications Server: SNA Diagnosis Vol 1, Techniques and Procedures</a> for more information.
SYS1.SBLSMSG0	ISPF messages for the IPCS dialog	Required for z/OS Communications Server dump analysis enhancements and VIT analysis. See <a href="#">z/OS Communications Server: SNA Diagnosis Vol 1, Techniques and Procedures</a> for more information.

Table 5. z/OS data sets containing information for z/OS Communications Server (continued)		
Name of data set	Contents	Comments
SYS1.SBLSPNLO	ISPF panels for the IPCS dialog	Required for z/OS Communications Server dump analysis enhancements and VIT analysis. See <a href="#">z/OS Communications Server: SNA Diagnosis Vol 1, Techniques and Procedures</a> for more information.
SYS1.SBLSTBLO	ISPF tables for the IPCS dialog	Required for z/OS Communications Server dump analysis enhancements and VIT analysis.
SYS1.SISTCLIB	z/OS Communications Server load modules to be loaded into common service area and extended common service area (CSA/ECSA) storage	Required.
SYS1.SISTDAT1	Online tools	Optional. Use this library only if you intend to use the online information tools included with z/OS Communications Server.
SYS1.SISTDAT2	Message skeleton file for translation	Required. See <a href="#">z/OS Communications Server: SNA Network Implementation Guide</a> .
SYS1.SISTMAC1	z/OS Communications Server macros used to build user tables and parameter lists to build installation exits	Required.
SYS1.TRACE	GTF trace records	Required to run external trace.  <b>Note:</b> For information about using multiple SYS1.TRACE data sets, see the <a href="#">z/OS MVS Diagnosis: Tools and Service Aids</a> .
SYS1.TRSDDB	Network topology database	Required for APPN topology database checkpointing function; must be allocated before initialization.  This data set cannot be allowed to span multiple volumes.  In a sysplex, this data set must be unique for each system; it may not be shared.
Dynamic I/O configuration data sets	Dynamically created definitions of devices with all associated LUs	Optional; includes USER1.AUTO.VTAMLST and a catalog entry checkpoint data set. Required for dynamic I/O configuration.  In a sysplex, these data sets must be unique for each system; it may not be shared.

Table 6 on page 9 shows the z/OS data sets that contain VTAM information.

Table 6. z/OS data sets containing information for VTAM		
Name of data set	Contents	Comments
SYS1.ASAMPLIB	Sample of network operator command table and sample JCL for installation	Required for installation. Provided by IBM.

Table 6. z/OS data sets containing information for VTAM (continued)		
Name of data set	Contents	Comments
SYS1.SAMPLIB	Alterable copy of sample network operator command table, sample JCL for installation, and command lists for dynamic I/O	Required for installation. Provided by IBM.
SYS1.VTAMLIB	<ul style="list-style-type: none"> <li>Load modules for z/OS Communications Server</li> <li>User-defined tables, default tables, and exit routines</li> </ul>	Only z/OS Communications Server load modules are required. Must be listed in an IEAAPFxx parmlib member.
SYS1.VTAMLST	z/OS Communications Server definition statements and start options	Required; created by user before starting z/OS Communications Server.
Configuration restart data sets	z/OS Communications Server status of minor nodes for each major node	<p>Required if a warm restart is to be used. Created by user before starting z/OS Communications Server.</p> <p>In a sysplex, these data sets must be unique for each system; it may not be shared.</p>
SYS1.NODELST	z/OS Communications Server status of major nodes	<p>Required if restart of all previously active major nodes is desired.</p> <p>In a sysplex, this data set must be unique for each system; it may not be shared.</p>

## Data sets containing information for z/OS V2R5 Communications Server

This section describes data sets that contain information for z/OS V2R5 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 IEAAPFxx).

### 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 IEAAPFxx).

## 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 IVTCSM 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(*maxfixK* | M)

ECSA MAX(*maxecsaK* | M)

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 512 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.

**DSPACE**

Buffers are allocated from data space storage.

**HVCOMM**

Buffers are allocated from high virtual common storage.

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

***expbuf***

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.

***initbuf***

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.

***minfree***

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 on page 14 and Table 8 on page 14 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					
<b>Bufsize</b>	<b>4 KB</b>	<b>16 KB</b>	<b>32 KB</b>	<b>60 KB</b>	<b>180 KB</b>
<i>EXPBUF</i>	16	8	4	4	2
<i>INITBUF</i>	64	32	16	16	2
<i>MINFREE</i>	8	4	2	2	1

Table 8. IBM-supplied default values for CSM buffer pools for HVCOMM					
<b>Bufsize</b>	<b>4 KB</b>	<b>16 KB</b>	<b>32 KB</b>	<b>60 KB</b>	<b>180 KB</b>
<i>EXPBUF</i>	256	64	32	17	5
<i>INITBUF</i>	256	64	32	17	5
<i>MINFREE</i>	32	8	4	4	2

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	
Task	Reference
Optionally update the IVTPRM00 parmlib member to specify the parameters to use when you allocate storage for CSM buffer use above the bar.	<a href="#">z/OS Communications Server: New Function Summary</a>
Issue the <b>D CSM</b> command to monitor the use of storage above the bar that is managed by CSM.	<a href="#">z/OS Communications Server: SNA Operation</a>
Issue the <b>MODIFY CSM</b> command to update values for storage above the bar that is managed by CSM.	<a href="#">z/OS Communications Server: SNA Operation</a>

## 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 V2R5 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:

**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 [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(NODELST1) -
    VOL(PUBLIC) -
```

```
KEYS(2 0) -  
DATA(NAME(NODLST1.DATA) -  
RECORDS(120 20) -  
RECORDSIZE(10 10)) -  
INDEX(NAME(NODLST1I.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.



## Chapter 2. Roadmap to functions

This topic includes a roadmap table to all of the functions and enhancements that were introduced in z/OS V2R5 Communications Server and z/OS V2R4 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	
Functional enhancement	Exploitation actions
<b>Enhancements introduced in z/OS V2R5 Communications Server</b>	
<a href="#">“IBM Health Checker for the removal of VTAM LSA Architecture” on page 21 with APAR OA62208</a>	Yes
<a href="#">“IBM Health Checker for the removal of DEVICE, LINK, and HOME for OSA-Express connectivity” on page 22 with APARs OA62208 and PH40875</a>	Yes
<a href="#">“Ping output enhanced to provide microsecond precision” on page 31</a>	No
<a href="#">“zERT policy-based enforcement” on page 34</a>	Yes
<a href="#">“AT-TLS currency with System SSL” on page 33</a>	Yes
<a href="#">“AT-TLS and IPsec certificate diagnostics” on page 39</a>	Yes
<a href="#">“Notification of availability of TCP/IP extended services” on page 31</a>	Yes
<a href="#">“IPsec certificate reporting enhancements” on page 40</a>	No
<a href="#">“Shared Memory Communications multiple IP subnet support (SMCv2)” on page 23</a>	Yes
<a href="#">“zERT Aggregation recording interval” on page 27</a>	Yes
<a href="#">“Inbound Workload Queueing (IWQ) support for IBM z/OS Container Extensions” on page 29</a>	Yes
<a href="#">“Sysplex Autonomics for IPSec” on page 41</a>	Yes
<a href="#">“IBM zERT Network Analyzer database administration enhancements” on page 43</a>	Yes
<a href="#">“SMTPD compatibility enhancements for CSSMTP” on page 45</a>	Yes
<b>Enhancements introduced in z/OS V2R4 Communications Server</b>	
For all V2R4 new function APARs, see <a href="#">z/OS Communications Server V2R4 New Function APAR Summary</a> .	
<a href="#">“IBM Health Checker for the removal of VTAM LSA Architecture” on page 77 with APAR OA62208</a>	Yes
<a href="#">“IBM Health Checker for the removal of DEVICE, LINK, and HOME for OSA-Express connectivity” on page 78 with APARs OA62208 and PH40875</a>	Yes
<a href="#">“Shared Memory Communications multiple IP subnet support (SMCv2)” on page 79 with TCP/IP APAR PH22695 and SNA APAR OA59152</a>	Yes
<a href="#">“IBM Health Checker for use of native TLS/SSL support for DCAS” on page 95 with TCP/IP APAR PH16144 and SNA APAR OA58255</a>	Yes
<a href="#">IBM Health Checker for use of native TLS/SSL support for the FTP server with TCP/IP APAR PH21573 and SNA APAR OA59022</a>	Yes

<i>Table 10. Roadmap to functions (continued)</i>	
<b>Functional enhancement</b>	<b>Exploitation actions</b>
<a href="#">“IBM Health Checker for use of native TLS/SSL support for the TN3270 server” on page 98 with TCP/IP APAR PH16144 and SNA APAR OA58255</a>	Yes
<a href="#">Communications Server resolver enhancements</a>	Yes
<a href="#">Sysplex Autonomics for IPSec with APAR PH12788, and Network Configuration Assistant APAR PH16303</a>	Yes
<a href="#">IBM zERT Network Analyzer database administration enhancements with APAR PH24494</a>	Yes
<a href="#">Communications Server QDIO display enhancements</a>	Yes
<a href="#">“AT-TLS support for TLS v1.3” on page 102</a>	Yes
<a href="#">“zERT Aggregation recording interval” on page 87 with APAR PH25049</a>	Yes
<a href="#">“Inbound Workload Queueing (IWQ) support for IBM z/OS Container Extensions” on page 89 with VTAM APAR OA58300 and TCP/IP APAR PH16581</a>	Yes
<a href="#">“SMTPD compatibility enhancements for CSSMTP” on page 111 with APAR PH18237</a>	Yes
<a href="#">“Sysplex notification of TCP/IP stack join or leave” on page 90</a>	Yes
<a href="#">“Network support for z/OS Container Extensions” on page 91</a>	Yes
<a href="#">“Communications Server support for OSA-Express7S 25 GbE features” on page 82</a>	Yes
<a href="#">“Communications Server support for 25 GbE RoCE Express2 features” on page 83</a>	Yes
<a href="#">“HiperSockets Converged Interface support” on page 85</a>	Yes
<a href="#">“IWQ support for IPSec” on page 93</a>	Yes
<a href="#">“IBM zERT Network Analyzer” on page 108</a>	Yes
<a href="#">“z/OS Encryption Readiness Technology (zERT) aggregation” on page 105</a>	Yes
<a href="#">“TN3270E Telnet server Express Logon Feature support for Multi-Factor Authentication” on page 110</a>	Yes
<a href="#">“Code page enhancements for CSSMTP” on page 113</a>	Yes

---

## Chapter 3. V2R5 new function summary

This information contains topics about every function or enhancement introduced in z/OS V2R5 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 19 for a complete list of the functional enhancements.

See [z/OS Upgrade Workflow](#) for information about how to migrate and maintain the functional behavior of previous releases.

See [z/OS Release Upgrade Reference Summary](#) for information about new and changed messages and interfaces.

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### Support considerations in V2R5

z/OS V2R5 Communications Server rejects the invalid configuration of TLSRFCLEVEL CCCNONOTIFY with TLSMECHANISM ATTLS for both the FTP client and the FTP server.

z/OS V2R5 Communications Server removes support for the following functions:

- Workload distribution to non-z/OS targets (IBM WebSphere® DataPower® appliances)
- Native TLS/SSL support from TN3270E Telnet server, FTP server, and DCAS
- Support for NCA policy import
- CMIP from VTAM
- Sysplex Distributor optimized load balancing with Cisco Multi-Node Load Balancer
- z/OS V2R5 Communications Server removes several migration health checks:
  - ZOSMIGV2R4\_NEXT\_CS\_DCAS\_NTVSSL
  - ZOSMIGV2R4\_NEXT\_CS\_FTPCLI\_RFCLVL
  - ZOSMIGV2R4\_NEXT\_CS\_FTPSRV\_NTVSSL
  - ZOSMIGV2R4\_NEXT\_CS\_FTPSRV\_RFCLVL
  - ZOSMIGV2R4\_NEXT\_CS\_TN3270\_NTVSSL
  - ZOSMIGV2R4\_NEXT\_CS\_OSIMGMT

For more information about z/OS V2R5 Communications Server support considerations, see [z/OS Upgrade Workflow](#).

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### Simplification

The following topics describe enhancements for simplification:

- [“IBM Health Checker for the removal of VTAM LSA Architecture” on page 21](#)
- [“IBM Health Checker for the removal of DEVICE, LINK, and HOME for OSA-Express connectivity” on page 22](#)

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### IBM Health Checker for the removal of VTAM LSA Architecture

z/OS V2R5 Communications Server, with SNA APAR OA62208, provides a new migration health check to use with the IBM Health Checker for z/OS function. The migration health check identifies if VTAM Link

Station Architecture (LSA) devices are in use. These devices are configured with MEDIUM=CSMACD in the XCA major node PORT statement.

Support for VTAM Link Station Architecture (LSA) devices will be withdrawn in a future release of the IBM z/OS Communications Server.

**Dependency:**

To use the IBM Health Checker for the removal of VTAM LSA Architecture, perform the following steps:

- Apply the appropriate PTF for SNA APAR OA62208
- Start the IBM Health Checker for z/OS

## Using the IBM Health Checker for the removal of VTAM LSA Architecture

To use the IBM Health Checker for the removal of VTAM LSA Architecture, perform the tasks in [Table 11](#) on page 22.

Table 11. IBM Health Checker for the removal of VTAM LSA Architecture	
Task/Procedure	Reference
To use this migration health check, take the following steps:  1. Configure and start the IBM Health Checker for z/OS.  2. Activate the ZOSMIGV2R5_NEXT_CS_LSA migration health check.  3. Review health check output messages ISTM051I or ISTM052E for potential migration actions.	See the following topics in <a href="#">IBM Health Checker for z/OS: User's Guide</a> : <ul style="list-style-type: none"><li>• <a href="#">Setting up IBM Health Checker for z/OS</a></li><li>• <a href="#">Working with check output</a></li><li>• <a href="#">Managing checks</a></li></ul>

To find all new and updated topics about IBM Health Checker for the removal of VTAM LSA Architecture, see [Table 12](#) on page 22.

Table 12. All related topics about IBM Health Checker for the removal of VTAM LSA Architecture	
Book name	Topics
<a href="#">z/OS Communications Server: IP Diagnosis Guide</a>	<a href="#">IBM Health Checker for z/OS</a>
<a href="#">IBM Health Checker for z/OS: User's Guide</a>	<a href="#">ZOSMIGV2R5_NEXT_CS_LSA</a>
<a href="#">z/OS Upgrade Workflow</a>	<i>SNA and IP services: Prepare for the removal of support for LSA and LCS devices</i>
<a href="#">z/OS Communications Server: SNA Messages</a>	<ul style="list-style-type: none"><li>• <a href="#">ISTM051I</a></li><li>• <a href="#">ISTM052E</a></li></ul>

## IBM Health Checker for the removal of DEVICE, LINK, and HOME for OSA-Express connectivity

z/OS V2R5 Communications Server, with SNA APAR OA62208 and TCP/IP APAR PH40875, provides a new migration health check to use with the IBM Health Checker for z/OS function. The migration health check identifies if TCP/IP profile statements DEVICE, LINK, and HOME for OSA-Express connectivity are in use.

Support for DEVICE/LINK/HOME TCP/IP profile statements for OSA-Express connectivity will be withdrawn in a future release of IBM z/OS Communications Server.

**Dependency:**

To use the IBM Health Checker for the removal of DEVICE, LINK, and HOME for OSA-Express connectivity, perform the following steps:

- Apply the appropriate PTF for SNA APAR OA62208
- Apply the appropriate PTF for TCP/IP APAR PH40875
- Start the IBM Health Checker for z/OS

### Using the IBM Health Checker for the removal of DEVICE, LINK, and HOME for OSA-Express connectivity

To use the IBM Health Checker for the removal of DEVICE, LINK, and HOME for OSA-Express connectivity, perform the tasks in [Table 13 on page 23](#).

Table 13. IBM Health Checker for the removal of DEVICE, LINK, and HOME for OSA-Express connectivity	
Task/Procedure	Reference
To use this migration health check, take the following steps:  1. Configure and start the IBM Health Checker for z/OS.  2. Activate the ZOSMIGV2R5_NEXT_CS_OSADLH migration health check.  3. Review health check output messages ISTM053I or ISTM054E for potential migration actions.	See the following topics in <a href="#">IBM Health Checker for z/OS: User's Guide</a> : <ul style="list-style-type: none"><li>• <a href="#">Setting up IBM Health Checker for z/OS</a></li><li>• <a href="#">Working with check output</a></li><li>• <a href="#">Managing checks</a></li></ul>

To find all new and updated topics about IBM Health Checker for the removal of DEVICE, LINK, and HOME for OSA-Express connectivity, see [Table 14 on page 23](#).

Table 14. All related topics about IBM Health Checker for the removal of DEVICE, LINK, and HOME for OSA-Express connectivity	
Book name	Topics
<a href="#">z/OS Communications Server: IP Diagnosis Guide</a>	<a href="#">IBM Health Checker for z/OS</a>
<a href="#">IBM Health Checker for z/OS: User's Guide</a>	<a href="#">ZOSMIGV2R5_NEXT_CS_OSADLH</a>
<a href="#">z/OS Upgrade Workflow</a>	<i>IP Services: Prepare for the removal of support for OSA DEVICE/LINK/HOME configuration</i>
<a href="#">z/OS Communications Server: SNA Messages</a>	<ul style="list-style-type: none"><li>• <a href="#">ISTM053I</a></li><li>• <a href="#">ISTM054E</a></li></ul>

## Hardware support

The following topics describe enhancements for hardware support:

- [“Shared Memory Communications multiple IP subnet support \(SMCv2\)” on page 23](#)

### Shared Memory Communications multiple IP subnet support (SMCv2)

In z/OS V2R5 Communications Server, Shared Memory Communications - Direct Memory Access (SMC-D) is enhanced to remove the same IP subnet restriction by exploiting SMC-Dv2.

In z/OS V2R5 Communications Server, Shared Memory Communications - Remote Direct Memory Access (SMC-R) is enhanced to remove the same IP subnet restriction by exploiting SMC-Rv2.

In z/OS V2R5 Communications Server, SMC is enhanced to allow greater control of which peers are to perform SMC negotiation using SMC global filters.

#### Dependencies:

- SMC-Dv2 is enabled with new IBM Z capability provided by the IBM Z Internal Shared Memory (ISM) function. The new ISMv2 capability is available on IBM z15. For IBM z15 T01, refer to the MCL number P46601.067 driver D41C. The ISMv2 support is in the base of the IBM z15 T02.
- SMC-Rv2 is supported on IBM z15 with the IBM RoCE Express2 10 GbE and 25 GbE features.

#### Restrictions:

SMC-Dv2 supports both IPv4 and IPv6. SMC-Rv2 supports IPv4 only.

Down-level SMC partners might require a toleration PTF. If you plan to enable SMCv2 on a host which has connections to a down-level SMC (SMC-Dv1 or SMC-Rv1) system (z/OS Communications Server, Linux on Z, and AIX®), the down-level host will require the following toleration maintenance applied prior to enabling SMC-Dv2:

- For z/OS Communications Server, the down-level host will need the appropriate PTF for PH17556.
- For Linux on Z, see the Linux on Z web page at <https://linux-on-z.blogspot.com/p/smc-for-linux-on-ibm-z.html> for information related to toleration requirements.
- For AIX, see the AIX web page at [https://www.ibm.com/support/knowledgecenter/en/ssw\\_aix\\_72/rdma/smc\\_r.html](https://www.ibm.com/support/knowledgecenter/en/ssw_aix_72/rdma/smc_r.html) for information related to toleration requirements.

**Note:** Failure to apply the proper toleration maintenance might result in connection hangs or failures when SMCv2 is enabled on z/OS.

### Using the Shared Memory Communications multiple IP subnet support (SMCv2)

To use the Shared Memory Communications multiple IP subnet support (SMCv2), perform the tasks in Table 15 on page 24.

Table 15. Shared Memory Communications multiple IP subnet support (SMCv2)	
Task/Procedure	Reference
Determine if using SMC will be a benefit in this configuration by using SMCAT.	<a href="#">VARY TCPIP,,SMCAT</a> about SMC Applicability Tool (SMCAT) in <a href="#">z/OS Communications Server: IP System Administrator's Commands</a>
Configure SMCEID on the SMCGLOBAL parameter of the GLOBALCONFIG statement to enable z/OS CS exploitation of SMCv2.	<a href="#">GLOBALCONFIG</a> statement in <a href="#">z/OS Communications Server: IP Configuration Reference</a>
Configure SYSTEID on the SMCD parameter of the GLOBALCONFIG statement to enable z/OS CS exploitation of SMC-Dv2.	<a href="#">GLOBALCONFIG</a> statement in <a href="#">z/OS Communications Server: IP Configuration Reference</a>
Configure at least one RoCE Express2 feature in HCD. For each IBM RoCE Express2 port, configure the physical network identifier (PNetID), the physical channel identifier (PCHID), the function identifier (FID), the virtual function identifier (VF), and the port number (PORTNUM).	<a href="#">z/OS HCD User's Guide</a>
Configure PFID, SMCRIADDR and optionally SMCRTU parameters on the SMCR configuration statement on one or more IPAQENET OSD interface statements to enable SMC-Rv2.	<a href="#">INTERFACE - IPAQENET OSA-Express QDIO interfaces</a> statement in <a href="#">z/OS Communications Server: IP Configuration Reference</a>

Table 15. Shared Memory Communications multiple IP subnet support (SMCv2) (continued)

Task/Procedure	Reference
Optionally configure SMCPERMIT on the GLOBALCONFIG statement to specify which partners can participate in SMC.	<a href="#">GLOBALCONFIG statement in z/OS Communications Server: IP Configuration Reference</a>
Optionally configure SMCEXCLUDE on the GLOBALCONFIG statement to specify which partners will be not allowed to participate in SMC.	<a href="#">GLOBALCONFIG statement in z/OS Communications Server: IP Configuration Reference</a>
Display whether SMCEID values were specified on SMCGLOBAL by issuing the Netstat CONFIG/-f command.	<a href="#">Netstat CONFIG/-f report in z/OS Communications Server: IP System Administrator's Commands</a>
Display whether SMCPERMIT values were specified on SMCGLOBAL by issuing the Netstat CONFIG/-f command.	<a href="#">Netstat CONFIG/-f report in z/OS Communications Server: IP System Administrator's Commands</a>
Display whether SMCEXCLUDE values were specified on SMCGLOBAL by issuing the Netstat CONFIG/-f command.	<a href="#">Netstat CONFIG/-f report in z/OS Communications Server: IP System Administrator's Commands</a>
Display SMC version used for a connection or link.	<a href="#">z/OS Communications Server: IP System Administrator's Commands:</a> <ul style="list-style-type: none"> <li>• <a href="#">Netstat ALL/-A report</a></li> <li>• <a href="#">Netstat DEvlinks/-d SMC report</a></li> </ul>
Display all interfaces z/OS CS used for SMC communications.	<a href="#">Netstat DEvlinks/-d report in z/OS Communications Server: IP System Administrator's Commands</a>
Display the RoCEv2 capable RNIC that is associated with an OSD interface by issuing the Netstat DEvlinks/-d command and specifying the OSD interface name.	<a href="#">Netstat DEvlinks/-d report in z/OS Communications Server: IP System Administrator's Commands</a>
Display SMCv2 Link Group information to verify your link groups are fully redundant to your SMC partners for high availability.	<a href="#">Netstat DEvlinks/-d SMC report in z/OS Communications Server: IP System Administrator's Commands</a>
Display information about the dynamic ISM TRLEs by issuing the D NET,ID=trle, or D NET,TRL,TRLE=trle command, which might now show **NA** for the PNETID.	<a href="#">z/OS Communications Server: SNA Operation</a> <ul style="list-style-type: none"> <li>• <a href="#">DISPLAY ID command</a></li> <li>• <a href="#">DISPLAY TRL command</a></li> </ul>
Display information about the dynamic RoCE TRLEs by issuing the D NET,ID=trle, or D NET,TRL,TRLE=trle command.	<a href="#">z/OS Communications Server: SNA Operation</a> <ul style="list-style-type: none"> <li>• <a href="#">DISPLAY ID command</a></li> <li>• <a href="#">DISPLAY TRL command</a></li> </ul>
Display routing information to your SMC-Rv2 partners to verify you have redundant routes using SMC-Rv2 enabled OSA-Express interfaces.	<a href="#">Netstat ROUTe/-r report in z/OS Communications Server: IP System Administrator's Commands</a>

To find all new and updated topics about Shared Memory Communications multiple IP subnet support (SMCv2), see [Table 16 on page 26](#).

Table 16. All related topics about Shared Memory Communications multiple IP subnet support (SMCv2)

Book name	Topics
<a href="#">z/OS Communications Server: IP Configuration Guide</a>	<ul style="list-style-type: none"> <li>• <a href="#">Shared Memory Communications multiple IP subnet support (SMCv2)</a></li> <li>• <a href="#">Physical network considerations</a></li> <li>• <a href="#">VLANID considerations</a></li> <li>• <a href="#">Configuring Shared Memory Communications - Direct Memory Access</a></li> </ul>
<a href="#">z/OS Communications Server: IP Configuration Reference</a>	<ul style="list-style-type: none"> <li>• <a href="#">GLOBALCONFIG statement</a></li> <li>• <a href="#">INTERFACE - IPAQENET OSA-Express QDIO interfaces statement</a></li> </ul>
<a href="#">z/OS Communications Server: IP Programmer's Guide and Reference</a>	<ul style="list-style-type: none"> <li>• <a href="#">TCP connection termination record (subtype 2)</a></li> <li>• <a href="#">TCP/IP profile event record (subtype 4)</a> <ul style="list-style-type: none"> <li>– <a href="#">TCP/IP profile record Global configuration section</a></li> <li>– <a href="#">TCP/IP profile record interface section</a></li> <li>– <a href="#">TCP/IP profile record self-defining section</a></li> <li>– <a href="#">TCP/IP profile record Permit table for SMC Filter section</a></li> <li>– <a href="#">TCP/IP profile record Exclude table for SMC Filter section</a></li> </ul> </li> <li>• <a href="#">SMC-D link statistics record (subtype 38)</a></li> <li>• <a href="#">SMC-D link state start record (subtype 39)</a></li> <li>• <a href="#">SMC-D link state end record (subtype 40)</a></li> <li>• <a href="#">SMC-R link group statistics record (subtype 41)</a></li> <li>• <a href="#">SMC-R link state start record (subtype 42)</a></li> <li>• <a href="#">SMC-R link state end record (subtype 43)</a></li> <li>• <a href="#">RDMA network interface card (RNIC) interface statistics record (subtype 44)</a></li> </ul>
<a href="#">z/OS Communications Server: IP Diagnosis Guide</a>	<ul style="list-style-type: none"> <li>• <a href="#">Diagnosing problems with Shared Memory Communications</a></li> <li>• <a href="#">Physical network ID configuration issues</a></li> <li>• <a href="#">No associated subnet mask</a></li> </ul>
<a href="#">z/OS Communications Server: IP System Administrator's Commands</a>	<ul style="list-style-type: none"> <li>• <a href="#">DISPLAY TCPIP,,NETSTAT</a></li> <li>• <a href="#">VARY TCPIP,,SMCAT</a></li> <li>• <a href="#">Netstat ALL/-A report</a></li> <li>• <a href="#">Netstat CONFIG/-f report</a></li> <li>• <a href="#">Netstat DEvlinks/-d report</a></li> </ul>
<a href="#">z/OS Communications Server: SNA Operation</a>	<ul style="list-style-type: none"> <li>• <a href="#">DISPLAY ID command</a></li> <li>• <a href="#">DISPLAY TRL command</a></li> </ul>



Table 16. All related topics about Shared Memory Communications multiple IP subnet support (SMCv2) (continued)

Book name	Topics
<a href="#">z/OS Communications Server: SNA Diagnosis Vol 2, FFST Dumps and the VIT</a>	<ul style="list-style-type: none"> <li>• <a href="#">ENF entry for ENF exit</a></li> <li>• <a href="#">RPLA entry for invoking a RoCE Poll command (Part 3)</a></li> </ul>
<a href="#">z/OS Communications Server: SNA Network Implementation Guide</a>	<a href="#">Resources automatically activated by VTAM</a>
<a href="#">z/OS Communications Server: IP Messages Volume 2 (EZB, EZD)</a>	<ul style="list-style-type: none"> <li>• <a href="#">EZD1978I</a></li> <li>• <a href="#">EZD2051I</a></li> <li>• <a href="#">EZD2056I</a></li> <li>• <a href="#">EZD2057I</a></li> </ul>
<a href="#">z/OS Communications Server: IP Messages Volume 4 (EZZ, SNM)</a>	<ul style="list-style-type: none"> <li>• <a href="#">EZZ0841I</a></li> <li>• <a href="#">EZZ0842I</a></li> <li>• <a href="#">EZZ0843I</a></li> <li>• <a href="#">EZZ0844I</a></li> <li>• <a href="#">EZZ0845I</a></li> <li>• <a href="#">EZZ0846I</a></li> <li>• <a href="#">EZZ0847I</a></li> <li>• <a href="#">EZZ0848I</a></li> </ul>
<a href="#">z/OS Communications Server: SNA Messages</a>	<ul style="list-style-type: none"> <li>• <a href="#">IST2396I</a></li> <li>• <a href="#">IST2398I</a></li> <li>• <a href="#">IST2406I</a></li> <li>• <a href="#">IST2418I</a></li> <li>• <a href="#">IST2421I</a></li> <li>• <a href="#">IST2464I</a></li> <li>• <a href="#">IST2465I</a></li> <li>• <a href="#">IST2466I</a></li> <li>• <a href="#">IST2467I</a></li> </ul>

## Scalability and performance

The following topics describe enhancements for scalability and performance:

- [“zERT Aggregation recording interval” on page 27](#)
- [“Inbound Workload Queueing \(IWQ\) support for IBM z/OS Container Extensions” on page 29](#)

### zERT Aggregation recording interval

z/OS V2R5 Communications Server provides a zERT Aggregation recording interval that is not bound to the system SMF interval. This interval allows zERT summary records to be generated at an interval that can range from 1 to 24 hours.

zERT summary records can be collected as SMF type 119, subtype 12 records in the System Management Facility data sets or log streams. zERT summary records can also be collected by a real-time NMI application using the SYSTCPES service.

**Warning:**

Decreasing the frequency at which zERT summary records are written can increase the amount of 64-bit pageable, private memory needed. This is because zERT aggregation information is held longer in memory before being captured in SMF records.

## Using the zERT Aggregation recording interval

To use the zERT Aggregation recording interval, perform the tasks in [Table 17 on page 28](#).

<i>Table 17. zERT Aggregation recording interval</i>	
<b>Task/Procedure</b>	<b>Reference</b>
Determine if you want to use the zERT aggregation recording interval.	<a href="#">Enabling a longer zERT aggregation recording interval in z/OS Communications Server: IP Configuration Guide</a>
Enable the zERT aggregation recording interval using the new INTVAL and SYNCVAL sub-parameters on the GLOBALCONFIG ZERT AGGREGATION statement.	<a href="#">GLOBALCONFIG statement in z/OS Communications Server: IP Configuration Reference</a>
Display zERT aggregation recording interval settings.	<a href="#">Netstat CONFIG/-f report in z/OS Communications Server: IP System Administrator's Commands</a>

To find all new and updated topics about zERT Aggregation recording interval, see [Table 18 on page 28](#).

<i>Table 18. All related topics about zERT Aggregation recording interval</i>	
<b>Book name</b>	<b>Topics</b>
<a href="#">z/OS Communications Server: IP Configuration Guide</a>	<ul style="list-style-type: none"> <li>• <a href="#">Enabling a longer zERT aggregation recording interval</a></li> <li>• <a href="#">z/OS Encryption Readiness Technology (zERT) Concepts</a></li> <li>• <a href="#">How does zERT aggregation provide the information?</a></li> <li>• <a href="#">Enabling zERT aggregation</a></li> <li>• <a href="#">Setting up TCP/IP operating characteristics in PROFILE.TCPIP</a></li> </ul>
<a href="#">z/OS Communications Server: IP Configuration Reference</a>	<ul style="list-style-type: none"> <li>• <a href="#">GLOBALCONFIG statement</a></li> </ul>
<a href="#">z/OS Communications Server: IP System Administrator's Commands</a>	<ul style="list-style-type: none"> <li>• <a href="#">D TCPIP,,STOR command</a></li> <li>• <a href="#">Netstat CONFIG/-f report</a></li> </ul>
<a href="#">z/OS Communications Server: IP Programmer's Guide and Reference</a>	<ul style="list-style-type: none"> <li>• <a href="#">Format and details for poll-type requests</a></li> <li>• <a href="#">TCP/IP statistics record (subtype 5)</a></li> <li>• <a href="#">zERT Summary record (subtype 12)</a></li> <li>• <a href="#">TCP/IP profile record Global configuration section</a></li> </ul>
<a href="#">z/OS Communications Server: IP Messages Volume 4 (EZZ, SNM)</a>	<ul style="list-style-type: none"> <li>• <a href="#">EZZ8455I</a></li> </ul>

## Inbound Workload Queueing (IWQ) support for IBM z/OS Container Extensions

z/OS V2R5 Communications Server is enhanced to support inbound workload queueing for IBM z/OS Container Extensions (zCX) workloads for OSA-Express in QDIO mode.

Inbound workload queueing uses multiple input queues for each QDIO data device (subchannel device) to improve TCP/IP stack scalability and general network optimization. To implement the performance improvements for zCX workloads, enable inbound workload queueing to process zCX, IPSec, EE, sysplex distributor, and streaming bulk data traffic all concurrently with other types of inbound QDIO traffic. When you enable these improvements for a QDIO interface, zCX, inbound IPSec, EE, sysplex distributor, and streaming bulk data traffic are each processed on their own ancillary input queue (AIQ). All other inbound traffic is processed on the primary input queue.

**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 is limited to OSA-Express6S Ethernet features or later in QDIO mode running on IBM z14<sup>®</sup>. For more information about the QDIO inbound workload queueing function and the OSA-Express features that support it, see [QDIO inbound workload queueing in z/OS Communications Server: IP Configuration Guide](#). See the 3906DEVICE or 3907DEVICE Preventive Service Planning (PSP) bucket for more information.
- This function is supported only for interfaces that are configured to use a virtual MAC (VMAC) address.

To enable IWQ support for z/OS Container Extensions, complete the appropriate tasks in [Table 19 on page 29](#).

Table 19. Task topics to enable IWQ support for z/OS Container Extensions	
Task	Reference
Enable inbound workload queueing for a specific QDIO interface by specifying the WORKLOADQ parameter on the IPAQENET or IPAQENET6 INTERFACE statement (if not already configured).	<ul style="list-style-type: none"> <li>• See the following statements in <a href="#">z/OS Communications Server: IP Configuration Reference</a>: <ul style="list-style-type: none"> <li>– <a href="#">INTERFACE-IPAQENET OSA-Express QDIO interfaces</a></li> <li>– <a href="#">INTERFACE-IPAQENET6 OSA-Express QDIO interfaces</a></li> </ul> </li> <li>• <a href="#">Steps for enabling QDIO inbound workload queueing in z/OS Communications Server: IP Configuration Guide</a></li> </ul>
Display whether inbound workload queueing is in effect for the QDIO interface by issuing the <b>Netstat DEvlinks/-d</b> command.	<a href="#">Netstat DEvlinks/-d report in z/OS Communications Server: IP System Administrator's Commands</a>
Display whether inbound workload queueing is in effect for the QDIO interface and display the workload queueing functions and queue IDs for that interface by issuing the <b>DISPLAY NET,ID=trle</b> command or the <b>DISPLAY NET,TRL,TRLE=trle</b> command.	<a href="#">See the following topics in z/OS Communications Server: SNA Operation</a> : <ul style="list-style-type: none"> <li>• <a href="#">DISPLAY ID command</a></li> <li>• <a href="#">DISPLAY TRL command</a></li> </ul>
Monitor whether inbound traffic is using inbound workload queueing and display statistics for each queue by initiating VTAM tuning statistics for the QDIO interface.	<a href="#">MODIFY TNSTAT command in z/OS Communications Server: SNA Operation</a>

Table 19. Task topics to enable IWQ support for z/OS Container Extensions (continued)

Task	Reference
Monitor whether inbound traffic is using inbound workload queueing and display statistics for each queue by using the TCP/IP callable NMI GetIfStatsExtended request.	<a href="#">TCP/IP callable NMI (EZBNMIFR) in z/OS Communications Server: IP Programmer's Guide and Reference</a>
Determine the QID on which a specific packet was received, and the associated workload queueing function, from a packet trace.	<a href="#">Formatting packet traces using IPCS in z/OS Communications Server: IP Diagnosis Guide</a>
Determine the QID on which a specific packet was received from an OSAENTA trace.	<a href="#">Formatting OSA traces using IPCS in z/OS Communications Server: IP Diagnosis Guide</a>

To find all related topics about IWQ support for z/OS Container Extensions, see [Table 20 on page 30](#).

Table 20. All related topics about IWQ support for z/OS Container Extensions

Book name	Topics
<a href="#">z/OS Communications Server: IP Configuration Guide</a>	<ul style="list-style-type: none"> <li>• <a href="#">QDIO inbound workload queueing</a></li> </ul>
<a href="#">z/OS Communications Server: IP Configuration Reference</a>	<ul style="list-style-type: none"> <li>• <a href="#">INTERFACE-IPAQENET OSA-Express QDIO interfaces</a></li> <li>• <a href="#">INTERFACE-IPAQENET6 OSA-Express QDIO interfaces</a></li> </ul>
<a href="#">z/OS Communications Server: IP Programmer's Guide and Reference</a>	<ul style="list-style-type: none"> <li>• <a href="#">TCP/IP callable NMI (EZBNMIFR)</a></li> </ul>
<a href="#">z/OS Communications Server: IP Diagnosis Guide</a>	<ul style="list-style-type: none"> <li>• <a href="#">Formatting packet traces using IPCS</a></li> <li>• <a href="#">Formatting OSA traces using IPCS</a></li> </ul>
<a href="#">z/OS Communications Server: IP System Administrator's Commands</a>	<ul style="list-style-type: none"> <li>• <a href="#">DISPLAY TCPIP,,OSAINFO</a></li> <li>• <a href="#">Netstat DEvlinks/-d report</a></li> </ul>
<a href="#">z/OS Communications Server: SNA Operation</a>	<ul style="list-style-type: none"> <li>• <a href="#">DISPLAY ID command</a></li> <li>• <a href="#">DISPLAY TRL command</a></li> <li>• <a href="#">MODIFY TNSTAT command</a></li> </ul>
<a href="#">z/OS Communications Server: SNA Messages</a>	<ul style="list-style-type: none"> <li>• <a href="#">IST1221I</a></li> <li>• <a href="#">IST1230I</a></li> <li>• <a href="#">IST1233I</a></li> </ul>

## Systems management

The following topic describes enhancements for systems management:

- [“Ping output enhanced to provide microsecond precision” on page 31](#)
- [“Notification of availability of TCP/IP extended services” on page 31](#)

## Ping output enhanced to provide microsecond precision

z/OS V2R5 Communications Server enhances the output for the TSO PING command and the z/OS UNIX ping command to provide the response time with a precision of microseconds.

### Using the Ping output enhanced to provide microsecond precision

To use the Ping output enhanced to provide microsecond precision, perform the tasks in [Table 21 on page 31](#).

Table 21. Ping output enhanced to provide microsecond precision	
Task/Procedure	Reference
Issue the TSO PING command or the z/OS UNIX ping command.	<a href="#">Ping in z/OS Communications Server: IP System Administrator's Commands</a>

To find all new and updated topics about Ping output enhanced to provide microsecond precision, see [Table 22 on page 31](#).

Table 22. All related topics about Ping output enhanced to provide microsecond precision	
Book name	Topics
<a href="#">z/OS Communications Server: IP Configuration Guide</a>	<ul style="list-style-type: none"><li>• <a href="#">Verifying connections with Netstat, Ping, and Traceroute</a></li><li>• <a href="#">Activating the quick start Security Association</a></li></ul>
<a href="#">z/OS Communications Server: IP System Administrator's Commands</a>	<ul style="list-style-type: none"><li>• <a href="#">MVS console invocation of the EZACMD command</a></li><li>• <a href="#">NetView invocation of the EZACMD command</a></li><li>• <a href="#">The TSO PING command: Send an echo request</a></li><li>• <a href="#">The z/OS UNIX ping command: Send an echo request</a></li></ul>

## Notification of availability of TCP/IP extended services

z/OS V2R5 Communications Server has enhanced TCP/IP to dynamically generate a new console message (EZD1314I), Event Notification Facility signal, and Name/Token pair when the TCP/IP stack and all its extended stack services are fully initialized. You can use TCP/IP profile configuration to determine which extended services are required based on your needs.

### Using the notification of availability of TCP/IP extended services

To use the notification of availability of TCP/IP extended services, perform the tasks in [Table 23 on page 31](#).

Table 23. Notification of availability of TCP/IP extended services	
Task/Procedure	Reference
Configure one of the options on the new GLOBALCONFIG POLICYREQUIRED parameter or take the default option.	<a href="#">GLOBALCONFIG statement in z/OS Communications Server: IP Configuration Reference</a>
Configure one of the options on the new GLOBALCONFIG IKEDREQUIRED parameter or take the default option.	<a href="#">GLOBALCONFIG statement in z/OS Communications Server: IP Configuration Reference</a>

Table 23. Notification of availability of TCP/IP extended services (continued)

Task/Procedure	Reference
To programmatically determine if the TCP/IP stack and its extended services are initialized, create an ENF exit to listen for the ENF80 signal with the corresponding qualifier.	<ul style="list-style-type: none"> <li>• <a href="#">z/OS MVS Programming: Authorized Assembler Services Reference EDT-IXG</a>: <ul style="list-style-type: none"> <li>– <a href="#">ENFREQ — Listen for system events</a></li> <li>– <a href="#">Table: ENF macro event codes</a></li> </ul> </li> <li>• <a href="#">z/OS Communications Server: IP Programmer's Guide and Reference</a>: <ul style="list-style-type: none"> <li>– <a href="#">EZAENF80 Parameter list for ENF event code 80 listen exits</a></li> <li>– <a href="#">Using ENF event code 80 to notify applications of complete initialization of the TCP/IP stack and extended services</a></li> </ul> </li> </ul>
<p>Another step you should perform to programmatically determine if the TCP/IP stack and its extended services are initialized is to also create a Name/Token Pair retrieval. A Name/Token Pair will be created at the same time as ENF generation and is used to close a timing window that exists where an ENF signal can be missed if the signal is issued before the listener is started.</p> <p>The Name/Token Pair that will be generated will be 16 bytes, where the leftmost 8 bytes will be a constant (EZBSTKUP) and the rightmost 8 bytes will be the stack <i>jobname</i>. An example of this is EZBSTKUPTCPCS1.</p>	<ul style="list-style-type: none"> <li>• <a href="#">z/OS MVS Programming: Assembler Services Reference IAR-XCT</a>: <ul style="list-style-type: none"> <li>– <a href="#">IEAN4RT - Retrieve the token from a name/token pair (64-bit mode)</a></li> <li>– <a href="#">IEANTRT - Retrieve the token from a name/token pair (31-bit mode)</a></li> </ul> </li> <li>• <a href="#">z/OS MVS Programming: Assembler Services Guide</a>: <ul style="list-style-type: none"> <li>– <a href="#">Understanding name/token pairs and levels</a></li> </ul> </li> <li>• <a href="#">z/OS Communications Server: IP Programmer's Guide and Reference</a>: <ul style="list-style-type: none"> <li>– <a href="#">Using ENF event code 80 to notify applications of complete initialization of the TCP/IP stack and extended services</a></li> </ul> </li> </ul>
After starting the ENF listener and Name/Token Pair retrieval, if the receipt of the Name/Token Pair fails (meaning stack not ready yet) then wait for the ENF listen to pop, otherwise if the Name/Token receipt is successful (stack is ready) then cancel the ENF listen.	<ul style="list-style-type: none"> <li>• <a href="#">z/OS MVS Programming: Assembler Services Reference IAR-XCT</a>: <ul style="list-style-type: none"> <li>– <a href="#">IEAN4RT - Retrieve the token from a name/token pair (IPv4)</a></li> </ul> </li> <li>• <a href="#">z/OS Communications Server: IP Programmer's Guide and Reference</a>: <ul style="list-style-type: none"> <li>– <a href="#">Using ENF event code 80 to notify applications of complete initialization of the TCP/IP stack and extended services</a></li> </ul> </li> </ul>

To find all new and updated topics about notification of availability of TCP/IP extended services, see [Table 24 on page 32](#).

