



Shared Memory Communications over RDMA adapter (RoCE) virtualization documentation updates for APARs OA44576 and PI12223

Version 2 Release 1

Note:

Links to related publications are from original documents and might not work. The links to publications are included for reference purposes only.

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Chapter 1. New Function Summary

Conventions and terminology that are used in this document

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

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

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

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

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

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

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

For definitions of the terms and abbreviations that are used in this document, you can view the latest IBM terminology at the IBM Terminology website.

Clarification of notes

Information traditionally qualified as Notes is further qualified as follows:

Note Supplemental detail

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

Guideline

Customary way to perform a procedure

Rule Something you must do; limitations on your actions

Restriction

Indicates certain conditions are not supported; limitations on a product or facility

Requirement

Dependencies, prerequisites

Result Indicates the outcome

Roadmap to functions

This topic includes a roadmap table to all of the functions and enhancements that were introduced in z/OS V2R1 Communications Server and z/OS V1R13 Communications Server.

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

Table 1. Roadmap to functions

Functional enhancement	Exploitation actions
Enhancements introduced in z/OS V2R1 Communications Server	
Enhanced IDS IP fragment attack detection	Yes
Improve auditing of NetAccess rules	Yes
AT-TLS support for TLS v1.2 and related features	Yes
Improved FIPS 140 diagnostics	Yes
Limit defensive filter logging	Yes
QDIO outbound flood prevention	No
TN3270 client-bound data queueing limit	Yes
AT-TLS enablement for DCAS	Yes
Network security enhancements for SNMP	Yes
TLS security enhancements for sendmail	Yes
TLS security enhancements for Policy Agent	Yes
Configuration Assistant performance improvements and enhanced user interface	No
Improve translation of special characters in linemode for TSO/VTAM	Yes
Resolver initialization resiliency	Yes
Enterprise Extender IPv6 address configuration	Yes
Simplified configuration for progressive mode ARB	Yes
Check TCP/IP profile syntax without applying configuration changes	Yes
User control of Ephemeral Port Ranges	Yes
IPv4 INTERFACE statement for HiperSockets™ and Static VIPAs	Yes
IBM Health Checker for z/OS GATEWAY statement	Yes
CSSMTP mail message date header handling option	Yes
Socket establishment time for Netstat ALL/-A	Yes
Sysplex-wide security associations for IPv6	Yes
HPR PSRETRY Enhancement	Yes
RPCBIND recycle notification	Yes
SNA serviceability enhancements	No
TCP/IP serviceability enhancements	No
API to locate SYSLOGD configuration file	Yes
Real-time application-controlled TCP/IP trace NMI	Yes
FTP client security user exits	Yes
Simplify FTP transfer of data sets between z/OS systems	Yes

Table 1. Roadmap to functions (continued)

Functional enhancement	Exploitation actions
Enable DHCP clients on OSA interfaces	Yes
NMI and SMF enhancements for TCP/IP applications	Yes
QDIO acceleration coexistence with IP filtering	Yes
TCP support for selective acknowledgments	Yes
Shared Memory Communications over Remote Direct Memory Access	Yes
DISPLAY NET, BRUFUSE command Enhancement	Yes
“Shared Memory Communications over RDMA adapter (RoCE) virtualization” on page 4	Yes
Connection termination notification for sockets	Yes
IPv6 support for policy-based routing	Yes
Affinity for application-instance DVIPAs	Yes
Enhanced Fast Path socket support	No
Enhanced TCP protocol configuration options and default settings	Yes
Enhancements introduced in z/OS V1R13 Communications Server	
Expanded intrusion detection services	Yes
Network address translation traversal support for IKE version 2	Yes
Sysplex-Wide Security Associations for IKE version 2	Yes
Improved security granularity for VIPARANGE DVIPAs	Yes
FTP support for password phrases	Optional
Removed superuser requirement for Policy Agent and IKE daemon	Yes
Enhanced IPsec support for FIPS 140 cryptographic mode	Yes
Configuration Assistant management of multiple z/OS Communications Server releases	Yes
Configuration Assistant discovery of stack IP addresses	Yes
Configuration Assistant common configuration of multiple stacks	Yes
Configuration Assistant enhancements	Yes
Wildcard support for the PORTRANGE statement	Yes
HiperSockets optimization for intraensemble data networks	Yes
Support for additional VLANs for an OSA-Express QDIO port	Yes
Increased CTRACE and VIT capacity	Optional
OSA-Express4S QDIO IPv6 checksum and segmentation offload	Yes
System resolver autonomic quiescing of unresponsive name servers	Yes
Improved convergence for sysplex distribution routing when joining a sysplex	No
CSSMTP extended retry	Yes
Monitor CSM constrained conditions for sysplex autonomics	Optional
Enhanced FTP support for extended address volumes	Yes
FTP support for large-format data sets	Yes
NMI for retrieving system resolver configuration information	Yes
Simplified authorization requirements for real-time TCP/IP network monitoring NMI	Yes
Enhancements to the TN3270E server	Yes

Table 1. Roadmap to functions (continued)

Functional enhancement	Exploitation actions
CSSMTP enhancements	Yes
Support for bypassing host name lookup in otelnetd	Yes
TCP/IP serviceability enhancements	Yes
Intrusion detection services support for Enterprise Extender	Yes
Enterprise Extender firewall-friendly connectivity test	Yes
HPR packet trace analyzer for Enterprise Extender	Yes
Improved APPN routing resilience	No
Performance improvements for Enterprise Extender traffic	Yes

V2R1 new function summary

Economics and platform efficiency

Shared Memory Communications over RDMA adapter (RoCE) virtualization

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

Restriction:

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

Dependencies:

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

Shared Memory Communications over RDMA adapter (RoCE) virtualization

To exploit the Shared Memory Communications over RDMA Adapter (RoCE) virtualization function, complete the tasks in Table 2.

Table 2. Shared Memory Communications over RDMA adapter (RoCE) virtualization

Task	Reference
Configure at least one IBM 10GbE RoCE Express feature in HCD. If you have existing 10GbE RoCE Express definitions, update the definition to include a VFN value. For each unique combination of PCHID and VFN values, configure a unique function ID (FID) value.	<i>z/OS Hardware Configuration Definition (HCD) Reference Summary</i>

Table 2. Shared Memory Communications over RDMA adapter (RoCE) virtualization (continued)

Task	Reference
<p>Configure or update the GLOBALCONFIG SMCR statement in the TCP/IP profile.</p> <ul style="list-style-type: none"> If you have existing PFID definitions on the GLOBALCONFIG statement and you changed the FID value in the HCD for the 10GbE RoCE Express feature, update the existing GLOBALCONFIG PFID values to specify the new FID value. If you define PFID values, choose PFID values that represent physically different 10GbE RoCE Express features to provide full redundancy support. 	<p>GLOBALCONFIG statement in z/OS Communications Server: IP Configuration Reference</p> <p>Shared Memory Communications over Remote Direct Memory Access in z/OS Communications Server: IP Configuration Guide</p>
Verify the GLOBALCONFIG SMCR settings by issuing the Netstat CONFIG/-f command.	Netstat CONFIG/-f report in z/OS Communications Server: IP System Administrator's Commands
Display the status of the 10GbE RoCE Express feature by issuing the D PCIE command.	Displaying PCIE information in z/OS MVS System Commands
Verify that the correct VFN and PNetID values are assigned to the dynamic 10GbE RoCE Express TRLEs by issuing the D NET,ID=trle, or D NET,TRL,TRLE=trle command.	DISPLAY ID command and DISPLAY TRL command in z/OS Communications Server: SNA Operation
Display information about a 10GbE RoCE Express interface by issuing the Netstat DEvlinks/-d command and specifying the 10GbE RoCE Express interface.	Netstat DEvlinks/-d report in z/OS Communications Server: IP System Administrator's Commands

Chapter 2. z/OS Migration

Modify GLOBALCONFIG SMCR PFID definitions

Description: In z/OS Communications Server V2R1, VTAM provided physical function services for IBM 10GbE RoCE Express features used for Shared Memory Communications via Remote Direct Memory Access (SMC-R) processing. This allowed multiple TCP/IP stacks operating in the same logical partition (LPAR) to share a RoCE Express feature by configuring and activating the same Peripheral Component Interconnect Express (PCIe) function ID (PFID) representation of the feature. Starting with z/OS V2R1 with APARs OA44576 and PI12223 applied on a z13 level machine, each TCP/IP stack must have unique PFID values to represent the RoCE Express feature.

Element or feature:	z/OS Communications Server.
When change was introduced:	z/OS V2R1 with APARs OA44576 and PI12223 applied.
Applies to migration from:	z/OS V2R1.
Timing:	Before the first IPL of z/OS.
Is the migration action required?	Yes, if all the following conditions are true: <ul style="list-style-type: none">• You used Shared Memory Communications – RDMA in z/OS Communications Server V2R1.• The 10GbE RoCE Express features operated in a dedicated RoCE environment.• You are using z/OS V2R1 Communications Server with APARs OA44576 and PI12223 applied on a z13 level machine.
Target system hardware requirements:	z13.
Target system software requirements:	z/OS V2R1 with APARs OA44576 and PI12223 applied.
Other system (coexistence or fallback) requirements:	None.
Restrictions:	None.
System impacts:	None.
Related IBM Health Checker for z/OS check:	None.

Steps to take:

Before starting your TCP/IP stacks that activate 10GbE RoCE Express features, perform the following steps:

1. Use the hardware configuration definition (HCD) to define a unique FID value for each TCP/IP stack that will be activating the 10GbE RoCE Express feature. You must also assign a virtual function number (VFN) for each potential user of the 10GbE RoCE Express feature.

2. Modify the GLOBALCONFIG SMCR statement in the TCP/IP profile to specify the PFID values that are assigned for this stack. Update the GLOBALCONFIG statements for all TCP/IP stacks that activate a given 10GbE RoCE Express before starting any of the TCP/IP stacks. The PFID values should correspond to the FID values you defined in the HCD.

Reference information:

- z/OS Communications Server: IP Configuration Guide

Chapter 3. IP Configuration Guide

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Restriction

Indicates certain conditions are not supported; limitations on a product or facility

Requirement

Dependencies, prerequisites

Shared Memory Communications over Remote Direct Memory Access

Shared Memory Communications over RDMA terms and concepts

The following terms and concepts apply to Shared Memory Communications over Remote Direct Memory Access (SMC-R). You can use this list as needed for brief descriptions when you are using other SMC-R information.

Associated RNIC interface

An IBM 10GbE RoCE Express interface that is associated with an SMC-R capable interface that has the same physical network ID.

IBM 10GbE RoCE Express feature

A feature that enables Remote Direct Memory Access by managing low-level functions that the TCP/IP stack typically handles.

IBM 10GbE RoCE Express interface

An interface that is dynamically created by TCP/IP that uses a particular port of an IBM 10GbE RoCE Express feature.

Internal path

The System z[®] internal PCIe infrastructure for IBM 10GbE RoCE Express features. The internal path of a 10GbE RoCE Express feature is determined based on how the feature is plugged into the System z I/O drawers.

Operating system images

Logical partitions (LPARs) or guest virtual machines that operate in the same central processor complex (CPC).

Physical channel ID (PCHID)

A 2-byte hexadecimal value that is used to uniquely define a RoCE Express feature.

PCIe function ID (PFID)

A value that is configured on the SMCR parameter of the GLOBALCONFIG statement in the TCP/IP profile to identify an IBM 10GbE RoCE Express feature. The PFID represents a physical RoCE Express feature and must match a FID value configured in the hardware configuration definition (HCD) for the PCHID value that identifies the feature. When the RoCE Express feature is installed on a System z that supports a shared RoCE environment, the same physical feature can be shared with other operating system images, and multiple PFID values specified on the same GLOBALCONFIG statement can represent different ports on the same physical RoCE Express feature.

Peripheral Component Interconnect Express (PCI Express, or PCIe)

A local bus that provides the high-speed data path between the processor and an attached IBM 10GbE RoCE Express feature.

Physical network ID (PNet ID)

A value that is defined to uniquely identify your physical layer 2 LAN fabric or physical broadcast domain. You can use this value to logically associate the System z features, adapters, and ports to be physically connected to your network. You specify the PNet ID in a single step within the hardware configuration definition (HCD), and all operating systems of all associated central processor complexes (CPCs) can dynamically learn and use this definition.

RDMA network interface card (RNIC)

An IBM 10GbE RoCE Express feature that enables Remote Direct Memory Access by managing low-level functions that are typically handled by the TCP/IP stack.

RDMA over Converged Ethernet (RoCE)

An InfiniBand Trade Association (IBTA) standard that enables Remote Direct Memory Access over Converged Ethernet.

Redundancy level

For an SMC-R link group, this value indicates the level to which z/OS Communications Server can provide dynamic failover processing if there is a failure of an underlying IBM 10GbE RoCE Express interface or the associated network hardware.

Reliable connected queue pair (RC QP)

A logical connection between two virtual servers that enables that specific pair of servers to use RDMA communications between themselves.

Remote Direct Memory Access (RDMA)

A high-speed, low-latency network communications protocol in which data is transferred directly to the memory of a remote host with no involvement from the remote host processors or operating system.

Remote memory buffer (RMB)

Local memory that is used to receive inbound data over an SMC-R link. The remote peer places TCP socket application data directly into the RMB that the local peer assigns to receive data for the TCP connection. The local peer then copies the data from the RMB into the receive buffer of the receiving socket application.

Rendezvous processing

The sequence of TCP connection management flows that are required to establish SMC-R communications between two peers.

RMB element (RMBE)

The specific portion of an RMB that is associated with a specific TCP connection. Each RMB is partitioned into RMBEs.

RoCE environments

Depending on the level of hardware that is used, the 10GbE RoCE Express feature operates in either a shared or a dedicated RoCE environment.

Dedicated RoCE environment

A dedicated RoCE environment applies to an IBM zEnterprise® EC12 (zEC12) with driver 15, or an IBM zEnterprise BC12 (zBC12). In this environment, only a single operating system instance can use a physical RoCE feature. Multiple operating system instances cannot concurrently share the feature.

Shared RoCE environment

A shared RoCE environment applies to an IBM z13 (z13) or later system. In this environment, multiple operating system instances can concurrently use or share the same physical RoCE feature. With IBM z13 (z13) or later systems, the RoCE Express feature operates in a shared environment even if only one operating system instance is configured to use the feature.

SMC-R link

A logical point-to-point link between two virtual servers that is used for SMC-R communications.

SMC-R link group

A logical grouping of equal SMC-R links between two communicating peers.

Staging buffer

Memory that the TCP/IP stack allocates for outbound SMC-R data. Staging buffers are not associated with specific SMC-R links or link groups, and are used by all TCP connections that traverse SMC-R links on this stack. Only local applications access the staging buffer storage.

Remote Direct Memory Access over Converged Ethernet

Remote Direct Memory Access (RDMA) enables a host to make a subset of its memory directly available to a remote host. After RDMA connectivity is established between two TCP/IP stacks, either host can write to the memory of the remote host with no involvement from the remote host processors or operating system. RDMA enables efficient communications between the hosts because all the low-level functions are managed by RDMA network interface cards (RNICs) that are connected to each host, rather than by the software stack as is normally done for TCP/IP communications.

RDMA was traditionally confined to high-performance computing (HPC) environments where the cost of maintaining RDMA-capable network fabrics such as InfiniBand was justified given the emphasis of performance over cost. Now that RDMA is available on Ethernet fabrics through standards such as RDMA over Converged Ethernet (RoCE), the cost of adopting RDMA is lower because it can be enabled on the existing Ethernet fabrics that are used for IP network communications. Standard Ethernet management techniques are used to configure the RNIC adapters.

z/OS Communications Server provides support for sockets over RDMA by using SMC-R protocols. VTAM device drivers use Peripheral Component Interconnect Express (PCIe) operations to manage IBM 10GbE RoCE Express features that are defined to z/OS. Up to 16 10GbE RoCE Express PFID values can be defined to a z/OS TCP/IP stack.

Comparing 10GbE RoCE Express feature environments

An IBM 10GbE RoCE Express feature operates in either a dedicated or a shared RoCE environment.

z/OS Communications Server dynamically determines the operating environment supported by this generation of System z when the first 10GbE RoCE Express feature is activated. Any additional RoCE Express features that are activated operate in the same environment that is determined when the first feature is activated.

Dedicated RoCE environment:

In a dedicated RoCE environment, z/OS Communications Server uses PCIe Physical Function services to manage the RoCE Express feature.

A RoCE Express feature operating in a dedicated RoCE environment can only be used by a single LPAR. z/OS allows the feature to be shared by up to eight TCP/IP stacks within a single LPAR. Each TCP/IP stack uses the same PCIe function ID (PFID) value to define its representation of the RoCE Express feature. The PFID value is defined by using traditional hardware configuration definition (HCD) tools. In a dedicated RoCE environment, only one of the two available ports can be used at a time.

Figure 1 is an example of a 10GbE RoCE Express feature that is defined in a dedicated RoCE environment. A single z/OS image (z/OS 2) is using the 10GbE RoCE Express features identified by PCHID values 100 and 200. Two PFID values (0001 and 0016) are defined to represent the features, and the PFID values correspond to the FID values defined in the HCD for the features. No other z/OS images can use these two features, although up to eight stacks on z/OS 2 can use the features. In this example, port 1 is used on both features, and port 2 cannot be used when port 1 is in use.

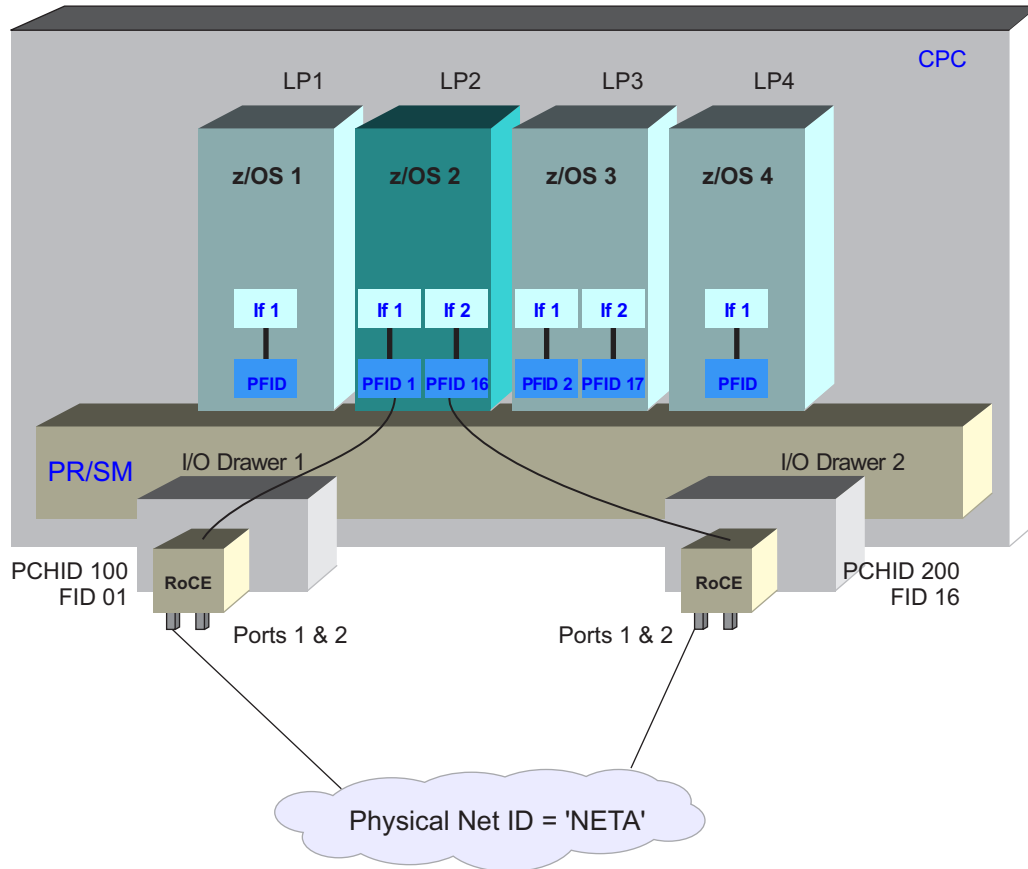


Figure 1. 10GbE RoCE Express feature in a dedicated RoCE environment

A dedicated RoCE environment mode is supported on an IBM zEnterprise EC12 (zEC12) with driver 15, or an IBM zEnterprise BC12 (zBC12).

Shared RoCE environment:

In a shared RoCE environment, z/OS Communications Server uses PCIe Virtual Function (VF) services to manage the RoCE Express feature, and System z provides the Physical Function management.

A RoCE Express feature operating in a shared RoCE environment can be shared by up to 31 operating system instances or TCP/IP stacks across the same central processor complex (CPC). Each TCP/IP stack within an LPAR, or each operating system instance, uses a unique FID value to define its representation of the RoCE Express feature. These FID values are defined by using HCD tools. In the shared environment, both RoCE ports can be used at the same time.

Guideline: For a TCP/IP stack, the FID value is represented by a PFID value on the GLOBALCONFIG statement in the TCP/IP profile. In addition, the same or different TCP/IP stacks can share the two RoCE Express ports of an individual RoCE Express feature if different PFID values are configured for the individual ports.

Figure 2 is an example of a 10GbE RoCE Express feature operating in a shared RoCE environment. Two z/OS images are using the 10GbE RoCE Express features identified by PCHID values 100 and 200. Four unique PFID values are defined, two per z/OS image, to represent the usage of the features. The PFID values correspond to the FID values defined for the features in the HCD. In this example, the combination of PFID and port is unique for all four interfaces, but TCP/IP stacks are sharing the same feature and port.

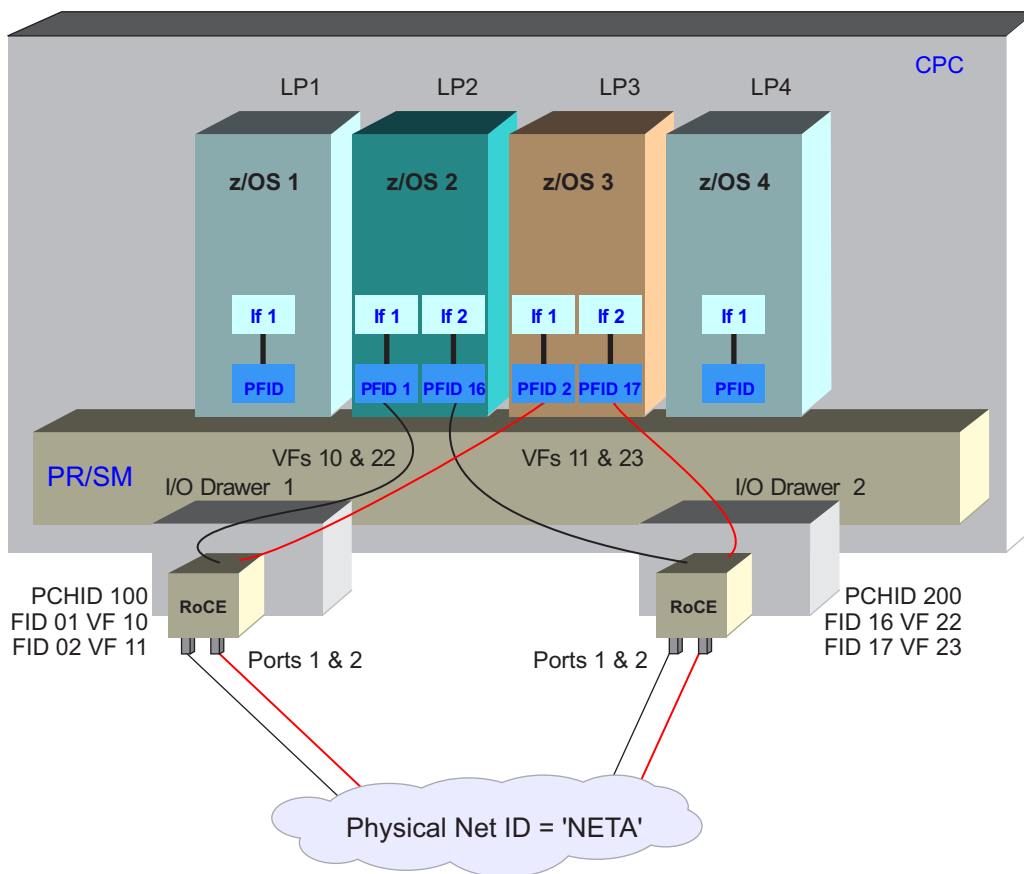


Figure 2. 10GbE RoCE Express feature in a shared RoCE environment

Guideline: For full redundancy at a TCP/IP stack, configure PFID values that are associated with physically separate 10GbE RoCE Express features. For example, in Figure 2, for z/OS 2, the two features are in different System z I/O drawers. Therefore, the failure of one I/O drawer or one feature does not affect the other I/O drawer or feature.

A shared RoCE environment must be used on the IBM z13 (z13) or later systems.

SMC-R links

After two Shared Memory Communications over RDMA (SMC-R) peers recognize during rendezvous processing that shared memory communications are possible, a logical point-to-point SMC-R link is established between the stacks over the RDMA

over Converged Ethernet (RoCE) fabric. An SMC-R link, as shown in Figure 3 on page 16, is uniquely defined by a combination of the following information:

- Remote and local virtual MAC (VMAC) values

A VMAC is a 6-byte value that is a virtual representation of the physical MAC address for an IBM 10GbE RoCE Express interface (shown as RNIC in Figure 3 on page 16).

Each TCP/IP stack that activates a particular 10GbE RoCE Express interface is assigned a different VMAC value.

- Remote and local global ID (GID) values

A GID is a 16-byte value. z/OS Communications Server generates the GID values by converting the VMAC address of the 10GbE RoCE Express interface into an IPv6 link-local address.

- Remote and local queue pair (QP) values

A QP represents one end of the logical connection between two RDMA peers. A combination of two reliable connected queue pairs (RC QPs) forms a single logical point-to-point link. The link enables exactly one pair of communicating RDMA peers to send and receive messages and initiate RDMA activities between themselves. A 10GbE RoCE Express interface associates units of work, such as confirmation of sent data or indication of received data, to a specific QP to enable the SMC-R protocols to identify which TCP/IP stack to notify for the unit of work. The stack then determines which TCP connection that uses that RC QP is to process the data.

- Virtual LAN (VLAN) ID

You can optionally use VLANs to isolate application traffic into different virtual networks on the same physical Ethernet.

- If you use VLANs, the VLAN ID specified on the IPAQENET or IPAQENET6 INTERFACE statement is used as an attribute to create unique SMC-R links between the peers for unique VLANs. In other words, the SMC-R links are VLAN qualified.
- If you do not use VLANs, no VLAN ID is used to define the SMC-R links between the peers. In other words, the SMC-R links are not VLAN qualified.

For more information about using VLANs, see “VLANID considerations” on page 18.

Application traffic between the two peers that uses the same remote and local VMACs, GIDs, and QPs, and that is associated with the same VLAN when VLANs are defined, can use the same SMC-R link.

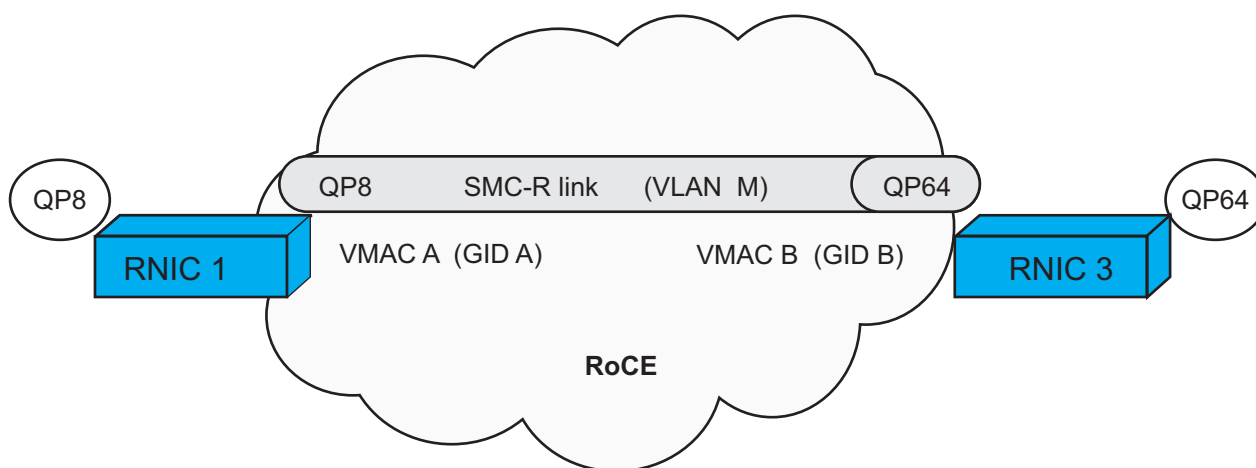


Figure 3. Identifying an SMC-R link

In addition to the 7-tuple (local VMAC, GID, QP# + remote VMAC, GID, QP# + VLAN ID) that uniquely defines an SMC-R link, each peer assigns a 4-byte SMC-R link ID value that uniquely identifies the SMC-R link within its own resource space. This SMC-R link ID is exchanged between peers and is intended to be used for network management and diagnostic purposes. For instance, you can use the SMC-R link ID to filter Netstat report information that is related to a specific SMC-R link. For more information, see [Displaying SMC-R information](#).

An SMC-R link supports multiple TCP connections between the same two peers, as shown in Figure 4. The first TCP connection between the peers establishes the SMC-R link, and subsequent TCP connections between the peers can use the previously established link. Because subsequent TCP connections between the peers can use the previously established link, extra SMC-R link setup costs between the peers are avoided.

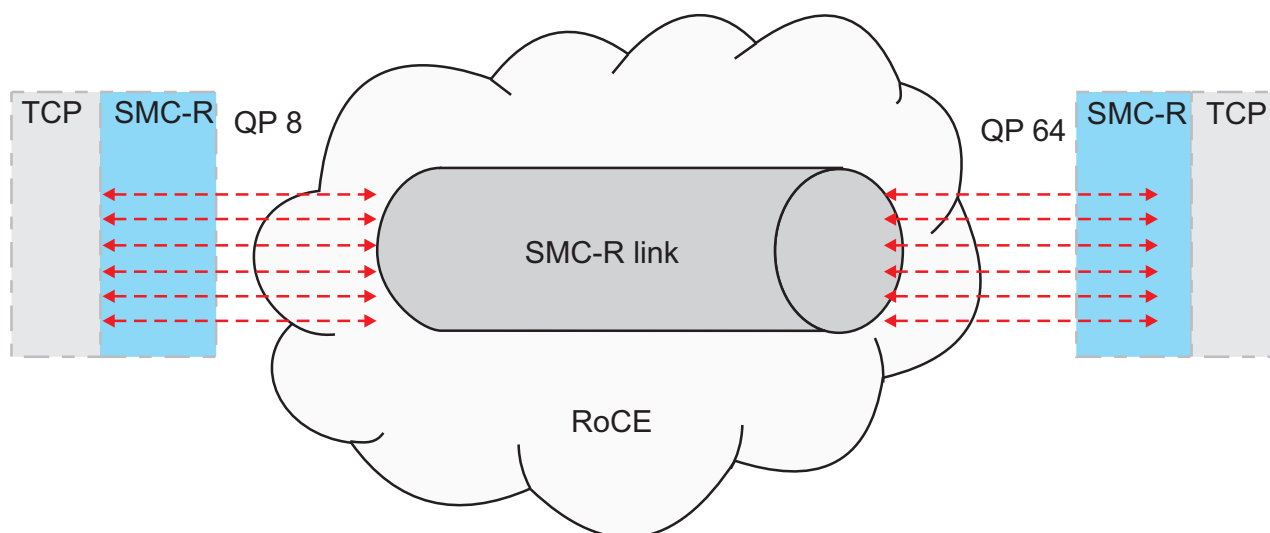


Figure 4. Multiple TCP connections over one SMC-R link

SMC-R link groups

A Shared Memory Communications over RDMA (SMC-R) link group is a logical grouping of SMC-R links between two communicating peers, as shown in Figure 5 on page 18. An SMC-R link group is formed when the initial SMC-R link is established between two peers.

All SMC-R links in an SMC-R link group must be *equal* links. SMC-R links are considered to be equal when all of the following conditions are true:

- The links provide access to the same RDMA memory buffers at the remote peer virtual servers.
- The links have the same VLAN ID, or they do not use a VLAN ID.
- The links have the same TCP server and TCP client roles or relationship.

A peer that is acting as the TCP connection server has different responsibilities for establishing and maintaining SMC-R communications than a peer that is acting as the TCP connection client. Unique SMC-R link groups are established between two peers when the peers act as both servers and clients for TCP connections.

When the initial SMC-R link is established and a second IBM 10GbE RoCE Express interface is available, Communications Server establishes an equal SMC-R link between the peers. The 10GbE RoCE Express interfaces are shown as RNICs in Figure 5 on page 18.

Adding a second SMC-R link to the SMC-R link group provides the following benefits:

- High availability

To maintain high availability, you need two SMC-R links between SMC-R peers. If a failure occurs with one SMC-R link, TCP connections that are using the failing SMC-R link are switched to the other active link in the link group and disruptions to application workloads are avoided. For more information, see “High availability considerations” on page 21.

- Workload balancing

TCP connections are distributed across the SMC-R links in a link group, increasing bandwidth and avoiding bottlenecks.

Rule: Workload balancing within an SMC-R link group occurs only when both the local and the remote peers have two 10GbE RoCE Express interfaces, and thus two SMC-R links are established in the link group.

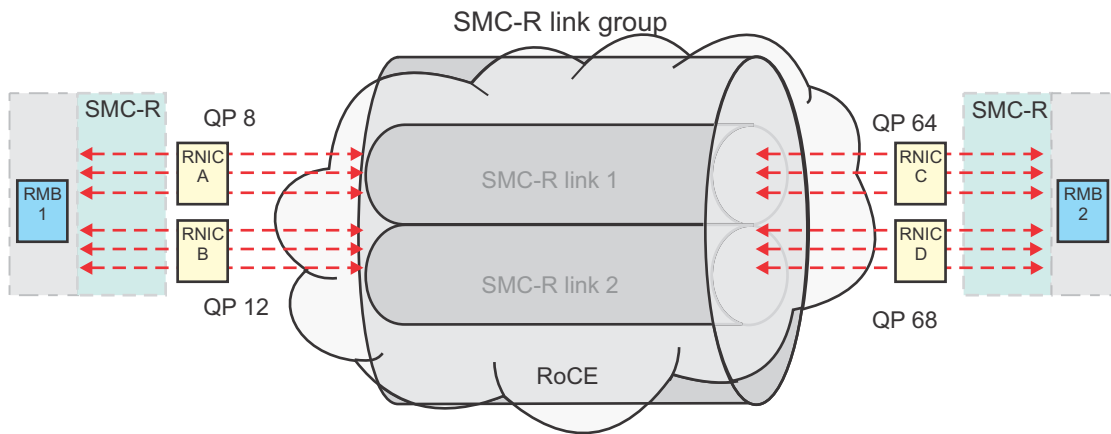


Figure 5. SMC-R link group

Because SMC-R links within a link group are considered equal, TCP connections can be assigned to any SMC-R link within the group. Furthermore, the client and the server can choose to assign the TCP connection to different SMC-R links within the group, and can move the TCP connections from one SMC-R link to another within the group. For example, in Figure 5, client traffic might flow over one SMC-R link (between RNICs A and C) and server traffic might flow over the other SMC-R link (between RNICs B and D). The peers do not have to exchange knowledge of which physical 10GbE RoCE Express interface is being used for data transmission, and the recipient is only aware that data was placed into the RDMA memory buffer.

An SMC-R link group remains active for up to 10 minutes after the last TCP connection that is using the link group is stopped.

Using Shared Memory Communications over RDMA

Configuration considerations for Shared Memory Communications over RDMA

Before you configure Shared Memory Communications over RDMA (SMC-R), consider the following factors:

- Decide whether to use VLANs. For more information, see “VLANID considerations.”
- Identify the physical connections between stacks and IBM 10GbE RoCE Express features. For more information, see “Physical network considerations” on page 19.
- Provide for physical redundancy for high availability. For more information, see “High availability considerations” on page 21.
- Determine the storage requirements. For more information, see Storage considerations.
- Verify the system requirements. For more information, see “System requirements for SMC-R in a dedicated RoCE environment” on page 27 and “System requirements for SMC-R in a shared RoCE environment” on page 28.

VLANID considerations: The VLANID operand is optional on IPAQENET and IPAQENET6 INTERFACE statements with the OSD channel path ID type (CHPIDTYPE OSD). On a specific OSA transport resource list element (TRLE) basis, Communications Server enforces consistent VLAN definitions for INTERFACE statements that are associated with the same OSA TRLE.

For example, when VLANs are not used, the stack configuration allows only a single INTERFACE statement, and the VLANID operand is omitted on that INTERFACE statement. When VLANs are used, multiple INTERFACE statements are allowed and each INTERFACE statement must specify a unique VLANID value.

The OSD VLAN attributes of the IPAQENET or IPAQENET6 interface are propagated to the IBM 10GbE RoCE Express interfaces (associated RNIC) that have the same physical network identifier (PnetID) value. See Physical network considerations for more details on PnetID. Whether SMC-R communications use virtual LANs depends on the definition of the SMC-R capable OSD interfaces that are extended to the associated 10GbE RoCE Express interfaces. The 10GbE RoCE Express feature can be shared by TCP/IP stacks that are configured to use different VLAN capabilities for the 10GbE RoCE Express feature.

Depending on the operating mode, the number of VLANID values that can be used per 10GbE RoCE Express feature has the following limits:

- When the RoCE Express feature operates in a dedicated RoCE environment, up to 126 unique VLANID values can be used per port.
- When the RoCE Express feature operates in a shared RoCE environment, up to 126 unique VLANID values can be used per port. In addition, each virtual function (VF) PFID representation of the feature can use up to 16 VLANID values, although internal RoCE Express feature limitations might further reduce that maximum value for individual PFID representations.

Result: Multiple VF representations of the same RoCE Express feature can use the same VLANID value, and only one of the available 126 VLANID values is used.

Results: If you define more unique VLANID values for one PnetID on the SMC-R capable INTERFACE statements than the 10GbE RoCE Express feature can support, the VLANID values of the last INTERFACE statements to be activated are not registered with the 10GbE RoCE Express feature. The IPAQENET or IPAQENET6 interfaces can start, but TCP connections that are established over these interfaces cannot use SMC-R communications. Netstat ALL/-A reports that display the TCP connections include the following diagnostic information for the connection:

```
SMCSTATUS:      INACTIVE
SMCREASON:      00005206 - VLAN ID NOT FOUND
```

Physical network considerations: A physically separate IBM 10GbE RoCE Express feature is provided to use RDMA over Converged Ethernet (RoCE) on System z. This feature is used with the existing Ethernet connectivity that OSA provides. The 10GbE RoCE Express feature provides access to the same physical Ethernet fabric that is used for traditional IP connectivity. For more information about the Ethernet switch requirements for RoCE, see “Setting up the environment for Shared Memory Communications over RDMA” on page 29 and *IBM z Systems Planning for Fiber Optic Links*.

The operating systems must logically group the associated physical ports of both the 10GbE RoCE Express and OSA adapters based on their required physical connectivity. Each central processor complex (CPC) connects to a physical network by using both OSA and 10GbE RoCE Express ports. You can use two RoCE Express ports at most to connect to a physical network at a given time, but you can use as many OSA adapters as necessary for your network bandwidth or usage requirements. An example of this logical grouping, using two OSA adapters and

two RoCE Express features, is shown in Figure 6.

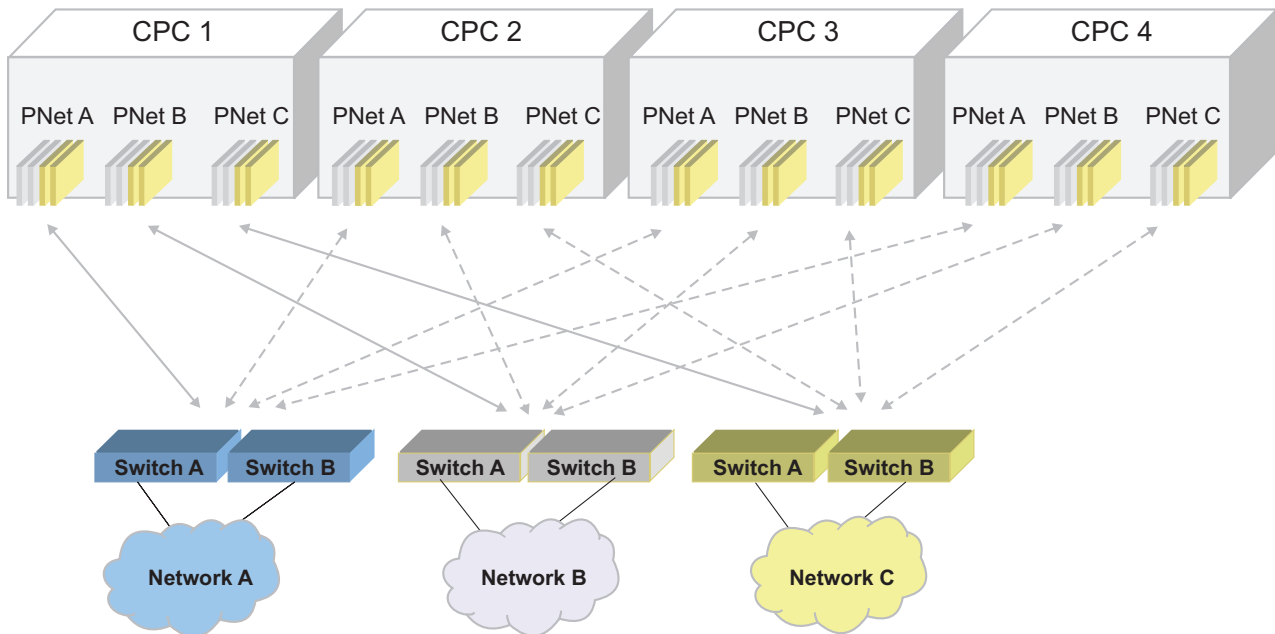


Figure 6. Physical networks

One TCP/IP stack can define up to 16 Peripheral Component Interconnect Express (PCIe) function ID (PFID) values. Each PFID value must match a FID value configured in the hardware configuration definition (HCD).

- In a dedicated RoCE environment, each PFID represents a unique PCHID definition of a RoCE Express feature, and only one of the two RoCE Express ports for the feature can be used at a time.
- In a shared RoCE environment, each PFID represents a virtual function (VF) usage of a RoCE Express feature, and multiple PFID values can be associated with the same physical feature and port.

The TCP/IP stack must be able to determine which physical network is connected to a particular 10GbE RoCE Express interface, so that the 10GbE RoCE Express interface can be associated with the SMC-R capable IPAQENET or IPAQENET6 interfaces that connect to that same physical network. For instance, in Figure 6, three distinct and physically separated networks can be accessed by using SMC-R communications.

The concept of a physical network identifier (PNet ID) was created to simplify this physical network configuration task. With the convention of a PNet ID, you can define a value to represent the ID or name of your physical layer 2 LAN fabric or physical broadcast domain. The System z physical ports that are to be connected to the associated physical networks are then logically associated with their respective PNet IDs. The PNet ID then becomes an attribute of the physical port of the feature or adapter, describing how this feature or adapter is physically connected to your data center network. You can specify the PNet ID in a single step within the hardware configuration definition (HCD), enabling all operating systems of all associated CPCs to dynamically learn and use this definition.

To match the 10GbE RoCE Express features with the correct OSA SMC-R capable adapters, you must define a PNet ID value for both the 10GbE RoCE Express interface (physical port) and the corresponding OSA adapters (physical port)

within the HCD. The OSA ports correspond to the stack IPAQENET and IPAQENET6 interfaces. VTAM and the TCP/IP stack then dynamically learn the PNet IDs for the 10GbE RoCE Express interface and the OSA interfaces when the 10GbE RoCE Express interface or the OSD interface is started. The 10GbE RoCE Express interface is associated with only SMC-R capable OSA interfaces that have the same PNet ID value defined.

Guideline: The TCP/IP stack does not validate the layer 2 physical network topology or broadcast domain. PNet IDs are values that you assign, and the operating systems learn and use these assigned values but cannot validate them within the Ethernet switched fabric. Therefore, the operating system does not assure or enforce any physical network separation or isolation across different physical networks. To physically isolate unique physical networks, you must ensure that traffic on network A cannot reach hosts on network B.

You can use virtual LANs (VLANs) to logically separate a physical network. If you configure multiple PNet IDs for SMC-R, then you must ensure that each VLAN or subnet in your configuration does not span more than one PNet ID. The physical network that a PNet ID represents can include multiple subnets, but each subnet must correspond to a specific PNet ID.

SMC-R processing requires the use of subnet masks. For more information, see “Configuring Shared Memory Communications over RDMA” on page 30.

For more information about the HCD, see *z/OS HCD Planning* and *z/OS HCD User's Guide*.

High availability considerations: Shared Memory Communications over RDMA (SMC-R) enables high-speed peer-to-peer connections over the RDMA over Converged Ethernet (RoCE) fabric between reliable connected queue pairs (RC QPs). SMC-R defines the RC QPs as an SMC-R link, and SMC-R links are logically grouped into SMC-R link groups. For more information, see “SMC-R links” on page 14 and “SMC-R link groups” on page 17.

IBM 10GbE RoCE Express features at each host are required for SMC-R communications. After a TCP connection dynamically and successfully switches to SMC-R, it cannot revert to standard TCP/IP communications. Therefore, to achieve network high availability for SMC-R, it is critical to provide redundant physical network connectivity.

If the underlying 10GbE RoCE Express interface or the associated network hardware fails, the z/OS host provides dynamic failover processing that transparently moves the TCP connections from the SMC-R links that are using the failed 10GbE RoCE Express interface to another SMC-R link in the link group. If no other SMC-R link in the link group is available at the time of failure, the TCP connections are lost. To have a second redundant SMC-R link within a link group, two 10GbE RoCE Express interfaces must be defined and active.

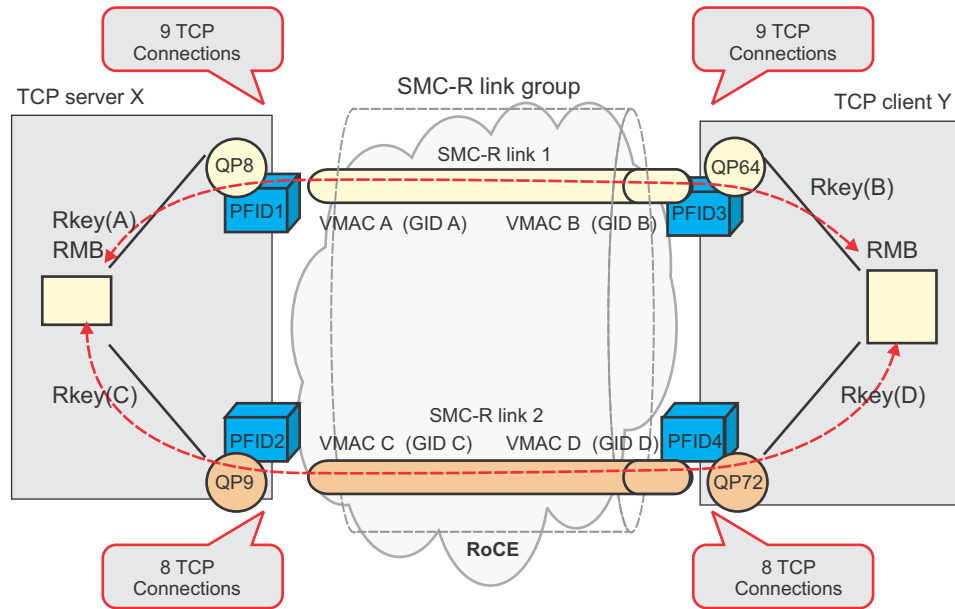


Figure 7. Redundant SMC-R links in an SMC-R link group

If the 10GbE RoCE Express interfaces operate in a shared RoCE environment , an SMC-R link group might be considered redundant, even though the 10GbE RoCE Express interfaces associated with SMC-R links use the same physical 10GbE RoCE Express feature.

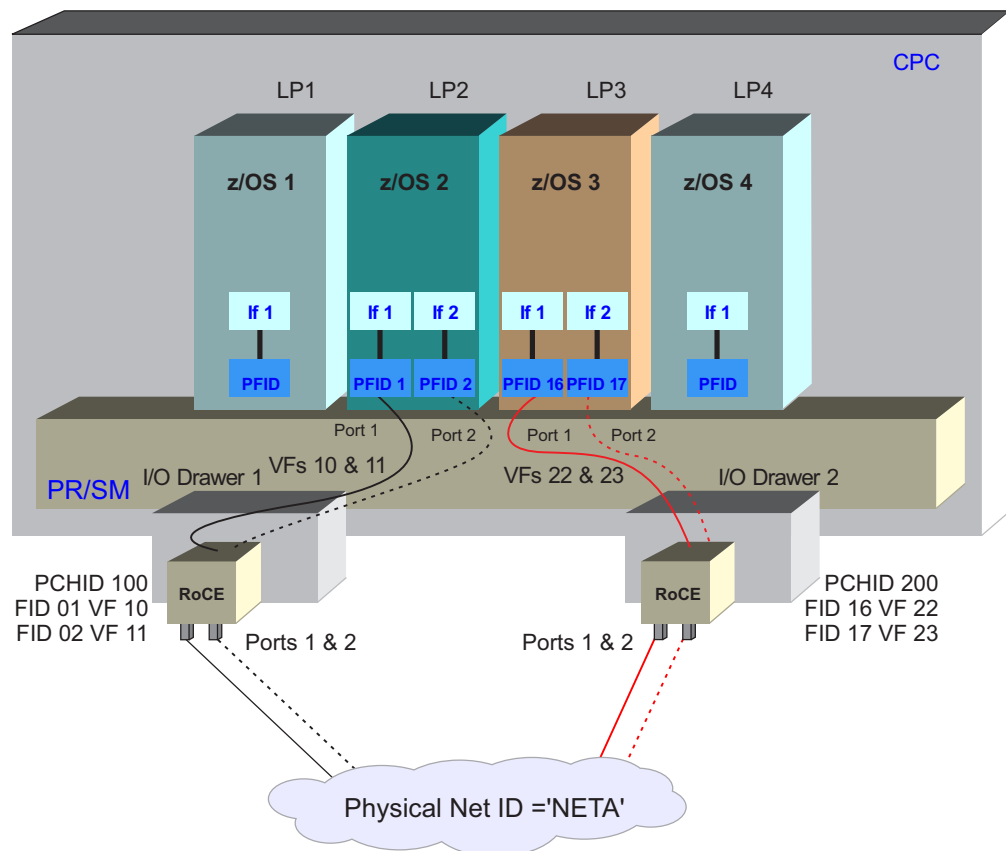


Figure 8. Misleading full redundancy configuration in a shared RoCE environment

For instance, in Figure 8, z/OS 2 has multiple PFID values defined, but the PFID values represent different ports on the same 10GbE RoCE Express feature. When TCP connections that use SMC-R are established in this configuration, an SMC-R link group, with two SMC-R links, is created. The two SMC-R links make this SMC-R link group appear to have full redundancy, but an failure involving the 10GbE RoCE Express feature will result in failures of both PFIDs and all the associated interfaces. This in turn will cause failures for both SMC-R links within the SMC-R link group. As a result, dynamic failover processing will not occur, and TCP connections that use those SMC-R links will fail. A configuration of this type is identified by a value of "Partial (single local PCHID, unique ports)" in Netstat Devlinks/-d reports involving the SMC-R link group. For more information, see Redundancy levels.

To ensure that a redundant path exists in a shared RoCE environment, you must design your connectivity to ensure that the PFID values used by a given TCP/IP stack represent physically different 10GbE RoCE Express features. Two 10GbE RoCE Express features are physically different if they are configured with different PCHID values. See Figure 2 on page 14 for an example of using physically different 10GbE RoCE Express features in a shared RoCE environment.

As shown in Figure 7 on page 22, when both SMC-R peers have two active 10GbE RoCE Express interfaces, TCP connections are distributed across the links. TCP connection data can use either SMC-R link, even if the TCP connection is considered to be assigned to a specific SMC-R link.

If a failure is experienced involving one SMC-R link, all the TCP connections are moved automatically to the other SMC-R link. For example, as shown in Figure 9, when SMC-R link 2 fails, all connections are moved to SMC-R link 1. After recovery, when a new SMC-R link is established, new TCP/IP connections are moved to the new link to balance utilization of the RoCE physical resources. Existing connection might also be moved to the new link.

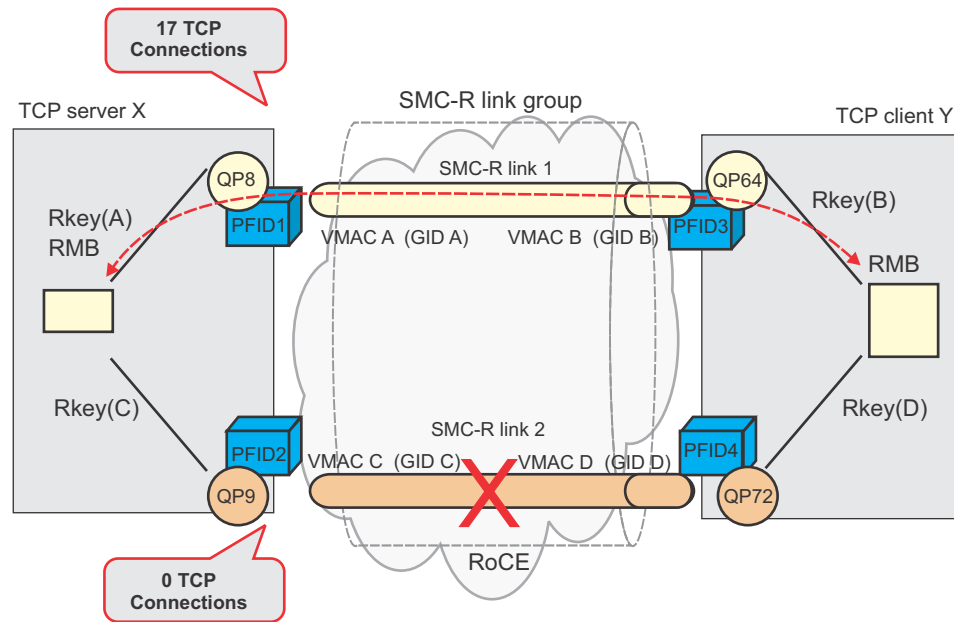


Figure 9. Failover processing within an SMC-R link group

Figure 7 on page 22 and Figure 9 do not show the RoCE switches, but ideally, redundant physical switches are also present.

If both SMC-R peers do not have multiple active 10GbE RoCE Express interfaces, then the SMC-R link group does not provide an ideal level of TCP connection resiliency. Figure 10 on page 25 is an example of a configuration where one peer (the server host) has two active 10GbE RoCE Express interfaces, but the other peer (the client host) has just one. In this situation, the server still creates two SMC-R links, one per active interface, so the server can still move the TCP connections between SMC-R links if a 10GbE RoCE Express interface fails. The client, however, cannot move the TCP connections if its 10GbE RoCE Express interface fails because no alternative path exists. Because only one peer can provide recovery capability, this configuration has partial redundancy.

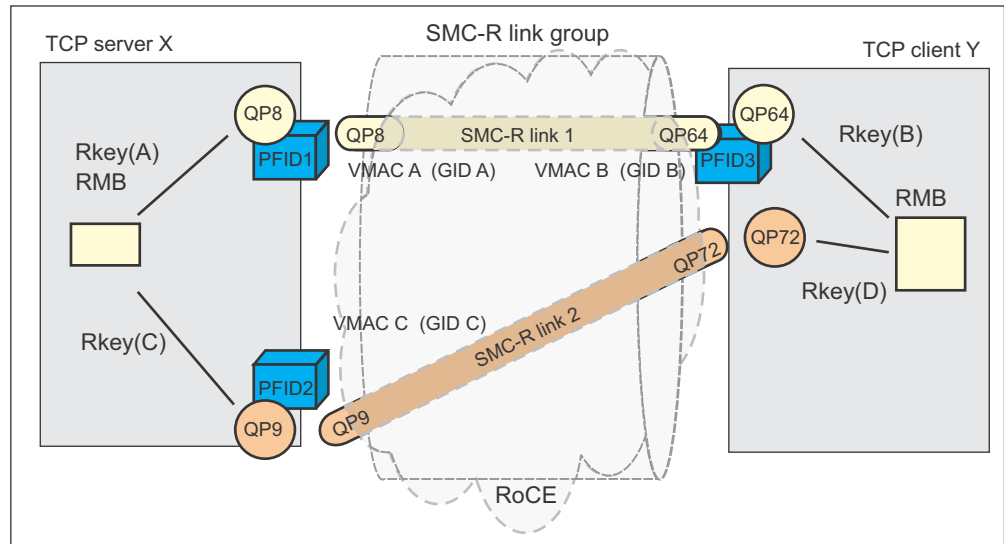


Figure 10. Partially redundant SMC-R links

If neither the server or the client has multiple active 10GbE RoCE Express interfaces, as shown in Figure 11, then the SMC-R link group is composed of a single SMC-R link. If a 10GbE RoCE Express interface fails in this configuration, the TCP connections cannot be recovered or moved, so they are all lost. This type of SMC-R link is called a single link, and the configuration has no redundancy capability.

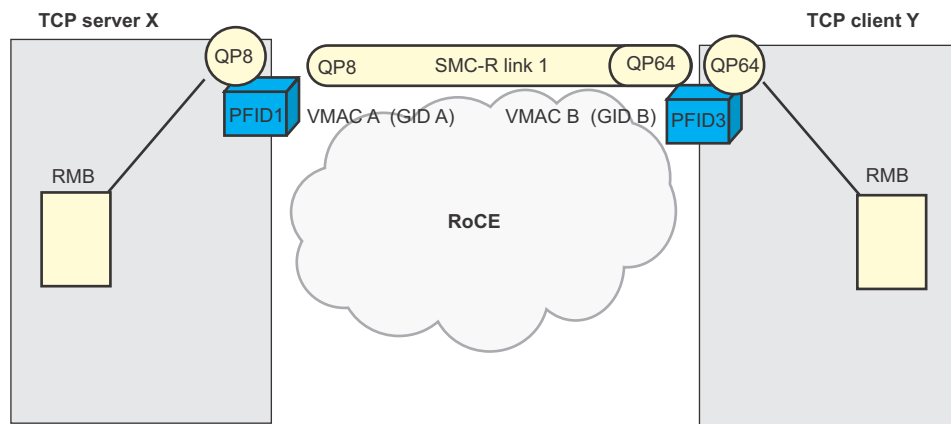


Figure 11. SMC-R link group with no redundant link

Redundancy levels

System z also provides redundant internal Peripheral Component Interconnect Express (PCIe) hardware support infrastructures for the PCIe-based 10GbE RoCE Express features. For simplicity, the System z internal PCIe infrastructure is referred to as the *internal path*. The internal path of the 10GbE RoCE Express feature is determined based on how the feature is plugged into the System z I/O drawers. To have full 10GbE RoCE Express hardware redundancy on System z, each feature must have unique internal paths. For more information about the System z I/O drawer configurations, see your IBM Service representative.

A complete high availability solution, therefore, requires the following setup between two SMC-R peers:

- Two unique physical 10GbE RoCE Express features that use unique PCHIDs (see “High availability considerations” on page 21)
- Unique system PCIe support infrastructures, or internal paths, for the two features
- Unique physical RoCE switches

From the perspective of the local stack, the physical network topology and the internal path configuration at the remote system to the remote adapters are not visible. z/OS Communications Server can evaluate and report a redundancy level that is based only on the known local factors. If the local stack has two unique 10GbE RoCE Express features that have unique internal paths, then an SMC-R link group with two redundant SMC-R links is considered to have full redundancy.

Table 3 shows the reported redundancy levels with a description of each level. The values that are listed here represent the values that are displayed for an SMC-R link group in a Netstat DEVlinks/-d report. For an example of the Netstat DEVlinks/-d report, see z/OS Communications Server: IP System Administrator's Commands.

Table 3. Redundancy levels

Redundancy level	SMC-R link group with redundant links	Unique 10GbE RoCE Express features have unique physical internal paths	Description
Full	Yes	Yes	Full local hardware redundancy Rule: Hardware redundancy must be verified at each host. The internal path at the remote host is not visible to the local host and therefore is not considered.
Partial (single local internal path)	Yes	No	The local 10GbE RoCE Express features share an internal System z PCIe adapter support infrastructure (hardware internal path). This hardware configuration provides a single point of failure, so full redundancy cannot be guaranteed.
Partial (single local PCHID, unique ports)	Yes	No	The local 10GbE RoCE Express features use the same PCHID but unique ports. Using the same PCHID creates a single point of failure, so full redundancy cannot be guaranteed.
Partial (single local PCHID and port)	Yes	No	The local 10GbE RoCE Express features use the same PCHID and port. Using the same PCHID and port creates a single point of failure, so full redundancy cannot be guaranteed.
Partial (single local RNIC)	No	N/A	The link group has only a single active feature on the local host, but multiple active features are available to the remote host.
Partial (single remote RNIC)	No	N/A	The link group has only a single active feature on the remote host, but multiple active features on the local host.
None (single local and remote RNIC)	No	N/A	The link group has only a single active feature on both the local and the remote host.

A 10GbE RoCE Express interface that is associated with an SMC-R capable interface because it has the same physical network ID is referred to as an *associated RNIC interface*. More than two 10GbE RoCE Express interfaces can be defined with the same physical network ID, but the TCP/IP stack creates SMC-R link groups

that use no more than two associated RNIC interfaces at any particular time. The 10GbE RoCE Express interfaces are considered to be associated RNIC interfaces for IPAQENET and IPAQENET6 interfaces that match all of the following characteristics:

- The interfaces are active.
- The interfaces are defined by the INTERFACE statement with the OSD channel path ID type (CHPIDTYPE OSD).
- The interfaces are enabled for SMC-R communications.
- The interfaces have matching PNet ID values.

Associated RNIC interfaces are displayed in the Netstat DEvlinks/-d OSD report. For an example of the Netstat DEvlinks/-d report, see z/OS Communications Server: IP System Administrator's Commands.

Any additional 10GbE RoCE Express interfaces that have the matching PNet ID are started, but they are not used to provide for added link level load-balancing purposes. Instead, the extra 10GbE RoCE Express interfaces are held in reserve for use if one of the associated RNIC interfaces fails.

For instance, in Figure 9 on page 24, if 10GbE RoCE Express interface 2 (shown as PFID2) on the server host fails, the TCP connections that were using SMC-R link 2 across interface 2 are switched to SMC-R link 1. The SMC-R link group loses its level of full link redundancy because only SMC-R link 1 is active. However, if another 10GbE RoCE Express interface, call it PFID 5, were active on the server host, and PFID 5 had the same PNet ID value as PFID 1 and PFID 2, the server can immediately activate new SMC-R links across PFID 5 to the client host to reestablish full link redundancy. If PFID 5 and PFID 1 have unique physical paths, then full redundancy is also restored. This new SMC-R link is used for TCP connections within the link group. If PFID 2 recovers, it now serves as a standby PFID and can be used if either PFID 1 or PFID 5 fails.

You can also use extra PFIDs for planned outages, such as to schedule an upgrade to the 10GbE RoCE Express features.

System requirements for SMC-R in a dedicated RoCE environment:

You need to ensure that your system meets the requirements to use SMC-R with RoCE Express features operating in a dedicated RoCE environment.

A z/OS image must be z/OS Version 2 Release 1 or later to use Shared Memory Communications over RDMA (SMC-R) with RoCE Express features operating in a dedicated RoCE environment.

SMC-R requires RDMA over Converged Ethernet (RoCE) hardware and firmware support. The following minimum hardware requirements must be met to use SMC-R:

- You must have an IBM zEnterprise EC12 (zEC12) with driver 15, or an IBM zEnterprise BC12 (zBC12).
- You must have one or more IBM 10GbE RoCE Express features.
10GbE RoCE Express features are dual ports with short range (SR) optics and dedicated to a single LPAR image.

Guideline: Provide two 10GbE RoCE Express features per z/OS image per unique physical network. For more information, see “RoCE network high availability” on page 29.

- You must have System z OSA-Express for traditional Ethernet LAN connectivity using CHPID type OSD.
- SMC-R does not impose any specific OSA requirements.
- You must have standard 10 GbE switches.

System requirements for SMC-R in a shared RoCE environment:

You need to ensure that your system meets the requirements to use SMC-R with RoCE Express features operating in a shared RoCE environment.

To use Shared Memory Communications over RDMA (SMC-R) with RoCE Express features operating in a shared RoCE environment, the minimum software requirement must be z/OS Version 2 Release 1 with APARs OA44576 and PI12223 applied.

SMC-R requires RDMA over Converged Ethernet (RoCE) hardware and firmware support. The following minimum hardware requirements must be met to use SMC-R:

- You must have IBM z13 (z13) or later systems.
 - You must have one or more IBM 10GbE RoCE Express features.
- 10GbE RoCE Express features are dual ports with short range (SR) optics and can be shared across multiple operating systems images or TCP/IP stacks in a central processor complex (CPC).

Guideline: Provide two 10GbE RoCE Express features per unique physical network. For more information, see “RoCE network high availability” on page 29.

- You must have System z OSA-Express for traditional Ethernet LAN connectivity.
- SMC-R does not impose any specific OSA requirements.
- You must have standard 10 GbE switches.

RoCE network configuration requirements

z/OS Communications Server supports connectivity to multiple, distinct layer 2 networks through unique physical LANs. Each unique physical network is identified by existing Ethernet standards that are based on the physical layer 2 broadcast domain. You can define a physical network ID (PNet ID) for each physical network. For more information, see “Physical network considerations” on page 19.

For hosts to communicate by using SMC-R, they must connect directly to the same Ethernet layer 2 LAN network. If VLANs are in use, each host must also have access to the same VLAN. For more information, see “VLANID considerations” on page 18.

There are restrictions on the physical distances that can be used to route RDMA frames. To understand these distance specifications and limitations, see *IBM z Systems Planning for Fiber Optic Links*.

RoCE network high availability

Because RoCE connections do not use IP routing and the RDMA connections to remote hosts are direct point-to-point connections that use reliable connected queue pairs (RC QPs), there is no concept of an alternative IP route to the peer. SMC-R connectivity is possible with a single 10GbE RoCE Express feature, but a loss in that single feature means that the associated TCP connections and workloads are disrupted. Therefore, redundant 10GbE RoCE Express features on both the local and remote hosts are required to achieve network high availability with SMC-R. If your TCP workloads require high availability, redundant 10GbE RoCE Express features and redundant Ethernet switches are required. The SMC-R protocol actively uses both features, rather than using one feature with the other in standby mode. For more information, see “High availability considerations” on page 21.

IBM 10GbE RoCE Express features also have redundant internal PCIe support structures, or PCIe internal paths, as described in “Redundancy levels” on page 25. To avoid another single point of failure, install each 10GbE RoCE Express feature that is managed by the same operating system with a unique internal path. For more information about how to install a 10GbE RoCE Express feature to achieve full redundancy, see your IBM service representative.

RoCE bandwidth

The 10GbE RoCE Express features provide 10 GbE ports. When redundant features are defined, SMC-R link groups can be formed by using both features, resulting in a 20 GbE logical pipe to each physical network. z/OS Communications Server uses only two features within a link group at any particular time.

Setting up the environment for Shared Memory Communications over RDMA

Before you configure Shared Memory Communications over RDMA (SMC-R), follow these steps to ensure that other components are configured.

Before you begin

Review “Configuration considerations for Shared Memory Communications over RDMA” on page 18.

Procedure

Perform the following steps to prepare to use SMC-R:

1. Install and configure the IBM 10GbE RoCE Express features in the hardware configuration definition (HCD). Logical partition (LPAR) access lists must be provided for the 10GbE RoCE Express features.
2. Assign physical network ID (PNet ID) values, and configure the values in the HCD for both the 10GbE RoCE Express ports and any OSA-Express devices that will use the 10GbE RoCE Express ports for SMC-R communications.
3. Provide for redundant system PCIe internal paths for the defined IBM 10GbE RoCE Express features. For more information, see “Redundancy levels” on page 25.
4. Configure Ethernet switches for RDMA functionality. RDMA processing requires standard 10 GbE switch support, and distance limitations might exist. Enable the global pause frame (a standard Ethernet switch feature for Ethernet flow control that is described in the IEEE 802.3x standard) on the switch. You might also need to configure the switch to indicate whether you use VLANs.

For more information, see “RoCE network configuration requirements” on page 28

Configuring Shared Memory Communications over RDMA

Use these steps to configure and begin to use Shared Memory Communications over RDMA (SMC-R).

Before you begin

See “Setting up the environment for Shared Memory Communications over RDMA” on page 29.

Procedure

Perform the following steps to configure SMC-R:

1. If necessary, convert IPv4 IPAQENET DEVICE, LINK, and HOME definitions to INTERFACE definitions. SMC-R processing is provided only for OSD interfaces configured with INTERFACE definitions. For more information about converting IPv4 IPAQENET DEVICE, LINK, and HOME definitions to INTERFACE definitions, see Steps for converting from IPv4 IPAQENET DEVICE, LINK, and HOME definitions to the IPv4 IPAQENET INTERFACE statement.
2. Configure the SMCR parameter on the GLOBALCONFIG statement in the TCP/IP profile. The SMCR parameter includes the following subparameters:
 - PFID specifies the PCI Express (PCIe) function ID (PFID) value for an IBM 10GbE RoCE Express feature that this stack uses.

You must code at least one PFID subparameter for this stack to use SMC-R, and two PFIDs per PNet ID per stack for redundancy.

- When the RoCE Express features operate in a dedicated RoCE environment, each RoCE Express feature must have a unique PFID value, but each TCP/IP stack that uses the RoCE Express feature specifies the same PFID value.
- When the RoCE Express features operate in a shared RoCE environment, each TCP/IP stack that uses the same RoCE Express feature must have a unique PFID value, even if the TCP/IP stacks are defined on different LPARs.

- PORTNUM specifies the 10GbE RoCE Express port number to use for each PFID.

Configure each PFID to use only a single port. The port number can be 1 or 2; 1 is the default port number.

- When the RoCE Express features operate in a dedicated RoCE environment, either port 1 or port 2 can be used for a particular 10GbE RoCE Express feature, but z/OS Communications Server cannot be configured to use both ports of a feature. For example, specifying PFID 0018 PORTNUM 1 and PFID 0018 PORTNUM 2, even if specified on different TCP/IP stacks in the same LPAR, results in an error during 10GbE RoCE Express activation processing for the second port that is activated.
- When the RoCE Express features operate in a shared RoCE environment, both port 1 and port 2 can be used simultaneously if the ports are associated with different PFID values. For example, assuming that PFID 0018 and PFID 0019 represent the same physical RoCE Express feature, you can specify PFID 0019 PORTNUM 1 and PFID 0018 PORTNUM 2 to use both ports.

- MTU specifies the maximum transmission unit (MTU) to be used for this PFID. The default value is 1024. For more information, see RoCE maximum transmission unit.
- FIXEDMEMORY specifies the total amount of memory, in megabytes, that can be used for the staging and remote memory buffers.
The default value is 256 MB. To choose a value that is appropriate for your environment, see Storage considerations.
- TCPKEEPMININTERVAL specifies the minimum time interval, in seconds, for sending keepalive probes for TCP connections that use SMC-R protocols to exchange data.
The default value is 300 seconds. For more information, see TCP keepalive.

The following GLOBALCONFIG statement defines two 10GbE RoCE Express features, PFID 0018 and PFID 0019. Port 2 is used on each feature, and the maximum amount of 64-bit private storage that can be used for SMC-R communications is 200 megabytes. The default values for both TCPKEEPMININTERVAL and MTU are used.

```
GLOBALCONFIG SMCR
  PFID 0018 PORTNUM 2
  PFID 0019 PORTNUM 2
  FIXEDMEMORY 200
```

For more information about these and other SMCR subparameters on the GLOBALCONFIG statement, see z/OS Communications Server: IP Configuration Reference.

3. (Optional) Configure the SMCR parameter on the IPAQENET and IPAQENET6 INTERFACE statements with the OSD channel path ID type (CHPIDTYPE OSD).

Tip: SMCR is the default setting on the IPAQENET and IPAQENET6 INTERFACE statements for the OSD CHPID type.

4. Associate the interfaces with the appropriate subnet or prefix.
 - For an IPv4 interface to be eligible for SMC-R, you must configure a nonzero subnet mask on the INTERFACE statement in the TCP/IP profile.

Result: SMC-R is used only between peers whose interfaces have the same subnet value.

- For an IPv6 interface to be eligible for SMC-R, the interface must have at least one prefix that is associated with it.

Rule: A prefix can be associated to an IPv6 interface in any of these ways:

- A prefix received on a router advertisement message from an attached router
- A prefix that is configured in OMROUTE by using the PREFIX parameter on the IPV6_OSPF_INTERFACE, IPV6_RIP_INTERFACE, or IPV6_INTERFACE statement
- A direct static prefix route that is configured over the interface on a ROUTE statement in a BEGINROUTES block in the TCP/IP profile

Result: SMC-R is used only between peers whose IPv6 interfaces have at least one prefix in common.

5. (Optional) If you are using VLANs for your SMC-R communications, configure the VLANID parameter on the IPAQENET and IPAQENET6 INTERFACE statements for the OSD CHPID type. For more information, see “VLANID considerations” on page 18.
6. (Optional) If you have a server application that primarily uses short-lived TCP connections, you might want to avoid SMC-R rendezvous processing for TCP connections that are using that server port. Configure NOSMCR on the PORT or PORTRANGE statement for the server port or ports that this server application uses. For more information, see *z/OS Communications Server: IP Configuration Reference*.
7. Start the IPAQENET and IPAQENET6 interfaces. When the first SMC-R capable OSD interface becomes active, z/OS Communications Server automatically starts all PFIDs that are defined in the GLOBALCONFIG statement, and associates the 10GbE RoCE Express interfaces with the OSD interfaces that have matching physical network IDs (PNet IDs). For more information about PNet IDs, see “Physical network considerations” on page 19.

What to do next

For information about how SMC-R interacts with other functions, see SMC-R interactions with other z/OS Communications Server functions.

For information about managing SMC-R communications, see “Managing SMC-R communications.”

Managing SMC-R communications

VTAM displays and tuning statistics

When an IBM 10GbE RoCE Express interface is first started, VTAM dynamically creates a transport resource list element (TRLE) to represent it. The dynamically created name is of the form IUT p ffff, where p is the port number and ffff is the PCI-Express function ID (PFID). For instance, if you specified GLOBALCONFIG SMCR PFID 0018 PORTNUM 1, the TRLE name would be IUT10018.

You can use the VTAM DISPLAY TRL and DISPLAY ID commands to display information about the TRLE representation of the 10GbE RoCE Express interface, including information about the physical network ID (PNet ID), and which TCP stacks use the interface.

Tip: Use the presence of a virtual function number (VFN) in the DISPLAY TRL or DISPLAY ID command output to determine whether the RoCE Express feature operates in a shared RoCE environment. A VFN is present in a shared environment and absent in a dedicated environment.

VTAM collects tuning statistics for 10GbE RoCE Express interfaces when requested by using the TNSTAT start option or the MODIFY TNSTAT command. Tuning statistics that represent processing at a 10GbE RoCE Express interface level and statistics at a user or TCP/IP stack level are both maintained. The TCP/IP stack level statistics are also provided on the GetRnics request. For more information, see *Network Management Interface*.

For more information about the VTAM commands, see *z/OS Communications Server: SNA Operation*. For more information about gathering tuning statistics, see *z/OS Communications Server: SNA Network Implementation Guide*.

Chapter 4. IP Configuration Reference

Conventions and terminology that are used in this document

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

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

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

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

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

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

- RDMA network interface card (RNIC), which is used to refer to the IBM 10GbE RoCE Express feature.
- Shared RoCE environment, which means that the 10GbE RoCE Express feature operates on an IBM z13 (z13) or later system, and that the feature can be used concurrently, or shared, by multiple operating system instances. The RoCE Express feature is considered to operate in a shared RoCE environment even if you use it with a single operating system instance.

For definitions of the terms and abbreviations that are used in this document, you can view the latest IBM terminology at the IBM Terminology website.

Clarification of notes

Information traditionally qualified as Notes is further qualified as follows:

Note Supplemental detail

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

Guideline

Customary way to perform a procedure

Rule Something you must do; limitations on your actions

Restriction

Indicates certain conditions are not supported; limitations on a product or facility

Requirement

Dependencies, prerequisites

Result Indicates the outcome

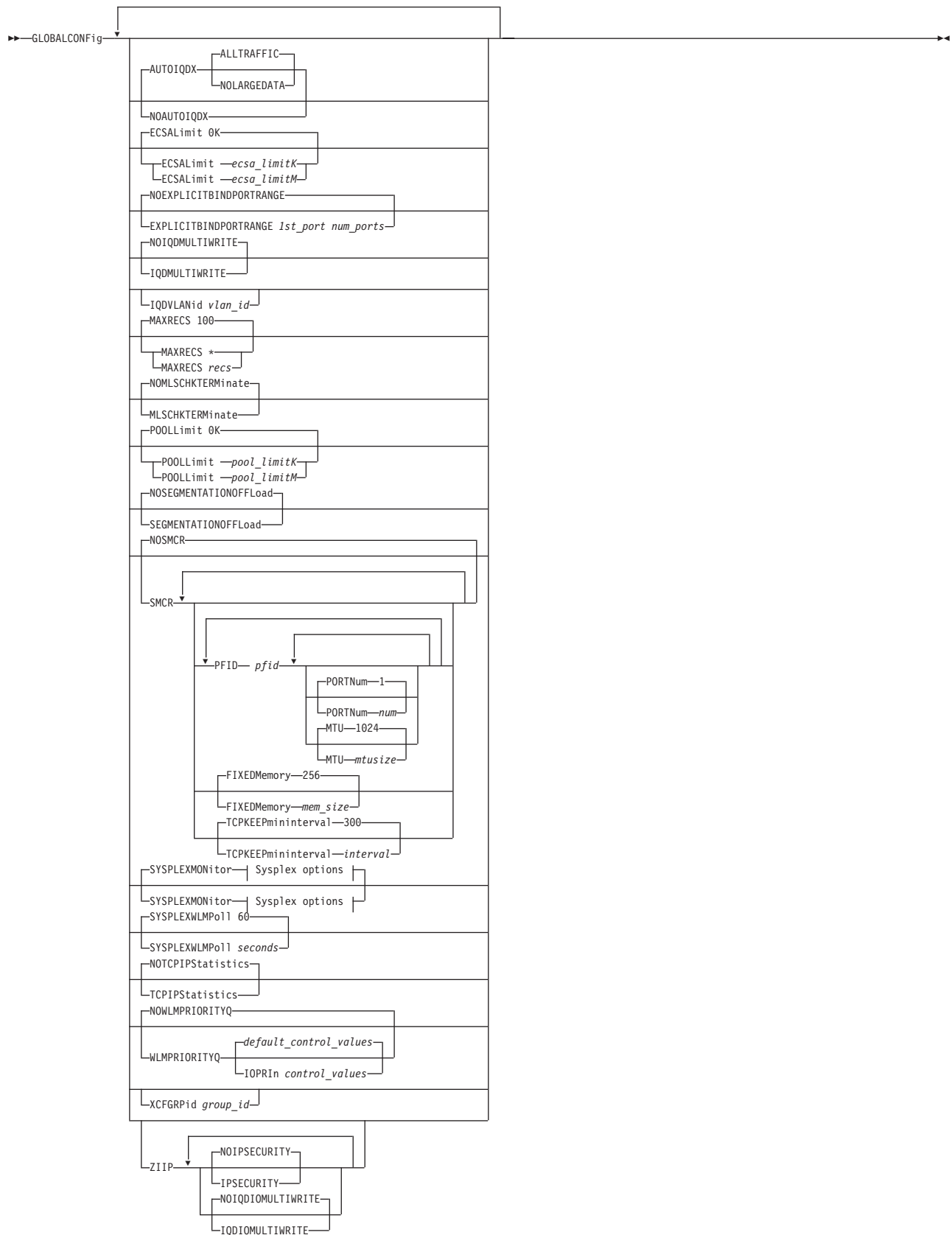
TCP/IP profile (PROFILE.TCPIP) and configuration statements

GLOBALCONFIG statement

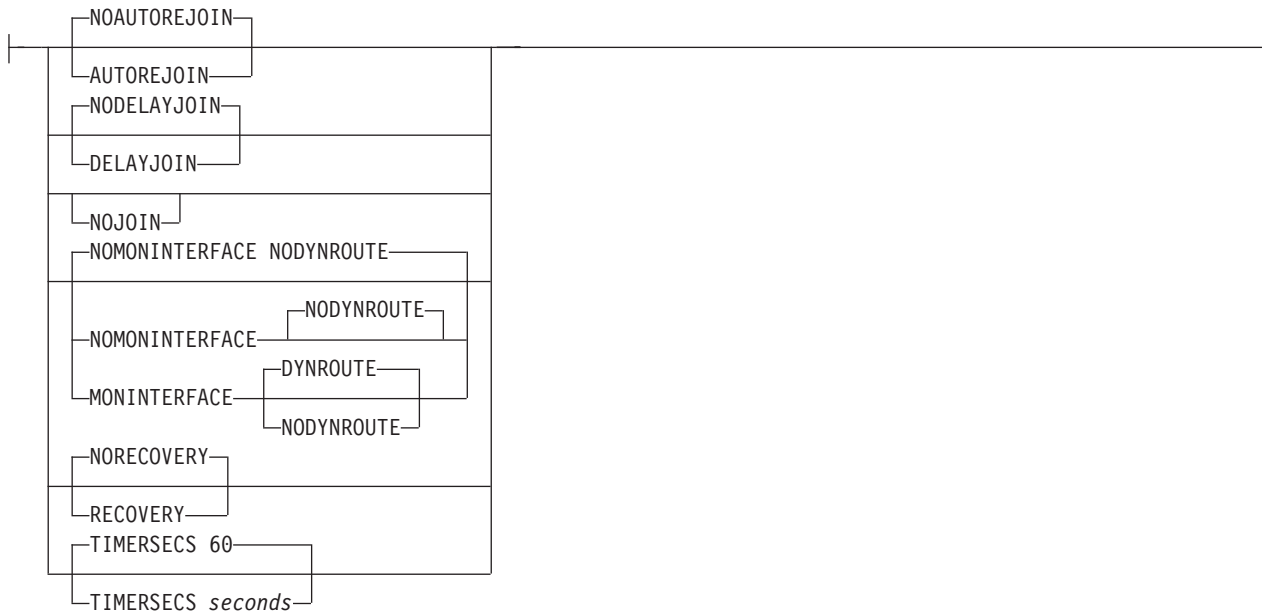
Use the GLOBALCONFIG statement to pass global configuration parameters to TCP/IP.

Syntax

Tip: Specify the parameters for this statement in any order.



Sysplex options:



Parameters

AUTOIQDX | NOAUTOIQDX

Specifies whether to use dynamic Internal Queued Direct I/O extensions (IQDX) interfaces for connectivity to the intraensemble data network.

See “Steps for modifying” on page 50 for details about changing this parameter while the TCP/IP stack is active. See z/OS Communications Server: IP Configuration Guide for information about the intraensemble data network and the dynamic IQDX function.

NOAUTOIQDX

Do not use dynamic IQDX interfaces.

AUTOIQDX

Use dynamic IQDX interfaces when an IQD CHPID has been configured with the Internal Queued Direct I/O extensions (IQDX) function. This value is the default value.

ALLTRAFFIC

Use IQDX interfaces for all eligible outbound traffic on the intraensemble data network. This value is the default value.

NOLARGEDATA

Do not use IQDX interfaces for outbound TCP socket data transmissions of length 32KB or larger. Use IQDX interfaces for all other eligible outbound traffic. See z/OS Communications Server: IP Configuration Guide for more information.

ECSALIMIT *ecsalimit* K | M

Specifies the maximum amount of extended common service area (ECSA) that TCP/IP can use. This limit can be expressed as a number followed by a K (which represents 1024 bytes), or a number followed by an M (which represents 1048576 bytes). If the K suffix is used, *ecsalimit* must be in the range 10240K and 2096128K inclusive or 0. If the M suffix is used, *ecsalimit* must be in the range 10M and 2047M inclusive or 0. The default is no limit, and it can

be specified as 0 K or 0 M. The minimum value for ECSALIMIT and POOLLIMIT is not allowed to be set to a value if the current storage in use would be greater than or equal to 80% of that value (for example, not allowed to set it such that there is an immediate storage shortage).

ECSALIMIT ensures that TCP/IP does not overuse common storage. It is intended to improve system reliability by limiting TCP/IP's storage usage. The limit must account for peak storage usage during periods of high system activity or TCP/IP storage abends might occur. The limit does not include storage used by communications storage manager (CSM). CSM ECSA storage is managed independently of the TCP/IP ECSALIMIT. See z/OS Communications Server: SNA Network Implementation Guide for more information about CSM.

Specifying a nonzero ECSALIMIT enables warning messages EZZ4360I, EZZ4361I, and EZZ4362I to appear if a storage shortage occurs.

EXPLICITBINDPORTRANGE | NOEXPLICITBINDPORTRANGE

NOEXPLICITBINDPORTRANGE

Indicates that this stack does not participate in the allocation of ports from a pool of ports. The ports in the pool are guaranteed to be unique across the sysplex in that they are allocated to only one requestor in the sysplex at any one time, when processing an explicit bind() of a TCP socket to the IPv4 INADDR_ANY address, or to the IPv6 unspecified address (in6addr_any), and port 0.

EXPLICITBINDPORTRANGE

Indicates that this stack participates in the allocation of ports from a pool of ports guaranteed to be unique across the sysplex, when processing an explicit bind() of a TCP socket to the IPv4 INADDR_ANY address, or to the IPv6 unspecified address (in6addr_any), and port 0. This parameter also designates the range of ports that defines that pool. This parameter defines the range used by all stacks participating in EXPLICITBINDPORTRANGE port allocation processing throughout the sysplex. The most recently processed profile or OBEYFILE command that specifies EXPLICITBINDPORTRANGE defines the range for the sysplex.

Use this parameter so that you can specify distributed DVIPAs as the source IP address on DESTINATION or JOBNAME rules in a SRCIP block. See SRCIP statement.

1st_port

The starting port for the range of ports. The *1st_port* value is in the range 1024 - 65535. The sum of the *1st_port* value plus the *num_ports* value minus 1 cannot exceed 65535.

num_ports

The number of ports in the range. The *num_ports* value is in the range 1 - 64512. The sum of the *1st_port* value plus the *num_ports* value minus 1 cannot exceed 65535.

Guidelines:

- All TCP/IP stacks in the sysplex that participate in EXPLICITBINDPORTRANGE processing should have the same port range specified. To ensure this, specify the GLOBALCONFIG EXPLICITBINDPORTRANGE statement in a file that is specified in an INCLUDE statement in the TCP profiles data set of all the participating stacks.

- The port range defined on the EXPLICITBINDPORTRANGE parameter should not overlap any existing port reservations of any TCP/IP stacks in the sysplex. Any reserved ports that are within the EXPLICITBINDPORTRANGE range are excluded from the EXPLICITBINDPORTRANGE port pool, effectively making the pool smaller.
- The EXPLICITBINDPORTRANGE port range must be large enough to accommodate all applications in the sysplex that might issue explicit bind() calls for the IPv4 INADDR_ANY address, or for the IPv6 unspecified address (in6addr_any), and port 0.
- If additional TCP/IP stacks or systems are introduced into the sysplex, the extent of the port range defined by EXPLICITBINDPORTRANGE should be re-evaluated.
- If the size of the port range defined by the EXPLICITBINDPORTRANGE parameter is too large, there are fewer ports available for local ephemeral port allocation.
- If you specify the EXPLICITBINDPORTRANGE parameter in a sysplex that contains pre-V1R9 TCP/IP stacks, each distributor, backup, and target TCP/IP stack of a distributed SYSPLEXEXPORTS DVIPA that is configured as a source IP address on a SRCIP profile statement must have one of the following characteristics:
 - Run on a V1R9 or later system.
 - Use the PORTRANGE profile statement on the pre-V1R9 stacks to reserve the ports that are configured on the V1R9 or later stacks with the EXPLICITBINDPORTRANGE parameter.

Failure to meet these characteristics can result in connection failures because unique ports assignments are no longer be assured throughout the sysplex for a SYSPLEXEXPORTS distributed DVIPA; the same port value could be assigned from the following pools:

- The DVIPA-specific pool by a pre-V1R9 system
- The EXPLICITBINDPORTRANGE pool by a V1R9 or later system

Restriction: In a common INET (CINET) environment, this parameter is accepted, but the EXPLICITBINDPORTRANGE function is supported in a limited set of conditions only. It is supported when CINET is managing one stack only on the system or when the affected application has established stack affinity. Otherwise, results can be unpredictable.

IQDMULTIWRITE | NOIQDMULTIWRITE

Specifies whether HiperSockets interfaces should use multiple write support. HiperSockets multiple write might reduce CPU usage and might provide a performance improvement for large outbound messages that are typically generated by traditional streaming workloads such as file transfer, and interactive web-based services workloads such as XML or SOAP. This parameter applies to all HiperSockets interfaces, including IUTIQDIO and IQDIOINTF6 interfaces created for Dynamic XCF.

Restriction: HiperSockets multiple write is effective only on an IBM System z10™ or later and when z/OS is not running as a guest in a z/VM® environment.

See the modifying information in this topic for details about changing this parameter while the TCP/IP stack is active. See the HiperSockets multiple write information in z/OS Communications Server: IP Configuration Guide for more information about HiperSockets multiple write support.

NOIQDMULTIWRITE

HiperSockets interfaces do not use the multiple write support. This is the default.

IQDMULTIWRITE

HiperSockets interfaces do use the multiple write support.

IQDVLANID *vlan_id*

Specifies a VLAN ID to be used when HiperSockets (iQDIO) connectivity is used for dynamic XCF support. VLAN IDs are used to partition communication across HiperSockets. Stacks on the same CPC using the same HiperSockets CHPID that use the same VLAN ID can establish communications; stacks on the same CPC using the same HiperSockets CHPID that use different VLAN IDs cannot.

The specified value, *vlan_id*, is used for both IPv4 and IPv6 DYNAMICXCF HiperSockets connectivity. This parameter is intended to be used in conjunction with the GLOBALCONFIG XCFGRPID parameter to support subplexing.

Subplexing enables TCP/IP participation in a Sysplex to be partitioned into subsets based on the XCFGRPID value. When using subplexing, TCP/IP stacks with the same XCFGRPID value should specify the same IQDVLANID value. Stacks with different XCFGRPID values should have different IQDVLANID values. If you have stacks in the default subplex (that is, stacks that do not specify an XCFGRPID value) that use the same HiperSockets CHPID as stacks within a non-default subplex (an XCFGRPID value was specified), then the stacks in the default subplex should specify an IQDVLANID value that is different from the other IQDVLANID values specified by the other non-default subplex stacks that use the same HiperSockets CHPID.

Restriction: The IQDVLANID parameter can be specified only in the initial profile.

Valid VLAN IDs are in the range 1 - 4094. For more information about VLANs and HiperSockets see z/OS Communications Server: IP Configuration Guide.

MAXRECS

Specifies the maximum number of records to be displayed by the DISPLAY TCPIP,,NETSTAT operator command. The term *records* refers to the number of entries displayed on each report. For example, for the connection-related reports, a record is a TCP connection or listener, or a UDP endpoint. This configured value is used when the MAX parameter is not explicitly specified on the command. The default value is 100. If the number of output lines exceeds the maximum number of lines for a multi-line Write to Operator (WTO), the report output is truncated. See the information about the Display TCPIP,,NETSTAT command in z/OS Communications Server: IP System Administrator's Commands for more details about the command.

* A value of asterisk (*) specifies that all records are to be displayed.

recs This value specifies the number of records to be displayed. The valid range is 1 - 65535.

MLSCHKTERMINATE | NOMLSCHKTERMINATE

NOMLSCHKTERMINATE

Specifies that the stack should remain active after writing an informational message when inconsistent configuration information is discovered in a multilevel-secure environment.

Informational message EZD1217I is written to the system console summarizing the number of problems found. Additional informational messages between EZD1219I and EZD1234I are written to the job log for each configuration inconsistency found.

This is the default value.

MLSCHKTERMINATE

Specifies that the stack should be terminated after writing an informational message when inconsistent configuration information is discovered in a multilevel-secure environment.

Informational message EZD1217I is written to the system console summarizing the number of problems found. Additional informational messages between EZD1219I and EZD1234I are written to the job log for each configuration inconsistency found.

POOLLIMIT *pool_limit* K | M

Specifies the maximum amount of authorized private storage that TCP/IP can use within the TCP/IP address space. This limit can be expressed as a number followed by a K (which represents 1024 bytes), or a number followed by an M (which represents 1048576 bytes). If the K suffix is used, *pool_limit* must be in the range 10240K and 2096128K inclusive or 0. If the M suffix is used, *pool_limit* must be in the range 10M and 2047M inclusive or 0. The default is no limit, and it can be specified as 0K or 0M. The minimum value for ECSALIMIT and POOLLIMIT is not allowed to be set to a value if the current storage in use would be greater than or equal to 80% of that value (for example, not allowed to set it such that there is an immediate storage shortage).

POOLLIMIT ensures that TCP/IP does not overuse its authorized private storage. Most systems can use the default POOLLIMIT (no limit). Systems with limited paging capacity can use POOLLIMIT to help limit TCP/IP storage usage. If the limit is used, it must account for peak storage usage during periods of high system activity or TCP/IP storage abends might occur.

POOLLIMIT can be higher than the REGION size on the TCP/IP start procedure because POOLLIMIT applies to authorized storage, whereas REGION applies to unauthorized storage. Specifying a nonzero POOLLIMIT enables warning messages EZZ4364I, EZZ4365I, and EZZ4366I to appear if a storage shortage occurs.

SEGMENTATIONOFFLOAD | NOSEGMENTATIONOFFLOAD

Specifies whether the stack should offload TCP segmentation for IPv4 packets to OSA-Express features. TCP segmentation offload support transfers the overhead of segmenting outbound data into individual TCP packets to QDIO-attached OSA-Express devices whose features that support this function. Offloading segmentation of streaming-type workloads reduces CPU use and increases throughput. This parameter is ignored for OSA-Express features that do not support segmentation offload.

Guideline: The support for specifying IPv4 segmentation offload on the GLOBALCONFIG profile statement has been deprecated. The parameters are still supported on the GLOBALCONFIG statement, but the support for specifying these parameters on the GLOBALCONFIG statement will be dropped in a future release. It is recommended to specify these parameters on the IPCONFIG profile statement instead.

Rule: The SEGMENTATIONOFFLOAD and NOSEGMENTATIONOFFLOAD parameters specified on the IPCONFIG statement override the equivalent parameters specified on the GLOBALCONFIG statement.

See the Modifying topic for information about changing this parameter while the TCP/IP stack is active. See TCP segmentation offload information in z/OS Communications Server: IP Configuration Guide for more information about TCP segmentation offload support.

NOSEGMENTATIONOFFLOAD

TCP segmentation is performed by the TCP/IP stack. This is the default.

SEGMENTATIONOFFLOAD

TCP segmentation is offloaded to the OSA-Express feature.

SMCR | NOSMCR

Specifies whether this stack uses Shared Memory Communications over Remote Direct Memory Access (RDMA), or SMC-R, for external data network communications. For more information about SMC-R, see Shared Memory Communications over Remote Direct Memory Access in z/OS Communications Server: IP Configuration Guide.

NOSMCR

Specifies that this stack should not use SMC-R for external data network communications. This is the default setting.

SMCR

Specifies that this stack should use SMC-R for external data network communications. Use this parameter to define the IBM 10GbE RoCE Express features that this stack should use for SMC-R communications. You can use this parameter to define additional operational characteristics for SMC-R communications.

If you specify the SMCR parameter without any subparameters, you get one of the following results:

- If this is the first time that you specify the SMCR parameter, no Peripheral Component Interconnect Express (PCIe) function IDs are defined and the FIXEDMEMORY and TCPKEEPMININTERVAL subparameters are set to default values.
- If you previously specified the SMCR parameter with subparameters, TCP/IP retains the knowledge of the subparameter settings, even if SMC-R processing is stopped by issuing the VARY TCPIP,,OBEYFILE command with a data set that contains a GLOBALCONFIG NOSMCR parameter. Therefore, a subsequent specification of a GLOBALCONFIG SMCR profile statement resumes SMC-R processing with the previous subparameter settings.

PFID *pfid*

Specifies the Peripheral Component Interconnect Express (PCIe) function ID (PFID) value for a 10GbE RoCE Express feature that this stack uses. A *pfid* is a 2-byte hexadecimal value in the range 0 - 0FFF that identifies this TCP/IP stack's representation of a 10GbE RoCE Express feature.

Rules:

- You must code at least one PFID subparameter for this stack to use SMC-R communications.

- You can specify a maximum of 16 PFID subparameter values on the SMCR parameter.
- The value for each PFID and PORTNUM pair must be unique.
- When the RoCE Express feature operates in a shared RoCE environment, you cannot simultaneously activate a 10GbE RoCE Express feature that uses the same PFID value from different TCP/IP stacks within the same logical partition (LPAR).

PORTNUM *num*

Specifies the 10GbE RoCE Express port number to use for a particular PFID. Configure each PFID to use only a single port. The port number can be 1 or 2; 1 is the default value.

Rules:

- If the 10GbE RoCE Express feature operates in a dedicated RoCE environment, you can activate either port 1 or port 2 but not both simultaneously for an individual PFID value. If PORTNUM 1 and PORTNUM 2 definitions for the same PFID value are created, the port that is first activated is used.
- If the 10GbE RoCE Express feature operates in a shared RoCE environment, you can use both port 1 and port 2 on an individual 10GbE RoCE Express feature, but the PFID value that is associated with each port must be different. You cannot simultaneously activate PORTNUM 1 and PORTNUM 2 definitions for the same PFID value.

For example, if PFID 0013 and PFID 0014 are both defined in HCD to represent the 10GbE RoCE Express feature with PCHID value 0140, you can configure PFID 0013 PORT 1 PFID 0014 PORT 2 to use both ports on the 10GbE RoCE Express feature. However, if you specify PFID 0013 PORT 1 PFID 0013 PORT 2, only the first port that is activated will be used.

MTU *mtusize*

Specifies the maximum transmission unit (MTU) value to be used for a particular PFID. The MTU value can be 1024 or 2048. The default value is 1024 and can be used for most workloads. If you set the MTU size to 2048, you must also enable jumbo frames on all switches in the network path for all peer hosts. For more information about the RoCE maximum transmission unit, see *z/OS Communications Server: IP Configuration Guide*.

FIXEDMEMORY *mem_size*

Specifies the maximum amount of 64-bit storage that the stack can use for the send and receive buffers that are required for SMC-R communications. The *mem_size* value is an integer in the range 30 - 9999, and represents the maximum storage in megabytes of data. The default value is 256 megabytes.

TCPKEEPMININTERVAL *interval*

This interval specifies the minimum interval that TCP keepalive packets are sent on the TCP path of an SMC-R link.

Rules:

- If a keepalive interval is also specified on the INTERVAL parameter of the TCPCONFIG statement or is set for a specific SMC-R link socket by the TCP_KEEPALIVE setsockopt() option, the largest of the three interval values is used.
- The valid range for this interval is 0-2147460 seconds, and the default is 300 seconds.
- A value of 0 disables TCP keepalive probe packets on the TCP path of an SMC-R link.
- The SO_KEEPALIVE setsockopt() option must be set for keepalive processing to be used.

Result: The TCPKEEPMININTERVAL setting has no effect on keepalive processing for the SMC-R path of an SMC-R link.

For more information about TCP keepalive processing for the TCP path and the SMC-R path of SMC-R links, see TCP keepalive in z/OS Communications Server: IP Configuration Guide.

SYSPLEXMONITOR

Specifies SYSPLEXMONITOR subparameters to configure the operation of the sysplex autonomics function. For more information about connectivity problems in a sysplex, see z/OS Communications Server: IP Configuration Guide.

If the SYSPLEXMONITOR parameter is not specified in the initial TCP/IP profile, then the sysplex autonomics function uses the default values for all SYSPLEXMONITOR subparameters. If the SYSPLEXMONITOR parameter is specified but not all subparameters are specified in the initial TCP/IP profile, then the sysplex autonomics function uses the default values for those SYSPLEXMONITOR subparameters that are not specified. For example, if SYSPLEXMONITOR is specified without RECOVERY or NORECOVERY specified in the initial profile, then the NORECOVERY action is in effect.

Rule: If you specify the GLOBALCONFIG statement in a data set associated with a VARY TCPIP, OBEYFILE command and the SYSPLEXMONITOR parameter is specified without any subparameters, an informational message is issued and the parameter is ignored.

AUTOREJOIN | NOAUTOREJOIN

Specifies whether TCP/IP should automatically rejoin the TCP/IP sysplex group when a detected problem is relieved after the stack has left the sysplex group.

NOAUTOREJOIN

Do not rejoin the TCP/IP sysplex group when a detected problem is relieved. This is the default value.

AUTOREJOIN

When all detected problems (that caused the stack to leave the sysplex group) are relieved, the stack automatically rejoins the sysplex group and reprocesses the saved VIPADYNAMIC block configuration.

Restriction: AUTOREJOIN cannot be configured when NORECOVERY is configured (or set to the default value).

Guideline: AUTOREJOIN should be used when RECOVERY is configured to allow the stack to rejoin the sysplex group without operator intervention.

DELAYJOIN | NODELAYJOIN

Specify whether TCP/IP should delay joining or rejoining the TCP/IP sysplex group (EZBTCPCS) during stack initialization, or rejoining the sysplex group following a VARY TCPIP,,OBEYFILE command.

NODELAYJOIN

Attempt to join the TCP/IP sysplex group. When specified during stack initialization, the stack attempts to join the sysplex group. This is the default value.

DELAYJOIN

Delay joining the TCP/IP sysplex group and processing any VIPADYNAMIC block or DYNAMICXCF statements during stack initialization until OMPROUTE is started and active.

DYNROUTE | NODYNROUTE

Specifies whether TCP/IP should monitor the presence of dynamic routes over monitored network links or interfaces.

NODYNROUTE

The TCP/IP stack should not monitor the presence of dynamic routes over monitored network links or interfaces. When MONINTERFACE is not configured, this is the default value.

DYNROUTE

The TCP/IP stack should monitor the presence of dynamic routes over monitored network links or interfaces.

Tip: This level of monitoring is useful in detecting problems that OMPROUTE is having in communicating with other routing daemons on the selected network interfaces.

If no dynamic routes are present in the TCP/IP stack from that network, a specific interface attached to that network might not be active or routers attached to that network might not be active or healthy. In either case, when these conditions are detected, they provide a reasonable indication that client requests for DVIPAs or distributed DVIPAs owned by this TCP/IP stack might not reach this stack over that interface. These checks can help further qualify the state of a network interface on this TCP/IP stack. When the MONINTERFACE parameter is specified, This is the default value.

Restriction: DYNROUTE cannot be specified when NOMONINTERFACE is configured (or is the default value).

Rules:

- Specify DYNROUTE only when OMPROUTE is configured and started; otherwise, the TCP/IP stack might be forced to leave the TCP/IP sysplex group if RECOVERY is coded.
- If DYNROUTE is specified, also specify DELAYJOIN to avoid a scenario where the TCP/IP stack leaves the TCP/IP sysplex group before OMPROUTE is started.

NOJOIN

Specifies that the TCP/IP stack should not join the TCP/IP sysplex group (EZBTCPCS) during stack initialization. If this value is specified,

the TCP/IP stack does not process any VIPADYNAMIC block or DYNAMICXCF statements. Any other GLOBALCONFIG SYSPLEXMONITOR parameter settings (configured or default) are ignored, and the settings are saved in case you want the TCP/IP stack to join the sysplex group at a later time.

If you subsequently issue a VARY TCPIP,,SYSPLEX,JOINGROUP command, the NOJOIN setting is overridden and the saved GLOBALCONFIG SYSPLEXMONITOR parameter settings become active. For example, if you configure NOJOIN and DELAYJOIN, DELAYJOIN is initially ignored. If you subsequently issue a VARY TCPIP,,SYSPLEX,JOINGROUP command, NOJOIN is overridden, DELAYJOIN becomes active, and the stack joins the sysplex group if OMPROUTE is initialized.

Any sysplex-related definitions within the TCP/IP profile, such as VIPADYNAMIC or IPCONFIG DYNAMICXCF statements, are not processed until the TCP/IP stack joins the sysplex group.

Restriction: You can specify this parameter only in the initial profile; you cannot specify it when you issue a VARY TCPIP,,OBEYFILE command.

MONINTERFACE | NOMONINTERFACE

NOMONINTERFACE

The TCP/IP stack should not monitor the status of any network links or interfaces. This is the default.

MONINTERFACE

The TCP/IP stack should monitor the status of specified network link or interfaces. The interfaces or links being monitored are those that are configured with the MONSYSPLEX keyword on the LINK or INTERFACE statement. See Summary of DEVICE and LINK statements or Summary of INTERFACE statements for more information.

Guideline: This level of monitoring can further qualify the health of the TCP/IP stack by ensuring that at least one key interface is active and available. This option can be useful in environments where the dynamic XCF interface is not configured as an alternate network path for this stack (for example, where no dynamic routes are advertised over dynamic XCF interfaces and no static or replaceable static routes are defined over those interfaces).

RECOVERY | NORECOVERY

Specify the action to be taken when a sysplex problem is detected.

NORECOVERY

When a problem is detected, issue messages regarding the problem but take no further action. This is the default value.

RECOVERY

When a problem is detected, issue messages regarding the problem, leave the TCP/IP sysplex group, and delete all DVIPA resources owned by this stack. As allowed by a configuration with backup capabilities, other members of the TCP/IP sysplex automatically take over the functions of this member that was removed from the TCP/IP sysplex group.

Recovery is the preferred method of operation because other members of the TCP/IP sysplex can automatically take over the functions of a member with no actions needed by an operator. IBM Health Checker for z/OS enhancements can be used to check whether the RECOVERY parameter has been specified when the IPCONFIG DYNAMICXCF or IPCONFIG6 DYNAMICXCF parameters have been specified. For more details about IBM Health Checker for z/OS enhancements, see the IBM Health Checker for z/OS enhancements information in the z/OS Communications Server: IP Diagnosis Guide.

TIMERSECS *seconds*

Time value specified in seconds. Determines how quickly the sysplex monitor reacts to problems with needed sysplex resources. Valid values are in the range 10 - 3600 seconds. The default value is 60 seconds.

SYSPLXWLPOLL *seconds*

Time value specified in seconds. Determines how quickly the sysplex distributor and its target servers poll WLM for new weight values. A short time results in quicker reactions to changes in target status. Valid values are in the range 1 - 180 seconds. The default value is 60 seconds.

TCPIPSTATISTICS | NOTCPIPSTATISTICS

NOTCPIPSTATISTICS

Indicates that the TCP/IP counter values are not to be written to the output data set designated by the CFGPRINT JCL statement.

The NOTCPIPSTATISTICS parameter is confirmed by the message:

```
EZZ0613I TCPIPSTATISTICS IS DISABLED
```

This is the default value.

TCPIPSTATISTICS

Prints the values of several TCP/IP counters to the output data set designated by the CFGPRINT JCL statement. These counters include number of TCP retransmissions and the total number of TCP segments sent from the MVS™ TCP/IP system. These TCP/IP statistics are written to the designated output data set only during termination of the TCP/IP address space.

The TCPIPSTATISTICS parameter is confirmed by the message:

```
EZZ0613I TCPIPSTATISTICS IS ENABLED
```

The SMFCONFIG TCPIPSTATISTICS parameter (see SMFCONFIG statement) serves a different purpose. It requests that SMF records of subtype 5 containing TCP/IP statistics be created. These statistics are recorded in SMF type 118 or 119, subtype 5 records.

WLMRIORITYQ | NOWLMRIORITYQ

Specifies whether OSA-Express QDIO write priority values should be assigned to packets associated with WorkLoad Manager service classes, and to forwarded packets. See the information about prioritizing outbound OSA-Express data using the WorkLoad Manager service class in z/OS Communications Server: IP Configuration Guide .

NOWLMRIORITYQ

Specifies that OSA-Express QDIO write priority values should not be assigned to packets associated with WorkLoad Manager service class values or to forwarded packets. This value is the default.

WLMPRIORITYQ

Specifies that OSA-Express QDIO write priority values should be assigned to packets associated with WorkLoad Manager service class values and to forwarded packets.

You can assign specific OSA-Express QDIO write priority values by using the `IOPRI n` subparameters, where n is one or more of the priority values in the range 1 - 4. For each subparameter, you can specify a control value in the range 0 - 6, which correlates to the WLM service classes, or you can specify the keyword `FWD` for forwarded packets. WLM supports a service class for the `SYSTEM` value, but this value is always assigned the OSA-Express QDIO write priority 1 and its assignment cannot be configured; therefore, a control value is not assigned for the `SYSTEM` WLM service class.

You can use the default assignment by specifying the `WLMPRIORITYQ` parameter without any `IOPRI n` subparameters. See the description of the *default_control_values* variable in this topic to understand the default assignment.

control_values

Control values are used to represent the WLM service classes and forwarded packets. Valid control values are the digits 0 - 6, which represent WLM service classes, or the keyword `FWD`, which represents forwarded packets. Table 4 identifies the control value, the type of packet that it represents, and the default QDIO priority assigned to the packet:

Table 4. WLM Service Class Importance Levels

Control value	Type of packet	Default QDIO priority
0	System-defined service class (SYSSTC) used for high-priority started tasks	1
1	User-defined service classes with importance level 1	2
2	User-defined service classes with importance level 2	3
3	User-defined service classes with importance level 3	3
4	User-defined service classes with importance level 4	4
5	User-defined service classes with importance level 5	4
6	User-defined service classes associated with a discretionary goal	4
FWD	Forwarded packets	4

default_control_values

When the `WLMPRIORITYQ` parameter is specified without any `IOPRI n` subparameters, then the OSA-Express QDIO write priority values are assigned as shown Table 4.

IOPRI n control_values

Use the `IOPRI n` subparameters to correlate control values with

specific OSA-Express QDIO write priority values. You can use one or more of the following subparameter keywords:

- IOPRI1
- IOPRI2
- IOPRI3
- IOPRI4

Each subparameter keyword corresponds to one of the four QDIO write priority values, 1 through 4. Each subparameter can be specified once on a GLOBALCONFIG statement.

control_values

Indicates the type of packet to which the QDIO write priority value should be assigned. Valid values are:

Digits 0 - 6

Causes the QDIO write priority value that is specified by the IOPRI n subparameter to be assigned to packets associated with the WLM service classes represented by the control value.

FWD This keyword causes the QDIO write priority value indicated by the IOPRI n subparameter to be assigned to forwarded packets.

Rules:

- IOPRI n must be followed by one or more priority level releases.
- You can specify more than one control value for an IOPRI n subparameter. Each control value must be separated by at least one blank.
- A specific control value can be specified only once in the set of IOPRI n subparameters on a GLOBALCONFIG statement.
- If any control value is not explicitly specified on an IOPRI n subparameter, then the associated packets are assigned a default QDIO write priority 4.

In the following example, QDIO priority 1 is assigned to packets associated with control values 0 and 1, QDIO priority 2 is assigned to packets associated with control value 2 and to forwarded packets, QDIO priority 3 is assigned to packets associated with control values 3 and 4, and QDIO priority 4 is assigned to packets associated with control values 5 and 6.

```
WLMRIORITYQ IOPRI1 0 1
             IOPRI2 2 FWD
             IOPRI3 3 4
             IOPRI4 5 6
```

XCFGRPID *group_id*

This parameter is needed only if you want subplexing. If specified, the value provides a 2-digit suffix that is used in generating the XCF group name that the TCP/IP stack joins. Valid values are in the range 2 - 31. The group name is EZBT $vvtt$, where the vv value is the VTAM XCF group ID suffix (specified with the XCFGRPID VTAM start option) and the tt value is the *group_id* value supplied on this parameter, used as a 2-digit value converted to character format. If no VTAM XCF group ID suffix was specified, the group name is EZBTCPT t . If no VTAM XCF group ID suffix and no TCP XCF group ID suffix is specified, the group name is EZBTCPCS.