Table 24. All related topics about notification of availability of TCP/IP extended services

Book name	Topics
<a href="#">z/OS Communications Server: IP Configuration Guide</a>	<ul style="list-style-type: none"> <li>• <a href="#">Verifying your configuration</a></li> </ul>
<a href="#">z/OS Communications Server: IP Configuration Reference</a>	<ul style="list-style-type: none"> <li>• <a href="#">GLOBALCONFIG statement</a></li> </ul>

Table 24. All related topics about notification of availability of TCP/IP extended services (continued)

Book name	Topics
<a href="#">z/OS Communications Server: IP Programmer's Guide and Reference</a>	<ul style="list-style-type: none"> <li>• <a href="#">TCP/IP profile record Global configuration section</a></li> <li>• <a href="#">EZAENF80 Parameter list for ENF event code 80 listen exits</a></li> <li>• <a href="#">Using ENF event code 80 to notify applications of complete initialization of the TCP/IP stack and extended services</a></li> </ul>
<a href="#">z/OS Communications Server: IP Diagnosis Guide</a>	<ul style="list-style-type: none"> <li>• <a href="#">Diagnosing TCP/IP stack initialization problems</a></li> </ul>
<a href="#">z/OS Communications Server: IP Messages Volume 2 (EZB, EZD)</a>	<ul style="list-style-type: none"> <li>• <a href="#">EZB6473I</a></li> <li>• <a href="#">EZD1176I</a></li> <li>• <a href="#">EZD1314I</a></li> </ul>
<a href="#">z/OS MVS Programming: Authorized Assembler Services Reference EDT-IXG</a>	<ul style="list-style-type: none"> <li>• <a href="#">ENFREQ — Listen for system events</a></li> <li>• <a href="#">Table: ENF macro event codes</a></li> </ul>
<a href="#">z/OS MVS Programming: Assembler Services Reference IAR-XCT</a>	<ul style="list-style-type: none"> <li>• <a href="#">IEAN4RT - Retrieve the token from a name/token pair (64-bit mode)</a></li> <li>• <a href="#">IEANTRT - Retrieve the token from a name/token pair (31-bit mode)</a></li> </ul>
<a href="#">z/OS MVS Programming: Assembler Services Guide</a>	<ul style="list-style-type: none"> <li>• <a href="#">Understanding name/token pairs and levels</a></li> </ul>

## Enhancing security

The following topics describe enhancements for security:

- [“zERT policy-based enforcement” on page 34](#)
- [“AT-TLS currency with System SSL” on page 33](#)
- [“AT-TLS and IPsec certificate diagnostics” on page 39](#)
- [“IPsec certificate reporting enhancements” on page 40](#)
- [“Sysplex Autonomics for IPSec” on page 41](#)
- [“IBM zERT Network Analyzer database administration enhancements” on page 43](#)

### AT-TLS currency with System SSL

z/OS V2R5 Communications Server provides AT-TLS support for RFC 7627 "Transport Layer Security (TLS) Session Hash and Extended Master Secret Extension". RFC 7627 defines an extended master secret extension. The extension is used to negotiate whether an extended master secret computation will be used for a TLSv1.2 or earlier handshake.

**Incompatibility:** TLSv1.3 does not use the extended master secret extension to negotiate whether an extended master secret computation will be used or not. The same protection provided by the extended master secret computation is built into the base TLSv1.3 support.

To enable AT-TLS currency with System SSL, perform the tasks in [Table 25 on page 34](#).

Table 25. AT-TLS currency with System SSL	
Task/Procedure	Reference
Review the options for enabling AT-TLS support for the Extended Master Secret extension and computation. By default, the support is enabled for AT-TLS clients and servers.	<ul style="list-style-type: none"> <li>• <a href="#">Network Configuration Assistant online help</a></li> <li>• ClientExtendedMasterSecret and ServerExtendedMasterSecret parameters in <a href="#">TTLSEnvironmentAdvancedParms</a> statement and <a href="#">TTLSTransportAdvancedParms</a> statement in <a href="#">z/OS Communications Server: IP Configuration Reference</a></li> </ul>
Display AT-TLS policy using the z/OS UNIX pasearch command to query information from the Policy Agent.	<a href="#">The z/OS UNIX pasearch command: Display policies in z/OS Communications Server: IP System Administrator's Commands</a>
Display AT-TLS policy for an active connection using the Netstat TTLS/-x command.	<a href="#">Netstat TTLS/-x report in z/OS Communications Server: IP System Administrator's Commands</a>

To find all related topics about AT-TLS currency with System SSL, see [Table 26 on page 34](#).

Table 26. All related topics about AT-TLS currency with System SSL	
Book name	Topics
<a href="#">z/OS Communications Server: IP System Administrator's Commands</a>	<ul style="list-style-type: none"> <li>• <a href="#">COnn report examples</a></li> <li>• <a href="#">Report field descriptions</a></li> <li>• <a href="#">The z/OS UNIX pasearch command: Display policies</a></li> </ul>
<a href="#">z/OS Communications Server: IP Configuration Reference</a>	<ul style="list-style-type: none"> <li>• <a href="#">TTLSEnvironmentAdvancedParms</a> statement</li> <li>• <a href="#">TTLSTransportAdvancedParms</a> statement</li> <li>• <a href="#">General syntax rules for Policy Agent</a></li> </ul>

## zERT policy-based enforcement

z/OS V2R5 Communications Server enhances the z/OS Encryption Readiness Technology (zERT) function to provide enforcement of your network encryption standards. The zERT policy-based enforcement (zERT enforcement) solution allows policy-based rules that describe different levels of cryptographic protection along with optional actions to take when TCP connections match those rules. zERT enforcement actions enable immediate notification through messages, auditing through SMF records, and automatic connection termination when questionable or unacceptable cryptographic protection is detected.

z/OS network security administrators can create and manage zERT enforcement rules and actions through the Network Configuration Assistant with APAR PH35304 and the z/OS Communications Server policy agent.

### Restrictions:

- zERT enforcement applies only to TCP traffic. It does not apply to UDP traffic (including EE) or traffic using other IP protocols.
- For TLS and SSH, zERT enforcement uses the cryptographic protection attributes that are obtained through stream observation only. A limited amount of security attribute data is available through observation as compared to data obtained by zERT enabled z/OS cryptographic protocol providers.
- zERT discovery collects cryptographic security attributes for the TLS, SSL, SSH, and IPsec protocols. No other cryptographic security protocols are supported. For more information, see [What are the limitations for zERT discovery?](#) in [z/OS Communications Server: IP Configuration Guide](#).

### Dependencies:



- z/OS Encryption Readiness Technology (zERT) function must be enabled with the GLOBALCONFIG statement in the TCP/IP profile.
- To create and manage zERT enforcement rules and actions with the Network Configuration Assistant (NCA), NCA APAR PH35304 is required.
- zERT enforcement requires policy agent to be started.
- If you plan to configure zERT enforcement to log messages to syslogd, the syslog daemon and traffic regulation manager daemon (TRMD) must be active.

*Table 27. zERT policy-based enforcement*

<b>Task/Procedure</b>	<b>Reference</b>
Evaluate zERT policy-based enforcement requirements.	<ul style="list-style-type: none"> <li>• <a href="#">How does zERT enforcement work? in z/OS Communications Server: IP Configuration Guide</a></li> <li>• <a href="#">Defining a zERT enforcement policy in z/OS Communications Server: IP Configuration Guide</a></li> </ul>
(Preferred) Use the IBM Configuration Assistant for z/OS Communications Server to create the zERT enforcement policies and install them on the z/OS system where policy agent can process them	<a href="#">Network Configuration Assistant online help</a>
(Optional) To define zERT enforcement policies manually in policy agent: <ul style="list-style-type: none"> <li>• Understand the policy configuration files</li> <li>• Review sample zERT enforcement policy definitions</li> <li>• Enable zERT configuration for policy agent</li> <li>• Create zERT enforcement rules per security protocol</li> </ul>	<ul style="list-style-type: none"> <li>• <a href="#">Policy-based networking in z/OS Communications Server: IP Configuration Guide</a></li> <li>• <a href="#">Policy configuration files and Policy Agent general configuration file statements in z/OS Communications Server: IP Configuration Reference</a></li> <li>• <a href="#">ZERTConfig statement, PolicyServer statement, and DynamicConfigPolicyLoad statement in z/OS Communications Server: IP Configuration Reference</a></li> <li>• <a href="#">zERT policy statements in z/OS Communications Server: IP Configuration Reference</a></li> <li>• The policy agent sample file is provided here:  <pre>/usr/lpp/tcpip/samples/pagent.conf</pre></li> <li>• The ZERT policy sample file is provided here:  <pre>/usr/lpp/tcpip/samples/pagent_ZERT.conf</pre></li> </ul>
Enable z/OS Encryption Readiness Technology discovery function	<a href="#">GLOBALCONFIG statement in z/OS Communications Server: IP Configuration Reference</a>

Table 27. zERT policy-based enforcement (continued)

Task/Procedure	Reference
<p>If an audit action is enabled in your zERT enforcement policies:</p> <ul style="list-style-type: none"> <li>Determine where zERT SMF records are to be collected <ul style="list-style-type: none"> <li>If you want the records to go to the System Management Facility, specify SMFCONFIG TYPE119 ZERTDETAILBYPOLICY.</li> <li>If you want the records to be available to the real-time NMI zERT service (SYSTCPR), specify NETMONITOR ZERTSERVICEBYPOLICY.</li> <li>If you want the records available to both services, specify both SMFCONFIG TYPE119 ZERTDETAILBYPOLICY and NETMONITOR ZERTSERVICEBYPOLICY.</li> </ul> </li> <li>Use the information from the SMF 119 subtype 11 'zERT enforcement' event records that provide zERT data</li> </ul>	<ul style="list-style-type: none"> <li>Selecting a destination for zERT discovery SMF record in <a href="#">z/OS Communications Server: IP Configuration Guide</a></li> <li>SMFCONFIG statement in <a href="#">z/OS Communications Server: IP Configuration Reference</a></li> <li>NETMONITOR statement in <a href="#">z/OS Communications Server: IP Configuration Reference</a></li> <li>zERT connection detail record (subtype 11) in <a href="#">z/OS Communications Server: IP Programmer's Guide and Reference</a></li> </ul>
<p>If a syslogd logging action is enabled in your zERT enforcement policies:</p> <ul style="list-style-type: none"> <li>(Optional) Configure syslogd rule to direct zERT messages to a file. zERT messages are written to syslog facility local5 using the priority configured for the zERT action.</li> <li>Start syslog daemon</li> <li>Start TRMD (for each stack in use)</li> </ul>	<ul style="list-style-type: none"> <li>Syslog daemon in <a href="#">z/OS Communications Server: IP Configuration Reference</a></li> <li>Starting the traffic regulation manager daemon (TRMD) from the z/OS shell and <a href="#">Starting the traffic regulation manager daemon (TRMD) as a started task in z/OS Communications Server: IP Configuration Reference</a></li> </ul>
<p>If a console logging action is enabled in your zERT enforcement policies, to prevent the TCP/IP job log from growing very large and filling up the spool space, ensure that the TCP/IP job log is being spun-off on a regular basis.</p>	<ul style="list-style-type: none"> <li>Writing your own master scheduler JCL in <a href="#">z/OS MVS Initialization and Tuning Reference</a></li> <li>Determining the source JCL for the started task in <a href="#">z/OS MVS JCL Reference</a></li> <li>JESLOG parameter in <a href="#">z/OS MVS JCL Reference</a></li> </ul>
<p>Start the Policy Agent</p>	<ul style="list-style-type: none"> <li>Starting and stopping the Policy Agent in <a href="#">z/OS Communications Server: IP Configuration Guide</a></li> <li>Starting Policy Agent from the z/OS shell and <a href="#">Starting Policy Agent as a started task in z/OS Communications Server: IP Configuration Reference</a></li> </ul>
<p>Display zERT configuration settings in the TCP/IP profile</p>	<a href="#">Netstat CONFIG/-f report in z/OS Communications Server: IP System Administrator's Commands</a>
<p>Display zERT enforcement policy entries (rules and actions)</p> <ul style="list-style-type: none"> <li>Issue the <b>pasearch -z</b> command</li> </ul>	<a href="#">The z/OS UNIX pasearch command: Display policies in z/OS Communications Server: IP System Administrator's Commands</a>
<p>Display the names of the zERT enforcement policy rule for a connection</p> <ul style="list-style-type: none"> <li>Issue the <b>Netstat ALL/-A</b> command</li> </ul>	<a href="#">Netstat ALL/-A report in z/OS Communications Server: IP System Administrator's Commands</a>

To find all related topics about zERT policy-based enforcement, see [Table 28 on page 37](#).

<i>Table 28. All related topics about zERT policy-based enforcement</i>	
Book name	Topics
<a href="#">z/OS Communications Server: IP Configuration Guide</a>	<ul style="list-style-type: none"> <li>• <a href="#">Logging of system messages</a></li> <li>• <a href="#">zERT information service access control</a></li> <li>• <a href="#">Secure Shell (SSH)</a></li> <li>• <a href="#">Monitoring cryptographic network protection: z/OS encryption readiness technology (zERT)</a></li> <li>• <a href="#">How does zERT discovery provide the information?</a></li> <li>• <a href="#">What are the limitations for zERT discovery?</a></li> <li>• <a href="#">What does zERT aggregation collect?</a></li> <li>• <a href="#">How does zERT aggregation provide the information?</a></li> <li>• <a href="#">How does zERT enforcement work?</a></li> <li>• <a href="#">Using z/OS Encryption Readiness Technology</a></li> <li>• <a href="#">Enabling zERT discovery</a></li> <li>• <a href="#">Enabling zERT policy-based enforcement</a></li> <li>• <a href="#">Selecting a destination for zERT discovery SMF records</a></li> <li>• <a href="#">Disabling zERT discovery</a></li> <li>• <a href="#">Defining a zERT enforcement policy</a></li> <li>• <a href="#">Policy types and infrastructure overview</a></li> <li>• <a href="#">Configuration files and policy definition files</a></li> <li>• <a href="#">Storing configuration files and policy definition files</a></li> <li>• <a href="#">TCP/IP stack</a></li> <li>• <a href="#">Policy Agent policies</a></li> <li>• <a href="#">Policy sample files</a></li> <li>• <a href="#">zERT policy-based enforcement (ZERT) policy</a></li> <li>• <a href="#">Policy configuration files</a></li> <li>• <a href="#">Step 1: Configure general information</a></li> <li>• <a href="#">Step 2: Configure Policy Agent as a policy server</a></li> <li>• <a href="#">Step 4: Configure policies in Policy Agent configuration files</a></li> <li>• <a href="#">Stopping the Policy Agent</a></li> <li>• <a href="#">FLUSH and PURGE considerations</a></li> <li>• <a href="#">Switching between local and remote policies</a></li> <li>• <a href="#">Traffic regulation management daemon</a></li> </ul>

Table 28. All related topics about zERT policy-based enforcement (continued)

Book name	Topics
<a href="#">z/OS Communications Server: IP Configuration Reference</a>	<ul style="list-style-type: none"> <li>• <a href="#">NETMONITOR statement</a></li> <li>• <a href="#">SMFCONFIG statement</a></li> <li>• <a href="#">Policy Agent and policy applications</a></li> <li>• <a href="#">Policy Agent configuration files overview</a></li> <li>• <a href="#">Policy Agent configuration statements overview</a></li> <li>• <a href="#">General syntax rules for Policy Agent</a></li> <li>• <a href="#">PolicyServer statement</a></li> <li>• <a href="#">DynamicConfigPolicyLoad statement</a></li> <li>• <a href="#">IpAddr statement</a></li> <li>• <a href="#">IpAddrGroup statement</a></li> <li>• <a href="#">IpAddrSet statement</a></li> <li>• <a href="#">Facilities used by z/OS Communications Server</a></li> <li>• <a href="#">ZERTConfig statement</a></li> <li>• <a href="#">zERT policy statement</a></li> </ul>
<a href="#">z/OS Communications Server: IP Diagnosis Guide</a>	<ul style="list-style-type: none"> <li>• <a href="#">Diagnosing zERT policy-based enforcement problems</a></li> <li>• <a href="#">Overview</a></li> <li>• <a href="#">Policy definition problems</a></li> </ul>
<a href="#">z/OS Communications Server: IP System Administrator's Commands</a>	<ul style="list-style-type: none"> <li>• <a href="#">The z/OS UNIX pasearch command: Display policies</a></li> <li>• <a href="#">Netstat CONFIG/-f report</a> <ul style="list-style-type: none"> <li>– <a href="#">Not IPv6 enabled (SHORT format)</a></li> <li>– <a href="#">IPv6 enabled or request for LONG format</a></li> <li>– <a href="#">Report field description</a></li> </ul> </li> <li>• <a href="#">Netstat ALL/-A report z/OS UNIX syntax</a> <ul style="list-style-type: none"> <li>– <a href="#">Not IPv6 enabled (SHORT format)</a></li> <li>– <a href="#">IPv6 enabled or request for LONG format</a></li> <li>– <a href="#">Report field description</a></li> </ul> </li> </ul>
<a href="#">z/OS Communications Server: IP Programmer's Guide and Reference</a>	<ul style="list-style-type: none"> <li>• <a href="#">Real-time TCP/IP network monitoring NMI</a></li> <li>• <a href="#">Real-time NMI: Interacting with the servers</a></li> <li>• <a href="#">Requests sent by the client to the server: SYSTCPER service</a></li> <li>• <a href="#">Processing the cte records for SYSTCPER</a></li> <li>• <a href="#">zERT connection detail record (subtype 11)</a></li> <li>• <a href="#">TCP connection termination record (subtype 2)</a></li> <li>• <a href="#">TCP/IP profile record management section</a></li> </ul>
<a href="#">z/OS Communications Server: Quick Reference</a>	<a href="#">pasearch command</a>

Table 28. All related topics about zERT policy-based enforcement (continued)

Book name	Topics
z/OS Communications Server: IP Messages Volume 4 (EZZ, SNM)	<ul style="list-style-type: none"> <li>• <a href="#">EZZ8544I</a></li> <li>• <a href="#">EZZ8546I</a></li> <li>• <a href="#">EZZ8547I</a></li> <li>• <a href="#">EZZ8551I</a></li> <li>• <a href="#">EZZ8552I</a></li> <li>• <a href="#">EZZ8553I</a></li> <li>• <a href="#">EZZ8554I</a></li> <li>• <a href="#">EZZ8555I</a></li> <li>• <a href="#">EZZ8556I</a></li> <li>• <a href="#">EZZ8557I</a></li> <li>• <a href="#">EZZ8558I</a></li> <li>• <a href="#">EZZ8559I</a></li> <li>• <a href="#">EZZ8560I</a></li> <li>• <a href="#">EZZ8561I</a></li> <li>• <a href="#">EZZ8562I</a></li> <li>• <a href="#">EZZ8563I</a></li> <li>• <a href="#">EZZ8564I</a></li> <li>• <a href="#">EZZ8565I</a></li> <li>• <a href="#">EZZ8583I</a></li> <li>• <a href="#">EZZ8584I</a></li> <li>• <a href="#">EZZ8585I</a></li> <li>• <a href="#">EZZ8586I</a></li> </ul>

## AT-TLS and IPsec certificate diagnostics

z/OS V2R5 Communications Server provides additional certificate diagnostic data to allow you to more quickly determine the cause of an AT-TLS or IPsec negotiation failure. New syslogd messages are provided to identify certificate validation errors detected when processing a peer's certificate.

### Restrictions:

- Certificate diagnostic messages are provided when the validation of the peer's certificate fails. For validation failures accessing the local certificate, certificate diagnostic data is not provided.
- For IPsec negotiation failures due to errors with the peer's certificate, certificate diagnostic data will only be provided when the failure is detected by System SSL.

### Dependencies:

The syslog daemon (i.e. syslogd) must be active. For AT-TLS and IPsec, the additional certificate diagnostic messages are written to syslogd.

To enable AT-TLS and IPsec certificate diagnostics, perform the tasks in [Table 29 on page 40](#).

Table 29. AT-TLS and IPsec certificate diagnostics

Task/Procedure	Reference
<p>If you use AT-TLS to secure connections, view the tracing levels enabled in the AT-TLS policy.</p> <ul style="list-style-type: none"> <li>When the trace level includes error, message "EZD2052I TTLS Certificate Diagnostics" is written to syslogd when additional certificate information is available for a negotiation failure.</li> <li>When the trace level includes event, messages "EZD2053I TTLS Certificate Diagnostics Details" and "EZD2054I TTLS Certificate Diagnostics Data Sources" are written to syslogd when additional certificate information is available for a negotiation failure.</li> </ul>	<ul style="list-style-type: none"> <li>In <a href="#">z/OS Communications Server: IP Configuration Reference</a>, Trace parameter in <ul style="list-style-type: none"> <li><a href="#">TTLSGroupAction</a> statement</li> <li><a href="#">TTLSEnvironmentAction</a> statement</li> <li><a href="#">TTLSConnectionAction</a> statement</li> </ul> </li> <li>Rule Advanced Settings, Tracing tab in Network Configuration Assistant</li> </ul>
<p>If you use IPsec to secure network traffic, view the log levels enabled in the IKED configuration file.</p> <ul style="list-style-type: none"> <li>When the log level includes level 1 (default level), message "EZD2055I Certificate Diagnostics" is written to syslogd when additional certificate information is available for a negotiation failure.</li> <li>When the log level includes level 4 (debug for security association negotiations), messages "DEBUGSA : Certificate Diagnostics Details" and "DEBUGSA : Certificate Diagnostics Data Sources" are written to syslogd when additional certificate information is available for a negotiation failure.</li> </ul>	<ul style="list-style-type: none"> <li><a href="#">IkeSyslogLevel</a> parameter in <a href="#">IkeConfig</a> statement in <a href="#">z/OS Communications Server: IP Configuration Reference</a></li> <li>IKE Daemon Syslog Trace in Network Configuration Assistant</li> </ul>

To find all related topics about AT-TLS and IPsec certificate diagnostics, see [Table 30 on page 40](#).

Table 30. All related topics about AT-TLS and IPsec certificate diagnostics

Book name	Topics
<a href="#">z/OS Communications Server: IP Diagnosis Guide</a>	<ul style="list-style-type: none"> <li><a href="#">Common problems</a></li> <li><a href="#">Error codes</a></li> <li><a href="#">Steps for diagnosing AT-TLS problems</a></li> <li><a href="#">AT-TLS traces</a></li> <li><a href="#">AT-TLS return codes</a></li> </ul>
<a href="#">z/OS Communications Server: IP Messages Volume 2 (EZB, EZD)</a>	<ul style="list-style-type: none"> <li><a href="#">EZD0902I</a></li> <li><a href="#">EZD1139I</a></li> <li><a href="#">EZD2052I</a></li> <li><a href="#">EZD2053I</a></li> <li><a href="#">EZD2054I</a></li> <li><a href="#">EZD2055I</a></li> </ul>

## IPsec certificate reporting enhancements

In V2R5, the z/OS UNIX ipsec command has been enhanced to display local and remote certificate information, such as serial number and expiration date, for phase 1 tunnels. The same certificate information is provided in the IPsec Network Management Interface (NMI) NMSec\_GET\_IKETUN and

NMsec\_GET\_IKETUNCASCADE message responses, and the SMF type 119 IPsec IKE tunnel activation (subtype 73) and tunnel deactivation (subtype 74) records.

**Restriction:** When using the z/OS UNIX ipsec command to retrieve phase 1 tunnel data from a remote system, both the local and remote system must be at z/OS V2R5 or later for the new certificate fields to be displayed.

Table 31. IPsec certificate reporting enhancements	
Task/Procedure	Reference
Display new certificate fields on the ipsec -k display	<a href="#">IKE tunnel (-k) primary option in z/OS Communications Server: IP System Administrator's Commands</a>
Process new certificate fields in the NMsec_GET_IKETUN and NMsec_GET_IKETUNCASCADE message response	<a href="#">NMset_GET_IKETUN and NMset_GET_IKETUNCASCADE in z/OS Communications Server: IP Programmer's Guide and Reference</a>
Process new certificate fields in the SMF type 119 subtype 73 (IPSec IKE tunnel activation and refresh record) and the subtype 74 (IPSec IKE tunnel deactivation and expire record).	<a href="#">IPSec IKE tunnel activation and refresh record (subtype 73) and IPSec IKE tunnel deactivation and expire record (subtype 74) in z/OS Communications Server: IP Programmer's Guide and Reference</a>

To find all related topics about IPsec certificate reporting enhancements, see [Table 32 on page 41](#).

Table 32. All related topics about IPsec certificate reporting enhancements	
Book name	Topics
<a href="#">z/OS Communications Server: IP System Administrator's Commands</a>	<ul style="list-style-type: none"> <li><a href="#">IKE tunnel (-k) primary option report example</a></li> <li><a href="#">IKE tunnel (-k) primary option report field descriptions</a></li> </ul>
<a href="#">z/OS Communications Server: IP Programmer's Guide and Reference</a>	<ul style="list-style-type: none"> <li><a href="#">NMset_GET_IKETUN</a></li> <li><a href="#">NMset_GET_IKETUNCASCADE</a></li> <li><a href="#">IPSec IKE tunnel activation and refresh record (subtype 73)</a></li> <li><a href="#">IPSec IKE tunnel deactivation and expire record (subtype 74)</a></li> </ul>
<a href="#">z/OS Communications Server: IP Configuration Guide</a>	<ul style="list-style-type: none"> <li><a href="#">Displaying IKE tunnel information with the ipsec command</a></li> <li><a href="#">Displaying the quick start Security Associations</a></li> </ul>

## Sysplex Autonomics for IPsec

z/OS V2R5 enhances the sysplex autonomics function to monitor IPsec infrastructure. You can request that sysplex autonomics delay a TCP/IP stack from joining a sysplex group until the IPsec infrastructure is active. You can also request that sysplex autonomics monitor the IPsec infrastructure after the stack has joined the sysplex group. If monitoring the IPsec infrastructure is enabled, you are alerted with new messages when the IPsec infrastructure is not operational. You can optionally configure the TCP/IP stack to also take a recovery action and leave the sysplex when it detects that the IPsec infrastructure is not active. This allows a backup TCP/IP stack to take over DVIPAs from the system that left the sysplex.

**Restrictions:**

- The monitoring of the IPsec infrastructure can only be enabled for a TCP/IP stack that is using sysplex-wide security sessions (SWSA) and has the DVIPSEC parameter configured on the IPSEC statement in the TCP/IP profile.
- While the EZBDVIPA coupling facility structure is required for IPsec sysplex-wide security associations (SWSA), the ability of the TCP/IP stack to connect to or access the EZBDVIPA structure is not monitored by sysplex autonomics for IPsec. A failure related to the EZBDVIPA structure would typically be sysplex-wide. It would not be beneficial for a TCP/IP stack to leave the sysplex for a sysplex-wide failure.
- In IPsec configurations where both a primary and backup NSSD are configured for certificate services, no monitoring of the IKED connection to NSSD is done after the TCP/IP stack joins the sysplex. See the IP Configuration Guide “Sysplex Autonomics for IPsec infrastructure” for additional information.

**Incompatibilities:**

- If your IPsec infrastructure includes the Network Security Services daemon (NSSD), and the IKED to NSSD connection uses a DVIPA as the source or destination IP address, the sysplex autonomics IPsec infrastructure monitoring function should not be enabled.
- If you use a centralized Policy Agent server for IPsec or AT-TLS policy, and the connection from the policy client to the policy server uses a DVIPA as the source or destination IP address, the sysplex autonomics IPsec infrastructure monitoring function should not be enabled.

To enable Sysplex Autonomics for IPsec, perform the tasks in [Table 33 on page 42](#).

<i>Table 33. Sysplex Autonomics for IPsec</i>	
<b>Task/Procedure</b>	<b>Reference</b>
Enable monitoring of the IPsec infrastructure by sysplex autonomics with the GLOBALCONFIG SYSPLEXMONITOR sub-parameters DELAYJOINIPSEC and MONIPSEC	<ul style="list-style-type: none"> <li>• <a href="#">GLOBALCONFIG statement in z/OS Communications Server: IP Configuration Reference</a></li> <li>• <a href="#">Sysplex problem detection and recovery topic in z/OS Communications Server: IP Configuration Guide</a></li> </ul>
Display sysplex autonomics configuration settings	<a href="#">Netstat CONFIG/-f report in z/OS Communications Server: IP System Administrator's Commands</a>
(Optional) Configure the NoKeyring parameter on the IkeConfig statement in the IKE configuration file, if appropriate.  If an IKE key ring is not explicitly configured, the Keyring parameter defaults to iked/keyring.  If there is no keyring for IKED to process, you can specify NoKeyring.	<a href="#">IkeConfig statement in z/OS Communications Server: IP Configuration Reference</a>
Display the IKED configuration parameters	<a href="#">MODIFY command: IKE server in z/OS Communications Server: IP System Administrator's Commands</a>

To find all related topics about Sysplex Autonomics for IPsec, see [Table 34 on page 43](#).



Table 34. All related topics about Sysplex Autonomics for IPsec

Book name	Topics
<a href="#">z/OS Communications Server: IP Configuration Guide</a>	<ul style="list-style-type: none"> <li>• <a href="#">Sysplex problem detection and recovery</a></li> <li>• <a href="#">Problem detection</a></li> <li>• <a href="#">Recovery</a></li> <li>• <a href="#">Summary of problems monitored and actions taken</a></li> <li>• <a href="#">Sysplex autonomics for IPsec</a></li> </ul>
<a href="#">z/OS Communications Server: IP Configuration Reference</a>	<ul style="list-style-type: none"> <li>• <a href="#">GLOBALCONFIG statement</a></li> <li>• <a href="#">IkeConfig statement</a></li> </ul>
<a href="#">z/OS Communications Server: IP System Administrator's Commands</a>	<ul style="list-style-type: none"> <li>• <a href="#">Not IPv6 enabled (SHORT format)</a></li> <li>• <a href="#">IPv6 enabled or request for LONG format</a></li> <li>• <a href="#">Report field descriptions</a></li> <li>• <a href="#">VARY TCPIP,,SYSPLEX Parameters</a></li> <li>• <a href="#">Netstat CONFIG/-f report</a></li> <li>• <a href="#">MODIFY command: IKE server</a></li> </ul>
<a href="#">z/OS Communications Server: IP Programmer's Guide and Reference</a>	<a href="#">TCP/IP profile record Global configuration section</a>
<a href="#">z/OS Communications Server: IP Diagnosis Guide</a>	<a href="#">Sample output of the TCPIP CS PROFILE subcommand</a>
<a href="#">z/OS Communications Server: IP Messages Volume 2 (EZB, EZD)</a>	<ul style="list-style-type: none"> <li>• <a href="#">EZD1976E</a></li> <li>• <a href="#">EZD1977E</a></li> <li>• <a href="#">EZD1979E</a></li> <li>• <a href="#">EZD2048I</a></li> <li>• <a href="#">EZD2049I</a></li> <li>• <a href="#">EZD2050I</a></li> </ul>
<a href="#">z/OS Communications Server: IP Messages Volume 4 (EZZ, SNM)</a>	<a href="#">EZZ0839I</a>

## IBM zERT Network Analyzer database administration enhancements

z/OS Management Facility (z/OSMF) V2R5 with the IBM zERT Network Analyzer provides additional flexibility in IBM zERT Network Analyzer's Db2 for z/OS database schema definitions and reduces the access privileges required by the IBM zERT Network Analyzer's database user ID. The supplied database schema tooling now supports customized values for the database schema name, index names and even table names along with many other operational parameters that were already configurable.

**Dependencies:** No new dependencies are introduced. The IBM zERT Network Analyzer requires z/OSMF to be installed and a type 4 JDBC connection to Db2 for z/OS 11 or higher.

To enable IBM zERT Network Analyzer database administration enhancements, perform the tasks in [Table 35 on page 43](#).

Table 35. IBM zERT Network Analyzer database administration enhancements

Task/Procedure	Reference
Stop z/OSMF if it is running	

Table 35. IBM zERT Network Analyzer database administration enhancements (continued)

Task/Procedure	Reference
<ul style="list-style-type: none"> <li>If you are installing the IBM zERT Network Analyzer for the first time, your Db2 for z/OS database administrator (DBA) will need to create your customized database using the provided schema tooling.</li> <li>If you already have the IBM zERT Network Analyzer running: <ul style="list-style-type: none"> <li>Your DBA needs to either upgrade the existing database schema to the new schema version or else drop your existing database and re-create it with customized schema, index and/or table names at the new schema version.</li> <li>Regardless of which approach you decide, your DBA uses the provided database schema tooling to implement the changes. This includes deciding on and defining the desired number of IBM zERT Network Analyzer query result table partitions.</li> </ul> </li> </ul>	See <a href="#">Db2 for z/OS customization for the IBM zERT Network Analyzer task in IBM z/OS Management Facility Configuration Guide</a>
Once the IBM zERT Network Analyzer database is updated to or created at the new schema version, start z/OSMF and the IBM zERT Network Analyzer plugin. If you are using a newly created database, you need to fill in and save the required JDBC connectivity settings in the IBM zERT Network Analyzer's database settings panel.	See <a href="#">Connect the IBM zERT Network Analyzer task with the Db2 for z/OS database in IBM z/OS Management Facility Configuration Guide</a>
Once the correct database settings are stored and the IBM zERT Network Analyzer successfully connects to the database, you can verify the database schema information in the database settings panel.	See <i>Working with the Database Settings panel</i> of IBM zERT Network Analyzer online help, <i>Analysis</i> category under the IBM z/OS Management Facility online help
(Optionally) Configure the report timeout value to specify how many minutes of inactivity will result in the report being closed and the associated query result table partition being made available for future query requests.	IBM zERT Network Analyzer online help
(Optionally) Configure the maximum number of reports a single user can have concurrently open.	IBM zERT Network Analyzer online help

To find all related topics about IBM zERT Network Analyzer database administration enhancements, see Table 36 on page 44.

Table 36. All related topics about IBM zERT Network Analyzer database administration enhancements

Book name	Topics
<a href="#">IBM z/OS Management Facility Configuration Guide</a>	<ul style="list-style-type: none"> <li><a href="#">Updating z/OS for the IBM zERT Network Analyzer plug-in</a></li> <li><a href="#">Db2 for z/OS customization for the IBM zERT Network Analyzer task</a></li> <li><a href="#">Recovering unavailable partition</a></li> </ul>
<a href="#">z/OS Management Facility online help</a>	IBM zERT Network Analyzer online help

## Application development

The following topics describe enhancements for application development:

- [“SMTPD compatibility enhancements for CSSMTP” on page 45](#)

### SMTPD compatibility enhancements for CSSMTP

z/OS V2R5 Communications Server enhances the Communications Server SMTP (CSSMTP) application with three new configuration parameters to provide better compatibility with SMTPD for your migration from SMTPD to CSSMTP.

To enable SMTPD compatibility enhancements for CSSMTP, perform the tasks in [Table 37 on page 45](#).

Table 37. SMTPD compatibility enhancements for CSSMTP	
Task/Procedure	Reference
Configure ReportMailFrom to define a default email address for the "Mail From" field in the error report.	<a href="#">ReportMailFrom statement in Communications Server SMTP application in z/OS Communications Server: IP Configuration Reference</a>
Configure ReportSysoutClass to assign a Sysout Class for error reports.	<a href="#">ReportSysoutClass statement in Communications Server SMTP application in z/OS Communications Server: IP Configuration Reference</a>
Configure MailBoxCompatibility to define the mailbox length (Standard or Long).	<a href="#">MailBoxCompatibility statement in Communications Server SMTP application in z/OS Communications Server: IP Configuration Reference</a>
Display the values for the ReportMailFrom, ReportSysoutClass, and MailBoxCompatibility.	<a href="#">MODIFY command: Communications Server SMTP application (CSSMTP) in z/OS Communications Server: IP System Administrator's Commands</a>

To find all related topics about SMTPD compatibility enhancements for CSSMTP, see [Table 38 on page 45](#).

Table 38. All related topics about SMTPD compatibility enhancements for CSSMTP	
Book name	Topics
<a href="#">z/OS Communications Server: IP Configuration Guide</a>	<a href="#">Customizing the CSSMTP configuration file to handle undeliverable mail</a>
<a href="#">z/OS Communications Server: IP Configuration Reference</a>	<ul style="list-style-type: none"><li>• <a href="#">Communications Server SMTP application</a><ul style="list-style-type: none"><li>– <a href="#">General syntax rules for CSSMTP</a></li><li>– <a href="#">CSSMTP configuration statements</a><ul style="list-style-type: none"><li>- <a href="#">MailBoxCompatibility statement</a></li><li>- <a href="#">ReportMailFrom statement</a></li><li>- <a href="#">ReportSysoutClass statement</a></li></ul></li></ul></li></ul>
<a href="#">z/OS Communications Server: IP System Administrator's Commands</a>	<ul style="list-style-type: none"><li>• <a href="#">MODIFY command: Communications Server SMTP application (CSSMTP)</a></li></ul>



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## Chapter 4. Communications Server interface changes for z/OS V2R5

This topic includes the Communications Server interface changes for z/OS V2R5.

In addition to the interface changes included in this topic, refer to the following topics in the z/OS V2R5 Release Upgrade Reference Summary for additional information.

- *New and changed members in SYS1.MACLIB for z/OS V2R5*
- *New and changed SYS1.PARMLIB members for z/OS V2R5*
- *New and changed System Management Facilities (SMF) records for z/OS V2R5*

The Communications Server interface changes described in this topic are:

- [“Communications Server IP interface changes” on page 47](#)
- [“Communications Server SNA interface changes” on page 73](#)

The tables in this topic contain a **Reason for change** column that provides the name of the related functional enhancement.

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### Communications Server IP interface changes

This topic describes the following Communications Server IP interfaces:

- [“PROFILE.TCPIP configuration file” on page 48](#)
  - [“PROFILE.TCPIP statement and parameter changes” on page 48](#)
- [“Configuration files” on page 50](#) (other than PROFILE.TCPIP)
  - [“FTP client configuration statements” on page 50](#)
  - [“FTP server configuration statements” on page 50](#)
  - [“TN3270E Telnet server PROFILE configuration file” on page 51](#)
    - [“BEGINVTAM information block” on page 51](#)
    - [“TELNETGLOBALS information block” on page 51](#)
    - [“TELNETPARMS information block” on page 52](#)
  - [“General updates for the non-PROFILE.TCPIP IP configuration files” on page 53](#)
- [“RACF interfaces” on page 54](#)
- [“Operator commands” on page 55](#)
  - [“Netstat operator commands \(DISPLAY TCPIP,,NETSTAT\)” on page 55](#)
  - [“TN3270E Telnet server operator commands” on page 58](#)
  - [“General updates of IP operator commands” on page 58](#)
- [“TSO commands” on page 58](#)
  - [“NETSTAT TSO commands” on page 58](#)
  - [“FTP TSO and z/OS UNIX commands” on page 61](#)
    - [“FTP subcommands” on page 61](#)
  - [“General updates of TSO commands” on page 61](#)
- [“z/OS UNIX commands” on page 61](#)
  - [“Netstat UNIX commands” on page 61](#)
  - [“General updates of z/OS UNIX commands” on page 64](#)

- [“Application programming interfaces and network management interfaces” on page 65](#)
  - [“FTP client API FCAI control block” on page 66](#)
  - [“FTP client API for REXX predefined variables” on page 66](#)
  - [“Local IPsec NMI” on page 66](#)
  - [“Network security services NMI” on page 66](#)
  - [“Real-time application-controlled TCP/IP trace NMI \(EZBRCIFR\)” on page 66](#)
  - [“Real-time network monitoring TCP/IP NMI” on page 66](#)
  - [“Resolver callable NMI \(EZBREIFR\)” on page 67](#)
  - [“SNMP manager API” on page 67](#)
  - [“Syslog daemon name/token pair” on page 67](#)
  - [“TCP/IP callable NMI \(EZBNMIFR\)” on page 67](#)
  - [“Trace formatting NMI \(EZBCTAPI\)” on page 69](#)
  - [“Trusted TCP connections API for Java” on page 69](#)
- [“Environment variables” on page 69](#)
- [“Socket APIs” on page 70](#)
  - [“General updates of socket APIs” on page 70](#)
- [“IPCS subcommands” on page 70](#)
  - [“CTRACE COMP\(SYSTCPDA\) subcommand” on page 70](#)
  - [“CTRACE COMP\(SYSTCPIS\) subcommand” on page 70](#)
  - [“CTRACE COMP\(SYSTCPOT\) subcommand” on page 70](#)
  - [“CTRACE COMP\(SYSTCPRE\) subcommand” on page 70](#)
  - [“TCPIPCS subcommand” on page 71](#)
  - [“General updates to IPCS subcommands” on page 71](#)
- [“SNMP MIB modules” on page 71](#)
- [“User exits” on page 72](#)
- [“Application data” on page 72](#)
- [“FTP client error codes” on page 72](#)
- [“SMF record type 119 enhancements” on page 72](#)
- [“z/OS UNIX /etc files” on page 72](#)
- [“General updates of IP interfaces” on page 72](#)
- [“Samples provided in MVS data set SEZAINST” on page 72](#)
- [“Samples provided in z/OS UNIX TCPIP directory” on page 72](#)

## PROFILE.TCPIP configuration file

This topic contains the PROFILE.TCPIP statement and parameter changes.

### PROFILE.TCPIP statement and parameter changes

Table 39 on page 49 lists the new and updated Communications Server PROFILE.TCPIP configuration statements and parameters. See [z/OS Communications Server: IP Configuration Reference](#) for more detailed information.

Table 39. New and changed Communications Server PROFILE.TCPIP configuration statements and parameters for z/OS V2R5

Statement	Description	Reason for change
<b>GLOBALCONFIG</b>	<p>The following new subparameter is added to the SMCGLOBAL parameter:</p> <ul style="list-style-type: none"> <li>• SMCEID/ENDSMCEID</li> </ul> <p>The following new subparameter is added to the SMCD parameter:</p> <ul style="list-style-type: none"> <li>• SYSTEMEID/NOSYSTEMEID</li> </ul> <p>The following new subparameters are added to the SMCGLOBAL parameter:</p> <ul style="list-style-type: none"> <li>• SMCPERMIT/ENDSMCPERMIT</li> <li>• SMCEXCLUDE/ENDSMCEXCLUDE</li> </ul>	Shared Memory Communications multiple IP subnet support (SMCv2)
<b>GLOBALCONFIG</b>	<p>The following new subparameters are added to the SYSPLEXMONITOR parameter:</p> <ul style="list-style-type: none"> <li>• DELAYJOINIPSEC</li> <li>• MONIPSEC</li> </ul>	Sysplex Autonomics for IPsec
<b>GLOBALCONFIG</b>	<p>The following new subparameters are added to the ZERT AGGREGATION parameter:</p> <ul style="list-style-type: none"> <li>• INTVAL</li> <li>• SYNCVAL</li> </ul>	z/OS Encryption Readiness Technology (zERT) aggregation recording interval
<b>GLOBALCONFIG</b>	<p>The following new parameters are added:</p> <ul style="list-style-type: none"> <li>• IKEDREQUIRED</li> <li>• POLICYREQUIRED</li> </ul>	Notification of availability of TCP/IP extended services
<b>INTERFACE</b>	<p>The following new subparameters are added to the SMCR parameter of the INTERFACE-IPAQENET statement:</p> <ul style="list-style-type: none"> <li>• PFID</li> <li>• SMCRIPADDR</li> <li>• SMCRMTU</li> </ul>	Shared Memory Communications multiple IP subnet support (SMCv2)
<b>NETMONITOR</b>	New ZERTSERVICEBYPOLICY and NOZERTSERVICEBYPOLICY parameters are added to control creation of zERT-related SMF 119 subtype 11 records by zERT policy-based enforcement.	zERT policy-based enforcement
<b>SMFCONFIG</b>	New ZERTDETAILBYPOLICY and NOZERTDETAILBYPOLICY parameters are added to control creation of zERT-related SMF 119 subtype 11 records by zERT policy-based enforcement.	zERT policy-based enforcement
<b>VIPDEFINE</b> <b>VIPBACKUP</b>	The SERVICEMGR parameter has been removed due to deprecation of Sysplex Distributor support for Cisco Multi-Node Load Balancer (MNLB).	Removal of Sysplex Distributor support for Cisco Multi-Node Load Balancer (MNLB)

Table 39. New and changed Communications Server PROFILE.TCPIP configuration statements and parameters for z/OS V2R5 (continued)

Statement	Description	Reason for change
<b>VIPADISTRIBUTE</b>	The GRE, ENCAP, TARGCONTROLLED, and CONTROLPORT parameters have been removed from the Tier1 options due to the deprecation of support for workload distribution to non-z/OS targets.	Removal of support for load balancing to Data Power®
<b>VIPASMPARMS</b>	The VIPASMPARMS statement has been removed due to the deprecation of Sysplex Distributor support for Cisco Multi-Node Load Balancer (MNLB).	Removal of Sysplex Distributor support for Cisco Multi-Node Load Balancer (MNLB)

## Configuration files

This topic includes information about the following configuration statements and files:

- “FTP client configuration statements” on page 50
- “FTP server configuration statements” on page 50
- “TN3270E Telnet server PROFILE configuration file” on page 51
- “General updates for the non-PROFILE.TCPIP IP configuration files” on page 53

The Communications Server PROFILE.TCPIP configuration file updates are in a separate topic; see “PROFILE.TCPIP configuration file” on page 48.

See [z/OS Communications Server: IP Configuration Reference](#) for more detailed information about all of the Communications Server IP configuration files and statements.

## FTP client configuration statements

Table 40 on page 50 lists the new and updated FTP client configuration statements. See [z/OS Communications Server: IP Configuration Reference](#) for more detailed information.

Table 40. New and changed Communications Server FTP client configuration statements for V2R5

Statement	Description	Reason for change
<b>TLSRFCLEVEL</b>	CCNONOTIFY value is no longer supported for the FTP client if TLSMECHANISM ATTLS is configured.	Removal of native TLS/SSL support from TN3270E Telnet Server, FTP Server, and DCAS

## FTP server configuration statements

Table 41 on page 50 lists the new and updated FTP server configuration statements. See [z/OS Communications Server: IP Configuration Reference](#) for more detailed information.

Table 41. New and changed Communications Server FTP server configuration statements for z/OS V2R5

Statement	Description	Reason for change
<ul style="list-style-type: none"> <li>• <b>CIPHERSUITE</b></li> <li>• <b>KEYRING</b></li> <li>• <b>SSLV3</b></li> <li>• <b>TLSTIMEOUT</b></li> </ul>	Keyword is no longer supported for the FTP server.	Removal of native TLS/SSL support from TN3270E Telnet Server, FTP Server, and DCAS



Table 41. New and changed Communications Server FTP server configuration statements for z/OS V2R5 (continued)

Statement	Description	Reason for change
<b>TLSRFCLEVEL</b>	CCCNONOTIFY value is no longer supported for the FTP server.	Removal of native TLS/SSL support from TN3270E Telnet Server, FTP Server, and DCAS
<b>TLSMECHANISM</b>	<ul style="list-style-type: none"> <li>FTP value is no longer supported for the FTP server.</li> <li>Default value changed to ATTLS for the FTP server.</li> </ul>	Removal of native TLS/SSL support from TN3270E Telnet Server, FTP Server, and DCAS

## TN3270E Telnet server PROFILE configuration file

During initialization of the TN3270E Telnet server (Telnet) address space, configuration parameters are read from a configuration PROFILE data set. The PROFILE data set is used to configure Telnet to accept or reject connection requests. You can update the PROFILE data set to change or add statements to support new functions, or to change or add usage rules.

This topic includes tables with the descriptions of the new and changed Telnet PROFILE configuration statements. See [z/OS Communications Server: IP Configuration Reference](#) for complete information on configuration statements and the PROFILE statement.

### **BEGINVTAM information block**

There is no new and changed BEGINVTAM information block for V2R5.

### **TELNETGLOBALS information block**

The TELNETGLOBALS information block is a Telnet configuration block used to provide definitions that apply to all Telnet ports.

Table 42. Summary of new and changed Communications Server Telnet configuration file - TELNETGLOBALS block for z/OS V2R5

Statement	Description	Reason for change
<b>CLIENTAUTH</b>	Keyword no longer supported for the TN3270E Telnet server	Removal of native TLS/SSL support from TN3270E Telnet Server, FTP Server, and DCAS
<b>CRLLDAPSERVER</b>	Keyword no longer supported for the TN3270E Telnet server	Removal of native TLS/SSL support from TN3270E Telnet Server, FTP Server, and DCAS
<b>ENCRYPTION</b>	Keyword no longer supported for the TN3270E Telnet server	Removal of native TLS/SSL support from TN3270E Telnet Server, FTP Server, and DCAS

Table 42. Summary of new and changed Communications Server Telnet configuration file - TELNETGLOBALS block for z/OS V2R5 (continued)

Statement	Description	Reason for change
<b>KEYRING</b>	Keyword no longer supported for the TN3270E Telnet server	Removal of native TLS/SSL support from TN3270E Telnet Server, FTP Server, and DCAS
<b>SSLTIMEOUT</b>	Keyword no longer supported for the TN3270E Telnet server	Removal of native TLS/SSL support from TN3270E Telnet Server, FTP Server, and DCAS
<b>SSLV2 and NOSSLV2</b>	Keyword no longer supported for the TN3270E Telnet server	Removal of native TLS/SSL support from TN3270E Telnet Server, FTP Server, and DCAS
<b>SSLV3 and NOSSLV3</b>	Keyword no longer supported for the TN3270E Telnet server	Removal of native TLS/SSL support from TN3270E Telnet Server, FTP Server, and DCAS

### **TELNETPARMS information block**

Table 43. Summary of new and changed Communications Server Telnet configuration file - TELNETPARMS block for z/OS V2R5

Statement	Description	Reason for change
<b>SECUREPORT</b>	Keyword no longer supported for the TN3270E Telnet server	Removal of native TLS/SSL support from TN3270E Telnet Server, FTP Server, and DCAS
<b>CLIENTAUTH</b>	Keyword no longer supported for the TN3270E Telnet server	Removal of native TLS/SSL support from TN3270E Telnet Server, FTP Server, and DCAS
<b>CRLLDAPSERVER</b>	Keyword no longer supported for the TN3270E Telnet server	Removal of native TLS/SSL support from TN3270E Telnet Server, FTP Server, and DCAS
<b>ENCRYPTION</b>	Keyword no longer supported for the TN3270E Telnet server	Removal of native TLS/SSL support from TN3270E Telnet Server, FTP Server, and DCAS

Table 43. Summary of new and changed Communications Server Telnet configuration file - TELNETPARMS block for z/OS V2R5 (continued)

Statement	Description	Reason for change
<b>KEYRING</b>	Keyword no longer supported for the TN3270E Telnet server	Removal of native TLS/SSL support from TN3270E Telnet Server, FTP Server, and DCAS
<b>SSLTIMEOUT</b>	Keyword no longer supported for the TN3270E Telnet server	Removal of native TLS/SSL support from TN3270E Telnet Server, FTP Server, and DCAS
<b>SSLV2 and NOSSLV2</b>	Keyword no longer supported for the TN3270E Telnet server	Removal of native TLS/SSL support from TN3270E Telnet Server, FTP Server, and DCAS
<b>SSLV3 and NOSSLV3</b>	Keyword no longer supported for the TN3270E Telnet server	Removal of native TLS/SSL support from TN3270E Telnet Server, FTP Server, and DCAS

## General updates for the non-PROFILE.TCPIP IP configuration files

Table 44 on page 53 lists the general updates for the Communications Server IP configuration files.

Table 44. New and changed non-PROFILE.TCPIP configuration files for z/OS V2R5

File	Statement / Entry	Description	Reason for change
<b>AT-TLS policy files</b>	<ul style="list-style-type: none"> <li>TTLSEnvironmentAdvancedParms</li> <li>TTLSTLSConnectionAdvancedParms</li> </ul>	New parameters, ClientExtendedMasterSecret and ServerExtendedMasterSecret, are defined for each statement.	AT-TLS currency with System SSL

Table 44. New and changed non-PROFILE.TCPIP configuration files for z/OS V2R5 (continued)

File	Statement / Entry	Description	Reason for change
<b>DCAS configuration file</b>	KEYRING	Keyword is no longer supported	Removal of native TLS/SSL support from TN3270E Telnet Server, FTP Server, and DCAS
	LDAPPORT	Keyword is no longer supported	
	LDAPSERVER	Keyword is no longer supported	
	SAFKEYRING	Keyword is no longer supported	
	STASHFILE	Keyword is no longer supported	
	TLSV1ONLY	Keyword is no longer supported	
	V3CIPHER	Keyword is no longer supported	
	TLSMECHANISM	DCAS value is no longer supported. Default value changed to ATTLS.	
<b>Communications Server SMTP (CSSMTP) configuration file</b>	ReportMailFrom	New parameter ReportMailFrom is an optional parameter that specifies the mailbox to use in the Mail From field in error reports.	SMTPD compatibility enhancements for CSSMTP
	ReportSysoutClass	New parameter ReportSysoutClass is an optional parameter that specifies the SYSOUT class used for error reports.	SMTPD compatibility enhancements for CSSMTP
	MailBoxCompatibility	New parameter MailBoxCompatibility is an optional parameter to state the size of the mail box (Standard 64 characters or Long 256 characters).	SMTPD compatibility enhancements for CSSMTP
<b>IKE daemon configuration file</b>	New parameter NoKeyRing on the existing IkeConfig statement	NoKeyRing can be specified when no IKED key ring is provided.	Sysplex Autonomics for IPSec

## RACF interfaces

Table 45 on page 55 This topic lists the functions for which new or changed RACF support is available. Sample RACF commands to change the RACF configuration can be found in one of the following members of the installation data set, SEZAINST:

- EZARACF - Contains sample commands for environments where multilevel security is not configured.
- EZARACFM - Contains sample commands for environments where multilevel security is configured.

You can use the function name from the table to search EZARACF for all the commands necessary for the function. See [z/OS Communications Server: IP Configuration Guide](#) for more information for each function.

Table 45. New and changed Communications Server RACF interfaces for z/OS V2R5		
Function name	Description	Reason for change
EZB.PAGENT.sysname.imagename.ZERT	New SAF resource to control access to zERT policy for a policy client.	zERT policy-based enforcement

## Operator commands

This topic includes information about the following Communications Server IP operator commands:

- “[Netstat operator commands \(DISPLAY TCPIP,,NETSTAT\)](#)” on page 55
- “[TN3270E Telnet server operator commands](#)” on page 58
- “[General updates of IP operator commands](#)” on page 58

See [z/OS Communications Server: IP System Administrator's Commands](#) for more detailed information.

### Netstat operator commands (DISPLAY TCPIP,,NETSTAT)

Table 46 on page 55 lists the new and updated Communications Server IP Netstat operator command DISPLAY TCPIP,,NETSTAT. See [Table 47 on page 58](#) for the other Communications Server IP operator command entries.

See [z/OS Communications Server: IP System Administrator's Commands](#) for more detailed information about the Communications Server IP operator commands.

All parameters in the following table are for the DISPLAY TCPIP,,NETSTAT operator command.

Table 46. New and changed Communications Server Netstat operator commands (DISPLAY TCPIP,,NETSTAT) for z/OS V2R5		
Parameters	Description	Reason for change
<b>ALL</b>	<p>The following information is now displayed under the SMC INFORMATION section:</p> <ul style="list-style-type: none"> <li>• SMCDVERSION</li> <li>• SMCEID</li> </ul> <p>SMCRSTATUS is now either SMCRV1STATUS or SMCRV2STATUS, depending on the SMC version. SMCDSTATUS is now either SMCDV1STATUS or SMCDV2STATUS, depending on the SMC version. Up to four status fields might be displayed now.</p> <p>If there is a global reason for SMC not being used, this field will be simply SMCSTATUS.</p>	Shared Memory Communications multiple IP subnet support (SMCv2)
<b>ALL</b>	Displays zERT enforcement policy rules in use by TCP connections.	zERT policy-based enforcement
<b>ARP</b>	Netstat ARP will now show ARP cache entries related to SMC-Rv2 indirect links.	Shared Memory Communications multiple IP subnet support (SMCv2)

Table 46. New and changed Communications Server Netstat operator commands (DISPLAY TCPIP,,NETSTAT) for z/OS V2R5 (continued)

Parameters	Description	Reason for change
<b>CONFIG</b>	Displays new ZERT Aggregation sub parameter information with INTVAL and SYNCVAL in the GLOBALCONFIG section.	z/OS Encryption Readiness Technology (zERT) aggregation recording interval
<b>CONFIG</b>	The configured values for POLICYREQUIRED and IKEDREQUIRED are listed in the GLOBALCONFIG section.	Notification of availability of TCP/IP extended services
<b>CONFIG</b>	<p>The configured SMCEIDs are listed in the SMCGlobal section.</p> <p>Whether a SMCDSEID is configured and its value, if configured, is displayed in the SMCD section.</p> <p>The configured SMCPERMIT entries are listed in the SMCGlobal section.</p> <p>The configured SMCEXCLUDE entries are listed in the SMCGlobal section.</p>	Shared Memory Communications multiple IP subnet support (SMCv2)
<b>CONFIG</b>	The Global Configuration Information section of the display includes the new Sysplex Monitor settings - DelayJoinIpsec and MonIpsec.	Sysplex Autonomics for IPsec
<b>CONFIG</b>	<ul style="list-style-type: none"> <li>Displays new ZertDetailByPolicy subparameter information in the SMFCONFIG section.</li> <li>Displays new ZertSrvByPolicy subparameter information in the NETMONITOR section.</li> </ul>	zERT policy-based enforcement

Table 46. New and changed Communications Server Netstat operator commands (DISPLAY TCPIP,,NETSTAT) for z/OS V2R5 (continued)

Parameters	Description	Reason for change
<b>DEvlinks</b>	<p>Specifying PNETID=NONE will display all SMC-D capable interfaces without a PNETID.</p> <p>Specifying PNETID=* will display all SMC-D capable interfaces without a PNETID under a new PNETID=*NONE* heading.</p> <p>Specifying an INTFNAME of an SMC-D capable interface will display any unassociated ISM interfaces.</p> <p>Specifying SMC will display the following information under the SMCD LINK INFORMATION section:</p> <ul style="list-style-type: none"> <li>• SMCDversion</li> <li>• SMCEID, if SMCv2</li> <li>• Remote host, if SMCv2 and available</li> <li>• Remote host type, if SMCv2 and available</li> </ul> <p>Specifying INTFN=osa_interface will show SMCR version capabilities of the OSA interface and the RNIC interfaces associated with those capabilities. New interface parameters PFID, SMCRIPADDR, and SMCRMTU will be displayed if configured.</p> <p>Specifying INTFN=rnic_interface will show SMCR version capabilities of the RNIC interface. For SMC-Rv2, this includes the IP address associated with the RNIC.</p> <p>Specifying PNETID=pnetid will show the new interface parameters, PFID, SMCRIPADDR, and SMCRMTU, if configured.</p> <p>Specifying SMC will display the following information in the SMC Link section if the link is for SMC-Rv2:</p> <ul style="list-style-type: none"> <li>• Link type: Direct or Indirect</li> <li>• Link role: Server or Client</li> <li>• If Link type is Indirect, it also shows Next Hop IP address and Next Hop MAC address</li> </ul> <p>Specifying SMC will display the following information in the SMC Link Group section:</p> <ul style="list-style-type: none"> <li>• SMC version</li> <li>• SMCEID, if SMCv2</li> <li>• Remote host name, if SMCv2 and available</li> <li>• Remote host type, if SMCv2 and available</li> <li>• PNETID only displays if SMCv1</li> </ul>	Shared Memory Communications multiple IP subnet support (SMCv2)

Table 46. New and changed Communications Server Netstat operator commands (DISPLAY TCPIP,,NETSTAT) for z/OS V2R5 (continued)

Parameters	Description	Reason for change
<b>TTLS CONN DETAIL</b>	The new parameters, ClientExtendedMasterSecret and ServerExtendedMasterSecret, are displayed for the environment action and the connection action, if configured.	AT-TLS currency with System SSL
<b>VIPADCFG</b>	The "SrvMgr" field is no longer displayed.	Removal of Sysplex Distributor support for Cisco Multi-Node Load Balancer (MNLB)

## TN3270E Telnet server operator commands

There are no new or changed TN3270E Telnet server operator commands for z/OS V2R5.

## General updates of IP operator commands

Table 47 on page 58 lists the new and updated Communications Server IP operator commands, **except** the Netstat operator command DISPLAY TCPIP,,NETSTAT and the Telnet operator commands. See the following tables for those commands:

- Table 46 on page 55, IP Netstat operator commands (DISPLAY TCPIP,,NETSTAT)
- “TN3270E Telnet server operator commands” on page 58, Telnet operator commands

Table 47. New and changed Communications Server operator commands for z/OS V2R5

Command	Parameters	Description	Reason for change
<b>MODIFY CSSMTP</b>	DISPLAY,CONFIG	Display the new values for ReportMailFrom, ReportSysoutClass, and MailBoxCompatibility statements	SMTPD compatibility enhancements for CSSMTP
<b>MODIFY IKED</b>	DISPLAY	Display includes the NoKeyRing parameter if configured.	Sysplex Autonomics for IPSec
<b>VARY TCPIP</b>	PURGECACHE	Vary PURGECACHE is enhanced to accept an RNIC interface as an input.	Shared Memory Communications multiple IP subnet support (SMCv2)

## TSO commands

This topic includes information about the following TSO commands:

- “NETSTAT TSO commands” on page 58
- “FTP TSO and z/OS UNIX commands” on page 61

See [z/OS Communications Server: IP System Administrator's Commands](#) for more detailed information about the Communications Server TSO commands.

## NETSTAT TSO commands

Table 48 on page 59 lists the new and updated Communications Server NETSTAT TSO command.

See [z/OS Communications Server: IP System Administrator's Commands](#) for more detailed information about the Communications Server TSO commands.



Table 48. New and changed Communications Server NETSTAT TSO commands for z/OS V2R5

Parameter	Description	Reason for change
<b>ALL</b>	<p>The following information is displayed under the SMC INFORMATION section:</p> <ul style="list-style-type: none"> <li>• SMCDVERSION</li> <li>• SMCEID</li> </ul> <p>SMCRSTATUS is now either SMCRV1STATUS or SMCRV2STATUS, depending on the SMC version. SMCDSTATUS is now either SMCDV1STATUS or SMCDV2STATUS, depending on the SMC version. Up to four status fields might be displayed now.</p> <p>If there is a global reason for SMC not being used, this field will be simply SMCSTATUS.</p>	Shared Memory Communications multiple IP subnet support (SMCv2)
<b>ALL</b>	Displays zERT enforcement policy rules in use by TCP connections.	zERT policy-based enforcement
<b>ARP</b>	Netstat ARP will now show ARP cache entries related to SMC-Rv2 indirect links.	Shared Memory Communications multiple IP subnet support (SMCv2)
<b>CONFIG</b>	The configured values for POLICYREQUIRED and IKEDREQUIRED are listed in the GLOBALCONFIG section.	Notification of availability of TCP/IP extended services
<b>CONFIG</b>	<p>The configured SMCEIDs are listed in the SMCGlobal section.</p> <p>Whether a SMCDSEID is configured and its value, if configured, is displayed in the SMCD section.</p> <p>The configured SMCERMIT entries are listed in the SMCGlobal section.</p> <p>The configured SMCEXCLUDE entries are listed in the SMCGlobal section.</p>	Shared Memory Communications multiple IP subnet support (SMCv2)
<b>CONFIG</b>	The Global Configuration Information section of the display includes the new Sysplex Monitor settings - DelayJoinIpsec and MonIpsec.	Sysplex Autonomics for IPsec
<b>CONFIG</b>	Displays new ZERT Aggregation subparameter information with INTVAL and SYNCVAL in the GLOBALCONFIG section.	z/OS Encryption Readiness Technology (zERT) aggregation recording interval
<b>CONFIG</b>	<ul style="list-style-type: none"> <li>• Displays new ZertDetailByPolicy subparameter information in the SMFCONFIG section.</li> <li>• Displays new ZertSrvByPolicy subparameter information in the NETMONITOR section.</li> </ul>	zERT policy-based enforcement

Table 48. New and changed Communications Server NETSTAT TSO commands for z/OS V2R5 (continued)

Parameter	Description	Reason for change
<b>DEvlinks</b>	<p>Specifying PNETID=NONE will display all SMC-D capable interfaces without a PNETID.</p> <p>Specifying PNETID=* will display all SMC-D capable interfaces without a PNETID under a new PNETID=*NONE* heading.</p> <p>Specifying INTFNAME of an SMC-D capable interface will display any unassociated ISM interfaces.</p> <p>Specifying SMC will display the following information under the SMCD LINK INFORMATION section:</p> <ul style="list-style-type: none"> <li>• SMCDversion</li> <li>• SMCEID, if SMCv2</li> <li>• Remote host, if SMCv2 and available</li> <li>• Remote host type, if SMCv2 and available</li> </ul> <p>Specifying INTFN=osa_interface will show SMCR version capabilities of the OSA interface and the RNIC interfaces associated with those capabilities. New interface parameters PFID, SMCRIPADDR, and SMCRMTU will be displayed if configured.</p> <p>Specifying INTFN=rnic_interface will show SMCR version capabilities of the RNIC interface. For SMC-Rv2, this includes the IP address associated with the RNIC.</p> <p>Specifying PNETID=pnetid will show the new interface parameters, PFID, SMCRIPADDR, and SMCRMTU, if configured.</p> <p>Specifying SMC will display the following information in the SMC Link section if the link is for SMC-Rv2:</p> <ul style="list-style-type: none"> <li>• Link type: Direct or Indirect</li> <li>• Link role: Server or Client</li> <li>• If Link type is Indirect, it also shows Next Hop IP address and Next Hop MAC address</li> </ul> <p>Specifying SMC will display the following information in the SMC Link Group section:</p> <ul style="list-style-type: none"> <li>• SMC version</li> <li>• SMCEID, if SMCv2</li> <li>• Remote host name, if SMCv2 and available</li> <li>• Remote host type, if SMCv2 and available</li> <li>• PNETID only displays if SMCv1</li> </ul>	Shared Memory Communications multiple IP subnet support (SMCv2)

Table 48. New and changed Communications Server NETSTAT TSO commands for z/OS V2R5 (continued)		
Parameter	Description	Reason for change
<b>TTLS CONN DETAIL</b>	The new parameters, ClientExtendedMasterSecret and ServerExtendedMasterSecret, are displayed for the environment action and the connection action, if configured.	AT-TLS currency with System SSL
<b>VIPADCFG</b>	The "SrvMgr" field is no longer displayed.	Removal of Sysplex Distributor support for Cisco Multi-Node Load Balancer (MNLB)

## FTP TSO and z/OS UNIX commands

There are no new or changed FTP TSO and z/OS UNIX commands for z/OS V2R5.

### FTP subcommands

There are no new or changed FTP subcommands for z/OS V2R5.

## General updates of TSO commands

There are no general updates of TSO commands for z/OS V2R5.

## z/OS UNIX commands

[“General updates of z/OS UNIX commands” on page 64](#) lists the new and updated z/OS UNIX commands, except the z/OS UNIX FTP commands, and the z/OS UNIX netstat commands. See the following tables for those commands:

- [“FTP subcommands” on page 61](#), FTP TSO and z/OS UNIX commands
- [Table 49 on page 62](#), z/OS UNIX netstat commands

See [z/OS Communications Server: IP System Administrator's Commands](#) for more detailed information about the Communications Server UNIX commands.

## Netstat UNIX commands

Table 49 on page 62 lists the new and updated Communications Server z/OS UNIX netstat command. See [“General updates of z/OS UNIX commands” on page 64](#) for the other (the non-netstat) z/OS UNIX command entries.

See [z/OS Communications Server: IP System Administrator's Commands](#) for more detailed information about the z/OS UNIX commands.

All parameters in the following table are for the z/OS UNIX netstat command.

Table 49. New and changed Communications Server z/OS UNIX netstat commands for z/OS V2R5

Parameter	Description	Reason for change
-A	<p>The following information is displayed under the SMC INFORMATION section:</p> <ul style="list-style-type: none"> <li>• SMCDVERSION</li> <li>• SMCEID</li> </ul> <p>SMCRSTATUS is now either SMCRV1STATUS or SMCRV2STATUS, depending on the SMC version. SMCDSTATUS is now either SMCDV1STATUS or SMCDV2STATUS, depending on the SMC version. Up to four status fields might be displayed now.</p> <p>If there is a global reason for SMC not being used, this field will be simply SMCSTATUS.</p>	Shared Memory Communications multiple IP subnet support (SMCv2)
-A	Displays zERT enforcement policy rules in use by TCP connections.	zERT policy-based enforcement

Table 49. New and changed Communications Server z/OS UNIX netstat commands for z/OS V2R5 (continued)

Parameter	Description	Reason for change
-d	<p>Specifying PNETID=NONE will display all SMC-D capable interfaces without a PNETID.</p> <p>Specifying PNETID=* will display all SMC-D capable interfaces without a PNETID under a new PNETID=*NONE* heading.</p> <p>Specifying INTFNAME of an SMC-D capable interface will display any unassociated ISM interfaces.</p> <p>Specifying SMC will display the following information under the SMCD LINK INFORMATION section:</p> <ul style="list-style-type: none"> <li>• SMCDversion</li> <li>• SMCEID, if SMCv2</li> <li>• Remote host, if SMCv2 and available</li> <li>• Remote host type, if SMCv2 and available</li> </ul> <p>Specifying INTFN=osa_interface will show SMCR version capabilities of the OSA interface and the RNIC interfaces associated with those capabilities. New interface parameters PFID, SMCRIPADDR, and SMCRMTU will be displayed if configured.</p> <p>Specifying INTFN=rnic_interface will show SMCR version capabilities of the RNIC interface. For SMC-Rv2, this includes the IP address associated with the RNIC.</p> <p>Specifying PNETID=pnetid will show the new interface parameters, PFID, SMCRIPADDR, and SMCRMTU, if configured.</p> <p>Specifying SMC will display the following information in the SMC Link section if the link is for SMC-Rv2:</p> <ul style="list-style-type: none"> <li>• Link type: Direct or Indirect</li> <li>• Link role: Server or Client</li> <li>• If Link type is Indirect, it also shows Next Hop IP address and Next Hop MAC address</li> </ul> <p>Specifying SMC will display the following information in the SMC Link Group section:</p> <ul style="list-style-type: none"> <li>• SMC version</li> <li>• SMCEID, if SMCv2</li> <li>• Remote host name, if SMCv2 and available</li> <li>• Remote host type, if SMCv2 and available</li> <li>• PNETID only displays if SMCv1</li> </ul>	Shared Memory Communications multiple IP subnet support (SMCv2)

Table 49. New and changed Communications Server z/OS UNIX netstat commands for z/OS V2R5 (continued)

Parameter	Description	Reason for change
-f	<ul style="list-style-type: none"> <li>Displays new ZertDetailByPolicy subparameter information in the SMFCONFIG section.</li> <li>Displays new ZertSrvByPolicy subparameter information in the NETMONITOR section.</li> </ul>	zERT policy-based enforcement
-f	Displays new ZERT Aggregation sub parameter information with INTVAL and SYNCVAL in the GLOBALCONFIG section.	z/OS Encryption Readiness Technology (zERT) aggregation recording interval
-f	The configured values for POLICYREQUIRED and IKEDREQUIRED are listed in the GLOBALCONFIG section.	Notification of availability of TCP/IP extended services
-f	<p>The configured SMCEIDs are listed in the SMCGlobal section.</p> <p>Whether a SMCDSEID is configured and its value, if configured, is displayed in the SMCD section.</p> <p>The configured SMCPERMIT entries are listed in the SMCGlobal section.</p> <p>The configured SMCEXCLUDE entries are listed in the SMCGlobal section.</p>	Shared Memory Communications multiple IP subnet support (SMCv2)
-f	The Global Configuration Information section of the display includes the new Sysplex Monitor settings - DelayJoinIpsec and MonIpsec.	Sysplex Autonomics for IPsec
-R	Netstat ARP will now show ARP cache entries related to SMC-Rv2 indirect links.	Shared Memory Communications multiple IP subnet support (SMCv2)
-x CONN DETAIL	The new parameters, ClientExtendedMasterSecret and ServerExtendedMasterSecret, are displayed for the environment action and the connection action, if configured.	AT-TLS currency with System SSL
VIPADCFG	The "SrvMgr" field is no longer displayed.	Removal of Sysplex Distributor support for Cisco Multi-Node Load Balancer (MNLB)

## General updates of z/OS UNIX commands

Table 50 on page 65 lists the new and updated Communications Server z/OS UNIX non-netstat command.

See [z/OS Communications Server: IP System Administrator's Commands](#) for more detailed information about the z/OS UNIX commands.

All parameters in the following table are for the z/OS UNIX non-netstat command.

Table 50. New and changed Communications Server z/OS UNIX commands for z/OS V2R5

Command	Parm	Description	Reason for change
<b>ipsec</b>	-k display	This ipsec command display now includes the following new certificate details: <ul style="list-style-type: none"> <li>• LocalCertExpires</li> <li>• LocalSerialNumber</li> <li>• LocalIssuerDNLength</li> <li>• LocalIssuerDN</li> <li>• LocalSubjectDNLength</li> <li>• LocalSubjectDN</li> <li>• RemoteCertExpires</li> <li>• RemoteSerialNumber</li> <li>• RemoteIssuerDNLength</li> <li>• RemoteIssuerDN</li> <li>• RemoteSubjectDNLength</li> <li>• RemoteSubjectDN</li> </ul>	IPsec certificate reporting enhancements
<b>pasearch</b>	-z	New ZERT policy configuration displayed.	zERT policy-based enforcement
<b>pasearch</b>	-t	The new parameters, ClientExtendedMasterSecret and ServerExtendedMasterSecret, are displayed for the environment action and the connection action, if configured.	AT-TLS currency with System SSL

## Application programming interfaces and network management interfaces

This topic includes updates made to the application programming interfaces (APIs) and network management interfaces (NMIs) documented in [z/OS Communications Server: IP Programmer's Guide and Reference](#). The following programming interfaces were updated:

- [“FTP client API FCAI control block” on page 66](#)
- [“FTP client API for REXX predefined variables” on page 66](#)
- [“Local IPSec NMI” on page 66](#)
- [“Network security services NMI” on page 66](#)
- [“Real-time application-controlled TCP/IP trace NMI \(EZBRCIFR\)” on page 66](#)
- [“Real-time network monitoring TCP/IP NMI” on page 66](#)
- [“Resolver callable NMI \(EZBREIFR\)” on page 67](#)
- [“SNMP manager API” on page 67](#)
- [“Syslog daemon name/token pair” on page 67](#)
- [“TCP/IP callable NMI \(EZBNMIFR\)” on page 67](#)
- [“Trace formatting NMI \(EZBCTAPI\)” on page 69](#)
- [“Trusted TCP connections API for Java” on page 69](#)

See [z/OS Communications Server: IP Programmer's Guide and Reference](#) for more detailed API information.

## FTP client API FCAI control block

There are no new or changed FTP client API FCAI control block for z/OS V2R5.

## FTP client API for REXX predefined variables

There are no new or changed FTP client API for REXX predefined variables for z/OS V2R5.

## Local IPsec NMI

Table 51 on page 66 lists the updates to the Communications Server application interface for local IPsec network management interface (NMI).

Table 51. New Communications Server IP Local IPsec NMI for z/OS V2R5		
Request / Response	Description	Reason for change
<ul style="list-style-type: none"><li>• <b>NMsec_GET_IKETUN</b></li><li>• <b>NMsec_GET_IKETUNCASCADE</b></li></ul>	<p>Includes the following new phase 1 IKE Tunnel data fields:</p> <ul style="list-style-type: none"><li>• NMsecIKETunLclNotAfterType</li><li>• NMsecIKETunLclCertExp</li><li>• NMsecIKETunLclSerialNumber</li><li>• NMsecIKETunLclSerialNumLen</li><li>• NMsecIKETunRmtNotAfterType</li><li>• NMsecIKETunRmtCertExp</li><li>• NMsecIKETunRmtSerialNumber</li><li>• NMsecIKETunRmtSerialNumLen</li></ul> <p>Includes 4 new section descriptors for:</p> <ul style="list-style-type: none"><li>• Local issuer distinguished name</li><li>• Remote issuer distinguished name</li><li>• Local subject distinguished name</li><li>• Remote subject distinguished namec</li></ul>	IPsec certificate reporting enhancements

## Network security services NMI

There are no new or changed Network security services NMI for z/OS V2R5.

## Real-time application-controlled TCP/IP trace NMI (EZBRCIFR)

There are no new or changed Real-time application-controlled TCP/IP trace NMI (EZBRCIFR) for z/OS V2R5.

## Real-time network monitoring TCP/IP NMI

Table 52 on page 66 lists the updates to the Communications Server real-time TCP/IP network monitoring NMI. For changes to SMF 119 records provided by the real-time SMF data NMI (SYSTCPSM) and the real-time TCP connection SMF data NMI (SYSTCPCN), see [“SMF record type 119 enhancements”](#) on page 72.

Table 52. New Communications Server real-time TCP/IP NMI for z/OS V2R5			
NMI	Request/response	Description	Reason for change
Real-time TCP connection SMF NMI (SYSTCPCN)	TCP connection termination record (subtype 2)	New value SMF119AP_TTTermCode_Enforcement (x'77') in the SMF119AP_TTTermCode field. Indicates the connection was reset by zERT enforcement policy action.	zERT policy-based enforcement



Table 52. New Communications Server real-time TCP/IP NMI for z/OS V2R5 (continued)

NMI	Request/response	Description	Reason for change
Real-time zERT SMF NMI (SYSTCPR)	zERT connection detail record (subtype 11)	<ul style="list-style-type: none"> <li>New event type SMF119SC_SAType_Enforcement (x'07') in the SMF119SC_SAEvent_Type field. Indicates the connection matches zERT enforcement policy rule with audit action.</li> <li>New value SMF119SC_SAEEnforcement (x'20') in the SMF119SC_SAFlags field. Indicates the connection was reset by zERT enforcement policy action.</li> <li>New zERT policy-based enforcement section. Indicates the zERT enforcement policy rules in use by the TCP connection.</li> </ul>	zERT policy-based enforcement

## Resolver callable NMI (EZBREIFR)

There are no new or changed Resolver callable NMI (EZBREIFR) for z/OS V2R5.

## SNMP manager API

There are no new or changed SNMP manager API for z/OS V2R5.

## Syslog daemon name/token pair

There are no new or changed syslog daemon name/token pair for z/OS V2R5

## TCP/IP callable NMI (EZBNMIFR)

Table 53 on page 67 lists the updates to the Communications Server TCP/IP callable NMI.

Table 53. New Communications Server TCP/IP callable NMI (EZBNMIFR) for z/OS V2R5

Request	Parameter/output	Description	Reason for change
<b>GetConnectionDetail</b>	<ul style="list-style-type: none"> <li>NWMConnSMCVersion</li> <li>NWMConnSMCEID</li> </ul>	These new fields indicate the SMC characteristics of the connection.	Shared Memory Communications multiple IP subnet support (SMCv2)
<b>GetConnectionDetail</b>	<ul style="list-style-type: none"> <li>NWMConnSMCRv2Reason</li> <li>NWMConnSMCDv2Reason</li> </ul>	<p>This new field indicates the reason SMC-Rv2 was not chosen.</p> <p>This new field indicates the reason SMC-Dv2 was not chosen.</p>	Shared Memory Communications multiple IP subnet support (SMCv2)
<b>GetIfs</b>	<ul style="list-style-type: none"> <li>NWMIfSMCRStatus</li> <li>NWMIfSMCDStatus</li> <li>NWMIfSmcrV2_Pfid</li> <li>NWMIfSmcrV2_Mtu</li> <li>NWMIfSmcrV2_IpAddr</li> </ul>	<ul style="list-style-type: none"> <li>– The following values are obsolete from the NWMIfSMCRStatus field: <ul style="list-style-type: none"> <li>NWMIFSMCRNOPNETID</li> <li>NWMIFSMCRNOGC</li> <li>NWMIFSMCRNOSUBMSK</li> </ul> </li> <li>– The following values are obsolete from the NWMIfSMCDStatus field: <ul style="list-style-type: none"> <li>NWMIFSMCDNOPNETID</li> <li>NWMIFSMCDNOGC</li> <li>NWMIFSMCDNOSUBMSK</li> <li>NWMIFSMCDPNETIDMISCFG</li> </ul> </li> </ul> <p>These new fields represent new INTERFACE parameters for SMC-Rv2.</p>	Shared Memory Communications multiple IP subnet support (SMCv2)

Table 53. New Communications Server TCP/IP callable NMI (EZBNMIFR) for z/OS V2R5 (continued)

Request	Parameter/output	Description	Reason for change
<b>GetProfile</b>	<ul style="list-style-type: none"> <li>NMTP_GBCFPolicyReq <ul style="list-style-type: none"> <li>NMTP_GBCFPolicyReq_YESIFTTLS</li> <li>NMTP_GBCFPolicyReq_YES</li> <li>NMTP_GBCFPolicyReq_NO</li> </ul> </li> <li>NMTP_GBCFIkedReq <ul style="list-style-type: none"> <li>NMTP_GBCFIkedReq_YESIFDYNIPSEC</li> <li>NMTP_GBCFIkedReq_NO</li> </ul> </li> </ul>	These new fields indicate the settings of the new GLOBALCONFIG POLICYREQUIRED and IKEREQUIRED parameters.	Notification of availability of TCP/IP extended services
<b>GetProfile</b>	<ul style="list-style-type: none"> <li>NMTP_GBCFSYSTEMEID</li> <li>NMTP_GBCFSYSTEMEIDSTR</li> <li>NMTP_GBCFSMCEID</li> <li>NMTP_GBCFSMCEIDCount</li> <li>NMTP_GBCFUEIDList</li> </ul>	These new fields indicate the settings of the new GLOBALCONFIG parameters.	Shared Memory Communications multiple IP subnet support (SMCv2)
<b>GetProfile</b>	<ul style="list-style-type: none"> <li>NMTP_INTFSmcrV2Pfid</li> <li>NMTP_INTFSmcrV2MTU</li> <li>NMTP_INTFSmcrV2IpAddr</li> </ul>	These new NMTP_INTF fields represent new INTERFACE parameters for SMC-Rv2.	Shared Memory Communications multiple IP subnet support (SMCv2)
<b>GetProfile</b>	<ul style="list-style-type: none"> <li>NMTP_PICOsecChanged</li> <li>NMTP_PICOSECLTP</li> <li>NMTP_PICOSECLTE</li> </ul>	New flags that indicate Permit filter section or Exclude filter section were changed. These flags are set only if the record was created due to a profile change.	Shared Memory Communications multiple IP subnet support (SMCv2)
<b>GetProfile</b>	<p>New NMTP_FLTP and NMTP_FLTE sections:</p> <ul style="list-style-type: none"> <li>NMTP_FLTPEye</li> <li>NMTP_FLTPIpAddrV6</li> <li>NMTP_FLTPPrefix</li> <li>NMTP_FLTPFLG - has the flag bit NMTP_FLTP_IPv6 to indicate if the IP address is IPv6 or IPv4</li> <li>NMTP_FLTEEye</li> <li>NMTP_FLTEIpAddrV6</li> <li>NMTP_FLTEPrefix</li> <li>NMTP_FLTEFLG - has the flag bits NMTP_FLTP_IPv6 to indicate if the IP address is IPv6 or IPv4</li> </ul>	These new sections represent the configured GLOBALCONFIG SMCGLOBAL SMCPERMIT and SMCEXCLUDE lists.	Shared Memory Communications multiple IP subnet support (SMCv2)
<b>GetProfile</b>	<p>Global configuration section:</p> <ul style="list-style-type: none"> <li>NMTP_GBCFZERTINTV</li> <li>NMTP_GBCFZERTSYNC</li> </ul>	<ul style="list-style-type: none"> <li>New NMTP_GBCFZERTINTV flag bit that indicates the setting of the INTVAL sub-parameter on the GLOBALCONFIG statement.</li> <li>New NMTP_GBCFZERTSYNC flag bit that indicates the setting of the SYNCVAL sub-parameter on the GLOBALCONFIG statement.</li> </ul>	z/OS Encryption Readiness Technology (zERT) aggregation recording interval
<b>GetProfile</b>	<p>Global configuration section:</p> <ul style="list-style-type: none"> <li>NMTP_GBCFSysMonDelayJoinI</li> <li>NMTP_GBCFSysMonIpsec</li> </ul>	New fields, NMTP_GBCFSysMonDelayJoinI and NMTP_GBCFSysMonIpsec, indicate the settings of the new SYSPLEXMONITOR subparameters	Sysplex Autonomics for IPsec
<b>GetProfile</b>	<p>Management section:</p> <ul style="list-style-type: none"> <li>NMTP_MGMTSmf119Types</li> <li>NMTP_MGMTNetMonServices</li> </ul>	<ul style="list-style-type: none"> <li>New NMTP_MGMT119ZertDetailPolicy flag bit is set in the NMTP_MGMTSmf119Types field to indicate that the ZERTDETAILBYPOLICY parameter was specified on the SMFCONFIG TYPE119 profile statement.</li> <li>NMTP_MGMTNMZertServP flag bit is set in the NMTP_MGMTNetMonServices field to indicate that the ZERTSERVICEBYPOLICY parameter was specified on the NETMONITOR profile statement.</li> </ul>	zERT policy-based enforcement

Table 53. New Communications Server TCP/IP callable NMI (EZBNMIFR) for z/OS V2R5 (continued)			
Request	Parameter/output	Description	Reason for change
<b>GetRnics</b>	<ul style="list-style-type: none"> <li>NWMRnicSmcrV2MultiIpAddr</li> <li>NWMRnicSmcCapability</li> <li>NWMRnicSmcrV2_MTU</li> <li>NWMRnicSmcrV2IpAddr</li> </ul>	These new fields indicate SMC characteristics of the associated RNIC.	Shared Memory Communications multiple IP subnet support (SMCv2)
<b>GetSmcLinks</b>	<ul style="list-style-type: none"> <li>NWMSmcGrp_SmcrVersion</li> <li>NWMSmcGrp_Smceid</li> <li>NWMSmcGrp_RemoteHostType</li> <li>NwmSmcGrp_RemoteHostName</li> <li>NWMSmcLnkTypeDirect</li> <li>NWMSmcLnkRoleServer</li> <li>NWMSmcLnkNextHopMAC</li> <li>NWMSmcLnkNextHopIpAddr</li> </ul>	These new fields indicate the SMC characteristics of the SMCD link.	Shared Memory Communications multiple IP subnet support (SMCv2)
<b>GetSmcDLinks</b>	<ul style="list-style-type: none"> <li>NWMSmcDLnkSMCEID</li> <li>NWMSmcDLnkVersion</li> <li>NWMSmcDLnkRemoteOSType</li> <li>NWMSmcDLnkRmtHostName</li> </ul>	These new fields indicate the SMC characteristics of the SMCD link.	Shared Memory Communications multiple IP subnet support (SMCv2)
<b>GetStorageStatistics</b>	<ul style="list-style-type: none"> <li>NWMStgFlags <ul style="list-style-type: none"> <li>NWMStgZAGGCfg</li> </ul> </li> <li>New ZERT aggregation storage utilization fields <ul style="list-style-type: none"> <li>NWMStg64ZaggCurrent</li> <li>NWMStg64ZaggMax</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>New flag bit NWMStgZaggCfg indicates whether ZERT AGGREGATION is configured on the GLOBALCONFIG statement.</li> <li>New fields NWMStg64ZaggCurrent and NWMStg64ZaggMax provide current and maximum storage usage statistics for ZERT AGGREGATION.</li> </ul>	z/OS Encryption Readiness Technology (zERT) aggregation recording interval

## Trace formatting NMI (EZBCTAPI)

There are no new or changed trace formatting NMI (EZBCTAPI) for z/OS V2R5.

## Trusted TCP connections API for Java

There are no new or changed trusted TCP connections API for Java™ for z/OS V2R5.

## General updates of other NMI or API

[Table 54 on page 69](#) lists the new and updated NMI or API.

Table 54. New and changed Communications Server NMI or API for z/OS V2R5			
Socket API	Function call/Parameter	Description	Reason for change
<b>Application data: FTP server application data format for the control connection and FTP server application data format for the data connection.</b>	The security method used for the FTP connection if security protection is either Private or Safe.	Value "F – TLS managed by FTP" removed.	Removal of native TLS/SSL support from TN3270E Telnet Server, FTP Server, and DCAS

## Environment variables

There are no new or changed environment variables for z/OS V2R5.

## Socket APIs

This topic includes information about Communications Server socket APIs.

Refer to the following documents for more information about socket APIs:

- For complete documentation of the z/OS UNIX C sockets APIs, refer to [z/OS XL C/C++ Runtime Library Reference](#)
- For information about z/OS UNIX Assembler Callable Services, refer to [z/OS UNIX System Services Programming: Assembler Callable Services Reference](#)
- For information about TCP/IP socket APIs, refer to [z/OS Communications Server: IP Sockets Application Programming Interface Guide and Reference](#)
- For information about TCP/IP CICS sockets, refer to [z/OS Communications Server: IP CICS Sockets Guide](#)

### General updates of socket APIs

There are no general updates of socket APIs for z/OS V2R5.

## IPCS subcommands

This topic includes information about these IPCS subcommands:

- “CTTRACE COMP(SYSTCPDA) subcommand” on page 70
- “CTTRACE COMP(SYSTCPIS) subcommand” on page 70
- “CTTRACE COMP(SYSTCPOT) subcommand” on page 70
- “CTTRACE COMP(SYSTCPRE) subcommand” on page 70
- “TCPIPCS subcommand” on page 71
- “General updates to IPCS subcommands” on page 71

See [z/OS Communications Server: IP Diagnosis Guide](#) for more detailed IPCS subcommands information.

### CTTRACE COMP(SYSTCPDA) subcommand

This topic lists changes to Communications Server CTTRACE COMP(SYSTCPDA) subcommand options for z/OS V2R5.

There are no new or changed CTTRACE COMP(SYSTCPDA) subcommand for z/OS V2R5.

### CTTRACE COMP(SYSTCPIS) subcommand

This topic describes the Communications Server CTTRACE COMP(SYSTCPIS) subcommand options for z/OS V2R5.

There are no new or changed CTTRACE COMP(SYSTCPIS) subcommand for z/OS V2R5.