These characters are also used as a suffix for the EZBDVIPA and EZBEPOR structure names, in the form EZBDVIPA*vvtt* and EZBEPOR*vvtt*. If no VTAM XCF group ID suffix was specified, the structure names are EZBDVIPA01*tt* and EZBEPOR01*tt*.

If XCFGRPID is not specified, the XCF group name is EZBTvvCS and the structure names are EZBDVIPA*vv* and EZBEPOR*vv*. If no VTAM XCF group id suffix was specified, the group name is EZBTCPCS and the structure names are EZBDVIPA and EZBEPOR.

Restriction: XCFGRPID can be specified only in the initial profile.

This allows multiple TCP/IP stacks to join separate Sysplex groups and access separate Coupling Facility structures, isolating sets of TCP/IP stacks into subplexes with XCF communication only with other TCP/IP stacks within the same subplex.

If HiperSockets is supported on this system, the IQDVLANID parameter, on the GLOBALCONFIG statement, must be specified if XCFGRPID is specified. Stacks on the same CPC using the same HiperSockets CHPID that specify the same XCFGRPID value must specify the same IQDVLANID value.

Stacks on the same CPC using the same HiperSockets CHPID specifying different XCFGRPID values must specify different IQDVLANID values. This allows partitioning of connectivity across the Sysplex to include partitioning of connectivity across HiperSockets.

Creating TCP/IP and VTAM subplexes can add some complexity to your VTAM and TCP/IP configurations and requires careful planning. Before setting this parameter you should review the information about setting up a subplex in the z/OS Communications Server: IP Configuration Guide.

ZIIP

Specifies subparameters that control whether TCP/IP displaces CPU cycles onto a System z9® Integrated Information Processor (zIIP). You must specify at least one subparameter. If the ZIIP parameter is specified with no subparameters, an informational message is issued and the parameter is ignored.

IPSECURITY | NOIPSECURITY

Specifies whether TCP/IP should displace CPU cycles for IPsec workload to a zIIP. For more information about this function, see the Additional IPsec assist using z9® Integrated Information Processor (zIIP IP security) topic in z/OS Communications Server: IP Configuration Guide.

NOIPSECURITY

Do not displace CPU cycles for IPsec workload to a zIIP. This is the default value.

IPSECURITY

When possible, displace CPU cycles for IPsec workload to a zIIP. Workload Manager (WLM) definitions should be examined and possible changes made before this option is used. See the more detailed description in the additional IPsec Assist by way of z9 Integrated Information Processor (zIIP IPSECURITY) topic in z/OS Communications Server: IP Configuration Guide.

NOIQDIOMULTIWRITE | IQDIOMULTIWRITE

Specifies whether TCP/IP should displace CPU cycles for large outbound TCP messages that are typically created by traditional streaming workloads such as file transfer, and interactive web-based service workloads

such as XML or SOAP. The TCP/IP outbound message must be at 32KB in length before the write processing is off-loaded to an available zIIP specialty engine. For more information about this function, see the information about additional IPsec Assist by way of z9 Integrated Information Processor (zIIP IPSECURITY) in z/OS Communications Server: IP Configuration Guide.

NOIQDIOMULTIWRITE

Do not displace CPU cycles for the writing of large TCP outbound messages to a zIIP. This is the default value.

IQDIOMULTIWRITE

When possible, displace CPU cycles for the writing of large TCP outbound messages to a zIIP.

Rules:

- You cannot specify IQDIOMULTIWRITE as a zIIP parameter when GLOBALCONFIG IQDMULTIWRITE is not configured. When GLOBALCONFIG IQDMULTIWRITE is not configured, HiperSockets interfaces do not use the multiple write support.
- Only large TCP outbound messages (32KB and larger) are processed on the zIIP specialty engine.
- The TCP message must be originating from this node. Routed TCP messages are not eligible for zIIP assistance.

Tip: These zIIP parameters apply to pre-defined HiperSockets interfaces, as well as HiperSockets interfaces that are created and used by dynamic XCF definitions.

Steps for modifying

To modify parameters for the GLOBALCONFIG statement, you must respecify the statement with the new parameters.

The following list describes how to modify individual parameters:

AUTOIQDX and NOAUTOIQDX

If you use the VARY TCPIP,,OBEYFILE command to change this parameter from AUTOIQDX to NOAUTOIQDX, no new dynamic IQDX interfaces will be activated. All active dynamic IQDX interfaces will remain active and available for use. To stop existing interfaces, you must issue a V TCPIP,,STOP command for each active IQDX interface.

If you use the VARY TCPIP,,OBEYFILE command to change this parameter from NOAUTOIQDX to AUTOIQDX, active OSX interfaces are not affected, but the stack will attempt to activate a dynamic IQDX interface on any subsequent OSX activations.

EXPLICITBINDPORTRANGE and NOEXPLICITBINDPORTRANGE

If you specified the EXPLICITBINDPORTRANGE parameter and then you change to the NOEXPLICITBINDPORTRANGE parameter, then the stack stops allocating more ports from the EXPLICITBINDPORTRANGE pool. However, the existing active range for the EXPLICITBINDPORTRANGE pool in the coupling facility is unaffected unless you are changing the parameter on the last stack in the sysplex using this function.

If you specified the NOEXPLICITBINDPORTRANGE parameter and then you change to the EXPLICITBINDPORTRANGE parameter, then a range of ports used for the EXPLICITBINDPORTRANGE pool is set. The stack uses

ports from that pool for explicit bind() requests to the IPv4 INADDR_ANY address, or to the IPv6 unspecified address (in6addr_any), and port 0. If the range specified on the EXPLICITBINDPORTRANGE parameter is different from the currently active range for the EXPLICITBINDPORTRANGE pool in the coupling facility, the new range replaces that value.

Changing the starting port (*1st_port*), the number of ports (*num_ports*), or both for the EXPLICITBINDPORTRANGE parameter changes the port numbers in the pool of ports that is guaranteed to be unique across the sysplex for future port allocation

Guidelines:

- Changing the range specified on the EXPLICITBINDPORTRANGE parameter of the GLOBALCONFIG statement affects every stack in the sysplex that has configured a GLOBALCONFIG EXPLICITBINDPORTRANGE value. Future port allocations for all such stacks use the new port range.
- Ports in the EXPLICITBINDPORTRANGE range are usually assigned to a stack in blocks of 64 ports. When expanding the range, use multiples of 64 multiplied by the number of stacks that use a GLOBALCONFIG EXPLICITBINDPORTRANGE configuration.

IQDMULTIWRITE and NOIQDMULTIWRITE

If this parameter is changed with the VARY TCPIP,,OBEYFILE command, the new value does not take effect for any active HiperSockets (iQDIO) interfaces. For a change in this parameter to take effect for an active iQDIO interface, you must stop and restart both the IPv4 and IPv6 interface for the change to be effective.

IQDVLANID

If the IQDVLANID parameter was previously specified and you modify that value, then you must stop and restart the TCP/IP stack for the change to take effect.

MLSCHKTERMINATE

You cannot change the MLSCHKTERMINATE parameter to the NOMLSCHKTERMINATE parameter when the RACF[®] option MLSTABLE is on and the RACF option MLQUIET is off. You can always change the NOMLSCHKTERMINATE parameter to the MLSCHKTERMINATE parameter, but this change is ignored if the value is specified in the data set of a VARY TCPIP,,OBEYFILE command and consistency errors are detected at the same time.

SEGMENTATIONOFFLOAD and NOSEGMENTATIONOFFLOAD:

If this parameter is changed with the VARY TCPIP,,OBEYFILE command, the new value does not take effect for any active OSA-Express QDIO interfaces. For a change in these parameters to take effect, all the OSA-Express QDIO interfaces that support TCP segmentation offload must be stopped and restarted.

SMCR and NOSMCR

- If SMCR support is not enabled, you can specify the SMCR parameter in a VARY TCPIP,,OBEYFILE command data set to activate the support.

Result: TCP/IP retains knowledge of the last set of SMCR subparameter values that are specified on the GLOBALCONFIG statement, even if GLOBALCONFIG NOSMCR was specified subsequently. If you issue a VARY TCPIP,,OBEYFILE command with GLOBALCONFIG SMCR

specified, TCP/IP uses the saved last set of SMCR subparameters, unless new values for the subparameters are coded on the GLOBALCONFIG SMCR statement. This allows you to temporarily stop SMC-R processing by issuing a VARY TCPIP,,OBEYFILE command with GLOBALCONFIG NOSMCR specified. Then you can resume SMC-R processing with the previous subparameter settings by issuing a second VARY TCPIP,,OBEYFILE command with just GLOBALCONFIG SMCR specified.

- If SMCR support is enabled, you can specify the NOSMCR parameter in a VARY TCPIP,,OBEYFILE command data set to deactivate the support.
 - No new TCP connections that use SMC-R processing will be established.
 - Existing TCP connections that use SMC-R will continue to use SMC-R processing.
- You cannot change the SMCR PFID parameter values that are currently configured when the associated 10GbE RoCE Express interfaces are active. To change the SMCR PFID parameter values that are currently configured, you must perform the following steps in order:
 1. Stop the associated 10GbE RoCE Express interfaces.
 2. Issue the VARY TCPIP,,OBEYFILE command with the new PFID values that are coded in the command data set. The new PFID values replace the existing PFID values.
- To add PFID values when you have one or more PFID values coded, you must specify the existing PFID values and the additional PFID values on the SMCR parameter in the VARY TCPIP,,OBEYFILE command data set. Existing PFID values and any existing 10GbE RoCE Express interfaces are not affected.

SYSPLEXMONITOR

AUTOREJOIN and NOAUTOREJOIN

If you change NOAUTOREJOIN to AUTOREJOIN after the stack has left the sysplex and before the problem that caused it to leave has been relieved, the stack automatically rejoins the sysplex group when the problem is relieved. However, if you change NOAUTOREJOIN to AUTOREJOIN after the problem that caused the stack to leave the group has been relieved, you must issue a VARY TCPIP,,SYSPLEX,JOINGROUP command to cause the stack to rejoin the sysplex.

DELAYJOIN and NODELAYJOIN

Changing from DELAYJOIN to NODELAYJOIN while the TCP/IP stack is in the process of delaying joining the sysplex group because OMROUTE is not active causes the TCP/IP stack to immediately join the sysplex group.

Changing from NODELAYJOIN to DELAYJOIN has no immediate effect until the TCP/IP stack leaves the sysplex group and then attempts to rejoin while OMROUTE is not active.

SYSPLEXWLMPOLL

You can change the polling rate for WLM values while the TCP/IP stack is active. In order for the change to be effective, you should change the polling rate on all stacks that participate in sysplex distribution (all active distributing stacks, any backup stacks that might take over distribution, and all target stacks).

WLMPPRIORITYQ

If you specify WLMPPRIORITYQ with the VARY TCPIP,,OBEYFILE command, the IOPRI*n* values are changed to the values specified for the *default_control_values* variable. The new values take effect immediately for all workloads influenced by this function.

WLMPPRIORITYQ IOPRI*n* control_values

If you specify this parameter with the VARY TCPIP,,OBEYFILE command, and you do not specify all the control values, the QDIO priority 4 is assigned to packets associated with all control values omitted. The new values immediately take effect for all workloads influenced by this function.

Rule: You cannot modify individual IOPRI*n* control values. If you attempt to modify IOPRI*n* control values, but you specify only those control values that you want to modify, then the QDIO priority 4 is assigned to packets that are associated with any control values that you omitted.

XCFGRPID

For a change in this parameter to take effect, you must stop and restart the TCP/IP stack.

Examples

This example shows the use of the SYSPLEXMONITOR parameter on the GLOBALCONFIG statement that enables many of the sysplex autonomies functions:

```
GLOBALCONFIG SYSPLEXMONITOR AUTOREJOIN DELAYJOIN MONINTERFACE DYNROUTE RECOVERY
```

The following example shows the use of the EXPLICITBINDPORTRANGE parameter to define 1024 ports in the range 5000 - 6023. The ports are used for explicit binds to the IPv4 INADDR_ANY address, or to the IPv6 unspecified address (in6addr_any), and port 0:

```
GLOBALCONFIG EXPLICITBINDPORTRANGE 5000 1024
```

The following example shows the use of the SMCR parameter to define two 10GbE RoCE Express features that use PFID values 0018 and 0019 and port numbers 1 and 2, and to limit the stack to 500 megabytes of 64-bit storage for SMC-R communications.

```
GLOBALCONFIG SMCR PFID 0018 PORTNUM 1 PFID 0019 PORTNUM 2 FIXEDMEMORY 500
```

Related topics

- SMFCONFIG statement
- For more information about TCP/IP networking in a multilevel-secure environment, see the security information in *z/OS Communications Server: IP Configuration Guide*.

INTERFACE - IPAQENET OSA-Express QDIO interfaces statement

Use the INTERFACE statement to specify an OSA-Express QDIO Ethernet interface for IPv4.

Restriction: This statement applies to IPv4 IP addresses only.

To determine the OSA-Express microcode level, use the DISPLAY TRL command. If a specific OSA-Express function is documented with a minimum microcode level, you can use this command to determine whether that function is supported. IBM service might request the microcode level for problem diagnosis. For more information about the DISPLAY TRL command, see z/OS Communications Server: SNA Operation.

The following OSA-Express features can be defined in QDIO mode for IPv4:

- Fast Ethernet
- Gigabit Ethernet
- 1000BASE-T Ethernet
- 10G Ethernet

When you start an IPAQENET interface (and you did not specify VMAC with ROUTEALL), TCP/IP registers all non-loopback local (home) IPv4 addresses for this TCP/IP instance to the OSA-Express feature. If you subsequently add, delete, or change any home IPv4 addresses on this TCP/IP instance, TCP/IP dynamically registers the changes to the OSA-Express feature. The OSA adapter routes datagrams destined for those IPv4 addresses to this TCP/IP instance.

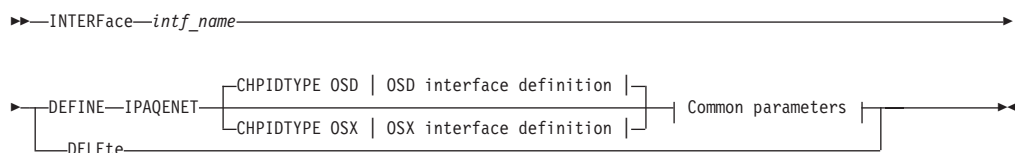
If a datagram is received at the OSA adapter for an unregistered IPv4 address, then the OSA-Express feature routes the datagram to the TCP/IP instance, depending on the setting of a virtual MAC (VMAC) address or definition of an instance as PRIROUTER or SECROUTER. If the datagram is not destined for a virtual MAC address and no active TCP/IP instance using this interface is defined as PRIROUTER or SECROUTER, then the OSA-Express feature discards the datagram. See the router information in z/OS Communications Server: IP Configuration Guide for more details and primary and secondary routing in z/OS Communications Server: SNA Network Implementation Guide.

For detailed instructions on setting up an OSA-Express feature, see zEnterprise System and System z10 OSA-Express Customer's Guide and Reference.

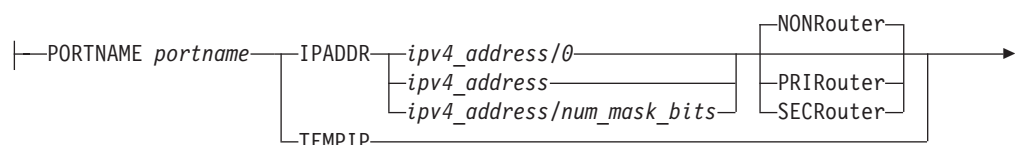
For more information about missing interrupt handler (MIH) considerations with TCP/IP interfaces, see Missing interrupt handler factors.

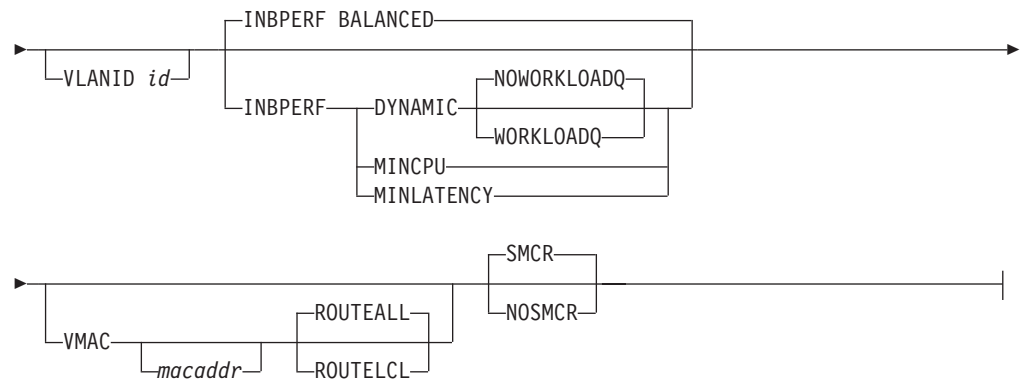
Syntax

Rule: Specify the required parameters and the CHPIDTYPE parameter in the order shown here. The OSD Interface Definition and OSX Interface Definition parameters can be specified in any order.

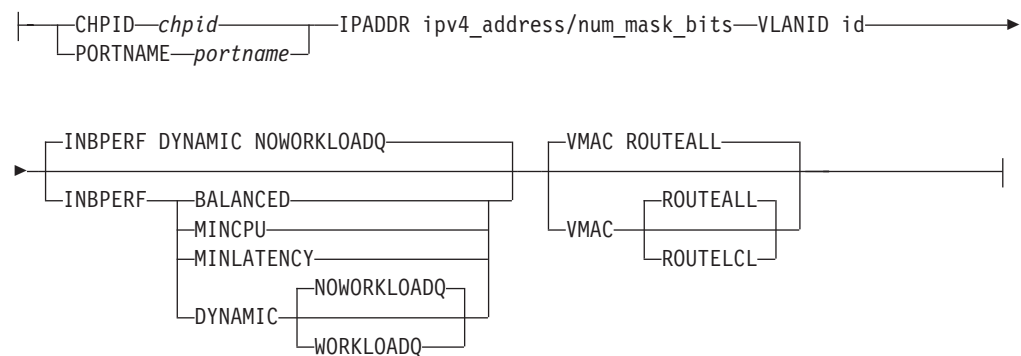


OSD Interface Definition:

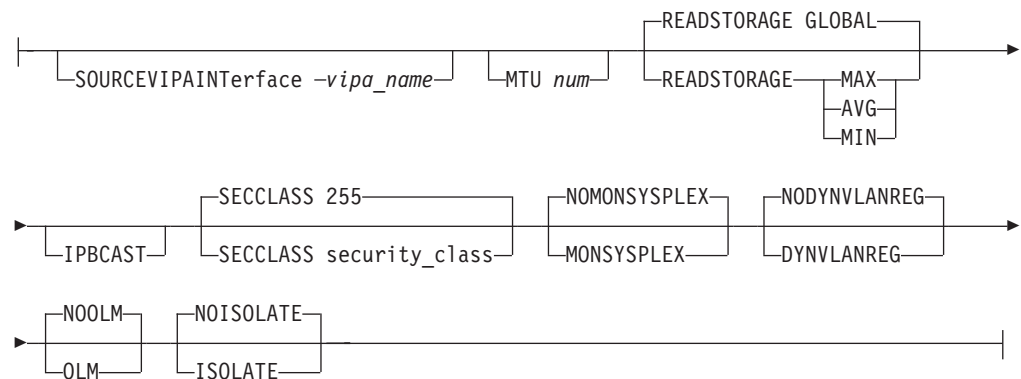




OSX Interface Definition:



Common parameters for OSD and OSX interface definitions:



Parameters

intf_name

The name of the interface. The maximum length is 16 characters.

Requirement: This name must be different than the name specified for the PORTNAME parameter.

DEFINE

Specifies that this definition is to be added to the list of defined interfaces.

DELETE

Specifies that this definition is to be deleted from the list of defined interfaces.

The *intf_name* value must be the name of an interface previously defined by an INTERFACE statement. Specifying INTERFACE DELETE deletes the home IP address for the interface.

IPAQENET

Indicates that the interface uses the interface based on IP assist, which belongs to the QDIO family of interfaces, and uses the Ethernet protocol.

CHPIDTYPE

An optional parameter indicating the CHPID type of the OSA-Express QDIO interface.

OSD Indicates an external data network type. This is the default value.

OSX The intraensemble data network. See z/OS Communications Server: IP Configuration Guide for information about requirements necessary to make an OSX work.

Rule: You must specify an OSD interface definition to make this interface eligible to use Shared Memory Communications over Remote Direct Memory Access (SMC-R).

CHPID *chpid*

This parameter applies only to interfaces of CHPIDTYPE OSX and is used to specify the CHPID for the interface. This value is a 2-character hexadecimal value (00 - FF).

PORTNAME *portname*

Use this parameter to specify the PORT name that is in the TRLE definition for the QDIO interface. The TRLE must be defined as MPCLEVEL=QDIO. For details about defining a TRLE, see z/OS Communications Server: SNA Resource Definition Reference.

Requirement: The *portname* value must be different than the name specified for *intf_name*.

IPADDR

ipv4_address

The home IP address for this interface.

Requirement: The IP address must be specified in dotted decimal form.

num_mask_bits

An integer value in the range 0 - 32 that represents the number of leftmost significant bits for the subnet mask of the interface. This value also controls how ARP processing for VIPAs is handled for this interface. When you specify a nonzero value, the TCP/IP stack informs OSA to perform ARP processing for a VIPA only if the VIPA is configured in the same subnet as the OSA (as defined by this subnet mask). The default is 0 for CHPIDTYPE OSD. This parameter is required for CHPIDTYPE OSX..

Requirement: If you are configuring multiple IPv4 VLAN interfaces to the same OSA-Express feature, then you must specify a nonzero value for the *num_mask_bits* variable for each of these interfaces and the resulting subnet must be unique for each of these interfaces.

Rule: If you are using OMPROUTE and OMPROUTE is not configured to ignore this interface, ensure that the subnet mask value that you define on this parameter matches the subnet mask used by

OMPROUTE for this interface. The subnet mask used by OMPROUTE is the subnet mask value defined on the corresponding OMPROUTE statement (OSPF_INTERFACE, RIP_INTERFACE, or INTERFACE) for this interface. If no OMPROUTE statement is specified for this interface, the subnet mask used by OMPROUTE is the class mask for the interface IP address.

TEMPIP

Specifies that the interface starts with an IP address of 0.0.0.0. The interface can be used for broadcast traffic. This parameter applies only to interfaces that are defined with CHPIDTYPE OSD.

Guideline: Use TEMPIP interfaces in a unit test environment to support an application that provides a DHCP client, such as IBM Rational® Developer for System z Unit Test feature (Rdz-UT). For more information about configuring a TEMPIP interface, see Using TEMPIP interfaces in z/OS Communications Server: IP Configuration Guide.

NONROUTER

If a datagram is received at this interface for an unknown IP address, the datagram is not routed to this TCP/IP instance. This is the default value.

The PRIROUTER and SECROUTER parameters interact with the VLANID parameter. See the VLANID parameter definition to understand this relationship.

For more information about VLANID parameter interactions, see z/OS Communications Server: IP Configuration Guide.

Rule: This keyword applies only to interfaces of CHPIDTYPE OSD and is ignored if the VMAC parameter is configured on the INTERFACE statement.

PRIROUTER

If a datagram is received at this interface for an unknown IP address and is not destined for a virtual MAC, the datagram is routed to this TCP/IP instance. This parameter interacts with the VLANID parameter. See the VLANID parameter definition to understand this relationship.

For more information about VLANID parameter interactions, see z/OS Communications Server: IP Configuration Guide.

Rule: This keyword applies only to interfaces of CHPIDTYPE OSD and is ignored if the VMAC parameter is configured on the INTERFACE statement.

SECROUTER

If a datagram is received at this interface for an unknown IP address and is not destined for a virtual MAC, and there is no active TCP/IP instance defined as PRIROUTER, then the datagram is routed to this TCP/IP instance. This parameter interacts with the VLANID parameter. See the VLANID parameter definition to understand this relationship.

For more information about VLANID parameter interactions, see z/OS Communications Server: IP Configuration Guide.

Rule: This keyword applies only to interfaces of CHPIDTYPE OSD and is ignored if the VMAC parameter is configured on the INTERFACE statement.

VLANID id

Specifies the decimal virtual LAN identifier to be assigned to the OSA-Express interface. This field should be a virtual LAN identifier recognized by the

switch for the LAN that is connected to this OSA-Express interface. The valid range is 1 - 4094. This parameter is optional for CHPIDTYPE OSD and required for CHPIDTYPE OSX.

Guideline: Installation configuration on other platforms or related to Ensemble networking can limit the maximum VLANID of 4096.

The VLANID parameter interacts with the PRIROUTER and SECROUTER parameters. If you configure both the VLANID parameter and either PRIROUTER or SECROUTER parameter, then this TCP/IP instance acts as a router for this VLAN (ID) only. Datagrams that are received at this device instance for an unknown IP address and are not destined for a virtual MAC are routed only to this TCP/IP instance if it is VLAN tagged with this VLAN ID. For more information about VLANID parameter interactions, see z/OS Communications Server: IP Configuration Guide.

Rule: If you are configuring multiple VLAN interfaces to the same OSA-Express feature, then you must specify the VMAC parameter (with the default ROUTEALL attribute) on the INTERFACE statement for each of these interfaces.

Restriction: The stack supports a maximum of 32 IPv4 VLAN interfaces to the same OSA-Express port. Additional VLANID limitations might exist if this interface can be used with Shared Memory Communications over Remote Direct Memory Access (SMC-R). See VLANID considerations in z/OS Communications Server: IP Configuration Guide for details.

INBPERF

An optional parameter that indicates how processing of inbound traffic for the QDIO interface is performed.

There are three supported static settings that indicate how frequently the adapter should interrupt the host for inbound traffic: BALANCED, MINCPU, and MINLATENCY. The static settings use static interrupt-timing values. The static values are not always optimal for all workload types or traffic patterns, and the static values cannot account for changes in traffic patterns.

There is also one supported dynamic setting (DYNAMIC). This setting causes the host (stack) to dynamically adjust the timer-interrupt value while the device is active and in use. This function exploits an OSA hardware function called Dynamic LAN Idle. Unlike the static settings, the DYNAMIC setting reacts to changes in traffic patterns and sets the interrupt-timing values to maximize throughput. The dynamic setting does not incur additional CPU consumption that might be produced when you specify any of the static settings. In addition, the DYNAMIC setting uses the OSA Dynamic Router Architecture function to enable QDIO inbound workload queues for specific inbound traffic types.

Result: When you specify OLM on the INTERFACE statement, the INBPERF parameter is ignored and the statement takes the value DYNAMIC.

Valid values for INBPERF are:

BALANCED

This setting uses a static interrupt-timing value, which is selected to achieve reasonably high throughput and reasonably low CPU consumption. This is the default value for CHPIDTYPE OSD. .

DYNAMIC

This setting causes the host to dynamically signal the OSA-Express feature to change the timer-interrupt value, based on current inbound

workload conditions. The DYNAMIC setting is effective only for OSA-Express2 or later features on at least an IBM System z9 that supports the corresponding Dynamic LAN Idle function. See the 2097DEVICE Preventive Service Planning (PSP) bucket for more information about the OSA-Express3 adapter that supports this function. The DYNAMIC setting should outperform the other three static settings for most workload combinations. This is the default value for CHPIDTYPE OSX.

If the DYNAMIC setting is specified for an OSA-Express adapter that does not support the dynamic LAN Idle function, the stack reverts to using the BALANCED setting.

WORKLOADQ | NOWORKLOADQ

This subparameter controls the QDIO inbound workload queueing function for the interface. QDIO inbound workload queueing is effective only for OSA-Express features in QDIO mode that support the corresponding Data Router Architecture. OSA-Express features that support workload queueing do not necessarily support workload queueing for all possible traffic types. 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.

NOWORKLOADQ

Specifies that QDIO inbound workload queueing is not enabled for inbound traffic. All inbound traffic for this interface uses a single input queue. This is the default value.

WORKLOADQ

Specifies that QDIO inbound workload queueing is enabled for inbound traffic.

If the WORKLOADQ subparameter is specified, QDIO inbound workload queueing is enabled for specific inbound traffic types. A primary input queue is reserved for all other traffic types.

Ancillary input queues (AIQs) are created for the following inbound traffic types when supported by the OSA-Express feature:

- Sysplex distributor
- Streaming workloads (for example FTP)
- Enterprise Extender (EE)

Requirement: You must specify the VMAC parameter with WORKLOADQ to enable QDIO inbound workload queueing.

If the WORKLOADQ setting is specified for an OSA-Express adapter that does not support the Data Router Architecture function, the stack reverts to using a single input queue.

MINCPU

This setting uses a static interrupt-timing value, which is selected to minimize host interrupts without regard to throughput. This mode of

operation might result in minor queueing delays (latency) for packets flowing into the host, which is not optimal for workloads with demanding latency requirements.

MINLATENCY

This setting uses a static interrupt-timing value, which is selected to minimize latency (delay), by more aggressively sending received packets to the host. This mode of operation generally results in higher CPU consumption than the other three settings. Use this setting only if host CPU consumption is not an issue.

VMAC macaddr

Specifies the virtual MAC address, which can be represented by 12 hexadecimal characters. The OSA-Express device uses this address rather than the physical MAC address of the device for all IPv4 packets sent to and received from this TCP/IP stack. For CHPIDTYPE OSD, using a virtual MAC address is optional. For CHPIDTYPE OSX, using a virtual MAC address is required, so the VMAC parameter is the default

The *macaddr* value is optional. The *macaddr* value is optional for CHIPIDTYPE OSD and cannot be specified for CHIPIDTYPE OSX. If you do not code the *macaddr* value, then the OSA-Express device generates a virtual MAC address. If you do code the *macaddr* value, it must be defined as a locally administered individual MAC address. This means the MAC address must have bit 6 (the universal or local flag U bit) of the first byte set to 1 and bit 7 (the group or individual flag G bit) of the first byte set to 0. The second hexadecimal character must be 2, 6, A, or E. The bit positions within the 12 hexadecimal characters are indicated as follows:

0	1 5	1 6	3 1	3 2	4 7

xxxxxxxUGxxxxxxx	xxxxxxxxxxxxxxxxxx		xxxxxxxxxxxxxxxxxx		

Rules:

- The same virtual MAC address generated by the OSA-Express device during interface activation remains in effect for this OSA-Express for this TCP/IP stack, even if the interface is stopped or becomes inoperative (INOPs). A new virtual MAC address is generated only if the INTERFACE statement is deleted and redefined or if the TCP/IP stack is recycled.
- The NONROUTER, PRIROUTER, and SECROUTER parameters are ignored for an OSA-Express interface if the VMAC parameter is configured on the INTERFACE statement.

Guideline: Unless the virtual MAC address representing this OSA-Express device must remain the same even after TCP/IP termination and restart, configure VMAC without a *macaddr* value and allow the OSA-Express device to generate it. This guarantees that the VMAC address is unique from all other physical MAC addresses and from all other VMAC addresses generated by any OSA-Express feature.

ROUTEALL

Specifies that all IP traffic destined to the virtual MAC is forwarded by the OSA-Express device to the TCP/IP stack. This is the default value. See the router information in *z/OS Communications Server: IP Configuration Guide* for more details.

ROUTECL

Specifies that only traffic destined to the virtual MAC and whose destination

IP address is registered with the OSA-Express device by this TCP/IP stack is forwarded by the OSA-Express. See the router information in z/OS Communications Server: IP Configuration Guide for more details.

SMCR | NOSMCR

Specifies whether this interface can be used with Shared Memory Communications over Remote Direct Memory Access (SMC-R) for external data network communications.

NOSMCR

Specifies that this interface cannot be used for new TCP connections with SMC-R for external data network communications.

SMCR

Specifies that this interface can be used for new TCP connections with SMC-R for external data network communications. This is the default setting.

Rules:

- SMCR and NOSCMR are valid with CHPIDTYPE OSD definitions only.
- SMCR has no effect unless at least one Peripheral Component Interconnect Express (PCIe) function ID (PFID) value is specified by using the PFID subparameter of the SMCR parameter on the GLOBALCONFIG statement.
- SMCR has no effect unless a nonzero subnet mask is configured on the INTERFACE statement.

SOURCEVIPINTERFACE *vipa_name*

Specifies which previously-defined static VIPA interface is used for SOURCEVIPA (when IPCONFIG SOURCEVIPA is in effect). The *vipa_name* value is the interface name (or link name) for a VIRTUAL interface. This parameter is optional.

Requirement: The VIRTUAL interface must be defined prior to specifying this INTERFACE statement to the TCP/IP stack. It must either already be defined, or the INTERFACE statement (or DEVICE and LINK statements) that define the static VIPA must precede this INTERFACE statement in the profile data set.

Tip: The SOURCEVIPINTERFACE setting can be overridden. See the information about Source IP address selection in z/OS Communications Server: IP Configuration Guide for the hierarchy of ways that the source IP address of an outbound packet is determined.

MTU *num*

The maximum transmission unit (MTU), in bytes. This value can be in the range 576 - 8992. The minimum MTU for IPv4 is 576. The stack takes the minimum of the configured value and the value supported by the device (returned by OSA).

The MTU default, which depends on the value that is supported by the device, is the following value:

- Gigabit Ethernet default MTU = 8992
- Fast Ethernet default MTU = 1492

The MTU default is 1492 for Fast Ethernet; otherwise, it is 8992.

Rule: If you are using OMPROUTE and OMPROUTE is not configured to ignore this interface, ensure that the MTU that you define on this parameter matches the MTU used by OMPROUTE for this interface. The MTU used by OMPROUTE is the MTU value defined on the corresponding OMPROUTE

statement (OSPF_INTERFACE, RIP_INTERFACE, or INTERFACE) for this interface. If an MTU value is not defined on the corresponding OMROUTE statement for this interface or if no OMROUTE statement is specified for this interface, the MTU used by OMROUTE is the minimum MTU for IPv4 (576).

Tip: See z/OS Communications Server: IP Configuration Guide, in section Maximum transmission unit considerations, for additional information about how TCP/IP uses the MTU to determine the largest size frame to send.

READSTORAGE

An optional parameter indicating the amount of fixed storage that z/OS Communications Server should keep available for read processing for this adapter. Use the QDIOSTG VTAM start option to specify a value that applies to all OSA-Express adapters in QDIO mode. You can use the READSTORAGE keyword to override the global QDIOSTG value for this adapter based on the inbound workload that you expect over this interface on this stack. The valid values for READSTORAGE are:

GLOBAL

The amount of storage is determined by the QDIOSTG VTAM start option. This is the default value.

MAX Use this value if you expect a heavy inbound workload over this interface.

AVG Use this value if you expect a medium inbound workload over this interface.

MIN Use this value if you expect a light inbound workload over this interface.

Tip: See the description of the QDIOSTG VTAM start option in the z/OS Communications Server: SNA Resource Definition Reference for details about exactly how much storage is allocated by z/OS Communications Server for each of these values.

IPBCAST

Specifies that the interface both sends and receives IP broadcast packets. If this parameter is not specified, no IP broadcast packets are sent or received on this interface.

SECCLASS *security_class*

Use this parameter to associate a security class for IP filtering with this interface. For traffic over the interface to match a filter rule, the filter rule must have the same security class value as the interface or a value of 0. You can specify filter rules in the TCP/IP profile or in an IP security policy file that is read by the Policy Agent. Filter rules can include a security class specification on the IpService statement in an IP Security policy file or on the SECCLASS parameter on the IPSECRULE statement in the TCP/IP profile.

Valid security classes are identified as a number in the range 1 - 255. The default value is 255. For more information about security class values, see z/OS Communications Server: IP Configuration Guide.

The TCP/IP stack ignores this value if IPSECURITY is not specified on the IPCONFIG statement.

MONSYSPLEX | NOMONSYSPLEX

Specifies whether sysplex autonomics should monitor the interface's status.

NOMONSYSPLEX

Specifies that sysplex autonomics should not monitor the interface's status. This is the default value.

MONSYSPLEX

Specifies that sysplex autonomics should monitor the interface's status.

Restriction: The MONSYSPLEX attribute is not in effect unless the MONINTERFACE keyword is specified on the GLOBALCONFIG SYSPLEXMONITOR profile statement. The presence of dynamic routes over this interface is monitored if the DYNROUTE keyword is also specified on the GLOBALCONFIG SYSPLEXMONITOR profile statement.

DYNVLANREG | NODYNVLANREG

This parameter controls whether or not the VLAN ID for this interface is dynamically or statically registered with the physical switch on the LAN.

Restriction: This parameter is applicable only if a VLAN ID is specified on the statement.

Dynamic registration of VLAN IDs is handled by the OSA-Express feature and the physical switch on your LAN. Therefore, in order for the DYNVLANREG parameter to be effective, both must be at a level that provides the necessary hardware support for dynamic VLAN ID registration. After the interface is active, you can view the Netstat DEvlinks/-d report output to determine whether your OSA-Express feature can support VLAN dynamic registration. This Netstat report also displays whether dynamic VLAN ID registration has been configured for the interface.

NODYNVLANREG

Specifies that if a VLAN ID is configured for this interface, it must be manually registered with the physical switches on the corresponding LAN. This is the default value. If this parameter is specified without a VLAN ID, then it is ignored.

DYNVLANREG

Specifies that if a VLAN ID is configured for this interface, it is dynamically registered with the physical switches on the corresponding LAN. If this parameter is specified without a VLAN ID, then warning message EZZ0056I is issued and the NODYNVLANREG setting is used instead.

OLM | NOOLM

An optional parameter indicating whether an OSA-Express adapter operates in optimized latency mode.

NOOLM

Specifies that the OSA-Express adapter should not operate in optimized latency mode. This is the default value.

OLM Specifies that the OSA-Express adapter operates in optimized latency mode (OLM). Optimized latency mode optimizes interrupt processing for both inbound and outbound data. Use this mode for workloads that have demanding latency requirements. Because this mode can provide significant increases of throughput, particularly for interactive, non-streaming workloads. For more information about optimized latency mode, see the optimized latency mode topic in z/OS Communications Server: IP Configuration Guide.

Guidelines:

- Because of the operating characteristics of optimized latency mode, you might need to change your configuration to direct traffic to particular OSA-Express write priority queues and to limit the number of concurrent users sharing an OSA-Express configured for optimized latency mode. For more information about OLM, see the optimized latency mode topic in z/OS Communications Server: IP Configuration Guide.
- The optimized latency mode function targets a z/OS environment with a high-volume, interactive workloads. Although optimized latency mode can compensate for some mixing of workloads, an excessive amount of high-volume streaming workloads, such as bulk data or file transfer, can result in higher CPU consumption.

Restrictions:

- This function is limited to OSA-Express3 or later Ethernet features in QDIO mode that are running with an IBM System z10 or later. See the 2097 DEVICE Preventive Service Planning (PSP) bucket for more information.
- Traffic that is either inbound over or being forwarded to an OSA-Express configured to use optimized latency mode is not eligible for the accelerated routing function provided by HiperSockets Accelerator and QDIO Accelerator.
- For an OSA-Express configured to use optimized latency mode, the stack ignores the configured or default INBPERF setting and uses the value DYNAMIC.

ISOLATE | NOISOLATE

Specifies whether packets should be directly routed between TCP/IP stacks that share the OSA adapter.

NOISOLATE

Route packets directly between TCP/IP stacks sharing the OSA adapter. In this mode, if the next hop address was registered by another stack that is sharing the OSA adapter, then the OSA-Express adapter routes the packet directly to the sharing stack without putting the packet on the external LAN.

ISOLATE

Prevent OSA-Express from routing packets directly to another TCP/IP stack that is sharing the OSA adapter. In this mode, OSA-Express adapter discards any packets when the next hop address was registered by another stack that is sharing the OSA adapter. Packets can flow between two stacks that share the OSA only by first going through a router on the LAN. For more details, see the OSA-Express connection isolation information in z/OS Communications Server: IP Configuration Guide.

Tips:

- If you isolate an interface, there might be an adverse effect on latency.
- You can selectively apply OSA-Express connection isolation to individual virtual LANs.
- The OSA-Express adapter requires that both stacks sharing the port be non-isolated for direct routing to occur. Therefore, for traffic between two stacks sharing the OSA adapter, as long as at least one of the stacks is isolated, connection isolation is in effect for traffic in both directions between these stacks.

Restriction: This function is limited to OSA-Express2 or later Ethernet features in QDIO mode and running at least an IBM System z9 Enterprise Class (EC) or z9 Business Class (BC). See the 2094DEVICE, 2096DEVICE, 2097DEVICE, or 2098DEVICE Preventive Service Planning (PSP) bucket for more information.

Steps for modifying

See Summary of INTERFACE statements for modification information.

Examples

```
INTERFACE OSAQDIO24
DEFINE IPAQENET
PORTNAME OSAQDIO2
SOURCEVIPAINIT VIPAV4
IPADDR 100.1.1.1/24
```

Related topics

- BEGINROUTES statement
- BSDROUTINGPARMS statement
- DEVICE and LINK — MPCIPA OSA-Express QDIO devices statement
- “GLOBALCONFIG statement” on page 34
- “INTERFACE - IPAQENET6 OSA-Express QDIO interfaces statement”
- SCONFIG statement
- START statement
- STOP statement

INTERFACE - IPAQENET6 OSA-Express QDIO interfaces statement

Use the INTERFACE statement to specify an OSA-Express QDIO Ethernet interface for IPv6.

To determine the OSA-Express microcode level, use the DISPLAY TRL command. If a specific OSA-Express function is documented with a minimum microcode level, you can use this command to determine whether that function is supported. IBM service might request the microcode level for problem diagnosis. For more information about the DISPLAY TRL command, see z/OS Communications Server: SNA Operation.

The following OSA-Express features can be defined in QDIO mode for IPv6:

- Fast Ethernet
- Gigabit Ethernet
- 1000BASE-T Ethernet
- 10G Ethernet

When you start an IPAQENET6 interface (and you do not specify VMAC with ROUTEALL), TCP/IP registers all non-loopback local (home) IPv6 addresses for this TCP/IP instance to the OSA-Express feature. If you subsequently add, delete, or change any home IPv6 addresses on this TCP/IP instance, TCP/IP dynamically registers the changes to the OSA-Express feature. If stateless address autoconfiguration is enabled for this interface, TCP/IP dynamically registers autoconfigured addresses to the OSA-Express feature. This includes both public

and temporary autoconfigured addresses. The OSA-Express feature routes datagrams destined to those IPv6 addresses to this TCP/IP instance.

If a datagram is received by the OSA adapter for an unregistered IPv6 address, then the OSA-Express feature routes the datagram to the TCP/IP instance, depending on the setting of a virtual MAC (VMAC) address or whether the definition of an instance is PRIROUTER or SECROUTER. If the datagram is not destined for a virtual MAC address and no active TCP/IP instance using this interface is defined as PRIROUTER or SECROUTER, then the OSA-Express feature discards the datagram. For more details about the OSA-Express feature routing considerations, see the router information in *z/OS Communications Server: IP Configuration Guide* and primary and secondary routing in *z/OS Communications Server: SNA Network Implementation Guide*.

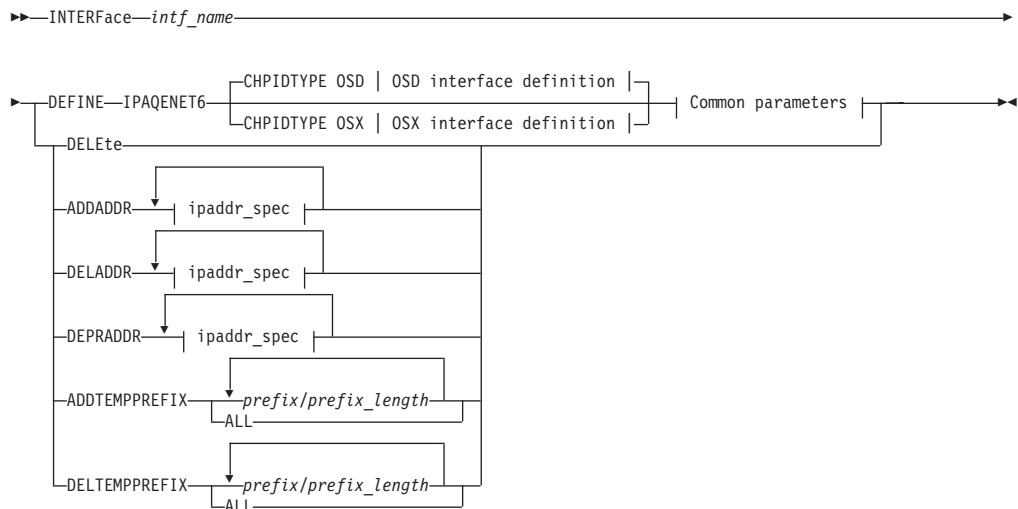
For detailed instructions on setting up an OSA-Express feature, see *zEnterprise System and System z10 OSA-Express Customer's Guide and Reference*.

For more information about missing interrupt handler (MIH) considerations with TCP/IP interfaces, see *Missing interrupt handler factors*.

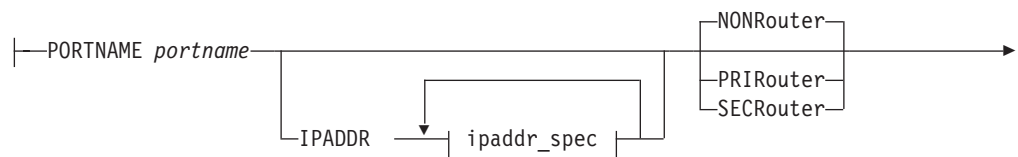
Restriction: This statement applies to IPv6 IP addresses only.

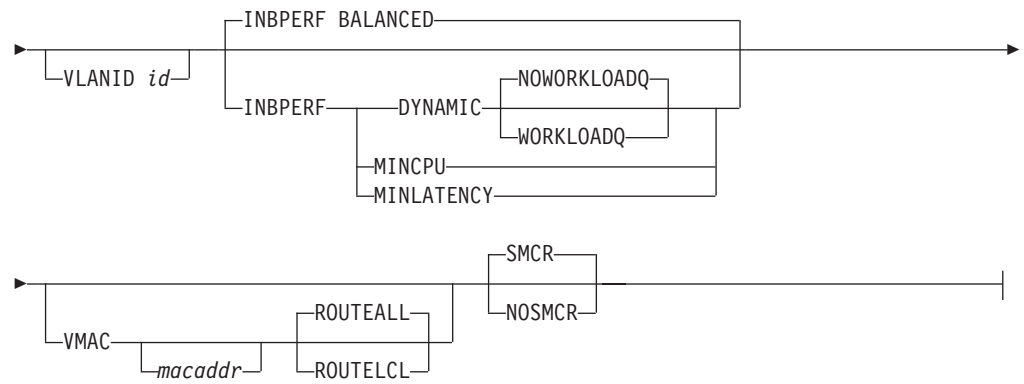
Syntax

Rule: Specify the required parameters and the CHPIDTYPE parameter in the order shown here. The OSD Interface Definition and OSX Interface Definition parameters can be specified in any order.

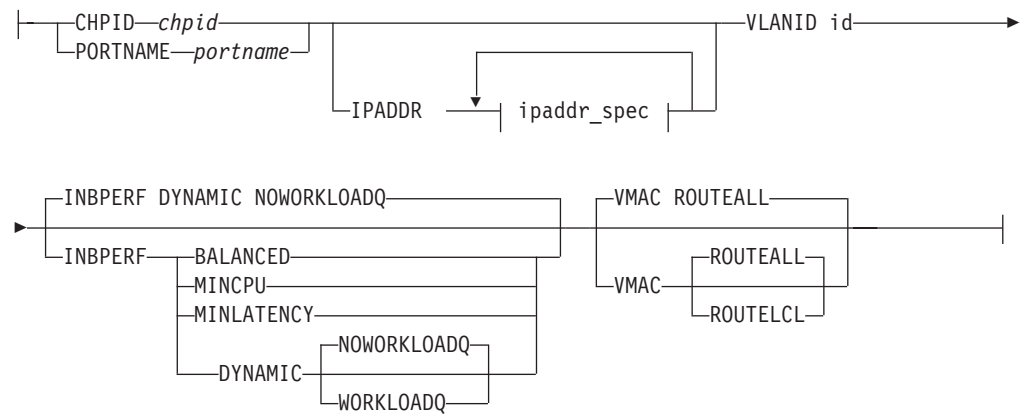


OSD interface definition:

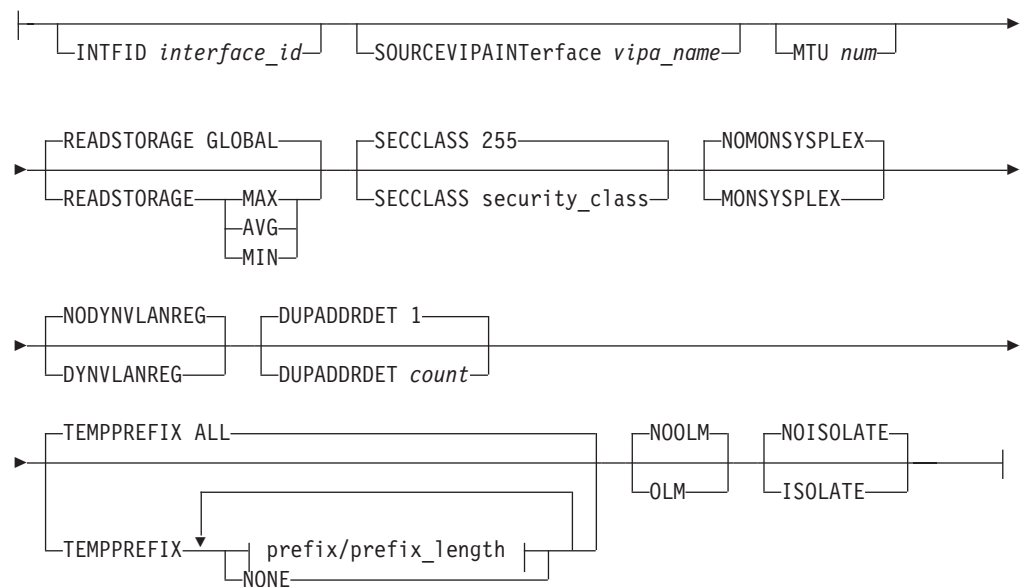




OSX Interface definition:



Common parameters for OSD and OSX interface definitions:



ipaddr_spec:



Parameters

intf_name

The name of the interface. The maximum length is 16 characters.

Requirement: This name must be different than the name specified for the PORTNAME parameter.

Restriction: Do not specify the value PUBLICADDRS or TEMPADDRS for the interface name. The values PUBLICADDRS and TEMPADDRS are keywords on the SRCIP statement. These values are not recognized if they are specified as an IPv6 interface name on an SRCIP entry.

DEFINE

Specifies that this definition is to be added to the list of defined interfaces.

DELETE

Specifies that this definition is to be deleted from the list of defined interfaces. The *intf_name* must be the name of an interface previously defined by an INTERFACE statement. INTERFACE DELETE deletes all home IP addresses for the interface.

CHPIDTYPE

An optional parameter indicating the CHPID type of the OSA-Express QDIO interface.

OSD The external data network. This is the default value.

OSX The intraensemble data network. See z/OS Communications Server: IP Configuration Guide for information about requirements necessary to make an OSX work.

Rule: You must specify an OSD interface definition to make this OSA-Express QDIO interface use Shared Memory Communications over Remote Direct Memory Access (SMC-R) for external data network communications.

IPADDR *ipaddr_spec*

For information about the IPv6 address restrictions, see Restrictions on IPv6 addresses configured in the TCP/IP profile.

The following value can be specified for *ipaddr_spec*:

ipv6_address

This parameter can be one of the following values:

- **ipv6_addr** (A fully qualified IPv6 address is in colon-hexadecimal format.)
- **prefix/64** [The digits (in colon-hexadecimal format) before the / represent the prefix. The prefix length represents the length of the prefix in bits. If a prefix length is coded, it must be equal to 64. When a prefix is specified, TCP/IP constructs the IPv6 address by appending the interface ID to it.]

Restriction: If you code a prefix that is longer than 64 bits, it is truncated to 64 bits, and no error messages are issued.

ADDADDR *ipaddr_spec*

Allows the addition of IP addresses to an existing INTERFACE definition (similar to updating the HOME list with the VARY TCPIP,,OBEYFILE command) without having to delete and redefine the INTERFACE. This can be used to change the autoconfiguration state of an interface. If ADDADDR is coded and this is the first manually configured IP address for the interface, then TCP/IP disables autoconfiguration for the interface. The *intf_name* coded with ADDADDR must be the name of an interface previously defined by an INTERFACE statement.

Any public or temporary addresses that had previously been autoconfigured for the interface are deleted.

DELADDR *ipaddr_spec*

Allows you to delete IP addresses from an existing INTERFACE definition. If DELADDR is coded for the last or only manually configured IP address for an interface, then TCP/IP enables autoconfiguration for the interface. DELADDR is valid only for an IP address or prefix configured manually. The *intf_name* coded with DELADDR must be the name of an interface previously defined by an INTERFACE statement. DELADDR is valid only in a data set specified on a VARY TCPIP,,OBEYFILE command.

Guideline: If you specify a prefix for DELADDR, then the only IP addresses affected are those defined by way of the same prefix specified on IPADDR or ADDADDR.

DEPRADDR *ipaddr_spec*

The DEPRADDR keyword allows you to deprecate an IP address. This can assist with site renumbering. DEPRADDR is valid only for an IP address or prefix configured manually. If you use DEPRADDR to deprecate an IP address, you can subsequently use ADDADDR again to make that IP address preferred. For DEPRADDR, the *interface_name* must be the name of an interface previously defined by an INTERFACE statement. DEPRADDR is valid only in a data set specified on a VARY TCPIP,,OBEYFILE command.

Guideline: If you specify a prefix for DEPRADDR, then the only IP addresses affected are those defined by way of the same prefix specified on IPADDR or ADDADDR.

ADDTEMPPREFIX

Use the ADDTEMPPREFIX keyword to add prefixes to the temporary prefixes list of an existing INTERFACE definition without having to delete and redefine the INTERFACE statement. The temporary prefixes list limits the set of prefixes for which temporary IPv6 addresses can be generated. A temporary IPv6 address is generated when a router advertisement containing the prefix is processed, and the prefix is included in one of the prefixes in the temporary prefixes list. For example, if the temporary prefixes list for an interface contains a single prefix 2001:0db8:58cd::/48, a temporary address is generated for advertised prefix 2001:0db8:58cd:0001/64; however, a temporary address is not generated on this interface for advertised prefix 2001:0db8:5555:0001/64. The *intf_name* variable coded with ADDTEMPPREFIX must be the name of an interface that was previously defined by an INTERFACE statement.

prefix/prefix_length

The digits (in colon-hexadecimal format) before the slash (/) represent the prefix. The *prefix_length* value represents the length of the prefix in bits. Valid values for *prefix_length* parameter are in the range 1 - 64.

ALL Causes temporary addresses to be generated for all prefixes that are learned over this interface by way of router advertisements.

DELTEMPPREFIX

Use the DELTEMPPREFIX keyword to delete prefixes from the temporary prefixes list of an existing INTERFACE definition. The temporary prefixes list limits the set of prefixes for which temporary IPv6 addresses can be generated. A temporary IPv6 address is generated when a router advertisement containing the prefix is processed and the prefix is included in one of the prefixes in the temporary prefixes list. The *intf_name* variable coded with the DELTEMPPREFIX keyword must be the name of an interface that was previously defined by an INTERFACE statement.

prefix/prefix_length

The digits (in colon-hexadecimal format) before the slash (/) represent the prefix. The *prefix_length* value represents the length of the prefix in bits. Valid values for the *prefix_length* are in the range 1 - 64. All temporary addresses for this interface whose prefix is not included in the updated temporary prefixes list are deleted.