### CTTRACE COMP(SYSTCPOT) subcommand

This topic lists changes to Communications Server CTTRACE COMP(SYSTCPDA) subcommand options for z/OS V2R5.

There are no new or changed CTTRACE COMP(SYSTCPOT) subcommand for z/OS V2R5.

### CTTRACE COMP(SYSTCPRE) subcommand

This topic describes the CTTRACE COMP(SYSTCPRE) subcommand options for z/OS V2R5.

There are no new or changed CTTRACE COMP(SYSTCPRE) subcommand for z/OS V2R5.

## TCPIPES subcommand

This topic describes the Communications Server TCPIPES subcommand option changes for z/OS V2R5.

Table 55 on page 71 lists the TCPIPES subcommand options.

The TCPIPES command contains the OPTLOCAL specification in some displays.

Table 55. New and changed Communications Server TCPIPES subcommand options for z/OS V2R5		
Subcommand	Description	Reason for change
<b>CONFIG</b>	The unassociated ISM interfaces will be displayed.	Shared Memory Communications multiple IP subnet support (SMCv2)
<b>MAP POLICY</b>	Includes zERT enforcement policy information in the output.	zERT policy-based enforcement
<b>POLICY</b>	Includes zERT enforcement policy information in the output.	zERT policy-based enforcement
<b>PROFILE</b>	Displays the new INTVAL and SYNCVAL sub-parameters for the GLOBALCONFIG statement.	z/OS Encryption Readiness Technology (zERT) aggregation recording interval
<b>PROFILE</b>	The configured values for GLOBALCONFIG POLICYREQUIRED and IKEDREQUIRED will be displayed.	Notification of availability of TCP/IP extended services
<b>PROFILE</b>	The configured SMCEIDs and the SYSTEID will be displayed. The configured SMCPERMIT entries and SMCEXCLUDE entries will be displayed. New Interface keywords (SMCRIPADR, PFID, SMCRMTU) are displayed for the OSA interface.	Shared Memory Communications multiple IP subnet support (SMCv2)
<b>PROFILE</b>	The display includes the new Sysplex Monitor subparameters – DELAYJOINIPSEC and MONIPSEC.	Sysplex Autonomics for IPsec
<b>STATE</b>	The report includes a new table, the IKED Heartbeat Historical Data table	Sysplex Autonomics for IPsec
<b>TCPIPES TTLS</b>	The new parameters, ClientExtendedMasterSecret and ServerExtendedMasterSecret, are formatted in a dump of a TCP/IP address space.	AT-TLS currency with System SSL

## General updates to IPES subcommands

There are no general updates to IPES subcommands for z/OS V2R5.

## SNMP MIB modules

This topic lists updates to Communications Server's support for SNMP MIB modules.

There are no new or changed SNMP MIB modules for z/OS V2R5.

# User exits

There are no new or changed user exits for z/OS V2R5.

# Application data

There are no new or changed application data for z/OS V2R5.

# FTP client error codes

This topic describes new client error codes for the FTP client.

There are no new or changed FTP client error codes for z/OS V2R5.

# SMF record type 119 enhancements

See New and changed System Management Facilities (SMF) records for z/OS V2R5 in [z/OS Release Upgrade Reference Summary](#) for information on new and changed SMF type 119 records.

See the [Type 119 SMF records](#) topic in [z/OS Communications Server: IP Programmer's Guide and Reference](#) for more information.

# z/OS UNIX /etc files

Changes to z/OS UNIX /etc files are listed in in [z/OS Upgrade Workflow](#).

# General updates of IP interfaces

There are no general updates of IP interface for z/OS V2R5.

# Samples provided in MVS data set SEZAINST

[Table 56 on page 72](#) lists the changes to the samples that are provided in MVS data set SEZAINST.

Table 56. IP samples provided in MVS data set SEZAINST for z/OS V2R5		
Member	Description	Reason for change
CSSMTPCF	This CSSMTP sample configuration file is updated to add information about ReportMailFrom, ReportSysoutClass, and MailBoxCompatibility.	SMTPD compatibility enhancements for CSSMTP
EZARACF	The sample RACF commands are updated to provide commands for using the RDATA LIB class to protect keyring access.	Release updates
EZAFTPAS	Sample FTP.DATA file for the FTP server. Removed CIPHERSUITE, KEYRING, SSLV3, and TLSTIMEOUT statements.	Removal of native TLS/SSL support from TN3270E Telnet Server, FTP Server, and DCAS

# Samples provided in z/OS UNIX TCPIP directory

[Table 57 on page 73](#) lists the changes to the samples that are provided in z/OS UNIX directory /usr/lpp/tcpip/samples.

Table 57. IP samples provided in z/OS UNIX directory /usr/lpp/tcpip/samples for z/OS V2R5		
File name	Description	Reason for change
iked.conf	The IKE configuration file sample has been updated to add the NoKeyRing parameter.	Sysplex Autonomics for IPSec
pagent.conf	The main pagent configuration file has been updated to add zERT enforcement policy information.	zERT policy-based enforcement
pagent_ZERT.conf	A new sample file with zERT enforcement policy definitions.	zERT policy-based enforcement

## Communications Server SNA interface changes

This topic describes the following Communications Server SNA interfaces:

- [“Start options” on page 73](#)
- [“Start option behavior changes” on page 73](#)
- [“Definition statements” on page 73](#)
- [“Commands” on page 74](#)
- [“Command behavior changes” on page 74](#)
- [“VTAM internal trace entries” on page 74](#)
- [“VTAMMAP Formatted Dump changes” on page 75](#)
- [“Tuning statistics reports” on page 75](#)

### Start options

Table 58 on page 73 lists the new or changed SNA start options.

Refer to [z/OS Communications Server: SNA Resource Definition Reference](#) for more information on start options.

Table 58. New and changed Communications Server start options for z/OS V2R5		
Start option	Description of update	Reason for change
<ul style="list-style-type: none"> <li>• OSIEVENT</li> <li>• OSIMGMT</li> <li>• OSITOPPO</li> <li>• UPDDELAY</li> </ul>	These start options are deleted.	Removal of CMIP from VTAM

### Start option behavior changes

There are no start option behavior changes for z/OS V2R5.

### Definition statements

Table 59 on page 74 lists the changes to SNA definition statements.

For complete information about all changed and new definition statements, see [z/OS Communications Server: SNA Resource Definition Reference](#).

Table 59. New and changed Communications Server definition statements for z/OS V2R5		
Definition statement	Description of update	Reason for change
<b>VTAMTOPO</b>	The statement is removed from all SNA resources (Group, LINE, PORT, PU, etc).	Removal of CMIP from VTAM

## Commands

Table 60 on page 74 lists the new and changed SNA commands.

For complete information about SNA commands, refer to the [z/OS Communications Server: SNA Operation](#).

Table 60. New and changed Communications Server commands in z/OS V2R5		
Command	Description	Reason for change
<b>Modify VTAMOPTS</b>	Modify command is rejected for OSIMGMT, OSITOPPO, OSIEVENT and UPDDELAY start options.	Removal of CMIP from VTAM
<b>Modify resource, VTAMTOPO</b>	VTAMTOPO resource definition is being deleted.	
<b>Modify TRACE,TYPE,BUF or IO</b>	CMIP trace options is removed.	

## Command behavior changes

Table 61 on page 74 lists the SNA commands that have changed behavior.

For complete information about SNA commands, refer to the [z/OS Communications Server: SNA Operation](#).

Table 61. New and changed Communications Server commands with changed behavior for z/OS V2R5		
Command	Description of behavior change	Reason for change
D NET,ID=trle	A TRLE for an unassociated ISM device will display **NA** for the PNETID.	Shared Memory Communications multiple IP subnet support (SMCv2)
D NET,TRL,TRLE=	<ul style="list-style-type: none"> <li>A TRLE for an unassociated ISM device will display **NA** for the PNETID.</li> <li>When DEVSTATS is specified for a RNIC TRLE, statistics for ethernet frames related to ARP processing will be displayed.</li> </ul>	Shared Memory Communications multiple IP subnet support (SMCv2)

## VTAM CMIP Services

Table 62 on page 74 lists the SNA VTAM CMIP services that have changed behavior.

Table 62. New and changed VTAM CMIP services with changed behavior for z/OS V2R5		
CMIP services	Description of behavior change	Reason for change
Deprecated	CMIP services and TOPO agent are deprecated	Removal of CMIP from VTAM

## VTAM internal trace entries

For complete information about VIT entries, see [z/OS Communications Server: SNA Diagnosis Vol 2, FFST Dumps and the VIT](#).



Table 63 on page 75 lists the new and changed VIT entries.

Table 63. New and changed Communications Server VTAM internal trace (VIT) entries for z/OS V2R5		
VIT entry	Description	Reason for change
<b>CMER, CME2, MCO1, MCO2, MDEL, MDIS, MQRQ, MQRS, MREG, MRG, MRG2, RQE</b>	<b>Deleted:</b> These entries are being deleted.	Removal of CMIP from VTAM
<b>ENFx</b>	Updated to record the driving of an ENF exit for an ISM device.	Shared Memory Communications multiple IP subnet support (SMCv2)
<b>RPLA</b>	A count field was added to the RPLA VIT entry.	Shared Memory Communications multiple IP subnet support (SMCv2)

## VTAMMAP Formatted Dump changes

There are no VTAMMAP formatted dump changes for z/OS V2R5.

## Tuning statistics reports

This topic lists the Communications Server SNA tuning statistics reports changes for z/OS V2R5.

There are no new and changed tuning statistics reports for z/OS V2R5.



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## Chapter 5. V2R4 new function summary

This information contains topics about every function or enhancement introduced in z/OS V2R4 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 [Chapter 2, “Roadmap to functions,”](#) on page 19 for a complete list of the functional enhancements.

See [z/OS Upgrade Workflow](#) for information about how to migrate and maintain the functional behavior of previous releases.

See [z/OS Release Upgrade Reference Summary](#) for information about new and changed messages and interfaces.

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### Simplification

The following topics describe enhancements for simplification:

- [“IBM Health Checker for the removal of VTAM LSA Architecture”](#) on page 77
- [“IBM Health Checker for the removal of DEVICE, LINK, and HOME for OSA-Express connectivity”](#) on page 78

#### IBM Health Checker for the removal of VTAM LSA Architecture

z/OS V2R4 Communications Server, with SNA APAR OA62208, provides a new migration health check to use with the IBM Health Checker for z/OS function. The migration health check identifies if VTAM Link Station Architecture (LSA) devices are in use. These devices are configured with MEDIUM=CSMACD in the XCA major node PORT statement.

Support for VTAM Link Station Architecture (LSA) devices will be withdrawn in a future release of the IBM z/OS Communications Server.

##### Dependency:

To use the IBM Health Checker for the removal of VTAM LSA Architecture, perform the following steps:

- Apply the appropriate PTF for SNA APAR OA62208
- Start the IBM Health Checker for z/OS

##### Using the IBM Health Checker for the removal of VTAM LSA Architecture

To use the IBM Health Checker for the removal of VTAM LSA Architecture, perform the tasks in [Table 64](#) on page 78.

Table 64. IBM Health Checker for the removal of VTAM LSA Architecture

Task/Procedure	Reference
<p>To use this migration health check, take the following steps:</p> <ol style="list-style-type: none"> <li>1. Configure and start the IBM Health Checker for z/OS.</li> <li>2. Activate the ZOSMIGV2R5_NEXT_CS_LSA migration health check.</li> <li>3. Review health check output messages ISTM051I or ISTM052E for potential migration actions.</li> </ol>	<p>See the following topics in <a href="#">IBM Health Checker for z/OS: User's Guide</a>:</p> <ul style="list-style-type: none"> <li>• <a href="#">Setting up IBM Health Checker for z/OS</a></li> <li>• <a href="#">Working with check output</a></li> <li>• <a href="#">Managing checks</a></li> </ul>

To find all new and updated topics about IBM Health Checker for the removal of VTAM LSA Architecture, see [Table 65 on page 78](#).

Table 65. All related topics about IBM Health Checker for the removal of VTAM LSA Architecture

Book name	Topics
<a href="#">z/OS Communications Server: IP Diagnosis Guide</a>	IBM Health Checker for z/OS
<a href="#">IBM Health Checker for z/OS: User's Guide</a>	ZOSMIGV2R5_NEXT_CS_LSA
<a href="#">z/OS Upgrade Workflow</a>	<i>SNA and IP services: Prepare for the removal of support for LSA and LCS devices</i>
<a href="#">z/OS Communications Server: SNA Messages</a>	<ul style="list-style-type: none"> <li>• <a href="#">ISTM051I</a></li> <li>• <a href="#">ISTM052E</a></li> </ul>

## IBM Health Checker for the removal of DEVICE, LINK, and HOME for OSA-Express connectivity

z/OS V2R4 Communications Server, with SNA APAR OA62208 and TCP/IP APAR PH40875, provides a new migration health check to use with the IBM Health Checker for z/OS function. The migration health check identifies if TCP/IP profile statements DEVICE, LINK, and HOME for OSA-Express connectivity are in use.

Support for DEVICE/LINK/HOME TCP/IP profile statements for OSA-Express connectivity will be withdrawn in a future release of IBM z/OS Communications Server.

### Dependency:

To use the IBM Health Checker for the removal of DEVICE, LINK, and HOME for OSA-Express connectivity, perform the following steps:

- Apply the appropriate PTF for SNA APAR OA62208
- Apply the appropriate PTF for TCP/IP APAR PH40875
- Start the IBM Health Checker for z/OS

### Using the IBM Health Checker for the removal of DEVICE, LINK, and HOME for OSA-Express connectivity

To use the IBM Health Checker for the removal of DEVICE, LINK, and HOME for OSA-Express connectivity, perform the tasks in [Table 66 on page 79](#).

Table 66. IBM Health Checker for the removal of DEVICE, LINK, and HOME for OSA-Express connectivity

Task/Procedure	Reference
<p>To use this migration health check, take the following steps:</p> <ol style="list-style-type: none"> <li>1. Configure and start the IBM Health Checker for z/OS.</li> <li>2. Activate the ZOSMIGV2R5_NEXT_CS_OSADLH migration health check.</li> <li>3. Review health check output messages ISTM053I or ISTM054E for potential migration actions.</li> </ol>	<p>See the following topics in <a href="#">IBM Health Checker for z/OS: User's Guide</a>:</p> <ul style="list-style-type: none"> <li>• <a href="#">Setting up IBM Health Checker for z/OS</a></li> <li>• <a href="#">Working with check output</a></li> <li>• <a href="#">Managing checks</a></li> </ul>

To find all new and updated topics about IBM Health Checker for the removal of DEVICE, LINK, and HOME for OSA-Express connectivity, see [Table 67 on page 79](#).

Table 67. All related topics about IBM Health Checker for the removal of DEVICE, LINK, and HOME for OSA-Express connectivity

Book name	Topics
<a href="#">z/OS Communications Server: IP Diagnosis Guide</a>	IBM Health Checker for z/OS
<a href="#">IBM Health Checker for z/OS: User's Guide</a>	ZOSMIGV2R5_NEXT_CS_OSADLH
<a href="#">z/OS Upgrade Workflow</a>	<i>IP Services: Prepare for the removal of support for OSA DEVICE/LINK/HOME configuration</i>
<a href="#">z/OS Communications Server: SNA Messages</a>	<ul style="list-style-type: none"> <li>• <a href="#">ISTM053I</a></li> <li>• <a href="#">ISTM054E</a></li> </ul>

## Hardware support

The following topics describe enhancements for hardware support:

- [“Shared Memory Communications multiple IP subnet support \(SMCv2\)” on page 79](#)
- [“Communications Server support for OSA-Express7S 25 GbE features” on page 82](#)
- [“Communications Server support for 25 GbE RoCE Express2 features” on page 83](#)
- [“Communications Server QDIO display enhancements” on page 84](#)

## Shared Memory Communications multiple IP subnet support (SMCv2)

In z/OS V2R4 Communications Server, with TCP/IP APAR PH22695 and SNA APAR OA59152, Shared Memory Communications - Direct Memory Access (SMC-D) is enhanced to remove the same subnet restriction by exploiting SMC-Dv2.

### Dependencies:

- SMC-Dv2 is enabled with new IBM Z capability provided by the IBM Z Internal Shared Memory (ISM) function. The new ISMv2 capability is available on IBM z15. For IBM z15 T01, refer to the MCL number P46601.067 driver D41C. The ISMv2 support is in the base of the IBM z15 T02.

Downlevel SMC partners might require a toleration PTF. If you plan to enable SMC-Dv2 on a host which has connections to a down-level SMC (SMC-Dv1 or SMC-Rv1) system (z/OS Communications Server, Linux on Z, and AIX), the down-level host will require the following toleration maintenance applied prior to enabling SMC-Dv2:

- For z/OS Communications Server, the down-level host will need the appropriate PTF for PH17556.

- For Linux on Z, see the Linux on Z web page at <https://linux-on-z.blogspot.com/p/smc-for-linux-on-ibm-z.html> for information related to toleration requirements.
- For AIX, see the AIX web page at [https://www.ibm.com/support/knowledgecenter/en/ssw\\_aix\\_72/rdma/smc\\_r.html](https://www.ibm.com/support/knowledgecenter/en/ssw_aix_72/rdma/smc_r.html) for information related to toleration requirements.

**Note:** Failure to apply the proper toleration maintenance might result in connection hangs or failures when SMC-Dv2 is enabled on z/OS.

The PTF for z/OS IOS PCIe Services APAR OA59235 is required. Failure to apply that PTF will result in activation failures.

## Using the Shared Memory Communications multiple IP subnet support (SMCv2)

To use the Shared Memory Communications multiple IP subnet support (SMCv2), perform the tasks in [Table 68 on page 80](#).

<i>Table 68. Shared Memory Communications multiple IP subnet support (SMCv2)</i>	
<b>Task/Procedure</b>	<b>Reference</b>
Determine if using SMC will be a benefit in this configuration by using SMCAT.	<a href="#">VARY TCPIP,,SMCAT</a> about SMC Applicability Tool (SMCAT) in <a href="#">z/OS Communications Server: IP System Administrator's Commands</a>
Configure SMCEID on the SMCGLOBAL parameter of the GLOBALCONFIG statement to enable z/OS CS exploitation of SMC-Dv2.	<a href="#">GLOBALCONFIG statement</a> in <a href="#">z/OS Communications Server: IP Configuration Reference</a>
Configure SYSTEID on the SMCD parameter of the GLOBALCONFIG statement to enable z/OS CS exploitation of SMC-Dv2.	<a href="#">GLOBALCONFIG statement</a> in <a href="#">z/OS Communications Server: IP Configuration Reference</a>
Display whether SMCEID values were specified on SMCGLOBAL by issuing the Netstat CONFIG/-f command.	<a href="#">Netstat CONFIG/-f report</a> in <a href="#">z/OS Communications Server: IP System Administrator's Commands</a>
Display SMC version used for a connection or link.	<a href="#">z/OS Communications Server: IP System Administrator's Commands</a> : <ul style="list-style-type: none"> <li>• <a href="#">Netstat ALL/-A report</a></li> <li>• <a href="#">Netstat DEvlinks/-d report</a></li> </ul>
Display all interfaces z/OS CS used for SMC communications.	<a href="#">Netstat DEvlinks/-d report</a> in <a href="#">z/OS Communications Server: IP System Administrator's Commands</a>
Display information about the dynamic ISM TRLEs by issuing the D NET,ID=trle, or D NET,TRL,TRLE=trle command, which might now show **NA** for the PNETID.	<a href="#">z/OS Communications Server: SNA Operation</a> <ul style="list-style-type: none"> <li>• <a href="#">DISPLAY ID command</a></li> <li>• <a href="#">DISPLAY TRL command</a></li> </ul>

To find all new and updated topics about Shared Memory Communications multiple IP subnet support (SMCv2), see .

Table 69. All related topics about Shared Memory Communications multiple IP subnet support (SMCv2)

Book name	Topics
<a href="#">z/OS Communications Server: IP Configuration Guide</a>	<ul style="list-style-type: none"> <li>• <a href="#">Shared Memory Communications multiple IP subnet support (SMCv2)</a></li> <li>• <a href="#">Physical network considerations</a></li> <li>• <a href="#">VLANID considerations</a></li> <li>• <a href="#">Configuring Shared Memory Communications - Direct Memory Access</a></li> </ul>
<a href="#">z/OS Communications Server: IP Configuration Reference</a>	<ul style="list-style-type: none"> <li>• <a href="#">GLOBALCONFIG statement</a></li> </ul>
<a href="#">z/OS Communications Server: IP Programmer's Guide and Reference</a>	<ul style="list-style-type: none"> <li>• <a href="#">TCP connection termination record (subtype 2)</a></li> <li>• <a href="#">SMC-D link statistics record (subtype 38)</a></li> <li>• <a href="#">SMC-D link state start record (subtype 39)</a></li> <li>• <a href="#">SMC-D link state end record (subtype 40)</a></li> <li>• <a href="#">TCP/IP profile record Global configuration section</a></li> </ul>
<a href="#">z/OS Communications Server: IP Diagnosis Guide</a>	<ul style="list-style-type: none"> <li>• <a href="#">Diagnosing problems with Shared Memory Communications</a></li> <li>• <a href="#">Physical network ID configuration issues</a></li> <li>• <a href="#">No associated subnet mask</a></li> </ul>
<a href="#">z/OS Communications Server: IP System Administrator's Commands</a>	<ul style="list-style-type: none"> <li>• <a href="#">DISPLAY TCPIP,,NETSTAT</a></li> <li>• <a href="#">VARY TCPIP,,SMCAT</a></li> <li>• <a href="#">Netstat ALL/-A report</a></li> <li>• <a href="#">Netstat CONFIG/-f report</a></li> <li>• <a href="#">Netstat DEvlinks/-d report</a></li> </ul>
<a href="#">z/OS Communications Server: SNA Operation</a>	<ul style="list-style-type: none"> <li>• <a href="#">DISPLAY ID command</a></li> <li>• <a href="#">DISPLAY TRL command</a></li> </ul>
<a href="#">z/OS Communications Server: SNA Diagnosis Vol 2, FFST Dumps and the VIT</a>	<ul style="list-style-type: none"> <li>• <a href="#">ENFx entry for ENF exit</a></li> <li>• <a href="#">RPLA entry for invoking a RoCE Poll command (Part 3)</a></li> </ul>
<a href="#">z/OS Communications Server: IP Messages Volume 2 (EZB, EZD)</a>	<ul style="list-style-type: none"> <li>• <a href="#">EZD2051I</a></li> </ul>
<a href="#">z/OS Communications Server: SNA Messages</a>	<ul style="list-style-type: none"> <li>• <a href="#">IST2418I</a></li> <li>• <a href="#">IST2421I</a></li> <li>• <a href="#">IST2464I</a></li> <li>• <a href="#">IST2465I</a></li> </ul>

## Communications Server support for OSA-Express7S 25 GbE features

z/OS V2R4 Communications Server is enhanced to support the OSA-Express7S feature with 25 GbE bandwidth.

To enable Communications Server support for OSA-Express7S 25 GbE features, complete the appropriate tasks in [Table 70 on page 82](#).

<i>Table 70. Task topics to enable Communications Server support for OSA-Express7S 25 GbE features</i>	
Task	Reference
Display the generation level and speed for an active OSA-Express7S QDIO interface by issuing the <b>DISPLAY TCPIP,,OSAINFO</b> command.	<a href="#">DISPLAY TCPIP,,OSAINFO in z/OS Communications Server: IP System Administrator's Commands</a>
Display the interface speed value for an active OSA-Express7S QDIO interface by issuing the <b>Netstat DEvlinks/-d</b> command.	<a href="#">Netstat DEvlinks/-d report in z/OS Communications Server: IP System Administrator's Commands</a>
Display the read storage value for an active OSA-Express7S QDIO interface by issuing the <b>Netstat DEvlinks/-d</b> command.	<a href="#">Netstat DEvlinks/-d report in z/OS Communications Server: IP System Administrator's Commands</a>
Display the read storage value for an active OSA-Express7S QDIO data device by issuing the <b>DTRL,TRLE=trle</b> command.	<a href="#">DISPLAY TRL command in z/OS Communications Server: SNA Operation</a>
Determine the amount of fixed storage that will be allocated for each OSA-Express QDIO interface.	<a href="#">Fixed storage considerations for OSA-Express interfaces in QDIO mode in z/OS Communications Server: IP Configuration Guide</a>
Consider whether to increase the FIXED MAX setting in your IVTPRM00 parmlib member.	<a href="#">Fixed maximum storage for CSM buffers in z/OS Communications Server: IP Configuration Guide</a>

To find all related topics about Communications Server support for OSA-Express7S 25 GbE features, see [Table 71 on page 82](#).

<i>Table 71. All related topics about Communications Server support for OSA-Express7S 25 GbE features</i>	
Book name	Topics
<a href="#">IP Configuration Guide</a>	<ul style="list-style-type: none"> <li><a href="#">Fixed storage considerations for OSA-Express interfaces in QDIO mode</a></li> <li><a href="#">Fixed maximum storage for CSM buffers</a></li> <li><a href="#">Additional fixed storage for OSA interfaces using 8 MB of read storage</a></li> </ul>
<a href="#">IP Configuration Reference</a>	<ul style="list-style-type: none"> <li><a href="#">INTERFACE-IPAQENET OSA-Express QDIO interfaces</a></li> <li><a href="#">INTERFACE-IPAQENET6 OSA-Express QDIO interfaces</a></li> <li><a href="#">DEVICE and LINK - MPCIPA OSA-Express QDIO devices statement</a></li> </ul>
<a href="#">IP System Administrator's Commands</a>	<ul style="list-style-type: none"> <li><a href="#">DISPLAY TCPIP,,OSAINFO</a></li> <li><a href="#">Netstat DEvlinks/-d report</a></li> <li><a href="#">Reply field descriptions</a></li> </ul>



*Table 71. All related topics about Communications Server support for OSA-Express7S 25 GbE features (continued)*

Book name	Topics
<a href="#">SNA Operations</a>	<ul style="list-style-type: none"> <li>• <a href="#">DISPLAY TRL command</a></li> <li>• <a href="#">DISPLAY VTAMOPTS command</a></li> <li>• <a href="#">START command</a></li> </ul>
<a href="#">SNA Resource Definition Reference</a>	<ul style="list-style-type: none"> <li>• <a href="#">QDIOSTG start option</a></li> </ul>

## Communications Server support for 25 GbE RoCE Express2 features

z/OS Communications Server V2R4 is enhanced to support IBM 25 GbE RoCE Express2 features.

To enable the z/OS Communications Server support for 25 GbE RoCE Express2 features, complete the appropriate tasks in [Table 72 on page 83](#).

*Table 72. Task topics to enable z/OS Communications Server support for 25 GbE RoCE Express2 features*

Task	Reference
Configure at least one IBM 25 GbE RoCE Express2 feature in HCD. For each IBM RoCE Express2 port, configure the physical network identifier (PNetID), the physical channel identifier (PCHID), the function identifier (FID), the virtual function identifier (VF), and the port number (PORTNUM).	<a href="#">z/OS HCD User's Guide</a>
Configure or update the GLOBALCONFIG SMCR statement in the TCP/IP profile. <ul style="list-style-type: none"> <li>• Use the FID values configured in HCD to define the PFID values that represent physically different IBM 25 GbE RoCE Express2 features to provide full redundancy support. Do not specify PortNum for IBM RoCE Express2 PFIDs.</li> </ul>	<ul style="list-style-type: none"> <li>• <a href="#">GLOBALCONFIG statement in z/OS Communications Server: IP Configuration Reference</a></li> <li>• <a href="#">Shared Memory Communications over Remote Direct Memory Access in z/OS Communications Server: IP Configuration Guide</a></li> </ul>
Display information about a RoCE Express2 interface, including the interface speed, by issuing the Netstat DEvlinks/-d command and specifying the RoCE Express2 interface name.	<a href="#">Netstat DEvlinks/-d report in z/OS Communications Server: IP System Administrator's Commands</a>

To find all related topics about Communications Server support for 25 GbE RoCE Express2 features, see [Table 73 on page 83](#).

*Table 73. All related topics about z/OS Communications Server support for 25 GbE RoCE Express2 features*

Book name	Topics
<a href="#">IP Configuration Guide</a>	<ul style="list-style-type: none"> <li>• <a href="#">Shared Memory Communications terms</a></li> <li>• <a href="#">SMC-R link groups</a></li> <li>• <a href="#">System requirements for SMC-R in a shared RoCE environment</a></li> </ul>
<a href="#">IP Configuration Reference</a>	<ul style="list-style-type: none"> <li>• <a href="#">GLOBALCONFIG statement</a></li> </ul>
<a href="#">IP System Administrator's Commands</a>	<ul style="list-style-type: none"> <li>• <a href="#">Netstat DEvlinks/-d report</a></li> </ul>

Table 73. All related topics about z/OS Communications Server support for 25 GbE RoCE Express2 features (continued)

Book name	Topics
<a href="#">SNA Messages</a>	<ul style="list-style-type: none"> <li>• <a href="#">IST2361I</a></li> </ul>
<a href="#">z/OS HCD User's Guide</a>	N/A

## Communications Server QDIO display enhancements

Starting with z/OS Communications Server V2R4, read errors, if any, on the OSA inbound queues are displayed under the queue ID when VTAM TRLE display commands are issued.

To enable Communications Server QDIO display enhancements, complete the appropriate tasks in [Table 74](#) on page 84.

Table 74. Task topics to enable Communications Server QDIO display enhancements

Task/Procedure	Reference
To see information about OSA read errors on the inbound queues, issue the command D NET,ID=trle_name or D NET,TRL,TRLE=trle_name. If there are OSA read errors, they will be displayed under the queue ID.	<ul style="list-style-type: none"> <li>• <a href="#">DISPLAY ID command</a> in <a href="#">z/OS Communications Server: SNA Operation</a></li> <li>• <a href="#">DISPLAY TRL command</a> in <a href="#">z/OS Communications Server: SNA Operation</a></li> </ul>

To find all related topics about Communications Server QDIO display enhancements, see [Table 75](#) on page 84.

Table 75. All related topics about Communications Server QDIO display enhancements

Book name	Topics
<a href="#">z/OS Communications Server: SNA Operation</a>	<ul style="list-style-type: none"> <li>• <a href="#">DISPLAY ID command</a></li> <li>• <a href="#">DISPLAY TRL command</a></li> </ul>
<a href="#">z/OS Communications Server: SNA Diagnosis Vol 2, FFST Dumps and the VIT</a>	<ul style="list-style-type: none"> <li>• <a href="#">ODPK entry for OSA-Express QDIO or HiperSockets packets (Part 1)</a></li> </ul>
<a href="#">z/OS Communications Server: SNA Messages</a>	<ul style="list-style-type: none"> <li>• <a href="#">IST1221I</a></li> <li>• <a href="#">IST2457I</a></li> <li>• <a href="#">IST2458I</a></li> <li>• <a href="#">IST2459I</a></li> <li>• <a href="#">IST2460I</a></li> <li>• <a href="#">IST2461I</a></li> <li>• <a href="#">IST2462I</a></li> <li>• <a href="#">IST2463I</a></li> </ul>

## Usability and skills

The following topics describe enhancements for usability and skills:

- [“HiperSockets Converged Interface support”](#) on page 85

## HiperSockets Converged Interface support

z/OS V2R4 Communications Server provides HiperSockets Converged Interface (HSCI) solution to support the z/VM bridge environment. With this solution, a Linux guest can connect to z/OS via Layer 2 HiperSockets and to the external network by using a single IP interface.

This support also significantly improves HiperSockets usability by dynamically provisioning and activating a HiperSockets interface when an OSD interface is activated for the same physical network ID (PNetID). With this support, the TCP/IP stack only sees the OSD interface. This design approach greatly reduces the network administration costs as HiperSockets interfaces no longer are required to be configured, operated, or managed in z/OS Communications Server. This solution allows a single IP interface (OSD) to provide access to the external Ethernet LAN and transparent access to HiperSockets for LPAR to LPAR communications within the central processor complex (CPC). This solution also eliminates the need to reconfigure z/OS HiperSockets interfaces when moving a z/OS instance from one CPC to another. The HSCI is also referred to as an IQDC interface.

### 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.
- This function also requires the virtual MAC (VMAC) operand be specified on your IPAQENET interfaces to request OSA-generated VMACs.

### Dependencies:

- This function minimally requires a zEnterprise EC12 (zEC12).
- This function requires an Internal Queued Direct I/O (IQD) channel path ID (CHPID) configured with the external bridge function.

To enable HiperSockets Converged Interface support, perform the tasks in [Table 76](#) on page 85.

Table 76. HiperSockets Converged Interface support	
Task/Procedure	Reference
If you use IPv4 Queued Direct I/O (QDIO) interfaces that are defined with the DEVICE, LINK, and HOME statements, convert those definitions to use the IPAQENET INTERFACE statement.	<a href="#">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</a>
Configure at least one IQD CHPID with the external bridge function in hardware configuration definition (HCD). For each bridged IQD CHPID, configure at least 10 channel unit addresses (CUAs) for each protocol (IPv4 and IPv6) that your network supports.  If you use jumbo frames for your OSD interfaces that are associated with a converged HiperSockets CHPID, specify an IQD frame size larger than 16 K when you configure your converged HiperSockets CHPID. This avoids fragmentation, which allows more traffic to flow over the converged HiperSockets interface.	<a href="#">z/OS HCD User's Guide</a>
Select a unique physical network ID (PNetID) for each of your networks. Configure the appropriate PNetID in HCD for each OSD CHPID on a network and configure the same PNetID on each bridged IQD CHPID to be used on that network. If you already have a PNetID configured on your OSD CHPID for Shared Memory Communications, configure the same PNetID on your bridged IQD CHPID.	<a href="#">z/OS HCD User's Guide</a>

Table 76. HiperSockets Converged Interface support (continued)	
Task/Procedure	Reference
Configure AUTOIQDC on the GLOBALCONFIG statement in the TCP/IP profile.	<a href="#">GLOBALCONFIG statement in z/OS Communications Server: IP Configuration Reference</a>
Display whether the stack is enabled for dynamic IQDC interfaces and whether large outbound TCP socket sends should use these interfaces.	<a href="#">Netstat CONFIG/-f report in z/OS Communications Server: IP System Administrator's Commands</a>
Display information about the dynamic IQDC TRLEs and datapath devices by issuing the <b>D NET,ID=trle</b> , or <b>D NET,TRL,TRLE=</b> command.	<a href="#">z/OS Communications Server: SNA Operation</a> <ul style="list-style-type: none"> <li>• <a href="#">DISPLAY ID command</a></li> <li>• <a href="#">DISPLAY TRL command</a></li> </ul>
Display the dynamically generated name of an IQDC interface by issuing the <b>Netstat DEvlinks/-d</b> command against the associated OSD interface. Extract the name from the "Associated IQD Converged Interface" output line.	<a href="#">Netstat DEvlinks/-d report in z/OS Communications Server: IP System Administrator's Commands</a>
Display information about the number of packets and bytes which went over the dynamic IQDC interface by issuing the <b>Netstat DEvlinks/-d</b> command against the IQDC interface.	<a href="#">Netstat DEvlinks/-d report in z/OS Communications Server: IP System Administrator's Commands</a>
Display the ARP cache entries that are associated with an IPv4 IQDC interface by issuing the <b>Netstat ARp/-R</b> command.	<a href="#">Netstat ARp/-R report in z/OS Communications Server: IP System Administrator's Commands</a>
Display the neighbor cache entries that are associated with an IPv6 IQDC interface by issuing the <b>Netstat ND/-n</b> command.	<a href="#">Netstat ND/-n report in z/OS Communications Server: IP System Administrator's Commands</a>

To find all related topics about HiperSockets Converged Interface support, see [Table 77 on page 86](#).

Table 77. All related topics about HiperSockets Converged Interface support	
Book name	Topics
<a href="#">z/OS Communications Server: IP Configuration Guide</a>	<ul style="list-style-type: none"> <li>• <a href="#">z/OS HiperSockets Layer 3 connectivity</a> <ul style="list-style-type: none"> <li>– <a href="#">HiperSockets Converged Interface overview</a></li> <li>– <a href="#">Linux and z/VM VSwitch bridge considerations</a></li> <li>– <a href="#">Performance considerations for HiperSockets Converged Interface</a></li> <li>– <a href="#">SMC and HSCI PNetID considerations</a></li> <li>– <a href="#">Steps for enabling HiperSockets Converged Interface</a></li> <li>– <a href="#">Steps for converting from IPv4 IPAQENET DEVICE, LINK, and HOME definitions to the IPv4 IPAQENET INTERFACE statement</a></li> </ul> </li> </ul>
<a href="#">z/OS Communications Server: IP Configuration Reference</a>	<ul style="list-style-type: none"> <li>• <a href="#">GLOBALCONFIG statement</a></li> </ul>
<a href="#">z/OS Communications Server: IP Diagnosis Guide</a>	<ul style="list-style-type: none"> <li>• <a href="#">OPTIONS syntax</a></li> <li>• <a href="#">OPTIONS keywords</a></li> </ul>

Table 77. All related topics about HiperSockets Converged Interface support (continued)	
Book name	Topics
<a href="#">z/OS Communications Server: IP Programmer's Guide and Reference</a>	<ul style="list-style-type: none"> <li>• <a href="#">Common real-time trace record attributes</a></li> <li>• <a href="#">TCP/IP profile record Global configuration section</a></li> <li>• <a href="#">Interface statistics record (subtype 6)</a></li> </ul>
<a href="#">z/OS Communications Server: IP System Administrator's Commands</a>	<ul style="list-style-type: none"> <li>• <a href="#">Netstat ARp/-R report</a></li> <li>• <a href="#">Netstat: CONFIG/-f report</a></li> <li>• <a href="#">Netstat DEvlinks/-d report</a></li> <li>• <a href="#">Netstat ND/-n report</a></li> </ul>
<a href="#">z/OS Communications Server: IP and SNA Codes</a>	<ul style="list-style-type: none"> <li>• <a href="#">Data link control (DLC) status codes</a></li> </ul>
<a href="#">z/OS Communications Server: SNA Operation</a>	<ul style="list-style-type: none"> <li>• <a href="#">DISPLAY ID command</a></li> <li>• <a href="#">DISPLAY TRL command</a></li> </ul>
<a href="#">z/OS Communications Server: SNA Network Implementation Guide</a>	<ul style="list-style-type: none"> <li>• <a href="#">Resources automatically activated by VTAM</a></li> </ul>
<a href="#">z/OS Communications Server: SNA Resource Definition Reference</a>	<ul style="list-style-type: none"> <li>• <a href="#">Operation-level USS table (ISTINCNO)</a></li> </ul>
<a href="#">z/OS Communications Server: IP Messages Volume 2 (EZB, EZD)</a>	<ul style="list-style-type: none"> <li>• <a href="#">EZD2028I</a></li> </ul>
<a href="#">z/OS Communications Server: SNA Messages</a>	<ul style="list-style-type: none"> <li>• <a href="#">IST1016I</a></li> <li>• <a href="#">IST1221I</a></li> <li>• <a href="#">IST2319I</a></li> </ul>

## Scalability and performance

The following topics describe enhancements for scalability and performance:

- [“zERT Aggregation recording interval” on page 87](#)
- [“Inbound Workload Queueing \(IWQ\) support for IBM z/OS Container Extensions” on page 89](#)
- [“Sysplex notification of TCP/IP stack join or leave” on page 90](#)
- [“Network support for z/OS Container Extensions” on page 91](#)
- [“IWQ support for IPSec” on page 93](#)

### zERT Aggregation recording interval

z/OS V2R4 Communications Server with APAR PH25049 provides a zERT Aggregation recording interval that is not bound to the system SMF interval. This interval allows zERT summary records to be generated at an interval that can range from 1 to 24 hours.

**Note:** With APAR PH24543, you can configure this function in the Network Configuration Assistant (NCA).

zERT summary records can be collected as SMF type 119, subtype 12 records in the System Management Facility data sets or log streams. zERT summary records can also be collected by a real-time NMI application using the SYSTCPES service.



**Warning:**

Decreasing the frequency at which zERT summary records are written can increase the amount of 64-bit pageable, private memory needed. This is because zERT aggregation information is held longer in memory before being captured in SMF records.

## Using the zERT Aggregation recording interval

To use the zERT Aggregation recording interval, perform the tasks in [Table 78 on page 88](#).

<i>Table 78. zERT Aggregation recording interval</i>	
<b>Task/Procedure</b>	<b>Reference</b>
Determine if you want to use the zERT aggregation recording interval.	<a href="#">Enabling a longer zERT aggregation recording interval in z/OS Communications Server: IP Configuration Guide</a>
Enable the zERT aggregation recording interval using the new INTVAL and SYNCVAL sub-parameters on the GLOBALCONFIG ZERT AGGREGATION statement.	<a href="#">GLOBALCONFIG statement in z/OS Communications Server: IP Configuration Reference</a>
Display zERT aggregation recording interval settings.	<a href="#">Netstat CONFIG/-f report in z/OS Communications Server: IP System Administrator's Commands</a>

To find all new and updated topics about zERT Aggregation recording interval, see [Table 79 on page 88](#).

<i>Table 79. All related topics about zERT Aggregation recording interval</i>	
<b>Book name</b>	<b>Topics</b>
<a href="#">z/OS Communications Server: IP Configuration Guide</a>	<ul style="list-style-type: none"> <li>• <a href="#">Enabling a longer zERT aggregation recording interval</a></li> <li>• <a href="#">z/OS Encryption Readiness Technology (zERT) Concepts</a></li> <li>• <a href="#">How does zERT aggregation provide the information?</a></li> <li>• <a href="#">Enabling zERT aggregation</a></li> <li>• <a href="#">Setting up TCP/IP operating characteristics in PROFILE.TCPIP</a></li> </ul>
<a href="#">z/OS Communications Server: IP Configuration Reference</a>	<ul style="list-style-type: none"> <li>• <a href="#">GLOBALCONFIG statement</a></li> </ul>
<a href="#">z/OS Communications Server: IP System Administrator's Commands</a>	<ul style="list-style-type: none"> <li>• <a href="#">D TCPIP,,STOR command</a></li> <li>• <a href="#">Netstat CONFIG/-f report</a></li> </ul>
<a href="#">z/OS Communications Server: IP Programmer's Guide and Reference</a>	<ul style="list-style-type: none"> <li>• <a href="#">Format and details for poll-type requests</a></li> <li>• <a href="#">TCP/IP statistics record (subtype 5)</a></li> <li>• <a href="#">zERT Summary record (subtype 12)</a></li> <li>• <a href="#">TCP/IP profile record Global configuration section</a></li> </ul>
<a href="#">z/OS Communications Server: IP Messages Volume 4 (EZZ, SNM)</a>	<ul style="list-style-type: none"> <li>• <a href="#">EZZ8455I</a></li> </ul>

## Inbound Workload Queueing (IWQ) support for IBM z/OS Container Extensions

z/OS V2R4 Communications Server, with VTAM APAR OA58300 and TCP/IP APAR PH16581, is enhanced to support inbound workload queueing for IBM z/OS Container Extensions (zCX) workloads for OSA-Express in QDIO mode.

Inbound workload queueing uses multiple input queues for each QDIO data device (subchannel device) to improve TCP/IP stack scalability and general network optimization. To implement the performance improvements for zCX workloads, enable inbound workload queueing to process zCX, IPSec, EE, sysplex distributor, and streaming bulk data traffic all concurrently with other types of inbound QDIO traffic. When you enable these improvements for a QDIO interface, zCX, inbound IPSec, EE, sysplex distributor, and streaming bulk data traffic are each processed on their own ancillary input queue (AIQ). All other inbound traffic is processed on the primary input queue.

**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 is limited to OSA-Express6S Ethernet features or later in QDIO mode running on IBM z14. For more information about the QDIO inbound workload queueing function and the OSA-Express features that support it, see [QDIO inbound workload queueing in z/OS Communications Server: IP Configuration Guide](#). See the 3906DEVICE or 3907DEVICE Preventive Service Planning (PSP) bucket for more information.
- This function is supported only for interfaces that are configured to use a virtual MAC (VMAC) address.

To enable IWQ support for z/OS Container Extensions, complete the appropriate tasks in [Table 80](#) on page 89.