ALL Delete all prefixes from the temporary prefixes list, which sets the temporary prefixes list to NONE. All temporary addresses for this interface are deleted, and no more temporary addresses are generated for this interface.

IPADDR *ipaddr_spec*

TCP/IP always creates the link-local IPv6 address. If IPADDR is not specified, then TCP/IP enables autoconfiguration for the interface.

Tip: Autoconfiguration is enabled if there is a router or some other device that provides a router advertisement.

If no address or prefix is specified, it is obtained from a router on the LAN by way of an IPv6 stateless autoconfiguration. For more information, see z/OS Communications Server: IPv6 Network and Application Design Guide.

IPAQENET6

Indicates that the interface uses the interface based on IP assist, belongs to the QDIO family of interfaces, and uses the Gigabit Ethernet or Fast Ethernet protocol.

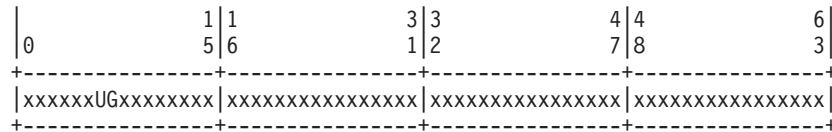
INTFID *interface_id*

An optional 64-bit interface identifier in colon-hexadecimal format. IPv6 shorthand is not allowed when specifying the interface ID. If specified, this interface ID is used to form the link-local address for the interface, and is also appended to any manually configured prefixes for the interface, to form complete IPv6 addresses on the interface. If you do not configure manual IP addresses on the interface, the INTFID value is appended to any prefixes that are learned over this interface by way of router advertisements to form public IPv6 addresses on the interface. The INTFID value is not used to form temporary IPv6 addresses. A randomly generated interface ID is appended to any learned prefixes to form temporary IPv6 addresses on the interface (if temporary addresses are enabled).

If INTFID is not coded, TCP/IP builds the Interface ID using information returned from the OSA-Express Adapter (during Interface activation). The built Interface ID value is then used to form the link-local address. This value is also used to complete the formation of other IPv6 addresses on the interface, if you choose to configure only the prefix portion of the addresses (by way of IPADDR or ADDADDR). Also, if you do not configure manual IP addresses on the interface, the built interface ID value is appended to any prefixes learned over this interface by way of router advertisements to form public IPv6 addresses on the interface. The built interface ID value is not used to form

temporary IPv6 addresses. A randomly generated interface ID is appended to any learned prefixes to form temporary IPv6 addresses on the interface (if temporary addresses are enabled).

When defining the interface ID, the local/universal flag (the U bit, bit 6 shown in the following example) must be set to 0. The group/individual flag (the G bit, bit 7 shown in the following example) must also be set to 0. If either flag is set incorrectly, interface definition fails. Additionally, an interface ID value correlating to an ISATAP address or a Reserved Anycast address is not allowed. (An ISATAP Interface ID has '00005EFE'x in bits 0 - 31, and a Reserved Anycast Interface ID has 'FCFFFFFFFFFFFF' in bits 0 - 56.)



SOURCEVIPAINTERFACE *vipa_name*

SOURCEVIPAINTERFACE is optional. Use this parameter to specify which previously defined static VIPA interface is to be used for SOURCEVIPA (when IPCONFIG6 SOURCEVIPA is in effect).

Tip: The use of the SOURCEVIPAINTERFACE parameter can be overridden. See the information about source IP address selection in z/OS Communications Server: IP Configuration Guide for the hierarchy of ways that the source IP address of an outbound packet is determined.

The *vipa_name* is the interface name for a VIRTUAL6 interface. If the VIPA has multiple IP addresses, then the sourcevipa address for outbound packets is selected from among these addresses according to the default source address selection algorithm. For more information, see z/OS Communications Server: IPv6 Network and Application Design Guide.

Requirement: The VIRTUAL6 interface must be defined prior to specifying this INTERFACE statement to the TCP/IP stack. It must either already be defined or, the INTERFACE statement that defines it must precede this INTERFACE statement in the profile data set.

CHPID *chpid*

This parameter applies only to interfaces of CHPIDTYPE OSX and is used to specify the CHPID for the interface. This value is a 2-character hexadecimal value (00 - FF).

PORTNAME *portname*

Use this parameter to specify the PORT name contained in the TRLE definition for the QDIO interface. The TRLE must be defined as MPCLEVEL=QDIO. For details about defining a TRLE, see z/OS Communications Server: SNA Resource Definition Reference.

Requirement: The *portname* value must be different from the name that is specified for the *intf_name* value.

NONROUTER

If a datagram is received at this interface for an unknown IP address, the datagram is not routed to this TCP/IP instance. This is the default value.

PRIRouter and SECRouter parameters interact with the VLANID parameter. See the VLANID parameter to understand this relationship.

For more information about VLANID parameter interactions, see z/OS Communications Server: IP Configuration Guide.

Rule: This keyword applies only to interfaces of CHPIDTYPE OSD and is ignored if the VMAC parameter is configured on the INTERFACE statement.

PRIROUTER

If a datagram is received at this interface for an unknown IP address and is not destined for a virtual MAC, the datagram is routed to this TCP/IP instance.

Rule: This keyword applies only to interfaces of CHPIDTYPE OSD and is ignored if the VMAC parameter is configured on the INTERFACE statement.

SECRROUTER

If a datagram is received at this interface for an unknown IP address and is not destined for a virtual MAC, and there is no active TCP/IP instance defined as PRIROUTER, then the datagram is routed to this TCP/IP instance.

Rule: This keyword applies only to interfaces of CHPIDTYPE OSD and is ignored if the VMAC parameter is configured on the INTERFACE statement.

DUPADDRDET *count*

Use this parameter to specify the number of times to attempt duplicate address detection. The minimum value is 0, maximum is 2 and default is 1. This is an optional parameter.

Guideline: A value of 0 means that TCP/IP does not perform duplicate address detection for this interface.

MTU *num*

The maximum transmission unit (MTU) in bytes. This value can be up to 9000. The minimum MTU for IPv6 is 1280. The stack takes the minimum of the configured value and the value supported by the device (returned by the OSA adapter).

The MTU default, which depends on value supported by device, is the following value:

- Gigabit Ethernet default MTU = 9000
- Fast Ethernet default MTU = 1500

Tip: See z/OS Communications Server: IP Configuration Guide, in section Maximum transmission unit considerations, for additional information about how TCP/IP uses the MTU to determine the largest size frame to send.

VLANID *id*

Specifies the decimal virtual LAN identifier to be assigned to the OSA-Express INTERFACE. This field should be a virtual LAN identifier recognized by the switch for the LAN connected to this OSA-Express. The valid range is 1 - 4094. This parameter is optional for CHPIDTYPE OSD and required for CHPIDTYPE OSX.

Guideline: Installation configuration on other platforms or related to Ensemble networking can limit the maximum VLANID of 4096.

The VLANID parameter interacts with the PRIRouter and SECRouter parameters. If you configure both the VLANID parameter and either PRIROUTER or SECRROUTER parameter, then this TCP/IP instance acts as a router for this VLAN (ID) only. Datagrams that are received at this device instance for an unknown IP address and are not destined for a virtual MAC are routed only to this TCP/IP instance if it is VLAN tagged with this VLAN ID. For more information about VLANID parameter interactions, see z/OS Communications Server: IP Configuration Guide.

Rule: If you are configuring multiple VLAN interfaces to the same OSA-Express feature, then you must specify the VMAC parameter (with the default ROUTEALL attribute) on the INTERFACE statement for each of these interfaces.

Restriction: The stack supports a maximum of 32 IPv6 VLAN interfaces to the same OSA-Express port. Additional VLANID limitations might exist if this interface can be used with Shared Memory Communications over Remote Direct Memory Access (SMC-R). See VLANID considerations in z/OS Communications Server: IP Configuration Guide for details.

READSTORAGE

An optional parameter indicating the amount of fixed storage that z/OS Communications Server should keep available for read processing for this adapter. The QDIOSTG VTAM start option allows you to specify a value which applies to all OSA-Express adapters in QDIO mode. You can use the READSTORAGE keyword to override the global QDIOSTG value for this adapter based on the inbound workload you expect over this interface on this stack. The valid values are:

GLOBAL

The amount of storage is determined by the QDIOSTG VTAM start option. This is the default value.

MAX Use this value if you expect a heavy inbound workload over this interface.

AVG Use this value if you expect a medium inbound workload over this interface.

MIN Use this value if you expect a light inbound workload over this interface.

Tip: See the description of the QDIOSTG VTAM start option in the z/OS Communications Server: SNA Resource Definition Reference for details about exactly how much storage is allocated by z/OS Communications Server for each of these values.

Rule: If you define both a LINK and INTERFACE statement for the same adapter, then the READSTORAGE value on the LINK statement must match the READSTORAGE value on the corresponding INTERFACE statement. If you define an INTERFACE statement that contains a value for READSTORAGE that conflicts with the READSTORAGE value for a previous LINK statement for the same adapter, then TCP/IP rejects the INTERFACE statement.

INBPERF

An optional parameter that indicates how processing of inbound traffic for the QDIO interface is performed.

There are three supported static settings (MINCPU, MINLATENCY, and BALANCED).that indicate how frequently the adapter should interrupt the host for inbound traffic: BALANCED, MINCPU, and MINLATENCY. The static settings use static interrupt-timing values. The static values are not always optimal for all workload types or traffic patterns, and cannot account for changes in traffic patterns.

There is also one supported dynamic setting (DYNAMIC). This setting causes the host (stack) to dynamically adjust the timer-interrupt value while the device is active and in use. This function exploits an OSA hardware function called Dynamic LAN Idle. Unlike the static settings, the DYNAMIC setting reacts to changes in traffic patterns, and sets the interrupt-timing values at the

point where throughput is maximized. In addition, the DYNAMIC setting uses the OSA Dynamic Router Architecture function to enable QDIO inbound workload queues for specific inbound traffic types.

Result: When you specify OLM on the INTERFACE statement, the INBPERF parameter is ignored and the statement defaults to the value DYNAMIC.

Valid values are:

BALANCED

This setting uses a static interrupt-timing value, which is selected to achieve reasonably high throughput and reasonably low CPU consumption. This is the default value for CHPIDTYPE OSD.

DYNAMIC

This setting causes the host to dynamically signal the OSA-Express feature to change the timer-interrupt value, based on current inbound workload conditions. The DYNAMIC setting is effective only for OSA-Express2 or later features on at least an IBM System z9 that supports the corresponding Dynamic LAN Idle function. See the 2094DEVICE Preventive Service Planning (PSP) bucket and the 2096DEVICE Preventive Service Planning (PSP) bucket for more information about the level of OSA-Express2 adapter that supports this function. See the 2097DEVICE Preventive Service Planning (PSP) bucket for more information about the OSA-Express3 adapter that supports this function. The DYNAMIC setting can decrease latency and provide increases in throughput for many interactive workloads. For all other workload combinations, this setting provides performance similar to the three static settings. This is the default value for CHPIDTYPE OSX.

If the DYNAMIC setting is specified for an OSA-Express adapter that does not support the dynamic LAN Idle function, the stack reverts to using the BALANCED setting.

WORKLOADQ | NOWORKLOADQ

This subparameter controls the QDIO inbound workload queueing function for the interface. QDIO inbound workload queueing is effective only for OSA-Express features in QDIO mode that support the corresponding Data Router Architecture. OSA-Express features that support workload queueing do not necessarily support workload queueing for all possible traffic types. 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.

NOWORKLOADQ

Specifies that QDIO inbound workload queueing is not enabled for inbound traffic. All inbound traffic for this interface uses a single input queue. This is the default.

WORKLOADQ

Specifies that QDIO inbound workload queueing is enabled for inbound traffic.

If the WORKLOADQ subparameter is specified, QDIO inbound workload queueing is enabled for specific inbound traffic types. A primary input queue is reserved for all other traffic types.

Ancillary input queues (AIQs) are created for the following inbound traffic types when supported by the OSA-Express feature:

- Sysplex distributor
- Streaming workloads (for example FTP)
- Enterprise Extender (EE)

Requirement: You must specify the VMAC parameter with WORKLOADQ to enable QDIO inbound workload queueing.

If the WORKLOADQ setting is specified for an OSA-Express adapter that does not support the Data Router Architecture function, the stack reverts to using a single input queue.

MINCPU

This setting uses a static interrupt-timing value, which is selected to minimize host interrupts without regard to throughput. This mode of operation might result in minor queueing delays (latency) for packets into the host, which is not optimal for workloads with demanding latency requirements.

MINLATENCY

This setting uses a static interrupt-timing value, which is selected to minimize latency (delay), by more aggressively presenting received packets to the host. This mode of operation generally results in higher CPU consumption than the other three settings. Use this setting only if host CPU consumption is not an issue.

Rule: If you define both a LINK IPAQENET and an INTERFACE IPAQENET6 statement for the same adapter, then the following rules apply for the INBPERF parameter on these statements:

- The value on the LINK statement must match the INBPERF value on the corresponding INTERFACE statement.
- The INTERFACE statement supports the subparameters WORKLOADQ and NOWORKLOADQ for the INBPERF DYNAMIC parameter. These subparameters are associated with QDIO inbound workload queueing support and are not supported on the LINK IPAQENET statement. So, if you specify the INBPERF DYNAMIC parameter for both the LINK and the INTERFACE statements, then you must use the default or specify the NOWORKLOADQ subparameter for the INBPERF DYNAMIC parameter on the INTERFACE statement. This ensures that the INBPERF DYNAMIC setting for both statements is the same.
- If you define an INTERFACE IPAQENET6 statement that contains a value for INBPERF that conflicts with the INBPERF value for a previous LINK IPAQENET statement for the same adapter, then TCP/IP rejects the INTERFACE statement.

SECCLASS *security_class*

Use this parameter to associate a security class for IP filtering with this interface. In order for traffic over the interface to match a filter rule, the filter rule must have the same security class value as the interface or a value of 0. Filter rules can be specified in the TCP/IP profile or in an IP Security policy file read by the Policy Agent. Filter rules can include a security class specification on the IpService statement in an IP Security policy file or on the SECCLASS parameter on the IPSEC6RULE statement in the TCP/IP profile.

Valid security classes are identified as a number in the range 1 - 255. The default value is 255. For more information about security class values, see *z/OS Communications Server: IP Configuration Guide*.

The TCP/IP stack ignores this value if IPSECURITY is not specified on the IPCONFIG6 statement.

MONSYSPLEX | NOMONSYSPLEX

Specifies whether or not sysplex autonomics should monitor the interface's status.

NOMONSYSPLEX

Specifies that sysplex autonomics should not monitor the interfaces' status. This is the default value.

MONSYSPLEX

Specifies that sysplex autonomics should monitor the interface's status.

Restriction: The MONSYSPLEX attribute is not in effect unless the MONINTERFACE keyword is specified on the GLOBALCONFIG SYSPLEXMONITOR profile statement. The presence of dynamic routes over this interface is monitored if the DYNROUTE keyword is also specified on the GLOBALCONFIG SYSPLEXMONITOR profile statement.

DYNVLANREG | NODYNVLANREG

This parameter controls whether or not the VLAN ID for this interface is dynamically or statically registered with the physical switch on the LAN.

Restriction: This parameter is applicable only if a VLAN ID is specified on the statement.

Dynamic registration of VLAN IDs is handled by the OSA-Express feature and the physical switch on your LAN. Therefore, in order for the DYNVLANREG parameter to be effective, both must be at a level which provides the necessary hardware support for dynamic VLAN ID registration. After the interface is active, you can view the Netstat DEvlinks/-d report output to determine if your OSA-Express feature can support VLAN dynamic registration. This Netstat report also displays whether or not dynamic VLAN ID registration has been configured for the interface.

Rule: If you define both a LINK and INTERFACE statement for the same adapter, then the dynamic VLAN ID registration parameter value on the LINK statement must match the value of this same parameter on the corresponding INTERFACE statement. If you define an INTERFACE statement that contains a dynamic VLAN ID registration parameter value that conflicts with the same parameter value for a previous INTERFACE statement for the same OSA-Express feature, then TCP/IP rejects the INTERFACE statement.

NODYNVLANREG

Specifies that if a VLAN ID is configured for this interface, it must be manually registered with the physical switches on the corresponding LAN. This is the default value. If this parameter is specified without a VLAN ID, then it is ignored.

DYNVLANREG

Specifies that if a VLAN ID is configured for this interface, it is dynamically registered with the physical switches on the corresponding LAN. If this parameter is specified without a VLAN ID, then warning message EZZ0056I is issued and the NODYNVLANREG setting is used instead.

VMAC *macaddr*

Specifies the virtual MAC address, which can be represented by 12 hexadecimal characters. The OSA-Express device uses this address rather than the physical MAC address of the device for all IPv6 packets to and from this TCP/IP stack. For CHPIDTYPE OSD, using a virtual MAC address is optional. For CHPIDTYPE OSX, using a virtual MAC address is required, so the VMAC parameter is the default.

The *macaddr* value is optional for CHPIDTYPE OSD and cannot be specified for CHPIDTYPE OSX. If the *macaddr* value is not coded, then the OSA-Express device generates a virtual MAC address. If the *macaddr* is coded, it must be defined as a locally administered individual MAC address. This means the MAC address must have bit 6 (the universal or local flag U bit) of the first byte set to 1 and bit 7 (the group or individual flag G bit) of the first byte set to 0. The second hexadecimal character must be 2, 6, A or E. The bit positions within the 12 hexadecimal characters are indicated as follows:

	1	1	3	3	4
0	5	6	1	2	7
+-----+-----+-----+					
xxxxxxUGxxxxxxxx	xxxxxxxxxxxxxxxx		xxxxxxxxxxxxxxxx		
+-----+-----+-----+					

Rules:

- The same virtual MAC address generated by the OSA-Express device at interface activation remains in effect for this OSA-Express for this TCP/IP stack, even if the interface is stopped or becomes inoperative (INOPs). A new Virtual MAC address is generated only if the INTERFACE statement is deleted and redefined, or if the TCP/IP stack is recycled.
- The NONROUTER, PRIROUTER, and SECROUTER parameters are ignored for an OSA-Express interface if the VMAC parameter is configured on the INTERFACE statement.

Guideline: Unless the virtual MAC address representing this OSA-Express device must remain the same even after TCP/IP termination and restart, configure VMAC without a *macaddr* value and allow the OSA-Express device to generate it. This guarantees that the VMAC address is unique from all other physical burned-in MAC addresses and from all other VMAC addresses generated by any OSA-Express feature.

ROUTEALL

Specifies that all IP traffic destined to the virtual MAC is forwarded by the OSA-Express device to the TCP/IP stack. This is the default value. See the router information in z/OS Communications Server: IP Configuration Guide for more details.

ROUTECL

This specifies that only traffic destined to the virtual MAC and whose destination IP address is registered with the OSA-Express device by this TCP/IP stack is forwarded by the OSA-Express. See the router information in z/OS Communications Server: IP Configuration Guide for more details.

SMCR | NOSMCR

Specifies whether this interface can be used with Shared Memory Communications over Remote Direct Memory Access (SMC-R) for external data network communications.

NOSMCR

Specifies that this interface cannot be used for new TCP connections with SMC-R for external data network communications.

SMCR

Specifies that this interface can be used for new TCP connections with SMC-R for external data network communications. This is the default setting.

Rules:

- SMCR and NOSCMR are valid with CHPIDTYPE OSD definitions only.
- SMCR has no effect unless at least one Peripheral Component Interconnect Express (PCIe) function ID (PFID) value is specified by using the PFID subparameter of the SMCR parameter on the GLOBALCONFIG statement.

OLM | NOOLM

An optional parameter indicating whether an OSA-Express adapter operates in optimized latency mode.

OLM Specifies that the OSA-Express adapter operates in optimized latency mode (OLM). Optimized latency mode optimizes interrupt processing for both inbound and outbound data. Use this mode for workloads that have demanding latency requirements. Because this mode can provide significant increases of throughput, this mode is particularly suited for interactive, non-streaming workloads. For more information about OLM, see the optimized latency mode topic in z/OS Communications Server: IP Configuration Guide.

NOOLM

Specifies that the OSA-Express adapter should not operate in optimized latency mode. This is the default value.

Guidelines:

- Because of the operating characteristics of optimized latency mode, you might need to change configuration to direct traffic to particular OSA-Express write priority queues and to limit the number of concurrent users sharing an OSA-Express adapter configured for OLM. See the optimized latency mode topic in z/OS Communications Server: IP Configuration Guide. for more information.
- The optimized latency mode function targets a z/OS environment with high-volume interactive workloads. Although optimized latency mode can compensate for some mixing of workloads, an excessive amount of high-volume streaming workloads, such as bulk data or file transfer, can result in higher CPU consumption.

Restrictions:

- This function is limited to OSA-Express3 or later Ethernet features in QDIO mode that are running with an IBM System z10 or later. See the 2097 DEVICE Preventive Service Planning (PSP) bucket for more information.
- For an OSA-Express configured to use optimized latency mode, the stack ignores the configured or default INBPERF setting and uses the value DYNAMIC.

NOISOLATE | ISOLATE

Specifies whether packets should be directly routed between TCP/IP stacks that share the OSA adapter.

NOISOLATE

Route packets directly between TCP/IP stacks that share the OSA adapter. In this mode, if the next hop address was registered by

another stack that is sharing the OSA, then OSA-Express routes the packet directly to the sharing stack without putting the packet on the external LAN.

ISOLATE

Prevent OSA-Express from routing packets directly to another TCP/IP stack that is sharing the OSA adapter. In this mode, OSA-Express discards any packets when the next hop address was registered by another stack that is sharing the OSA adapter. In this mode, packets can flow between two stacks that share the OSA adapter only by first going through a router on the LAN. For more details, see OSA-Express connection isolation information in *z/OS Communications Server: IP Configuration Guide*.

Tips:

- If you isolate an INTERFACE, that action might have an adverse effect on latency.
- You can selectively apply OSA-Express connection isolation to individual virtual LANs.
- OSA-Express requires that both stacks sharing the port be non-isolated for direct routing to occur. Therefore, for traffic between two stacks sharing the OSA adapter, as long as at least one of the stacks is isolated, connection isolation is in effect for traffic in both directions between these stacks.

Restriction: This function is limited to OSA-Express2 or later Ethernet features in QDIO mode and running at least an IBM System z9 Enterprise Class (EC) or z9 Business Class (BC). See the 2094, 2096, 2097, or 2098 DEVICE Preventive Service Planning (PSP) and the 2096DEVICE Preventive Service Planning (PSP) buckets for more information.

TEMPPREFIX

TEMPPREFIX specifies the set of prefixes for which temporary IPv6 addresses can be generated. A temporary IPv6 address is generated when a router advertisement containing a prefix is processed and the prefix is included in one of the prefixes in the temporary prefix list. For example, if TEMPPREFIX 2001:0db8:58cd::/48 is specified for an interface, a temporary address is generated for advertised prefix 2001:0db8:58cd:0001/64; however, a temporary address is not generated for advertised prefix 2001:0db8:5555:0001/64.

ALL Generate temporary addresses for all prefixes that are learned over this interface by way of router advertisements. ALL is the default.

NONE

No IPv6 temporary addresses are generated for this interface.

prefix/prefix_length

The digits (in colon-hexadecimal format) before the slash (/) represent the prefix. The *prefix_length* value represents the length of the prefix, in bits. Valid values for *prefix_length* are in the range 1 - 64.

Rules:

- Temporary addresses are generated only on an interface that is enabled for stateless address autoconfiguration.
- Temporary addresses are generated only when the TEMPADDRS keyword is specified on the IPCONFIG6 statement.

Requirement: You must specify the job name of an application in the SRCIP statement block with a value of TEMPADDRS to cause a temporary IPv6 address to be preferred over a public IPv6 address as the source IP address for the application; otherwise, the default source address selection algorithm prefers public IPv6 addresses over temporary addresses. For more information, see the information about the default source address selection algorithm in z/OS Communications Server: IPv6 Network and Application Design Guide.

Steps for modifying

See Summary of INTERFACE statements for modification information.

Examples

```
INTERFACE OSAQDIO26 ; OSA QDIO (Fast Ethernet)
DEFINE IPAQENET6
PORTNAME OSAQDIO2
SOURCEVIPAINIT VIPAV6
IPADDR 2001:0DB8:1:9:67:115:66      ; (Global Address)
```

Usage notes

Restriction: For each interface, the PRIROUTER and SECROUTER attributes can be in effect for only one TCP/IP instance within a central processor complex (CPC). If PRIROUTER is specified for an IPAQENET6 interface, but the IPv6 primary router attribute is already in effect on another TCP/IP instance for the same OSA-Express, then TCP/IP issues a warning message during interface activation and ignores the PRIROUTER parameter. Therefore, only one TCP/IP instance can be the primary router for the OSA-Express. Depending on the level of OSA-Express being started, either only one or multiple TCP/IP instances can be allowed to have SECROUTER specified. If OSA-Express allows only one secondary router, any TCP/IP instance subsequently starting that interface with SECROUTER receives a warning message during START processing for the interface. If OSA-Express allows multiple secondary routers, then OSA-Express can select any TCP/IP instance which specifies SECROUTER as the secondary router. There is no requirement that the same TCP/IP instance be specified PRIROUTER or SECROUTER for all OSA-Express adapters attached to the CPC.

Rule: To configure a single OSA port for both IPv4 and IPv6 traffic, consider the following conditions:

- If you use DEVICE/LINK/HOME for the IPv4 definition and INTERFACE for the IPv6 definition, the PORTNAME value on the INTERFACE statement must match the device_name on the DEVICE statement. This combination shares a single DATAPATH device.
- If you use INTERFACE for both IPv4 and IPv6 definitions, the PORTNAME value on the IPv4 INTERFACE statement must match the PORTNAME value on the IPv6 INTERFACE statement. This combination results in separate DATAPATH devices.

Related topics

- BEGINROUTES statement
- DEVICE and LINK — MPCIPA OSA-Express QDIO devices statement
- “GLOBALCONFIG statement” on page 34
- “INTERFACE - IPAQENET OSA-Express QDIO interfaces statement” on page 53
- START statement

- STOP statement

Chapter 5. IP System Administrator's Commands

Conventions and terminology that are used in this document

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

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

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

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

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

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

- RDMA network interface card (RNIC), which is used to refer to the IBM 10GbE RoCE Express feature.
- Shared RoCE environment, which means that the 10GbE RoCE Express feature operates on an IBM z13 (z13) or later system, and that the feature can be used concurrently, or shared, by multiple operating system instances. The RoCE Express feature is considered to operate in a shared RoCE environment even if you use it with a single operating system instance.

For definitions of the terms and abbreviations that are used in this document, you can view the latest IBM terminology at the IBM Terminology website.

Clarification of notes

Information traditionally qualified as Notes is further qualified as follows:

Note Supplemental detail

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

Guideline

Customary way to perform a procedure

Rule Something you must do; limitations on your actions

Restriction

Indicates certain conditions are not supported; limitations on a product or facility

Requirement

Dependencies, prerequisites

Result Indicates the outcome

Netstat DEvlinks/-d report

Report field descriptions

DevName

The device name that is configured on the DEVICE statement.

DevType

The device type that is configured on the DEVICE statement.

DevNum

The device number that is configured on the DEVICE statement. This field is significant only for device types CTC, CLAW, LCS, and CDLC.

DevStatus

The device status. You can use this field if you are having activation problems with the device or interface. Table 5 describes the possible status values:

Table 5. Possible device status values

Device status	Description
Starting	A START of the device has been issued by the operator, and TCP/IP has sent an Activation request to the Data Link Control (DLC) layer.
Sent SETUP	DLC has acknowledged the TCP/IP Activation request, and TCP/IP has requested DLC to perform the initial I/O sequence with the device.
Enabling	DLC has acknowledged the TCP/IP Activation request, and TCP/IP has requested DLC to allow data connections to be established for the device.
Connecting	DLC has accepted the Initial I/O Sequence request.
Connecting2	The control connection for a CLAW device has been established, and the second connection (on which IP traffic is carried) is being established.
Negotiating	The initial I/O sequence with the device is complete, and TCP/IP is performing additional link-layer initialization.
Ready	The initialization sequence with the device is complete. The device is now ready.
Deactivating	DLC has performed the first stage of an orderly device deactivation.
Not active	The device is not active. (The device has never been started, or has been stopped after having been started.)

Configured router status (CfgRouter)

The router attribute (PRIROUTER/SECROUTER/NONROUTER) that is specified on the DEVICE or INTERFACE statement. This field is significant only for MPCIPA devices and for IPAQENET and IPAQENET6 interfaces. This field is not displayed if virtual MAC (VMAC) has been configured.

Actual router status (ActRouter)

The router attribute in effect for the device or interface. It matches the configured router status unless the configured value conflicted with the configured value of another stack that is sharing the adapter. This field is significant only for MPCIPA devices and for IPAQENET and IPAQENET6

interfaces. The router attribute is determined when the device or interface starts. This field is not displayed if virtual MAC (VMAC) has been configured.

Virtual MAC address (VMACAddr)

The virtual local hardware address for this link or interface. This field is significant for the following types of devices:

- An IPAQENET link or interface, or an IPAQENET6 interface, where a virtual MAC address was configured by specifying the VMAC parameter. The value n/a is displayed if VMAC was configured but a virtual MAC address was not configured.
- An RNIC interface that is created when an IPAQENET or IPAQENET6 interface specified SMCR. The VMAC address is provided by VTAM, and is not configured on the INTERFACE profile statement. VMACAddr is displayed for active RNIC interfaces only.

Virtual MAC origin (VMACOrigin)

Displays whether the virtual MAC address (VMACAddr) was configured on the LINK or INTERFACE statement, or was generated by OSA-Express. This field is significant only for IPAQENET links or interfaces and for IPAQENET6 interfaces for which virtual MAC (VMAC) has been configured. The following list shows the possible values:

Cfg The virtual MAC address is configured on the LINK statement or on the INTERFACE statement.

OSA The virtual MAC address has been generated by OSA-Express.

Virtual MAC router status (VMACRouter)

Displays the virtual MAC router attribute that was specified on the LINK or INTERFACE statement using the ROUTEALL or ROUTELCL keywords. This field is significant only for IPAQENET links or interfaces and for IPAQENET6 interfaces for which virtual MAC (VMAC) has been configured. See OSA Routing information in the z/OS Communications Server: IP Configuration Guide for more information about Virtual MAC router attributes. The following list shows the possible values:

All Corresponds to the ROUTEALL keyword. Indicates that all IP traffic destined to the Virtual MAC is forwarded by the OSA-Express device to the TCP/IP stack

Local Corresponds to the ROUTELCL keyword. Indicates that only traffic destined to the Virtual MAC whose destination IP address is registered with the OSA-Express device by this TCP/IP stack is forwarded by the OSA-Express device.

Configured packing status (CfgPacking)

This field is the packing attribute (Packed/None) specified on the DEVICE statement. This field is significant only for CLAW devices.

Actual packing status (ActPacking)

This field indicates the packing attribute in effect for the device. It will match the configured packing status unless packing was requested and the device does not support packing. This field is significant only for a CLAW device and is determined when the device starts.

LnkName/IntfName

This field is the link name or the interface name of the particular device or interface being displayed. If the device or interface is configured, this field is the link name configured in the LINK statement or the interface name

configured in the INTERFACE statement. If the link name or interface name is dynamically generated by the TCP/IP stack, this field is the dynamically generated link name or interface name.

LnkType/IntfType

This field is the link type or the interface type of the particular device or interface being displayed. If the device or interface is configured, this field is the link type configured in the LINK statement or the interface type configured in the INTERFACE statement. If the link type or interface type is dynamically generated by the TCP/IP stack, this field is the dynamically generated link type or interface type. A 10GbE RoCE Express interface has an IntfType value equal to RNIC.

LnkStatus/IntfStatus

This field is the link or interface status. The following list describes the possible link or interface status values:

Link/Interface status	Description
Ready	A START of the device/interface has been issued by the operator, and TCP/IP has been sent an Activation request to the Data Link Control (DLC) layer.
Not Active	The link or interface is not active. There is no command to start a link; link activation is normally performed during START device processing. Interface activation is performed during START interface processing. A link or interface is marked Not Active when: <ul style="list-style-type: none"> • The device or interface has not yet been started. • A failure has been encountered during the link or interface activation phase. (Such a failure produces an error message to the operator console, indicating the cause.)
DAD Pend	Duplicate Address Detection (DAD) for the link-local address is in progress on the IPv6 interface.

PortName

The name of the OSA-Express port. This is the value that was specified on the PORTNAME parameter on the INTERFACE statement. This field is significant only for IPAQENET and IPAQENET6 interfaces.

Datapath

The subchannel address that is associated with the TRLE definition. This value is one of the addresses that was specified on the DATAPATH parameter on the TRLE definition and is the subchannel address that VTAM assigned to this interface. If VTAM has not yet assigned a subchannel address to this interface, then this field contains the value Unknown. This field is significant only for IPAQENET, IPAQIDIO, IPAQENET6, and IPAQIDIO6 interfaces.

DatapathStatus

The datapath status. This field is significant only for IPAQENET, IPAQIDIO, IPAQENET6, and IPAQIDIO6 interfaces. This field contains information that is useful if the interface is not activating correctly. See Table 5 on page 84 for possible status values.

CHPIDType

The CHPID type that is associated with this interface. This value was specified on the CHPIDTYPE parameter on the INTERFACE statement (or

was generated by the stack) for OSA-Express QDIO interfaces. This field is significant only for IPAQENET and IPAQENET6 interfaces. The possible values and meanings are:

- OSD** A CHPID with connectivity to the external data network
- OSX** A CHPID with connectivity to the intra ensemble data network
- OSM** A CHPID with connectivity to the intra node management network

IPAddr

The IP address and optional number of bits (leftmost significant bits), which identifies the subnet mask of the interface. This value was specified on the IPADDR parameter on the INTERFACE statement. This field is significant for IPAQENET interfaces only. If the interface is defined with the TEMPIP keyword, the IP address is 0.0.0.0.

CHPID

The CHPID value that is associated with this interface. For HiperSockets, this value was specified on the CHPID parameter on the INTERFACE statement for predefined HiperSockets interfaces or is the value obtained from VTAM for HiperSockets interfaces that are created by dynamic XCF definitions. For OSA-Express QDIO interfaces that are configured with CHPIDTYPE OSX, this value was specified on the CHPID parameter. This field is significant only for IPAQIDIO6, IPAQENET, or IPAQENET6 interfaces.

SMCR

Indicates whether this interface can be used for new TCP connections for Shared Memory Communications over Remote Direct Memory Access (SMC-R) for external data network communications. This value was specified on the SMCR or NOSMCR parameter on the INTERFACE statement for OSA-Express QDIO interfaces. This field is significant only for IPAQENET and IPAQENET6 interfaces. The possible values and meanings are:

- YES** Indicates that this interface can be used for new TCP connections to communicate with other stacks on the external data network by using SMC-R.

For an inactive interface, Yes means the interface is configured for SMC-R. An interface is configured for SMC-R when the SMCR parameter was specified on the INTERFACE statement or is in effect by default.

For an active interface, Yes means the interface is enabled for SMC-R. An interface is enabled for SMCR when the following conditions are true:

- The SMCR parameter was specified on the INTERFACE statement or is in effect by default.
- The TCP/IP stack is enabled for SMC-R. A TCP/IP stack is enabled for SMC-R when the SMCR parameter was specified on the GLOBALCONFIG statement.
- A physical network ID value was configured in HCD for this interface.

- NO** Indicates that this interface cannot be used for new TCP connections to communicate with other stacks on the external data network by using SMC-R. The NOSMCR parameter was specified on the INTERFACE statement.

Disabled (*reason_text*)

Indicates that this interface was configured to communicate with other stacks on the external data network by using SMC-R, but SMC-R cannot be used for new TCP connections because of one of the following reasons:

No PNetID

No physical network ID value was configured in HCD for this interface. The physical network ID is learned during interface activation so this reason text is only valid for an active interface.

GLOBALCONFIG NOSMCR

The TCP/IP stack was not enabled for SMC-R.

No Subnet Mask

No subnet mask was configured on the INTERFACE statement for this interface.

PFID The Peripheral Component Interconnect Express (PCIe) function ID (PFID) value that defines an 10GbE RoCE Express feature. This value is specified on the SMCR PFID parameter of the GLOBALCONFIG TCP/IP profile statement. This field is significant only for RNIC interfaces that are created when an IPAQENET or IPAQENET6 interface specifies SMCR or takes SMCR as the default setting.

PortNum

Specifies the 10GbE RoCE Express port number that is used for the associated PFID. The PortNum value is specified with the PFID value on the SMCR parameter of the GLOBALCONFIG statement in the TCP/IP profile.

PNetID

The physical network ID value that is configured in HCD for an interface. This field is significant only for IPAQENET interfaces defined by using the INTERFACE statement, IPAQENET6 interfaces, and active RNIC interfaces.

Interface	Value
Active OSD interfaces	<ul style="list-style-type: none"> • If a physical network ID is configured in HCD for the OSD interface, the configured value is displayed. • If no physical network ID is configured in HCD for the OSD interface, the value*None* is displayed. If the OSD interface is configured to use SMCR, a value of Disabled (No PNetID) is displayed in the SMCR field.
Active OSX interfaces	The reserved value IEDN is used.
Active RNIC interfaces	The value that is configured in HCD for the RNIC interface is displayed. If no value is configured in HCD, activation of the RNIC interface fails.

TRLE The name of the TRLE that is associated with this interface. This field is significant only for MPCPTP6, IPAQIDIO, IPAQIDIO6 and RNIC interfaces.

For MPCPTP6 interfaces

This value was specified on the TRLE parameter of the

INTERFACE statement for predefined MPC interfaces or is the value obtained from VTAM for MPC interfaces that are created by dynamic XCF definitions.

For IPAQIDIO or IPAQIDIO6 interfaces

This value is obtained from VTAM for IPAQIDIO or IPAQIDIO6 interfaces that INTERFACE definitions create. This value is displayed for active interfaces only.

For RNIC interfaces

This value is obtained from VTAM for RNIC interfaces that are created for PFIDs configured on the GLOBALCONFIG statement when SMC-R is enabled. This value is displayed only when the PFIDStatus value of the interface is Starting or Ready.

PFIDStatus

This field is the RNIC interface PFID status. The following list describes several status values:

PFID status	Description
Ready	The initialization sequence with the PFID is complete. The PFID is ready.
Not Active	The PFID is not active. The PFID has never been started, or has been stopped after having been started.
Starting	A START command of the PFID has been issued, and TCP/IP has sent an Activation request to the Data Link Control (DLC) layer.
Deactivating	DLC has performed the first stage of an orderly PFID deactivation.

GidAddr

The group identifier (GID) value that is associated with the RNIC interface. This value is obtained from VTAM for RNIC interfaces that are created for PFIDs configured on the GLOBALCONFIG statement when SMC-R is enabled. This value is displayed for active RNIC interfaces only.

NetNum

The adapter number that was specified on the LINK statement. This field is significant only for CTC and LCS links.

QueSize

The queue size represents the number of outbound packets for this link or interface that are queued and waiting for ARP or neighbor resolution. This field is significant only for links on ATM and LCS devices and for IPAQENET6 interfaces.

Speed Indicates the interface speed (in million bits per second) that is reported by the device. This field is significant only for IPAQENET links or interfaces, ATM and IPAQTR links, and IPAQENET6 interfaces, and only if the link or interface is active.

MAC address order (MacAddrOrder)

Indicates the canonical option (CANON/NONCANON) that is specified on the LINK statement. This field is significant only for token-ring links.

SrBridgingCapability

Indicates whether the link supports source route bridging. This field is significant only for token-ring links.

IpBroadcastCapability

Indicates whether the link is broadcast capable. This field is significant only for links on LCS and MPCIPA devices and IPAQENET interfaces.

ArpBroadcastType

Indicates the ARP broadcast option (ALLRINGSBCAST/LOCALBCAST) that is specified on the LINK statement. This field is significant only for token-ring links.

ArpOffload

Indicates whether ARP processing is being offloaded to the adapter. This field is significant only for active links that support ARP offload.

ArpOffloadInfo

Indicates whether the adapter reports ARP offload data to TCP/IP. If so, then the ARP cache data can be displayed with the Netstat ARP/-R report even though the ARP function is being offloaded. This field is significant only for active links that support ARP offload.

Routing Parameters

This section displays routing information for IPv4 links that are defined with the DEVICE and LINK profile statements.

MTU Size

This value is determined in one of the following ways:

- If you are using OMPROUTE and the link is defined to OMPROUTE, the value might have been specified on the MTU parameter on the OSPF_INTERFACE, RIP_INTERFACE, or INTERFACE statement for the link. If one of these OMPROUTE statements was specified for the link but the MTU parameter was not specified, OMPROUTE sets the **MTU Size** value to 576.
- If you are using OMPROUTE, the link is not defined to OMPROUTE, and OMPROUTE is not configured to ignore undefined links, OMPROUTE sets the **MTU Size** value to 576.
- If you are not using OMPROUTE (or if the link is not defined to OMPROUTE), OMPROUTE is configured to ignore undefined links, and a BSDROUTINGPARMS profile statement was specified for the link, then the **MTU Size** value is configured using the BSDROUTINGPARMS profile statement MTU parameter.
- If none of the previously described methods provides an MTU Size value or if the MTU Size parameter does not apply to this link, then the value n/a is displayed.

To determine the MTU Size value that is being used by the stack for a link, see the ActMtu field for the link. To determine the MTU Size value that is being used for a route over this link, see the MTU field on the Netstat ROUTE/-r report.

Metric The routing metric that is associated with the link. This value is determined in one of the following ways:

- If you use OMPROUTE and the link is defined to OMPROUTE using the OSPF_INTERFACE statement, then the Metric value is

configured using the Cost0 parameter on the OSPF_INTERFACE statement. If the Cost0 parameter is not specified, then OMPROUTE sets the value to 1.

- If you use OMPROUTE and the link is defined to OMPROUTE using the RIP_INTERFACE statement, then the Metric value is configured using the In_Metric parameter on the RIP_INTERFACE statement. If the In_Metric parameter is not specified, then OMPROUTE sets the value to 1.
- If you use OMPROUTE and the link is defined to OMPROUTE using the INTERFACE statement or if the link is not defined to OMPROUTE and OMPROUTE is not configured to ignore undefined links, then OMPROUTE sets the Metric value to 0.
- If you are not using OMPROUTE (or if the link is not defined to OMPROUTE) and OMPROUTE is configured to ignore undefined links, the Metric value is configured in one of the following ways:
 - For dynamic XCF links, the Metric value is configured using the cost_metric value of the DYNAMICXCF parameter on the IPCONFIG profile statement.
 - If a BSDROUTINGPARMS profile statement was specified for the link, the Metric value is configured using the cost_metric parameter of BSDROUTINGPARMS profile statement.
- If none of the previously described methods provided a Metric value, the stack sets the value to 0

DestAddr

The destination address applies to point-to-point links only and is the IP Address of the other side of the point-to-point link. This value is determined in one of the following ways:

- If you are using OMPROUTE and the link is defined to OMPROUTE, then the value is configured using the Destination_Addr parameter on the OSPF_INTERFACE, RIP_INTERFACE, or INTERFACE statement. If the Destination_Addr parameter is not specified, then OMPROUTE sets the value to 0.
- If you are using OMPROUTE but the link is not defined to OMPROUTE and OMPROUTE is not configured to ignore undefined links, then OMPROUTE sets the value to 0.
- If you are not using OMPROUTE (or if the link is not defined to OMPROUTE), OMPROUTE is configured to ignore undefined links, and a BSDROUTINGPARMS profile statement was specified for the link, then the value is configured using the dest_addr parameter for this statement.
- If none of these methods has provided a destination address value, then the stack sets a default value in one of the following ways:
 - For links other than point-to-point links, the value is set to 0.
 - For point-to-point links, the value is set as follows:
 - If routes are defined over the link, then the stack sets the value using the gateway address of an indirect route or the destination address of a direct host route.
 - If no routes are defined over the link, then the value is set to 0.

SubnetMask

The subnet mask that is associated with the link. This value is determined in one of the following ways:

- If you are using OMPROUTE and the link is defined to OMPROUTE, then the value is configured using the Subnet_Mask parameter on the OSPF_INTERFACE, RIP_INTERFACE, or INTERFACE statement.
- If you are using OMPROUTE, the link is not defined to OMPROUTE, and OMPROUTE is not configured to ignore undefined links, then OMPROUTE assigns a value based on the IP address that is assigned to the link.
- If you are not using OMPROUTE (or if the link is not defined to OMPROUTE) and OMPROUTE is configured to ignore undefined links, then the value is assigned in one of the following ways:
 - For dynamic XCF links, the value is configured using the *subnet_mask* or *num_mask_bits* value of the DYNAMICXCF parameter on the IPCONFIG profile statement.
 - For dynamic VIPA links, the value is configured using the *address_mask* parameter on the VIPADEFINE, VIPABACKUP, or the VIPARANGE profile statement.
 - If a BSDROUTINGPARMS profile statement was specified for the link, the value is configured using the *subnet_mask* parameter for the BSDROUTINGPARMS profile statement.
- If none of the previously described methods provides a subnet mask value, then the stack assigns a value based on the IP address that is assigned to the link.

Packet trace settings

Use the PKTTRACE statement to control the packet tracing facility in TCP/IP. You can use this statement to select IP packets as candidates for tracing and subsequent analysis. An IP packet must meet all of the conditions specified on the statement for it to be traced.

Protocol

The protocol number from the PROT keyword of the PKTTRACE command or * if not specified.

TrRecCnt

The number of packets traced for this PKTTRACE command.

PckLength

The value of the ABBREV keyword of the PKTTRACE command or FULL to capture the entire packet.

SrcPort

The port number from the SRCPORT parameter of the PKTTRACE command or profile statement. If an asterisk (*) is displayed, then either a port number was not specified for the SRCPORT parameter, or the PORTNUM parameter was also specified. If both the SrcPort and PortNum fields contain a value *, then the IP packets are not being filtered by the source port.

DestPort

The port number from the DESTPORT parameter of the PKTTRACE command or profile statement. If an asterisk (*) is displayed, then either a port number was not specified for the

DESTPORT parameter, or the PORTNUM parameter was also specified. If both the DestPort and PortNum fields contain an asterisk (*), then the IP packets are not being filtered by destination port.

PortNum

The port number from the PORTNUM parameter of the PKTTRACE command or profile statement. If an asterisk (*) is displayed, then either a port number was not specified for the PORTNUM parameter, or the DESTPORT or SRCPORT parameters were also specified. If the PortNum, SrcPort, and DestPort fields all contain an asterisk (*), then the IP packets are not being filtered by port.

Discard

The value specified for the PKTTRACE DISCARD parameter. A numerical value is a discard reason code. The value NONE, which is the default, indicates that only packets that were delivered are being traced. The value ALL indicates that only discarded IP packets are being traced. The value asterisk (*) indicates that discarded IP packets and delivered IP packets are being traced.

IpAddr

The IP address from the IPADDR keyword of the PKTTRACE command or asterisk (*) if not specified.

SubNet

The IP subnet mask from the SUBNET keyword of the PKTTRACE command or asterisk (*) if not specified.

ATM Specific

This section contains information about ATM links:

ATM PortName

The PORTNAME value specified on the DEVICE statement.

For an ATM link configured as a Permanent Virtual Circuit (PVC), the following additional fields are displayed:

ATM PVC Name

The name of the PVC specified on the ATMPVC statement.

PVC Status

This field can have the following values:

ATM PVC status	Description
Not Active	The PVC is not active. There is no command to start a PVC; PVC activation is normally attempted during START device processing. A PVC is marked Not Active when: <ul style="list-style-type: none">• The device has not yet been started.• The remote side of the PVC is not active.• A failure has been encountered during the PVC activation phase. (Such a failure produces an error message to the operator.)
Ready	The initialization sequence for the PVC is complete. The PVC is now ready for use.

For an ATM link configured as a Switched Virtual Circuit (SVC), the following additional fields are displayed:

ATM LIS Name

The name of the ATM Logical IP Subnet (LIS) specified on the ATMLIS statement.

SubnetValue

The subnet_value specified on the ATMLIS statement.

SubnetMask

The subnet_mask specified on the ATMLIS statement.

DefaultMTU

The DFLTMTU value specified on the ATMLIS statement.

InactvTimeOut

The INACTVTO value specified on the ATMLIS statement.

MinHoldTime

The MINHOLD value specified on the ATMLIS statement.

MaxCalls

The maximum number of SVCs that can be active for this ATMLIS.

CachEntryAge

The CEAGE value specified on the ATMLIS statement.

ATMArpReTry

The ARPRETRIES value specified on the ATMLIS statement.

ATMArpTimeOut

The ARPTO value specified on the ATMLIS statement.

PeakCellRate

The PEAKCR value specified on the ATMLIS statement.

NumOfSVCs

The number of currently active SVCs for this ATMLIS.

BearerClass

The BEARERCLASS value specified on the ATMLIS statement.

For an ATM SVC link that is configured with an ATM ARP server, the following additional fields are displayed:

ATMARPSV Name

The name of the ATM ARP server specified on the ATMARPSV statement.

VcType

Indicates whether the ATM ARP server connection is a PVC or an SVC. This value comes from the ATMARPSV statement.

ATMaddrType

The ATM address type specified on the ATMARPSV statement. The only supported value is NSAP.

ATMaddr

The ATM address of the ATM ARP server. If the connection to the ATM ARP server is an SVC, then this is the physical_addr value specified on the ATMARPSV statement. For a PVC connection to the ATM ARP server, this is the remote ATM address learned by TCP/IP when the PVC was activated.

IpAddr

The IP address of the ATM ARP server. If the connection to the ATM ARP server is an SVC, then this is the ip_addr value specified

on the ATMARPSV statement. For a PVC connection to the ATM ARP server, this is the remote IP address learned by TCP/IP when the PVC was activated.

Multicast Specific

This section displays multicast information for the link or interface.

Multicast Capability

Indicates whether the link or interface is multicast capable.

- For point-to-point interfaces, the value of this field is always Yes.
- For LCS and MPCIPA links and IPAQENET, IPAQENET6, IPAQIDIO, and IPAQIDIO6 interfaces, the multicast capability is known only after the link or interface is active. If the link or interface is not active, the multicast capability value is Unknown.
- For IPAQIQDX6 interfaces, the value of this field is always ND only, the interface is multicast capable but multicast processing is used only for neighbor discovery.

If the link or interface is multicast capable then the following additional fields are displayed for each multicast group for which the link or interface is receiving data. There is no limit to the number of multicast groups for which a link or interface can receive data. For IPAQIQDX6 interfaces, the multicast groups indicate only neighbor discovery processing.

Group The multicast group address for which this link or interface is receiving data.

RefCnt

The number of applications that are receiving data for this multicast group.

SrcFltMd

The source filter mode indicates the type of multicast source IP address filtering that has been configured at the interface. Source IP address filtering can be done by either an IGMPv3 or MLDv2-capable multicast router on a per interface basis or by the host on a per socket basis. The host provides its source filter mode and source IP address filter list for each multicast group that an application has joined on the interface with any IGMPv3 and MLDv2-capable multicast routers that are connected to the interface. This permits IGMPv3-capable and MLDv2-capable multicast routers to send only multicast packets that have been requested by at least one host on the subnet to which the interface is connected. If the multicast packets are not filtered by an IGMPv3-capable or MLDv2-capable multicast router (for example the router does not support IGMPv3 or MLDv2), or if there are multiple hosts on the local area network that have either a different source filter mode or a different source IP address filter list for a given multicast group, the host uses the source IP address filter information to ensure that each application receives only packets that it has requested.

The value is either Include or Exclude. A source filter applies only to incoming multicast data. The source filter applies to all the IP addresses in the SrcAddr fields for the associated multicast group address and the link or the interface. The source filter mode and the corresponding source filter IP addresses are configured by applications for their UDP or RAW sockets that have joined the

multicast group for this interface. See the information about Designing multicast programs in the z/OS Communications Server: IP Sockets Application Programming Interface Guide and Reference for details about how applications configure these values for a socket.

Include

Indicates that the interface or link receives only multicast datagrams that have a source IP address that matches an IP address indicated in the SrcAddr field.

Exclude

Indicates either that the source filter function is not active or that the interface or link receives only multicast datagrams that have a source IP address that does not match an IP address indicated in the SrcAddr field. If the source filter function is not active or if the source filter function is active but no SrcAddr value is set, the SrcAddr field contains the value None.

SrcAddr

Source address information for the socket.

ipaddr The source IP address that is used in conjunction with the SrcFltMd value to determine which incoming multicast datagrams are received by the interface.

None This value is displayed only when the source filter function is not configured for the interface or when the source filter mode is Exclude but there was no intersection of excluded source IP addresses among the sockets for the same multicast group address and interface.

Source VIPA interface (SrcVipaIntf)

The name of the VIPA that is used for this interface if source VIPA is in effect. This is the value that was specified on the SOURCEVIPAINTERFACE parameter on the INTERFACE statement. This field is significant only for IPAQENET, IPAQENET6, IPAQIDIO6, and MPCPTP6 interfaces.

Duplicate address detection (DupAddrDet)

The DUPADDRDET value specified on the INTERFACE statement. This field is significant only for IPAQENET6 interfaces.

Interface ID (IntfID)

The INTFID value specified on the INTERFACE statement. This field is significant only for IPAQENET6, IPAQIDIO6, and MPCPTP6 interfaces.

MAC address (MacAddress)

The local hardware address for this link or interface. This field is significant only for links on LCS devices and for IPAQENET6 interfaces. This field is displayed only if the link or interface is active and if virtual MAC (VMAC) is not configured.

Router Hop Limit (RtrHopLimit)

The value that is placed in the Hop Count field of the IP header for outgoing IP packets. This value was obtained from a received router advertisement and is significant only for IPAQENET6 interfaces. This field is displayed only when a nonzero hop limit value was received in a router advertisement over this interface and IGNOREROUTERHOPLIMIT is not configured on the IPCONFIG6 profile statement.

CfgMtu

The MTU value that was configured on the INTERFACE statement (or None if an MTU value was not configured). This field is significant only for IPAQENET, IPAQENET6, or IPAQIDIO interfaces.

ActMtu

The largest MTU that is supported by an active link or interface. If the link or interface is inactive, then this field displays Unknown. This field is significant for all links and interfaces except virtual ones.

VLANid

This field is significant only for IPAQENET links or interfaces, IPAQIDIO links, or IPAQENET6 and IPAQIDIO6 interfaces. This field indicates whether a virtual LAN ID was configured on the VLANID parameter on the LINK or INTERFACE profile statement. The following values can be displayed in this field:

None

This value indicates that the VLANID parameter was not specified on the LINK or INTERFACE profile statement for the interface. For an IPAQIDIO link or IPAQIDIO6 interface that is dynamically generated as part of dynamic XCF HiperSockets processing, this value indicates that the IQDVLANID parameter was not specified on the GLOBALCONFIG profile statement.

n/a

This value indicates that the VLANID parameter was specified on the LINK or INTERFACE profile statement, but the interface does not support VLAN IDs.

vlanid

If an OSA-Express device is active and supports virtual LAN IDs, this field indicates that all IP packets through this OSA-Express link or interface from this stack are being tagged with this VLAN ID. For an active HiperSockets link or interface that supports virtual LAN IDs, this field indicates that all IP packets through this HiperSockets link or interface from this stack are associated with this VLAN ID.

VLANpriority

This field is significant only for active IPAQENET links or interfaces or IPAQENET6 interfaces. This field indicates whether all IP packets through this OSA-Express link or interface from this stack are being tagged with a VLAN priority. The possible values are:

Enabled

Indicates that all IP packets through this OSA-Express link or interface are being tagged with a VLAN priority. See z/OS Communications Server: IP Configuration Reference for information about the SetSubnetPrioTosMask statement and details about how to configure VLAN priorities.

Disabled

Indicates that the OSA-Express link or interface supports VLAN priority, but currently no VLAN priority values are defined. If the VLANid field displays None or n/a, all IP packets through this OSA-Express link or interface are not VLAN tagged. All other values indicate that all IP packets are VLAN tagged, but only with VLAN IDs, not with VLAN priority.

Unknown

Indicates that the VLAN priority tagging support for the OSA-Express is unknown because the link or interface is not yet active.

DynVLANRegCfg

This field is significant only for IPAQENET links or interfaces and IPAQENET6 interfaces. This field is displayed only under the following conditions:

- The link or interface is not yet active and a VLAN ID was specified.
- The link or interface is active, a VLAN ID value was specified, and the OSA-Express feature has accepted the VLAN ID value.

This field indicates whether dynamic VLAN ID registration was configured on the LINK or INTERFACE statement. The possible values are:

Yes

Indicates that the DYNVLANREG parameter was specified on the LINK or INTERFACE statement.

No Indicates that the NODYNVLANREG parameter was specified on the LINK or INTERFACE statement or is in effect by default.

DynVLANRegCap

This field indicates whether the OSA-Express feature that is represented by the LINK or INTERFACE statement is capable of supporting dynamic VLAN ID registration. This field is significant only for IPAQENET links or interfaces and IPAQENET6 interfaces. This field is displayed only under the following conditions:

- The link or interface is not yet active and a VLAN ID was specified.
- The link or interface is active, a VLAN ID value was specified, and the OSA-Express feature has accepted the VLAN ID value.

The possible values are:

Yes

Indicates that the OSA-Express feature is capable of supporting dynamic VLAN ID registration.

No Indicates that the OSA-Express feature is not capable of supporting dynamic VLAN ID registration.

Unknown

Indicates that the dynamic VLAN ID registration capability of the OSA-Express feature is unknown because the link or interface is not yet active.

ChecksumOffload

This field is significant only for active IPAQENET and IPAQENET6 links or interfaces. This field indicates whether the checksum offload support is in effect and is displayed only when the link or interface is active. The possible values are:

Yes Indicates that the checksum offload function is enabled on the adapter for this interface.

No Indicates that the checksum offload function is not enabled on the adapter for this interface.

Unsupported

Indicates that the checksum offload function is not supported on the adapter for this interface.

SegmentationOffload

This field is significant only for active IPAQENET and IPAQENET6 links or interfaces. This field indicates whether the TCP segmentation offload support is in effect and is displayed only when the link or interface is active. Possible values are:

- Yes** Indicates that the segmentation offload function is enabled on the adapter for this interface.
- No** Indicates that the segmentation offload function is not enabled on the adapter for this interface.

Unsupported

Indicates that the segmentation offload function is not supported on the adapter for this interface.

SecClass

This field identifies the security class value for IP filtering. This field applies to all IPv4 and IPv6 interfaces except virtual and loopback, but the value is in effect only if the IPsec function is active for the applicable IP version. You can use the Netstat CONFIG/-f command to determine whether IPsec is active. Valid security class values are in the range 1 - 255. The displayed value was defined by one of the following methods:

- By the SECCLASS parameter on the LINK or INTERFACE profile statement
- For dynamic XCF interfaces, by the DYNAMICXCF SECCLASS subparameter on the IPCONFIG or IPCONFIG6 profile statement
- For OSM interfaces, by the TCP/IP stack's automatic configuration of the interface, or by the IPSECURITY OSMSECCLASS subparameter on the IPCONFIG6 profile statement

MonSysplex

Indicates whether the status of this link or interface is being monitored by Sysplex Autonomics. This field is significant for all IPv4 links or interfaces except virtual, loopback, and all dynamically configured links, and for all IPv6 interfaces except virtual, loopback, and all dynamically configured interfaces.

- Yes** Indicates that the status of this link or interface is being monitored by Sysplex Autonomics. It is configured by specifying the MONSYSPLEX keyword on the LINK or INTERFACE profile statement and specifying the MONINTERFACE keyword for the SYSPLEXMONITOR parameter on the GLOBALCONFIG profile statement. If DYNROUTE keyword is also coded on the GLOBALCONFIG SYSPLEXMONITOR profile statement, then the presence of dynamic routes over this link or interface is also monitored.

Configured

Indicates that this link or interface was configured to be monitored by Sysplex Autonomics. It was configured by specifying the MONSYSPLEX keyword on the LINK or INTERFACE profile statement, but the link or interface is not currently being monitored

because the MONINTERFACE keyword was not specified on the SYSPLEXMONITOR parameter on the GLOBALCONFIG profile statement.

- No** Indicates that the status of this link or interface is not being monitored by Sysplex Autonomics because the MONSYSPLEX keyword was not specified on the LINK or INTERFACE profile statement.

Isolate

This field is significant only for IPAQENET interfaces (defined using the INTERFACE statement) and for IPAQENET6 interfaces. This field indicates whether the OSA-Express device is prevented from routing packets directly to another stack that is sharing the OSA-Express connection. For more details, see OSA-Express connection isolation information in z/OS Communications Server: IP Configuration Guide.

- No** Indicates that this interface is eligible for OSA-Express direct routing. Therefore, the OSA-Express device can route packets directly to another stack that is sharing the OSA-Express connection (as long as the interface from the other stack is also eligible for direct routing).
- Yes** Indicates that this interface is not eligible for OSA-Express direct routing. Therefore, the OSA-Express device cannot routing packets directly to another stack that is sharing the OSA-Express connection.

OptLatencyMode

This field is significant only for IPAQENET interfaces (defined using the INTERFACE statement) and for IPAQENET6 interfaces. The field indicates whether optimized latency mode (OLM) was configured for this OSA-Express interface. For more information about optimized latency mode, see optimized latency mode information in z/OS Communications Server: IP Configuration Guide. Possible values are:

- No** Indicates that the OSA-Express interface is not configured with optimized latency mode.
- Yes** Indicates that the OSA-Express interface is configured with optimized latency mode. Optimized latency mode optimizes interrupt processing for both inbound and outbound data.

Disabled

Indicates that the OSA-Express interface was configured with optimized latency mode, but the function could not be enabled when the interface was activated. The most likely reason is that the OSA-Express interface does not support this function.

IQDMultiWrite

This field is significant only for active HiperSockets devices or interfaces. This field indicates whether the HiperSockets multiple write facility is currently being used for the device or interface. To configure the stack to use the HiperSockets multiple write facility, specify the IQDMULTIWRITE parameter on the GLOBALCONFIG profile statement. The possible values are:

Enabled

Indicates that the HiperSockets multiple write facility is currently being used for the device or interface.

Enabled (ZIIP)

Indicates that the HiperSockets multiple write facility is currently being used for the device or interface. Additionally, CPU cycles that are associated with the HiperSockets multiple write facility are to be displaced to an available zIIP.

Disabled

Indicates that the HiperSockets multiple write facility is not currently being used for the device or interface.

Unsupported

Indicates that the IBM System z environment does not support the HiperSockets multiple write facility.

ReadStorage

This field is significant only for active IPAQENET and IPAQIDIO links or interfaces, IPAQTR links, and for IPAQIDIO6 and IPAQENET6 interfaces. This field indicates the amount of storage (in kilobytes) that is being used for read processing.

InbPerf

This field is significant only for IPAQENET links or interfaces, IPAQTR links, and IPAQENET6 interfaces. This field indicates how frequently the adapter interrupts the host. This field indicates how the processing of inbound traffic is performed. If the interface is not active, then this field shows the configured value. If the interface is active, then this field shows the value that is in effect. The possible values are:

Balanced

Indicates that the adapter is to use a static interrupt-timing value that strikes a balance between MinCPU and MinLatency.

Dynamic

This setting is significant only for IPAQENET links, and IPAQENET and IPAQENET6 interfaces. It indicates that the stack and the adapter are to dynamically update the frequency with which the adapter interrupts the host for inbound traffic.

WorkloadQueueing

This field is displayed only for IPAQENET and IPAQENET6 interfaces. It indicates whether QDIO inbound workload queueing is enabled. Possible values are:

- | | |
|------------|---|
| Yes | QDIO inbound workload queueing is in effect. The QDIO interface is defined using the INTERFACE statement with INBPERF DYNAMIC WORKLOADQ specified. |
| No | QDIO inbound workload queueing is not in effect. The QDIO interface is defined using the INTERFACE statement with INBPERF DYNAMIC or INBPERF DYNAMIC NOWORKLOADQ specified. |

Unsupported

QDIO inbound workload queueing was requested on the INTERFACE statement but the OSA-Express interface does not support it. QDIO inbound workload queueing is supported on OSA-Express3 or later features on an IBM System z10 GA3 or later CPC.

MinCPU

Indicates that the adapter is to use a static interrupt-timing value that minimizes host interrupts, and therefore minimizes host CPU consumption.

MinLatency

Indicates that the adapter is to use a static interrupt-timing value that minimizes latency delay by more aggressively presenting received packets to the host.

TempPrefix

This field is significant only for IPAQENET6 interfaces with stateless address autoconfiguration enabled. One or more TempPrefix fields are displayed. Together the TempPrefix fields indicate the set of prefixes for which temporary IPv6 addresses can be generated, if temporary addresses are enabled on the IPCONFIG6 statement. The set of prefixes is specified on the TEMPPREFIX parameter on the INTERFACE statement. The possible values displayed are:

All IPv6 temporary addresses are generated for all prefixes that are learned from a router advertisement over this interface. This is the default.

Disabled

Autoconfiguration of temporary addresses for the interface is disabled because duplicate addresses were detected. Temporary addresses are not generated for this interface.

None Temporary addresses are not generated for this interface.

IPv6 prefix/prefix length

IPv6 temporary addresses are generated for all prefixes that are learned from a router advertisement over this interface and that are included in one of the prefixes in this prefix list.

Link/Interface Statistics

This section is significant for all links and interfaces except virtual ones. The following statistical information is displayed:

BytesIn

Number of bytes received over an interface.

Inbound Packets

The number of unicast inbound packets received over an interface. This value applies to all links and interfaces except for RNIC interfaces.

Inbound Packets In Error

Number of inbound packets discarded because of an error validating the packet. This value applies to all links and interfaces except for RNIC interfaces.

Inbound Packets Discarded

Number of inbound packets discarded because of an out-of-storage condition. This value applies to all links and interfaces except for RNIC interfaces.

Inbound Packets With No Protocol

Number of inbound packets discarded because of an unknown protocol type. This value applies to all links and interfaces except for RNIC interfaces.

BytesOut

Number of bytes transmitted over an interface.

Outbound Packets

The number of unicast outbound packets transmitted over an interface. This value applies to all links and interfaces except for RNIC interfaces.

Outbound Packets In Error

Number of outbound packets discarded because of errors other than an out-of-storage condition. This value applies to all links and interfaces except for RNIC interfaces.

Outbound Packets Discarded

Number of outbound packets discarded because of an out-of-storage condition. This value applies to all links and interfaces except for RNIC interfaces.

Inbound Operations

Number of Remote Direct Memory Access (RDMA) inbound operations processed across this interface. This value applies to RNIC interfaces only.

Outbound Operations

Number of RDMA outbound operations processed across this interface. This value applies to RNIC interfaces only.

SMC Links

Current number of SMC-R links between this stack and other stacks across this interface. This value applies to RNIC interfaces only.

TCP Connections

Number of TCP connections across all the SMC-R links that are associated with this interface. One or more TCP connections can use the same SMC-R link. This value applies to RNIC interfaces only.

Intf Receive Buffer Inuse

Amount of RMB storage in use by the TCP connections that are using the SMC-R links associated with this interface. This value applies to RNIC interfaces only.

IPv4 LAN Group Summary

The IPv4 LAN group summary lists links or interfaces that are takeover candidates for each other. The stack creates a LAN group when it detects redundant connectivity to a LAN. For each link or interface in the LAN group, this summary displays which link or interface owns ARP responsibility for that link or interface. The summary also displays which link or interface owns the ARP responsibility in the LAN group for any VIPAs.

IPv6 LAN Group Summary

The IPv6 LAN group summary lists interfaces that are takeover candidates for each other. The stack creates a LAN group when it detects redundant connectivity to a LAN. For each interface in the LAN group, this summary displays which interface owns neighbor discovery (ND) address resolution responsibility for that interface. The summary also displays which interface owns the ND Address Resolution responsibility in the LAN group for any VIPAs.

LanGroup

Identifies the LAN group. This identifier is assigned by the stack and represents a group of interfaces on the same LAN. This identifier is not a VLAN ID.

Name The link name configured on the LINK statement or the interface name configured on the INTERFACE statement.

Status The link or interface status. Valid values are Active or Not Active.

ArpOwner

The link or interface name that owns ARP responsibility for this link or interface in the LAN group. An active link or interface owns its ARP responsibility.

NDOwner

The interface name that owns neighbor discovery (ND) responsibility for this interface in the LAN group. An active interface owns its ND responsibility.

VipaOwner

Indicates whether the link or interface owns the ARP or ND responsibility for the VIPAs in the LAN group.

Associated IQDX Interface

The name of the Internal Queued Direct I/O extensions function (IQDX) interface that is associated with this OSX interface. This section is significant for OSX interfaces that use an IQDX interface for intraensemble data network (IEDN) connectivity. The following information is displayed:

IQDX Status

The status of the IQDX interface. See the description of the LnkStatus/IntfStatus field for the possible interface status values.

BytesIn

The number of bytes that have been received over the associated IQDX interface.

Inbound Packets

The number of unicast inbound packets that have been received over the associated IQDX interface.

BytesOut

The number of bytes that have been transmitted over the associated IQDX interface.

Outbound Packets

The number of unicast outbound packets that have been transmitted over the associated IQDX interface.

Associated RNIC Interface

The dynamic interface name that is generated for 10GbE RoCE Express interface that this stack uses for SMC-R communications. This field is significant only for active IPAQENET and IPAQENET6 interfaces that specify SMCR or take SMCR as the default value.

SMC Link Information

The SMC link information. This section is displayed for each RNIC interface only when the SMC modifier or the SMCID/-U filter is specified. The following fields and statistics are displayed.

Guideline: An SMC-R link is uniquely identified by the combination of the VLAN number, local GID, local VMAC address, local QP number, remote GID, remote VMAC address, and remote QP number.

LocalSMCLinkId

The SMC-R link identifier that this TCP/IP stack dynamically creates to represent the link.

RemoteSMCLinkId

The SMC-R link identifier that the remote peer uses to represent the link. The value is provided to this TCP/IP stack during link activation.

SMCLinkGroupId

The group identifier that this TCP/IP stack dynamically creates to represent the SMC-R link group that includes this individual link.

VLANid

The virtual LAN ID for this SMC-R link. The value None is displayed if a virtual LAN ID has not been configured.

MTU The negotiated MTU size that is used for this SMC-R link.

LocalGid

The local GID value that is associated with this SMC-R link. This is the same information that is displayed in the GidAddr field.

LocalMACAddr

The local virtual MAC address that is associated with this SMC-R link.

LocalQP

The local queue pair (QP) value that is associated with this SMC-R link.

RemoteGid

The peer GID value that is associated with this SMC-R link.

RemoteMACAddr

The peer virtual MAC address that is associated with this SMC-R link.

RemoteQP

The peer QP value that is associated with this SMC-R link.

SMCLinkBytesIn

Number of inbound data bytes transferred across this SMC-R link.

SMCLinkInOperations

Number of Remote Direct Memory Access (RDMA) inbound operations processed across this SMC-R link.

SMCLinkBytesOut

Number of outbound data bytes transferred across this SMC-R link.

SMCLinkOutOperations

Number of RDMA outbound operations processed across this SMC-R link.

TCP Connections

Number of TCP connections across this SMC-R link.

Link Receive Buffer Inuse

Amount of RMB storage in use by the active TCP connections that are associated with this SMC-R link.

32K Buffer Inuse

Amount of 32K RMB storage in use by the active TCP connections that are associated with this SMC-R link.

64K Buffer Inuse

Amount of 64K RMB storage in use by the active TCP connections that are associated with this SMC-R link.

128K Buffer Inuse

Amount of 128K RMB storage in use by the active TCP connections that are associated with this SMC-R link.

256K Buffer Inuse

Amount of 256K RMB storage in use by the active TCP connections that are associated with this SMC-R link.

Other Buffer Inuse

For RMB storage that is allocated as buffers larger than 256K, the amount of these other buffers that are in use by the active TCP connections that are associated with this SMC-R link. If no buffers larger than 256K are allocated, this information is not displayed.

Guidelines:

1. The LOOPBACK device and link are displayed. The LOOPBACK6 interface is displayed if the stack is enabled for IPv6.
2. The byte counts for number of bytes received and number of bytes transmitted are always 0 for VIPA links and interfaces.
3. If an MTU was configured on the INTERFACE statement, then the actual MTU is the minimum of the configured MTU and the physical MTU value supported by the interface.

Restrictions:

1. No link-related information, packet trace settings, or BSD parameters are displayed for a device that has no link defined.
2. The packet trace setting is displayed only when it is defined and set to ON.
3. ATM specific information is displayed only for ATM devices that have links defined.

OSA-Express Network Traffic Analyzer Information

This section displays all currently defined OSA interfaces that are dynamically created by VARY TCPIP,,OSAENTA commands or OSAENTA PROFILE statements.

OSA PortName

The port name value of the OSA that is currently defined for performing the OSA-Express network traffic analyzer (OSAENTA) function. This value was specified on the PORTNAME parameter of a VARY TCPIP,,OSAENTA command or on an OSAENTA PROFILE statement. The following information is specific to this *PortName* value.

OSA DevStatus

The device status. The following list shows the possible values:

Starting

An OSAENTA ON command or statement has been processed and TCP/IP has sent an activation request to the data link control (DLC) layer.

Sent SETUP

DLC has acknowledged the TCP/IP activation request and TCP/IP has requested that DLC perform the initial I/O sequence with the device.

Enabling

DLC has acknowledged the TCP/IP activation request and TCP/IP has requested that DLC allow data connections to be established for the device.

Connecting

DLC has accepted the initial I/O sequence request.

Negotiating

The initial I/O sequence with the device is complete and TCP/IP is performing additional link-layer initialization.

Ready The initialization sequence with the device is complete. The device is now ready.

Deactivating

DLC has performed the first stage of an orderly device deactivation.

Not Active

The device is not active. (The device has never been started or has been stopped after having been started.)

OSA IntfName

The name of the interface that is dynamically created to communicate with the OSA Express2 adapter.

OSA IntfStatus

The trace collection interface status. The following list shows the possible values:

Ready The OSA interface used for OSAENTA is accepting all trace requests from the host.

Not Active

The OSA interface that is used for OSAENTA is not active. Either trace collection is disabled or else an error occurred during activation of the OSA interface that is to be used for trace collection. Such an error condition generates an error message on the operator console.

OSA Speed

The speed reported by the interface (in millions of bits per second).

OSA Authorization

The value of the OSA HMC authorization parameter. Possible values are Disabled, Logical Partition, PORT, CHPID, or UNKNOWN. The value is set to UNKNOWN until the first OSAENTA ON command has completed.

Disabled

The OSA does not allow the NTA function to trace any frames for the OSA.

Logical Partition

The OSA allows the NTA function to trace frames only for the current logical partition.

PORT The OSA allows the NTA function to trace frames for all stacks that share this OSA port.

CHPID

The OSA allows the NTA function to trace frames for all stacks that share the OSA.

UNKNOWN

The NTA trace interface has not been activated.

OSAENTA Cumulative Trace Statistics

Statistics accumulated for all frames that have been traced since the OSAENTA interface was first activated. These values are not reset by the OSAENTA ON command or statement.

DataMegs

The number of bytes of trace data (in megabytes) that have been received.

Frames

The total number of frames that have been traced.

DataBytes

The number of bytes of trace data that have been received.

FramesDiscarded

The number of frames that were traced but that the OSA device was not able to either forward to a host image or deliver outbound. These packets are available for formatting in the CTRACE SYSTCPOT component, but have not been delivered to any user.

FramesLost

The number of frames that could not be recorded by TCP/IP in the SYSTCPOT buffers.

OSAENTA Active Trace Statistics

Statistics that have accumulated since the OSAENTA ON command or statement was last issued.

DataMegs

The number of bytes of trace data (in megabytes) that have been collected.

Frames

The total number of frames that have been collected.

DataBytes

The number of bytes of trace data that have been collected.

FramesDiscarded

The number of frames that were collected but that the OSA device was not able to either forward to a host image or deliver outbound. These packets are available for formatting in the CTRACE SYSTCPOT component, but have not been delivered to any user.

FramesLost

The number of frames that were not collected by TCP/IP in the SYSTCPOT buffers.

TimeActive

The number of minutes that have elapsed since the last OSAENTA ON command or statement.

OSAENTA Trace Settings

The current trace settings that are in effect for this OSAENTA interface.

Status The current trace status. Possible values are:

ON Tracing is enabled.

OFF Tracing is disabled.

DataMegsLimit

The amount of data (in megabytes) to be collected before the trace is automatically stopped. This value was specified on the DATA parameter.

FramesLimit

The number of frames to be collected before the trace is automatically stopped. This value was specified on the FRAMES parameter.

TimeLimit

The amount of time (in minutes) that data is collected before the trace is automatically stopped. This value was specified on the TIME parameter.

Abbrev

The size limit for the frames (in bytes) that are to be traced. This value was specified on the ABBREV parameter. This value can be modified to reflect the size limit set by the OSA.

Discard

Identifies which frames being discarded by the OSA-Express device are to be traced. This value was specified on the DISCARD parameter. Possible values are:

All All frames discarded by the OSA-Express device are traced.

Exception

Frames discarded by the OSA-Express device for exception conditions are traced.

None No discarded frames are traced.

list A list of from one to eight values, that indicate the type of discarded frames that are to be traced by the OSA-Express device. This list includes decimal discard codes and the keyword parameter EXCEPTION.

OSAENTA Trace Filters

The values of the current accumulated filter variables from OSAENTA commands or statements for this OSA. If a filter

variable has not been specified using OSAENTA commands or statements, then an asterisk is shown.

Nofilter

The filtering behavior when all filters (DEVICEID, MAC, ETHTYPE, VLANID, IPADDR, PROTOCOL, and PORTNUM) have been cleared or are inactive. This behavior applies when no filters have been specified, if the CLEARFILTER parameter is specified, or when the current setting for every filter is an asterisk (*). This filtering behavior applies only to packets that were not discarded by the OSA-Express device. This value was specified on the NOFILTER parameter. Possible values are:

All All frames are traced.

None No frames are traced.

DeviceID

Up to eight hexadecimal device identifiers that are specified on the DEVICEID keyword of an OSAENTA command or statement. The value is an asterisk (*) if no device identifiers were specified.

Mac Up to eight hexadecimal MAC addresses that are specified on the MAC keyword of an OSAENTA command or statement. The value is an asterisk (*) if no MAC addresses were specified.

VLANid

Up to eight decimal VLAN identifiers that are specified on the VLANID keyword of an OSAENTA command or statement. The value is an asterisk (*) if no VLAN identifiers were specified.

ETHType

Up to eight hexadecimal Ethernet types that are specified on the ETHTYPE keyword of an OSAENTA command or statement. The value is an asterisk (*) if no Ethernet types were specified. The name of the Ethernet type filter is displayed for commonly used Ethernet types, such as ARP, IPv4, IPv6, and SNA.

IPAddr

Up to eight dotted decimal IPv4 IP addresses and up to eight colon hexadecimal IPv6 IP addresses that are specified on the IPADDR keyword of an OSAENTA command or statement. The value is an asterisk (*) if no IP addresses were specified.

Protocol

Up to eight decimal protocol identifiers that are specified on the PROTOCOL keyword of an OSAENTA command or statement. The value is an asterisk (*) if no protocol identifiers were specified. The name of the protocol filter is displayed for commonly used protocols, while the protocol number is displayed for all others.

PORTNum

Up to eight decimal port numbers that are specified on the

PORTNUM keyword of an OSAENTA command or statement. The value is an asterisk (*) if no port numbers were specified.

SMC Link Group Information

The information of the SMC link group. This section is displayed for each RNIC interface only when the SMC modifier or the SMCID/-U filter is specified. The following fields are displayed:

SMCLinkGroupId

The group identifier that this TCP/IP stack dynamically creates to represent the SMC-R link group that includes this individual link.

PNetID

The physical network ID value that is configured in HCD for this SMC-R link group.

Redundancy

The recovery and load balancing capabilities of the link group. The following list shows the possible values:

Full The link group has redundant active SMC-R links. Both the local and remote stacks have full failover capability. The z/OS server performs load balancing of TCP connections across the SMC-R links that are members of the link group.

Partial (Single local internal path)

The link group has redundant active SMC-R links. Both the local and remote stacks have failover capability. The z/OS server performs load balancing of TCP connections across the SMC-R links that are members of the link group. However, the links on the local stack have the same internal path.

Partial (Single local PCHID, unique ports)

The link group has redundant active SMC-R links. Both the local and remote stacks have failover capability. The z/OS server performs load balancing of TCP connections across the SMC-R links that are members of the link group. However, the links on the local stack have the same PCHID with unique ports.

Partial (Single local PCHID and port)

The link group has redundant active SMC-R links. Both the local and remote stacks have failover capability. The z/OS server performs load balancing of TCP connections across the SMC-R links that are members of the link group. However, the links on the local stack have the same PCHID and port.

Partial (Single local RNIC)

The link group has multiple active SMC-R links and the remote stack has full failover capability, but the local stack has no failover capability. The z/OS server does not perform load balancing of TCP connections.

Partial (Single remote RNIC)

The link group has multiple active SMC-R links and the local stack has full failover capability, but the remote stack has no failover capability. The z/OS server does not perform load balancing of TCP connections.

None (Single local and remote RNIC)

The link group has a single active SMC-R link. Neither the local stack nor the remote stack has failover capability. The z/OS server cannot perform load balancing of TCP connections.

Link Group Receive Buffer Total

Amount of remote memory buffer (RMB) storage that is assigned to this SMC-R link group.

32K Buffer Total

Amount of 32K RMB storage that is assigned to this SMC-R link group.

64K Buffer Total

Amount of 64K RMB storage that is assigned to this SMC-R link group.

128K Buffer Total

Amount of 128K RMB storage that is assigned to this SMC-R link group.

256K Buffer Total

Amount of 256K RMB storage that is assigned to this SMC-R link group.

Other Buffer Total

For RMB storage that is allocated as buffers larger than 256K, the amount of these other buffers that are assigned to this SMC-R link group. If no buffers larger than 256K are allocated, this information is not displayed.

LocalSMCLinkId

The link identifier this TCP/IP stack dynamically creates to represent the SMC-R link in this SMC-R link group.

RemoteSMCLinkId

The SMC-R link identifier that the remote peer uses to represent the link in this SMC-R link group. The value is provided to this TCP/IP stack during link activation.

Chapter 6. IP and SNA codes

Conventions and terminology that are used in this document

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

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

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

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

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

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

- RDMA network interface card (RNIC), which is used to refer to the IBM 10GbE RoCE Express feature.
- Shared RoCE environment, which means that the 10GbE RoCE Express feature operates on an IBM z13 (z13) or later system, and that the feature can be used concurrently, or shared, by multiple operating system instances. The RoCE Express feature is considered to operate in a shared RoCE environment even if you use it with a single operating system instance.

For definitions of the terms and abbreviations that are used in this document, you can view the latest IBM terminology at the IBM Terminology website.

Clarification of notes

Information traditionally qualified as Notes is further qualified as follows:

Note Supplemental detail

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

Guideline

Customary way to perform a procedure

Rule Something you must do; limitations on your actions

Restriction

Indicates certain conditions are not supported; limitations on a product or facility

Requirement

Dependencies, prerequisites

Result Indicates the outcome

Data link control (DLC) status codes

DLC status codes provide information about errors that are encountered during the use of high performance data transfer (HPDT) services. They are displayed in some messages and in the IUTx VIT entry.

DLC status codes are 4 bytes long. The bytes contain the following information:

Byte Contents

0 Category

1 Reporting layer identifier and location

2 and 3
 Completion code

The following tables show the possible values that can appear in each byte and their meaning.

Table 6. Byte 0 (category) of the DLC status code

Hexadecimal Value	Meaning
X'00'	Request successful Explanation: The specific primitive has been processed with no error. The receiver of this primitive successfully forwarded or replied to this primitive successfully. Note: The completion code could have informational errors.
X'08'	Request rejected Explanation: All aspects of the primitive were understood but a transitory system or network error occurred which prevented the execution of this request. An example of this could be storage shortage. Note: This category is one that an upper layer protocol (ULP) might choose to try the failed primitive again.
X'10'	Request error Explanation: This primitive was rejected due to inaccurate information in the primitive (for example, incorrect token, incorrect information element).
X'20'	State error Explanation: A primitive was received "out of order."
X'40'	Usage error Explanation: Primitive rejected due to incorrect use of either the primitive itself or a parameter that is associated with the primitive.
X'80'	Permanent error Explanation: Request rejected due to failure of either a system or network function.

Table 7. Byte 1 (reporting layer identifier and location) of the DLC status code

Hexadecimal Value	Meaning
X'10'	LLC layer local error Explanation: A primitive was processed and an error was found by the local VTAM.
X'20'	LLC layer path error Explanation: A primitive was processed and an error was found by the local VTAM while trying to send a primitive out on an MPC group.
X'30'	LLC layer remote error Explanation: A primitive was processed and an error was found by the remote VTAM. This value should be used when a remote VTAM is sending common status back to an adjacent host.
X'12'	Port Control Manager (PCM) local error Explanation: A primitive was processed and an error was found by the IBM Open System Adapter's PCM.
X'22'	Port Control Manager path-related error Explanation: A primitive was processed and an error was found by the IBM Open System Adapter's PCM while trying to send a primitive out on an MPC group or sending a primitive to the ATM network.
X'32'	Port Control Manager remote error Explanation: A primitive was processed and an error was found by the remote node; for example, the local ATM switch experienced a failure.
X'1C'	Service-specific component local error Explanation: A primitive was processed and an error was found by a service-specific component part of the ATM adaptation layer (AAL) sublayer.
X'2C'	Service-specific component path-related error Explanation: A primitive was processed and an error was found by a service-specific component part of the AAL sublayer, while trying to send a primitive to the ATM network.
X'3C'	Service-specific component remote error Explanation: A primitive was processed and an error was found by the remote node; for example, the local ATM switch experienced a failure.
X'1A'	Common-part component local error Explanation: A primitive was processed and an error was found by a common-part component that includes the ATM layer function and non-service-specific sublayers of the AAL layer.
X'2A'	Common-part component path-related error Explanation: A primitive was processed and an error was found by a common-part component that includes the ATM layer function and non-service-specific sublayers of the AAL layer while trying to send a primitive to the ATM network.
X'3A'	Common-part component remote error Explanation: A primitive was processed and an error was found by a remote partner in its common-part component that includes the ATM layer function and non-service-specific sublayers of the AAL layer.

Table 8. Bytes 2 and 3 (completion code) of the DLC status code

Hexadecimal Code	Meaning
X'00nn'	n/a Explanation: Codes starting with X'00' are specific to the VTAM product implementation.
X'0000'	Successful Explanation: The primitive completed successfully.
X'0001'	Initialization failure Explanation: A failure occurred during the initialization of support code. Notify VTAM operator to determine cause of failure.
X'0018'	VTAM is not available Explanation: Request returned as a result of VTAM termination. Termination might be normal due to an operator initiated action or due to some abnormal condition.
X'0021'	Connection constructor error Explanation: Failure occurred during the construction of the connection object. Notify the VTAM operator of the failure to determine cause and possible corrective actions.
X'0022'	State error Explanation: Failure occurred during the execution of the request due to a state error indicating a protocol violation. Notify the VTAM operator of the failure to determine cause of inconsistency and possible corrective actions.
X'0023'	TRLE activation/deactivation state error Explanation: User issued an activate or deactivation request and an internal state error was encountered.
X'0024'	Provider ID error Explanation: Provider ID supplied on the primitive is either incorrect or cannot be found. Condition indicates an interface inconsistency. Notify the VTAM operator of the failure to determine cause of inconsistency and possible corrective actions.
X'0025'	Selective Retransmit Not Supported Explanation: A request to set up a connection was received, and Selective Retransmit service was requested for that connection. Selective Retransmit is not supported now, so the request was rejected. Condition indicates that the remote partner expects Selective Retransmit, which might be a configuration mismatch. Notify the VTAM operator of the failure to determine cause of inconsistency and possible corrective actions.
X'0027'	OpenPathReq error Explanation: Internal command OPENPATH_request, which causes the initial activation of the channel paths and either the XID or IDX exchange, failed. Failure might be due to a channel problem or an error condition that is discovered during the initial activation sequence. Notify the VTAM operator of the failure to determine cause and possible corrective actions. It might also be necessary to notify the operator of the platform containing the remote MPC instance.
X'0029'	DactPathReq error Explanation: Internal command DACTPATH_request, which causes the termination of an MPC group, failed for some reason. MPC will complete system takedown of the group but the user should notify the VTAM operator of the failure to determine cause and possible corrective actions. Failure to take corrective action might lead to the inability to reactivate the path.

Table 8. Bytes 2 and 3 (completion code) of the DLC status code (continued)

Hexadecimal Code	Meaning
X'002A'	ActPathRsp error Explanation: Internal command ACTPATH_response, which causes the allocation of devices and the construction of the MPC environment, failed. Notify the VTAM operator of the failure to determine cause and possible corrective actions.
X'002B'	OpenPathRsp error Explanation: Internal command OPENPATH_response, which causes the initial activation of the channel paths and either the XID or IDX exchange, failed. Failure might be due to a channel problem or an error condition that is discovered during the initial activation sequence. Notify the VTAM operator of the failure to determine cause and possible corrective actions. It might also be necessary to notify the operator of the platform containing the remote MPC instance.
X'002F'	MPC connection does not support high performance data transfer. Explanation: Either the local definitions or the remote partner does not support high performance data transfer data interface. Check Hardware Configuration Definition (HCD) and VTAM definitions for possible mismatch.
X'0030'	Storage error Explanation: Storage incorrect or not obtainable.
X'0040'	INOP-deact SAP Explanation: SAP becomes inoperative.
X'0041'	INOP-connection Explanation: Data connection becomes inoperative.
X'0042'	INOP-signaling connection Explanation: Signaling connection becomes inoperative.
X'0043'	INOP-device Explanation: Local device becomes inoperative.
X'0044'	INOP-soft Explanation: The connection or MPC group is inoperative; however, recovery of the connection is possible.
X'0045'	INOP-hard Explanation: The connection or MPC group is inoperative, and is not expected to recover without intervention.
X'0046'	Incorrect token Explanation: User specified an incorrect token on a data connection.
X'0047'	Incorrect token Explanation: Internally specified token incorrect.
X'0048'	Duplicate data activation request Explanation: ULP has sent multiple data activation requests for a single connection.
X'0049'	Selector value error Explanation: A primitive was processed that specified a selector that did not match the selector of the provider token that was received.

Table 8. Bytes 2 and 3 (completion code) of the DLC status code (continued)

Hexadecimal Code	Meaning
X'004A'	Protocol value error Explanation: A primitive was processed that did not specify a known protocol value.
X'004B'	VCNAME value error Explanation: A primitive was processed that did not specify a known virtual circuit value.
X'0050'	Multiple TCP/IP instances trying to register filters for incoming calls Explanation: Multiple TCP/IPs requested identical filter values.
X'0051'	Buffer size error Explanation: An activation SAP request was issued with an incorrect bufsize, or an incorrect combination of buffer size and buffer number for a TCP/IP read or write device.
X'0052'	Missing XBFL Explanation: An attempt was made to execute a data primitive and an XBFL (extended buffer list) was not provided. An XBFL is required for data primitives.
X'0053'	Empty XBFL Explanation: An XBFL was provided for a data primitive that has no entries within the list; for example, XBFLBEGN=0.
X'0054'	Incorrect XBFL entry Explanation: An XBFL was provided for a data primitive that has an incorrect entry within the list (for example, XBFLAREA=0).
X'0055'	Packet and XBFL length mismatch Explanation: An XBFL was provided for a data primitive where the total length of all entries does not match the packet length.
X'0056'	XBFL free option not specified Explanation: An XBFL was provided for a data primitive where the XBFL free option (XBFL_FREE_OPT) was not specified. The free option is required for all data primitives.
X'0057'	Incorrect packet length Explanation: The packet length was 0 or too large; for example, exceeds the defined values for the device.
X'0058'	Incorrect parameter list version Explanation: The parameter list version is incorrect.
X'0060'	Connection not active Explanation: The data activation request for a specific connection was received before the connection was active.
X'0061'	Data not enabled with data activation request Explanation: Data activation request has not been received so data cannot be processed.
X'0062'	Class value error Explanation: A primitive was processed that does not specify a known class value.

Table 8. Bytes 2 and 3 (completion code) of the DLC status code (continued)

Hexadecimal Code	Meaning
X'0063'	Control value error Explanation: A primitive was processed that does not specify a known control value which is permitted for this primitive.
X'0064'	MPC Group in Use Explanation: An MPC group is defined as EXCLUSIVE USE (MPCUSAGE = EXC on TRLE), and is already in use. Activation is rejected.
X'0065'	iQDIO Prohibited Explanation: iQDIO activation is prohibited by VTAM start option IQDCHPID = NONE.
X'0066'	iQDIO CHPID Ambiguous Explanation: iQDIO activation is not allowed due to an ambiguous configuration with specifying IQDCHPID = ANY (default), and configuring (HCD/IOCDS) multiple IQD CHPIDs to this logical partition (LPAR). When IQDCHPID = ANY is specified (or defaulted) only one IQD CHPID can be configured for this LPAR. If multiple IQD CHPIDs must be configured to this LPAR, then define IQDCHPID = 'HEXCHPID' (the specific hex IQDCHPID that this LPAR should use).
X'0067'	iQDIO or QDIO Devices Not Available Explanation: An attempt was made to build a dynamic TRLE for a QDIO OSA-Express device or a HiperSockets device, but VTAM could not find the minimum number of required subchannel devices (CUAs) for the device. For a HiperSockets device, at least 3 CUAs are required to the same HiperSockets CHPID. For a QDIO OSA-Express device, the OSA-Express CHPID must be configured with 2 consecutive device addresses beginning with an even number for the control channels, and at least one additional device address for a DATAPATH channel. Verify the HCD or IOCDS configuration for accuracy for this logical partition (LPAR).
X'0068'	iQDIO CHPID Conflict Explanation: The user defined an iQDIO device CHPID and it conflicts with the sysplex IQD CHPID. This is defined by the IQDCHPID start option and is used for DYNAMICXCF communication. For more information, see the IQDCHPID start option in z/OS Communications Server: SNA Resource Definition Reference.
X'0069'	Processor not iQDIO capable Explanation: The user attempted to activate an iQDIO device and the processor does not support iQDIO devices.
X'006A'	iQDIO IQD CHPID multiple channel subsystem error Explanation: Multiple channel subsystem capable machine but the Internal Channel ID (CHID) is not available.
X'006B'	Frame invalidation mismatch Explanation: Frame invalidation is not supported by the stack that is issuing ActSap and frame invalidation was enabled by the first stack to issue ActSap.
X'006C'	Too many input queues requested by the stack Explanation: The stack specified more input queues than supported.
X'006D'	Input queue ID out of range Explanation: An internal Communications Server error occurred.

Table 8. Bytes 2 and 3 (completion code) of the DLC status code (continued)

Hexadecimal Code	Meaning
X'006E'	Input queue ID not registered Explanation: An internal Communications Server error occurred.
X'006F'	QDIO or IQDIO CHPID Not Available Explanation: An attempt was made to build a dynamic TRLE for a QDIO OSA-Express device or a HiperSockets device, and a CHPID for this device could not be found. If the CHPID was configured, for example on an MPCIPA HiperSockets device statement or using the CHPID parameter on an OSA-Express QDIO Interface statement, that particular CHPID was not defined to the system. If the CHPID was searched for dynamically, for example activating a dynamic IUTIQDIO link for HiperSockets with VTAM start option IQDCHPID=ANY or an OSA-Express OSM device, a CHPID for that particular channel type was not defined to the system. Verify the configured CHPID parameter or the HCD or IOCDS configuration for accuracy for this logical partition (LPAR).
X'0070'	QDIO device control channels not available Explanation: An attempt was made to build a dynamic TRLE for a QDIO OSA-Express device. A CHPID was found, but two consecutively numbered device addresses beginning with an even number could not be found. For QDIO OSA-Express devices, an even-numbered device address is required for the READ control channel, and the next consecutive odd address for the WRITE control channel. Verify the HCD or IOCDS configuration for accuracy for this logical partition (LPAR).
X'30nn'	n/a Explanation: Codes starting with X'30' can be errors that are detected in the interface between TCP/IP and VTAM, between VTAM and the IBM Open System Adapter, or between VTAM and TCP/IP channel units. These errors result from either a software or definitional problem. Use the specific return code to help identify the problem.
X'3001'	Incorrect control information field Explanation: The control information field of the primitive contains data that is blank, in an incorrect format, or cannot be recognized.
X'3002'	Incorrect identifier Explanation: The value that is specified in the identifier/token parameter of the control information field is blank, in an incorrect format, or cannot be recognized.
X'3003'	Incorrect identifier type Explanation: The value that is specified in the identifier type parameter of the control information field is incorrect; for example, the ID type says it is an SAP but the identifier is a filter.
X'3004'	Incorrect primitive Explanation: The value that is specified in the primitive code parameter of the control information field is incorrect.
X'3005'	State error Explanation: An illogical or incorrect primitive was received for the current SAP or the call instance state of the Port Connection Manager.
X'3007'	Incorrect information data Explanation: Either the primitive's data information field is missing data, or it contains blank, syntactically incorrect, or unrecognizable data.

Table 8. Bytes 2 and 3 (completion code) of the DLC status code (continued)

Hexadecimal Code	Meaning
X'3008'	Resource not available Explanation: The requested resource is not available.
X'300A'	Task ABEND Explanation: An error occurred that prevents the processing of the primitive.
X'300E'	Incorrect service type Explanation: The ServiceType parameter in the primitive's Control Information field is either blank, syntactically incorrect, or unrecognizable. Service Type is REQ/CNF/IND/RSP.
X'3011'	IBM Open Systems Adapter disabled Explanation: The IBM Open Systems Adapter has been disabled by user command.
X'3012'	PVC removed from IBM Open Systems Adapter Explanation: A PVC definition has been removed from IBM Open Systems Adapter while that PVC connection was active. The PVC connection is being deactivated.
X'3013'	PCM signaling virtual channel is not active Explanation: The signaling virtual channel (VCI=5, VPCI=0) between the IBM Open Systems Adapter and the ATM switch that carries signaling requests is not active.
X'3014'	Incorrect entry point Explanation: The entry point/interpret routine indicated contains a null character or incorrect value.
X'3016'	Incorrect Port Control Manager name Explanation: The value that is specified in the Port Control Manager name parameter is blank, in an incorrect format, or cannot be recognized. Note: 1. The port name is specified in multiple places and MUST be the same in the IBM Open Systems Adapter/SF configuration file, on the PORTNAME operand on the TRLE definition statement in the TRL major node, and (in the case of APPN communication) on the PORTNAME operand on the PORT definition statement in the XCA major node. The port name must be the same in all places that it is specified. If it is not, correct the mismatches. 2. The user request is failed if the requested TRLE cannot be activated because of one of the following conditions. <ul style="list-style-type: none"> • TRL major node has not been activated. • The TRLE entry is missing from the activated TRL major node. • The TRLE entry has an error that does not allow it to be defined. • The TRLE has been activated but it is inoperative.
X'3017'	Incorrect user call instance identifier Explanation: The value that is specified in the user call instance identifier parameter of the control information field is missing, blank, in an incorrect format, or cannot be recognized.
X'3018'	Incorrect provider call instance identifier Explanation: The value that is specified in the provider call instance identifier parameter of the control information field is missing, blank, in an incorrect format, or cannot be recognized.

Table 8. Bytes 2 and 3 (completion code) of the DLC status code (continued)

Hexadecimal Code	Meaning
X'3019'	Incorrect user SAP identifier Explanation: The value that is specified in the user SAP identifier parameter of the control information field is missing, blank, in an incorrect format, or cannot be recognized.
X'301A'	Incorrect provider SAP identifier Explanation: The value that is specified in the provider SAP identifier parameter of the control information field is missing, blank, in an incorrect format, or cannot be recognized.
X'301B'	Incorrect provider call enabling identifier Explanation: The value that is specified in the P_CE_ID parameter of the control information field is missing, blank, in an incorrect format, or cannot be recognized.
X'301C'	Incorrect user call enabling identifier Explanation: The value that is specified in the U_CE_ID parameter of the control information field is missing, blank, in an incorrect format, or cannot be recognized.
X'3022'	Incorrect control information field length Explanation: The value that is specified in the control information field length parameter contains an incorrect value. Note: Each primitive has a unique fixed control information field.
X'3023'	Incorrect data information field length Explanation: The value that is specified in the data information field length parameter contains a value that is incorrect or unrecognized.
X'3024'	Incorrect action code Explanation: The value that is specified in the action code specified in the control information on the Call_Setup response field is missing, blank, in an incorrect format, or cannot be recognized.
X'3025'	Missing data information field Explanation: The data information field must be complete for the primitive to work.
X'3026'	Incorrect logical link value Explanation: The value that is specified in the logical link identifier parameter is outside the valid range of 0-31, decimal.
X'3027'	PCM TRLE cannot support selector Explanation: The user issued an activate request that specified a selector that is not valid for the TRLE found by RNAME.
X'3028'	Datapath device activation failed Explanation: A storage error occurred during early processing of a datapath channel address for a QDIO device.
X'3029'	Datapath device activation negative Explanation: An error occurred attempting to allocate or activate a datapath channel address for a QDIO device.
X'302A'	Datapath device Open failed Explanation: An error occurred attempting to start a connection across a datapath channel address for a QDIO device.

Table 8. Bytes 2 and 3 (completion code) of the DLC status code (continued)

Hexadecimal Code	Meaning
X'302B'	Datapath Device Start Data failed Explanation: An error occurred attempting to start data flow on a connection across a datapath channel address for a QDIO device.
X'302C'	Enable Incoming connections for Port failed Explanation: A QDIO device rejected an attempt to allow connections to be enabled on this device.
X'302D'	No datapath devices available Explanation: A ULP cannot use a QDIO device because there are no datapath channel addresses available.
X'302E'	Activation failed to complete Explanation: A QDIO or iQDIO device failed to complete activation or properly register its HOME IP Address within 5 minutes.
X'302F'	Channel unit address not available Explanation: The channel is not the correct type for this device, there is no path for this channel, or the channel is not varied online.
X'3030'	Incorrect channel unit address specification Explanation: The channel unit address was either not specified by TCP/IP or is not a correct hexadecimal number.
X'3031'	Channel unit address already in use Explanation: The channel unit address specified by TCP/IP is already allocated to another user.
X'3032'	Maximum connections exceeded Explanation: The connection request attempted for this device exceeds the allowable maximum for this device type.
X'3033'	Lack of resources Explanation: The resources requested from the system could not be obtained (for example, memory errors).
X'3034'	Connection failed by the remote host with no cause code Explanation: A connection request was failed by the remote host for a given device, but a cause code indicating why the connection failed was not supplied.
X'3035'	QDIO CHPID type mismatch Explanation: An attempt was made to activate a QDIO device for a particular CHPID type, but the TRLE associated with this device was already active with channels of a different CHPID type. Verify the DEVICE name or PORTNAME are correctly configured for this device, and if the TRLE was configured, verify the device addresses are addresses for a CHPID of the correct type.
X'3036'	Secondary OSM Interface activated before primary Explanation: An attempt was made to activate EZ6OSM02 before EZ6OSM01. This failure can occur when there are no OSM CHPIDs available at TCP/IP stack initialization, and EZ6OSM02 is subsequently activated before EZ6OSM01. Activate EZ6OSM01 then EZ6OSM02.

Table 8. Bytes 2 and 3 (completion code) of the DLC status code (continued)

Hexadecimal Code	Meaning
X'3037'	<p>OSX or OSM Interface activation not permitted</p> <p>Explanation: An attempt was made to activate an interface with CHPID type OSX or OSM. The activation attempt failed because the ENSEMBLE start option is set to NO, which does not permit TCP/IP connectivity to either the intraensemble data network or the intranode management network.</p>
X'3038'	<p>OSX or OSM Interface activation not permitted</p> <p>Explanation: An attempt was made to activate an interface with CHPID type OSX or OSM. The activation attempt failed because the central processor complex (CPC) is not configured as a member of an ensemble.</p>
X'3039'	<p>IQD activation not permitted against an IQDX device</p> <p>Explanation: A CHPID that is defined to HCD as IQDX cannot be used as an iQDIO device.</p>
X'303A'	<p>Function type not valid</p> <p>Explanation: The IBM 10GbE RoCE Express interface does not recognize the function identifier on the activation attempt.</p>
X'303B'	<p>Outbound request flood detected</p> <p>Explanation: The Internet Control Message Protocol (ICMP) time stamp request is rejected because CSM storage is constrained or too many time stamp requests are generated at the same time.</p>
X'3053'	<p>Maximum number of network interfaces exceeded</p> <p>Explanation: An attempt was made to activate an OSA-Express port in QDIO mode. The OSA-Express port, or another port on the same OSA-Express3 or later channel path identifier (CHPID), is currently operating in optimized latency mode for at least one network interface. Optimized latency mode limits the number of concurrent network interfaces allowed to share this port and this CHPID. This activation attempt exceeds that limit. See the information about the optimized latency mode in z/OS Communications Server: IP Configuration Guide for information about these limits.</p>
X'31nn'	<p>OSA-Express rejected an attempt to activate a port</p> <p>Explanation: Codes starting with X'31' are specific to OSA-Express QDIO Mode activation attempts. X'31' indicates that the OSA has rejected an activation attempt. The <i>nn</i> indicates the reason for the rejection. Specific <i>nn</i> codes are listed in this table. If you receive a code that is not listed in this table, contact IBM Service.</p>
X'311B'	<p>Duplicate port name</p> <p>Explanation: An attempt was made to activate an OSA-Express3 or later port in QDIO mode. The port name for this activation attempt was already in use on the other port that belongs to that CHPID. Two ports on the same CHPID cannot have the same port name.</p>
X'3150'	<p>Incorrect port name</p> <p>Explanation: An attempt was made to activate an OSA-Express port in QDIO mode. The port name for this activation attempt did not match the port name already assigned to this port by a previous user. All z/OS users of that port must activate with the same port name.</p>
X'32nn'	<p>n/a</p> <p>Explanation: Codes starting with X'32' are specific to ATM connection establishment. In particular, they relate to the inability of the IBM Open Systems Adapter to establish a reserved bandwidth connection because of lack of available resources.</p>

Table 8. Bytes 2 and 3 (completion code) of the DLC status code (continued)

Hexadecimal Code	Meaning
X'3201'	<p>Bytes per second exceeded</p> <p>Explanation: The IBM Open Systems Adapter received a request for a reserved bandwidth circuit. The number of bytes per second that were requested cannot be honored because the IBM Open Systems Adapter's capacity for bytes per second for reserved bandwidth connections would be exceeded.</p>
X'3202'	<p>Receive packets per second exceeded</p> <p>Explanation: The IBM Open Systems Adapter received a request for a reserved bandwidth circuit. The number of packets per second that were requested in the receive direction (to the IBM Open Systems adapter) cannot be honored because the IBM Open Systems Adapter's capacity for receive packets per second for reserved bandwidth connections would be exceeded.</p>
X'3203'	<p>Transmit packets per second exceeded</p> <p>Explanation: The IBM Open Systems Adapter received a request for a reserved bandwidth circuit. The number of packets per second that were requested in the transmit direction (from the IBM Open Systems Adapter) cannot be honored because the IBM Open Systems Adapter's capacity for transmit packets per second for reserved bandwidth connections would be exceeded.</p>
X'3204'	<p>No packet buffers available</p> <p>Explanation: The IBM Open Systems Adapter received a request for a reserved bandwidth circuit. The number of bytes per second that were requested cannot be honored because the IBM Open Systems Adapter's capacity for packet buffers for reserved bandwidth connections would be exceeded.</p>
X'3205'	<p>Bandwidth unavailable</p> <p>Explanation: The IBM Open Systems Adapter received a request for a reserved bandwidth circuit. The number of ATM cells per second that were requested cannot be honored because the total number of cells per second would exceed the physical capacity of the ATM link.</p>
X'3210'	<p>Network down</p> <p>Explanation: The IBM Open Systems Adapter has lost communications to the ATM switch to which it is attached. The OSA lost communication with the attached ATM network, or an attempt was made to activate an XCA while the OSA had lost communication with the network (a missing cable or a switch registration failure, for example.)</p>
X'33nn'	<p>n/a</p> <p>Explanation: Codes starting with X'33' are specific to ATM signaling or data transfer. Generally they are the result of either a ULP software or definitional problem in constructing an ATM primitive. Use the specific return code to identify incorrect parameter, termed an information element (IE), to perform diagnostics.</p>
X'330B'	<p>Call does not exist</p> <p>Explanation: The Port Control Manager received a primitive associated with a call that no longer or never existed.</p>
X'330D'	<p>Endpoint does not exist</p> <p>Explanation: The value of the endpoint reference identifier in the endpoint reference subfield is not currently assigned to a call endpoint.</p>
X'3312'	<p>Service access point not activated</p> <p>Explanation: The primitive is incorrect because the SAP is not activated or recognized.</p>

Table 8. Bytes 2 and 3 (completion code) of the DLC status code (continued)

Hexadecimal Code	Meaning
X'3315'	User subfields too large Explanation: The subfields specified in the primitive exceed the number of allowable octets.
X'331B'	Subfields not allowed Explanation: The subfields contained in the specified primitive are not allowed.
X'331D'	Mandatory subfield missing Explanation: A required subfield not present.
X'3323'	Selected channel busy Explanation: The specified permanent virtual channel (PVC) is busy or allocated to another call.
X'3324'	Maximum calls exceeded Explanation: The call setup request was not executed because the required resource could not be allocated.
X'3329'	Maximum requests exceed Explanation: The limit on outstanding primitives was reached.
X'332A'	Call clear indication pending Explanation: A call clear indicate has been issued to the user. The user should respond. The call instance is cleared when the call clear response is received from the user.
X'332D'	Timeout on call Explanation: The call could not be processed within the time constraints of the network.
X'332F'	Lack of resources Explanation: The resources requested from the system (for example, memory errors) could not be obtained.
X'3330'	Operating system error Explanation: An operating system error was encountered.
X'3331'	Incorrect bearer capability Explanation: The length or the parameter information in the bearer capability subfield is incorrect.
X'3332'	Incorrect channel identification Explanation: The length or the parameter information in the channel identification subfield is incorrect or the channel not varied online properly by operator.
X'3333'	Incorrect calling party number Explanation: The length or the parameter information in the calling party number subfield is incorrect.
X'3334'	Incorrect called party number Explanation: The length or the parameter information in the called party number subfield is incorrect.
X'3335'	Incorrect calling party subaddress Explanation: The length or the parameter information in the calling party subaddress subfield is incorrect.

Table 8. Bytes 2 and 3 (completion code) of the DLC status code (continued)

Hexadecimal Code	Meaning
X'3336'	Incorrect called party subaddress Explanation: The length or the parameter information in the called party subaddress subfield is incorrect.
X'3337'	Incorrect low-layer compatibility Explanation: The length or the parameter information in the low-layer compatibility subfield is incorrect.
X'3338'	Incorrect high-layer compatibility Explanation: The length or the parameter information in the high-layer compatibility subfield is incorrect.
X'3339'	Incorrect transit network selection Explanation: The length or the parameter information in the transit network selection subfield is incorrect.
X'333A'	Incorrect cause Explanation: The length or the parameter information in the cause subfield is incorrect.
X'333B'	Incorrect call status Explanation: The length or the parameter information in the call status subfield is incorrect.
X'333C'	No cause code specified Explanation: The incoming call clearing message from the network did not contain a cause code indicating why the call was being cleared.
X'3340'	Incorrect AAL parameters Explanation: The length or parameter values in the AAL parameters subfield is incorrect.
X'3341'	Duplicate AAL parameters Explanation: The AAL parameters subfield is specified more than once.
X'3342'	Incorrect endpoint identifier Explanation: The length or parameter value in the endpoint reference subfield is incorrect.
X'3343'	Duplicate endpoint reference Explanation: The endpoint reference is specified more than once.
X'3344'	Incorrect endpoint state Explanation: The length or parameter value in the endpoint status subfield is incorrect.
X'3346'	Incorrect QoS Explanation: The length or parameter values in the quality of service subfield is incorrect.
X'3347'	Duplicate QoS Explanation: The quality of service subfield is specified more than once.
X'3348'	Incorrect PCI Explanation: The length or the parameter value in the permanent connection identifier subfield is incorrect.