Table 80. Task topics to enable IWQ support for z/OS Container Extensions	
Task	Reference
Enable inbound workload queueing for a specific QDIO interface by specifying the WORKLOADQ parameter on the IPAQENET or IPAQENET6 INTERFACE statement (if not already configured).	<ul style="list-style-type: none"> <li>• See the following statements in <a href="#">z/OS Communications Server: IP Configuration Reference</a>: <ul style="list-style-type: none"> <li>– <a href="#">INTERFACE-IPAQENET OSA-Express QDIO interfaces</a></li> <li>– <a href="#">INTERFACE-IPAQENET6 OSA-Express QDIO interfaces</a></li> </ul> </li> <li>• <a href="#">Steps for enabling QDIO inbound workload queueing in z/OS Communications Server: IP Configuration Guide</a></li> </ul>
Display whether inbound workload queueing is in effect for the QDIO interface by issuing the <b>Netstat DEvlinks/-d</b> command.	<a href="#">Netstat DEvlinks/-d report in z/OS Communications Server: IP System Administrator's Commands</a>
Display whether inbound workload queueing is in effect for the QDIO interface and display the workload queueing functions and queue IDs for that interface by issuing the <b>DISPLAY NET,ID=trle</b> command or the <b>DISPLAY NET,TRL,TRLE=trle</b> command.	<a href="#">See the following topics in z/OS Communications Server: SNA Operation</a> : <ul style="list-style-type: none"> <li>• <a href="#">DISPLAY ID command</a></li> <li>• <a href="#">DISPLAY TRL command</a></li> </ul>
Monitor whether inbound traffic is using inbound workload queueing and display statistics for each queue by initiating VTAM tuning statistics for the QDIO interface.	<a href="#">MODIFY TNSTAT command in z/OS Communications Server: SNA Operation</a>



*Table 80. Task topics to enable IWQ support for z/OS Container Extensions (continued)*

Task	Reference
Monitor whether inbound traffic is using inbound workload queueing and display statistics for each queue by using the TCP/IP callable NMI GetIfStatsExtended request.	<a href="#">TCP/IP callable NMI (EZBNMIFR) in z/OS Communications Server: IP Programmer's Guide and Reference</a>
Determine the QID on which a specific packet was received, and the associated workload queueing function, from a packet trace.	<a href="#">Formatting packet traces using IPCS in z/OS Communications Server: IP Diagnosis Guide</a>
Determine the QID on which a specific packet was received from an OSAENTA trace.	<a href="#">Formatting OSA traces using IPCS in z/OS Communications Server: IP Diagnosis Guide</a>

To find all related topics about IWQ support for z/OS Container Extensions, see [Table 81 on page 90](#).

*Table 81. All related topics about IWQ support for z/OS Container Extensions*

Book name	Topics
<a href="#">z/OS Communications Server: IP Configuration Guide</a>	<ul style="list-style-type: none"> <li>• <a href="#">QDIO inbound workload queueing</a></li> </ul>
<a href="#">z/OS Communications Server: IP Configuration Reference</a>	<ul style="list-style-type: none"> <li>• <a href="#">INTERFACE-IPAQENET OSA-Express QDIO interfaces</a></li> <li>• <a href="#">INTERFACE-IPAQENET6 OSA-Express QDIO interfaces</a></li> </ul>
<a href="#">z/OS Communications Server: IP Programmer's Guide and Reference</a>	<ul style="list-style-type: none"> <li>• <a href="#">TCP/IP callable NMI (EZBNMIFR)</a></li> </ul>
<a href="#">z/OS Communications Server: IP Diagnosis Guide</a>	<ul style="list-style-type: none"> <li>• <a href="#">Formatting packet traces using IPCS</a></li> <li>• <a href="#">Formatting OSA traces using IPCS</a></li> </ul>
<a href="#">z/OS Communications Server: IP System Administrator's Commands</a>	<ul style="list-style-type: none"> <li>• <a href="#">DISPLAY TCPIP,,OSAINFO</a></li> <li>• <a href="#">Netstat DEvlinks/-d report</a></li> </ul>
<a href="#">z/OS Communications Server: SNA Operation</a>	<ul style="list-style-type: none"> <li>• <a href="#">DISPLAY ID command</a></li> <li>• <a href="#">DISPLAY TRL command</a></li> <li>• <a href="#">MODIFY TNSTAT command</a></li> </ul>
<a href="#">z/OS Communications Server: SNA Messages</a>	<ul style="list-style-type: none"> <li>• <a href="#">IST1221I</a></li> <li>• <a href="#">IST1230I</a></li> <li>• <a href="#">IST1233I</a></li> </ul>

## Sysplex notification of TCP/IP stack join or leave

z/OS V2R4 has enhanced Event Notification Facility code 80 to send a signal when a stack joins or leaves a sysplex group.

To enable sysplex notification of TCP/IP stack join or leave, complete the appropriate tasks in [Table 82 on page 91](#).



Table 82. Task topics to enable sysplex notification of TCP/IP stack join or leave	
Task	Reference
Create an ENF 80 exit in order to listen for the new signal when a TCP/IP stack joins or leaves a sysplex group.	<ul style="list-style-type: none"> <li>• <a href="#">EZAENF80 Parameter list for ENF event code 80 listen exits in z/OS Communications Server: IP Programmer's Guide and Reference</a></li> <li>• <a href="#">Using ENF event code 80 to notify applications of TCP/IP joining or leaving a sysplex in z/OS Communications Server: IP Programmer's Guide and Reference</a></li> <li>• <a href="#">Listening for system events in z/OS MVS Programming: Authorized Assembler Services Guide</a></li> <li>• <a href="#">Table: ENF macro event codes in z/OS MVS Programming: Authorized Assembler Services Reference EDT-IXG</a></li> </ul>

To find all related topics about sysplex notification of TCP/IP stack join or leave, see [Table 83 on page 91](#).

Table 83. All related topics about sysplex notification of TCP/IP stack join or leave	
Book name	Topics
<a href="#">z/OS Communications Server: IP Programmer's Guide and Reference</a>	<ul style="list-style-type: none"> <li>• <a href="#">EZAENF80 Parameter list for ENF event code 80 listen exits</a></li> <li>• <a href="#">Using ENF event code 80 to notify applications of TCP/IP joining or leaving a sysplex</a></li> </ul>
<a href="#">z/OS MVS Programming: Authorized Assembler Services Guide</a>	<a href="#">Listening for system events</a>
<a href="#">z/OS MVS Programming: Authorized Assembler Services Reference EDT-IXG</a>	<a href="#">Table: ENF macro event codes</a>

## Network support for z/OS Container Extensions

z/OS V2R4 Communications Server has added network support for z/OS Container Extensions.

z/OS Container Extensions provides native z/OS support for Linux Docker based application workloads. The Communications Server support provides network support for z/OS Container Extensions workloads by introducing a new type of DVIPA called a zCX DVIPA. The zCX DVIPA represents an instance of a Docker server allowing TCP/IP to provide unique IP routing and apply various TCP/IP QoS functions for container workloads running within each Docker server address space.

The Communications Server VTAM support introduces a new type of zCX network transport that dynamically provides optimized internal network connectivity from each Docker server address space ID (ASID) to TCP/IP for providing access to and from the external network. The VTAM support also introduces the z/OS Container Extensions Direct Network Interface Component (DNIC) that provides a Virtual NIC for the Docker server virtualization environment.

To enable network support for z/OS Container Extensions, perform the tasks in [Table 84 on page 91](#).

Table 84. Task topics to enable network support for z/OS Container Extensions	
Task/Procedure	Reference
Use the z/OSMF workflows to create the zCX environment.	<a href="#">z/OS Upgrade Workflow</a>

Table 84. Task topics to enable network support for z/OS Container Extensions (continued)	
Task/Procedure	Reference
Generate the TCP/IP Docker Server interfaces.	Configure a DYNAMICXCF and/or DYNAMICXCF6 statement in <a href="#">z/OS Communications Server: IP Configuration Reference</a>
Configure the VIPARANGE ZCX DVIPA address and start the TCP/IP Docker Server interface.	VIPADYNAMIC - VIPARANGE statement in <a href="#">z/OS Communications Server: IP Configuration Reference</a>

To find all related topics about network support for z/OS Container Extensions, see [Table 85 on page 92](#).

Table 85. All related topics about network support for z/OS Container Extensions	
Book name	Topics
<a href="#">z/OS Communications Server: IP Configuration Guide</a>	<ul style="list-style-type: none"> <li>• <a href="#">IBM z/OS Container Extensions network overview</a></li> <li>• <a href="#">Configuring application-instance DVIPAs for IBM z/OS Container Extensions (zCX)</a></li> <li>• <a href="#">Connectivity and gateway functions</a></li> <li>• <a href="#">Terminology</a></li> <li>• <a href="#">Introduction to VIPA</a></li> <li>• <a href="#">Configuring DVIPA support</a></li> </ul>
<a href="#">z/OS Communications Server: IP Configuration Reference</a>	<ul style="list-style-type: none"> <li>• <a href="#">VIPADYNAMIC - VIPARANGE statement</a></li> </ul>
<a href="#">z/OS Communications Server: IP Programmer's Guide and Reference</a>	<ul style="list-style-type: none"> <li>• <a href="#">Interface statistics record (subtype 6)</a></li> <li>• <a href="#">TCP/IP profile record dynamic VIPA (DVIPA) address section</a></li> </ul>
<a href="#">z/OS Communications Server: IP System Administrator's Commands</a>	<ul style="list-style-type: none"> <li>• <a href="#">Netstat VIPADyn/-v report</a></li> <li>• <a href="#">Netstat VIPADCFG/-F report</a></li> </ul>
<a href="#">z/OS Communications Server: IP and SNA Codes</a>	<a href="#">Data link control (DLC) status codes</a>
<a href="#">z/OS Communications Server: SNA Operation</a>	<ul style="list-style-type: none"> <li>• <a href="#">DISPLAY ID command</a></li> <li>• <a href="#">DISPLAY TRL command</a></li> <li>• <a href="#">MODIFY TRACE command</a></li> <li>• <a href="#">MODIFY VTAMOPTS command</a></li> <li>• <a href="#">START command</a></li> </ul>
<a href="#">z/OS Communications Server: SNA Network Implementation Guide</a>	<ul style="list-style-type: none"> <li>• <a href="#">Resources automatically activated by VTAM</a></li> </ul>
<a href="#">z/OS Communications Server: SNA Diagnosis Vol 1, Techniques and Procedures</a>	<ul style="list-style-type: none"> <li>• <a href="#">I/O trace</a></li> </ul>

Table 85. All related topics about network support for z/OS Container Extensions (continued)	
Book name	Topics
<a href="#">z/OS Communications Server: SNA Diagnosis Vol 2, FFST Dumps and the VIT</a>	<ul style="list-style-type: none"> <li>• <a href="#">AFSM entry for altering an FSM state</a></li> <li>• <a href="#">DNIX entry for recording DNI events</a></li> <li>• <a href="#">DNI2 entry for continued recording of DNI events</a></li> <li>• <a href="#">DNI3 entry for continued recording of DNI events</a></li> <li>• <a href="#">IUTx entry for IUT processing (Part 1)</a> <ul style="list-style-type: none"> <li>– <a href="#">IUTZ mapping and field descriptions</a></li> </ul> </li> <li>• <a href="#">Trace options for the VIT</a></li> <li>• <a href="#">TSNS entry to trace sense codes</a></li> </ul>
<a href="#">z/OS Communications Server: SNA Resource Definition Reference</a>	<ul style="list-style-type: none"> <li>• <a href="#">INOPDUMP start option</a></li> </ul>
<a href="#">z/OS Communications Server: Quick Reference</a>	<ul style="list-style-type: none"> <li>• <a href="#">D TRL command</a></li> <li>• <a href="#">F VTAMOPTS command</a></li> <li>• <a href="#">Start options</a></li> </ul>
<a href="#">z/OS Communications Server: IP Messages Volume 2 (EZB, EZD)</a>	<ul style="list-style-type: none"> <li>• <a href="#">EZD0007I</a></li> <li>• <a href="#">EZD0009I</a></li> <li>• <a href="#">EZD2045I</a></li> </ul>
<a href="#">z/OS Communications Server: SNA Messages</a>	<ul style="list-style-type: none"> <li>• <a href="#">IST087I</a></li> <li>• <a href="#">IST1717I</a></li> <li>• <a href="#">IST2447I</a></li> <li>• <a href="#">IST2448I</a></li> <li>• <a href="#">IST2449I</a></li> <li>• <a href="#">IST2450I</a></li> <li>• <a href="#">IST2451I</a></li> <li>• <a href="#">IST2452I</a></li> <li>• <a href="#">IST2453I</a></li> <li>• <a href="#">IST2454I</a></li> <li>• <a href="#">IST2455E</a></li> <li>• <a href="#">IST2456I</a></li> </ul>

## IWQ support for IPSec

z/OS V2R4 Communications Server is enhanced to support inbound workload queueing for IPSec workloads for OSA-Express in QDIO mode.

Inbound workload queueing uses multiple input queues for each QDIO data device (subchannel device) to improve TCP/IP stack scalability and general network optimization. To implement the performance improvements for IPSec workloads, enable inbound workload queueing to process IPSec, EE, sysplex distributor, and streaming bulk data traffic all concurrently with other types of inbound QDIO traffic. When you enable these improvements for a QDIO interface, inbound IPSec, EE, sysplex distributor, and streaming bulk data traffic are each processed on their own ancillary input queue (AIQ). All other inbound traffic is processed on the primary input queue.

**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 is limited to OSA-Express6S Ethernet features or later in QDIO mode running on IBM z14. For more information about the QDIO inbound workload queueing function and the OSA-Express features that support it, see [QDIO inbound workload queueing in z/OS Communications Server: IP Configuration Guide](#). See the 3906DEVICE or 3907DEVICE Preventive Service Planning (PSP) bucket for more information.
- This function is supported only for interfaces that are configured to use a virtual MAC (VMAC) address.

To enable IWQ support for IPsec, complete the appropriate tasks in [Table 86 on page 94](#).

<i>Table 86. Task topics to enable IWQ support for IPsec</i>	
Task	Reference
Enable inbound workload queueing for a specific QDIO interface by specifying the WORKLOADQ parameter on the IPAQENET or IPAQENET6 INTERFACE statement (if not already configured).	<ul style="list-style-type: none"> <li>• See the following statements in <a href="#">z/OS Communications Server: IP Configuration Reference</a>: <ul style="list-style-type: none"> <li>– <a href="#">INTERFACE-IPAQENET OSA-Express QDIO interfaces</a></li> <li>– <a href="#">INTERFACE-IPAQENET6 OSA-Express QDIO interfaces</a></li> </ul> </li> <li>• <a href="#">Steps for enabling QDIO inbound workload queueing in z/OS Communications Server: IP Configuration Guide</a></li> </ul>
Display whether inbound workload queueing is in effect for the QDIO interface by issuing the <b>Netstat DEvlinks/-d</b> command.	<a href="#">Netstat DEvlinks/-d report in z/OS Communications Server: IP System Administrator's Commands</a>
Display whether inbound workload queueing is in effect for the QDIO interface and display the workload queueing functions and queue IDs for that interface by issuing the <b>DISPLAY NET,ID=trle</b> command or the <b>DISPLAY NET,TRL,TRLE=trle</b> command.	<a href="#">See the following topics in z/OS Communications Server: SNA Operation</a> : <ul style="list-style-type: none"> <li>• <a href="#">DISPLAY ID command</a></li> <li>• <a href="#">DISPLAY TRL command</a></li> </ul>
Monitor whether inbound traffic is using inbound workload queueing and display statistics for each queue by initiating VTAM tuning statistics for the QDIO interface.	<a href="#">MODIFY TNSTAT command in z/OS Communications Server: SNA Operation</a>
Monitor whether inbound traffic is using inbound workload queueing and display statistics for each queue by using the TCP/IP callable NMI (EZBNMIFR) in z/OS Communications Server: IP Programmer's Guide and Reference	<a href="#">TCP/IP callable NMI (EZBNMIFR) in z/OS Communications Server: IP Programmer's Guide and Reference</a>
Determine the QID on which a specific packet was received, and the associated workload queueing function, from a packet trace.	<a href="#">Formatting packet traces using IPCS in z/OS Communications Server: IP Diagnosis Guide</a>
Determine the QID on which a specific packet was received from an OSAENTA trace.	<a href="#">Formatting OSA traces using IPCS in z/OS Communications Server: IP Diagnosis Guide</a>

To find all related topics about IWQ support for IPsec, see [Table 87 on page 95](#).

Table 87. All related topics about IWQ support for IPSec	
Book name	Topics
<a href="#">IP Configuration Guide</a>	<ul style="list-style-type: none"> <li>• <a href="#">QDIO inbound workload queueing</a></li> </ul>
<a href="#">IP Configuration Reference</a>	<ul style="list-style-type: none"> <li>• <a href="#">INTERFACE-IPAQENET OSA-Express QDIO interfaces</a></li> <li>• <a href="#">INTERFACE-IPAQENET6 OSA-Express QDIO interfaces</a></li> </ul>
<a href="#">IP Programmer's Guide and Reference</a>	<ul style="list-style-type: none"> <li>• <a href="#">TCP/IP callable NMI (EZBNMIFR)</a></li> </ul>
<a href="#">IP Diagnosis Guide</a>	<ul style="list-style-type: none"> <li>• <a href="#">Formatting packet traces using IPCS</a></li> <li>• <a href="#">Formatting OSA traces using IPCS</a></li> </ul>
<a href="#">IP System Administrator's Commands</a>	<ul style="list-style-type: none"> <li>• <a href="#">DISPLAY TCPIP,,OSAINFO</a></li> <li>• <a href="#">Netstat DEvlinks/-d report</a></li> </ul>
<a href="#">SNA Operations</a>	<ul style="list-style-type: none"> <li>• <a href="#">DISPLAY ID command</a></li> <li>• <a href="#">DISPLAY TRL command</a></li> <li>• <a href="#">MODIFY TNSTAT command</a></li> </ul>
<a href="#">SNA Messages</a>	<ul style="list-style-type: none"> <li>• <a href="#">IST1221I</a></li> <li>• <a href="#">IST1230I</a></li> </ul>

## Enhancing security

The following topics describe enhancements for security:

- [“IBM Health Checker for use of native TLS/SSL support for DCAS” on page 95](#)
- [“IBM Health Checker for use of native TLS/SSL support for the FTP server” on page 96](#)
- [“IBM Health Checker for use of native TLS/SSL support for the TN3270 server” on page 98](#)
- [“IBM zERT Network Analyzer database administration enhancements” on page 100](#)
- [“Sysplex Autonomics for IPSec” on page 98](#)
- [“AT-TLS support for TLS v1.3” on page 102](#)
- [“IBM zERT Network Analyzer” on page 108](#)
- [z/OS Encryption Readiness Technology \(zERT\) aggregation](#)
- [“TN3270E Telnet server Express Logon Feature support for Multi-Factor Authentication” on page 110](#)

### IBM Health Checker for use of native TLS/SSL support for DCAS

z/OS V2R4 Communications Server, with TCP/IP APAR PH16144 and SNA APAR OA58255, provides a new migration health check to use with the IBM Health Checker for z/OS function. The migration health check identifies if DCAS uses native TLS/SSL support.

**Dependency:** You must install TCP/IP APAR PH16144 and SNA APAR OA58255 and start the IBM Health Checker for z/OS to use the new migration health check.

#### Using the IBM Health Checker for use for native TLS/SSL support for DCAS

To use the IBM Health Checker for z/OS migration health check support, perform the tasks in [Table 88 on page 96](#).

*Table 88. IBM Health Checker for use of native TLS/SSL support for DCAS*

Task/Procedure	Reference
<p>To use the new migration health check, take the following steps:</p> <ol style="list-style-type: none"> <li>1. Configure and start the IBM Health Checker for z/OS.</li> <li>2. Activate the ZOSMIGV2R4_NEXT_CS_DCAS_NTVSSL migration health check.</li> <li>3. Review health check output for potential migration actions.</li> </ol>	<p>See the following topics in <a href="#">IBM Health Checker for z/OS: User's Guide</a>:</p> <ul style="list-style-type: none"> <li>• <a href="#">Setting up IBM Health Checker for z/OS</a></li> <li>• <a href="#">Working with check output</a></li> <li>• <a href="#">Managing checks</a></li> </ul>

To find all new and updated topics about IBM Health Checker for use of native TLS/SSL support for DCAS, see [Table 89 on page 96](#).

*Table 89. All related topics about IBM Health Checker for use of native TLS/SSL support for DCAS*

Book name	Topics
<a href="#">z/OS Communications Server: IP Diagnosis Guide</a>	IBM Health Checker for z/OS
<a href="#">IBM Health Checker for z/OS: User's Guide</a>	ZOSMIGV2R4_NEXT_CS_DCAS_NTVSSL
<a href="#">z/OS Upgrade Workflow</a>	<i>IP Services: Migrate TLS/SSL support for DCAS to AT-TLS</i>
<a href="#">z/OS Communications Server: SNA Messages</a>	<ul style="list-style-type: none"> <li>• <a href="#">ISTM043I</a></li> <li>• <a href="#">ISTM044E</a></li> </ul>

## IBM Health Checker for use of native TLS/SSL support for the FTP server

z/OS V2R4 Communications Server, with TCP/IP APAR PH21573 and SNA APAR OA59022, provides a new migration health check to use with the IBM Health Checker for z/OS function. The migration health check identifies active FTP servers using native TLS/SSL support.

z/OS V2R4 Communications Server, with TCP/IP APAR PH24732 and SNA APAR OA59490, provides additional migration health checks to use with the IBM Health Checker for z/OS function. These migration health checks identify FTP servers and clients that are configured with an invalid configuration of TLSRFCLEVEL CCCNONOTIFY with TLSMECHANISM ATTLS.

### Dependencies:

- You must install TCP/IP APAR PH21573 and SNA APAR OA59022 and start the IBM Health Checker for z/OS to use the new migration health check to identify active FTP servers using native TLS/SSL support.
- You must install TCP/IP APAR PH24732 and SNA APAR OA59490 and start the IBM Health Checker for z/OS to use the new migration health checks to identify FTP servers and clients that are configured with an invalid configuration of TLSRFCLEVEL CCCNONOTIFY with TLSMECHANISM ATTLS.

### Using the IBM Health Checker for use of native TLS/SSL support for the FTP server.

To use the IBM Health Checker for z/OS migration health check support, perform the tasks in [Table 90 on page 97](#).

Table 90. IBM Health Checker for use of native TLS/SSL support for the FTP server

Task/Procedure	Reference
<p>To use the new migration health check, take the following steps:</p> <ol style="list-style-type: none"> <li>1. Configure and start the IBM Health Checker for z/OS.</li> <li>2. Activate the ZOSMIGV2R4_NEXT_CS_FTPSRV_NTVSSL FTP server migration health check.</li> <li>3. Activate the ZOSMIGV2R4_NEXT_CS_FTPSRV_RFCLVL FTP server migration health check.</li> <li>4. Activate the ZOSMIGV2R4_NEXT_CS_FTPCLI_RFCLVL FTP client migration health check.</li> <li>5. Review health check output for potential migration actions.</li> </ol>	<p>See the following topics in <a href="#">IBM Health Checker for z/OS: User's Guide</a>:</p> <ul style="list-style-type: none"> <li>• <a href="#">Setting up IBM Health Checker for z/OS</a></li> <li>• <a href="#">Working with check output</a></li> <li>• <a href="#">Managing checks</a></li> </ul>

To find all new and updated topics about IBM Health Checker for use of native TLS/SSL support for the FTP server, see [Table 91 on page 97](#).

Table 91. All related topics about IBM Health Checker for use of native TLS/SSL support for the FTP server

Book name	Topics
<a href="#">z/OS Communications Server: IP Diagnosis Guide</a>	<a href="#">IBM Health Checker for z/OS</a>
<a href="#">z/OS Communications Server: IP Configuration Guide</a>	<ul style="list-style-type: none"> <li>• <a href="#">Steps for customizing the FTP server for TLS</a></li> <li>• <a href="#">Steps for migrating the FTP server and client to use AT-TLS</a></li> </ul>
<a href="#">IBM Health Checker for z/OS: User's Guide</a>	<ul style="list-style-type: none"> <li>• <a href="#">ZOSMIGV2R4_NEXT_CS_FTPSRV_NTVSSL</a></li> <li>• <a href="#">ZOSMIGV2R4_NEXT_CS_FTPSRV_RFCLVL</a></li> <li>• <a href="#">ZOSMIGV2R4_NEXT_CS_FTPCLI_RFCLVL</a></li> </ul>
<a href="#">z/OS Upgrade Workflow</a>	<ul style="list-style-type: none"> <li>• <i>IP Services: Migrate TLS/SSL support for FTP server to AT-TLS</i></li> <li>• <i>IP Services: Ensure FTP servers and FTP clients are not configured with TLSRFCLEVEL CCCNONOTIFY and TLSMECHANISM ATTLS</i></li> </ul>
<a href="#">z/OS Communications Server: SNA Messages</a>	<ul style="list-style-type: none"> <li>• <a href="#">ISTM045I</a></li> <li>• <a href="#">ISTM046E</a></li> <li>• <a href="#">ISTM047I</a></li> <li>• <a href="#">ISTM048E</a></li> <li>• <a href="#">ISTM049I</a></li> <li>• <a href="#">ISTM050E</a></li> </ul>
<a href="#">z/OS Communications Server: IP Messages Volume 3 (EZY)</a>	<ul style="list-style-type: none"> <li>• <a href="#">EZYFT79I</a></li> <li>• <a href="#">EZYFT88I</a></li> </ul>

## IBM Health Checker for use of native TLS/SSL support for the TN3270 server

z/OS V2R4 Communications Server, with TCP/IP APAR PH16144 and SNA APAR OA58255, provides a new migration health check to use with the IBM Health Checker for z/OS function. The migration health check identifies active TN3270 servers using native TLS/SSL support.

**Dependency:** You must install TCP/IP APAR PH16144 and SNA APAR OA58255 and start the IBM Health Checker for z/OS to use the new migration health check.

### Using the IBM Health Checker for use for native TLS/SSL support for the TN3270 server

To use the IBM Health Checker for z/OS migration health check support, perform the tasks in [Table 92 on page 98](#).

Table 92. IBM Health Checker for use of native TLS/SSL support for the TN3270 server	
Task/Procedure	Reference
To use the new migration health check, take the following steps:  1. Configure and start the IBM Health Checker for z/OS.  2. Activate the ZOSMIGV2R4_NEXT_CS_TN3270_NTVSSL migration health check.  3. Review health check output for potential migration actions.	See the following topics in <a href="#">IBM Health Checker for z/OS: User's Guide</a> : <ul style="list-style-type: none"><li>• <a href="#">Setting up IBM Health Checker for z/OS</a></li><li>• <a href="#">Working with check output</a></li><li>• <a href="#">Managing checks</a></li></ul>

To find all new and updated topics about IBM Health Checker for use of native TLS/SSL support for the TN3270 server, see [Table 93 on page 98](#).

Table 93. All related topics about IBM Health Checker for use of native TLS/SSL support for the TN3270 server	
Book name	Topics
<a href="#">z/OS Communications Server: IP Diagnosis Guide</a>	<a href="#">IBM Health Checker for z/OS</a>
<a href="#">IBM Health Checker for z/OS: User's Guide</a>	<a href="#">ZOSMIGV2R4_NEXT_CS_TN3270_NTVSSL</a>
<a href="#">z/OS Upgrade Workflow</a>	<a href="#">IP Services: Migrate TLS/SSL support for TN3270 to AT-TLS</a>
<a href="#">z/OS Communications Server: SNA Messages</a>	<ul style="list-style-type: none"><li>• <a href="#">ISTM041I</a></li><li>• <a href="#">ISTM042E</a></li></ul>

## Sysplex Autonomics for IPsec

z/OS V2R4 with APAR PH12788 enhances the sysplex autonomics function to monitor IPsec infrastructure. You can request that sysplex autonomics delay a TCP/IP stack from joining a sysplex group until the IPsec infrastructure is active. You can also request that sysplex autonomics monitor the IPsec infrastructure after the stack has joined the sysplex group. If monitoring the IPsec infrastructure is enabled, you are alerted with new messages when the IPsec infrastructure is not operational. You can optionally configure the TCP/IP stack to also take a recovery action and leave the sysplex when it detects that the IPsec infrastructure is not active. This allows a backup TCP/IP stack to take over DVIPAs from the system that left the sysplex.

### Restrictions:



- The monitoring of the IPsec infrastructure can only be enabled for a TCP/IP stack that is using sysplex-wide security sessions (SWSA) and has the DVIPSEC parameter configured on the IPSEC statement in the TCP/IP profile.
- While the EZBDVIPA coupling facility structure is required for IPsec sysplex-wide security associations (SWSA), the ability of the TCP/IP stack to connect to or access the EZBDVIPA structure is not monitored by sysplex autonomics for IPsec. A failure related to the EZBDVIPA structure would typically be sysplex-wide. It would not be beneficial for a TCP/IP stack to leave the sysplex for a sysplex-wide failure.
- In IPsec configurations where both a primary and backup NSSD are configured for certificate services, no monitoring of the IKED connection to NSSD is done after the TCP/IP stack joins the sysplex. See the IP Configuration Guide “Sysplex Autonomics for IPsec infrastructure” for additional information.

#### Incompatibilities:

- If your IPsec infrastructure includes the Network Security Services daemon (NSSD), and the IKED to NSSD connection uses a DVIPA as the source or destination IP address, the sysplex autonomics IPsec infrastructure monitoring function should not be enabled.
- If you use a centralized Policy Agent server for IPsec or AT-TLS policy, and the connection from the policy client to the policy server uses a DVIPA as the source or destination IP address, the sysplex autonomics IPsec infrastructure monitoring function should not be enabled.

**Note:** With APAR PH16303, you can configure this function in Network Configuration Assistant (NCA).

To enable Sysplex Autonomics for IPsec, perform the tasks in [Table 94 on page 99](#).

<i>Table 94. Sysplex Autonomics for IPsec</i>	
Task/Procedure	Reference
Enable monitoring of the IPsec infrastructure by sysplex autonomics with the GLOBALCONFIG SYSPLEXMONITOR sub-parameters DELAYJOINIPSEC and MONIPSEC	<ul style="list-style-type: none"> <li>• <a href="#">GLOBALCONFIG statement in z/OS Communications Server: IP Configuration Reference</a></li> <li>• <a href="#">Sysplex problem detection and recovery topic in z/OS Communications Server: IP Configuration Guide</a></li> </ul>
Display sysplex autonomics configuration settings	<a href="#">Netstat CONFIG/-f report in z/OS Communications Server: IP System Administrator's Commands</a>
(Optional) Configure the NoKeyring parameter on the IkeConfig statement in the IKE configuration file, if appropriate.  If an IKE key ring is not explicitly configured, the Keyring parameter defaults to iked/keyring.  If there is no keyring for IKED to process, you can specify NoKeyring.	<a href="#">IkeConfig statement in z/OS Communications Server: IP Configuration Reference</a>
Display the IKED configuration parameters	<a href="#">MODIFY command: IKE server in z/OS Communications Server: IP System Administrator's Commands</a>

To find all related topics about Sysplex Autonomics for IPsec, see [Table 95 on page 100](#).

Table 95. All related topics about Sysplex Autonomics for IPsec	
Book name	Topics
<a href="#">z/OS Communications Server: IP Configuration Guide</a>	<ul style="list-style-type: none"> <li>• <a href="#">Sysplex problem detection and recovery</a></li> <li>• <a href="#">Problem detection</a></li> <li>• <a href="#">Recovery</a></li> <li>• <a href="#">Summary of problems monitored and actions taken</a></li> <li>• <a href="#">Sysplex autonomics for IPsec</a></li> </ul>
<a href="#">z/OS Communications Server: IP Configuration Reference</a>	<ul style="list-style-type: none"> <li>• <a href="#">GLOBALCONFIG statement</a></li> <li>• <a href="#">IkeConfig statement</a></li> </ul>
<a href="#">z/OS Communications Server: IP System Administrator's Commands</a>	<ul style="list-style-type: none"> <li>• <a href="#">Not IPv6 enabled (SHORT format)</a></li> <li>• <a href="#">IPv6 enabled or request for LONG format</a></li> <li>• <a href="#">Report field descriptions</a></li> <li>• <a href="#">VARY TCPIP,,SYSPLEX Parameters</a></li> <li>• <a href="#">Netstat CONFIG/-f report</a></li> <li>• <a href="#">MODIFY command: IKE server</a></li> </ul>
<a href="#">z/OS Communications Server: IP Programmer's Guide and Reference</a>	<a href="#">TCP/IP profile record Global configuration section</a>
<a href="#">z/OS Communications Server: IP Diagnosis Guide</a>	<a href="#">Sample output of the TCPIP CS PROFILE subcommand</a>
<a href="#">z/OS Communications Server: IP Messages Volume 2 (EZB, EZD)</a>	<ul style="list-style-type: none"> <li>• <a href="#">EZD1976E</a></li> <li>• <a href="#">EZD1977E</a></li> <li>• <a href="#">EZD1979E</a></li> <li>• <a href="#">EZD2048I</a></li> <li>• <a href="#">EZD2049I</a></li> <li>• <a href="#">EZD2050I</a></li> </ul>
<a href="#">z/OS Communications Server: IP Messages Volume 4 (EZZ, SNM)</a>	<a href="#">EZZ0839I</a>

## IBM zERT Network Analyzer database administration enhancements

z/OS Management Facility (z/OSMF) V2R4 with the IBM zERT Network Analyzer APAR PH24494 provides additional flexibility in IBM zERT Network Analyzer's Db2 for z/OS database schema definitions and reduces the access privileges required by the IBM zERT Network Analyzer's database user ID. The supplied database schema tooling now supports customized values for the database schema name, index names and even table names along with many other operational parameters that were already configurable.

**Dependencies:** No new dependencies are introduced. The IBM zERT Network Analyzer requires z/OSMF to be installed and a type 4 JDBC connection to Db2 for z/OS 11 or higher.

To enable IBM zERT Network Analyzer database administration enhancements, perform the tasks in [Table 96 on page 100](#).

Table 96. IBM zERT Network Analyzer database administration enhancements	
Task/Procedure	Reference
Stop z/OSMF if it is running	

Table 96. IBM zERT Network Analyzer database administration enhancements (continued)

Task/Procedure	Reference
<ul style="list-style-type: none"> <li>If you are installing the IBM zERT Network Analyzer for the first time, your Db2 for z/OS database administrator (DBA) will need to create your customized database using the provided schema tooling.</li> <li>If you already have the IBM zERT Network Analyzer running: <ul style="list-style-type: none"> <li>Your DBA needs to either upgrade the existing database schema to the new schema version or else drop your existing database and re-create it with customized schema, index and/or table names at the new schema version.</li> <li>Regardless of which approach you decide, your DBA uses the provided database schema tooling to implement the changes. This includes deciding on and defining the desired number of IBM zERT Network Analyzer query result table partitions.</li> </ul> </li> </ul>	See <a href="#">Db2 for z/OS customization for the IBM zERT Network Analyzer task in IBM z/OS Management Facility Configuration Guide</a>
Once the IBM zERT Network Analyzer database is updated to or created at the new schema version, start z/OSMF and the IBM zERT Network Analyzer plugin. If you are using a newly created database, you need to fill in and save the required JDBC connectivity settings in the IBM zERT Network Analyzer's database settings panel.	See <a href="#">Connect the IBM zERT Network Analyzer task with the Db2 for z/OS database in IBM z/OS Management Facility Configuration Guide</a>
Once the correct database settings are stored and the IBM zERT Network Analyzer successfully connects to the database, you can verify the database schema information in the database settings panel.	See <i>Working with the Database Settings panel</i> of IBM zERT Network Analyzer online help, <i>Analysis</i> category under the IBM z/OS Management Facility online help
(Optionally) Configure the report timeout value to specify how many minutes of inactivity will result in the report being closed and the associated query result table partition being made available for future query requests.	IBM zERT Network Analyzer online help
(Optionally) Configure the maximum number of reports a single user can have concurrently open.	IBM zERT Network Analyzer online help

To find all related topics about IBM zERT Network Analyzer database administration enhancements, see Table 97 on page 101.

Table 97. All related topics about IBM zERT Network Analyzer database administration enhancements

Book name	Topics
<a href="#">IBM z/OS Management Facility Configuration Guide</a>	<ul style="list-style-type: none"> <li><a href="#">Updating z/OS for the IBM zERT Network Analyzer plug-in</a></li> <li><a href="#">Db2 for z/OS customization for the IBM zERT Network Analyzer task</a></li> <li><a href="#">Recovering unavailable partition</a></li> </ul>
z/OS Management Facility online help	IBM zERT Network Analyzer online help

## AT-TLS support for TLS v1.3

z/OS V2R4 Communications Server adds support for TLS Version 1.3 for Application Transparent Transport Layer Security (AT-TLS). This includes support for the following new TLSv1.3 cipher suites: TLS\_AES\_128\_GCM\_SHA256, TLS\_AES\_256\_GCM\_SHA384, and TLS\_CHACHA20\_POLY1305\_SHA256.

z/OS V2R4 Communications Server enhances the z/OS Encryption Readiness Technology (zERT) function to detect and report TLSv1.3 security session information using SMF Type 119 subtype 11 and 12 records. The IBM zERT Network Analyzer z/OSMF plug-in is also enhanced to accept and display TLSv1.3 information and to allow IBM zERT Network Analyzer users to query database content using the new TLSv1.3 security session characteristics.

### Restrictions:

Support for TLS Version 1.3 is provided only for AT-TLS. Native TLS support for the FTP server and client, the TN3270E server, and DCAS is not updated to support TLSv1.3.

### Incompatibilities:

- The cipher suites supported for TLS Version 1.2 and earlier are not supported for TLS Version 1.3. And the cipher suites supported for TLS Version 1.3 are not supported by earlier versions of TLS. If TLSv1.3 and earlier versions are enabled, the configured list of supported cipher suites must include values supported for TLSv1.3 and values supported by earlier TLS versions.
- The FIPS 140-2 standard does not define support for TLSv1.3 or the new cipher suites defined for it. Enabling both the TLSv1.3 protocol and FIPS support results in an error.

### Dependency:

The Integrated Cryptographic Services Facility (ICSF) must be active to provide support for all TLSv1.3 cipher suites.

Table 98. AT-TLS support for TLS v1.3	
Task/Procedure	Reference
Enable TLS v1.3 in AT-TLS policy by using the Network Configuration Assistant (NCA) or manual configuration.	See the following topics: <ul style="list-style-type: none"><li>• <a href="#">IBM Configuration Assistant for z/OS Communications Server online helps</a></li><li>• <a href="#">AT-TLS policy statements in z/OS Communications Server: IP Configuration Reference</a></li><li>• <a href="#">Using TLSv1.3 protocol support in z/OS Communications Server: IP Configuration Guide</a></li></ul>
Optionally, display the policy-based networking information. Use the pasearch command to display AT-TLS policies.	The z/OS UNIX pasearch command: <a href="#">Display policies in z/OS Communications Server: IP System Administrator's Commands</a>
Optionally, display the AT-TLS negotiated and configured parameters in use for a TCP connection.	<a href="#">Netstat TTLS/-x report in z/OS Communications Server: IP System Administrator's Commands</a>

Table 98. AT-TLS support for TLS v1.3 (continued)

Task/Procedure	Reference
<p>Optionally, view updated AT-TLS information in the following SMF type 119 records:</p> <ul style="list-style-type: none"> <li>• TCP connection termination record (subtype 2)</li> <li>• FTP records, including: <ul style="list-style-type: none"> <li>– subtype 3</li> <li>– subtype 70</li> <li>– subtype 100</li> <li>– subtype 101</li> <li>– subtype 102</li> <li>– subtype 103</li> <li>– subtype 104</li> </ul> </li> <li>• zERT connection detail record (subtype 11)</li> <li>• zERT connection summary record (subtype 12)</li> <li>• CSSMTP connection record (subtype 49)</li> </ul>	<p>Type 119 SMF records in <a href="#">z/OS Communications Server: IP Programmer's Guide and Reference</a></p>
<p>Optionally, retrieve updated AT-TLS information for a connection with the TCP/IP callable NMI (EZBNMIFR).</p>	<p>TCP/IP callable NMI (EZBNMIFR) in <a href="#">z/OS Communications Server: IP Programmer's Guide and Reference</a></p>

To find all related topics about AT-TLS support for TLS v1.3, see [Table 99 on page 103](#).

Table 99. All related topics about AT-TLS support for TLS v1.3

Book name	Topics
<a href="#">z/OS Communications Server: IP Sockets Application Programming Interface Guide and Reference</a>	<ul style="list-style-type: none"> <li>• <a href="#">IOCTL</a></li> <li>• <a href="#">Sockets return codes (ERRNOs)</a></li> </ul>
<a href="#">z/OS Communications Server: IP CICS Sockets Guide</a>	<a href="#">Sockets return codes (ERRNOs)</a>
<a href="#">z/OS Communications Server: IP IMS Sockets Guide</a>	<a href="#">Sockets return codes (ERRNOs)</a>
<a href="#">z/OS Communications Server: IP Messages Volume 2 (EZB, EZD)</a>	<ul style="list-style-type: none"> <li>• <a href="#">EZD1282I</a></li> <li>• <a href="#">EZD1283I</a></li> <li>• <a href="#">EZD1286I</a></li> </ul>

Table 99. All related topics about AT-TLS support for TLS v1.3 (continued)

Book name	Topics
<a href="#">z/OS Communications Server: IP Programmer's Guide and Reference</a>	<ul style="list-style-type: none"> <li>• <a href="#">zERT connection detail record (subtype 11)</a></li> <li>• <a href="#">zERT Summary record (subtype 12)</a></li> <li>• <a href="#">Application Transparent Transport Layer Security (AT-TLS)</a></li> <li>• <a href="#">CICS transaction considerations</a></li> <li>• <a href="#">Starting AT-TLS on a connection</a></li> <li>• <a href="#">Steps for implementing a controlling server application</a></li> <li>• <a href="#">SIOCTLCTL ioctl return values</a></li> <li>• <a href="#">TCP connection termination record (subtype 2)</a></li> <li>• <a href="#">FTP client transfer completion record (subtype 3)</a></li> <li>• <a href="#">FTP server transfer completion record (subtype 70)</a></li> <li>• <a href="#">FTP server logon failure record (subtype 72)</a></li> <li>• <a href="#">z/OS Communications Server: IP Programmer's Guide and Reference</a></li> <li>• <a href="#">FTP client transfer initialization record (subtype 101)</a></li> <li>• <a href="#">FTP client login failure record (subtype 102)</a></li> <li>• <a href="#">FTP client session record (subtype 103)</a></li> <li>• <a href="#">FTP server session record (subtype 104)</a></li> <li>• <a href="#">FTP client application data format for the control connection</a></li> <li>• <a href="#">FTP client application data format for the data connection</a></li> <li>• <a href="#">FTP server application data format for the control connection</a></li> <li>• <a href="#">FTP server application data format for the data connection</a></li> <li>• <a href="#">Application data format for CSSMTP</a></li> <li>• <a href="#">Application data format for Telnet</a></li> <li>• <a href="#">Type 119 SMF records</a></li> <li>• <a href="#">TCP/IP callable NMI (EZBNMIFR)</a></li> </ul>
<a href="#">z/OS Communications Server: IP System Administrator's Commands</a>	<ul style="list-style-type: none"> <li>• <a href="#">COnn report examples</a></li> <li>• <a href="#">Report field descriptions</a></li> <li>• <a href="#">The z/OS UNIX pasearch command: Display policies</a></li> </ul>

Table 99. All related topics about AT-TLS support for TLS v1.3 (continued)

Book name	Topics
<a href="#">z/OS Communications Server: IP Configuration Guide</a>	<ul style="list-style-type: none"> <li>• <a href="#">Security</a></li> <li>• <a href="#">Existing workload</a></li> <li>• <a href="#">TLS and SSL</a></li> <li>• <a href="#">TN3270E Telnet server security</a></li> <li>• <a href="#">Multiple port support</a></li> <li>• <a href="#">Secure and non-secure connections using a single Telnet port</a></li> <li>• <a href="#">Express Logon Feature</a></li> <li>• <a href="#">Application Transparent Transport Layer Security</a></li> <li>• <a href="#">Cipher suite specification</a></li> <li>• <a href="#">Protocol versions</a></li> <li>• <a href="#">Using TLSv1.3 protocol support</a></li> <li>• <a href="#">Certificate validation</a></li> <li>• <a href="#">Encryption key refresh</a></li> <li>• <a href="#">Handshake timer</a></li> <li>• <a href="#">Wireless performance</a></li> <li>• <a href="#">Certificate selection</a></li> <li>• <a href="#">Session caching</a></li> <li>• <a href="#">AT-TLS access control considerations</a></li> <li>• <a href="#">Client application model</a></li> <li>• <a href="#">What are the limitations for zERT discovery?</a></li> <li>• <a href="#">AT-TLS controlling application considerations</a></li> <li>• <a href="#">Client application model</a></li> <li>• <a href="#">Server application model</a></li> <li>• <a href="#">Forked server application model</a></li> </ul>
<a href="#">z/OS Communications Server: IP Configuration Reference</a>	<ul style="list-style-type: none"> <li>• <a href="#">TTLSTConnectionAdvancedParms statement</a></li> <li>• <a href="#">TTLSEnvironmentAction statement</a></li> <li>• <a href="#">TTLSEnvironmentAdvancedParms statement</a></li> <li>• <a href="#">TTLSSignatureParms statement</a></li> <li>• <a href="#">TTLSGskAdvancedParms statement</a></li> <li>• <a href="#">TTLSCipherParms statement</a></li> <li>• <a href="#">TTLSGskOcspParms statement</a></li> <li>• <a href="#">General syntax rules for Policy Agent</a></li> <li>• <a href="#">AT-TLS policy statements</a></li> </ul>

## z/OS Encryption Readiness Technology (zERT) aggregation

z/OS V2R3 Communications Server, introduced a new function called z/OS Encryption Readiness Technology (zERT). With zERT, the TCP/IP stack acts as a focal point in collecting and reporting the cryptographic security attributes of IPv4 and IPv6 application traffic that is protected using the TLS/SSL, SSH, and IPsec cryptographic network security protocols. The collected connection level data is written to SMF in SMF 119 subtype 11 records.

In certain environments, the volume of SMF 119 subtype 11 records can be large. z/OS V2R4 Communications Server provides the zERT aggregation function. The zERT aggregation function provides an alternative SMF view of the collected security session data. This alternate view is written in the form of new SMF 119 subtype 12 records that summarize the use of security sessions by many application connections over time and which are written at the end of each SMF/INTVAL interval. This alternate view condenses the volume of SMF record data while still providing all the critical security information.

Decreasing the frequency at which zERT summary records are written may increase the amount of 64-bit pageable, private memory needed, because the zERT aggregation information is held longer in memory before being written out to SMF.

#### Restrictions:

The following restrictions apply to both zERT discovery and zERT aggregation functions.

- zERT collects information for TCP and Enterprise Extender (EE) connections. Information is not collected for non-EE UDP traffic or traffic using other IP protocols.
- zERT collects cryptographic security attributes for the TLS, SSL, SSH, and IPsec protocols. No other cryptographic security protocols are supported.
- The following z/OS cryptographic protocol providers are fully enabled for zERT: z/OS Communications Server IPsec and AT-TLS, z/OS Cryptographic Services System SSL, and z/OS OpenSSH. Detailed security attribute data is available for connections using these protocol providers. Other TLS, SSL, and SSH implementations running on z/OS are monitored through stream observation only. A limited amount of security attribute data is available for these connections.
- The interval at which the SMF 119 subtype 12 records are created will be determined by the ZERT AGGREGATION sub-parameter INTVAL. (INTVAL/SYNCDVAL sub-parameters are available in z/OS V2R4 Communications Server with APAR PH25049.)
- For information on the specific cases where security attribute data is limited or unavailable, see [What are the limitations for zERT discovery?](#) in *z/OS Communications Server: IP Configuration Guide*.

**Dependency:** In order to properly monitor IBM Sterling Connect:Direct traffic when it is protected through SecurePlus TLS/SSL support, you must apply Connect:Direct APAR PI77316.

Table 100. zERT aggregation	
Task/Procedure	Reference
Plan for collection and storage of zERT summary SMF records and decide whether or not you want to discontinue collection of zERT connection detail records.	<ul style="list-style-type: none"> <li>• <a href="#">Monitoring cryptographic network protection: z/OS encryption readiness technology (zERT) in z/OS Communications Server: IP Configuration Guide</a></li> <li>• <a href="#">z/OS MVS System Management Facilities (SMF)</a></li> </ul>
Enable the zERT aggregation function.	<a href="#">GLOBALCONFIG statement in z/OS Communications Server: IP Configuration Reference</a>
If you want zERT summary records to be available in the System Management Facility data sets or log streams, specify SMFCONFIG TYPE119 ZERTSUMMARY.	<ul style="list-style-type: none"> <li>• <a href="#">SMFCONFIG statement in z/OS Communications Server: IP Configuration Reference</a></li> </ul>
If you want zERT summary records to be available to a real-time NMI application: <ul style="list-style-type: none"> <li>• Perform the necessary RACF processing to authorize the NMI application to use the zERT Summary SMF NMI service (SYSTCPES).</li> <li>• Specify NETMONITOR ZERTSUMMARY in the TCP/IP profile.</li> </ul>	<ul style="list-style-type: none"> <li>• <a href="#">Requests sent by the client to the server: SYSTCPES service in z/OS Communications Server: IP Programmer's Guide and Reference</a></li> <li>• <a href="#">NETMONITOR statement in z/OS Communications Server: IP Configuration Reference</a></li> </ul>



Table 100. zERT aggregation (continued)	
Task/Procedure	Reference
Display zERT aggregation configuration settings	<a href="#">Netstat CONFIG/-f report in z/OS Communications Server: IP System Administrator's Commands</a>
Enable the zERT aggregation INTVAL and SYNCVAL.	<a href="#">GLOBALCONFIG statement in z/OS Communications Server: IP Configuration Reference</a>
Display zERT aggregation INTVAL and SYNCVAL configuration settings.	<a href="#">Netstat CONFIG/-f report in z/OS Communications Server: IP System Administrator's Commands</a>

To find all related topics about zERT aggregation, see [Table 101 on page 107](#).

Table 101. All related topics about zERT aggregation	
Book name	Topics
<a href="#">z/OS Communications Server: IP Configuration Guide</a>	<ul style="list-style-type: none"> <li>• <a href="#">Monitoring cryptographic network protection: z/OS encryption readiness technology (zERT)</a></li> <li>• <a href="#">What are the limitations for zERT discovery?</a></li> <li>• <a href="#">What does zERT aggregation collect?</a></li> <li>• <a href="#">How does zERT aggregation summarize the information?</a></li> <li>• <a href="#">How does zERT aggregation provide the information?</a></li> <li>• <a href="#">How does zERT aggregation determine the server port?</a></li> <li>• <a href="#">Using z/OS Encryption Readiness Technology (zERT)</a></li> <li>• <a href="#">Enabling zERT discovery</a></li> <li>• <a href="#">Enabling zERT aggregation</a></li> <li>• <a href="#">Enabling a longer zERT aggregation recording interval</a></li> <li>• <a href="#">Selecting a destination for zERT discovery SMF records</a></li> <li>• <a href="#">Selecting a destination for zERT aggregation SMF records</a></li> <li>• <a href="#">Disabling zERT discovery</a></li> <li>• <a href="#">Disabling zERT aggregation</a></li> </ul>
<a href="#">z/OS Communications Server: IP Configuration Reference</a>	<ul style="list-style-type: none"> <li>• <a href="#">GLOBALCONFIG statement</a></li> <li>• <a href="#">SMFCONFIG statement</a></li> <li>• <a href="#">NETMONITOR statement</a></li> </ul>
<a href="#">z/OS Communications Server: IP System Administrator's Commands</a>	<ul style="list-style-type: none"> <li>• <a href="#">Netstat CONFIG/-f report</a></li> </ul>

Table 101. All related topics about zERT aggregation (continued)

Book name	Topics
<a href="#">z/OS Communications Server: IP Programmer's Guide and Reference</a>	<ul style="list-style-type: none"> <li>• <a href="#">Real-time TCP/IP network monitoring NMI</a></li> <li>• <a href="#">Connecting to the AF_UNIX stream socket</a></li> <li>• <a href="#">Authorizing the applications</a></li> <li>• <a href="#">Real-time NMI: Connecting to the server</a></li> <li>• <a href="#">Real-time NMI: Interacting with the servers</a></li> <li>• <a href="#">Real-time NMI: Common record header</a></li> <li>• <a href="#">Real-time NMI: Requests sent by the client to the server</a></li> <li>• <a href="#">Requests sent by the client to the server: SYSTCPES service</a></li> <li>• <a href="#">Records sent by the server to the client: Initialization record</a></li> <li>• <a href="#">Records sent by the server to the client: Token record</a></li> <li>• <a href="#">EZBTMIC1 or EZBTMIC4 parameters</a></li> <li>• <a href="#">Processing the cte records for SYSTCPEP</a></li> <li>• <a href="#">Processing the cte records for SYSTCPES</a></li> <li>• <a href="#">SMF type 119 records</a></li> <li>• <a href="#">TCP/IP profile record Global configuration section</a></li> <li>• <a href="#">TCP/IP profile record management section</a></li> <li>• <a href="#">zERT Summary record (subtype 12)</a></li> </ul>

## IBM zERT Network Analyzer

IBM zERT (z/OS Encryption Readiness Technology) Network Analyzer is a web-based graphical user interface that z/OS network security administrators can use to analyze and report on data reported in zERT Summary records.

z/OS V2R3 Communications Server introduced a new feature called z/OS Encryption Readiness Technology (zERT). zERT positions the TCP/IP stack to act as a focal point for collecting and reporting the cryptographic security attributes of IPv4 and IPv6 TCP and Enterprise Extender (EE) connection traffic that is protected using the TLS/SSL, SSH and IPsec cryptographic network security protocols. Connection data is written to z/OS System Management Facility (SMF) in two new SMF type 119 records:

- zERT Connection Detail (subtype 11) records are written on a per-connection basis to record the cryptographic protection history of a given TCP or EE connection.
- zERT Summary (subtype 12) records are written on a per-security-session basis at the end of each SMF interval to summarize the repeated use of security sessions during the interval.

A new z/OS Management Facility (z/OSMF) plug-in named IBM zERT Network Analyzer is available with z/OSMF V2R4. IBM zERT Network Analyzer is a web-based graphical user interface that z/OS network security administrators can use to analyze and report on data reported in zERT Summary records.

To get a quick start with IBM zERT Network Analyzer, see [IBM zERT Network Analyzer tutorial](#).

### Dependency:

- The IBM zERT Network Analyzer task requires either Db2 11 for z/OS or Db2 12 for z/OS.

Table 102. IBM zERT Network Analyzer	
Task/Procedure	Reference
<p>Enable collection of zERT Summary (SMF Type 119 subtype 12) SMF records</p> <ul style="list-style-type: none"> <li>• Enable zERT Aggregation function by specifying the GLOBALCONFIG ZERT AGGREGATION statement.</li> <li>• Enable a longer interval at which the SMF 119 subtype 12 (zERT summary) records are created by using the INTVAL sub-parameter of the ZERT AGGREGATION statement.</li> <li>• Display zERT aggregation INTVAL or SYNCVAL configuration settings.</li> <li>• Direct zERT to write the zERT Summary SMF records to the System Management Facility (SMF) by specifying the SMFCONFIG TYPE119 ZERTSUMMARY statement.</li> <li>• Enable the recording of type 119 records, and optionally define the SMF interval duration, in your SMF parmlib member.</li> </ul>	<ul style="list-style-type: none"> <li>• <a href="#">GLOBALCONFIG statement in z/OS Communications Server: IP Configuration Reference</a></li> <li>• <a href="#">SMFCONFIG statement in z/OS Communications Server: IP Configuration Reference</a></li> <li>• <a href="#">z/OS MVS System Management Facilities (SMF)</a></li> </ul>
<p>Dump the collected zERT Summary records to a sequential data set using the IFASMFDP or IFASMF DL program</p> <ul style="list-style-type: none"> <li>• Use IFASMFDP for SMF data sets</li> <li>• Use IFASMF DL for SMF log streams</li> </ul>	<a href="#">z/OS MVS System Management Facilities (SMF)</a>
<p>Enable the IBM zERT Network Analyzer plug-in in z/OSMF by adding ZERT_ANALYZER to the PLUGINS statement.</p>	<a href="#">IZUPRMxx reference information in IBM z/OS Management Facility Configuration Guide</a>
<p>Authorize the user IDs that will be using IBM zERT Network Analyzer</p>	<a href="#">Updating z/OS for the IBM zERT Network Analyzer plug-in in IBM z/OS Management Facility Configuration Guide</a>
<p>Create the proper Db2 for z/OS database definitions to use with IBM zERT Network Analyzer</p>	<a href="#">Updating z/OS for the IBM zERT Network Analyzer plug-in in IBM z/OS Management Facility Configuration Guide</a>
<p>Start the z/OSMF IBM zERT Network Analyzer plug-in</p>	<a href="#">Analysis category under the IBM z/OS Management Facility online help</a>
<p>Import the dumped zERT SMF Summary records into IBM zERT Network Analyzer</p>	<a href="#">IBM zERT Network Analyzer online help, Analysis category under the IBM z/OS Management Facility online help</a>
<p>Analyze the imported zERT Summary data using IBM zERT Network Analyzer query and reporting functions</p>	<a href="#">IBM zERT Network Analyzer online help, Analysis category under the IBM z/OS Management Facility online help</a>

To find all related topics about IBM zERT Network Analyzer, see [Table 103 on page 110](#).

Table 103. All related topics about IBM zERT Network Analyzer	
Book name	Topics
<a href="#">z/OS Communications Server: IP Configuration Guide</a>	<ul style="list-style-type: none"> <li>• <a href="#">z/OS Encryption Readiness Technology (zERT) Concepts</a></li> <li>• <a href="#">Selecting a destination for zERT aggregation SMF records</a></li> <li>• <a href="#">Using IBM zERT Network Analyzer</a></li> </ul>
<a href="#">z/OS Communications Server: IP Configuration Reference</a>	<ul style="list-style-type: none"> <li>• <a href="#">GLOBALCONFIG statement</a></li> <li>• <a href="#">SMFCONFIG statement</a></li> </ul>
<a href="#">z/OS Communications Server: IP Programmer's Guide and Reference</a>	<ul style="list-style-type: none"> <li>• <a href="#">zERT connection detail record (subtype 11)</a></li> <li>• <a href="#">zERT Summary record (subtype 12)</a></li> </ul>
<a href="#">IBM z/OS Management Facility Configuration Guide</a>	<ul style="list-style-type: none"> <li>• <a href="#">Configure IBM z/OS Encryption Readiness Technology (zERT) Network Analyzer</a></li> <li>• <a href="#">Updating z/OS for the IBM zERT Network Analyzer Plug-in</a></li> <li>• <a href="#">Problems when using IBM zERT Network Analyzer</a></li> <li>• <a href="#">Steps for sending information to IBM Support</a></li> </ul>
IBM zERT Network Analyzer online help	<a href="#">Messages: IZUETXXXXX</a>

## TN3270E Telnet server Express Logon Feature support for Multi-Factor Authentication

z/OS V2R4 Communications Server, with RACF and IBM MFA for z/OS, extends the TN3270 Telnet server Express Logon Feature (ELF) to support IBM Multi-Factor Authentication (MFA) for z/OS. With this support, TN3270 clients can experience the same single sign-on behavior that is already offered by the PassTicket-based ELF, but now via an MFA token that is assigned by a SAF-compliant external security manager like IBM Security Server RACF. With the new EXPRESSLOGONMFA parameter in the TN3270E Telnet server profile, ELF attempts to authenticate clients by using their X.509 client certificate through MFA. If no MFA token is available for the user, the authentication fails by default. ELF can be configured to revert back to PassTicket authentication in certain cases where MFA authentication is unsuccessful.

### Dependencies:

- IBM Security Server RACF
- IBM Multi-Factor Authentication for z/OS

To enable TN3270E Telnet server Express Logon Feature support for Multi-Factor Authentication, perform the tasks in [Table 104 on page 110](#).

Table 104. TN3270E Telnet server Express Logon Feature support for Multi-Factor Authentication	
Task/Procedure	Reference
Define MFA policies for the appropriate client user IDs.	<a href="#">z/OS Security Server RACF Security Administrator's Guide</a>
Enable Express Logon MFA support in the TN3270E Telnet server.	<ul style="list-style-type: none"> <li>• <a href="#">z/OS Communications Server: IP Configuration Guide</a></li> <li>• <a href="#">z/OS Communications Server: IP Configuration Reference</a></li> </ul>

To find all related topics about TN3270E Telnet server Express Logon Feature support for Multi-Factor Authentication, see [Table 105 on page 111](#).

<i>Table 105. All related topics about TN3270E Telnet server Express Logon Feature support for Multi-Factor Authentication</i>	
Book name	Topics
<a href="#">z/OS Communications Server: IP Configuration Guide</a>	<ul style="list-style-type: none"> <li>• <a href="#">Express Logon Feature</a></li> <li>• <a href="#">Express logon services with the Digital Certificate Access Server</a></li> <li>• <a href="#">Express Logon Feature</a> <ul style="list-style-type: none"> <li>– <a href="#">Configuring RACF services for Express Logon</a></li> <li>– <a href="#">An example of configuring the Express Logon components</a> <ul style="list-style-type: none"> <li>- <a href="#">Configuring the Host On Demand Telnet client</a></li> <li>- <a href="#">Configuring the z/OS TN3270E Telnet server (two-tier solution)</a></li> <li>- <a href="#">Configuring the middle-tier Telnet server (IBM Communications Server for Windows example)</a></li> </ul> </li> </ul> </li> </ul>
<a href="#">z/OS Communications Server: IP Configuration Reference</a>	<ul style="list-style-type: none"> <li>• <a href="#">EXPRESSLOGON statement</a></li> <li>• <a href="#">EXPRESSLOGONMFA statement</a></li> </ul>
<a href="#">z/OS Communications Server: IP Programmer's Guide and Reference</a>	<ul style="list-style-type: none"> <li>• <a href="#">TN3270E Telnet server profile record TelnetGlobals section</a></li> <li>• <a href="#">TN3270E Telnet server profile record TelnetParms section</a></li> </ul>
<a href="#">z/OS Communications Server: IP Messages Volume 4 (EZZ, SNM)</a>	<ul style="list-style-type: none"> <li>• <a href="#">EZZ6035I</a></li> <li>• <a href="#">EZZ6060I</a></li> <li>• <a href="#">EZZ6065I</a></li> </ul>

## Application development

The following topics describe enhancements for application development:

- [“SMTPD compatibility enhancements for CSSMTP” on page 111](#)
- [“Communications Server resolver enhancements” on page 112](#)
- [“Code page enhancements for CSSMTP” on page 113](#)

### SMTPD compatibility enhancements for CSSMTP

z/OS V2R4 Communications Server with APAR PH18237, enhances the Communications Server SMTP (CSSMTP) application with three new configuration parameters to provide better compatibility with SMTPD for your migration from SMTPD to CSSMTP.

To enable SMTPD compatibility enhancements for CSSMTP, perform the tasks in [Table 106 on page 112](#).

Table 106. SMTPD compatibility enhancements for CSSMTP

Task/Procedure	Reference
Configure ReportMailFrom to define a default email address for the "Mail From" field in the error report.	<a href="#">ReportMailFrom statement in Communications Server SMTP application in z/OS Communications Server: IP Configuration Reference</a>
Configure ReportSysoutClass to assign a Sysout Class for error reports.	<a href="#">ReportSysoutClass statement in Communications Server SMTP application in z/OS Communications Server: IP Configuration Reference</a>
Configure MailBoxCompatibility to define the mailbox length (Standard or Long).	<a href="#">MailBoxCompatibility statement in Communications Server SMTP application in z/OS Communications Server: IP Configuration Reference</a>
Display the values for the ReportMailFrom, ReportSysoutClass, and MailBoxCompatibility.	<a href="#">MODIFY command: Communications Server SMTP application (CSSMTP) in z/OS Communications Server: IP System Administrator's Commands</a>

To find all related topics about SMTPD compatibility enhancements for CSSMTP, see [Table 107 on page 112](#).

Table 107. All related topics about SMTPD compatibility enhancements for CSSMTP

Book name	Topics
<a href="#">z/OS Communications Server: IP Configuration Guide</a>	<a href="#">Customizing the CSSMTP configuration file to handle undeliverable mail</a>
<a href="#">z/OS Communications Server: IP Configuration Reference</a>	<ul style="list-style-type: none"> <li>• <a href="#">Communications Server SMTP application</a> <ul style="list-style-type: none"> <li>– <a href="#">General syntax rules for CSSMTP</a></li> <li>– <a href="#">CSSMTP configuration statements</a> <ul style="list-style-type: none"> <li>- <a href="#">MailBoxCompatibility statement</a></li> <li>- <a href="#">ReportMailFrom statement</a></li> <li>- <a href="#">ReportSysoutClass statement</a></li> </ul> </li> </ul> </li> </ul>
<a href="#">z/OS Communications Server: IP System Administrator's Commands</a>	<ul style="list-style-type: none"> <li>• <a href="#">MODIFY command: Communications Server SMTP application (CSSMTP)</a></li> </ul>

## Communications Server resolver enhancements

Starting with z/OS V2R4 Communications Server, users can specify two different maximum TTL values: a new MAXNEGTTTL resolver setup statement for negative cache entries and the existing MAXTTTL resolver setup statement for all other cache entries.

Prior to V2R4, the resolver caching function provided users with the ability to set a maximum time-to-live (TTL) value for cached Domain Name System (DNS) name server information, but the MAXTTTL resolver setup statement applied to all types of cached DNS name server entries.

In addition, the output of the MODIFY RESOLVER,DISPLAY|REFRESH command is enhanced to include the name of the most recently used resolver setup file.

*Table 108. Communications Server miscellaneous enhancements*

Task/Procedure	Reference
If you want a maximum time-to-live (TTL) value for negative cache entries that is different from the maximum TTL for other cache entries, add the MAXNEGTTTL configuration statement to the resolver setup file.	<a href="#">MAXNEGTTTL statement in z/OS Communications Server: IP Configuration Reference</a>
To enable the new value, take one of the following steps: <ul style="list-style-type: none"> <li>Start the resolver if it is not running.</li> <li>If the resolver is running, issue the MODIFY RESOLVER,REFRESH,SETUP=&lt;setup file name&gt; command.</li> </ul>	<a href="#">MODIFY command: Resolver address space in z/OS Communications Server: IP System Administrator's Commands</a>

To find all related topics about Communications Server miscellaneous enhancements, see [Table 109 on page 113](#).

*Table 109. All related topics about Communications Server miscellaneous enhancements*

Book name	Topics
<a href="#">z/OS Communications Server: IP Messages Volume 4 (EZZ, SNM)</a>	<ul style="list-style-type: none"> <li><a href="#">EZZ9293I</a></li> <li><a href="#">EZZ9298I</a></li> <li><a href="#">EZZ9304I</a></li> </ul>
<a href="#">z/OS Communications Server: IP Diagnosis Guide</a>	<a href="#">Interpreting the Trace Resolver output</a>
<a href="#">z/OS Communications Server: IP System Administrator's Commands</a>	<ul style="list-style-type: none"> <li><a href="#">MODIFY command: Resolver address space</a></li> <li><a href="#">DETAIL or DETAIL NEGATIVE reports</a></li> </ul>
<a href="#">z/OS Communications Server: IP Programmer's Guide and Reference</a>	<a href="#">GetResolverConfig response contents</a>
<a href="#">z/OS Communications Server: IP Configuration Reference</a>	<ul style="list-style-type: none"> <li><a href="#">Resolver setup statements</a></li> <li><a href="#">MAXNEGTTTL statement</a></li> <li><a href="#">MAXTTTL statement</a></li> </ul>
<a href="#">z/OS Communications Server: IP Configuration Guide</a>	<ul style="list-style-type: none"> <li><a href="#">The resolver setup file</a></li> <li><a href="#">Steps for creating a resolver setup file</a></li> <li><a href="#">Information that is cached by the resolver</a></li> <li><a href="#">Steps for configuring resolver caching (optional)</a></li> <li><a href="#">Steps for manually managing the storage capacity of the resolver cache</a></li> </ul>

## Code page enhancements for CSSMTP

z/OS V2R4 Communications Server is enhanced to support multi-byte character sets with the Communications Server SMTP (CSSMTP) application. This enhancement allows migration from SMTPD to CSSMTP for customers that use multi-byte character set code pages, and provides improved code page support for characters in the mail subject line.

To enable multi-byte character set support, complete the appropriate tasks in [Table 110 on page 114](#).

<i>Table 110. Task topics to enable multi-byte character set support</i>	
<b>Task</b>	<b>Reference</b>
Configure CSSMTP to support multi-byte character sets. Set the MBCS statement to YES and set the TRANSLATE and MBCharset statements to multi-byte code pages.	<a href="#">Communications Server SMTP application in z/OS Communications Server: IP Configuration Reference</a>
Display the values for the MBCS and MBCharset statements.	<a href="#">MODIFY command: Communications Server SMTP application (CSSMTP) in z/OS Communications Server: IP System Administrator's Commands</a>

To find all related topics about code page enhancements for CSSMTP, see [Table 111 on page 114](#).

<i>Table 111. All related topics about code page enhancements for CSSMTP</i>	
<b>Book name</b>	<b>Topics</b>
<a href="#">IP Configuration Guide</a>	<ul style="list-style-type: none"> <li>• <a href="#">Steps for creating mail on the JES spool data set for CSSMTP</a></li> </ul>
<a href="#">IP Configuration Reference</a>	<ul style="list-style-type: none"> <li>• <a href="#">Communications Server SMTP application</a> <ul style="list-style-type: none"> <li>– <a href="#">CSSMTP configuration statements</a> <ul style="list-style-type: none"> <li>- <a href="#">MBCS statement</a></li> <li>- <a href="#">TargetServer statement</a></li> <li>- <a href="#">TRANSLATE statement</a></li> </ul> </li> </ul> </li> </ul>
<a href="#">IP Diagnosis Guide</a>	<ul style="list-style-type: none"> <li>• <a href="#">Bad character translations</a></li> </ul>
<a href="#">z/OS Communications Server: IP Programmer's Guide and Reference</a>	<ul style="list-style-type: none"> <li>• <a href="#">CSSMTP configuration record (CONFIG subtype 48)</a></li> </ul>
<a href="#">IP System Administrator's Commands</a>	<ul style="list-style-type: none"> <li>• <a href="#">MODIFY command: Communications Server SMTP application (CSSMTP)</a></li> </ul>



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## Chapter 6. Communications Server interface changes for z/OS V2R4

This topic the Communications Server interface changes for z/OS V2R4.

In addition to the interface changes included in this topic, refer to the following topics in the z/OS V2R4 Release Upgrade Reference Summary for additional information.

- *New and changed members in SYS1.MACLIB for z/OS V2R4*
- *New and changed SYS1.PARMLIB members for z/OS V2R4*
- *New and changed System Management Facilities (SMF) records for z/OS V2R4*

The Communications Server interface changes described in this topic are:

- [“Communications Server IP interface changes” on page 115](#)
- [“Communications Server SNA interface changes” on page 137](#)

The tables in this topic contain a **Reason for change** column that provides the name of the related functional enhancement.

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### Communications Server IP interface changes

This topic describes the following Communications Server IP interfaces:

- [“PROFILE.TCPIP configuration file” on page 116](#)
  - [“PROFILE.TCPIP statement and parameter changes” on page 116](#)
- [“Configuration files” on page 118 \(other than PROFILE.TCPIP\)](#)
  - [“FTP client configuration statements” on page 118](#)
  - [“FTP server configuration statements” on page 118](#)
  - [“TN3270E Telnet server PROFILE configuration file” on page 118](#)
    - [“BEGINVTAM information block” on page 118](#)
    - [“TELNETGLOBALS information block” on page 118](#)
    - [“TELNETPARMS information block” on page 118](#)
  - [“General updates for the non-PROFILE.TCPIP IP configuration files” on page 119](#)
- [“RACF interfaces” on page 122](#)
- [“Operator commands” on page 123](#)
  - [“Netstat operator commands \(DISPLAY TCPIP,,NETSTAT\)” on page 123](#)
  - [“TN3270E Telnet server operator commands” on page 125](#)
  - [“General updates of IP operator commands” on page 125](#)
- [“TSO commands” on page 126](#)
  - [“NETSTAT TSO commands” on page 126](#)
  - [“FTP TSO and z/OS UNIX commands” on page 127](#)
    - [“FTP subcommands” on page 128](#)
  - [“General updates of TSO commands” on page 128](#)
- [“z/OS UNIX commands” on page 128](#)
  - [“Netstat UNIX commands” on page 128](#)
  - [“General updates of z/OS UNIX commands” on page 130](#)

- [“Application programming interfaces and network management interfaces” on page 130](#)
  - [“FTP client API FCAI control block” on page 131](#)
  - [“FTP client API for REXX predefined variables” on page 131](#)
  - [“Local IPsec NMI” on page 131](#)
  - [“Network security services NMI” on page 131](#)
  - [“Real-time application-controlled TCP/IP trace NMI \(EZBRCIFR\)” on page 131](#)
  - [“Real-time network monitoring TCP/IP NMI” on page 131](#)
  - [“Resolver callable NMI \(EZBREIFR\)” on page 131](#)
  - [“SNMP manager API” on page 131](#)
  - [“Syslog daemon name/token pair” on page 131](#)
  - [“TCP/IP callable NMI \(EZBNMIFR\)” on page 132](#)
  - [“Trace formatting NMI \(EZBCTAPI\)” on page 133](#)
  - [“Trusted TCP connections API for Java” on page 133](#)
- *Environment variables*
- *Socket APIs*
  - *General updates of socket APIs*
- *IPCS subcommands*
  - *CTTRACE COMP(SYSTCPDA) subcommand*
  - *CTTRACE COMP(SYSTCPIS) subcommand*
  - *CTTRACE COMP(SYSTCPOT) subcommand*
  - *CTTRACE COMP(SYSTCPRE) subcommand*
  - *TCPIPCS subcommand*
  - *General updates to IPCS subcommands*
- *SNMP MIB modules*
- *User exits*
- *Application data*
- *FTP client error codes*
- *SMF record type 119 enhancements*
- *z/OS UNIX /etc files*
- *General updates of IP interfaces*
- *Samples provided in MVS data set SEZAINST*
- *Samples provided in z/OS UNIX TCPIP directory*

## PROFILE.TCPIP configuration file

This topic contains the PROFILE.TCPIP statement and parameter changes. The TN3270E Telnet server profile statements are accepted but ignored by the TCP/IP stack. The statements must be specified in a data set configured to the TN3270E Telnet server running in its own address space. Therefore, the Telnet configuration statements are moved from this PROFILE.TCPIP configuration file topic to a general IP configuration file topic: see [“TN3270E Telnet server PROFILE configuration file” on page 118](#).

## PROFILE.TCPIP statement and parameter changes

Table 112 on page 117 lists the new and updated Communications Server PROFILE.TCPIP configuration statements and parameters. See [z/OS Communications Server: IP Configuration Reference](#) for more detailed information.

Table 112. New and changed Communications Server PROFILE.TCPIP configuration statements and parameters for z/OS V2R4

Statement	Description	Reason for change
<b>GLOBALCONFIG</b>	<p>The following new subparameter is added to the SMCGLOBAL parameter:</p> <ul style="list-style-type: none"> <li>• SMCEID/ENDSMCEID</li> </ul> <p>The following new subparameter is added to the SMCD parameter:</p> <ul style="list-style-type: none"> <li>• SYSTEMEID/NOSYSTEMEID</li> </ul>	Shared Memory Communications multiple IP subnet support (SMCv2)
<b>GLOBALCONFIG</b>	<p>The following new subparameters are added to the SYSPLEXMONITOR parameter:</p> <ul style="list-style-type: none"> <li>• DELAYJOINIPSEC</li> <li>• MONIPSEC</li> </ul>	Sysplex Autonomics for IPsec
<b>GLOBALCONFIG</b>	The AUTOIQDC parameter is defined to enable and configure the HiperSockets Converged Interface function. The AUTOIQDC parameter includes the ALLTRAFFIC and NOLARGEDATA sub-parameters. The NOAUTOIQDC parameter is defined to disable the HiperSockets Converged Interface function.	HiperSockets Converged Interface support
<b>GLOBALCONFIG</b>	<p>ZERT AGGREGATION INTVAL SYNCVAL</p> <ul style="list-style-type: none"> <li>• INTVAL is the recording interval that would permit a minimum of 1 hour to a maximum of 24 hours (1 day). The default setting is SMF and this indicates the zERT Aggregation interval is determined by the SMF interval.</li> <li>• SYNCVAL indicates a reference time for which zERT Aggregation records will begin to record. It is in the 24 hour clock format hh:mm (hour and minute value separated by a colon) and the default value is midnight or 00:00.</li> </ul>	z/OS Encryption Readiness Technology (zERT) aggregation recording interval
<b>GLOBALCONFIG</b>	New subparameters AGGREGATION and NOAGGREGATION are defined on the GLOBALCONFIG ZERT parameter	z/OS Encryption Readiness Technology (zERT) aggregation
<b>NETMONITOR</b>	New subparameters ZERTSUMMARY and NOZERTSUMMARY are added to control the real-time zERT Summary SMF NMI service (SYSTCPES).	z/OS Encryption Readiness Technology (zERT) aggregation
<b>SMFCONFIG</b>	New subparameters ZERTSUMMARY and NOZERTSUMMARY are defined as TYPE119 values.	z/OS Encryption Readiness Technology (zERT) aggregation
<b>VIPARANGE</b>	The ZCX parameter is defined for the VIPADYNAMIC VIPARANGE statement. This indicates that Dynamic VIPAs created within this VIPARANGE are to be reserved for use by the zCX function.	Network support for z/OS Container Extensions

# Configuration files

This topic includes information about the following configuration statements and files:

- [“FTP client configuration statements” on page 118](#)
- [“FTP server configuration statements” on page 118](#)
- [“TN3270E Telnet server PROFILE configuration file” on page 118](#)
- [“General updates for the non-PROFILE.TCPIP IP configuration files” on page 119](#)

The Communications Server PROFILE.TCPIP configuration file updates are in a separate topic; see [“PROFILE.TCPIP configuration file” on page 116](#).

See [z/OS Communications Server: IP Configuration Reference](#) for more detailed information about all of the Communications Server IP configuration files and statements.

## FTP client configuration statements

There is no new and changed FTP client configuration statement for V2R4.

## FTP server configuration statements

There is no new or changed FTP server configuration statement in z/OS V2R4.

## TN3270E Telnet server PROFILE configuration file

During initialization of the TN3270E Telnet server (Telnet) address space, configuration parameters are read from a configuration PROFILE data set. The PROFILE data set is used to configure Telnet to accept or reject connection requests. You can update the PROFILE data set to change or add statements to support new functions, or to change or add usage rules.

This topic includes tables with the descriptions of the new and changed Telnet PROFILE configuration statements. See [z/OS Communications Server: IP Configuration Reference](#) for complete information on configuration statements and the PROFILE statement.

### **BEGINVTAM information block**

There is no new and changed BEGINVTAM information block for V2R4.

### **TELNETGLOBALS information block**

The TELNETGLOBALS information block is a Telnet configuration block used to provide definitions that apply to all Telnet ports.

*Table 113. Summary of new and changed Communications Server Telnet configuration file - TELNETGLOBALS block for z/OS V2R4*

Statement	Description	Reason for change
<b>EXPRESSLOGONMFA statement</b>	Allows a user at a workstation, with a TELNET client and a X.509 certificate to log on to an SNA application without entering the user ID or password.	TN3270E Telnet server Express Logon Feature support for Multi-Factor Authentication

### **TELNETPARMS information block**

Table 114. Summary of new and changed Communications Server Telnet configuration file - TELNETPARMS block for z/OS V2R4

Statement	Description	Reason for change
<b>EXPRESSLOGONMFA statement</b>	Allows a user at a workstation, with a TELNET client and a X.509 certificate to log on to an SNA application without entering the user ID or password.	TN3270E Telnet server Express Logon Feature support for Multi-Factor Authentication

## General updates for the non-PROFILE.TCPIP IP configuration files

Table 115 on page 119 lists the general updates for the Communications Server IP configuration files.

Table 115. New and changed non-PROFILE.TCPIP configuration files for z/OS V2R4

File	Statement / Entry	Description	Reason for change
<b>Communications Server SMTP (CSSMTP) configuration file</b>	ReportMailFrom	ReportMailFrom is an optional parameter that specifies the mailbox to use in the Mail From field in error reports.	SMTPD compatibility enhancements for CSSMTP (APAR PH18237)
	ReportSysoutClass	The ReportSysoutClass is an optional parameter that specifies the SYSOUT class used for error reports.	SMTPD compatibility enhancements for CSSMTP (APAR PH18237)
	MailBoxCompatibility	The MailBoxCompatibility is an optional parameter to state the size of the mail box (Standard 64 characters or Long 256 characters).	SMTPD compatibility enhancements for CSSMTP (APAR PH18237)
	MBCS TargetServer: MBCharset	<ul style="list-style-type: none"> <li>The MBCS statement is used to specify whether or not CSSMTP supports multi-byte character sets.</li> <li>The multi-byte code page used by the target server to translate mail messages.</li> </ul>	<ul style="list-style-type: none"> <li>Code page enhancements for CSSMTP</li> </ul>

Table 115. New and changed non-PROFILE.TCPIP configuration files for z/OS V2R4 (continued)

File	Statement / Entry	Description	Reason for change
AT-TLS policy file	New TLSv1.3 and MiddleBoxCompatMode parameters on the existing TTLSEnvironmentAdvancedParms statement.	New AT-TLS parameters and parameter values are added to AT-TLS to support TLSv1.3.	AT-TLS support for TLS v1.3
	New TLSv1.3 parameter on the existing TTLSConnectionAdvancedParms statement.		
	New cipher values for the existing V3CipherSuites4Char parameter on the TTLSCipherParms statement. New TLSv1.3 cipher values are: <ul style="list-style-type: none"> <li>• TLS_AES_128_GCM_SHA256</li> <li>• TLS_AES_256_GCM_SHA384</li> <li>• TLS_CHACHA20_POLY1305_SHA256</li> </ul>		
	New signature algorithm pairs for the existing SignaturePairs parameter on the TTLSSignatureParms. New signature pair algorithms are: <ul style="list-style-type: none"> <li>• TLS_SIGALG_SHA256_WITH_RSASSA_PSS</li> <li>• TLS_SIGALG_SHA384_WITH_RSASSA_PSS</li> <li>• TLS_SIGALG_SHA512_WITH_RSASSA_PSS</li> </ul>		
	New ECDH (Elliptic curve Diffie-Hellman) curves for the existing ClientECurves parameter on the TTLSSignatureParms. New curves are: <ul style="list-style-type: none"> <li>• x25519</li> <li>• x448</li> </ul>		

Table 115. New and changed non-PROFILE.TCPIP configuration files for z/OS V2R4 (continued)

File	Statement / Entry	Description	Reason for change
AT-TLS policy file	New parameters ClientKeyShareGroups, ServerKeyShareGroups, and SignaturePairsCert on the existing TTLSSignatureParms statement.	New AT-TLS parameters and parameter values are added to AT-TLS to support TLSv1.3.	AT-TLS support for TLS v1.3
	Default values added for the existing ClientECurves and SignaturePairs parameters on the TTLSSignatureParms statement. The policy agent default value for ClientECurves is equivalent to the existing System SSL default value. The policy agent default value for SignaturePairs is equivalent to the existing System SSL default, with the new RSASSA_PSS values included at the end.		
	New signature algorithm pairs for the existing OcspRequestSigAlg and OcspResponseSigAlgPairs parameters on the TTLSGskOcspParms statement. New signature pair algorithms are: <ul style="list-style-type: none"> <li>• TLS_SIGALG_SHA256_WITH_RSASSA_PSS</li> <li>• TLS_SIGALG_SHA384_WITH_RSASSA_PSS</li> <li>• TLS_SIGALG_SHA512_WITH_RSASSA_PSS</li> </ul>		

Table 115. New and changed non-PROFILE.TCPIP configuration files for z/OS V2R4 (continued)

File	Statement / Entry	Description	Reason for change
<b>AT-TLS policy file</b>	<p>New parameters on the existing TTLSGskAdvancedParms statement. The new parameters are:</p> <ul style="list-style-type: none"> <li>• GSK_SESSION_TICKET_CLIENT_ENABLE</li> <li>• GSK_SESSION_TICKET_CLIENT_MAXSIZE</li> <li>• GSK_SESSION_TICKET_SERVER_ALGORITHM</li> <li>• GSK_SESSION_TICKET_SERVER_COUNT</li> <li>• GSK_SESSION_TICKET_SERVER_ENABLE</li> <li>• GSK_SESSION_TICKET_SERVER_TIMEOUT</li> <li>• GSK_SESSION_TICKET_SERVER_KEY_REFRESH</li> </ul>	New AT-TLS parameters and parameter values are added to AT-TLS to support TLSv1.3.	AT-TLS support for TLS v1.3
	<p>Default values added for the existing GSK_V3_SESSION_TIMEOUT and GSK_V3SIDCACHE_SIZE parameters on the TTLSGskAdvancedParms statement. The policy agent defaults are equivalent to the existing System SSL default values.</p>		
<b>IKE daemon configuration file</b>	New parameter NoKeyRing on the existing IkeConfig statement	NoKeyRing can be specified when no IKED key ring is provided.	Sysplex Autonomics for IPSec
<b>Resolver setup file</b>	MAXNEGTTTL	New statement that specifies the maximum amount of time that the resolver can cache negative responses from a Domain Name System (DNS) name server.	Communications server miscellaneous enhancements

## RACF interfaces

Table 116 on page 123 lists the functions for which new or changed RACF support is available. Sample RACF commands to change the RACF configuration can be found in one of the following members of the installation data set, SEZAINST:



- EZARACF - Contains sample commands for environments where multilevel security is not configured.
- EZARACFM - Contains sample commands for environments where multilevel security is configured.

You can use the function name from the table to search EZARACF for all the commands necessary for the function. See [z/OS Communications Server: IP Configuration Guide](#) for more information for each function.

Table 116. New and changed Communications Server RACF interfaces for z/OS V2R4		
Function name	Description	Reason for change
EZB.NETMGMT.sysname.tcpname.SYSTCPES	New SAF resource to control access to SYSTCPES real-time NMI SMF service	z/OS Encryption Readiness Technology (zERT) aggregation

## Operator commands

This topic includes information about the following Communications Server IP operator commands:

- “[Netstat operator commands \(DISPLAY TCPIP,,NETSTAT\)](#)” on page 123
- “[TN3270E Telnet server operator commands](#)” on page 125
- “[General updates of IP operator commands](#)” on page 125

See [z/OS Communications Server: IP System Administrator's Commands](#) for more detailed information.

### Netstat operator commands (DISPLAY TCPIP,,NETSTAT)

Table 117 on page 123 lists the new and updated Communications Server IP Netstat operator command DISPLAY TCPIP,,NETSTAT. See [Table 119 on page 125](#) for the other Communications Server IP operator command entries.

See [z/OS Communications Server: IP System Administrator's Commands](#) for more detailed information about the Communications Server IP operator commands.

All parameters in the following table are for the DISPLAY TCPIP,,NETSTAT operator command.

Table 117. New and changed Communications Server Netstat operator commands (DISPLAY TCPIP,,NETSTAT) for z/OS V2R4		
Parameters	Description	Reason for change
<b>ALL</b>	The following information is now displayed under the SMC INFORMATION section: <ul style="list-style-type: none"> <li>• SMCDVERSION</li> <li>• SMCEID</li> </ul>	Shared Memory Communications multiple IP subnet support (SMCv2)
<b>ARP</b>	Displays ARP information for the HiperSockets Converged Interfaces.	HiperSockets Converged Interface support
<b>CONFIG</b>	The configured SMCEIDs are listed in the SMCGlobal section.  Whether a SMCDSEID is configured and its value, if configured, is displayed in the SMCD section.	Shared Memory Communications multiple IP subnet support (SMCv2)
<b>CONFIG</b>	The Global Configuration Information section of the display includes the new Sysplex Monitor settings - DelayJoinIpsec and MonIpsec.	Sysplex Autonomics for IPsec

Table 117. New and changed Communications Server Netstat operator commands (DISPLAY TCPIP,,NETSTAT) for z/OS V2R4 (continued)

Parameters	Description	Reason for change
<b>CONFIG</b>	Displays the setting of the AUTOIQDC parameter.	HiperSockets Converged Interface support
<b>CONFIG</b>	Displays new ZERT Aggregation sub parameter information with INTVAL and SYNCVAL in the GLOBALCONFIG section.	z/OS Encryption Readiness Technology (zERT) aggregation recording interval
<b>CONFIG</b>	<ul style="list-style-type: none"> <li>Displays new ZERTSUMMARY subparameter information in the SMFCONFIG section.</li> <li>Displays new ZERT Aggregation subparameter information in the GLOBALCONFIG section.</li> <li>Displays new ZERTSUMMARY subparameter information in the NETMONITOR section.</li> </ul>	z/OS Encryption Readiness Technology (zERT) aggregation
<b>DEvlinks</b>	<p>Specifying PNETID=NONE will display all SMC-D capable interfaces without a PNETID.</p> <p>Specifying PNETID=* will display all SMC-D capable interfaces without a PNETID under a new PNETID=*NONE* heading.</p> <p>Specifying an INTFNAME of an SMC-D capable interface will display any unassociated ISM interfaces.</p> <p>Specifying SMC will display the following information under the SMCD LINK INFORMATION section:</p> <ul style="list-style-type: none"> <li>SMCDversion</li> <li>SMCEID</li> <li>Remote hostname</li> <li>Remote host type</li> </ul>	Shared Memory Communications multiple IP subnet support (SMCv2)
<b>DEvlinks</b>	<ul style="list-style-type: none"> <li>Displays the name of the HiperSockets Converged Interface, if any, that is associated with an OSD and statistics related to that associated interface.</li> <li>Displays the name of the zCX interface, if any, and statistics related to that interface.</li> <li>Displays the name of the zCX DVIPA interface, if any, and statistics related to that interface.</li> </ul>	<ul style="list-style-type: none"> <li>HiperSockets Converged Interface support</li> <li>Network support for z/OS Container Extensions</li> <li>Network support for z/OS Container Extensions</li> </ul>
<b>ND</b>	Displays ND information for the HiperSockets Converged Interfaces.	HiperSockets Converged Interface support

Table 117. New and changed Communications Server Netstat operator commands (DISPLAY TCPIP,,NETSTAT) for z/OS V2R4 (continued)

Parameters	Description	Reason for change
<b>TTLS</b>	<ul style="list-style-type: none"> <li>The negotiated TLS protocol and cipher can have new values for TLSv1.3.</li> <li>For a connection secured with TLSv1.3, the negotiated key share is displayed.</li> <li><b>With the DETAIL option</b>, new AT-TLS policy configuration parameters are displayed for a connection.</li> </ul>	AT-TLS support for TLS v1.3
<b>VIPADCFG</b>	Displays the setting of the ZCX parameter on the VIPARANGE statement.	Network support for z/OS Container Extensions
<b>VIPADYN</b>	Indicates whether a DVIPA with an origin of VIPARANGE IOCTL was created for zCX.	Network support for z/OS Container Extensions

## TN3270E Telnet server operator commands

Table 118 on page 125 includes the descriptions of the new and changed TN3270E Telnet server operator commands. Refer to *z/OS Communications Server: IP System Administrator's Commands* for complete information on Telnet operator commands.