Table 8. Bytes 2 and 3 (completion code) of the DLC status code (continued)

Hexadecimal Code	Meaning
X'3349'	Duplicate PCI Explanation: The permanent connection identifier subfield is specified more than once.
X'334A'	Incorrect traffic descriptor Explanation: The length or the parameter value in the traffic descriptor subfield is incorrect.
X'334B'	Duplicate traffic descriptor Explanation: The traffic descriptor subfield is specified more than once.
X'3351'	Duplicate bearer capability Explanation: The bearer capability subfield was specified more than one time.
X'3352'	Duplicate channel identification Explanation: The channel identification subfield was specified more than one time.
X'3353'	Duplicate calling party number Explanation: The calling party number subfield was specified more than one time.
X'3354'	Duplicate called party number Explanation: The called party number subfield was specified more than one time.
X'3355'	Duplicate calling party subaddress Explanation: The calling party subaddress subfield was specified more than one time.
X'3356'	Duplicate called party subaddress Explanation: The called party subaddress subfield was specified more than one time.
X'3357'	Too many instances of low-layer information Explanation: More instances of low-layer information subfield are present than are allowed.
X'3358'	Duplicate high-layer compatibility Explanation: The high-layer compatibility subfield was specified more than one time.
X'3359'	Duplicate Transit network selection Explanation: The transit network selection subfield was specified more than one time.
X'335A'	Duplicate cause Explanation: The cause subfield was specified more than one time.
X'335B'	Duplicate call status Explanation: The call status subfield was specified more than one time.
X'335D'	Duplicate PCI Explanation: The permanent connection identifier subfield was specified more than one time.
X'3360'	Subfield of length zero present Explanation: One of the subfields in the data information field has a length of zero.

Table 8. Bytes 2 and 3 (completion code) of the DLC status code (continued)

Hexadecimal Code	Meaning
X'3361'	Incorrect calling party number length Explanation: In the calling party number subfield, the value that is specified in the SFNumberLength parameter disagrees with the length of the subfield contained in the SFLength parameter.
X'3362'	Incorrect called party number length Explanation: In the called party number subfield, the value that is specified in the SFNumberLength parameter disagrees with the length of the subfield contained in the SFLength parameter.
X'3363'	Incorrect calling party subaddress length Explanation: In the calling party subaddress subfield, the value that is specified in the SFSubaddrLength parameter disagrees with the length of the subfield contained in the SFLength parameter.
X'3364'	Incorrect called party subaddress length Explanation: In the called party subaddress subfield, the value that is specified in the SFSubaddrLength parameter disagrees with the length of the subfield contained in the SFLength parameter.
X'3366'	Incorrect call status value Explanation: In the call status subfield, the SFCallStatus parameter specifies a value that is incorrect.
X'3367'	Call status subfield missing Explanation: The call status subfield information is missing. This is required information for this primitive.
X'336A'	Subfields of the same type are not the same Explanation: Two or more subfields of the same type are specified in the data information field; however they are not contiguous.
X'336B'	Entry not unique Explanation: The filter registration request is rejected because the call routing information and subfield specifications indicated in the data information field do not make the entry unique. An entry exists in the Port Control Manager incoming call routing table that has the same “must match” information as this request.
X'336C'	First subfield is not primitive specific Explanation: The first subfield you specified in the data information field is not the primitive-specific subfield.
X'3371'	Path Control Manager internal error Explanation: The Path Control Manager associated with the call detected an internal error.
X'3374'	Permanent connection not defined Explanation: The permanent connection that was requested in the call setup request is not defined.
X'3375'	Incorrect ID type in current state Explanation: In the current state of the call instance, the identifier type is incorrect.

Table 8. Bytes 2 and 3 (completion code) of the DLC status code (continued)

Hexadecimal Code	Meaning
X'3376'	Call setup confirm for unsuccessful call queued Explanation: The Path Control Manager will not process this call clear request because the call that the user requested to be cleared failed.
X'337A'	Prior call control request outstanding Explanation: A call control request previously issued by the user has not been confirmed by the Path Control Manager. The user should try the request again after the confirmation is received from the Path Control Manager.
X'3380'	User software error Explanation: The user discovered an unexpected software error.
X'3393'	Incorrect usage indicator in primitive-specific subfield Explanation: The usage indicator provided in the primitive specific subfield on the filter registration request primitive is incorrect. Either the first primitive-specific subfield specified must meet the "must not match" criteria, or the second primitive-specific subfield specified must meet the "must match" criteria.
X'3394'	Incorrect called party address in filter registration request or data transmission flow control state is blocked. Explanation: If this error occurs during device activation, the called party number on the filter registration request is incorrect; either it was not supplied, or does not match an address registered to the Path Control Manager. Otherwise a halt data flow request has been sent so data is not flowing.
X'3395'	Connection state incorrect for data transfer Explanation: Data cannot be accepted until the data SAP has been processed.
X'3396'	Data transmit flow control blocked for pacing. Explanation: The connection over which this data flows is an ATM reserved bandwidth connection. More data has been requested to be sent than has been reserved. The data flow will be blocked for an interval of time to ensure data is not dropped by the ATM network. Data flow will be reopened when the interval of time passes.
X'3397'	Data transmit flow control blocked for remote Explanation: The connection over which this data flows is an ATM connection. The IBM Open Systems Adapter has reached a level of congestion and has requested that no more data be sent on this connection until the congestion is relieved. Data flow will be reopened by IBM Open Systems Adapter when the congestion condition has passed.
X'34nn'	n/a Explanation: Codes starting with X'34' are specific to the OSA-Express data path. These codes represent errors reported by the OSA-Express adapter relating to the read or write Storage Block Address List Entries (SBALEs).
X'3400'	Error reason unknown Explanation: The specific cause of the error cannot be determined.
X'3401'	Invalid buffer contents Explanation: The contents of the storage pointed to by the SBALE does not contain a valid OSA-Express header or IP header.

Table 8. Bytes 2 and 3 (completion code) of the DLC status code (continued)

Hexadecimal Code	Meaning
X'3402'	Block crosses 4k boundary Explanation: The last byte of the storage represented by the SBALE is not contained in the same 4K storage frame as the first byte.
X'3403'	Invalid fragment type Explanation: The SBALE fragment type does not correlate with the fragment type of the previous SBALE.
X'3404'	Real address invalid Explanation: The SBALE storage address exceeds the size of central storage.
X'40nn'	n/a Explanation: Codes starting with X'40' are specific to the VTAM/IBM Open Systems Adapter IDX channel interface.
X'4001'	VTAM/IBM Open Systems Adapter function level mismatch Explanation: The IBM Open Systems Adapter returned this code indicating request failed due to function mismatch between VTAM and the IBM Open Systems Adapter; for example, incompatible versions of the two products. Contact system operator to determine cause of the incompatibility.
X'4002'	Incorrect or no header size specified Explanation: The IBM Open Systems Adapter returned this code indicating request failed during IDX exchange due to MPC specifying an improper header size. Contact VTAM operator to determine cause of the incorrect size.
X'4003'	Incorrect or no block size specified Explanation: The IBM Open Systems Adapter returned this code indicating request failed during IDX exchange due to MPC specifying an improper I/O buffer size. Contact VTAM operator to determine cause of the incorrect size.
X'4004'	Channel path read write polarity mismatch Explanation: The IBM Open Systems Adapter returned this code indicating request failed during IDX exchange due to incorrect channel path polarity; for example, read defined as write or write defined as read. The paths were defined incorrectly in either the TRL entry for the device or during IBM Open Systems Adapter configuration. Contact VTAM operator to determine cause of the incorrect size.
X'4005'	VTAM name mismatch Explanation: The IBM Open Systems Adapter returned this code indicating request failed during IDX exchange because the same VTAM name was not received over both channel paths. This indicates a condition where two different VTAM instances are configured such that one is trying to use the Read path, the other the Write. Contact VTAM operator to determine correct definition of channel paths.
X'4010'	Channel path pair quiesced Explanation: The IBM Open Systems Adapter returned this code indicating that channel paths will be halted due to the failure of some internal IBM Open Systems Adapter process. Contact system operator to determine reason for the IBM Open System Adapter's action.

Table 8. Bytes 2 and 3 (completion code) of the DLC status code (continued)

Hexadecimal Code	Meaning
X'4011'	<p>Incorrect data message size</p> <p>Explanation: The IBM Open Systems Adapter returned this code indicating an incorrect message size, normally too large. Channel operation is quiesced and the channel path to the IBM Open Systems Adapter becomes inoperative. Contact VTAM operator or system operator to determine correct maximum message size.</p>
X'4080'	<p>Normal termination</p> <p>Explanation: MPC uses this code to inform the IBM Open Systems Adapter that normal channel termination is required. It is not normally exposed to the ULP but might appear in the IBM Open Systems Adapter tracing facilities.</p>
X'4081'	<p>VTAM/IBM Open Systems Adapter level mismatch</p> <p>Explanation: MPC returned this code indicating initialization request failed due to function mismatch between VTAM and the IBM Open Systems Adapter; for example, incompatible versions of the two products. Contact VTAM operator or system operator to determine cause of the incompatibility.</p>
X'4082'	<p>Channel path read/write polarity error</p> <p>Explanation: MPC returned this code indicating initialization request failed due to the IBM Open Systems Adapter specifying an incorrect read or write channel address; the read channel address must be an "even" address and the associated write channel address must be the read address + 1.</p>
X'4083'	<p>Incorrect or no header size specified</p> <p>Explanation: MPC returned this code indicating initialization request failed due to the IBM Open Systems Adapter specifying an incorrect header segment size. Contact VTAM operator or system operator to determine cause of the incorrect size.</p>
X'4084'	<p>Incorrect or no buffer size</p> <p>Explanation: MPC returned this code indicating initialization request failed due to the IBM Open Systems Adapter specifying an incorrect I/O buffer size. Contact VTAM operator or system operator to determine cause of the I/O buffer size.</p>
X'4085'	<p>Data path failure</p> <p>Explanation: MPC returned this code indicating the channel paths to the IBM Open Systems Adapter are now inoperative due to a failure of the data path. Note, this is not a channel failure; it is the failure of a software component that processes data. Failure is normally due to an incorrect data primitive or the occurrence of a VTAM-detected processing error. Contact VTAM operator to perform problem diagnosis.</p>
X'4086'	<p>System failure</p> <p>Explanation: MPC returned this code indicating the failure of a process has caused an ABEND within MPC processing components. Failure might be due to an MPC software problem or an underlying system failure. Contact VTAM operator to perform problem diagnosis.</p>
X'4087'	<p>Channel path failure</p> <p>Explanation: MPC returned this code indicating the failure of the channel path between itself and the IBM Open Systems Adapter. Failure has been recorded as a long OBR record in the system log. Contact VTAM operator or the system operator to determine cause of failure.</p>

Table 8. Bytes 2 and 3 (completion code) of the DLC status code (continued)

Hexadecimal Code	Meaning
X'4088'	Token failure Explanation: MPC uses this code to indicate that the IBM Open Systems Adapter has returned inconsistent token values over the two channel paths. The tokens returned must contain identical bit strings. Contact the system operator to determine cause of inconsistency.
X'4089'	State mismatch Explanation: MPC uses this code to indicate that an inconsistency in processing states exists between MPC and the IBM Open Systems Adapter. Contact the VTAM operator to determine cause of inconsistency.
X'408A'	Event Notification Facility offline signal Explanation: MPC uses this code to indicate that an Event Notification Signal (ENF) has been received indicating the channel paths have been varied offline. Contact the system operator to determine reason the paths were put offline.
X'408B'	No storage for I/O buffer Explanation: MPC uses this code to indicate that storage was not available for it to build the required channel I/O buffers for the data and header segments. System storage might be constrained due to competing requests for storage. Contact the VTAM operator to determine VTAM's current storage usage and the system operator to determine cause of storage scarcity.
X'408C'	Incorrect IBM Open Systems Adapter name Explanation: The name used to activate the IBM Open Systems Adapter does not match the defined value. Check your definitions.
X'408D'	Channel control failure Explanation: MPC uses this code to indicate a failure in its channel control (CC) component. The failure might have been caused by a software failure in the CC component or an underlying system failure. Contact the VTAM operator to determine failure cause. If a system failure, notify the system operator.
X'408E'	Signaling plane failure Explanation: MPC uses this code to indicate a failure in the signaling plane. Contact the VTAM operator to determine failure cause. If a system failure, notify the system operator.
X'50nn'	Shared Memory Communications over Remote Direct Memory Access (SMC-R) failures Explanation: Codes starting with X'50' are specific to SMC-R operation failures. Use the specific return code to help identify the problem.
X'5001'	Peripheral Component Interconnect Express (PCIe) function ID (PFID) is not valid Explanation: The PFID value that is specified on the activation attempt contained characters that are not valid or that did not match the PFID of any active 10GbE RoCE Express interface.
X'5002'	The buffer size of the outbound buffer is not valid Explanation: The buffer size that is specified for a buffer to be used for outbound RDMA operations was too large or represented only a partial buffer.
X'5003'	The buffer size of the inbound buffer is not valid Explanation: The buffer size that is specified for a buffer to be used for inbound RDMA operations was too large or represented only a partial buffer.

Table 8. Bytes 2 and 3 (completion code) of the DLC status code (continued)

Hexadecimal Code	Meaning
X'5004'	<p>The outbound RDMA buffer could not be registered</p> <p>Explanation: The buffer to be used for outbound RDMA operations could not be registered with the 10GbE RoCE Express interface because the buffer descriptor on the primitive request did not contain the correct information.</p>
X'5005'	<p>The inbound RDMA buffer could not be registered</p> <p>Explanation: The buffer to be used for inbound RDMA operations could not be registered with the 10GbE RoCE Express interface because the buffer descriptor on the primitive request did not contain the correct information.</p>
X'5006'	<p>Incorrect primitive</p> <p>Explanation: The value that is specified in the primitive code parameter of the control information field is not correct.</p>
X'5008'	<p>Maximum users exceeded</p> <p>Explanation: The activation request attempted for this adapter exceeds the allowable number of adapter users.</p>
X'5009'	<p>Internal state error</p> <p>Explanation: The primitive request is received in an unexpected adapter state.</p>
X'500A'	<p>Virtual LAN (VLAN) identifier is not valid</p> <p>Explanation: The value that is specified for the VLAN identifier on the activation request exceeds the maximum value allowed.</p>
X'500B'	<p>Incorrect SMC-R link activation message</p> <p>Explanation: The SMC-R link activation message that is received from the SMC-R peer contained no data or the data specified was incorrect.</p>
X'500C'	<p>Queue pair (QP) activation timed out</p> <p>Explanation: The attempt to activate a QP as part of SMC-R link establishment did not complete within an acceptable amount of time.</p>
X'500D'	<p>Internal abend</p> <p>Explanation: VTAM returns this code to indicate that the failure of a process caused an abnormal end of task (abend) within SMC-R processing components. A software problem or an underlying system failure might be the cause. Contact the VTAM operator to perform problem diagnosis.</p>
X'500E'	<p>Unable to schedule TCP/IP during interrupt processing</p> <p>Explanation: During a normal interrupt completion event, VTAM was unable to schedule the TCP/IP stack to process inbound data.</p>
X'500F'	<p>SMC-R VLAN disabled</p> <p>Explanation: The TCP/IP stack requested VTAM to disable a specific VLAN. As a result, all QPs that are associated with this VLAN are stopped.</p>
X'5010'	<p>RDMA over Converged Ethernet (RoCE) token is not valid</p> <p>Explanation: The value that is specified for the RoCE token on the primitive was 0 or did not match any currently assigned tokens.</p>

Table 8. Bytes 2 and 3 (completion code) of the DLC status code (continued)

Hexadecimal Code	Meaning
X'5011'	VLAN token is not valid Explanation: The value that is specified for the VLAN token on the primitive did not match any currently assigned tokens.
X'5012'	QP token is not valid Explanation: The value that is specified for the QP token on the primitive was 0 or did not match any currently assigned tokens.
X'5013'	SMC-R link activation failure Explanation: VTAM could not successfully send the appropriate link activation message to the peer, preventing the SMC-R link from being activated.
X'5014'	Internal stall error detected Explanation: The SMC-R components determined that no outbound RDMA operations completed within an acceptable period. INOP processing is triggered for the 10GbE RoCE Express interface.
X'5015'	Internal poll error detected Explanation: An attempt by the SMC-R components to poll the 10GbE RoCE Express interface for information about outbound RDMA operations failed unexpectedly. INOP processing is triggered for the 10GbE RoCE Express interface.
X'5016'	Outbound RDMA operations cannot be queued Explanation: The SMC-R components determined that pending outbound RDMA operations must be queued because of 10GbE RoCE Express interface conditions, but this primitive indicated that it cannot be queued. The primitive is not queued.
X'5017'	Internal failure during 10GbE RoCE Express interface cleanup Explanation: The SMC-R components could not perform a final poll of the 10GbE RoCE Express interface for information about outbound RDMA operations before deactivating the 10GbE RoCE Express interface.
X'5018'	Could not schedule stack to process RDMA data Explanation: The SMC-R components could not schedule a TCP/IP process to receive RDMA data.
X'5020'	A CSDUMP was taken with a defined RNICTRLE that matched this 10GbE RoCE Express interface Explanation: A CSDUMP operation, with the RNICTRLE operand specified, requested that diagnostic data be gathered for a 10GbE RoCE Express interface. The process of collecting this data rendered the 10GbE RoCE Express feature inoperative for all users.
X'5021'	10GbE RoCE Express interface deactivated because a hardware diagnostic dump was taken Explanation: A 10GbE RoCE Express interface was deactivated for one the following reasons: <ul style="list-style-type: none"> • An INOPDUMP was taken for the 10GbE RoCE Express interface. • A CSDUMP was taken and a diagnostic dump was requested by using the RNICTRLE parameter. Note: The gathering of diagnostic data causes an inoperative condition for all users.

Table 8. Bytes 2 and 3 (completion code) of the DLC status code (continued)

Hexadecimal Code	Meaning
X'5022'	<p>10GbE RoCE Express interface deactivated because 10GbE RoCE Express internal error was detected</p> <p>Explanation: A 10GbE RoCE Express interface was deactivated because the interface reported an internal error. To recover from the internal error, VTAM resets the 10GbE RoCE Express interface and the 10GbE RoCE Express interface is temporarily unavailable for all users.</p>
X'51nn'	<p>10GbE RoCE Express device driver failure</p> <p>Explanation: In response to specific RoCE verb invocation failures, the 10GbE RoCE Express device driver sets the codes that start with X'51'. These codes are internally generated software codes that identify failures to communicate correctly with PCIe services or with the hardware.</p> <ul style="list-style-type: none"> • For PCIe service failures, the 10GbE RoCE Express device driver issues message IST2390I or IST2391I to report these failures. In these cases, the <i>nn</i> portion of the error code represents the return code that was recorded for the specific PCIe service failure. • For all other failures, the <i>nn</i> portion of the error is an internally generated value to uniquely identify the failure.
X'5113'	<p>PFID is not defined</p> <p>Explanation: The 10GbE RoCE Express device driver attempted to activate a 10GbE RoCE Express interface, but the PFIDs value is not defined for this LPAR. The 10GbE RoCE Express device driver issues message IST2392I to report this failure.</p>
X'5115'	<p>PFID is not online</p> <p>Explanation: The 10GbE RoCE Express device driver attempted to activate a 10GbE RoCE Express interface, but the PFID value is not configured online. The 10GbE RoCE Express device driver issues message IST2393I to report this failure.</p>
X'5116'	<p>Host channel adapter (HCA) configuration register (HCR) command operation timeout</p> <p>Explanation: The 10GbE RoCE Express device driver issued an HCR command to the RoCE hardware, but the hardware did not complete the operation within the internally specified timeout threshold. The 10GbE RoCE Express device driver initiates INOP processing to recover from this error.</p>
X'5117'	<p>PCIe load operation failure</p> <p>Explanation: During the processing of an HCR operation, the 10GbE RoCE Express device driver received an error in response to a PCIe load operation. The 10GbE RoCE Express device driver might initiate INOP processing to recover from this error.</p>
X'5118'	<p>PCIe store operation failure</p> <p>Explanation: During the processing of an HCR operation, the 10GbE RoCE Express device driver received an error in response to a PCIe store operation. The 10GbE RoCE Express device driver might initiate INOP processing to recover from this error.</p>
X'5121'	<p>HCR command operation failure</p> <p>Explanation: The 10GbE RoCE Express device driver issued an HCR command to the RoCE hardware, but the hardware rejected the operation with a specific status code. The specific HCR operation failed.</p>
X'5131'	<p>PCIe connect service call failure</p> <p>Explanation: The 10GbE RoCE Express device driver received an error in response to a PCIe connect service call (IQP4CON) during the activation of a 10GbE RoCE Express interface. The 10GbE RoCE Express device driver issues message IST2391I to report this failure.</p>

Table 8. Bytes 2 and 3 (completion code) of the DLC status code (continued)

Hexadecimal Code	Meaning
X'5132'	<p>PCIe open service call failure</p> <p>Explanation: The 10GbE RoCE Express device driver received an error in response to a PCIe open service call (IQP4OPN) during the activation of a 10GbE RoCE Express interface. The 10GbE RoCE Express device driver issues message IST2391I to report this failure.</p>
X'5138'	<p>PCIe deregister service call failure</p> <p>Explanation: The 10GbE RoCE Express device driver received an error in response to a PCIe deregister service call (IQP4DMR) in one of the following situations:</p> <ul style="list-style-type: none"> • When a 10GbE RoCE Express interface is deactivated. • When the TCP/IP stack contracts a storage pool and attempts to deregister specific memory regions. <p>The 10GbE RoCE Express device driver issues message IST2391I to report this failure.</p>
X'513B'	<p>Software reset failure</p> <p>Explanation: While the 10GbE RoCE Express device was initialized, the 10GbE RoCE Express device driver received an error during a software reset of the 10GbE RoCE Express feature. This call is issued during the activation of a 10GbE RoCE Express interface. The 10GbE RoCE Express interface does not activate.</p>
X'5140'	<p>PCIe close service call failure</p> <p>Explanation: The 10GbE RoCE Express device driver received an error in response to a PCIe close service call (IQP4CLO) during the deactivation of a 10GbE RoCE Express interface. The 10GbE RoCE Express device driver issues message IST2391I to report this failure.</p>
X'5141'	<p>PCIe deallocation service call failure</p> <p>Explanation: The 10GbE RoCE Express device driver received an error in response to a PCIe deallocation service call (IQP4DEA) during the deactivation of a 10GbE RoCE Express interface. The 10GbE RoCE Express device driver issues message IST2391I to report this failure.</p>
X'5144'	<p>PCIe allocation service call failure</p> <p>Explanation: The 10GbE RoCE Express device driver received an error in response to a PCIe allocation service call (IQP4ALL) during the activation of a 10GbE RoCE Express interface. The 10GbE RoCE device driver issues message IST2391I to report this failure.</p>
X'514A'	<p>No physical network ID detected</p> <p>Explanation: The 10GbE RoCE Express device driver issued a PCIe service call (IQP4GDI) to learn information about a 10GbE RoCE Express interface. The 10GbE RoCE Express device driver detected that no physical network ID (PNetID) was configured for this PFID. A 10GbE RoCE Express interface without a configured PNetID cannot be used for SMC-R communications. The 10GbE RoCE Express device driver issues message IST2391I to report this failure.</p>
X'5150'	<p>PCIe service processor call failure</p> <p>Explanation: The 10GbE RoCE Express device driver received an error in response to a PCIe service processor call (IQP4SPC) to collect diagnostic hardware information during the INOPDUMP or the CSDUMP processing. The 10GbE RoCE device driver issues message IST2391I to report this failure.</p>

Table 8. Bytes 2 and 3 (completion code) of the DLC status code (continued)

Hexadecimal Code	Meaning
X'5151'	<p>Incorrect operating environment detected for the IBM 10GbE RoCE Express feature</p> <p>Explanation: A 10GbE RoCE Express feature was configured in the hardware configuration definition (HCD) to run in a dedicated RoCE environment, but z/OS Communications Server expected the feature to run in a shared RoCE environment. Another possible situation is that a 10GbE RoCE Express feature was configured to run in a shared RoCE environment, but z/OS Communications Server expected the feature to run in a dedicated RoCE environment. The first 10GbE RoCE Express feature to be activated determines the operating environment for all subsequent features.</p>
X'52nn'	<p>TCP/IP SMC-R component failures during SMC-R processing</p> <p>Explanation: Codes that start with X'52' are specific to failures that are encountered within the TCP/IP SMC-R components during SMC-R processing. These errors cause the TCP connection to not use the SMC-R protocols.</p>
X'52E0'	<p>SMC-R link failure, no failover processing</p> <p>Explanation: The TCP/IP stack detected that an SMC-R link failed and no alternative SMC-R link was available.</p>
X'52E1'	<p>SMC-R link failure, local and remote partners are out of synch</p> <p>Explanation: The TCP/IP stack attempted to establish an initial SMC-R link to the remote partner, but the partner detects that an SMC-R link exists between the two endpoints.</p>
X'52F0'	<p>SMC-R link failure, failover processing</p> <p>Explanation: The TCP/IP stack detected that an SMC-R link failed. The TCP/IP stack switched the TCP connections that were using the failing SMC-R link to an alternative link within the SMC-R link group.</p>
X'52F1'	<p>SMC-R link failure, loss of path detected</p> <p>Explanation: The TCP/IP stack was notified that the RDMA path for an SMC-R link failed.</p>
X'52F2'	<p>SMC-R link failure, protocol violation</p> <p>Explanation: The TCP/IP stack detected that an SMC-R link failed because of a violation of the Link Layer Control (LLC) protocol that is used to manage the link.</p>
X'52F3'	<p>SMC-R link failure, RDMA write operation failed</p> <p>Explanation: The TCP/IP stack detected that an attempt to write RDMA data over an SMC-R link failed.</p>
X'52F4'	<p>SMC-R link failure, remote buffer confirmation failed</p> <p>Explanation: The TCP/IP stack detected that the remote partner did not confirm that an SMC-R link used a remote buffer. The link was stopped and, if possible, the TCP connections that were using the stopped link were switched to an alternative link in the link group.</p>
X'52F5'	<p>SMC-R link failure, delete buffer failed</p> <p>Explanation: The TCP/IP stack detected that the remote partner did not acknowledge that a buffer was no longer available for an SMC-R link to use. The link was stopped and, if possible, the TCP connections that were using the stopped link were switched to an alternative link in the link group.</p>

Table 8. Bytes 2 and 3 (completion code) of the DLC status code (continued)

Hexadecimal Code	Meaning
X'52F6'	SMC-R link failure, link deletion timed out Explanation: The TCP/IP stack attempted to delete an SMC-R link from a link group, but the remote partner did not acknowledge the request. The link was stopped and, if possible, the TCP connections that were using the stopped link were switched to an alternative link in the link group.
X'52F7'	SMC-R link failure, link test timed out Explanation: The TCP/IP stack tested the status of an SMC-R link, but the remote partner did not respond to the test request. The SMC-R link was assumed to be inactive and, if possible, the TCP connections that were using the stopped link were switched to an alternative link in the link group.
X'52F8'	SMC-R link failure, link addition timed out Explanation: The TCP/IP stack attempted to add an SMC-R link to a link group, but the remote partner did not acknowledge the request. The link was stopped and, if possible, the TCP connections that were using the stopped link were switched to an alternative link in the link group.
X'53nn'	TCP/IP stack failures during SMC-R processing Explanation: Codes that start with X'53' are specific to failures that the TCP/IP stack encountered during SMC-R processing. These errors cause the TCP connection to not use the SMC-R protocols.
X'54nn'	10GbE RoCE Express interrupt handler errors Explanation: Codes that start with X'54' are specific to failures that the 10GbE RoCE Express interrupt handlers encountered. The 10GbE RoCE Express interrupt handlers are associated with a 10GbE RoCE Express interface. These failures cause VTAM to initiate INOP processing of the 10GbE RoCE Express interface. For these failures, the <i>nn</i> portion of the error code represents the 1-byte event code that the 10GbE RoCE Express interface generates.
X'5409'	Port state event Explanation: The disabled interrupt exit was driven by PCIe services to notify the 10GbE RoCE Express device driver that the state of the 10GbE RoCE Express port is inactive. The 10GbE RoCE Express device driver initiates INOP processing for all TCP/IP stacks with active connections to this 10GbE RoCE Express interface.
X'54F0'	Allocation error exit Explanation: PCIe services drove the 10GbE RoCE Express allocation error exit to inform the 10GbE RoCE Express device driver of a PCIe error event. The 10GbE RoCE Express device driver initiates INOP processing for all TCP/IP stacks with active connections to this 10GbE RoCE Express interface.
X'54F1'	Open error exit Explanation: PCIe services requested the 10GbE RoCE Express open error exit to inform the TCP/IP stack that the PFID was deallocated. This code can be issued for one of the following reasons: <ul style="list-style-type: none"> • The 10GbE RoCE Express device driver detected an error that caused the Force Close processing to take down the 10GbE RoCE Express interface. • PCIe services detected a condition that required the deallocation of a PFID that VTAM allocated. In either case, the 10GbE RoCE Express device driver initiates INOP processing for the reported TCP/IP stack.

Table 8. Bytes 2 and 3 (completion code) of the DLC status code (continued)

Hexadecimal Code	Meaning
X'54F2'	<p>Event Queue (EQ) Doorbell error</p> <p>Explanation: The 10GbE RoCE Express device driver did a PCIe store operation to notify the 10GbE RoCE Express interface that the driver finished processing event queue elements. The store operation completed with an error. The 10GbE RoCE Express device driver initiates INOP processing for all TCP/IP stacks with active connections to the 10GbE RoCE Express interface.</p>
X'55nn'	<p>SMC-R link failure, RDMA write operation did not complete successfully</p> <p>Explanation: Codes that start with X'55' are specific to RDMA write-completion failures that are reported to the TCP/IP stack. These failures cause the TCP/IP stack to stop the SMC-R link that is associated with the failed RDMA write operation. If possible, the TCP/IP stack switches the TCP connections that are using the link to another link within the SMC-R link group. For these failures, the <i>nn</i> portion of the error code represents the 1-byte event code that the 10GbE RoCE Express interface generates to report the write completion failure.</p>

Chapter 7. SNA Resource Definition Reference

Conventions and terminology that are used in this document

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

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

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

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

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

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

- RDMA network interface card (RNIC), which is used to refer to the IBM 10GbE RoCE Express feature.
- Shared RoCE environment, which means that the 10GbE RoCE Express feature operates on an IBM z13 (z13) or later system, and that the feature can be used concurrently, or shared, by multiple operating system instances. The RoCE Express feature is considered to operate in a shared RoCE environment even if you use it with a single operating system instance.

For definitions of the terms and abbreviations that are used in this document, you can view the latest IBM terminology at the IBM Terminology website.

Clarification of notes

Information traditionally qualified as Notes is further qualified as follows:

Note Supplemental detail

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

Guideline

Customary way to perform a procedure

Rule Something you must do; limitations on your actions

Restriction

Indicates certain conditions are not supported; limitations on a product or facility

Requirement

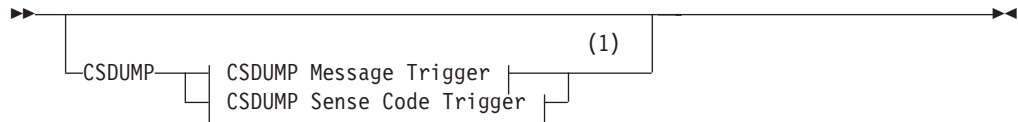
Dependencies, prerequisites

Result Indicates the outcome

VTAM start options

Descriptions of start options

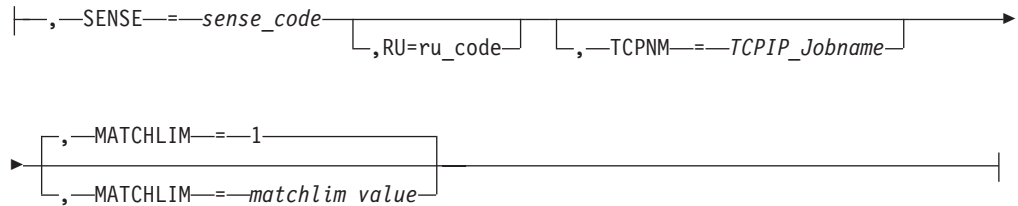
CSDUMP start option



Notes:

- 1 Specify the CSDUMP start option twice to set both message and sense code triggers.

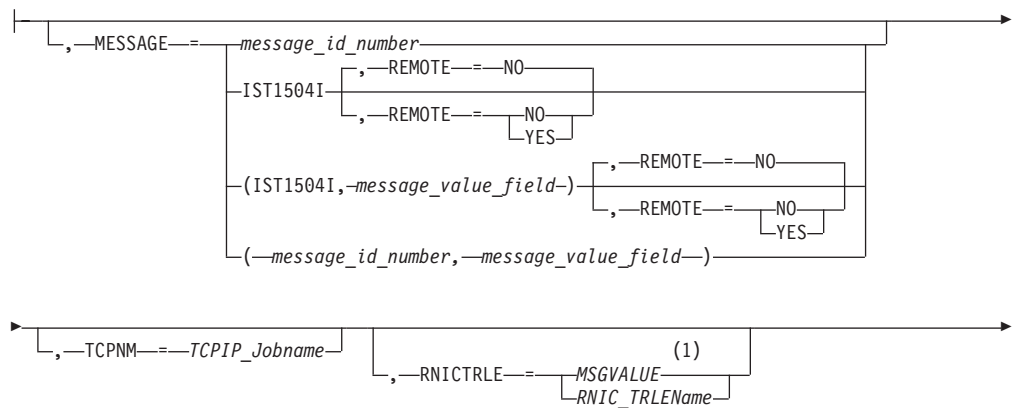
CSDUMP sense code trigger:



Rules:

1. When an error message is received on any parameter of the CSDUMP start option, the remaining parameters for this CSDUMP start option are ignored. You are required to re-enter the complete CSDUMP start option.
2. When the same parameter is entered multiple times on a CSDUMP sense code trigger, only the last occurrence is accepted.

CSDUMP message trigger:





Notes:

- 1 MSGVALUE is valid only when the MESSAGE operand is used, and MESSAGE specifies either message IST2391I or IST2406I.

Rules:

- When an error message is received on any parameter of the CSDUMP start option, the remaining parameters for this CSDUMP start option are ignored. You are required to re-enter the complete CSDUMP start option.
- When the same parameter is entered multiple times on a CSDUMP message trigger, only the last occurrence is accepted.

You can use the CSDUMP start option to set up a trigger that invokes a dump of the current address space when a particular sense code or message is issued. You can set only one sense code and one message trigger simultaneously; you cannot set two different message or sense code triggers at the same time. You can change a message trigger or a sense code trigger using the MODIFY CSDUMP command.

Either the MESSAGE operand or the SENSE operand must be specified after the CSDUMP start option or the CSDUMP start option is invalid.

MATCHLIM=matchlim_value

Specifies that the CSDUMP trigger is to be disabled after the *matchlim_value* value matches the value specified on the message trigger. The *matchlim_value* value is an integer in the range 1-255. The default is 1.

MESSAGE=message_id_number

Specifies the ID number of the message that triggers a dump. Message numbers must be in the format ISTxxxI, ISTxxxI, ISTxxxE, ISTxxxE, or IVTxxxI.

Rule: If the start option MSGLEVEL=BASE is specified, or if MSGLVL=BASE is specified in a USS operator message table, then the message displayed on the console is the pre-version 4 VTAM message. If you specify CSDUMP with a message trigger, the message ID number is checked before it is swapped to the base *message_id_number* value. Therefore, the *message_id_number* value used with the CSDUMP command must be the version 4 VTAM message number for CSDUMP to match the *message_id_number* value and take the dump. See *z/OS Communications Server: SNA Messages* for a list of the base messages and their corresponding version 4 VTAM numbers.

MESSAGE=(message_id_number,message_value_field,...)

Specifies the message variable text that can be used to trigger a dump. Instead of just matching a message number, this field causes the trigger to be more specific. If variable text is specified, then a dump is taken only when the message and variable text match. If a variable text field is blank, then it is considered to be a wildcard. See *z/OS Communications Server: SNA Messages* for more information about message text for VTAM operator messages.

Rules:

1. Use an underscore as a substitute for a space in the message text fields that contain variable values. You do not need to pad the end of the variable to fill out the text field; however, in a few rare cases messages can contain text fields (mostly numbers) in which the variable is right justified and does not completely fill the variable length. In these cases, when you are specifying

the CSDUMP operand, the *message_value_field* value must be padded to the left with underscores. For example, the first variable in the IST1461I message is a 3-byte field which is right justified. If a 2-byte number is displayed, an underscore must precede the number in the command in order for the dump command to function correctly. See the following example:

```
CSDUMP,MESSAGE=(IST1461I,_21)
```

2. Each message has a fixed number of *message_value_field* values. Each *message_value_field* value has a maximum length.
3. The specified number of *message_value_field* values must be less than or equal to the number of *message_value_field* values in the specified message.
4. The specified length of the *message_value_field* value must be less than or equal to the maximum length of the specified *message_value_field* value.

Leading *message_value_field* values can be skipped using a comma (,) for each *message_value_field* value. The trailing *message_value_field* values are not required.

See z/OS Communications Server: SNA Messages to determine the number of message value fields and their maximum lengths.

REMOTE

Specifies whether to request a dump of the remote VTAM when an XCF link connecting the two VTAMs becomes inoperative. You can specify this operand only when you specify MESSAGE=IST1504I.

REMOTE=NO

A dump of the remote VTAM is not requested when an XCF link becomes inoperative. This is the default behavior.

REMOTE=YES

A dump of the remote VTAM is requested when an XCF link becomes inoperative. The remote VTAM must be z/OS V1R9 or later for the dump to be taken.

RNICTRLE

Specifies that a diagnostic dump of an IBM 10GbE RoCE Express feature needs to be taken under certain conditions. The RNICTRLE operand can be used only with the MESSAGE trigger.

RNICTRLE=MSGVALUE

MSGVALUE is valid only when the MESSAGE operand is used, and MESSAGE specifies either message IST2391I or IST2406I. Specifying the MSGVALUE keyword allows VTAM to collect diagnostic dump information for the 10GbE RoCE Express feature identified in these messages.

RNICTRLE=RNIC_TRLEName

The format of *RNIC_TRLEName* must be IUTyxxxx, where xxxx is the Peripheral Component Interconnect Express (PCIe) function ID (PFID) that identifies the 10GbE RoCE Express feature, and y is the port number used on the 10GbE RoCE Express interface. The value of y can be 1 or 2.

Usage

The 10GbE RoCE Express diagnostic dump is taken in addition to any other dumps that CSDUMP produces. After the 10GbE RoCE Express diagnostic dump is produced, recovery of the 10GbE RoCE Express feature is attempted.

Notes: No 10GbE RoCE Express diagnostic dump is taken in either of the following cases:

- The TRLE is not active when CSDUMP produces the dump.
- A specific TRLE value is coded for RNICTRLE but the TRLE is not an RDMA over Converged Ethernet (RoCE) TRLE.

Rules:

- When the 10GbE RoCE Express feature operates in a dedicated RoCE environment, the diagnostic dump deactivates the 10GbE RoCE Express feature, and causes an inoperative condition for all users.
- When the 10GbE RoCE Express feature operates in a shared RoCE environment, the diagnostic dump only affects the TCP/IP stack that configured the PFID value included in the value of RNIC_TRLEName. Other TCP/IP stacks that use the RoCE Express feature are not affected.

Guideline: Ensure that multiple 10GbE RoCE Express interfaces are active with the same physical network ID to avoid loss of connections during a CSDUMP operation. For more information, see High availability considerations in z/OS Communications Server: IP Configuration Guide.

RU=*ru_code*

Specifies the response unit code that contains the sense code specified. The RU operand can be used only with the SENSE operand. If the RU operand is specified, then the dump is triggered only if the RU and SENSE codes occur together. The RU code must be 2, 4, or 6 characters in length.

See z/OS Communications Server: SNA Data Areas Volume 1 for valid RU codes or see SNA Formats.

SENSE=*sense_code*

Specifies the sense code that will trigger a dump. This value must be 8 characters in length.

See z/OS Communications Server: IP and SNA Codes for valid sense codes.

TCPNM=*TCPIP_Jobname*

Specifies that a dump of the TCPIP job should be taken when the corresponding sense or message trigger occurs. The current address space is also specified. The *TCPIP_Jobname* value must be 1-8 characters in length

Examples:

- Set the message trigger to take the dump:
CSDUMP,MESSAGE=IST1386I
- Set the message trigger to take the dump of the current address space and the dump of the TCPIP job:
CSDUMP,MESSAGE=IST1386I,TCPNM=TCPCS
- Set the message trigger with the message and first *message_value_field* value to take the dump:
CSDUMP,MESSAGE=(IST169I,react)
- Set the message trigger with the message and first two *message_value_field* values to take the dump:
CSDUMP,MESSAGE=(IST169I,react,pua)
- Set the message trigger with the message and first and fifth *message_value_field* values to take the dump:
CSDUMP,MESSAGE=(IST252I,rct,,,,pua)

- Set the sense code trigger to take a dump of the current address space:
CSDUMP,SENSE=08090000
- Set the message trigger and the sense trigger to take a dump:
CSDUMP,MESSAGE=(IST169I,react,pua),
CSDUMP,SENSE=08090000
- Set the sense code to take a dump of the current address space and a dump of the TCPIP job:
CSDUMP,SENSE=08090000,RU=818641,TCPNM=TCPCS
- Set the message trigger with the message and remote option to take a dump of the current address space and the remote VTAM connected through an XCF link to another VTAM:
CSDUMP,MESSAGE=IST1504I,REMOTE=YES

Chapter 8. SNA Diagnosis, Volume 2: FFST Dumps and the VIT

Conventions and terminology that are used in this document

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

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- When referring to the command in a general way in text, the command is presented with an initial capital letter (for example, Netstat).

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

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

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

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

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Note Supplemental detail

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

Guideline

Customary way to perform a procedure

Rule Something you must do; limitations on your actions

Restriction

Indicates certain conditions are not supported; limitations on a product or facility

Requirement
Dependencies, prerequisites

Result Indicates the outcome

VTAM internal trace (VIT) record descriptions

CCR entry for a communication channel operation

Entry: CCR

VIT option:
CIA

Event: communication channel operation for an IBM 10GbE RoCE Express feature that operates in a shared RoCE environment

This trace record is written when a communication channel operation is performed during the activation of a 10GbE RoCE Express feature that operates in a shared RoCE environment.

0000	0000	0000	0000	0000	0000	1111	1111	1111	1111	1111	1111
0123	4567	89AB	CDEF	0123	4567	89AB	CDEF	0123	4567	89AB	CDEF
CCR	ASID	0	CODE	REASON	0	PFCTE ADDRESS	MIDULE	RPH ADDRESS			

Byte (hex)

Contents

- 00-03** Record ID: C"CCR"
- 04-05** ID is the primary address space ID (ASID).
- 06** 0
- 07** Operation code for the communication channel command that was issued
- 08-09** Return code
- 0A-0B** Reason code
- 0C-0F** 0
- 10-18** Address of the PFCTE control block that represents this 10GbE RoCE Express feature
- 19-1B** Identifier of the module that issued the communication channel command
- 1C-1F** RPH address

CCR2 entry for communication channel operation (Part 2)

Entry: CCR2

VIT option:
CIA

Event: communication channel operation for an IBM 10GbE RoCE Express feature that operates in a shared RoCE environment.

This record is a continuation of the CCR trace record.

0000	0000	0000	0000	1111	1111	1111	1111
0123	4567	89AB	CDEF	0123	4567	89AB	CDEF
C C R 2	OPCODE AND RETRIES	INITIAL VALUE	COMMAND VALUE	COMPLETION VALUE			

Byte (hex)

Contents

00-03 Record ID: C"CCR2"

04-07 Operation code and operation retries values

Bit Meaning

0 - 11 Represents the operation code performed

12 - 31

Represents the number of retries before the command completes

08-0F The value of the communication channel before the command is attempted

10-17 The value stored by z/OS Communication Server into the communication channel to execute the command

18-1F The value of the communication channel after the command completes

IOSP entry for invoking a RoCE IOS' operation (part 1)

IOS2 entry for invoking a Peripheral Component Interconnect Express (PCIe) service (Part 2)

Entry: IOS2

VIT option:
CIA

Event: Invocation of a Remote Direct Memory Access (RDMA) over Converged Ethernet (RoCE) Peripheral Component Interconnect Express (PCIe) service, as part of Shared Memory Communications over Remote Direct Memory Access (SMC-R) processing.

VIT processing module:
ISTITCSH

This trace record is a continuation of the IOSP record.

08 - 09 Return code

0A - 0B Reason code

0C - 0F Operation code modifier

10 - 17 Address of the PFC TE

18 - 1B Hardware handle

1C - 1F Request parameter header (RPH) address

VHC2 entry for invoking a RoCE VHCR operation (part 2)

Entry: VHC2

VIT option:
CIA

Event: Invocation of a Remote Direct Memory Access (RDMA) over Converged Ethernet (RoCE) VHCR operation as part of Shared Memory Communications over Remote Direct Memory Access (SMC-R) processing when the IBM 10GbE RoCE Express feature operates in a shared RoCE environment.

This trace record is a continuation of the VHCR entry.

0000	0000	0000	0000	1111	1111	1111	1111
0123	4567	89AB	CDEF	0123	4567	89AB	CDEF
V H C 2	I M N O P I U F T E R	INPUT PARM	OUTPUT PARM	OUTPUT RETURNED ADDRESS			

Byte (hex)

Contents

00-03 Record ID: C"VHC2"

04-07 Input modifier

08-0F Input parameter area

10-17 Output parameter area

18-1F Output address returned by command processing

VHC3 entry for invoking a RoCE VHCR operation (part 3)

Entry: VHC3

VIT option:
CIA

Event: Invocation of a Remote Direct Memory Access (RDMA) over Converged Ethernet (RoCE) VHCR operation as part of Shared Memory

Communications over Remote Direct Memory Access (SMC-R) processing when the IBM 10GbE RoCE Express feature operates in a shared RoCE environment.

This trace record is a continuation of the VHCR entry.

0 0 0 0 0 1 2 3	0 0 0 0 4 5 6 7	0 0 0 0 8 9 A B	0 0 0 0 C D E F	1 1 1 1 0 1 2 3	1 1 1 1 4 5 6 7	1 1 1 1 8 9 A B	1 1 1 1 C D E F
V H C 3	OPCODE AND RETRIES	INITIAL VALUE		COMMAND VALUE		COMPLETION VALUE	

Byte (hex)

Contents

00-03 Record ID: C"VHC3"

04-07 Operation code and operation retries values

Bit Meaning

0 - 11 Represents the operation code performed

12 - 31

Represents the number of retries before the command completes

08-0F The value of the communication channel before the command is attempted

10-17 The value stored by z/OS Communication Server into the communication channel to execute the command

18-1F The value of the communication channel after the command completes

VHC4 entry for invoking a RoCE VHCR operation (part 4)

Entry: VHC4

VIT option:

CIA

Event: Invocation of a Remote Direct Memory Access (RDMA) over Converged Ethernet (RoCE) VHCR operation as part of Shared Memory Communications over Remote Direct Memory Access (SMC-R) processing when the IBM 10GbE RoCE Express feature operates in a shared RoCE environment.

This trace record is a continuation of the VHCR entry, and is generated only when the VHCR operation requires command input data. Multiple VHC4 entries might be generated, depending on the length of the command input data.

0 0 0 0 0 1 2 3	0 0 0 0 4 5 6 7	0 0 0 0 8 9 A B	0 0 0 0 C D E F	1 1 1 1 0 1 2 3	1 1 1 1 4 5 6 7	1 1 1 1 8 9 A B	1 1 1 1 C D E F
V H C 4	28 BYTES OF COMMAND INPUT DATA						

Byte (hex)

Contents

1

1

1

1

1

1

— — — — —

— — —

11

1

1

1

1

Chapter 9. SNA Operation

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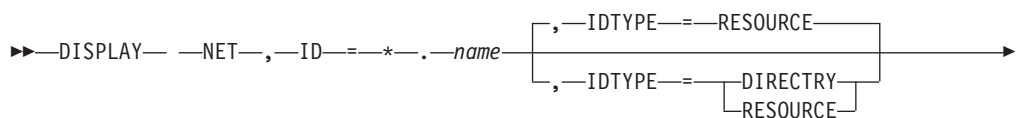
Requirement

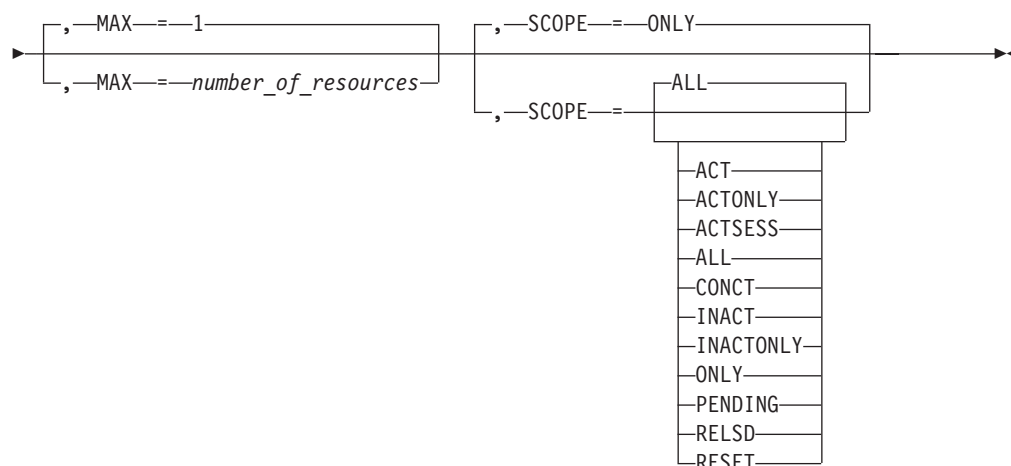
Dependencies, prerequisites

VTAM operator commands

DISPLAY ID command

►►—DISPLAY— —NET—,—ID—=*name*————→





Display a resource name using an IP address:

```
▶▶—DISPLAY— —NET—,—ID—==—ipaddress—,—IDTYPE—==—IPADDR————▶
```

Abbreviations

Operand	Abbreviation
DISPLAY	D
HPRDIAG=YES	HPRDIAG or HPRDIAG=Y
SCOPE=ACT	ACT or A
SCOPE=ACTONLY	ACTONLY
SCOPE=ACTSESS	ACTSESS
SCOPE=ALL	EVERY or E
SCOPE=CONCT	CONCT
SCOPE=INACT	INACT or I
SCOPE=INACTONLY	INACTONL
SCOPE=ONLY	NONE or N
SCOPE=PENDING	PEND
SCOPE=RELS	RELS
SCOPE=RESET	RESET

When using an abbreviation in place of an operand, code the abbreviation exactly as shown in the table. For example, when coding the abbreviation for SCOPE=ALL, code only EVERY or E. Do not code SCOPE=E.

Purpose

The DISPLAY ID command provides information about a particular major node, minor node, or directory entry. Additional information can be displayed about the subordinate resources of the node.

Note: This command applies only to active major nodes and minor nodes within active major nodes.

Inactive subarea nodes (for example, NCP major nodes) that have been contacted by VTAM as a result of the activation of a cross-subarea link station can be displayed, if the name of the given subarea node is known to VTAM. Both the NCP being displayed and the NCP containing the link station must be an NCP V1R3 or later release level. In all other cases, inactive major nodes and their minor nodes are not known to VTAM and are therefore not displayed.

When the operator specifies:

- A switched line, the display indicates whether the line is dial-in, dial-out, or both dial-in and dial-out. For a dial-in line, the answer mode is indicated.
- An application program minor node or LU name, the associated z/OS UNIX System Services , interpret, and logon-mode table names and the default logon-mode entry are displayed.

Note: Specifying ISTNOP, the name of the application program that represents the network operator, also displays the names of the message-flooding prevention table and the session awareness (SAW) data filter table.

- An NCP or host physical unit name, the following information is displayed:
 - The name and status of the associated dynamic path update members
 - The load module name of the NCP that was loaded (if different from the NCP PU name)
 - An indication of whether a nondisruptive load (MODIFY LOAD) is currently in progress
 - An indication of whether an NCP, MOSS, or CSP dump transfer (MODIFY DUMP) is currently in progress.
- The name of an FRSESET definition statement, an FRSESET display is issued. The display includes a message that shows how the FRSESET was defined, statically or dynamically. (Statically means that it was included in the NCP generation.)
- An application program minor node, the compression-level values are displayed.
- An application program, LU, or cross-domain resource name, the security data for data encryption and message authentication are displayed.

Operands

CLEAR

Specifies whether to clear diagnostic counters for the RTP pipe.

CLEAR=ALL

The diagnostic counters of the specified RTP pipe are cleared.

CLEAR=NONE

The diagnostic counters are not cleared.

The HPRDIAG=YES operand is required when you specify the CLEAR operand. The resource identified by the ID operand must be an RTP physical unit in this host.

HPRDIAG

Specifies whether additional HPR diagnostic information is to be displayed for the Rapid Transport Protocol (RTP) physical unit.

HPRDIAG=YES

Specifies that additional HPR diagnostic information is to be displayed for the Rapid Transport Protocol (RTP) physical unit.

The resource identified by the ID operand must be an RTP physical unit in this host.

HPRDIAG=NO

Specifies that additional HPR diagnostic information is not to be displayed for the Rapid Transport Protocol (RTP) physical unit. If specified, the resource identified by the ID operand must be an RTP physical unit in this host.

ID=name

Specifies the name of a major node, minor node, USERVAR, generic resource name, LU_ALIAS, or resource in the directory database.

The name can be a network-qualified name. Regardless of whether you specify a network-qualified name on the ID operand, the resource name in the display output is network-qualified only for application programs, SSCPs, CDRSCs, and LUs. The resource name in the display output is not network-qualified for any other type of resource.

For an APPN node, to display information about a dynamic XCF local SNA PU representing the connection to another VTAM, you can specify one of the following names:

- The name of the PU
- The CP name (or SSCP name) of the other VTAM with IDTYPE=XCFCP

For a pure subarea node, to display information about a dynamic XCF TRLE representing the connectivity to another VTAM node, you can specify one of the following names:

- The name of the TRLE
- The SSCP name (or CP name) of the other VTAM with IDTYPE=XCFCP

Note:

1. If the name is an NCP major node, the name used must be the name specified on the ID operand when the NCP was activated. If PUNAME was specified on the BUILD definition statement, then *name* is the PUNAME.
2. If the name is an application program in this domain, the ID operand can specify either the application program minor node name or the name under which the application program opened its ACB.
3. For an application program minor node, you can specify the name of a conventionally defined application program, a model application program, or a dynamic application program built from a model application program definition. For a CDRSC minor node, you can specify the name of a conventionally defined CDRSC, a model CDRSC, a clone CDRSC built from a model CDRSC, or a dynamic CDRSC.

If you are specifying a model resource (APPL or CDRSC), you can use wildcard characters in the name you specify. The use of wildcard characters on the ID operand of the DISPLAY ID command does not depend on the value of the DSPLYWLD start option. Unlike wildcard characters in other commands, the wildcard characters you specify on the ID operand of the DISPLAY ID command do not represent unspecified characters. They are interpreted as the actual characters, asterisk (*) and question mark (?).

Therefore, if you specify DISPLAY ID=APPL*, VTAM displays information about the model resource (APPL or CDRSC) named APPL*, but it does not display information about any other application programs or CDRSCs

whose names begin with APPL, followed by zero to four valid characters in length. It also does not display detailed information about any clone resource (APPL or CDRSC) that was built from the model resource named APPL*.

In other words, using wildcard characters in the name that you specify on the ID operand of the DISPLAY ID command results in the display of at most one model application program or one model CDRSC. If you want to display information about all application programs or CDRSCs whose names match a pattern established by the placement of wildcard characters, use the DISPLAY RSCLIST command.

4. For a CDRM, you can specify a network-qualified name, but this does not remove the restriction that the non-network-qualified CDRM name must be unique across networks.
5. If the name is a non-network-qualified CDRSC, VTAM uses the network ID of the host from which the command is issued. If two or more CDRSCs exist with the same resource name, but different network identifiers, and DISPLAY ID=*non-network-qualified_name* is issued, then one of the following situations occurs:
 - Only one CDRSC is displayed. The displayed CDRSC is one of the following types:
 - The one that has been defined with VTAM's network identifier
 - The one that has been defined as cross-network, but specified with NQNMODE=NAME, either on its CDRSC definition or by the NQNMODE start option
 - None of the CDRSCs are displayed if they are all specified with NQNMODE=NQNAME, either on their CDRSC definitions or by the NQNMODE start option.
6. If you specify a non-network-qualified USERVAR name, VTAM uses the network ID of the host from which you issue the command.
7. You can specify an asterisk (*) as a wildcard character (or *NETWORK) as the network ID portion of a network-qualified name. The wildcard character (*) is useful for displaying a resource for which you do not know the network ID. The wildcard character (*) is also useful for displaying several resources with the same name that are found in multiple networks, if you also specify the MAX operand on the command.
8. If the name is a generic resource name, the output lists all the members known by that generic resource name.
9. If the name is a TN3270 client IP address in dotted decimal format (for example, ID=192.5.48.122) or in colon-hexadecimal format for IPv6 addresses and there is an associated z/OS Communications Server Telnet server APPL, CDRSC, or LU minor node resource name, it is displayed. The saving and displaying of the IP information for TN3270 clients is controlled by the IPINFO start option. See z/OS Communications Server: SNA Resource Definition Reference for more information about the IPINFO start option.
10. If the name is an RTP pipe, the number of fully active sessions is displayed in the IST1855I message.

Restriction: When you specify an IP address, IDTYPE=IPADDR is also required.

IDTYPE

Specifies the type of resource that the ID operand names. If several types of

resources share the same name, IDTYPE can be used to identify which resource the command acts on. IDTYPE differs from MAX in that IDTYPE displays several representations of the same resource, whereas MAX displays several different resources with the same name.

IDTYPE=CDRM

Displays information only about the SSCP (represented as a CDRM).

IDTYPE=CP

Displays information only about the host CP (represented as an application) or an adjacent CP (represented as a CDRSC).

IDTYPE=DIRECTRY

Displays information from the directory database for the specified resource. The DISPLAY ID command with IDTYPE=DIRECTRY is valid only when it is issued at a network node or an interchange node.

IDTYPE=GENERIC

Displays the names of application program network names that are also generic resources.

IDTYPE=IPADDR

Displays the IP address of the currently connected TN3270 client applications and LUs. The IP address accepts a fully qualified dotted decimal format for IPv4 type addresses, or colon-hexadecimal format for IPv6 type addresses.

Note: The saving and displaying of the IP information for TN3270 clients is controlled by the IPINFO start option. See z/OS Communications Server: SNA Resource Definition Reference for more information.

IDTYPE=LUALIAS

Displays information only about the CDRSC whose name is associated with the LUALIAS. If a network-qualified name is specified, VTAM does not search for an LUALIAS with that resource name. For more information about CDRSCs that are defined with an LUALIAS, see z/OS Communications Server: SNA Resource Definition Reference.

IDTYPE=RESOURCE

Displays information about the resource named on the ID operand. VTAM searches for the resource in the following order:

1. VTAM searches for an SSCP (CDRM), a host CP (application), or an adjacent CP (CDRSC) by the name specified on the ID operand and displays information for any or all these resources it finds. If the resource is found and it is not the host CP, and you are issuing this command at a network node or interchange node, the display includes information from the directory database.
2. If VTAM does not find an SSCP, a host CP, or an adjacent CP, it searches for a resource with the name specified on the ID operand and displays information for the resource, if it finds it. If the resource is a CDRSC, and you are issuing this command at a network node or interchange node, the display includes information from the directory database.
3. If VTAM does not find a resource by that name, it searches for a USERVAR with the name specified on the ID operand and displays information for the resource, if it finds it.
4. If VTAM does not find a USERVAR by that name, or a USERVAR is found but the resource defined as the value of the USERVAR is not

found, it searches for an LUALIAS with the name specified on the ID operand and displays information for the CDRSC, if it finds it.

5. If no resource is found with the name specified on the ID operand, and you are issuing this command at a network node or interchange node, VTAM displays information about the resource from the directory database, if it finds it.
6. If no resource is found and no entry exists in the directory database with the specified name, the command fails.

IDTYPE=SHADOW

Displays information only about a shadow resource, if it exists. Included in the information displayed is the real resource that caused the displayed resource to become a shadow resource.

For more information about shadow resources, see the z/OS Communications Server: SNA Network Implementation Guide

IDTYPE=SSCP

Displays information only about the SSCP (represented as a CDRM).

IDTYPE=USERVAR

Displays information only about the resource whose name is associated with the USERVAR.

IDTYPE=XCFCP

Displays information only about the dynamic XCF local SNA PU representing the connection to another VTAM in the XCF group, when the ID operand specifies the CP name of the other VTAM.

MAX=number_of_resources

Specifies the maximum number of resources to display when the resource name on the ID operand is specified as being in “any network”. That is, the network ID portion of the network-qualified resource name is specified as * (or *NETWORK). For example, ID=*.a01n can be specified. MAX is valid only when the following conditions are both true:

1. An “any network” resource name is specified on the ID operand
2. IDTYPE=RESOURCE or IDTYPE=DIRECTRY is used

The value for MAX can be any integer from 1 to 200. The default is 1.

The resource name might exist in more networks than the number you specify on the MAX operand. However, VTAM searches only for the number of instances that you have specified. When that number is found, VTAM does not search any further. This saves processing time for the command and gives you control over the amount of display output generated by the command. If fewer resources are found than you have specified on MAX, VTAM displays only the resources that are found.

The display might show the same resource more than once if both subarea information and APPN directory information are available for a particular resource. The value specified for MAX does not consider this duplication of information for a particular resource, so you could specify a value such as MAX=3 and receive a display of up to six resources.

NETID=netid

Valid only for CDRSC major nodes and limits the scope of the display to CDRSCs within the indicated network and CDRSCs defined without a network identifier (not associated with any particular network). If you specify the NETID operand, but do not identify a specific network (that is, a value for

netid is not entered), all CDRSCs in the major node are displayed. CDRSCs are displayed in the order in which they were defined or added within the major node.

To display minor nodes and independent LUs, specify a network-qualified name on the ID operand, and do not use the NETID operand.

SCOPE

Specifies the wanted scope of the display.

Note: If you specify the SCOPE operand without specifying a value SCOPE=ALL is assumed.

The SCOPE operand is ignored for frame relay PUs or FRSESETs. Nor does SCOPE have any effect when you display resources in the directory database.

These values specify whether information is to be provided about the specified node's subordinate resources in addition to the information about the node itself. They are meaningful only for resources that have subordinate resources.

SCOPE=ACT

Specifies that, in addition to the resource specified on the ID operand, the name, and status of all its active, pending, and connectable subordinate resources, if any, are to be displayed. If this display is undesirably large, you can use SCOPE=ACTONLY or SCOPE=CONCT to further limit the display.

SCOPE=ACTONLY

Specifies that, in addition to the resource specified on the ID operand, the name, and status of all its active subordinate resources, if any, are to be displayed. The display does not include resources in pending or connectable states. If no resources are found in an active state, you can use SCOPE=ACT to broaden the scope of the display to active, connectable, and pending resources.

SCOPE=ACTSESS

Specifies that, in addition to the resource specified on the ID operand, the name of all its subordinate resources that are active with sessions, if any, are to be displayed.

SCOPE=ALL

Specifies that, in addition to the resource specified on the ID operand, the name, and status of all its subordinate resources, if any, are to be displayed (regardless of their status).

SCOPE=CONCT

Specifies that, in addition to the resource specified on the ID operand, the name, and status of all its subordinate resources in a CONCT (connectable) state, if any, are to be displayed. If no resources are found in a connectable state, you can use SCOPE=ACT to broaden the scope of the display to active, connectable, and pending resources.

SCOPE=INACT

Specifies that, in addition to the resource specified on the ID operand, the name, and status of all its inactive subordinate resources, if any, are to be displayed. If this display is undesirably large, you can use SCOPE=INACTONLY or SCOPE=RESET to further limit the display.

SCOPE=INACTONLY

Specifies that, in addition to the resource specified on the ID operand, the

DISPLAY ID

name, and status of all its inactive subordinate resources, if any, are to be displayed. Resources in a RESET state are not included in the SCOPE=INACTONLY display.

SCOPE=ONLY

Tells VTAM not to display the name and status of any subordinate resources.

SCOPE=PENDING

Specifies that, in addition to the resource specified on the ID operand, the name, and status of all its pending subordinate resources, if any, are to be displayed. A pending state is a transient state to or from the fully active state.

SCOPE=RELS

Specifies that the information is to be displayed about all PUs in a RELSD state within the specified major nodes.

SCOPE=RESET

Specifies that, in addition to the resource specified on the ID operand, the name, and status of all its subordinate resources in a RESET state, if any, are to be displayed.

Resulting display

The resources that are displayed depend on their relationship within the hierarchy that is specified on the ID operand. The following lists show what resources are displayed for each major node or minor node.

Note: Independent LUs that are defined under a PU do not always appear in this output. Only independent LUs that are currently using the PU as a boundary function for multiple concurrent sessions are displayed.

A DISPLAY ID command issued at an APPN node might show a resource name appearing in several networks even though the resource actually exists in only one network. This can happen if intermediate SSCPs are pre-V4R1 and they pass only the 8-character resource name. The real network ID is therefore lost and other network IDs might be subsequently assumed.

For a DISPLAY ID command with IDTYPE=RESOURCE or IDTYPE=DIRECTRY, if the resource type that is displayed is EN, the node might actually be a network node, end node, or SSCP. This is because in a mixed APPN and subarea network, CPs, and SSCPs that are found in or through a subarea network are represented in this host (the host where you are issuing this command) as end nodes which are served by the interchange node through which the resource was found.

Note: If model application program definitions are included in the display, any dynamic application programs built from those models that have been deactivated are not displayed. This is because dynamic application programs cannot exist in an inactive state. When a dynamic application program is deactivated and CLOSE macro processing is complete for the dynamic application program, the definition of the dynamic application program is deleted. The dynamic application program is no longer known by VTAM and will not appear in the output of any DISPLAY commands.

- Major nodes:
 - For ID=ADJCP *major node*, its subordinate nodes
 - For ID=*application program major node*, its subordinate applications:

- Conventionally defined application programs
- Model application programs
- Dynamic application programs built from model application program definitions
- For ID=CDRM *major node*, its subordinate CDRMs
- For ID=CDRSC *major node*, its subordinate CDRSCs:
 - Conventionally defined CDRSCs
 - Model CDRSCs
 - Clone CDRSCs built from model CDRSC definitions
- For ID=channel-attachment *major node*, its subordinate links
- For ID=external communications adapter (XCA) *major node*, its subordinate links
- For ID=hostpu, its subordinate cross-subarea links
- For ID=local non-SNA 3270 *major node*, its subordinate logical units
- For ID=local_sna_major_node:
 - Each PU providing local SNA connectivity and its subordinate logical units
 - Each PU providing APPN host-to-host connectivity
- For ID=lugroup *major node*, its model LU groups, and their model LUs
- For ID=model *major node*, its subordinate logical units and the physical units to which the logical units are subordinate
- For ID=NCP *major node*, its subordinate links
- For ID=rapid transport protocol *major node* (ISTRTPMN), its dynamic physical units
- For ID=switched *major node*, its subordinate logical units and the physical units to which the logical units are subordinate
- For ID=transport resource list *major node*, its subordinate transport resource list entries (TRLEs).
- Minor nodes:
 - For ID=conventionally defined application program or ACB name:
 - For SCOPE=ACT, the established sessions with the application program
 - For SCOPE=INACT, the names of logical units waiting for sessions with the application program
 - For SCOPE=ALL, the information provided for both ACT and INACT, as described above
 - An indication if the application is a VCNS user
 - For ID=model application program
 - An indication that the application program is a model
 - A list of dynamic application programs that have been built from this model, or an indication that no dynamic application programs have been built from this model
 - An indication if the model application program definition specifies that any dynamic application programs built from the model are to be VCNS users
 - For ID=dynamic application program
 - An indication that the application program is a dynamic application program
 - The name of the model application program definition used to build the dynamic application program

- For SCOPE=ACT, the established sessions with the dynamic application program
- For SCOPE=ALL, the established sessions with the dynamic application program
- An indication if the dynamic application program is a VCNS user
- For ID=CDRSC *minor node* (conventionally defined and dynamic):
 - For SCOPE=ACT, the established sessions with the cross-domain resource
 - For SCOPE=INACT, the names of logical units waiting for sessions with the cross-domain resource
 - For SCOPE=ALL, the information provided for both ACT and INACT, as described in the preceding information
- For ID=model CDRSC *minor node*:
 - An indication that the CDRSC is a model
 - An indication of the current value of the DELETE parameter of the model CDRSC
 - For SCOPE=ONLY, an indication if no clone CDRSCs currently exist that were built from this model
 - For other values of SCOPE, a list of clone CDRSCs that have been built from this model that meet the SCOPE criteria, or an indication if no clone CDRSCs currently exist that were built from this model that meet the SCOPE criteria
- For ID=clone CDRSC *minor node*:
 - An indication that the CDRSC is a clone
 - The name of the model CDRSC used to build the clone CDRSC
 - An indication of the current value of the DELETE parameter from the model CDRSC used to build this clone CDRSC
 - For SCOPE=ACT, the established sessions with the cross-domain resource
 - For SCOPE=INACT, the names of logical units waiting for sessions with the cross-domain resource
 - For SCOPE=ALL, the information provided for both ACT and INACT, as described previously
- For ID=host CDRM *name*, the host's network ID (where applicable), subarea and element addresses, and only the external CDRM session partner and session status for established sessions with the host CDRM
- For ID=same-network external CDRM *name*:
 - HPR capability, if the same-network external CDRM is active
 - For SCOPE=ACT, active cross-domain resources owned by the external CDRM
 - For SCOPE=INACT, inactive cross-domain resources owned by the external CDRM
 - For SCOPE=ALL, all active or inactive cross-domain resources owned by the external CDRM
- For ID=cross-network external CDRM *name*:
 - For SCOPE=ACT, active cross-network resources owned by the external CDRM
 - For SCOPE=INACT, inactive cross-network resources owned by the external CDRM
 - For SCOPE=ALL, all active or inactive cross-network resources owned by the external CDRM

- For ID=*line group*:
 - For SCOPE=ALL, lines and PUs
 - For SCOPE=ACT, all active lines and all active PUs
 - For SCOPE=INACT, all inactive lines, all inactive PUs, and all active lines that have inactive PUs
 - For SCOPE=ONLY, only line group
- For ID=*link*:
 - Its subordinate link stations, or
 - Its subordinate physical units and dependent logical units
- For ID=*physical_unit*:
 - Its subordinate logical units
 - For a PU providing APPN host-to-host connectivity, the name, status, and line control as specified by the TRLE operand on the PU definition statement
 - For a PU supported by a DLUR, the name of the DLUR and the switched major node that defines the PU
 - For a dynamic rapid transport protocol (RTP) PU, the data flow rate and the end-to-end route
 - For an HPR-capable PU in a type 2.1 node, the HPR capability.
- For ID=*transport_resource_list_entry*:
 - Names of the Communications Server z/OS upper-layer protocols (ULPs) using this TRLE
 - For a dynamic TCP TRLE or an exclusively owned TRLE, only one message with a ULP ID is issued because only one ULP can use each of these TRLEs. For an OSA-Express adapter, one message with a ULP ID is issued for each datapath channel address that a ULP uses. For other TRLEs, more than one ULP ID message can be issued, depending on how many ULPs are using the TRLE.

Rule: Only one message with a ULP ID is generated for a 10GbE RoCE Express feature that operates in a shared RoCE environment.

- The ULP ID will be the jobname for TCP/IP ULPs, the SNA PU name for ANNC ULPs, and the XCA Major Node name for ATM or EE ULPs.
- Resources in the directory database:
 - The name of the resource
 - The entry type, such as dynamic
 - The resource type, such as network node
 - The owning CP
 - The network node server
 - For an LU resource:
 - The subarea number
 - The required locate message size to retrieve routing information
 - The locate message size used when this LU was last searched
- Generic resource names:
 - Member name
 - Owning CP name
 - Whether the resource is currently available to be selected during resolution. NO indicates that the generic resource is on an end node that does not have a

CP-CP session with its network node server, and is therefore not selectable. YES indicates that the resource is selectable. DEL indicates that the resource has deleted itself as a generic resource and is not selectable. If you need to fully delete the generic resource from VTAM and the generic resource coupling facility structure, the application's ACB must be closed and the MODIFY GR DELETE command must be issued at every host in the sysplex. See the z/OS Communications Server: SNA Network Implementation Guide for a full description of generic resource deletion procedures.

- APPC value

Examples

Displaying an adjacent CP major node:

```
d net,id=istadjcp,scope=all
IST097I DISPLAY ACCEPTED
IST075I NAME = ISTADJCP, TYPE = ADJCP MAJOR NODE
IST486I STATUS= ACTIV , DESIRED STATE= ACTIV
IST1100I ADJACENT CONTROL POINTS FROM MAJOR NODE ISTADJCP
IST1102I NODENAME          NODETYPE CONNECTIONS CP CONNECTIONS NATIVE
IST1103I NETB.VN1          VN      0          0          *NA*
IST2157I ALIASRCH = *NA
IST1103I NETA.VN1          VN      1          0          *NA*
IST2157I ALIASRCH = *NA
IST314I END
```

Displaying an application program major node, including model application programs and dynamic application programs built from those models:

```
d net,id=a01appls,scope=all
IST097I DISPLAY ACCEPTED
IST075I NAME = A01APPLS, TYPE = APPL SEGMENT
IST486I STATUS= ACTIV , DESIRED STATE= ACTIV
IST360I APPLICATIONS:
IST080I APPL01 CONCT      APPL0102 CONCT      A01MVSNO CONCT
IST080I APPL1  CONCT      APPLA*  CONCT      APPL2  CONCT
IST080I APPLQ? CONCT      APPL3   CONCT      APPLQ1  ACTIV
IST314I END
```

Displaying a CDRM major node:

```
d net,id=cdrm1a,scope=all
IST097I DISPLAY ACCEPTED
IST075I NAME = CDRM1A, TYPE = CDRM SEGMENT
IST486I STATUS= ACTIV, DESIRED STATE= ACTIV
IST477I CDRMS:
IST1546I CDRM      STATUS      SUBAREA ELEMENT NETID      SSCPID
IST1547I SSCP1A    ACTIV        1      1  NETA          1
IST1547I SSCPAA    NEVAC        10     1  NETA          N/A
IST1547I SSCP2A    NEVAC        2      1  NETA          N/A
IST1547I SSCPBA    NEVAC        11     1  NETA          N/A
IST1547I SSCPCA    NEVAC        12     1  NETA          N/A
IST1547I SSCP7B    ACTIV        5      1  NETB          7
IST1547I SSCP9C    ACTIV        8      3  NETC          9
IST1500I STATE TRACE = OFF
IST314I END
```

Displaying a CDRSC major node:

```
d net,id=istcdrdy,scope=all
IST097I DISPLAY ACCEPTED
IST075I NAME = ISTCDRDY, TYPE = CDRSC SEGMENT
IST486I STATUS= ACTIV , DESIRED STATE= ACTIV
IST478I CDRSCS:
IST483I C25NVLUC ACTIV----Y, CDRM = ***NA***, NETID = NETA
```

```

IST483I B01NVLUC ACTIV----Y, CDRM = ***NA***, NETID = NETA
IST483I A81NVLUC ACTIV----Y, CDRM = ***NA***, NETID = NETA
IST483I A03D207F ACT/S----Y, CDRM = A01N , NETID = NETA
IST483I A02NVLUC ACT/S----Y, CDRM = A01N , NETID = NETA
IST483I ECH002A ACT/S----Y, CDRM = A01N , NETID = NETA
IST483I A50NVLUC ACT/S----Y, CDRM = A01N , NETID = NETA
IST483I A500N ACT/S----Y, CDRM = A01N , NETID = NETA
IST483I A02N ACT/S----Y, CDRM = A01N , NETID = NETA
IST314I END

```

Displaying a CDRSC major node for a specific network:

```

d net,id=a99cdrsc,netid=netc,scope=all
IST097I DISPLAY ACCEPTED
IST075I NAME = A99CDRSC, TYPE = CDRSC SEGMENT
IST486I STATUS= ACTIV , DESIRED STATE= ACTIV
IST478I CDRSCS:
IST483I CECH* ACTIV , CDRM = C01M , NETID = NETC
IST483I CECH001 ACTIV , CDRM = C01M , NETID = NETC
IST483I TPNSC01 ACTIV , CDRM = C01M , NETID = NETC
IST483I C01NVLUC ACTIV , CDRM = C01M , NETID = NETC
IST483I TS011 ACTIV , CDRM = ***NA***, NETID = NETC
IST483I ECH011 ACTIV , CDRM = C11M , NETID = NETC
IST483I C11NVLUC ACTIV , CDRM = C11M , NETID = NETC
IST483I TS0255 ACTIV , CDRM = ***NA***, NETID = NETC
IST483I ECH0255 ACTIV , CDRM = C255M , NETID = NETC
IST483I C255NLUC ACTIV , CDRM = C255M , NETID = NETC
IST314I END

```

Displaying a local SNA major node:

```

d net,id=a50lsna,scope=all
IST097I DISPLAY ACCEPTED
IST075I NAME = A50LSNA, TYPE = LCL SNA MAJ NODE
IST486I STATUS= ACTIV , DESIRED STATE= ACTIV
IST084I NETWORK NODES:
IST089I PUA TYPE = PU T2 , ACTIV ,CUA=0770
IST089I LSNALU1 TYPE = LOGICAL UNIT , ACTIV
IST089I LSNALU2 TYPE = LOGICAL UNIT , ACTIV
IST089I LSNALU3 TYPE = LOGICAL UNIT , ACTIV
IST089I LSNALU4 TYPE = LOGICAL UNIT , ACTIV
IST314I END

```

Displaying a local SNA major node for each PU providing APPN host-to-host connectivity:

```

d net,id=lsna1a,scope=all
IST097I DISPLAY ACCEPTED
IST075I NAME = LSNA1A, TYPE = LCL SNA MAJ NODE
IST486I STATUS= ACTIV , DESIRED STATE= ACTIV
IST084I NETWORK NODES:
IST1316I PU NAME = AHHCPU1 STATUS = NEVAC TRLE = ML1A2A2
IST1316I PU NAME = AHHCPU2 STATUS = NEVAC TRLE = ML1A2A3
IST1316I PU NAME = AHHCPU3 STATUS = NEVAC TRLE = ML1A2A4
IST314I END

```

Displaying the dynamic XCF local SNA major node:

```

d net,id=istlsxcf,scope=all
IST097I DISPLAY ACCEPTED
IST075I NAME = ISTLSXCF, TYPE = LCL SNA MAJ NODE
IST486I STATUS= ACTIV, DESIRED STATE= ACTIV
IST084I NETWORK RESOURCES:
IST1316I PU NAME = ISTP0001 STATUS = ACTIV--LX- TRLE = ISTT0001
IST1500I STATE TRACE = OFF
IST314I END

```


Displaying a transport resource list major node:

```
d net,id=tr11a,scope=all
IST097I DISPLAY ACCEPTED
IST075I NAME = TRL1A, TYPE = TRL MAJOR NODE
IST1314I TRLE = TRLE1A STATUS = NEVAC CONTROL = MPC
IST1314I TRLE = TRLE1B STATUS = NEVAC CONTROL = MPC
IST1314I TRLE = TRLE1C STATUS = NEVAC CONTROL = MPC
IST1314I TRLE = TRLE1D STATUS = NEVAC CONTROL = MPC
IST314I END
```

Displaying an active TRL entry:

```
d net,id=trle1a
IST097I DISPLAY ACCEPTED
IST075I NAME = TRLE1A, TYPE = TRLE
IST486I STATUS= ACTIV----E, DESIRED STATE= ACTIV
IST087I TYPE = LEASED , CONTROL = MPC , HPDT = NO
IST1954I TRL MAJOR NODE = TRL1
IST1715I MPCLEVEL = HPDT MPCUSAGE = SHARE
IST1221I WRITE DEV = 0508 STATUS = RESET STATE = ONLINE
IST1221I READ DEV = 0408 STATUS = RESET STATE = ONLINE
IST1500I STATE TRACE = OFF
IST314I END
```

Displaying a local non-SNA 3270 major node:

```
d net,id=a011local,scope=all
IST097I DISPLAY ACCEPTED
IST075I NAME = A011LOCAL, TYPE = LCL 3270 MAJ NODE
IST486I STATUS= ACTIV , DESIRED STATE= ACTIV
IST355I LOGICAL UNITS:
IST089I A01A741 TYPE = LOGICAL UNIT , NEVAC ,CUA=0741
IST089I A01A742 TYPE = LOGICAL UNIT , NEVAC ,CUA=0742
IST089I A01A743 TYPE = LOGICAL UNIT , NEVAC ,CUA=0743
IST089I A01A744 TYPE = LOGICAL UNIT , NEVAC ,CUA=0744
IST089I A01A745 TYPE = LOGICAL UNIT , NEVAC ,CUA=0745
IST089I A01A746 TYPE = LOGICAL UNIT , NEVAC ,CUA=0746
IST089I A01A747 TYPE = LOGICAL UNIT , NEVAC ,CUA=0747
IST089I A01A748 TYPE = LOGICAL UNIT , NEVAC ,CUA=0748
IST089I A01A721 TYPE = LOGICAL UNIT , ACT/S ,CUA=0721
IST089I A01A722 TYPE = LOGICAL UNIT , ACTIV ,CUA=0722
IST089I A01A723 TYPE = LOGICAL UNIT , ACTIV ,CUA=0723
IST089I A01A724 TYPE = LOGICAL UNIT , ACTIV ,CUA=0724
IST089I A01A725 TYPE = LOGICAL UNIT , ACTIV ,CUA=0725
IST089I A01A726 TYPE = LOGICAL UNIT , NEVAC ,CUA=0726
IST314I END
```

Displaying an NCP major node:

```
d net,id=a0462zc,scope=all
IST097I DISPLAY ACCEPTED
IST075I NAME = A0462ZC, TYPE = PU T4/5
IST486I STATUS= ACTIV , DESIRED STATE= ACTIV
IST247I LOAD/DUMP PROCEDURE STATUS = RESET
IST1656I VTAMTOPO = REPORT, NODE REPORTED - YES
IST484I SUBAREA = 4
IST391I ADJ LINK STATION = 0017-S, LINE = 0017-L, NODE = ISTPUS
IST654I I/O TRACE = OFF, BUFFER TRACE = OFF
IST077I SIO = 50078 CUA = 0017
IST675I VR = 0, TP = 2
IST170I LINES:
IST080I A04B00 NEVAC A04B01 NEVAC A04B03 NEVAC
IST080I A04B32 NEVAC A04B33 NEVAC A04B35 NEVAC
IST080I A04VXX NEVAC----T A04S02 NEVAC A04S34 NEVAC
IST080I A04S04 NEVAC A04S16 NEVAC A04S20 NEVAC
```



```

IST080I A04S36 NEVAC A04S48 NEVAC A04S52 NEVAC
IST080I A04S128 NEVAC A04S136 NEVAC A04PT88 ACTIV
IST080I A04C00 NEVAC A04C02 NEVAC
IST314I END

```

Displaying the host physical unit:

```

d net,id=istpus,scope=all
IST097I DISPLAY ACCEPTED
IST075I NAME = ISTPUS, TYPE = PU T4/5
IST486I STATUS= ACTIV, DESIRED STATE= ACTIV
IST596I IRN TRACE = OFF
IST1656I VTAMTOPO = INCLUDE, NODE REPORTED - YES
IST484I SUBAREA = 1
IST925I DYNAMIC PATH DEFINITION PATH1A STATUS = ACTIV
IST654I I/O TRACE = OFF, BUFFER TRACE = OFF
IST1500I STATE TRACE = OFF
IST170I LINES:
IST080I 091C-L ACTIV----I
IST314I END

```

Displaying the rapid transport protocol (RTP) major node:

```

d net,id=istrtpmn,scope=all
IST097I DISPLAY ACCEPTED
IST075I NAME = ISTRTPMN, TYPE = RTP MAJOR NODE
IST486I STATUS= ACTIV, DESIRED STATE= ACTIV
IST1486I RTP NAME STATE DESTINATION CP MNPS TYPE
IST1487I CNR00004 CONNECTED NETA.SSCP2A NO LULU
IST1487I CNR00003 CONNECTED NETA.SSCP2A NO RSTP
IST1487I CNR00002 CONNECTED NETA.SSCP2A NO CPCP
IST1487I CNR00001 CONNECTED NETA.SSCP2A NO CPCP
IST314I END

```

Displaying a switched major node:

```

d net,id=a04smnc,scope=all
IST097I DISPLAY ACCEPTED
IST075I NAME = A04SMNC, TYPE = SW SNA MAJ NODE
IST486I STATUS= ACTIV, DESIRED STATE= ACTIV
IST1656I VTAMTOPO = REPORT, NODE REPORTED - YES
IST084I NETWORK NODES:
IST089I A04P882 TYPE = PU_T2, ACTIV--L--
IST089I A04P883 TYPE = PU_T2, ACTIV--L--
IST089I A04D8831 TYPE = LOGICAL UNIT, ACTIV
IST089I A04D8832 TYPE = LOGICAL UNIT, ACTIV
IST089I A04D8833 TYPE = LOGICAL UNIT, ACT/S
IST089I A04D8834 TYPE = LOGICAL UNIT, ACTIV
IST089I A04D8835 TYPE = LOGICAL UNIT, ACTIV
IST089I A04D8836 TYPE = LOGICAL UNIT, ACT/S
IST089I A04D8837 TYPE = LOGICAL UNIT, ACT/S
IST089I A04P885 TYPE = PU_T2, ACTIV--L--
IST089I A04P886 TYPE = PU_T2, ACTIV--L--
IST089I A04D8861 TYPE = LOGICAL UNIT, ACT/S
IST089I A04D8862 TYPE = LOGICAL UNIT, ACT/S
IST089I A04D8863 TYPE = LOGICAL UNIT, ACTIV
IST089I A04D8864 TYPE = LOGICAL UNIT, ACTIV
IST314I END

```

Displaying a channel-attachment major node:

```

d net,id=ctcbc0t3,scope=all
IST097I DISPLAY ACCEPTED
IST075I NAME = CTCBC0T3, TYPE = CA MAJOR NODE
IST486I STATUS= ACTIV, DESIRED STATE= ACTIV

```

DISPLAY ID

```
IST654I I/O TRACE = OFF, BUFFER TRACE = OFF
IST170I LINES:
IST232I CTCLBC03, ACTIV----E, CUA = BC0
IST314I END
```

Displaying an XCA major node with its subordinate resources:

```
d net,id=xca1a,scope=all
IST097I DISPLAY ACCEPTED
IST075I NAME = XCA1A, TYPE = XCA MAJOR NODE
IST486I STATUS= ACTIV, DESIRED STATE= ACTIV
IST1021I MEDIUM=RING,ADAPNO= 1,CUA=0500,SNA SAP= 8
IST1885I SIO = 1234 SLOWDOWN = YES
IST1324I VNNAME = NETA.CN1 VNGROUP = GP1A2A
IST1105I RESOURCE STATUS TGN CP-CP TG CHARACTERISTICS
IST1106I XCA1A AC/R 21 NO 902D0000000000000000000017100808080
IST654I I/O TRACE = OFF, BUFFER TRACE = OFF
IST1656I VTAMTOPO = REPORT, NODE REPORTED - YES
IST170I LINES:
IST232I LN1A2A, ACTIV
IST232I LN1A7B, NEVAC
IST232I LN1A9C, NEVAC
IST232I LN1AAA, NEVAC
IST232I LN1ABA, NEVAC
IST232I LN1ACA, NEVAC
IST232I LN1ADA, NEVAC
IST232I LN1AEA, NEVAC
IST314I END
```

Displaying an XCA major node without its subordinate resources:

```
d net,id=x50rbf4a
IST097I DISPLAY ACCEPTED
IST075I NAME = X50RBF4A, TYPE = XCA MAJOR NODE
IST486I STATUS= ACTIV, DESIRED STATE= ACTIV
IST1021I MEDIUM=RING,ADAPNO= 0,CUA=0BF4,SNA SAP= 4
IST1885I SIO = 1234 SLOWDOWN = YES
IST654I I/O TRACE = OFF, BUFFER TRACE = OFF
IST1656I VTAMTOPO = REPORT, NODE REPORTED - YES
IST314I END
```

Displaying an XCA major node that defines a native ATM port:

```
d net,id=xcaosa1a,scope=all
IST097I DISPLAY ACCEPTED
IST075I NAME = XCAOSA1A, TYPE = XCA MAJOR NODE
IST486I STATUS= ACTIV, DESIRED STATE= ACTIV
IST1557I MEDIUM = ATM, PORT NAME = OSA11
IST1559I ATM ADDRESS TYPE FORMAT
IST1553I 11111111111111111111111111111111111100 LOCAL NSAP
IST1324I VNNAME = NETA.SSCPVN VNGROUP = GP1A2AC
IST1559I ATM ADDRESS TYPE FORMAT
IST1553I 2111111111111111111111111111111111110 GATEWAY NSAP
IST1105I RESOURCE STATUS TGN CP-CP TG CHARACTERISTICS
IST1106I XCAOSA1A AC/R 21 NO 10750000000000000000000014C00808080
IST654I I/O TRACE = OFF, BUFFER TRACE = OFF
IST1656I VTAMTOPO = REPORT, NODE REPORTED - YES
IST170I LINES:
IST232I LN1A2A ACTIV
IST232I LNP1A2A1 ACTIV
IST232I LN1A2AC1 ACTIV
IST314I END
```

Displaying an XCA major node group that defines a transmission group (TG) to a native ATM connection network:

```

d net,id=gpla2ac,scope=all
IST097I DISPLAY ACCEPTED
IST075I NAME = GP1A2AC, TYPE = LINE GROUP
IST486I STATUS= ACTIV, DESIRED STATE= ACTIV
IST231I XCA MAJOR NODE = XCAOSA1A
IST1485I DLCADDR SUBFIELDS FOR GP1A2AC
IST1318I 1,C'ATMSVCNETA.SSCPVNEXCLUSIVE'
IST1318I 7,BCD'03000000 40000000 40000000 536000'
IST1318I 8,X'0003'
IST1318I 21,X'00022111 11111111 11111111 11111111 11111111 1110'
IST084I NETWORK RESOURCES:
IST089I LN1A2AC1 TYPE = LINE , ACTIV
IST314I END

```

Displaying an XCA major node that defines Enterprise Extender:

```

d net,id=xcaip,scope=all
IST097I DISPLAY ACCEPTED
IST075I NAME = XCAIP, TYPE = XCA MAJOR NODE
IST486I STATUS= ACTIV, DESIRED STATE= ACTIV
IST1679I MEDIUM = HPRIP
IST1685I TCP/IP JOB NAME = ***NA***
IST924I-----
IST1324I VNNAME = IP.VNA VNGROUP = GPVNA (LOCAL)
IST1910I LOCAL HOSTNAME NODENAME.NETID.DOMAIN
IST1105I RESOURCE STATUS TGN CP-CP TG CHARACTERISTICS
IST1106I XCAIP NEV 0 NO 1075000000000000000014C00808080
IST924I-----
IST1324I VNNAME = IP.VNB VNGROUP = GPVNB (GLOBAL)
IST1680I LOCAL IP ADDRESS 223.254.254.252
IST1105I RESOURCE STATUS TGN CP-CP TG CHARACTERISTICS
IST1106I XCAIP NEV 0 NO 1275000000000000000014C00808080
IST924I-----
IST1324I VNNAME = IP.VNC VNGROUP = GPVNC (GLOBAL)
IST1910I LOCAL HOSTNAME NODENAME.NETID.REALLYREALLYLONGDOMAIN.COM
IST1105I RESOURCE STATUS TGN CP-CP TG CHARACTERISTICS
IST1106I XCAIP NEV 0 NO 12B4000000000000000017100808080
IST924I-----
IST1902I GROUP = GPIP1
IST1680I LOCAL IP ADDRESS 223.254.254.254
IST924I-----
IST1902I GROUP = GPIP2
IST1680I LOCAL IP ADDRESS 223.254.254.255
IST924I-----
IST654I I/O TRACE = OFF, BUFFER TRACE = OFF
IST1656I VTAMTOPO = REPORT, NODE REPORTED - YES
IST170I LINES:
IST1901I LINES UNDER GROUP: GPVNC
IST232I LNIPC1 NEVAC
IST232I LNIPC2 NEVAC
IST1901I LINES UNDER GROUP: GPVNA
IST232I LNIPA1 NEVAC
IST232I LNIPA2 NEVAC
IST1901I LINES UNDER GROUP: GPVNB
IST232I LNIPB1 NEVAC
IST232I LNIPB2 NEVAC
IST232I LNIPB3 NEVAC
IST1901I LINES UNDER GROUP: GPIP1
IST232I LNIP1 NEVAC
IST232I LNIP2 NEVAC
IST1901I LINES UNDER GROUP: GPIP2
IST232I LNIP21 NEVAC
IST232I LNIP22 NEVAC
IST232I LNIP23 NEVAC
IST314I END

```

DISPLAY ID

Displaying a GROUP associated with an XCA major node that defines Enterprise Extender, where the GROUP definition uses only IPADDR to define the IPv4 connection:

```
d net,id=gpip,scope=all
IST097I DISPLAY ACCEPTED
IST075I NAME = GPIIP, TYPE = LINE GROUP
IST486I STATUS= ACTIV, DESIRED STATE= ACTIV
IST231I XCA MAJOR NODE = XCAIP
IST1680I LOCAL IP ADDRESS 223.254.254.252
IST084I NETWORK RESOURCES:
IST089I LNIP1      TYPE = LINE              , NEVAC
IST089I LNIP2      TYPE = LINE              , NEVAC
IST314I END
```

Displaying a GROUP associated with an XCA major node that defines Enterprise Extender, where the GROUP definition uses HOSTNAME to define the IPv6 connection:

```
d net,id=gpip6v,e
IST097I DISPLAY ACCEPTED
IST075I NAME = GPIIP6V, TYPE = LINE GROUP
IST486I STATUS= ACTIV, DESIRED STATE= ACTIV
IST231I XCA MAJOR NODE = XCAIP1
IST1680I LOCAL IP ADDRESS 9::67:1:1
IST1910I LOCAL HOSTNAME VIPA26.SSCP1A.RALEIGH.IBM.COM
IST084I NETWORK RESOURCES:
IST089I LNGV6000 TYPE = LINE              , NEVAC
IST089I LNGV6001 TYPE = LINE              , NEVAC
IST314I END
```

Displaying an adjacent CP (CDRSC minor node):

```
d net,id=neta.sscp2a,idtype=cp,scope=all
IST097I DISPLAY ACCEPTED
IST075I NAME = NETA.SSCP2A, TYPE = ADJACENT CP
IST1046I SSCP NETA.SSCP2A ALSO EXISTS
IST486I STATUS= ACT/S----Y, DESIRED STATE= ACTIV - TRACE= OFF
IST1447I REGISTRATION TYPE = NO
IST977I MDLTAB=***NA*** ASLTAB=***NA***
IST1333I ADJLIST = ***NA***
IST861I MODETAB=***NA*** USSTAB=***NA*** LOGTAB=***NA***
IST934I DLOGMOD=***NA*** USS LANGTAB=***NA***
IST597I CAPABILITY-PLU ENABLED ,SLU ENABLED ,SESSION LIMIT NONE
IST231I CDRSC MAJOR NODE = ISTCDRDY
IST479I CDRM NAME = SSCP1A, VERIFY OWNER = NO
IST1184I CPNAME = NETA.SSCP2A - NETSRVR = ***NA***
IST1044I ALSLIST = ISTAPNPU
IST082I DEVTYPE = INDEPENDENT LU / CDRSC
IST654I I/O TRACE = OFF, BUFFER TRACE = OFF
IST171I ACTIVE SESSIONS = 0000000002, SESSION REQUESTS = 0000000002
IST206I SESSIONS:
IST1081I ADJACENT LINK STATION = P3A21
IST634I NAME      STATUS      SID      SEND RECV VR TP NETID
IST635I SSCP1A    ACTIV/CP-S F6ABEEC38077021A 0002 0001 0 0 NETA
IST635I SSCP1A    ACTIV/CP-P EAABEEC37D76FABF 0001 0002 0 0 NETA
IST314I END
```

Displaying a dependent LU requester:

```
d net,id=nncpa1,scope=all
IST097I DISPLAY ACCEPTED
IST075I NAME = NETA.NNCPA1, TYPE = ADJACENT CP
IST486I STATUS= ACT/S----Y, DESIRED STATE= ACTIV
IST977I MDLTAB=***NA*** ASLTAB=***NA***
IST861I MODETAB=***NA*** USSTAB=***NA*** LOGTAB=***NA***
IST934I DLOGMOD=CPSVCMG USS LANGTAB=***NA***
```

```

IST597I CAPABILITY-PLU ENABLED ,SLU ENABLED ,SESSION LIMIT NONE
IST231I CDRSC MAJOR NODE = ISTCDRDY
IST1044I ALSLIST = ISTAPNPU
IST1131 DEVICE = ILU/CDRSC
IST654I I/O TRACE = OFF, BUFFER TRACE = OFF
IST228I ENCRYPTION = OPT, TYPE = TDES24
IST1563I CKEYNAME = NNCPA1 CKEY = PRIMARY CERTIFY = NO
IST1552I MAC = NONE MACTYPE = NONE
IST171I ACTIVE SESSIONS = 0000000004, SESSION REQUESTS = 0000000004
IST206I SESSIONS:
IST1081I ADJACENT LINK STATION = P3A4956K
IST634I NAME STATUS SID SEND RECV VR TP NETID
IST635I SSCP1A ACTIV/DL-S E2C5E2E2D6D5000B 001C 0000 0 0 NETA
IST635I SSCP1A ACTIV/CP-S E2C5E2E2D6D50005 0004 0001 0 0 NETA
IST635I SSCP1A ACTIV/DL-P EAABEEC3361D945A 0000 0012 0 0 NETA
IST635I SSCP1A ACTIV/CP-P EAABEEC3361D945B 0001 0005 0 0 NETA
IST1355I PHYSICAL UNITS SUPPORTED BY DLUR NETA.NNCPA1
IST089I AA1PUA TYPE = PU_T2 , ACTIV
IST089I AA1PUB TYPE = PU_T2 , ACTIV
IST924I -----
IST075I NAME = NETA.NNCPA1, TYPE = DIRECTORY ENTRY
IST1186I DIRECTORY ENTRY = DYNAMIC NN
IST1184I CPNAME = NETA.NNCPA1 - NETSRVR = ***NA***
IST314I END

```

Displaying an SSCP (CDRM minor node) with virtual-route-based transmission group support:

```

d net,id=neta.sscp2a,idtype=sscp,scope=all
IST097I DISPLAY ACCEPTED
IST075I NAME = NETA.SSCP2A, TYPE = CDRM
IST1046I CP NETA.SSCP2A ALSO EXISTS
IST486I STATUS= ACTIV , DESIRED STATE= ACTIV
IST815I AUTOMATIC RECOVERY IS SUPPORTED
IST231I CDRM MAJOR NODE = CDRM1A
IST654I I/O TRACE = OFF, BUFFER TRACE = OFF
IST476I CDRM TYPE = EXTERNAL
IST637I SUBAREA= 2 ELEMENT= 1 SSCPID = 2
IST675I VR = 0, TP = 0
IST389I PREDEFINITION OF CDRSC = OPT
IST1105I RESOURCE STATUS TGN CP-CP TG CHARACTERISTICS
IST1106I SSCP2A AC/R 255 YES 982D000000000000000000000017100808080
IST636I CDRSCS OWNED BY SSCP2A -
IST080I L4A3278A ACTIV L4A3279A ACTIV L4A3767D ACTIV
IST080I L4A3278B ACTIV L4A3279B ACTIV L4A3287B ACTIV
IST080I L4A3767E ACTIV L4A4956D ACTIV L4A4956E ACTIV
IST080I L4A4956F ACTIV NETAPPL1 ACTIV NETAPPL2 ACTIV
IST080I NETAPPL3 ACTIV NETAPPL4 ACTIV APLMDSEC ACTIV
IST080I TS02 ACTIV
IST314I END

```

Displaying an SSCP (CDRM) and adjacent CP (CDRSC) with the same name from a network node:

```

d net,id=sscp2a,scope=all
IST097I DISPLAY ACCEPTED
IST075I NAME = NETA.SSCP2A, TYPE = CDRM
IST1046I CP NETA.SSCP2A ALSO EXISTS
IST486I STATUS= NEVAC, DESIRED STATE= INACT - TRACE= OFF
IST815I AUTOMATIC RECOVERY IS SUPPORTED
IST231I CDRM MAJOR NODE = CDRM1A
IST654I I/O TRACE = OFF, BUFFER TRACE = OFF
IST476I CDRM TYPE = EXTERNAL
IST637I SUBAREA= 2 ELEMENT= 1 SSCPID = 2
IST389I PREDEFINITION OF CDRSC = OPT
IST636I CDRSCS OWNED BY SSCP2A -
IST080I NETAPPL1 PNF/S

```

DISPLAY ID

```
IST924I -----
IST075I NAME = NETA.SSCP2A, TYPE = ADJACENT CP
IST1046I SSCP NETA.SSCP2A ALSO EXISTS
IST486I STATUS= ACT/S----Y, DESIRED STATE= ACTIV - TRACE= OFF
IST1447I REGISTRATION TYPE = NO
IST977I MDLTAB=***NA*** ASLTAB=***NA***
IST1333I ADJLIST = ***NA***
IST861I MODETAB=***NA*** USSTAB=***NA*** LOGTAB=***NA***
IST934I DLOGMOD=***NA*** USS LANGTAB=***NA***
IST597I CAPABILITY-PLU ENABLED ,SLU ENABLED ,SESSION LIMIT NONE
IST231I CDRSC MAJOR NODE = ISTDGRDY
IST479I CDRM NAME = SSCP1A, VERIFY OWNER = NO
IST1184I CPNAME = NETA.SSCP2A - NETSRVR = ***NA***
IST1044I ALSLIST = ISTAPNPU
IST082I DEVTYPE = INDEPENDENT LU / CDRSC
IST654I I/O TRACE = OFF, BUFFER TRACE = OFF
IST171I ACTIVE SESSIONS = 0000000002, SESSION REQUESTS = 0000000002
IST206I SESSIONS:
IST1081I ADJACENT LINK STATION = P3A21
IST634I NAME      STATUS      SID      SEND RECV VR TP NETID
IST635I SSCP1A    ACTIV/CP-S F6ABEEC38077021A 0006 0001 0 0 NETA
IST635I SSCP1A    ACTIV/CP-P EAABEEC37D76FABF 0001 0006 0 0 NETA
IST924I -----
IST075I NAME = NETA.SSCP2A, TYPE = DIRECTORY ENTRY
IST1186I DIRECTORY ENTRY = DYNAMIC NN
IST1184I CPNAME = NETA.SSCP2A - NETSRVR = ***NA***
IST314I END
```

Displaying an SSCP (CDRM) and a host CP (application) with the same name:

```
d net,id=neta.sscp1a,idtype=resource,scope=all
IST097I DISPLAY ACCEPTED
IST075I NAME = NETA.SSCP1A, TYPE = CDRM
IST1046I CP NETA.SSCP1A ALSO EXISTS
IST486I STATUS= ACTIV      , DESIRED STATE= ACTIV
IST815I AUTOMATIC RECOVERY IS SUPPORTED
IST231I CDRM MAJOR NODE = VTAMSEG
IST654I I/O TRACE = OFF, BUFFER TRACE = OFF
IST476I CDRM TYPE = HOST, GATEWAY CAPABLE
IST637I SUBAREA= 2  ELEMENT= 1 SSCPID = 2
IST388I DYNAMIC CDRSC DEFINITION SUPPORT = YES
IST171I ACTIVE SESSIONS = 0000000000, SESSION REQUESTS = 0000000000
IST172I NO SESSIONS EXIST
IST924I -----
IST075I NAME = NETA.SSCP1A, TYPE = HOST CP
IST1046I SSCP NETA.SSCP1A ALSO EXISTS
IST486I STATUS= ACT/S      , DESIRED STATE= ACTIV
IST977I MDLTAB=***NA*** ASLTAB=***NA***
IST861I MODETAB=***NA*** USSTAB=***NA*** LOGTAB=***NA***
IST934I DLOGMOD=***NA*** USS LANGTAB=***NA***
IST597I CAPABILITY-PLU ENABLED ,SLU ENABLED ,SESSION LIMIT NONE
IST231I APPL MAJOR NODE = VTAMSEG
IST654I I/O TRACE = OFF, BUFFER TRACE = OFF
IST271I JOBNAME = VTAM      , STEPNAME = VTAM      , DSPNAME = 0AAAABIST
IST228I ENCRYPTION = NONE, TYPE = DES
IST1563I CKEYNAME = SSCP1A CKEY = PRIMARY CERTIFY = NO
IST1552I MAC = NONE MACTYPE = NONE
IST1050I MAXIMUM COMPRESSION LEVEL - INPUT = 0, OUTPUT = 0
IST171I ACTIVE SESSIONS = 0000000002, SESSION REQUESTS = 0000000000
IST206I SESSIONS:
IST634I NAME      STATUS      SID      SEND RECV VR TP NETID
IST635I SSCP2A    ACTIV/CP-S EAABEEC3F11FF31F 0002 0001      NETA
IST635I SSCP2A    ACTIV/CP-P F6ABEEC3F4203D93 0001 0002      NETA
IST314I END
```

Displaying the host (this command works for any host). This display shows an interchange node:

```

d net,id=vtam
IST097I DISPLAY ACCEPTED
IST075I NAME = VTAM, TYPE = CDRM
IST1046I CP NETA.SSCP1A ALSO EXISTS
IST486I STATUS= ACTIV, DESIRED STATE= ACTIV
IST599I REAL NAME = NETA.SSCP1A
IST815I AUTOMATIC RECOVERY IS SUPPORTED
IST231I CDRM MAJOR NODE = VTAMSEG
IST654I I/O TRACE = OFF, BUFFER TRACE = OFF
IST1500I STATE TRACE = OFF
IST2159I XCF GROUP = ISTXCF11 CFS GROUP = ISTCFS11
IST2181I GR STRUCTURE NAME IS ISTGENERIC11
IST2181I MNPS STRUCTURE NAME IS ISTMNPS11
IST476I CDRM TYPE = HOST GATEWAY CAPABLE
IST637I SUBAREA = 1 ELEMENT = 1 SSCPID = 1
IST388I DYNAMIC CDRSC DEFINITION SUPPORT = YES
IST171I ACTIVE SESSIONS = 0000000000, SESSION REQUESTS = 0000000000
IST924I -----
IST075I NAME = NETA.SSCP1A, TYPE = HOST CP
IST1046I SSCP NETA.SSCP1A ALSO EXISTS
IST486I STATUS= ACT/S, DESIRED STATE= ACTIV
IST1447I REGISTRATION TYPE = NO
IST1501I XCF TOKEN = 010000B7000F0001
IST977I MDLTAB=***NA*** ASLTAB=***NA***
IST861I MODETAB=***NA*** USSTAB=***NA*** LOGTAB=***NA***
IST934I DLOGMOD=***NA*** USS LANGTAB=***NA***
IST1632I VPACING = 63
IST597I CAPABILITY-PLU ENABLED ,SLU ENABLED ,SESSION LIMIT NONE
IST231I APPL MAJOR NODE = VTAMSEG
IST654I I/O TRACE = OFF, BUFFER TRACE = OFF
IST1500I STATE TRACE = OFF
IST271I JOBNAME = VTAM550T, STEPNAME = NET, DSPNAME = ISTEAF13
IST228I ENCRYPTION = NONE, TYPE = DES
IST1563I CKEYNAME = SSCP1A CKEY = PRIMARY CERTIFY = NO
IST1552I MAC = NONE MACTYPE = NONE
IST1050I MAXIMUM COMPRESSION LEVEL - INPUT = 0, OUTPUT = 0
IST1633I ASRCVLM = 1999999
IST1634I DATA SPACE USAGE: CURRENT = 0 MAXIMUM = 272
IST171I ACTIVE SESSIONS = 0000000002, SESSION REQUESTS = 0000000000
IST314I END

```

Displaying a CDRSC (no SSCP, adjacent CP, or host CP was found with this name) from a network node:

```

d net,id=neta.netappl1,idtype=resource,scope=all
IST097I DISPLAY ACCEPTED
IST075I NAME = NETA.NETAPPL1, TYPE = CDRSC
IST486I STATUS= ACT/S, DESIRED STATE= ACTIV
IST1447I REGISTRATION TYPE = NO
IST977I MDLTAB=***NA*** ASLTAB=***NA***
IST1333I ADJLIST = ***NA***
IST861I MODETAB=***NA*** USSTAB=***NA*** LOGTAB=***NA***
IST934I DLOGMOD=***NA*** USS LANGTAB=***NA***
IST597I CAPABILITY-PLU ENABLED ,SLU ENABLED ,SESSION LIMIT NONE
IST231I CDRSC MAJOR NODE = CDRSC1A
IST479I CDRM NAME = SSCP2A, VERIFY OWNER = NO
IST1184I CPNAME = NETA.SSCP2A - NETSRVR = ***NA***
IST1044I ALSLIST = ISTAPNPU
IST082I DEVTYPE = INDEPENDENT LU / CDRSC
IST654I I/O TRACE = OFF, BUFFER TRACE = OFF
IST1500I STATE TRACE = OFF
IST228I ENCRYPTION = NONE, TYPE = DES
IST1563I CKEYNAME = NETAPPL1 CKEY = PRIMARY CERTIFY = NO
IST1552I MAC = NONE MACTYPE = NONE
IST171I ACTIVE SESSIONS = 0000000001, SESSION REQUESTS = 0000000000
IST206I SESSIONS:
IST1081I ADJACENT LINK STATION = P3A21

```

DISPLAY ID

```
IST634I NAME      STATUS      SID      SEND RECV VR TP NETID
IST635I APPL1     ACTIV-P     EAABEEC356FA371B 0000 0000 0 0 NETA
IST924I -----
IST075I NAME = NETA.NETAPPL1, TYPE = DIRECTORY ENTRY
IST1186I DIRECTORY ENTRY = DYNAMIC LU
IST1184I CPNAME = NETA.SSCP2A - NETSRVR = ***NA***
IST484I SUBAREA = 2
IST1703I DESIRED LOCATE SIZE = 1K LAST LOCATE SIZE = 16K
IST314I END
```

Displaying directory information for a resource (no SSCP, adjacent CP, host CP, or other resource was found with this name) and the command was issued at a network node or interchange node:

```
d net,id=neta.lu71,idtype=resource,scope=all
IST097I DISPLAY ACCEPTED
IST075I NAME = NETA.LU71, TYPE = DIRECTORY ENTRY
IST1186I DIRECTORY ENTRY = DYNAMIC LU
IST1184I CPNAME = NETA.NN3 - NETSRVR = ***NA***
IST484I SUBAREA = *****
IST1703I DESIRED LOCATE SIZE = 1K LAST LOCATE SIZE = 16K
IST314I END
```

Displaying only directory information for a resource:

```
d net,id=sscp2a,idtype=directry,scope=all
IST097I DISPLAY ACCEPTED
IST075I NAME = NETA.SSCP2A, TYPE = DIRECTORY ENTRY
IST1186I DIRECTORY ENTRY = DYNAMIC NN
IST1184I CPNAME = NETA.SSCP2A - NETSRVR = ***NA***
IST314I END
```