Table 118. New and changed Communications Server TN3270E Telnet server operator commands for z/OS V2R4

Command	Description
Display TCPIP,,Telnet,Conn	The ACCESS fields can display new 4-byte ciphers and can display a protocol value of TLSV1.3.

## General updates of IP operator commands

Table 119 on page 125 lists the new and updated Communications Server IP operator commands, **except** the Netstat operator command DISPLAY TCPIP,,NETSTAT and the Telnet operator commands. See the following tables for those commands:

- Table 117 on page 123, IP Netstat operator commands (DISPLAY TCPIP,,NETSTAT)
- “TN3270E Telnet server operator commands” on page 125, Telnet operator commands

Table 119. New and changed Communications Server operator commands for z/OS V2R4

Command	Parameters	Description	Reason for change
<b>MODIFY</b>	RESOLVER,REFRESH  DISPLAY	Enhanced to include the most recently used resolver setup file and the value of the MAXNEGTTTL resolver setup statement.	Communications Server miscellaneous enhancements
<b>MODIFY CSSMTP</b>	DISPLAY,CONFIG	Display the new values for ReportMailFrom, ReportSysoutClass, and MailBoxCompatibility statements  Display the new MBCS statement and MBCharset parameter on the TargetServer statement	SMTPD compatibility enhancements for CSSMTP (APAR PH18237)  Code page enhancements for CSSMTP
<b>MODIFY IKED</b>	DISPLAY	Display includes the NoKeyRing parameter if configured.	Sysplex Autonomics for IPsec

## TSO commands

This topic includes information about the following TSO commands:

- [“NETSTAT TSO commands” on page 126](#)
- [“FTP TSO and z/OS UNIX commands” on page 127](#)
- [“General updates of IP operator commands” on page 125](#)

See [z/OS Communications Server: IP System Administrator's Commands](#) for more detailed information about the Communications Server TSO commands.

### NETSTAT TSO commands

[Table 120 on page 126](#) lists the new and updated Communications Server NETSTAT TSO command.

See [z/OS Communications Server: IP System Administrator's Commands](#) for more detailed information about the Communications Server TSO commands.

Table 120. New and changed Communications Server NETSTAT TSO commands for z/OS V2R4		
Parameter	Description	Reason for change
<b>ALL</b>	The following information is displayed under the SMC INFORMATION section: <ul style="list-style-type: none"><li>• SMCDVERSION</li><li>• SMCEID</li></ul>	Shared Memory Communications multiple IP subnet support (SMCv2)
<b>ARP</b>	Displays ARP information for the HiperSockets Converged Interfaces.	HiperSockets Converged Interface support
<b>CONFIG</b>	The configured SMCEIDs are listed in the SMCGlobal section.  Whether a SMCDSEID is configured and its value, if configured, is displayed in the SMCD section.	Shared Memory Communications multiple IP subnet support (SMCv2)
<b>CONFIG</b>	The Global Configuration Information section of the display includes the new Sysplex Monitor settings - DelayJoinIpsec and MonIpsec.	Sysplex Autonomics for IPsec
<b>CONFIG</b>	Displays the setting of the AUTOIQDC parameter.	HiperSockets Converged Interface support
<b>CONFIG</b>	Displays new ZERT Aggregation subparameter information with INTVAL and SYNCVAL in the GLOBALCONFIG section.	z/OS Encryption Readiness Technology (zERT) aggregation recording interval
<b>CONFIG</b>	<ul style="list-style-type: none"><li>• Displays new ZERTSUMMARY subparameter information in the SMFCONFIG section.</li><li>• Displays new ZERT aggregation subparameter information in the GLOBALCONFIG section.</li><li>• Displays new ZERTSUMMARY subparameter information in the NETMONITOR section.</li></ul>	z/OS Encryption Readiness Technology (zERT) aggregation

Table 120. New and changed Communications Server NETSTAT TSO commands for z/OS V2R4 (continued)

Parameter	Description	Reason for change
<b>DEvlinks</b>	<p>Specifying PNETID=NONE will display all SMC-D capable interfaces without a PNETID.</p> <p>Specifying PNETID=* will display all SMC-D capable interfaces without a PNETID under a new PNETID=*NONE* heading.</p> <p>Specifying INTFNAME of an SMC-D capable interface will display any unassociated ISM interfaces.</p> <p>Specifying SMC will display the following information under the SMCD LINK INFORMATION section:</p> <ul style="list-style-type: none"> <li>• SMCDversion</li> <li>• SMCEID</li> <li>• Remote hostname</li> <li>• Remote host type</li> </ul>	Shared Memory Communications multiple IP subnet support (SMCv2)
<b>DEvlinks</b>	<ul style="list-style-type: none"> <li>• Displays the name of the HiperSockets Converged Interface, if any, that is associated with an OSD and statistics related to that associated interface.</li> <li>• Displays the name of the zCX interface, if any, and statistics related to that interface.</li> <li>• Displays the name of the zCX DVIPA interface, if any, and statistics related to that interface.</li> </ul>	<ul style="list-style-type: none"> <li>• HiperSockets Converged Interface support</li> <li>• Network support for z/OS Container Extensions</li> <li>• Network support for z/OS Container Extensions</li> </ul>
<b>ND</b>	Displays ND information for the HiperSockets Converged Interfaces.	HiperSockets Converged Interface support
<b>TTLS</b>	<ul style="list-style-type: none"> <li>• The negotiated TLS protocol and cipher can have new values for TLSv1.3.</li> <li>• For a connection secured with TLSv1.3, the negotiated key share is displayed.</li> <li>• <b>With the DETAIL option</b>, new AT-TLS policy configuration parameters are displayed for a connection.</li> </ul>	AT-TLS support for TLS v1.3
<b>VIPADCFG</b>	Displays the setting of the ZCX parameter on the VIPARANGE statement.	Network support for z/OS Container Extensions
<b>VIPADYN</b>	Indicates whether a DVIPA with an origin of VIPARANGE IOCTL was created for zCX.	Network support for z/OS Container Extensions

## FTP TSO and z/OS UNIX commands

There are no new or changed FTP TSO and z/OS UNIX commands for z/OS V2R4.

## FTP subcommands

There are no new or changed FTP subcommands for z/OS V2R4.

## General updates of TSO commands

There are no general updates of TSO commands for z/OS V2R4.

## z/OS UNIX commands

“General updates of z/OS UNIX commands” on page 130 lists the new and updated z/OS UNIX commands, except the z/OS UNIX FTP commands, and the z/OS UNIX netstat commands. See the following tables for those commands:

- “FTP subcommands” on page 128, FTP TSO and z/OS UNIX commands
- Table 121 on page 128, z/OS UNIX netstat commands

See [z/OS Communications Server: IP System Administrator's Commands](#) for more detailed information about the Communications Server UNIX commands.

## Netstat UNIX commands

Table 121 on page 128 lists the new and updated Communications Server z/OS UNIX netstat command. See “General updates of z/OS UNIX commands” on page 130 for the other (the non-netstat) z/OS UNIX command entries.

See [z/OS Communications Server: IP System Administrator's Commands](#) for more detailed information about the z/OS UNIX commands.

All parameters in the following table are for the z/OS UNIX netstat command.

Table 121. New and changed Communications Server z/OS UNIX netstat commands for z/OS V2R4		
Parameter	Description	Reason for change
-A	The following information is displayed under the SMC INFORMATION section: <ul style="list-style-type: none"><li>• SMCDVERSION</li><li>• SMCEID</li></ul>	Shared Memory Communications multiple IP subnet support (SMCv2)
-d	Specifying PNETID=NONE will display all SMC-D capable interfaces without a PNETID.  Specifying PNETID=* will display all SMC-D capable interfaces without a PNETID under a new PNETID=*NONE* heading.  Specifying INTFNAME of an SMC-D capable interface will display any unassociated ISM interfaces.  Specifying SMC will display the following information under the SMCD LINK INFORMATION section: <ul style="list-style-type: none"><li>• SMCDversion</li><li>• SMCEID</li><li>• Remote hostname</li><li>• Remote host type</li></ul>	Shared Memory Communications multiple IP subnet support (SMCv2)

Table 121. New and changed Communications Server z/OS UNIX netstat commands for z/OS V2R4 (continued)

Parameter	Description	Reason for change
-d	Displays the name of the HiperSockets Converged Interface, if any, that is associated with an OSD and statistics related to that associated interface.	HiperSockets Converged Interface support
-d	<ul style="list-style-type: none"> <li>Displays the name of the zCX interface, if any, and statistics related to that interface.</li> <li>Displays the name of the zCX DVIPA interface, if any, and statistics related to that interface.</li> </ul>	<ul style="list-style-type: none"> <li>Network support for z/OS Container Extensions</li> <li>Network support for z/OS Container Extensions</li> </ul>
-F	Displays the setting of the ZCX parameter on the VIPARANGE statement.	Network support for z/OS Container Extensions
-f	<p>The configured SMCEIDs are listed in the SMCGlobal section.</p> <p>Whether a SMCDSEID is configured and its value, if configured, is displayed in the SMCD section.</p>	Shared Memory Communications multiple IP subnet support (SMCv2)
-f	The Global Configuration Information section of the display includes the new Sysplex Monitor settings - DelayJoinIpsec and MonIpsec.	Sysplex Autonomics for IPsec
-f	Displays the setting of the AUTOIQDC parameter.	HiperSockets Converged Interface support
-f	Displays new ZERT Aggregation sub parameter information with INTVAL and SYNCVAL in the GLOBALCONFIG section.	z/OS Encryption Readiness Technology (zERT) aggregation recording interval
-f	<ul style="list-style-type: none"> <li>Displays new ZERTSUMMARY subparameter information in the SMFCONFIG section.</li> <li>Displays new ZERT Aggregation subparameter information in the GLOBALCONFIG section.</li> <li>Displays new ZERTSUMMARY subparameter information in the NETMONITOR section.</li> </ul>	z/OS Encryption Readiness Technology (zERT) aggregation
-n	Displays ND information for the HiperSockets Converged Interfaces.	HiperSockets Converged Interface support
-R	Displays ARP information for the HiperSockets Converged Interfaces.	HiperSockets Converged Interface support

Table 121. New and changed Communications Server z/OS UNIX netstat commands for z/OS V2R4 (continued)		
Parameter	Description	Reason for change
-X	<ul style="list-style-type: none"> <li>The negotiated TLS protocol and cipher can have new values for TLSv1.3.</li> <li>For a connection secured with TLSv1.3, the negotiated key share is displayed.</li> <li><b>With the DETAIL option</b>, new AT-TLS policy configuration parameters are displayed for a connection.</li> </ul>	AT-TLS support for TLS v1.3
-V	Indicates whether a DVIPA with an origin of VIPARANGE IOCTL was created for zCX.	Network support for z/OS Container Extensions

## General updates of z/OS UNIX commands

Table 122 on page 130 lists the new and updated Communications Server z/OS UNIX non-netstat command.

See [z/OS Communications Server: IP System Administrator's Commands](#) for more detailed information about the z/OS UNIX commands.

All parameters in the following table are for the z/OS UNIX non-netstat command.

Table 122. New and changed Communications Server z/OS UNIX commands for z/OS V2R4			
Command	Parm	Description	Reason for change
pasearch	N/A	New AT-TLS policy configuration parameters are displayed.	AT-TLS support for TLS v1.3

## Application programming interfaces and network management interfaces

This topic includes updates made to the application programming interfaces (APIs) and network management interfaces (NMIs) documented in [z/OS Communications Server: IP Programmer's Guide and Reference](#). The following programming interfaces were updated:

- [“FTP client API FCAI control block” on page 131](#)
- [“FTP client API for REXX predefined variables” on page 131](#)
- [“Local IPsec NMI” on page 131](#)
- [“Network security services NMI” on page 131](#)
- [“Real-time application-controlled TCP/IP trace NMI \(EZBRCIFR\)” on page 131](#)
- [“Real-time network monitoring TCP/IP NMI” on page 131](#)
- [“Resolver callable NMI \(EZBREIFR\)” on page 131](#)
- [“SNMP manager API” on page 131](#)
- [“Syslog daemon name/token pair” on page 131](#)
- [“TCP/IP callable NMI \(EZBNMIFR\)” on page 132](#)
- [“Trace formatting NMI \(EZBCTAPI\)” on page 133](#)
- [“Trusted TCP connections API for Java” on page 133](#)

See [z/OS Communications Server: IP Programmer's Guide and Reference](#) for more detailed API information.



## FTP client API FCAI control block

There are no new or changed FTP client API FCAI control block for z/OS V2R4.

## FTP client API for REXX predefined variables

There are no new or changed FTP client API for REXX predefined variables for z/OS V2R4.

## Local IPsec NMI

There are no new or changed Local IPsec NMI for z/OS V2R4.

## Network security services NMI

There are no new or changed Network security services NMI for z/OS V2R4.

## Real-time application-controlled TCP/IP trace NMI (EZBRCIFR)

There are no new or changed Real-time application-controlled TCP/IP trace NMI (EZBRCIFR) for z/OS V2R4.

## Real-time network monitoring TCP/IP NMI

There is no new or changed real-time network monitoring TCP/IP NMI for z/OS V2R4.

Table 123 on page 131 lists the updates to the Communications Server real-time TCP/IP network monitoring NMI. For changes to SMF 119 records provided by the real-time SMF data NMI (SYSTCPSM) and the real-time TCP connection SMF data NMI (SYSTPCPN), see [“SMF record type 119 enhancements”](#) on page 137.

Table 123. New Communications Server real-time TCP/IP NMI for z/OS V2R4			
NMI	Request/response	Description	Reason for change
Real-time zERT Summary SMF NMI (SYSTCPES)	zERT summary record (subtype 12)	New real-time SMF service for zERT summary data	z/OS Encryption Readiness Technology (zERT) aggregation

## Resolver callable NMI (EZBREIFR)

There are no new or changed Resolver callable NMI (EZBREIFR) for z/OS V2R4.

Table 124 on page 131 lists the new and changed resolver callable NMI (EZBREIFR) for z/OS V2R4.

Table 124. New Communications Server resolver callable NMI (EZBREIFR) for z/OS V2R4	
Request	Description
GetResolverConfig	Added the following information: <ul style="list-style-type: none"><li>NMSSOptions(NMSSOMaxNegTTL), a new flag to indicate that the MAXNEGTTTL function is active</li><li>NMSSDefaults(NMSSDMaxNegTTL), a new flag to indicate that the MAXNEGTTTL value was defaulted</li><li>NMSSSetupMaxNegTTL, a new field to contain the MAXNEGTTTL value, in seconds</li></ul>

## SNMP manager API

There are no new or changed SNMP manager API for z/OS V2R4.

## Syslog daemon name/token pair

There are no new or changed syslog daemon name/token pair for z/OS V2R4

## TCP/IP callable NMI (EZBNMIFR)

Table 125 on page 132 lists the updates to the Communications Server TCP/IP callable NMI.

Table 125. New Communications Server TCP/IP callable NMI (EZBNMIFR) for z/OS V2R4			
Request	Parameter/output	Description	Reason for change
<b>GetConnectionDetail</b>	<ul style="list-style-type: none"> <li>NWMConnSMCVersion</li> <li>NWMConnSMCEID</li> </ul>	These new fields indicate the SMC characteristics of the connection.	Shared Memory Communications multiple IP subnet support (SMCv2)
<b>GetConnectionDetail</b>	<ul style="list-style-type: none"> <li>NWMConnTTLSSLProt</li> <li>NWMConnTTLNegCiph4</li> <li>NWMConnTTLKeyShare</li> </ul>	AT-TLS support for TLS v1.3 <ul style="list-style-type: none"> <li>NWMConnTTLSSLProt (negotiated TLS protocol) can have a new value of x'0304' for TLSv1.3</li> <li>NWMConnTTLNegCiph4 (negotiated 4-byte cipher) can have new values</li> <li>NWMConnTTLKeyShare (negotiated TLSv1.3 key share) – new field</li> </ul>	AT-TLS support for TLS v1.3
<b>GetDVIPAList</b>	NWMDvListFlags	A new flag, NWMDvListFlags_DVRZCX (0x02), is added. The flag means that an application instance DVIPA was created for zCX. These DVIPAs are created within the range defined by a VIPARANGE statement with the ZCX keyword.	Network support for z/OS Container Extensions
<b>GetIfs</b>	<ul style="list-style-type: none"> <li>NWMIfSMCRStatus</li> <li>NWMIfSMCDStatus</li> </ul>	<ul style="list-style-type: none"> <li>The following values are obsolete from the NWMIfSMCRStatus field:               <ul style="list-style-type: none"> <li>NWMIfSMCRNOPNETID</li> <li>NWMIfSMCRNOGC</li> <li>NWMIfSMCRNOSUBMSK</li> </ul> </li> <li>The following values are obsolete from the NWMIfSMCDStatus field:               <ul style="list-style-type: none"> <li>NWMIfSMCDNOPNETID</li> <li>NWMIfSMCDNOGC</li> <li>NWMIfSMCDNOSUBMSK</li> <li>NWMIfSMCDPNETIDMISCFG</li> </ul> </li> </ul>	Shared Memory Communications multiple IP subnet support (SMCv2)
<b>GetIfs</b>	NWMIfType <ul style="list-style-type: none"> <li>NWMIFTZCX</li> </ul>	There is a new value for NWMIfType (NWMIFTZCX). This new value indicates that the interface being displayed is a zCX Interface.	Network support for z/OS Container Extensions
<b>GetIfs</b>	<ul style="list-style-type: none"> <li>NWMIfFlags2               <ul style="list-style-type: none"> <li>NWMIFIQDCFLG</li> </ul> </li> <li>NWMIfIQDCName</li> <li>NWMIfType               <ul style="list-style-type: none"> <li>NWMIFTHIPERIQDC</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>New flag bit NWMIFIQDCFLG indicates that NWMIfIQDCName contains the name of the associated HiperSockets IQDC Interface.</li> <li>NWMIfIQDCName contains the name of associated HiperSockets IQDC interface.</li> <li>There is a new value for NWMIfType (NWMIFTHIPERIQDC). This new value indicates that the interface being displayed is a HiperSockets Converged Interface.</li> </ul>	HiperSockets Converged Interface support
<b>GetIfStats</b>	NWMIfStType <ul style="list-style-type: none"> <li>NWMIFTZCX</li> </ul>	There is a new value for NWMIfStType (NWMIFTZCX). This new value indicates that the interface being displayed is a zCX Interface.	Network support for z/OS Container Extensions
<b>GetIfStats</b>	<ul style="list-style-type: none"> <li>NWMIfStFlags               <ul style="list-style-type: none"> <li>NWMIFSTIQDCFLG</li> </ul> </li> <li>NWMIfStType               <ul style="list-style-type: none"> <li>NWMIFTHIPERIQDC</li> </ul> </li> <li>NWMIfStInIQDCBytes</li> <li>NWMIfStInIQDCUcastPkts</li> <li>NWMIfStOutIQDCBytes</li> <li>NWMIfStOutIQDCUcastPkts</li> </ul>	<ul style="list-style-type: none"> <li>New flag bit NWMIFSTIQDCFLG indicates that statistics for the associated HiperSockets IQDC interface are provided in NWMIfStIQDXStats area of this record.</li> <li>There is a new value for NWMIfStType (NWMIFTHIPERIQDC). This new value indicates that the interface being displayed is a HiperSockets Converged Interface.</li> <li>Input bytes received over associated HiperSockets IQDC interface.</li> <li>Input unicast packets received over associated HiperSockets IQDC interface.</li> <li>Output bytes sent over associated HiperSockets IQDC interface.</li> <li>Output unicast packets sent over associated HiperSockets IQDC interface.</li> </ul>	HiperSockets Converged Interface support

Table 125. New Communications Server TCP/IP callable NMI (EZBNMIFR) for z/OS V2R4 (continued)			
Request	Parameter/output	Description	Reason for change
<b>GetIfStatsExtended</b>	NWMIIfStExtIType <ul style="list-style-type: none"> <li>NWMIFTHIPERIQDC</li> </ul>	There is a new value for NWMIIfStExtIType (NWMIFTHIPERIQDC). This new value indicates that the interface being displayed is a HiperSockets Converged Interface.	HiperSockets Converged Interface support
<b>GetProfile</b>	<ul style="list-style-type: none"> <li>NMTP_GBCFSYSTEMEID</li> <li>NMTP_GBCFSYSTEMEIDSTR</li> <li>NMTP_GBCFSMCEID</li> <li>NMTP_GBCFSMCEIDCount</li> <li>NMTP_GBCFUEIDList</li> </ul>	These new fields indicate the settings of the new GLOBALCONFIG parameters.	Shared Memory Communications multiple IP subnet support (SMCv2)
<b>GetProfile</b>	NMTP_GBCFAUTOIQDC	New byte NMTP_GBCFAUTOIQDC indicates the setting of AUTOIQDC in the GLOBALCONFIG statement.	HiperSockets Converged Interface support
<b>GetProfile</b>	Global configuration section: <ul style="list-style-type: none"> <li>NMTP_GBCFZERTINTV</li> <li>NMTP_GBCFZERTSYNC</li> </ul>	<ul style="list-style-type: none"> <li>New NMTP_GBCFZERTINTV flag bit that indicates the setting of the INTVAL sub-parameter on the GLOBALCONFIG statement.</li> <li>New NMTP_GBCFZERTSYNC flag bit that indicates the setting of the SYNCVAL sub-parameter on the GLOBALCONFIG statement.</li> </ul>	z/OS Encryption Readiness Technology (zERT) aggregation recording interval
<b>GetProfile</b>	Management section: <ul style="list-style-type: none"> <li>NMTP_MGMTSMf119Types</li> <li>NMTP_MGMT119ZertSummary</li> <li>NMTP_MGMTNetMonServices</li> <li>NMTP_MGMTNMZertSummary</li> </ul>	<ul style="list-style-type: none"> <li>New NMTP_MGMT119ZertSummary flag bit is set in the NMTP_MGMTSMf119Types field to indicate that the new zERT summary record was requested on the SMFCONFIG TYPE119 profile statement.</li> <li>NMTP_MGMTNMZertSummary flag bit is set in the NMTP_MGMTNetMonServices field to indicate that the new zERT summary records were requested on the NETMONITOR profile statement.</li> </ul>	z/OS Encryption Readiness Technology (zERT) aggregation
<b>GetProfile</b>	Global configuration section: <ul style="list-style-type: none"> <li>NMTP_GBCFSysMonDelayJoinI</li> <li>NMTP_GBCFSysMonIpsec</li> </ul>	New fields, NMTP_GBCFSysMonDelayJoinI and NMTP_GBCFSysMonIpsec, indicate the settings of the new SYSPLEXMONITOR subparameters	Sysplex Autonomics for IPsec
<b>GetSmcDLinks</b>	<ul style="list-style-type: none"> <li>NWMSmcDlnkSMCEID</li> <li>NWMSmcDlnkVersion</li> <li>NWMSmcDlnkRemoteOSType</li> <li>NWMSmcDlnkRmtHostName</li> </ul>	These new fields indicate the SMC characteristics of the SMCD link.	Shared Memory Communications multiple IP subnet support (SMCv2)
<b>GetStorageStatistics</b>	<ul style="list-style-type: none"> <li>NWMStgFlags <ul style="list-style-type: none"> <li>NWMStgZAGGCfg</li> </ul> </li> <li>New ZERT aggregation storage utilization fields <ul style="list-style-type: none"> <li>NWMStg64ZaggCurrent</li> <li>NWMStg64ZaggMax</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>New flag bit NWMStgZaggCfg indicates whether ZERT AGGREGATION is configured on the GLOBALCONFIG statement.</li> <li>New fields NWMStg64ZaggCurrent and NWMStg64ZaggMax provide current and maximum storage usage statistics for ZERT AGGREGATION.</li> </ul>	z/OS Encryption Readiness Technology (zERT) aggregation recording interval

## Trace formatting NMI (EZBCTAPI)

There are no new or changed trace formatting NMI (EZBCTAPI) for z/OS V2R4.

## Trusted TCP connections API for Java

There are no new or changed trusted TCP connections API for Java for z/OS V2R4.

## Environment variables

There are no new or changed environment variables for z/OS V2R4.

## Socket APIs

This topic includes information about Communications Server socket APIs.

Refer to the following documents for more information about socket APIs:

- For complete documentation of the z/OS UNIX C sockets APIs, refer to [z/OS XL C/C++ Runtime Library Reference](#)
- For information about z/OS UNIX Assembler Callable Services, refer to [z/OS UNIX System Services Programming: Assembler Callable Services Reference](#)
- For information about TCP/IP socket APIs, refer to [z/OS Communications Server: IP Sockets Application Programming Interface Guide and Reference](#)
- For information about TCP/IP CICS sockets, refer to [z/OS Communications Server: IP CICS Sockets Guide](#)

## General updates of socket APIs

Table 126 on page 134 lists the general updates made to the IP socket APIs.

Table 126. New and changed Communications Server socket APIs for z/OS V2R4			
Socket API	Function call/Parameter	Description	Reason for change
<ul style="list-style-type: none"> <li>• <b>Call instruction</b></li> <li>• <b>CICS® C</b></li> <li>• <b>CICS sockets extended</b></li> <li>• <b>MACRO</b></li> <li>• <b>REXX socket</b></li> <li>• <b>UNIX assembler callable services</b></li> <li>• <b>XL C/C++</b></li> </ul>	SIOCTTLCTL ioctl	<ul style="list-style-type: none"> <li>• TTLSi_SSL_Protocol updated to support TLSv1.3</li> <li>• TTLSi_Neg_Cipher4 updated to support new cipher values</li> <li>• TTLSi_Neg_KeyShare – new field that contains the negotiated TLSv1.3 key share</li> <li>• TTLSi_Req_Type – New request options TTLS_RESET_WRITE_CIPHER and TTLS_SEND_SESSION_TICKET are provided</li> </ul>	AT-TLS support for TLS v1.3

## IPCS subcommands

This topic includes information about these IPCS subcommands:

- [“CTTRACE COMP\(SYSTCPDA\) subcommand” on page 134](#)
- [“CTTRACE COMP\(SYSTCPIS\) subcommand” on page 134](#)
- [“CTTRACE COMP\(SYSTCPOT\) subcommand” on page 135](#)
- [“CTTRACE COMP\(SYSTCPRE\) subcommand” on page 135](#)
- [“TCPIPCS subcommand” on page 135](#)
- [“General updates to IPCS subcommands” on page 136](#)

See [z/OS Communications Server: IP Diagnosis Guide](#) for more detailed IPCS subcommands information.

### CTTRACE COMP(SYSTCPDA) subcommand

This topic lists changes to Communications Server CTRACE COMP(SYSTCPDA) subcommand options for z/OS V2R4.

There are no new or changed CTRACE COMP(SYSTCPDA) subcommand for z/OS V2R4.

### CTTRACE COMP(SYSTCPIS) subcommand

This topic describes the Communications Server CTRACE COMP(SYSTCPIS) subcommand options for z/OS V2R4.

There are no new or changed CTRACE COMP(SYSTCPIS) subcommand for z/OS V2R4.

## CTTRACE COMP(SYSTCPOT) subcommand

This topic lists changes to Communications Server CTRACE COMP(SYSTCPDA) subcommand options for z/OS V2R4.

There are no new or changed CTRACE COMP(SYSTCPOT) subcommand for z/OS V2R4.

## CTTRACE COMP(SYSTCPRE) subcommand

This topic describes the CTRACE COMP(SYSTCPRE) subcommand options for z/OS V2R4.

There are no new or changed CTRACE COMP(SYSTCPRE) subcommand for z/OS V2R4.

## TCPIPCS subcommand

This topic describes the Communications Server TCPIPCS subcommand option changes for z/OS V2R4.

Table 127 on page 135 lists the TCPIPCS subcommand options.

The TCPIPCS command contains the OPTLOCAL specification in some displays.

Table 127. New and changed Communications Server TCPIPCS subcommand options for z/OS V2R4		
Subcommand	Description	Reason for change
CONFIG	The unassociated ISM interfaces will be displayed.	Shared Memory Communications multiple IP subnet support (SMCv2)
CONFIG	<ul style="list-style-type: none"><li>Includes the new HiperSockets Converged Interfaces in the output.</li><li>Includes the new zCX interface in the output.</li></ul>	<ul style="list-style-type: none"><li>HiperSockets Converged Interface support</li><li>Network support for z/OS Container Extensions</li></ul>
PROFILE	Displays the new INTVAL and SYNCVAL subparameters for the GLOBALCONFIG statement.	z/OS Encryption Readiness Technology (zERT) aggregation recording interval
PROFILE	The configured SMCEIDs and the SYSTEMEID will be displayed.	Shared Memory Communications multiple IP subnet support (SMCv2)
PROFILE	The display includes the new Sysplex Monitor subparameters – DELAYJOINIPSEC and MONIPSEC.	Sysplex Autonomics for IPsec
PROFILE	<ul style="list-style-type: none"><li>Displays the AUTOIQDC parameter.</li><li>Displays the new ZCX parameter for VIPARANGE.</li></ul>	<ul style="list-style-type: none"><li>HiperSockets Converged Interface support</li><li>Network support for z/OS Container Extensions</li></ul>
STATE	The report includes a new table, the IKED Heartbeat Historical Data table	Sysplex Autonomics for IPsec

Table 127. New and changed Communications Server TCPIPSC subcommand options for z/OS V2R4 (continued)		
Subcommand	Description	Reason for change
<b>STATE</b>	Includes the new HiperSockets Converged Interfaces in the output.	HiperSockets Converged Interface support
<b>TREE</b>	Includes the new HiperSockets Converged Interfaces in the output.	HiperSockets Converged Interface support
<b>TTLS</b>	Updated to display new AT-TLS parameters and values.	AT-TLS support for TLS v1.3

## General updates to IPCS subcommands

There are no new or changed general updates to IPCS subcommands for z/OS V2R4.

## SNMP MIB modules

This topic lists updates to Communications Server's support for SNMP MIB modules.

For a complete list of supported SNMP MIB objects, refer to [z/OS Communications Server: IP System Administrator's Commands](#).

Table 128 on page 136 lists the changes to the SNMP MIB module support.

Table 128. New and changed Communications Server SNMP MIB module support for z/OS V2R4		
MIB module name	Description	Reason for change
<b>IBMTCPIPMVS-MIB</b>	<ul style="list-style-type: none"> <li>The ibmMvsIfType MIB object supports a new value, ipaqiqdc(41), to indicate an entry in the table is an IPAQIQDC interface.</li> <li>The ibmMvsIfType MIB object supports a new value, ipaqiqdc6(42), to indicate an entry in the table is an IPAQIQDC6 interface.</li> <li>The ibmMvsIfTrleName MIB object is supported for OSD, OSX, IPAQIQDC, and IPAQIQDC6 interfaces.</li> <li>The ibmMvsIfPNetID MIB object is supported for IPAQIQDC and IPAQIQDC6 interfaces.</li> </ul>	HiperSockets Converged Interface support
<b>IBMTCPIPMVS-MIB</b>	The ibmMvsTcpConnectionTtlsSslProt MIB object supports a new value, tlsVer1Dot3(7), to indicate TLS protocol Version 1.3.	AT-TLS support for TLS v1.3

## User exits

There are no new or changed user exits for z/OS V2R4.

## Application data

There are no new or changed application data for z/OS V2R4.

# FTP client error codes

This topic describes new client error codes for the FTP client.

There are no new or changed FTP client error codes for z/OS V2R4.

# SMF record type 119 enhancements

See New and changed System Management Facilities (SMF) records for z/OS V2R4 in [z/OS Release Upgrade Reference Summary](#) for information on new and changed SMF type 119 records.

See the [Type 119 SMF records](#) topic in [z/OS Communications Server: IP Programmer's Guide and Reference](#) for more information.

# z/OS UNIX /etc files

Changes to z/OS UNIX /etc files are listed in in [z/OS Upgrade Workflow](#).

# General updates of IP interfaces

There are no general updates of IP interface for z/OS V2R4.

# Samples provided in MVS data set SEZAINST

There are no new or changed samples provided in MVS data set SEZAINST for z/OS V2R4.

[Table 129 on page 137](#) lists the changes to the samples that are provided in MVS data set SEZAINST.

Table 129. IP samples provided in MVS data set SEZAINST for z/OS V2R4		
Member	Description	Reason for change
CSSMTPCF	This CSSMTP sample configuration file is updated to add information about ReportMailFrom, ReportSysoutClass, and MailBoxCompatibility.  This CSSMTP sample configuration file is updated to add information about MBCS and MBCharset.	SMTPD compatibility enhancements for CSSMTP (APAR PH18237)  Code page enhancements for CSSMTP
RESSETUP	Includes a description of the new MAXNEGTTTL resolver setup statement.	Communications Server miscellaneous enhancements

# Samples provided in z/OS UNIX TCP/IP directory

[Table 130 on page 137](#) lists the changes to the samples that are provided in z/OS UNIX directory /usr/lpp/tcpip/samples.

Table 130. IP samples provided in z/OS UNIX directory /usr/lpp/tcpip/samples for z/OS V2R4	
File name	Description
EZAIKCFG	The IKE configuration file sample has been updated to add the NoKeyRing parameter.

# Communications Server SNA interface changes

This topic describes the following Communications Server SNA interfaces:

- [“Start options” on page 138](#)

- [“Start option behavior changes” on page 138](#)
- [“Definition statements” on page 138](#)
- [“Commands” on page 138](#)
- [“Command behavior changes” on page 138](#)
- [“VTAM internal trace entries” on page 139](#)
- [“VTAMMAP Formatted Dump changes” on page 139](#)
- [“Tuning statistics reports” on page 139](#)

## Start options

[Table 131 on page 138](#) lists the new or changed SNA start options.

Refer to [z/OS Communications Server: SNA Resource Definition Reference](#) for more information on start options.

Table 131. New and changed Communications Server start options for z/OS V2R4		
Start option	Description of update	Reason for change
INOPDUMP	ZCX has been added as new control group (ctrlgrp) value.	Network support for z/OS Container Extensions

## Start option behavior changes

There are no start option behavior changes for z/OS V2R4.

## Definition statements

There are no new or changed definition statements for z/OS V2R4.

## Commands

[Table 132 on page 138](#) lists the new and changed SNA commands.

For complete information about SNA commands, refer to the [z/OS Communications Server: SNA Operation](#).

Table 132. New and changed Communications Server commands in z/OS V2R4		
Command	Description	Reason for change
DISPLAY NET,TRL	The value ZCX was added as a new CONTROL operand.	Network support for z/OS Container Extensions

## Command behavior changes

[Table 133 on page 138](#) lists the SNA commands that have changed behavior.

For complete information about SNA commands, refer to the [z/OS Communications Server: SNA Operation](#).

Table 133. New and changed Communications Server commands with changed behavior for z/OS V2R4		
Command	Description of behavior change	Reason for change
DISPLAY NET,ID	zCX TRLEs displayed by the D NET,ID command will indicate CONTROL=ZCX.	Network support for z/OS Container Extensions



*Table 133. New and changed Communications Server commands with changed behavior for z/OS V2R4 (continued)*

Command	Description of behavior change	Reason for change
DISPLAY NET,TRL	zCX TRLEs displayed by the D NET,TRL command will indicate CONTROL=ZCX.	Network support for z/OS Container Extensions
DISPLAY NET,ID= <i>trlename</i>	QDIO TRLEs will display additional information if there have been any read errors.	Communications Server miscellaneous enhancements
DISPLAY NET,TRL,TRLE= <i>trlename</i>	QDIO TRLEs will display additional information if there have been any read errors.	Communications Server miscellaneous enhancements
D NET,ID= <i>trle</i>	A TRLE for an unassociated ISM device will display <b>**NA**</b> for the PNETID.	Shared Memory Communications multiple IP subnet support (SMCv2)
D NET,TRL,TRLE=	A TRLE for an unassociated ISM device will display <b>**NA**</b> for the PNETID.	Shared Memory Communications multiple IP subnet support (SMCv2)

## VTAM internal trace entries

For complete information about VIT entries, see [z/OS Communications Server: SNA Diagnosis Vol 2, FFST Dumps and the VIT](#).

Table 134 on page 139 lists the new and changed VIT entries.

*Table 134. New and changed Communications Server VTAM internal trace (VIT) entries for z/OS V2R4*

VIT entry	Description	Reason for change
<b>ENFx</b>	Updated to record the driving of an ENF exit for an ISM device.	Shared Memory Communications multiple IP subnet support (SMCv2)

## VTAMMAP Formatted Dump changes

There are no VTAMMAP formatted dump changes for z/OS V2R4.

## Tuning statistics reports

This topic lists the Communications Server SNA tuning statistics reports changes for z/OS V2R4.

There are no new and changed tuning statistics reports for z/OS V2R4.



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## 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.

RFCs are available at <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:

### **RFC**

#### **Title and Author**

### **RFC 652**

*Telnet output carriage-return disposition option* D. Crocker

### **RFC 653**

*Telnet output horizontal tabstops option* D. Crocker

### **RFC 654**

*Telnet output horizontal tab disposition option* D. Crocker

### **RFC 655**

*Telnet output formfeed disposition option* D. Crocker

### **RFC 657**

*Telnet output vertical tab disposition option* D. Crocker

### **RFC 658**

*Telnet output linefeed disposition* D. Crocker

### **RFC 698**

*Telnet extended ASCII option* T. Mock

### **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 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 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
- RFC 884**  
*Telnet terminal type option* M. Solomon, E. Wimmers

- RFC 885**  
*Telnet end of record option* J. Postel
- RFC 894**  
*Standard for the transmission of IP datagrams over Ethernet networks* C. Hornig
- RFC 896**  
*Congestion control in IP/TCP internetworks* J. Nagle
- RFC 903**  
*Reverse Address Resolution Protocol* R. Finlayson, T. Mann, J. Mogul, M. Theimer
- RFC 904**  
*Exterior Gateway Protocol formal specification* D. Mills
- RFC 919**  
*Broadcasting Internet Datagrams* J. Mogul
- RFC 922**  
*Broadcasting Internet datagrams in the presence of subnets* J. Mogul
- 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
- RFC 959**  
*File Transfer Protocol* J. Postel, J.K. Reynolds
- RFC 961**  
*Official ARPA-Internet protocols* J.K. Reynolds, J. Postel
- RFC 974**  
*Mail routing and the domain system* C. Partridge
- RFC 1001**  
*Protocol standard for a NetBIOS service on a TCP/UDP transport: Concepts and methods* NetBios Working Group in the Defense Advanced Research Projects Agency, Internet Activities Board, End-to-End Services Task Force
- RFC 1002**  
*Protocol Standard for a NetBIOS service on a TCP/UDP transport: Detailed specifications* NetBios Working Group in the Defense Advanced Research Projects Agency, Internet Activities Board, End-to-End Services Task Force
- RFC 1006**  
*ISO transport services on top of the TCP: Version 3* M.T. Rose, D.E. Cass
- RFC 1009**  
*Requirements for Internet gateways* R. Braden, J. Postel
- RFC 1011**  
*Official Internet protocols* J. Reynolds, J. Postel
- RFC 1013**  
*X Window System Protocol, version 11: Alpha update April 1987* R. Scheifler
- RFC 1014**  
*XDR: External Data Representation standard* Sun Microsystems
- RFC 1027**  
*Using ARP to implement transparent subnet gateways* S. Carl-Mitchell, J. Quarterman

- RFC 1032**  
*Domain administrators guide* M. Stahl
- RFC 1033**  
*Domain administrators operations guide* M. Lottor
- RFC 1034**  
*Domain names—concepts and facilities* P.V. Mockapetris
- RFC 1035**  
*Domain names—implementation and specification* P.V. Mockapetris
- RFC 1038**  
*Draft revised IP security option* M. St. Johns
- RFC 1041**  
*Telnet 3270 regime option* Y. Rekhter
- RFC 1042**  
*Standard for the transmission of IP datagrams over IEEE 802 networks* J. Postel, J. Reynolds
- RFC 1043**  
*Telnet Data Entry Terminal option: DODIIS implementation* A. Yasuda, T. Thompson
- RFC 1044**  
*Internet Protocol on Network System's HYPERchannel: Protocol specification* K. Hardwick, J. Lekashman
- RFC 1053**  
*Telnet X.3 PAD option* S. Levy, T. Jacobson
- RFC 1055**  
*Nonstandard for transmission of IP datagrams over serial lines: SLIP* J. Romkey
- RFC 1057**  
*RPC: Remote Procedure Call Protocol Specification: Version 2* Sun Microsystems
- RFC 1058**  
*Routing Information Protocol* C. Hedrick
- RFC 1060**  
*Assigned numbers* J. Reynolds, J. Postel
- RFC 1067**  
*Simple Network Management Protocol* J.D. Case, M. Fedor, M.L. Schoffstall, J. Davin
- RFC 1071**  
*Computing the Internet checksum* R.T. Braden, D.A. Borman, C. Partridge
- RFC 1072**  
*TCP extensions for long-delay paths* V. Jacobson, R.T. Braden
- RFC 1073**  
*Telnet window size option* D. Waitzman
- RFC 1079**  
*Telnet terminal speed option* C. Hedrick
- RFC 1085**  
*ISO presentation services on top of TCP/IP based internets* M.T. Rose
- RFC 1091**  
*Telnet terminal-type option* J. VanBokkelen
- RFC 1094**  
*NFS: Network File System Protocol specification* Sun Microsystems
- RFC 1096**  
*Telnet X display location option* G. Marcy
- RFC 1101**  
*DNS encoding of network names and other types* P. Mockapetris

- RFC 1112**  
*Host extensions for IP multicasting* S.E. Deering
- RFC 1113**  
*Privacy enhancement for Internet electronic mail: Part I — message encipherment and authentication procedures* J. Linn
- RFC 1118**  
*Hitchhikers Guide to the Internet* E. Krol
- RFC 1122**  
*Requirements for Internet Hosts—Communication Layers* R. Braden, Ed.
- RFC 1123**  
*Requirements for Internet Hosts—Application and Support* R. Braden, Ed.
- RFC 1146**  
*TCP alternate checksum options* J. Zweig, C. Partridge
- RFC 1155**  
*Structure and identification of management information for TCP/IP-based internets* M. Rose, K. McCloghrie
- RFC 1156**  
*Management Information Base for network management of TCP/IP-based internets* K. McCloghrie, M. Rose
- RFC 1157**  
*Simple Network Management Protocol (SNMP)* J. Case, M. Fedor, M. Schoffstall, J. Davin
- RFC 1158**  
*Management Information Base for network management of TCP/IP-based internets: MIB-II* M. Rose
- RFC 1166**  
*Internet numbers* S. Kirkpatrick, M.K. Stahl, M. Recker
- RFC 1179**  
*Line printer daemon protocol* L. McLaughlin
- RFC 1180**  
*TCP/IP tutorial* T. Socolofsky, C. Kale
- RFC 1183**  
*New DNS RR Definitions* C.F. Everhart, L.A. Mamakos, R. Ullmann, P.V. Mockapetris
- RFC 1184**  
*Telnet Linemode Option* D. Borman
- RFC 1186**  
*MD4 Message Digest Algorithm* R.L. Rivest
- RFC 1187**  
*Bulk Table Retrieval with the SNMP* M. Rose, K. McCloghrie, J. Davin
- RFC 1188**  
*Proposed Standard for the Transmission of IP Datagrams over FDDI Networks* D. Katz
- RFC 1190**  
*Experimental Internet Stream Protocol: Version 2 (ST-II)* C. Topolcic
- RFC 1191**  
*Path MTU discovery* J. Mogul, S. Deering
- RFC 1198**  
*FYI on the X window system* R. Scheifler
- RFC 1207**  
*FYI on Questions and Answers: Answers to commonly asked “experienced Internet user” questions* G. Malkin, A. Marine, J. Reynolds
- RFC 1208**  
*Glossary of networking terms* O. Jacobsen, D. Lynch

**RFC 1213**

*Management Information Base for Network Management of TCP/IP-based internets: MIB-II* K. McCloghrie, M.T. Rose

**RFC 1215**

*Convention for defining traps for use with the SNMP* M. Rose

**RFC 1227**

*SNMP MUX protocol and MIB* M.T. Rose

**RFC 1228**

*SNMP-DPI: Simple Network Management Protocol Distributed Program Interface* G. Carpenter, B. Wijnen

**RFC 1229**

*Extensions to the generic-interface MIB* K. McCloghrie

**RFC 1230**

*IEEE 802.4 Token Bus MIB* K. McCloghrie, R. Fox

**RFC 1231**

*IEEE 802.5 Token Ring MIB* K. McCloghrie, R. Fox, E. Decker

**RFC 1236**

*IP to X.121 address mapping for DDN* L. Morales, P. Hasse

**RFC 1256**

*ICMP Router Discovery Messages* S. Deering, Ed.

**RFC 1267**

*Border Gateway Protocol 3 (BGP-3)* K. Lougheed, Y. Rekhter

**RFC 1268**

*Application of the Border Gateway Protocol in the Internet* Y. Rekhter, P. Gross

**RFC 1269**

*Definitions of Managed Objects for the Border Gateway Protocol: Version 3* S. Willis, J. Burruss

**RFC 1270**

*SNMP Communications Services* F. Kastenholz, ed.

**RFC 1285**

*FDDI Management Information Base* J. Case

**RFC 1315**

*Management Information Base for Frame Relay DTEs* C. Brown, F. Baker, C. Carvalho

**RFC 1321**

*The MD5 Message-Digest Algorithm* R. Rivest

**RFC 1323**

*TCP Extensions for High Performance* V. Jacobson, R. Braden, D. Borman

**RFC 1325**

*FYI on Questions and Answers: Answers to Commonly Asked "New Internet User" Questions* G. Malkin, A. Marine

**RFC 1327**

*Mapping between X.400 (1988)/ISO 10021 and RFC 822* S. Hardcastle-Kille

**RFC 1340**

*Assigned Numbers* J. Reynolds, J. Postel

**RFC 1344**

*Implications of MIME for Internet Mail Gateways* N. Bornstein

**RFC 1349**

*Type of Service in the Internet Protocol Suite* P. Almquist

**RFC 1351**

*SNMP Administrative Model* J. Davin, J. Galvin, K. McCloghrie



- RFC 1352**  
*SNMP Security Protocols* J. Galvin, K. McCloghrie, J. Davin
- RFC 1353**  
*Definitions of Managed Objects for Administration of SNMP Parties* K. McCloghrie, J. Davin, J. Galvin
- RFC 1354**  
*IP Forwarding Table MIB* F. Baker
- RFC 1356**  
*Multiprotocol Interconnect<sup>®</sup> on X.25 and ISDN in the Packet Mode* A. Malis, D. Robinson, R. Ullmann
- RFC 1358**  
*Charter of the Internet Architecture Board (IAB)* L. Chapin
- RFC 1363**  
*A Proposed Flow Specification* C. Partridge
- RFC 1368**  
*Definition of Managed Objects for IEEE 802.3 Repeater Devices* D. McMaster, K. McCloghrie
- RFC 1372**  
*Telnet Remote Flow Control Option* C. L. Hedrick, D. Borman
- RFC 1374**  
*IP and ARP on HIPPI* J. Renwick, A. Nicholson
- RFC 1381**  
*SNMP MIB Extension for X.25 LAPB* D. Throop, F. Baker
- RFC 1382**  
*SNMP MIB Extension for the X.25 Packet Layer* D. Throop
- RFC 1387**  
*RIP Version 2 Protocol Analysis* G. Malkin
- RFC 1388**  
*RIP Version 2 Carrying Additional Information* G. Malkin
- RFC 1389**  
*RIP Version 2 MIB Extensions* G. Malkin, F. Baker
- RFC 1390**  
*Transmission of IP and ARP over FDDI Networks* D. Katz
- RFC 1393**  
*Traceroute Using an IP Option* G. Malkin
- RFC 1398**  
*Definitions of Managed Objects for the Ethernet-Like Interface Types* F. Kastenholtz
- RFC 1408**  
*Telnet Environment Option* D. Borman, Ed.
- RFC 1413**  
*Identification Protocol* M. St. Johns
- RFC 1416**  
*Telnet Authentication Option* D. Borman, ed.
- RFC 1420**  
*SNMP over IPX* S. Bostock
- RFC 1428**  
*Transition of Internet Mail from Just-Send-8 to 8bit-SMTP/MIME* G. Vaudreuil
- RFC 1442**  
*Structure of Management Information for version 2 of the Simple Network Management Protocol (SNMPv2)* J. Case, K. McCloghrie, M. Rose, S. Waldbusser
- RFC 1443**  
*Textual Conventions for version 2 of the Simple Network Management Protocol (SNMPv2)* J. Case, K. McCloghrie, M. Rose, S. Waldbusser

**RFC 1445**

*Administrative Model for version 2 of the Simple Network Management Protocol (SNMPv2)* J. Galvin, K. McCloghrie

**RFC 1447**

*Party MIB for version 2 of the Simple Network Management Protocol (SNMPv2)* K. McCloghrie, J. Galvin

**RFC 1448**

*Protocol Operations for version 2 of the Simple Network Management Protocol (SNMPv2)* J. Case, K. McCloghrie, M. Rose, S. Waldbusser

**RFC 1464**

*Using the Domain Name System to Store Arbitrary String Attributes* R. Rosenbaum

**RFC 1469**

*IP Multicast over Token-Ring Local Area Networks* T. Pusateri

**RFC 1483**

*Multiprotocol Encapsulation over ATM Adaptation Layer 5* Juha Heinanen

**RFC 1514**

*Host Resources MIB* P. Grillo, S. Waldbusser

**RFC 1516**

*Definitions of Managed Objects for IEEE 802.3 Repeater Devices* D. McMaster, K. McCloghrie

**RFC 1521**

*MIME (Multipurpose Internet Mail Extensions) Part One: Mechanisms for Specifying and Describing the Format of Internet Message Bodies* N. Borenstein, N. Freed

**RFC 1535**

*A Security Problem and Proposed Correction With Widely Deployed DNS Software* E. Gavron

**RFC 1536**

*Common DNS Implementation Errors and Suggested Fixes* A. Kumar, J. Postel, C. Neuman, P. Danzig, S. Miller

**RFC 1537**

*Common DNS Data File Configuration Errors* P. Beertema

**RFC 1540**

*Internet Official Protocol Standards* J. Postel

**RFC 1571**

*Telnet Environment Option Interoperability Issues* D. Borman

**RFC 1572**

*Telnet Environment Option* S. Alexander

**RFC 1573**

*Evolution of the Interfaces Group of MIB-II* K. McCloghrie, F. Kastenholz

**RFC 1577**

*Classical IP and ARP over ATM* M. Laubach

**RFC 1583**

*OSPF Version 2* J. Moy

**RFC 1591**

*Domain Name System Structure and Delegation* J. Postel

**RFC 1592**

*Simple Network Management Protocol Distributed Protocol Interface Version 2.0* B. Wijnen, G. Carpenter, K. Curran, A. Sehgal, G. Waters

**RFC 1594**

*FYI on Questions and Answers—Answers to Commonly Asked "New Internet User" Questions* A. Marine, J. Reynolds, G. Malkin

**RFC 1644**

*T/TCP — TCP Extensions for Transactions Functional Specification* R. Braden

- RFC 1646**  
*TN3270 Extensions for LName and Printer Selection* C. Graves, T. Butts, M. Angel
- RFC 1647**  
*TN3270 Enhancements* B. Kelly
- RFC 1652**  
*SMTP Service Extension for 8bit-MIMEtransport* J. Klensin, N. Freed, M. Rose, E. Stefferud, D. Crocker
- RFC 1664**  
*Using the Internet DNS to Distribute RFC1327 Mail Address Mapping Tables* C. Allochio, A. Bonito, B. Cole, S. Giordano, R. Hagens
- RFC 1693**  
*An Extension to TCP: Partial Order Service* T. Connolly, P. Amer, P. Conrad
- RFC 1695**  
*Definitions of Managed Objects for ATM Management Version 8.0 using SMIPv2* M. Ahmed, K. Tesink
- RFC 1701**  
*Generic Routing Encapsulation (GRE)* S. Hanks, T. Li, D. Farinacci, P. Traina
- RFC 1702**  
*Generic Routing Encapsulation over IPv4 networks* S. Hanks, T. Li, D. Farinacci, P. Traina
- RFC 1706**  
*DNS NSAP Resource Records* B. Manning, R. Colella
- RFC 1712**  
*DNS Encoding of Geographical Location* C. Farrell, M. Schulze, S. Pleitner D. Baldoni
- RFC 1713**  
*Tools for DNS debugging* A. Romao
- RFC 1723**  
*RIP Version 2—Carrying Additional Information* G. Malkin
- RFC 1752**  
*The Recommendation for the IP Next Generation Protocol* S. Bradner, A. Mankin
- RFC 1766**  
*Tags for the Identification of Languages* H. Alvestrand
- RFC 1771**  
*A Border Gateway Protocol 4 (BGP-4)* Y. Rekhter, T. Li
- RFC 1794**  
*DNS Support for Load Balancing* T. Brisco
- RFC 1819**  
*Internet Stream Protocol Version 2 (ST2) Protocol Specification—Version ST2+* L. Delgrossi, L. Berger Eds.
- RFC 1826**  
*IP Authentication Header* R. Atkinson
- RFC 1828**  
*IP Authentication using Keyed MD5* P. Metzger, W. Simpson
- RFC 1829**  
*The ESP DES-CBC Transform* P. Karn, P. Metzger, W. Simpson
- RFC 1830**  
*SMTP Service Extensions for Transmission of Large and Binary MIME Messages* G. Vaudreuil
- RFC 1831**  
*RPC: Remote Procedure Call Protocol Specification Version 2* R. Srinivasan
- RFC 1832**  
*XDR: External Data Representation Standard* R. Srinivasan
- RFC 1833**  
*Binding Protocols for ONC RPC Version 2* R. Srinivasan

**RFC 1850**

*OSPF Version 2 Management Information Base* F. Baker, R. Coltun

**RFC 1854**

*SMTP Service Extension for Command Pipelining* N. Freed

**RFC 1869**

*SMTP Service Extensions* J. Klensin, N. Freed, M. Rose, E. Stefferud, D. Crocker

**RFC 1870**

*SMTP Service Extension for Message Size Declaration* J. Klensin, N. Freed, K. Moore

**RFC 1876**

*A Means for Expressing Location Information in the Domain Name System* C. Davis, P. Vixie, T. Goodwin, I. Dickinson

**RFC 1883**

*Internet Protocol, Version 6 (IPv6) Specification* S. Deering, R. Hinden

**RFC 1884**

*IP Version 6 Addressing Architecture* R. Hinden, S. Deering, Eds.

**RFC 1886**

*DNS Extensions to support IP version 6* S. Thomson, C. Huitema

**RFC 1888**

*OSI NSAPs and IPv6* J. Bound, B. Carpenter, D. Harrington, J. Houldsworth, A. Lloyd

**RFC 1891**

*SMTP Service Extension for Delivery Status Notifications* K. Moore

**RFC 1892**

*The Multipart/Report Content Type for the Reporting of Mail System Administrative Messages* G. Vaudreuil

**RFC 1894**

*An Extensible Message Format for Delivery Status Notifications* K. Moore, G. Vaudreuil

**RFC 1901**

*Introduction to Community-based SNMPv2* J. Case, K. McCloghrie, M. Rose, S. Waldbusser

**RFC 1902**

*Structure of Management Information for Version 2 of the Simple Network Management Protocol (SNMPv2)* J. Case, K. McCloghrie, M. Rose, S. Waldbusser

**RFC 1903**

*Textual Conventions for Version 2 of the Simple Network Management Protocol (SNMPv2)* J. Case, K. McCloghrie, M. Rose, S. Waldbusser

**RFC 1904**

*Conformance Statements for Version 2 of the Simple Network Management Protocol (SNMPv2)* J. Case, K. McCloghrie, M. Rose, S. Waldbusser

**RFC 1905**

*Protocol Operations for Version 2 of the Simple Network Management Protocol (SNMPv2)* J. Case, K. McCloghrie, M. Rose, S. Waldbusser

**RFC 1906**

*Transport Mappings for Version 2 of the Simple Network Management Protocol (SNMPv2)* J. Case, K. McCloghrie, M. Rose, S. Waldbusser

**RFC 1907**

*Management Information Base for Version 2 of the Simple Network Management Protocol (SNMPv2)* J. Case, K. McCloghrie, M. Rose, S. Waldbusser

**RFC 1908**

*Coexistence between Version 1 and Version 2 of the Internet-standard Network Management Framework* J. Case, K. McCloghrie, M. Rose, S. Waldbusser

**RFC 1912**

*Common DNS Operational and Configuration Errors* D. Barr

- RFC 1918**  
*Address Allocation for Private Internets* Y. Rekhter, B. Moskowitz, D. Karrenberg, G.J. de Groot, E. Lear
- RFC 1928**  
*SOCKS Protocol Version 5* M. Leech, M. Ganis, Y. Lee, R. Kuris, D. Koblas, L. Jones
- RFC 1930**  
*Guidelines for creation, selection, and registration of an Autonomous System (AS)* J. Hawkinson, T. Bates
- RFC 1939**  
*Post Office Protocol-Version 3* J. Myers, M. Rose
- RFC 1981**  
*Path MTU Discovery for IP version 6* J. McCann, S. Deering, J. Mogul
- RFC 1982**  
*Serial Number Arithmetic* R. Elz, R. Bush
- RFC 1985**  
*SMTP Service Extension for Remote Message Queue Starting* J. De Winter
- RFC 1995**  
*Incremental Zone Transfer in DNS* M. Ohta
- RFC 1996**  
*A Mechanism for Prompt Notification of Zone Changes (DNS NOTIFY)* P. Vixie
- RFC 2010**  
*Operational Criteria for Root Name Servers* B. Manning, P. Vixie
- RFC 2011**  
*SNMPv2 Management Information Base for the Internet Protocol using SMIPv2* K. McCloghrie, Ed.
- RFC 2012**  
*SNMPv2 Management Information Base for the Transmission Control Protocol using SMIPv2* K. McCloghrie, Ed.
- RFC 2013**  
*SNMPv2 Management Information Base for the User Datagram Protocol using SMIPv2* K. McCloghrie, Ed.
- RFC 2018**  
*TCP Selective Acknowledgement Options* M. Mathis, J. Mahdavi, S. Floyd, A. Romanow
- RFC 2026**  
*The Internet Standards Process — Revision 3* S. Bradner
- RFC 2030**  
*Simple Network Time Protocol (SNTP) Version 4 for IPv4, IPv6 and OSI* D. Mills
- RFC 2033**  
*Local Mail Transfer Protocol* J. Myers
- RFC 2034**  
*SMTP Service Extension for Returning Enhanced Error Codes* N. Freed
- RFC 2040**  
*The RC5, RC5–CBC, RC5–CBC–Pad, and RC5–CTS Algorithms* R. Baldwin, R. Rivest
- RFC 2045**  
*Multipurpose Internet Mail Extensions (MIME) Part One: Format of Internet Message Bodies* N. Freed, N. Borenstein
- RFC 2052**  
*A DNS RR for specifying the location of services (DNS SRV)* A. Gulbrandsen, P. Vixie
- RFC 2065**  
*Domain Name System Security Extensions* D. Eastlake 3rd, C. Kaufman
- RFC 2066**  
*TELNET CHARSET Option* R. Gellens

**RFC 2080**

*RIPng for IPv6* G. Malkin, R. Minnear

**RFC 2096**

*IP Forwarding Table MIB* F. Baker

**RFC 2104**

*HMAC: Keyed-Hashing for Message Authentication* H. Krawczyk, M. Bellare, R. Canetti

**RFC 2119**

*Keywords for use in RFCs to Indicate Requirement Levels* S. Bradner

**RFC 2133**

*Basic Socket Interface Extensions for IPv6* R. Gilligan, S. Thomson, J. Bound, W. Stevens

**RFC 2136**

*Dynamic Updates in the Domain Name System (DNS UPDATE)* P. Vixie, Ed., S. Thomson, Y. Rekhter, J. Bound

**RFC 2137**

*Secure Domain Name System Dynamic Update* D. Eastlake 3rd

**RFC 2163**

*Using the Internet DNS to Distribute MIXER Conformant Global Address Mapping (MCGAM)* C. Allocchio

**RFC 2168**

*Resolution of Uniform Resource Identifiers using the Domain Name System* R. Daniel, M. Mealling

**RFC 2178**

*OSPF Version 2* J. Moy

**RFC 2181**

*Clarifications to the DNS Specification* R. Elz, R. Bush

**RFC 2205**

*Resource ReSerVation Protocol (RSVP)—Version 1 Functional Specification* R. Braden, Ed., L. Zhang, S. Berson, S. Herzog, S. Jamin

**RFC 2210**

*The Use of RSVP with IETF Integrated Services* J. Wroclawski

**RFC 2211**

*Specification of the Controlled-Load Network Element Service* J. Wroclawski

**RFC 2212**

*Specification of Guaranteed Quality of Service* S. Shenker, C. Partridge, R. Guerin

**RFC 2215**

*General Characterization Parameters for Integrated Service Network Elements* S. Shenker, J. Wroclawski

**RFC 2217**

*Telnet Com Port Control Option* G. Clarke

**RFC 2219**

*Use of DNS Aliases for Network Services* M. Hamilton, R. Wright

**RFC 2228**

*FTP Security Extensions* M. Horowitz, S. Lunt

**RFC 2230**

*Key Exchange Delegation Record for the DNS* R. Atkinson

**RFC 2233**

*The Interfaces Group MIB using SMIV2* K. McCloghrie, F. Kastenholz

**RFC 2240**

*A Legal Basis for Domain Name Allocation* O. Vaughn

**RFC 2246**

*The TLS Protocol Version 1.0* T. Dierks, C. Allen

- RFC 2251**  
*Lightweight Directory Access Protocol (v3)* M. Wahl, T. Howes, S. Kille
- RFC 2253**  
*Lightweight Directory Access Protocol (v3): UTF-8 String Representation of Distinguished Names* M. Wahl, S. Kille, T. Howes
- RFC 2254**  
*The String Representation of LDAP Search Filters* T. Howes
- RFC 2261**  
*An Architecture for Describing SNMP Management Frameworks* D. Harrington, R. Presuhn, B. Wijnen
- RFC 2262**  
*Message Processing and Dispatching for the Simple Network Management Protocol (SNMP)* J. Case, D. Harrington, R. Presuhn, B. Wijnen
- RFC 2271**  
*An Architecture for Describing SNMP Management Frameworks* D. Harrington, R. Presuhn, B. Wijnen
- RFC 2273**  
*SNMPv3 Applications* D. Levi, P. Meyer, B. Stewartz
- RFC 2274**  
*User-based Security Model (USM) for version 3 of the Simple Network Management Protocol (SNMPv3)* U. Blumenthal, B. Wijnen
- RFC 2275**  
*View-based Access Control Model (VACM) for the Simple Network Management Protocol (SNMP)* B. Wijnen, R. Presuhn, K. McCloghrie
- RFC 2279**  
*UTF-8, a transformation format of ISO 10646* F. Yergeau
- RFC 2292**  
*Advanced Sockets API for IPv6* W. Stevens, M. Thomas
- RFC 2308**  
*Negative Caching of DNS Queries (DNS NCACHE)* M. Andrews
- RFC 2317**  
*Classless IN-ADDR.ARPA delegation* H. Eidnes, G. de Groot, P. Vixie
- RFC 2320**  
*Definitions of Managed Objects for Classical IP and ARP Over ATM Using SMIPv2 (IPOA-MIB)* M. Greene, J. Luciani, K. White, T. Kuo
- RFC 2328**  
*OSPF Version 2* J. Moy
- RFC 2345**  
*Domain Names and Company Name Retrieval* J. Klensin, T. Wolf, G. Oglesby
- RFC 2352**  
*A Convention for Using Legal Names as Domain Names* O. Vaughn
- RFC 2355**  
*TN3270 Enhancements* B. Kelly
- RFC 2358**  
*Definitions of Managed Objects for the Ethernet-like Interface Types* J. Flick, J. Johnson
- RFC 2373**  
*IP Version 6 Addressing Architecture* R. Hinden, S. Deering
- RFC 2374**  
*An IPv6 Aggregatable Global Unicast Address Format* R. Hinden, M. O'Dell, S. Deering
- RFC 2375**  
*IPv6 Multicast Address Assignments* R. Hinden, S. Deering

**RFC 2385**

*Protection of BGP Sessions via the TCP MD5 Signature Option* A. Hefferman

**RFC 2389**

*Feature negotiation mechanism for the File Transfer Protocol* P. Hethmon, R. Elz

**RFC 2401**

*Security Architecture for Internet Protocol* S. Kent, R. Atkinson

**RFC 2402**

*IP Authentication Header* S. Kent, R. Atkinson

**RFC 2403**

*The Use of HMAC-MD5-96 within ESP and AH* C. Madson, R. Glenn

**RFC 2404**

*The Use of HMAC-SHA-1-96 within ESP and AH* C. Madson, R. Glenn

**RFC 2405**

*The ESP DES-CBC Cipher Algorithm With Explicit IV* C. Madson, N. Doraswamy

**RFC 2406**

*IP Encapsulating Security Payload (ESP)* S. Kent, R. Atkinson

**RFC 2407**

*The Internet IP Security Domain of Interpretation for ISAKMPD* Piper

**RFC 2408**

*Internet Security Association and Key Management Protocol (ISAKMP)* D. Maughan, M. Schertler, M. Schneider, J. Turner

**RFC 2409**

*The Internet Key Exchange (IKE)* D. Harkins, D. Carrel

**RFC 2410**

*The NULL Encryption Algorithm and Its Use With IPsec* R. Glenn, S. Kent,

**RFC 2428**

*FTP Extensions for IPv6 and NATs* M. Allman, S. Ostermann, C. Metz

**RFC 2445**

*Internet Calendaring and Scheduling Core Object Specification (iCalendar)* F. Dawson, D. Stenerson

**RFC 2459**

*Internet X.509 Public Key Infrastructure Certificate and CRL Profile* R. Housley, W. Ford, W. Polk, D. Solo

**RFC 2460**

*Internet Protocol, Version 6 (IPv6) Specification* S. Deering, R. Hinden

**RFC 2461**

*Neighbor Discovery for IP Version 6 (IPv6)* T. Narten, E. Nordmark, W. Simpson

**RFC 2462**

*IPv6 Stateless Address Autoconfiguration* S. Thomson, T. Narten

**RFC 2463**

*Internet Control Message Protocol (ICMPv6) for the Internet Protocol Version 6 (IPv6) Specification* A. Conta, S. Deering

**RFC 2464**

*Transmission of IPv6 Packets over Ethernet Networks* M. Crawford

**RFC 2466**

*Management Information Base for IP Version 6: ICMPv6 Group* D. Haskin, S. Onishi

**RFC 2476**

*Message Submission* R. Gellens, J. Klensin

**RFC 2487**

*SMTP Service Extension for Secure SMTP over TLS* P. Hoffman

**RFC 2505**

*Anti-Spam Recommendations for SMTP MTAs* G. Lindberg



- RFC 2523**  
*Photuris: Extended Schemes and Attributes* P. Karn, W. Simpson
- RFC 2535**  
*Domain Name System Security Extensions* D. Eastlake 3rd
- RFC 2538**  
*Storing Certificates in the Domain Name System (DNS)* D. Eastlake 3rd, O. Gudmundsson
- RFC 2539**  
*Storage of Diffie-Hellman Keys in the Domain Name System (DNS)* D. Eastlake 3rd
- RFC 2540**  
*Detached Domain Name System (DNS) Information* D. Eastlake 3rd
- RFC 2554**  
*SMTP Service Extension for Authentication* J. Myers
- RFC 2570**  
*Introduction to Version 3 of the Internet-standard Network Management Framework* J. Case, R. Mundy, D. Partain, B. Stewart
- RFC 2571**  
*An Architecture for Describing SNMP Management Frameworks* B. Wijnen, D. Harrington, R. Presuhn
- RFC 2572**  
*Message Processing and Dispatching for the Simple Network Management Protocol (SNMP)* J. Case, D. Harrington, R. Presuhn, B. Wijnen
- RFC 2573**  
*SNMP Applications* D. Levi, P. Meyer, B. Stewart
- RFC 2574**  
*User-based Security Model (USM) for version 3 of the Simple Network Management Protocol (SNMPv3)* U. Blumenthal, B. Wijnen
- RFC 2575**  
*View-based Access Control Model (VACM) for the Simple Network Management Protocol (SNMP)* B. Wijnen, R. Presuhn, K. McCloghrie
- RFC 2576**  
*Co-Existence between Version 1, Version 2, and Version 3 of the Internet-standard Network Management Framework* R. Frye, D. Levi, S. Routhier, B. Wijnen
- RFC 2578**  
*Structure of Management Information Version 2 (SMIv2)* K. McCloghrie, D. Perkins, J. Schoenwaelder
- RFC 2579**  
*Textual Conventions for SMIv2* K. McCloghrie, D. Perkins, J. Schoenwaelder
- RFC 2580**  
*Conformance Statements for SMIv2* K. McCloghrie, D. Perkins, J. Schoenwaelder
- RFC 2581**  
*TCP Congestion Control* M. Allman, V. Paxson, W. Stevens
- RFC 2583**  
*Guidelines for Next Hop Client (NHC) Developers* R. Carlson, L. Winkler
- RFC 2591**  
*Definitions of Managed Objects for Scheduling Management Operations* D. Levi, J. Schoenwaelder
- RFC 2625**  
*IP and ARP over Fibre Channel* M. Rajagopal, R. Bhagwat, W. Rickard
- RFC 2635**  
*Don't SPEW A Set of Guidelines for Mass Unsolicited Mailings and Postings (spam\*)* S. Hambridge, A. Lunde
- RFC 2637**  
*Point-to-Point Tunneling Protocol* K. Hamzeh, G. Pall, W. Verthein, J. Taarud, W. Little, G. Zorn

- RFC 2640**  
*Internationalization of the File Transfer Protocol* B. Curtin
- RFC 2665**  
*Definitions of Managed Objects for the Ethernet-like Interface Types* J. Flick, J. Johnson
- RFC 2671**  
*Extension Mechanisms for DNS (EDNS0)* P. Vixie
- RFC 2672**  
*Non-Terminal DNS Name Redirection* M. Crawford
- RFC 2675**  
*IPv6 Jumbograms* D. Borman, S. Deering, R. Hinden
- RFC 2710**  
*Multicast Listener Discovery (MLD) for IPv6* S. Deering, W. Fenner, B. Haberman
- RFC 2711**  
*IPv6 Router Alert Option* C. Partridge, A. Jackson
- RFC 2740**  
*OSPF for IPv6* R. Coltun, D. Ferguson, J. Moy
- RFC 2753**  
*A Framework for Policy-based Admission Control* R. Yavatkar, D. Pendarakis, R. Guerin
- RFC 2782**  
*A DNS RR for specifying the location of services (DNS SRV)* A. Gubrandsen, P. Vixie, L. Esibov
- RFC 2821**  
*Simple Mail Transfer Protocol* J. Klensin, Ed.
- RFC 2822**  
*Internet Message Format* P. Resnick, Ed.
- RFC 2840**  
*TELNET KERMIT OPTION* J. Altman, F. da Cruz
- RFC 2845**  
*Secret Key Transaction Authentication for DNS (TSIG)* P. Vixie, O. Gudmundsson, D. Eastlake 3rd, B. Wellington
- RFC 2851**  
*Textual Conventions for Internet Network Addresses* M. Daniele, B. Haberman, S. Routhier, J. Schoenwaelder
- RFC 2852**  
*Deliver By SMTP Service Extension* D. Newman
- RFC 2874**  
*DNS Extensions to Support IPv6 Address Aggregation and Renumbering* M. Crawford, C. Huitema
- RFC 2915**  
*The Naming Authority Pointer (NAPTR) DNS Resource Record* M. Mealling, R. Daniel
- RFC 2920**  
*SMTP Service Extension for Command Pipelining* N. Freed
- RFC 2930**  
*Secret Key Establishment for DNS (TKEY RR)* D. Eastlake, 3rd
- RFC 2941**  
*Telnet Authentication Option* T. Ts'o, ed., J. Altman
- RFC 2942**  
*Telnet Authentication: Kerberos Version 5* T. Ts'o
- RFC 2946**  
*Telnet Data Encryption Option* T. Ts'o
- RFC 2952**  
*Telnet Encryption: DES 64 bit Cipher Feedback* T. Ts'o

**RFC 2953**

*Telnet Encryption: DES 64 bit Output Feedback* T. Ts'o

**RFC 2992**

*Analysis of an Equal-Cost Multi-Path Algorithm* C. Hopps

**RFC 3019**

*IP Version 6 Management Information Base for The Multicast Listener Discovery Protocol* B. Haberman, R. Worzella

**RFC 3060**

*Policy Core Information Model—Version 1 Specification* B. Moore, E. Ellessen, J. Strassner, A. Westerinen

**RFC 3152**

*Delegation of IP6.ARPA* R. Bush

**RFC 3164**

*The BSD Syslog Protocol* C. Lonvick

**RFC 3207**

*SMTP Service Extension for Secure SMTP over Transport Layer Security* P. Hoffman

**RFC 3226**

*DNSSEC and IPv6 A6 aware server/resolver message size requirements* O. Gudmundsson

**RFC 3291**

*Textual Conventions for Internet Network Addresses* M. Daniele, B. Haberman, S. Routhier, J. Schoenwaelder

**RFC 3363**

*Representing Internet Protocol version 6 (IPv6) Addresses in the Domain Name System* R. Bush, A. Durand, B. Fink, O. Gudmundsson, T. Hain

**RFC 3376**

*Internet Group Management Protocol, Version 3* B. Cain, S. Deering, I. Kouvelas, B. Fenner, A. Thyagarajan

**RFC 3390**

*Increasing TCP's Initial Window* M. Allman, S. Floyd, C. Partridge

**RFC 3410**

*Introduction and Applicability Statements for Internet-Standard Management Framework* J. Case, R. Mundy, D. Partain, B. Stewart

**RFC 3411**

*An Architecture for Describing Simple Network Management Protocol (SNMP) Management Frameworks* D. Harrington, R. Presuhn, B. Wijnen

**RFC 3412**

*Message Processing and Dispatching for the Simple Network Management Protocol (SNMP)* J. Case, D. Harrington, R. Presuhn, B. Wijnen

**RFC 3413**

*Simple Network Management Protocol (SNMP) Applications* D. Levi, P. Meyer, B. Stewart

**RFC 3414**

*User-based Security Model (USM) for version 3 of the Simple Network Management Protocol (SNMPv3)* U. Blumenthal, B. Wijnen

**RFC 3415**

*View-based Access Control Model (VACM) for the Simple Network Management Protocol (SNMP)* B. Wijnen, R. Presuhn, K. McCloghrie

**RFC 3416**

*Version 2 of the Protocol Operations for the Simple Network Management Protocol (SNMP)* R. Presuhn, J. Case, K. McCloghrie, M. Rose, S. Waldbusser

**RFC 3417**

*Transport Mappings for the Simple Network Management Protocol (SNMP)* R. Presuhn, J. Case, K. McCloghrie, M. Rose, S. Waldbusser

**RFC 3418**

*Management Information Base (MIB) for the Simple Network Management Protocol (SNMP)* R. Presuhn, J. Case, K. McCloghrie, M. Rose, S. Waldbusser

**RFC 3419**

*Textual Conventions for Transport Addresses* M. Daniele, J. Schoenwaelder

**RFC 3484**

*Default Address Selection for Internet Protocol version 6 (IPv6)* R. Draves

**RFC 3493**

*Basic Socket Interface Extensions for IPv6* R. Gilligan, S. Thomson, J. Bound, J. McCann, W. Stevens

**RFC 3513**

*Internet Protocol Version 6 (IPv6) Addressing Architecture* R. Hinden, S. Deering

**RFC 3526**

*More Modular Exponential (MODP) Diffie-Hellman groups for Internet Key Exchange (IKE)* T. Kivinen, M. Kojo

**RFC 3542**

*Advanced Sockets Application Programming Interface (API) for IPv6* W. Richard Stevens, M. Thomas, E. Nordmark, T. Jinmei

**RFC 3566**

*The AES-XCBC-MAC-96 Algorithm and Its Use With IPsec* S. Frankel, H. Herbert

**RFC 3569**

*An Overview of Source-Specific Multicast (SSM)* S. Bhattacharyya, Ed.

**RFC 3584**

*Coexistence between Version 1, Version 2, and Version 3 of the Internet-standard Network Management Framework* R. Frye, D. Levi, S. Routhier, B. Wijnen

**RFC 3602**

*The AES-CBC Cipher Algorithm and Its Use with IPsec* S. Frankel, R. Glenn, S. Kelly

**RFC 3629**

*UTF-8, a transformation format of ISO 10646* R. Kermode, C. Vicisano

**RFC 3658**

*Delegation Signer (DS) Resource Record (RR)* O. Gudmundsson

**RFC 3678**

*Socket Interface Extensions for Multicast Source Filters* D. Thaler, B. Fenner, B. Quinn

**RFC 3715**

*IPsec-Network Address Translation (NAT) Compatibility Requirements* B. Aboba, W. Dixon

**RFC 3810**

*Multicast Listener Discovery Version 2 (MLDv2) for IPv6* R. Vida, Ed., L. Costa, Ed.

**RFC 3826**

*The Advanced Encryption Standard (AES) Cipher Algorithm in the SNMP User-based Security Model* U. Blumenthal, F. Maino, K. McCloghrie.

**RFC 3947**

*Negotiation of NAT-Traversal in the IKE* T. Kivinen, B. Swander, A. Huttunen, V. Volpe

**RFC 3948**

*UDP Encapsulation of IPsec ESP Packets* A. Huttunen, B. Swander, V. Volpe, L. DiBurro, M. Stenberg

**RFC 4001**

*Textual Conventions for Internet Network Addresses* M. Daniele, B. Haberman, S. Routhier, J. Schoenwaelder

**RFC 4007**

*IPv6 Scoped Address Architecture* S. Deering, B. Haberman, T. Jinmei, E. Nordmark, B. Zill

- RFC 4022**  
*Management Information Base for the Transmission Control Protocol (TCP)* R. Raghunarayan
- RFC 4106**  
*The Use of Galois/Counter Mode (GCM) in IPsec Encapsulating Security Payload (ESP)* J. Viega, D. McGrew
- RFC 4109**  
*Algorithms for Internet Key Exchange version 1 (IKEv1)* P. Hoffman
- RFC 4113**  
*Management Information Base for the User Datagram Protocol (UDP)* B. Fenner, J. Flick
- RFC 4191**  
*Default Router Preferences and More-Specific Routes* R. Draves, D. Thaler
- RFC 4217**  
*Securing FTP with TLS* P. Ford-Hutchinson
- RFC 4292**  
*IP Forwarding Table MIB* B. Haberman
- RFC 4293**  
*Management Information Base for the Internet Protocol (IP)* S. Routhier
- RFC 4301**  
*Security Architecture for the Internet Protocol* S. Kent, K. Seo
- RFC 4302**  
*IP Authentication Header* S. Kent
- RFC 4303**  
*IP Encapsulating Security Payload (ESP)* S. Kent
- RFC 4304**  
*Extended Sequence Number (ESN) Addendum to IPsec Domain of Interpretation (DOI) for Internet Security Association and Key Management Protocol (ISAKMP)* S. Kent
- RFC 4307**  
*Cryptographic Algorithms for Use in the Internet Key Exchange Version 2 (IKEv2)* J. Schiller
- RFC 4308**  
*Cryptographic Suites for IPsec* P. Hoffman
- RFC 4434**  
*The AES-XCBC-PRF-128 Algorithm for the Internet Key Exchange Protocol* P. Hoffman
- RFC 4443**  
*Internet Control Message Protocol (ICMPv6) for the Internet Protocol Version 6 (IPv6) Specification* A. Conta, S. Deering
- RFC 4552**  
*Authentication/Confidentiality for OSPFv3* M. Gupta, N. Melam
- RFC 4678**  
*Server/Application State Protocol v1* A. Bivens
- RFC 4753**  
*ECP Groups for IKE and IKEv2* D. Fu, J. Solinas
- RFC 4754**  
*IKE and IKEv2 Authentication Using the Elliptic Curve Digital Signature Algorithm (ECDSA)* D. Fu, J. Solinas
- RFC 4809**  
*Requirements for an IPsec Certificate Management Profile* C. Bonatti, Ed., S. Turner, Ed., G. Lebovitz, Ed.
- RFC 4835**  
*Cryptographic Algorithm Implementation Requirements for Encapsulating Security Payload (ESP) and Authentication Header (AH)* V. Manral

**RFC 4862**

*IPv6 Stateless Address Autoconfiguration* S. Thomson, T. Narten, T. Jinmei

**RFC 4868**

*Using HMAC-SHA-256, HMAC-SHA-384, and HMAC-SHA-512 with IPsec* S. Kelly, S. Frankel

**RFC 4869**

*Suite B Cryptographic Suites for IPsec* L. Law, J. Solinas

**RFC 4941**

*Privacy Extensions for Stateless Address Autoconfiguration in IPv6* T. Narten, R. Draves, S. Krishnan

**RFC 4945**

*The Internet IP Security PKI Profile of IKEv1/ISAKMP, IKEv2, and PKIX* B. Korver

**RFC 5014**

*IPv6 Socket API for Source Address Selection* E. Nordmark, S. Chakrabarti, J. Laganier

**RFC 5095**

*Deprecation of Type 0 Routing Headers in IPv6* J. Abley, P. Savola, G. Neville-Neil

**RFC 5175**

*IPv6 Router Advertisement Flags Option* B. Haberman, Ed., R. Hinden

**RFC 5282**

*Using Authenticated Encryption Algorithms with the Encrypted Payload of the Internet Key Exchange version 2 (IKEv2) Protocol* D. Black, D. McGrew

**RFC 5996**

*Internet Key Exchange Protocol Version 2 (IKEv2)* C. Kaufman, P. Hoffman, Y. Nir, P. Eronen

**RFC 7627**

*Transport Layer Security (TLS) Session Hash and Extended Master Secret Extension* K. Bhargavan, A. Delignat-Lavaud, A. Pironti, Inria Paris-Rocquencourt, A. Langley, M. Ray

**RFC 8446**

*The Transport Layer Security (TLS) Protocol Version 1.3* E. Rescorla

**Internet drafts**

Internet drafts are working documents of the Internet Engineering Task Force (IETF), its areas, and its working groups. Other groups can also distribute working documents as Internet drafts. You can see Internet drafts at <http://www.ietf.org/ID.html>.

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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*

RFCs are available at <http://www.rfc-editor.org/rfc.html>.





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## Appendix C. Architectural specifications

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- APPN Architecture Reference (SG30-3422-04)
- APPN Branch Extender Architecture Reference Version 1.1
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- 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*

RFCs are available at <http://www.rfc-editor.org/rfc.html>.



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## Appendix D. Accessibility

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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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- For information about software support lifecycle, see: [IBM Lifecycle Support for z/OS \(www.ibm.com/software/support/systemsz/lifecycle\)](http://www.ibm.com/software/support/systemsz/lifecycle)
- For information about currently-supported IBM hardware, contact your IBM representative.

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## Bibliography

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This bibliography contains descriptions of the documents in the z/OS Communications Server library.

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### z/OS Communications Server library updates

Updates to documents are also available on RETAIN and in information APARs (info APARs). Go to <https://www.ibm.com/mysupport> to view information APARs.

- [z/OS Communications Server V2R1 New Function APAR Summary](#)
- [z/OS Communications Server V2R2 New Function APAR Summary](#)
- [z/OS Communications Server V2R3 New Function APAR Summary](#)
- [z/OS Communications Server V2R4 New Function APAR Summary](#)

### z/OS Communications Server information

z/OS Communications Server product information is grouped by task in the following tables.

#### Planning

Title	Number	Description
<a href="#">z/OS Communications Server: New Function Summary</a>	GC27-3664	This document is intended to help you plan for new IP or SNA functions, 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.
<a href="#">z/OS Communications Server: IPv6 Network and Application Design Guide</a>	SC27-3663	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.

#### Resource definition, configuration, and tuning

Title	Number	Description
<a href="#">z/OS Communications Server: IP Configuration Guide</a>	SC27-3650	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 <a href="#">z/OS Communications Server: IP Configuration Reference</a> .

<b>Title</b>	<b>Number</b>	<b>Description</b>
<a href="#">z/OS Communications Server: IP Configuration Reference</a>	SC27-3651	This document presents information for people who want to administer and maintain IP. Use this document with the <a href="#">z/OS Communications Server: IP Configuration Guide</a> . The information in this document includes: <ul style="list-style-type: none"> <li>• TCP/IP configuration data sets</li> <li>• Configuration statements</li> <li>• Translation tables</li> <li>• Protocol number and port assignments</li> </ul>
<a href="#">z/OS Communications Server: SNA Network Implementation Guide</a>	SC27-3672	This document presents the major concepts involved in implementing an SNA network. Use this document with the <a href="#">z/OS Communications Server: SNA Resource Definition Reference</a> .
<a href="#">z/OS Communications Server: SNA Resource Definition Reference</a>	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 <a href="#">z/OS Communications Server: SNA Network Implementation Guide</a> .
<a href="#">z/OS Communications Server: SNA Resource Definition Samples</a>	SC27-3676	This document contains sample definitions to help you implement SNA functions in your networks, and includes sample major node definitions.
<a href="#">z/OS Communications Server: IP Network Print Facility</a>	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.

## Operation

<b>Title</b>	<b>Number</b>	<b>Description</b>
<a href="#">z/OS Communications Server: IP User's Guide and Commands</a>	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 electronic mail, print on remote printers, and authenticate network users.
<a href="#">z/OS Communications Server: IP System Administrator's Commands</a>	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.
<a href="#">z/OS Communications Server: SNA Operation</a>	SC27-3673	This document serves as a reference for programmers and operators requiring detailed information about specific operator commands.
<a href="#">z/OS Communications Server: Quick Reference</a>	SC27-3665	This document contains essential information about SNA and IP commands.

## Customization

Title	Number	Description
<a href="#">z/OS Communications Server: SNA Customization</a>	SC27-3666	<p>This document enables you to customize SNA, and includes the following information:</p> <ul style="list-style-type: none"> <li>• Communication network management (CNM) routing table</li> <li>• Logon-interpret routine requirements</li> <li>• Logon manager installation-wide exit routine for the CLU search exit</li> <li>• TSO/SNA installation-wide exit routines</li> <li>• SNA installation-wide exit routines</li> </ul>

## Writing application programs

Title	Number	Description
<a href="#">z/OS Communications Server: IP Sockets Application Programming Interface Guide and Reference</a>	SC27-3660	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.
<a href="#">z/OS Communications Server: IP CICS Sockets Guide</a>	SC27-3649	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.
<a href="#">z/OS Communications Server: IP IMS Sockets Guide</a>	SC27-3653	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.
<a href="#">z/OS Communications Server: IP Programmer's Guide and Reference</a>	SC27-3659	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.
<a href="#">z/OS Communications Server: SNA Programming</a>	SC27-3674	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.
<a href="#">z/OS Communications Server: SNA Programmer's LU 6.2 Guide</a>	SC27-3669	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.)
<a href="#">z/OS Communications Server: SNA Programmer's LU 6.2 Reference</a>	SC27-3670	This document provides reference material for the SNA LU 6.2 programming interface for host application programs.

Title	Number	Description
<a href="#">z/OS Communications Server: CSM Guide</a>	SC27-3647	This document describes how applications use the communications storage manager.

## Diagnosis

Title	Number	Description
<a href="#">z/OS Communications Server: IP Diagnosis Guide</a>	GC27-3652	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.
<a href="#">z/OS Communications Server: ACF/TAP Trace Analysis Handbook</a>	GC27-3645	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.
<a href="#">z/OS Communications Server: SNA Diagnosis Vol 1, Techniques and Procedures</a> and <a href="#">z/OS Communications Server: SNA Diagnosis Vol 2, FFST Dumps and the VIT</a>	GC27-3667 GC27-3668	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.
<a href="#">z/OS Communications Server: SNA Data Areas Volume 1</a> and <a href="#">z/OS Communications Server: SNA Data Areas Volume 2</a>	GC31-6852 GC31-6853	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.

## Messages and codes

Title	Number	Description
<a href="#">z/OS Communications Server: SNA Messages</a>	SC27-3671	This document describes the ELM, IKT, IST, IUT, IVT, and USS messages. Other information in this document includes: <ul style="list-style-type: none"> <li>• Command and RU types in SNA messages</li> <li>• Node and ID types in SNA messages</li> <li>• Supplemental message-related information</li> </ul>
<a href="#">z/OS Communications Server: IP Messages Volume 1 (EZA)</a>	SC27-3654	This volume contains TCP/IP messages beginning with EZA.
<a href="#">z/OS Communications Server: IP Messages Volume 2 (EZB, EZD)</a>	SC27-3655	This volume contains TCP/IP messages beginning with EZB or EZD.
<a href="#">z/OS Communications Server: IP Messages Volume 3 (EZY)</a>	SC27-3656	This volume contains TCP/IP messages beginning with EZY.
<a href="#">z/OS Communications Server: IP Messages Volume 4 (EZZ, SNM)</a>	SC27-3657	This volume contains TCP/IP messages beginning with EZZ and SNM.
<a href="#">z/OS Communications Server: IP and SNA Codes</a>	SC27-3648	This document describes codes and other information that appear in z/OS Communications Server messages.

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