Displaying a conventionally defined application program:

```
d net,id=appl1,scope=all
IST097I DISPLAY ACCEPTED
IST075I NAME = NETA.APPL1, TYPE = APPL
IST486I STATUS= ACT/S, DESIRED STATE= ACTIV - TRACE= OFF
IST1447I REGISTRATION TYPE = CDSERVER
IST977I MDLTAB=***NA*** ASLTAB=***NA***
IST861I MODETAB=***NA*** USSTAB=***NA*** LOGTAB=***NA***
IST934I DLOGMOD=***NA*** USS LANGTAB=***NA***
IST1632I VPACING = 7
IST1938I APPC = YES
IST597I CAPABILITY-PLU ENABLED ,SLU ENABLED ,SESSION LIMIT NONE
IST231I APPL MAJOR NODE = APPL1A
IST654I I/O TRACE = OFF, BUFFER TRACE = OFF
IST1500I STATE TRACE = OFF
IST271I JOBNAME = ECHO, STEPNAME = ECHO, DSPNAME = IST6D2D6
IST228I ENCRYPTION = OPTIONAL, TYPE = DES
IST1563I CKEYNAME = APPL1 CKEY = PRIMARY CERTIFY = NO
IST1552I MAC = NONE MACTYPE = NONE
IST1050I MAXIMUM COMPRESSION LEVEL - INPUT = 0, OUTPUT = 0
IST1633I ASRCVLM = 2000000
IST1634I DATA SPACE USAGE: CURRENT = 0 MAXIMUM = 0
IST171I ACTIVE SESSIONS = 0000000001, SESSION REQUESTS = 0000000001
IST206I SESSIONS:
IST634I NAME      STATUS      SID      SEND RECV VR TP NETID
IST635I NETAPPL1 ACTIV-S     EAABEEC37D76FAC1 0000 0000 0 0 NETA
IST314I END
```

Displaying an application program that is multinode persistent session (MNPS) capable:

```
d net,id=mappl1,e
IST097I DISPLAY ACCEPTED
IST075I NAME = NETA.MAPPL1, TYPE = DYNAMIC APPL
```



```

IST486I STATUS= ACTIV, DESIRED STATE= ACTIV
IST1447I REGISTRATION TYPE = CDSERV
IST1550I MNPS STATE = DISABLED
IST2062I SNPS FORCED TAKEOVER REQUESTS ARE ACCEPTABLE
IST1629I MODSRCH = NEVER
IST977I MDLTAB=***NA*** ASLTAB=***NA***
IST861I MODETAB=***NA*** USSTAB=***NA*** LOGTAB=***NA***
IST934I DLOGMOD=***NA*** USS LANGTAB=***NA***
IST1632I VPACING = 7
IST1938I APPC = NO
IST597I CAPABILITY-PLU ENABLED ,SLU ENABLED ,SESSION LIMIT NONE
IST231I APPL MAJOR NODE = APPLANY
IST1425I DEFINED USING MODEL MAPPL*
IST654I I/O TRACE = OFF, BUFFER TRACE = OFF
IST1500I STATE TRACE = OFF
IST271I JOBNAME = ECHO, STEPNAME = ECHO, DSPNAME = ISTBFA93
IST228I ENCRYPTION = OPTIONAL , TYPE = DES
IST1563I CKEYNAME = MAPPL1 CKEY = PRIMARY CERTIFY = NO
IST1552I MAC = NONE MACTYPE = NONE
IST1050I MAXIMUM COMPRESSION LEVEL - INPUT = 0, OUTPUT = 0
IST1633I ASRCVLM = 1000000
IST1634I DATA SPACE USAGE: CURRENT = 0 MAXIMUM = 0
IST171I ACTIVE SESSIONS = 0000000000, SESSION REQUESTS = 0000000000
IST172I NO SESSIONS EXIST
IST314I END

```

Displaying an application program that is single node persistent session (SNPS) capable:

```

d net,id=appl1,e
IST097I DISPLAY ACCEPTED
IST075I NAME = NETA.APPL1, TYPE = APPL
IST486I STATUS= ACTIV, DESIRED STATE= ACTIV
IST1447I REGISTRATION TYPE = CDSERV
IST2062I SNPS FORCED TAKEOVER REQUESTS ARE ACCEPTABLE
IST977I MDLTAB=***NA*** ASLTAB=***NA***
IST861I MODETAB=***NA*** USSTAB=***NA*** LOGTAB=***NA***
IST934I DLOGMOD=***NA*** USS LANGTAB=***NA***
IST1632I VPACING = 7
IST1938I APPC = NO
IST597I CAPABILITY-PLU ENABLED ,SLU ENABLED ,SESSION LIMIT NONE
IST231I APPL MAJOR NODE = APPL1A
IST654I I/O TRACE = OFF, BUFFER TRACE = OFF
IST1500I STATE TRACE = OFF
IST271I JOBNAME = ECHO, STEPNAME = ECHO, DSPNAME = IST4915A
IST228I ENCRYPTION = OPTIONAL , TYPE = DES
IST1563I CKEYNAME = APPL1 CKEY = PRIMARY CERTIFY = NO
IST1552I MAC = NONE MACTYPE = NONE
IST1050I MAXIMUM COMPRESSION LEVEL - INPUT = 0, OUTPUT = 0
IST1633I ASRCVLM = 1000000
IST1634I DATA SPACE USAGE: CURRENT = 0 MAXIMUM = 0
IST171I ACTIVE SESSIONS = 0000000000, SESSION REQUESTS = 0000000000
IST172I NO SESSIONS EXIST
IST314I END

```

Displaying a model application program:

```

d net,id=appl*,scope=all
IST097I DISPLAY ACCEPTED
IST075I NAME = NETA.APPL*, TYPE = MODEL APPL
IST486I STATUS= CONCT, DESIRED STATE= CONCT - TRACE= OFF
IST1447I REGISTRATION TYPE = CDSERV
IST977I MDLTAB=***NA*** ASLTAB=***NA***
IST861I MODETAB=***NA*** USSTAB=***NA*** LOGTAB=***NA***
IST934I DLOGMOD=***NA*** USS LANGTAB=***NA***
IST1938I APPC = NO
IST597I CAPABILITY-PLU INHIBITED,SLU INHIBITED,SESSION LIMIT NON

```

DISPLAY ID

```
IST231I APPL MAJOR NODE = APPL1A
IST654I I/O TRACE = OFF, BUFFER TRACE = OFF
IST271I JOBNAME = ***NA***, STEPNAME = ***NA***, DSPNAME = ***NA
IST228I ENCRYPTION = OPTIONAL, TYPE = DES
IST1563I CKEYNAME = APPL* CKEY = PRIMARY CERTIFY = NO
IST1552I MAC = NONE MACTYPE = NONE
IST1050I MAXIMUM COMPRESSION LEVEL - INPUT = 0, OUTPUT = 0
IST1424I APPLICATIONS DEFINED USING THIS MODEL:
IST080I APPL1  ACTIV
IST314I END
```

Displaying a multinode persistent session application program from a remote node connected to the MNPS coupling facility structure might result in any of the following output:

```
d net,id=mapplx1,e
IST097I DISPLAY ACCEPTED
IST075I NAME = NETA.MAPPLX1, TYPE = APPL
IST1549I OWNER = NETA.SSCP2A MNPS STATE = DISABLED
IST2062I MNPS FORCED TAKEOVER REQUESTS ARE ACCEPTABLE
IST924I -----
IST075I NAME = NETA.MAPPLX1, TYPE = DIRECTORY ENTRY
IST1186I DIRECTORY ENTRY = REGISTERED LU
IST1184I CPNAME = NETA.SSCP1A - NETSRVR = NETA.SSCPA
IST314I END

d net,id=mapplx1,e
IST097I DISPLAY ACCEPTED
IST075I NAME = NETA.MAPPLX1, TYPE = CDRSC
IST486I STATUS= ACT/S---Y, DESIRED STATE= ACTIV
IST1447I REGISTRATION TYPE = NO
IST977I MDLTAB=***NA*** ASLTAB=***NA***
IST1333I ADJLIST = ***NA***
IST861I MODETAB=***NA*** USSTAB=***NA*** LOGTAB=***NA***
IST934I DLOGMOD=***NA*** USS LANGTAB=***NA***
IST597I CAPABILITY-PLU ENABLED ,SLU ENABLED ,SESSION LIMIT NONE
IST231I CDRSC MAJOR NODE = ISTCDRDY
IST479I CDRM NAME = SSCPA, VERIFY OWNER = NO
IST1184I CPNAME = NETA.SSCP2A - NETSRVR = ***NA***
IST082I DEVTYPE = INDEPENDENT LU / CDRSC
IST654I I/O TRACE = OFF, BUFFER TRACE = OFF
IST1500I STATE TRACE = OFF
IST228I ENCRYPTION = NONE, TYPE = DES
IST1563I CKEYNAME = MAPPLX1 CKEY = PRIMARY CERTIFY = NO
IST1552I MAC = NONE MACTYPE = NONE
IST171I ACTIVE SESSIONS = 0000000001, SESSION REQUESTS = 0000000000
IST206I SESSIONS:
IST1081I ADJACENT LINK STATION = CNR00005
IST634I NAME      STATUS      SID      SEND RECV VR TP NETID
IST635I APPLAA1  ACTIV-P    EAABEE185A59FD67 0000 0000 0 0 NETA
IST924I -----
IST075I NAME = NETA.MAPPLX1, TYPE = APPL
IST1549I OWNER = NETA.SSCP2A MNPS STATE = ENABLED
IST2062I MNPS FORCED TAKEOVER REQUESTS ARE ACCEPTABLE
IST924I -----
IST075I NAME = NETA.MAPPLX1, TYPE = DIRECTORY ENTRY
IST1186I DIRECTORY ENTRY = DYNAMIC LU
IST1184I CPNAME = NETA.SSCP2A - NETSRVR = ***NA***
IST314I END

d net,id=mappl1,e
IST097I DISPLAY ACCEPTED
IST075I NAME = NETA.MAPPL1, TYPE = CDRSC
IST486I STATUS= ACT/S---Y, DESIRED STATE= ACTIV
IST1447I REGISTRATION TYPE = NO
IST977I MDLTAB=***NA*** ASLTAB=***NA***
IST1333I ADJLIST = ***NA***
IST861I MODETAB=***NA*** USSTAB=***NA*** LOGTAB=***NA***
```

```

IST934I DLOGMOD=***NA*** USS LANGTAB=***NA***
IST597I CAPABILITY-PLU ENABLED ,SLU ENABLED ,SESSION LIMIT NONE
IST231I CDRSC MAJOR NODE = ISTCDRDY
IST479I CDRM NAME = SSCP1A, VERIFY OWNER = NO
IST1184I CPNAME = NETA.SSCP2A - NETSRVR = ***NA***
IST082I DEVTYPE = INDEPENDENT LU / CDRSC
IST654I I/O TRACE = OFF, BUFFER TRACE = OFF
IST1500I STATE TRACE = OFF
IST228I ENCRYPTION = NONE, TYPE = DES
IST1563I CKEYNAME = MAPPL1 CKEY = PRIMARY CERTIFY = NO
IST1552I MAC = NONE MACTYPE = NONE
IST171I ACTIVE SESSIONS = 0000000001, SESSION REQUESTS = 0000000000
IST206I SESSIONS:
IST1081I ADJACENT LINK STATION = CNR00003
IST634I NAME      STATUS      SID      SEND RECV VR TP NETID
IST635I APPL1     ACTIV-P     EAABEEC30C061090 0000 0000 0 0 NETA
IST924I -----
IST075I NAME = NETA.MAPPL1, TYPE = APPL
IST1549I OWNER = NETA.SSCP2A MNPS STATE = DISABLED
IST2062I MNPS FORCED TAKEOVER REQUESTS ARE ACCEPTABLE
IST314I END

d net,id=mapplx1,e
IST097I DISPLAY ACCEPTED
IST075I NAME = NETA.MAPPLX1, TYPE = APPL
IST486I STATUS= CONCT, DESIRED STATE= CONCT
IST1447I REGISTRATION TYPE = CDSERVER
IST1550I MNPS STATE = DEFINED
IST977I MDLTAB=***NA*** ASLTAB=***NA***
IST861I MODETAB=***NA*** USSTAB=***NA*** LOGTAB=***NA***
IST934I DLOGMOD=***NA*** USS LANGTAB=***NA***
IST1632I VPACING = 7
IST1938I APPC = YES
IST597I CAPABILITY-PLU INHIBITED,SLU INHIBITED,SESSION LIMIT NONE
IST231I APPL MAJOR NODE = APPLMG2
IST654I I/O TRACE = OFF, BUFFER TRACE = OFF
IST1500I STATE TRACE = OFF
IST271I JOBNAME = ***NA***, STEPNAME = ***NA***, DSPNAME = ***NA***
IST228I ENCRYPTION = OPTIONAL, TYPE = DES
IST1563I CKEYNAME = MAPPLX1 CKEY = PRIMARY CERTIFY = NO
IST1552I MAC = NONE MACTYPE = NONE
IST1050I MAXIMUM COMPRESSION LEVEL - INPUT = 0, OUTPUT = 0
IST1633I ASRCVLM = 1000000
IST1634I DATA SPACE USAGE: CURRENT = ***NA*** MAXIMUM = ***NA***
IST171I ACTIVE SESSIONS = 0000000000, SESSION REQUESTS = 0000000000
IST172I NO SESSIONS EXIST
IST924I -----
IST075I NAME = NETA.MAPPLX1, TYPE = APPL
IST1549I OWNER = NETA.SSCP1A MNPS STATE = DISABLED
IST2062I MNPS FORCED TAKEOVER REQUESTS ARE ACCEPTABLE
IST314I END

```

Displaying a dynamic application program:

```

d net,id=appl1,scope=all
IST097I DISPLAY ACCEPTED
IST075I NAME = NETA.APPL1, TYPE = DYNAMIC APPL
IST486I STATUS= ACTIV, DESIRED STATE= ACTIV - TRACE= OFF
IST1447I REGISTRATION TYPE = CDSERVER
IST977I MDLTAB=***NA*** ASLTAB=***NA***
IST861I MODETAB=***NA*** USSTAB=***NA*** LOGTAB=***NA***
IST934I DLOGMOD=***NA*** USS LANGTAB=***NA***
IST1632I VPACING = 7
IST1938I APPC = NO
IST597I CAPABILITY-PLU ENABLED ,SLU ENABLED ,SESSION LIMIT NON
IST231I APPL MAJOR NODE = APPL1A
IST1425I DEFINED USING MODEL APPL*
IST654I I/O TRACE = OFF, BUFFER TRACE = OFF

```

DISPLAY ID

```
IST1500I STATE TRACE = OFF
IST271I JOBNAME = ECHO, STEPNAME = ECHO, DSPNAME = IST75874
IST228I ENCRYPTION = OPTIONAL, TYPE = DES
IST1563I CKEYNAME = APPL1 CKEY = PRIMARY CERTIFY = NO
IST1552I MAC = NONE MACTYPE = NONE
IST1050I MAXIMUM COMPRESSION LEVEL - INPUT = 0, OUTPUT = 0
IST1633I ASRCVLM = 2000000
IST1634I DATA SPACE USAGE: CURRENT = 0 MAXIMUM = 0
IST171I ACTIVE SESSIONS = 0000000000, SESSION REQUESTS = 0000000
IST314I END
```

Displaying the application program representing the network operator:

```
d net,id=istnop
IST097I DISPLAY ACCEPTED
IST075I NAME = NETA.ISTNOP, TYPE = APPL
IST486I STATUS= ACTIV, DESIRED STATE= ACTIV - TRACE= OFF
IST1447I REGISTRATION TYPE = NO
IST977I MDLTAB=***NA*** ASLTAB=***NA***
IST1395I FLDTAB = ISTMSFLD FILTER = ISTMGC10
IST861I MODETAB=***NA*** USSTAB=***NA*** LOGTAB=***NA***
IST934I DLOGMOD=***NA*** USS LANGTAB=***NA***
IST1938I APPC = NO
IST597I CAPABILITY-PLU INHIBITED,SLU INHIBITED,SESSION LIMIT NONE
IST231I APPL MAJOR NODE = VTAMSEG
IST654I I/O TRACE = OFF, BUFFER TRACE = OFF
IST271I JOBNAME = ***NA***, STEPNAME = ***NA***, DSPNAME = ***NA***
IST228I ENCRYPTION = NONE, TYPE = DES
IST1563I CKEYNAME = ISTNOP CKEY = PRIMARY CERTIFY = NO
IST1552I MAC = NONE MACTYPE = NONE
IST1050I MAXIMUM COMPRESSION LEVEL - INPUT = 0, OUTPUT = 0
IST171I ACTIVE SESSIONS = 0000000000, SESSION REQUESTS = 0000000000
IST314I END
```

Displaying a dynamic same-network CDRSC:

```
d net,id=applaa3,scope=all
IST097I DISPLAY ACCEPTED
IST075I NAME = NETA.APPLAA3, TYPE = CDRSC
IST486I STATUS= ACTIV----Y, DESIRED STATE= ACTIV
IST1447I REGISTRATION TYPE = CDSERV
IST977I MDLTAB=***NA*** ASLTAB=***NA***
IST1333I ADJLIST = ***NA***
IST861I MODETAB=***NA*** USSTAB=***NA*** LOGTAB=***NA***
IST934I DLOGMOD=***NA*** USS LANGTAB=***NA***
IST597I CAPABILITY-PLU ENABLED ,SLU ENABLED ,SESSION LIMIT NONE
IST231I CDRSC MAJOR NODE = ISTCDRDY
IST479I CDRM NAME = ***NA***, VERIFY OWNER = NO
IST1184I CPNAME = NETA.SSCPAA - NETSRVR = ***NA***
IST082I DEVTYPE = CDRSC
IST654I I/O TRACE = OFF, BUFFER TRACE = OFF
IST228I ENCRYPTION = NONE, TYPE = DES
IST1563I CKEYNAME = APPLAA3 CKEY = PRIMARY CERTIFY = NO
IST1552I MAC = NONE MACTYPE = NONE
IST171I ACTIVE SESSIONS = 0000000000, SESSION REQUESTS = 0000000000
IST314I END
```

Displaying a dynamic cross-network CDRSC:

```
d net,id=netb.applb11,scope=all
IST097I DISPLAY ACCEPTED
IST075I NAME = NETB.APPLB11, TYPE = CDRSC
IST486I STATUS= ACT/S----Y, DESIRED STATE= ACTIV
IST1447I REGISTRATION TYPE = CDSERV
IST977I MDLTAB=***NA*** ASLTAB=***NA***
IST1333I ADJLIST = ***NA***
IST861I MODETAB=***NA*** USSTAB=***NA*** LOGTAB=***NA***
IST934I DLOGMOD=***NA*** USS LANGTAB=***NA***
```

```

IST597I CAPABILITY-PLU ENABLED ,SLU ENABLED ,SESSION LIMIT NONE
IST231I CDRSC MAJOR NODE = ISTCDRDY
IST479I CDRM NAME = SSCP7B, VERIFY OWNER = NO
IST1184I CPNAME = NETB.SSCP7B - NETSRVR = ***NA***
IST082I DEVTYPE = CDRSC
IST654I I/O TRACE = OFF, BUFFER TRACE = OFF
IST228I ENCRYPTION = NONE, TYPE = DES
IST1563I CKEYNAME = APPLB11 CKEY = PRIMARY CERTIFY = NO
IST1552I MAC = NONE MACTYPE = NONE
IST171I ACTIVE SESSIONS = 0000000002, SESSION REQUESTS = 0000000000
IST206I SESSIONS:
IST634I NAME      STATUS      SID      SEND RECV VR TP NETID
IST635I APPL1     ACTIV-S    C2BB19BC74339803 0016 0016 0 0 NETA
IST635I APPL1     ACTIV-P    EAABEEC34604F7E2 0009 000A 0 0 NETA
IST314I END

```

Displaying a predefined CDRSC for a specific network:

```

d net,id=applb11,netid=netb,scope=all
IST097I DISPLAY ACCEPTED
IST075I NAME = APPLB11, TYPE = CDRSC
IST486I STATUS= ACTIV, DESIRED STATE= ACTIV
IST1447I REGISTRATION TYPE = CDSERVR
IST977I MDLTAB=***NA*** ASLTAB=***NA***
IST1333I ADJLIST = ***NA***
IST861I MODETAB=***NA*** USSTAB=***NA*** LOGTAB=***NA***
IST934I DLOGMOD=***NA*** USS LANGTAB=***NA***
IST597I CAPABILITY-PLU ENABLED ,SLU ENABLED ,SESSION LIMIT NONE
IST231I CDRSC MAJOR NODE = CDRSC1A
IST479I CDRM NAME = SSCP7B, VERIFY OWNER = NO
IST082I DEVTYPE = CDRSC
IST654I I/O TRACE = OFF, BUFFER TRACE = OFF
IST228I ENCRYPTION = NONE, TYPE = DES
IST1563I CKEYNAME = APPLB11 CKEY = PRIMARY CERTIFY = NO
IST1552I MAC = NONE MACTYPE = NONE
IST171I ACTIVE SESSIONS = 0000000000, SESSION REQUESTS = 0000000000
IST314I END

```

Displaying a predefined CDRSC without network (no sessions):

```

d net,id=netappl2,scope=all
IST097I DISPLAY ACCEPTED
IST075I NAME = NETA.NETAPPL2, TYPE = CDRSC
IST486I STATUS= ACTIV, DESIRED STATE= ACTIV - TRACE= OFF
IST1447I REGISTRATION TYPE = NO
IST977I MDLTAB=***NA*** ASLTAB=***NA***
IST1333I ADJLIST = ***NA***
IST861I MODETAB=***NA*** USSTAB=***NA*** LOGTAB=***NA***
IST934I DLOGMOD=***NA*** USS LANGTAB=***NA***
IST597I CAPABILITY-PLU ENABLED ,SLU ENABLED ,SESSION LIMIT NONE
IST231I CDRSC MAJOR NODE = CDRSC1A
IST479I CDRM NAME = SSCP2A, VERIFY OWNER = NO
IST082I DEVTYPE = CDRSC
IST654I I/O TRACE = OFF, BUFFER TRACE = OFF
IST171I ACTIVE SESSIONS = 0000000000, SESSION REQUESTS = 0000000000
IST314I END

```

Displaying a model CDRSC:

```

d net,id=applb*,e
IST097I DISPLAY ACCEPTED
IST075I NAME = NETB.APPLB*, TYPE = MODEL CDRSC
IST486I STATUS= ACTIV, DESIRED STATE= ACTIV
IST1447I REGISTRATION TYPE = NO
IST977I MDLTAB=***NA*** ASLTAB=***NA***
IST1333I ADJLIST = ***NA***
IST861I MODETAB=***NA*** USSTAB=***NA*** LOGTAB=***NA***
IST934I DLOGMOD=***NA*** USS LANGTAB=***NA***

```

DISPLAY ID

```
IST597I CAPABILITY-PLU ENABLED ,SLU ENABLED ,SESSION LIMIT NONE
IST231I CDRSC MAJOR NODE = CDRSC1A
IST2095I MODEL CDRSC DELETE = YES
IST479I CDRM NAME = SSCP7B, VERIFY OWNER = NO
IST082I DEVTYPE = CDRSC
IST654I I/O TRACE = OFF, BUFFER TRACE = OFF
IST1500I STATE TRACE = OFF
IST228I ENCRYPTION = NONE , TYPE = DES
IST1563I CKEYNAME = APPLB11 CKEY = PRIMARY CERTIFY = NO
IST1552I MAC = NONE MACTYPE = NONE
IST2088I CDRSCS DEFINED USING THIS MODEL:
IST483I APPLB11 ACTIV , CDRM = SSCP7B , NETID = NETB
IST483I APPLB12 ACTIV , CDRM = SSCP7B , NETID = NETB
IST314I END
```

Displaying a clone CDRSC:

```
d net,id=applb11
IST097I DISPLAY ACCEPTED
IST075I NAME = NETB.APPLB11, TYPE = CLONE CDRSC
IST486I STATUS= ACT/S, DESIRED STATE= ACTIV
IST1447I REGISTRATION TYPE = NO
IST977I MDLTAB=***NA*** ASLTAB=***NA***
IST1333I ADJLIST = ***NA***
IST861I MODETAB=***NA*** USSTAB=***NA*** LOGTAB=***NA***
IST934I DLOGMOD=***NA*** USS LANGTAB=***NA***
IST597I CAPABILITY-PLU ENABLED ,SLU ENABLED ,SESSION LIMIT NONE
IST231I CDRSC MAJOR NODE = CDRSC1A
IST1425I DEFINED USING MODEL NETB.APPLB*
IST2095I MODEL CDRSC DELETE = YES
IST479I CDRM NAME = SSCP7B, VERIFY OWNER = NO
IST082I DEVTYPE = CDRSC
IST654I I/O TRACE = OFF, BUFFER TRACE = OFF
IST1500I STATE TRACE = OFF
IST228I ENCRYPTION = NONE , TYPE = DES
IST1563I CKEYNAME = APPLB11 CKEY = PRIMARY CERTIFY = NO
IST1552I MAC = NONE MACTYPE = NONE
IST171I ACTIVE SESSIONS = 0000000001, SESSION REQUESTS = 0000000000
IST314I END
```

Displaying a CDRSC for a TN3270 or TN3270E client:

```
d net,id=tcpm1011,e
IST097I DISPLAY ACCEPTED
IST075I NAME = NETA.TCPM1011, TYPE = CDRSC
IST486I STATUS= ACT/S---Y, DESIRED STATE= ACTIV
IST1447I REGISTRATION TYPE = NO
IST977I MDLTAB=***NA*** ASLTAB=***NA***
IST1333I ADJLIST = ***NA***
IST861I MODETAB=***NA*** USSTAB=***NA*** LOGTAB=***NA***
IST934I DLOGMOD=***NA*** USS LANGTAB=***NA***
IST597I CAPABILITY-PLU ENABLED ,SLU ENABLED ,SESSION LIMIT NONE
IST231I CDRSC MAJOR NODE = ISTCDRDY
IST479I CDRM NAME = SSCP1A, VERIFY OWNER = NO
IST1184I CPNAME = NETA.SSCP1A - NETSRVR = ***NA***
IST082I DEVTYPE = CDRSC
IST654I I/O TRACE = OFF, BUFFER TRACE = OFF
IST1500I STATE TRACE = OFF
IST228I ENCRYPTION = NONE , TYPE = DES
IST1563I CKEYNAME = TCPM1011 CKEY = PRIMARY CERTIFY = NO
IST1552I MAC = NONE MACTYPE = NONE
IST1727I DNS NAME: VIC127.TCP.RALEIGH.IBM.COM
IST1669I IPADDR..PORT 9.67.113.83..1027
IST171I ACTIVE SESSIONS = 0000000001, SESSION REQUESTS = 0000000000
IST206I SESSIONS:
IST634I NAME STATUS SID SEND RECV VR TP NETID
IST635I TS020001 ACTIV-P F6ABEEC39DE3E239 0008 0010 0 0 NETA
IST314I END
```

Displaying a CDRSC that is associated with an IPv6 TN3270 client:

```
d net,id=tcpm2012,e
IST097I DISPLAY ACCEPTED
IST075I NAME = NETA.TCPM2012, TYPE = CDRSC
IST486I STATUS= ACT/S---Y, DESIRED STATE= ACTIV
IST1447I REGISTRATION TYPE = NO
IST977I MDLTAB=***NA*** ASLTAB=***NA***
IST1333I ADJLIST = ***NA***
IST861I MODETAB=***NA*** USSTAB=***NA*** LOGTAB=***NA***
IST934I DLOGMOD=***NA*** USS LANGTAB=***NA***
IST597I CAPABILITY-PLU ENABLED ,SLU ENABLED ,SESSION LIMIT NONE
IST231I CDRSC MAJOR NODE = ISTCDRDY
IST479I CDRM NAME = SSCP1A, VERIFY OWNER = NO
IST1184I CPNAME = NETA.SSCP1A - NETSRVR = ***NA***
IST1131I DEVICE = CDRSC
IST654I I/O TRACE = OFF, BUFFER TRACE = OFF
IST1500I STATE TRACE = OFF
IST228I ENCRYPTION = NONE , TYPE = DES
IST1563I CKEYNAME = TCPM2012 CKEY = PRIMARY CERTIFY = NO
IST1552I MAC = NONE MACTYPE = NONE
IST1669I IPADDR..PORT 2001:0DB8::9:67:115:17..1026
IST171I ACTIVE SESSIONS = 0000000001, SESSION REQUESTS = 0000000000
IST206I SESSIONS:
IST634I NAME      STATUS      SID      SEND RECV VR TP NET
IST635I TS020002 ACTIV-P      F6ABEEC34C26E9F3 0003 000D 0 0 NET
IST314I END
```

Displaying an independent logical unit:

```
d net,id=13270a,scope=all
IST097I DISPLAY ACCEPTED
IST075I NAME = L3270A, TYPE = CDRSC
IST486I STATUS= ACTIV, DESIRED STATE= ACTIV
IST599I REAL NAME = ***NA***
IST1447I REGISTRATION TYPE = NO
IST977I MDLTAB=***NA*** ASLTAB=***NA***
IST1333I ADJLIST = ***NA***
IST861I MODETAB=***NA*** USSTAB=***NA*** LOGTAB=***NA***
IST934I DLOGMOD=***NA*** USS LANGTAB=***NA***
IST597I CAPABILITY-PLU ENABLED ,SLU ENABLED ,SESSION LIMIT NONE
IST231I CDRSC MAJOR NODE = ISTPDILU
IST1044I ALSLIST = AHHCPU1
IST082I DEVTYPE = INDEPENDENT LU / CDRSC
IST654I I/O TRACE = OFF, BUFFER TRACE = OFF
IST1500I STATE TRACE = OFF
IST228I ENCRYPTION = NONE, TYPE = DES
IST1563I CKEYNAME = L3270A CKEY = PRIMARY CERTIFY = NO
IST1552I MAC = NONE MACTYPE = NONE
IST171I ACTIVE SESSIONS = 0000000000, SESSION REQUESTS = 0000000000
IST172I NO SESSIONS EXIST
IST924I -----
IST075I NAME = NETA.L3270A, TYPE = DIRECTORY ENTRY
IST1186I DIRECTORY ENTRY = REGISTERED LU
IST1184I CPNAME = NETA.SSCP2A - NETSRVR = NETA.SSCP1A
IST484I SUBAREA = ****NA****
IST1703I DESIRED LOCATE SIZE = 1K LAST LOCATE SIZE = 1K
IST314I END
```

Displaying the host CDRM:

```
d net,id=a01n,scope=all
IST097I DISPLAY ACCEPTED
IST075I NAME = NETA.A01N, TYPE = CDRM
IST1046I CP NETA.A01N ALSO EXISTS
IST486I STATUS= ACTIV , DESIRED STATE= ACTIV
IST815I AUTOMATIC RECOVERY IS SUPPORTED
IST231I CDRM MAJOR NODE = VTAMSEG
```

DISPLAY ID

```
IST654I I/O TRACE = OFF, BUFFER TRACE = OFF
IST476I CDRM TYPE = HOST, GATEWAY CAPABLE
IST637I SUBAREA= 2   ELEMENT= 1 SSCPID = 2
IST388I DYNAMIC CDRSC DEFINITION SUPPORT = YES
IST171I ACTIVE SESSIONS = 0000000000, SESSION REQUESTS = 0000000000
IST172I NO SESSIONS EXIST
IST924I -----
IST075I NAME = NETA.A01N, TYPE = HOST CP
IST1046I SSCP NETA.A01N ALSO EXISTS
IST486I STATUS= ACT/S      , DESIRED STATE= ACTIV
IST977I MDLTAB=***NA*** ASLTAB=***NA***
IST861I MODETAB=***NA*** USSTAB=***NA*** LOGTAB=***NA***
IST934I DLOGMOD=***NA*** USS LANGTAB=***NA***
IST597I CAPABILITY-PLU ENABLED ,SLU ENABLED ,SESSION LIMIT NONE
IST231I APPL MAJOR NODE = VTAMSEG
IST654I I/O TRACE = OFF, BUFFER TRACE = OFF
IST271I JOBNAME = NET41B , STEPNAME = NET      , DSPNAME = 00000IST
IST1050I MAXIMUM COMPRESSION LEVEL - INPUT = 0, OUTPUT = 0
IST171I ACTIVE SESSIONS = 0000000014, SESSION REQUESTS = 0000000000
IST206I SESSIONS:
IST634I NAME      STATUS      SID      SEND RECV VR TP NETID
IST635I A04P882A  ACTIV/CP-S  E7F3895623BE5C86 000D 0001 0 0 NETY
IST635I A04P888A  ACTIV/CP-S  E7F3895623BE5C85 053E 0001 0 0 NETA
IST635I A04P886A  ACTIV/CP-S  E7F3895623BE5C84 0721 0001 0 0 NETA
IST635I A04P885A  ACTIV/CP-S  E7F3895623BE5C83 03AE 0001 0 0 NETA
IST635I A04P889A  ACTIV/CP-S  E7F3895623BE5C82 0727 0001 0 0 NETA
IST635I A04P883A  ACTIV/CP-S  E7F3895623BE5C81 01C5 0001 0 0 NETZ
IST635I A02N      ACTIV/CP-S  E7F3895623BE56A5 1055 0001 0 0 NETA
IST635I A02N      ACTIV/CP-P  E7E3F9563F1747D7 0001 1047 0 0 NETA
IST635I A04P882A  ACTIV/CP-P  F3342BAB9019C2B2 0001 000E 0 0 NETY
IST635I A04P883A  ACTIV/CP-P  E36D478882B602AB 0001 01C6 0 0 NETZ
IST635I A04P885A  ACTIV/CP-P  EF0E04F6C768DD2E 0001 03AF 0 0 NETA
IST635I A04P886A  ACTIV/CP-P  EF0E07F6C768E02F 0001 0722 0 0 NETA
IST635I A04P888A  ACTIV/CP-P  EF0E09F6C768E230 0001 053F 0 0 NETA
IST635I A04P889A  ACTIV/CP-P  EF0E08F6C768E131 0001 0728 0 0 NETA
IST314I END
```

Displaying an active, same-network, external CDRM:

```
d net,id=A02n,scope=all
IST097I DISPLAY ACCEPTED
IST075I NAME = NETA.A02N, TYPE = CDRM
IST1046I CP NETA.A02N ALSO EXISTS
IST486I STATUS= ACTIV, DESIRED STATE= ACTIV
IST815I AUTOMATIC RECOVERY IS SUPPORTED
IST231I CDRM MAJOR NODE = A01CDRMC
IST654I I/O TRACE = OFF, BUFFER TRACE = OFF
IST1500I STATE TRACE = OFF
IST476I CDRM TYPE = EXTERNAL
IST637I SUBAREA= 2   ELEMENT= 1 SSCPID = 2
IST675I VR=0, TP=0
IST389I PREDEFINITION OF CDRSC = OPT
IST1105I RESOURCE STATUS TGN CP-CP TG CHARACTERISTICS
IST1106I A02N      AC/R    255 YES  982D0000000000000000000017100808080
IST1482I HPR= NO - OVERRIDE = YES - CONNECTION = YES
IST636I CDRSCS OWNED BY A02N      -
IST172I NO CDRSCS EXIST
IST924I -----
IST075I NAME = NETA.A02N, TYPE = ADJACENT CP
IST1046I SSCP NETA.A02N ALSO EXISTS
IST486I STATUS= ACT/S----Y, DESIRED STATE= ACTIV
IST977I MDLTAB=***NA*** ASLTAB=***NA***
IST861I MODETAB=***NA*** USSTAB=***NA*** LOGTAB=***NA***
IST934I DLOGMOD=***NA*** USS LANGTAB=***NA***
IST597I CAPABILITY-PLU ENABLED ,SLU ENABLED ,SESSION LIMIT NONE
IST231I CDRSC MAJOR NODE = ISTDY
IST479I CDRM NAME = A01N      , VERIFY OWNER = NO
```



```

IST1044I ALSLIST = ISTAPNPU
IST082I DEVTYPE = INDEPENDENT LU / CDRSC
IST654I I/O TRACE = OFF, BUFFER TRACE = OFF
IST171I ACTIVE SESSIONS = 0000000002, SESSION REQUESTS = 0000000000
IST206I SESSIONS:
IST1081I ADJACENT LINK STATION = A02NETNA
IST634I NAME      STATUS      SID      SEND RECV VR TP NETID
IST635I A01N      ACTIV/CP-S E7E3F9563F1747D7 1055 0001 0 0 NETA
IST635I A01N      ACTIV/CP-P E7F3895623BE56A5 0001 105F 0 0 NETA
IST924I -----
IST075I NAME = NETA.A02N, TYPE = DIRECTORY ENTRY
IST1186I DIRECTORY ENTRY = DYNAMIC NN
IST1184I CPNAME = NETA.A02N      - NETSRVR = ***NA***
IST314I END

```

Displaying a cross-network external CDRM:

```

d net,id=c01n,scope=all
IST097I DISPLAY ACCEPTED
IST075I NAME = NETC.C01N, TYPE = CDRM
IST486I STATUS= ACTIV      , DESIRED STATE= ACTIV
IST815I AUTOMATIC RECOVERY IS SUPPORTED
IST231I CDRM MAJOR NODE = A50CDRMC
IST654I I/O TRACE = OFF, BUFFER TRACE = OFF
IST476I CDRM TYPE = EXTERNAL
IST637I SUBAREA= 2  ELEMENT= 1 SSCPID = 2
IST675I VR = 0, TP = 2
IST638I ADJNETSA = 1, ADJNETEL = 1
IST675I VR = 0, TP = 2
IST639I GWN = A0362ZC , ADJNET = NETC
IST640I A500N  ADDR IN ADJNET - SA =          31, EL =    11
IST641I GATEWAY PATH SELECTION LIST -
IST642I ADJNET  GWN      SUBAREA  ELEM    ADJNETSA  ADJNETEL
IST643I NETC    A0362ZC      3        1          1          1
IST643I NETC                255      3          1          1
IST898I GWSELECT = YES
IST389I PREDEFINITION OF CDRSC = OPT
IST636I CDRSCS OWNED BY C01N  -
IST080I C01NLUC ACT/S----Y
IST924I -----
IST075I NAME = NETC.C01N, TYPE = DIRECTORY ENTRY
IST1186I DIRECTORY ENTRY = DYNAMIC EN
IST1184I CPNAME = NETC.C01N      - NETSRVR = NETA.A01N
IST314I END

```

Displaying a peripheral BSC line group:

```

d net,id=a031bnnb,scope=all
IST097I DISPLAY ACCEPTED
IST075I NAME = A03LBNNB      , TYPE = LINE GROUP
IST486I STATUS= ACTIV      , DESIRED STATE= ACTIV
IST354I PU T4/5 MAJOR NODE = A0362ZC
IST084I NETWORK NODES:
IST089I A03B00  TYPE = LINE          , NEVAC
IST089I A03C001 TYPE = PU_T2         , NEVAC
IST089I A03C002 TYPE = PU_T2         , NEVAC
IST089I A03B01  TYPE = LINE          , NEVAC
IST089I A03C011 TYPE = PU_T2         , NEVAC
IST089I A03C012 TYPE = PU_T2         , NEVAC
IST089I A03B32  TYPE = LINE          , NEVAC
IST089I A03C321 TYPE = PU_T2         , NEVAC
IST089I A03C322 TYPE = PU_T2         , NEVAC
IST089I A03B33  TYPE = LINE          , NEVAC
IST089I A03C331 TYPE = PU_T2         , NEVAC
IST089I A03C332 TYPE = PU_T2         , NEVAC
IST314I END

```

Displaying a peripheral SDLC line group:

```
d net,id=a031bnns,scope=all
IST097I DISPLAY ACCEPTED
IST075I NAME = A03LBNNs, TYPE = LINE GROUP
IST486I STATUS= ACTIV, DESIRED STATE= ACTIV
IST354I PU T4/5 MAJOR NODE = A0362ZC
IST084I NETWORK NODES:
IST089I A03S16 TYPE = LINE, ACTIV
IST089I A03P161 TYPE = PU_T2, PREQC
IST089I A03P162 TYPE = PU_T2, PREQC
IST089I A03P163 TYPE = PU_T2, PREQC
IST089I A03P164 TYPE = PU_T2, PREQC
IST089I A03S20 TYPE = LINE, ACTIV
IST075I NAME = A03LBNNs, TYPE = LINE GROUP
IST089I A03P201 TYPE = PU_T2, PREQC
IST089I A03P202 TYPE = PU_T2, PREQC
IST089I A03P203 TYPE = PU_T2, PREQC
IST089I A03P204 TYPE = PU_T2, PREQC
IST089I A03P205 TYPE = PU_T2, PREQC
IST089I A03P206 TYPE = PU_T2, PREQC
IST314I END
```

Displaying a peripheral SDLC switched line group:

```
d net,id=grp3a9,scope=all
IST097I DISPLAY ACCEPTED
IST075I NAME = GRP3A9, TYPE = LINE GROUP
IST486I STATUS= ACTIV, DESIRED STATE= ACTIV
IST354I PU T4/5 MAJOR NODE = NCP3AB5
IST084I NETWORK NODES:
IST089I LN3A9 TYPE = LINE, ACTIV
IST089I P3A4956K TYPE = PU_T2, ACTIV--L--
IST089I L3A4956A TYPE = LOGICAL UNIT, ACT/S
IST089I LN3A10 TYPE = LINE, ACTIV
IST089I P3A4956L TYPE = PU_T2, ACTIV--L--
IST089I L3A4956A TYPE = LOGICAL UNIT, ACT/S
IST089I LN3A11 TYPE = LINE, ACTIV
IST089I P3A4956M TYPE = PU_T2, NEVAC
IST314I END
```

Note: Independent LU L3A4956A is shown under two PUs because it has active sessions through these PUs.

Displaying a peripheral BSC link:

```
d net,id=a03b00,scope=all
IST097I DISPLAY ACCEPTED
IST075I NAME = A03B00, TYPE = LINE
IST486I STATUS= NEVAC, DESIRED STATE= INACT
IST087I TYPE = LEASED, CONTROL = BSC, HPDT = *NA*
IST134I GROUP = A03LBNNB, MAJOR NODE = A0362ZC
IST650I POLL = 000, NEGPOLL = 010, SESSION(S) = 032
IST084I NETWORK NODES:
IST089I A03C001 TYPE = PU_T2, NEVAC
IST089I A03T0011 TYPE = LOGICAL UNIT, NEVAC
IST089I A03T0012 TYPE = LOGICAL UNIT, NEVAC
IST089I A03T0013 TYPE = LOGICAL UNIT, NEVAC
IST089I A03T0014 TYPE = LOGICAL UNIT, NEVAC
IST089I A03T0015 TYPE = LOGICAL UNIT, NEVAC
IST089I A03T0016 TYPE = LOGICAL UNIT, NEVAC
IST089I A03T0017 TYPE = LOGICAL UNIT, NEVAC
IST089I A03T0018 TYPE = LOGICAL UNIT, NEVAC
IST089I A03T0019 TYPE = LOGICAL UNIT, NEVAC
IST089I A03T001A TYPE = LOGICAL UNIT, NEVAC
IST089I A03T001B TYPE = LOGICAL UNIT, NEVAC
IST089I A03T001C TYPE = LOGICAL UNIT, NEVAC
```

```

IST089I A03T001D TYPE = LOGICAL UNIT      , NEVAC
IST089I A03T001E TYPE = LOGICAL UNIT      , NEVAC
IST089I A03T001F TYPE = LOGICAL UNIT      , NEVAC
IST089I A03C002  TYPE = PU_T2              , NEVAC
IST089I A03T0021 TYPE = LOGICAL UNIT      , NEVAC
IST089I A03T0022 TYPE = LOGICAL UNIT      , NEVAC
IST089I A03T0023 TYPE = LOGICAL UNIT      , NEVAC
IST089I A03T0024 TYPE = LOGICAL UNIT      , NEVAC
IST089I A03T0025 TYPE = LOGICAL UNIT      , NEVAC
IST089I A03T0026 TYPE = LOGICAL UNIT      , NEVAC
IST089I A03T0027 TYPE = LOGICAL UNIT      , NEVAC
IST089I A03T0028 TYPE = LOGICAL UNIT      , NEVAC
IST089I A03T0029 TYPE = LOGICAL UNIT      , NEVAC
IST089I A03T002A TYPE = LOGICAL UNIT      , NEVAC
IST089I A03T002B TYPE = LOGICAL UNIT      , NEVAC
IST089I A03T002C TYPE = LOGICAL UNIT      , NEVAC
IST089I A03T002D TYPE = LOGICAL UNIT      , NEVAC
IST089I A03T002E TYPE = LOGICAL UNIT      , NEVAC
IST089I A03T002F TYPE = LOGICAL UNIT      , NEVAC
IST314I END

```

Displaying an SDLC link (multidrop INN):

```

d net,id=a04in01,scope=all
IST097I DISPLAY ACCEPTED
IST075I NAME = A04IN01, TYPE = LINE
IST486I STATUS= ACTIV----E , DESIRED STATE = ACTIV
IST087I TYPE = LEASED          , CONTROL = SDLC, HPDT = *NA*
IST134I GROUP = A04MPRI, MAJOR NODE = A04N43A
IST084I NETWORK NODES:
IST089I A04P013 TYPE = PU_T2          , NEVAC
IST089I A04L013A TYPE = LOGICAL UNIT  , NEVAC
IST089I A04L013B TYPE = LOGICAL UNIT  , NEVAC
IST089I A04L013C TYPE = LOGICAL UNIT  , NEVAC
IST089I A04L013D TYPE = LOGICAL UNIT  , NEVAC
IST089I A04L013E TYPE = LOGICAL UNIT  , NEVAC
IST089I A04L013F TYPE = LOGICAL UNIT  , NEVAC
IST089I A04L013G TYPE = LOGICAL UNIT  , NEVAC
IST089I A04L013H TYPE = LOGICAL UNIT  , NEVAC
IST089I A04L013I TYPE = LOGICAL UNIT  , NEVAC
IST089I A04L013J TYPE = LOGICAL UNIT  , NEVAC
IST089I A04L013K TYPE = LOGICAL UNIT  , NEVAC
IST089I A04L013L TYPE = LOGICAL UNIT  , NEVAC
IST089I A04L013M TYPE = LOGICAL UNIT  , NEVAC
IST089I A04L013N TYPE = LOGICAL UNIT  , NEVAC
IST089I A04L013O TYPE = LOGICAL UNIT  , NEVAC
IST089I A04I013A TYPE = LOGICAL UNIT  , NEVAC
IST089I A04I013B TYPE = LOGICAL UNIT  , NEVAC
IST089I A04I013C TYPE = LOGICAL UNIT  , NEVAC
IST089I A04I013D TYPE = LOGICAL UNIT  , NEVAC
IST089I A04I013E TYPE = LOGICAL UNIT  , NEVAC
IST396I LNKSTA  STATUS      CTG GTG  ADJNODE  ADJSA  NETID  ADJLS
IST397I A04P014  NEVAC        2  2             0
IST397I A04P015  NEVAC        2  2             0
IST397I A04P016  NEVAC        2  2             0
IST397I A04P017  ACTIV----E   2  2  A31N52B    31
IST397I A04P018  ACTIV----E   2  2  A71N43A    71
IST397I A04P019  NEVAC        2  2             0
IST397I A04P01A  NEVAC        2  2             0
IST397I A04P01B  NEVAC        2  2             0
IST397I A04P01C  NEVAC        2  2             0
IST314I END

```

Displaying a peripheral SDLC link:

```

d net,id=ln3atr10,scope=all
IST097I DISPLAY ACCEPTED
IST075I NAME = LN3ATR10, TYPE = LINE

```

DISPLAY ID

```
IST486I STATUS= ACTIV      , DESIRED STATE= ACTIV
IST087I TYPE = LEASED      , CONTROL = SDLC, HPDT = *NA*
IST1440I USE = NCP, SPARE RESOURCE, CAN BE REDEFINED
IST134I GROUP = GP3ATRP1, MAJOR NODE = NCP3AB7
IST1324I VNNAME = NETA.VN1      VNGROUP = GP3ATR10
IST1105I RESOURCE STATUS TGN CP-CP TG CHARACTERISTICS
IST1106I LN3ATR10 AC/R      21 NO  9075000000000000000017100808080
IST084I NETWORK NODES:
IST089I P3ATR10 TYPE = PU_T2      , ACTIV
IST314I END
```

Displaying a cross-subarea SDLC switched link:

```
d net,id=a04hdx00,scope=all
IST097I DISPLAY ACCEPTED
IST075I NAME = A04HDX00, TYPE = LINE
IST486I STATUS= ACTIV      , DESIRED STATE = ACTIV
IST087I TYPE = SWITCHED DIAL-INOUT, CONTROL = SDLC, HPDT = *NA*
IST936I ANSWER MODE = ENABLED
IST134I GROUP = A04SADG1, MAJOR NODE = A04S43A
IST084I NETWORK NODES:
IST089I A31A TYPE = LINK STATION      , ACTIV
IST314I END
```

Displaying a peripheral SDLC switched link:

```
d net,id=j0004001,scope=all
IST097I DISPLAY ACCEPTED
IST075I NAME =J00004001, TYPE = LINE
IST486I STATUS= ACTIV      , DESIRED STATE = ACTIV
IST087I TYPE = SWITCHED DIAL-INOUT, CONTROL = SDLC, HPDT = *NA*
IST936I ANSWER MODE = ENABLED
IST134I GROUP = A04TRLG1, MAJOR NODE = A04S43A
IST1656I VTAMTOPO = REPORT, NODE REPORTED - YES
IST172I NO NETWORK NODES EXIST
IST314I END
```

Displaying an NTRI line in an NCP:

```
d net,id=ln3atr11
IST097I DISPLAY ACCEPTED
IST075I NAME = LN3ATR11, TYPE = LINE
IST486I STATUS= ACTIV, DESIRED STATE= ACTIV
IST087I TYPE = SWITCHED DIAL-INOUT, CONTROL = SDLC, HPDT = *NA*
IST936I ANSWER MODE = ENABLED
IST1440I USE = NCP, DEFINED RESOURCE, CANNOT BE REDEFINED
IST134I GROUP = GP3ATR10, MAJOR NODE = NCP3AB8
IST1500I STATE TRACE = OFF
IST1656I VTAMTOPO = REPORT, NODE REPORTED - NO
IST1657I MAJOR NODE VTAMTOPO = IGNORE
IST314I END
```

Displaying a logical line in an XCA major node:

```
d net,id=ln1a2a
IST097I DISPLAY ACCEPTED
IST075I NAME = LN1A2A, TYPE = LINE
IST486I STATUS= NEVAC, DESIRED STATE= INACT
IST087I TYPE = SWITCHED DIAL-INOUT, CONTROL = SDLC, HPDT = *NA*
IST936I ANSWER MODE = RESET
IST134I GROUP = GP1A2A, MAJOR NODE = XCA1A
IST1500I STATE TRACE = OFF
IST1656I VTAMTOPO = REPORT, NODE REPORTED - YES
IST1657I MAJOR NODE VTAMTOPO = REPORT
IST314I END
```

Displaying XCF TRLE:

```

d net,id=istt1q2q,e
IST097I DISPLAY ACCEPTED
IST075I NAME = ISTT1Q2Q, TYPE = TRLE
IST1954I TRL MAJOR NODE = ISTTRL
IST486I STATUS= ACTIV, DESIRED STATE= ACTIV
IST087I TYPE = LEASED , CONTROL = XCF , HPDT = *NA*
IST1715I MPCLEVEL = HPDT MPCUSAGE = SHARE
IST1717I ULPID = ISTP1Q2Q ULP INTERFACE = *NA*
IST1503I XCF TOKEN = 0200001900120002 STATUS = ACTIVE
IST1502I ADJACENT CP = NETA.SSCP2A
IST1500I STATE TRACE = OFF
IST314I END

```

Displaying TCP TRLE:

```

d net,id=iutx0aa0
IST097I DISPLAY ACCEPTED
IST075I NAME = IUTX0AA0, TYPE = TRLE
IST1954I TRL MAJOR NODE = ISTTRL
IST486I STATUS= ACTIV, DESIRED STATE= ACTIV
IST087I TYPE = LEASED , CONTROL = TCP , HPDT = *NA*
IST1717I ULPID = TCPCS ULP INTERFACE = *NA*
IST1221I READ DEV = 0AA0 STATUS = ACTIVE STATE = N/A
IST1221I WRITE DEV = 0AA1 STATUS = ACTIVE STATE = N/A
IST1500I STATE TRACE = OFF
IST314I END

```

Displaying a 10GbE RoCE Express TRLE in a dedicated RoCE environment:

```

d net,id=iut10005
IST097I DISPLAY ACCEPTED
IST075I NAME = IUT10005, TYPE = TRLE
IST486I STATUS= ACTIV, DESIRED STATE= ACTIV
IST087I TYPE = *NA* , CONTROL = ROCE, HPDT = *NA*
IST1954I TRL MAJOR NODE = ISTTRL
IST2361I SMCR PFID = 0005 PCHID = 0500 PNETID = NETWORK3
IST2362I PORTNUM = 1 RNIC CODE LEVEL = 2.10.4750
IST2389I PFIP = 01000300
IST924I -----
IST1717I ULPID = TCPIP1 ULP INTERFACE = EZARIUT10005
IST1724I I/O TRACE = OFF TRACE LENGTH = *NA*
IST1500I STATE TRACE = OFF
IST1866I TRLE = IUT10005 INOPDUMP = ON
IST924I -----
IST1717I ULPID = TCPIP2 ULP INTERFACE = EZARIUT10005
IST1724I I/O TRACE = OFF TRACE LENGTH = *NA*
IST1500I STATE TRACE = OFF
IST1866I TRLE = IUT10005 INOPDUMP = ON
IST314I END

```

Displaying a 10GbE RoCE Express TRLE in a shared RoCE environment:

```

d net,id=iut10011
IST097I DISPLAY ACCEPTED
IST075I NAME = IUT10011, TYPE = TRLE
IST486I STATUS= ACTIV, DESIRED STATE= ACTIV
IST087I TYPE = *NA* , CONTROL = ROCE, HPDT = *NA*
IST1954I TRL MAJOR NODE = ISTTRL
IST2361I SMCR PFID = 0011 PCHID = 0140 PNETID = PNETID1
IST2362I PORTNUM = 1 RNIC CODE LEVEL = **NA**
IST2389I PFIP = 01000300
IST2417I VFN = 0001
IST924I -----
IST1717I ULPID = TCPIP2 ULP INTERFACE = EZARIUT10011
IST1724I I/O TRACE = OFF TRACE LENGTH = *NA*
IST1500I STATE TRACE = OFF
IST314I END

```

I

Displaying a switched major node:

```
d net,id=swxca1a,e
IST097I DISPLAY ACCEPTED
IST075I NAME = SWXCA1A, TYPE = SW SNA MAJ NODE
IST486I STATUS= ACTIV, DESIRED STATE= ACTIV
IST1656I VTAMTOPO = REPORT, NODE REPORTED - YES
IST084I NETWORK RESOURCES:
IST089I SW1A2A TYPE = PU_T2 , CONCT
IST089I SW1A7B TYPE = PU_T2 , CONCT
IST089I SW1A9C TYPE = PU_T2 , CONCT
IST089I SW1AAA TYPE = PU_T2 , CONCT
IST089I SW1ABA TYPE = PU_T2 , CONCT
IST089I SW1ACA TYPE = PU_T2 , CONCT
IST089I SW1ADA TYPE = PU_T2 , CONCT
IST089I SW1AEA TYPE = PU_T2 , CONCT
IST1500I STATE TRACE = OFF
IST314I END
```

Displaying a switched PU in this switched major node:

```
d net,id=sw1a2a
IST097I DISPLAY ACCEPTED
IST075I NAME = SW1A2A, TYPE = PU_T2
IST486I STATUS= CONCT, DESIRED STATE= CONCT
IST1043I CP NAME = SSCP2A, CP NETID = NETA, DYNAMIC LU = YES
IST1589I XNETALS = YES
IST2238I DISCNT = YES - FINAL USE = NOT FINAL
IST136I SWITCHED SNA MAJOR NODE = SWXCA1A
IST654I I/O TRACE = OFF, BUFFER TRACE = OFF
IST1500I STATE TRACE = OFF
IST1656I VTAMTOPO = NOREPORT, NODE REPORTED - YES
IST1657I MAJOR NODE VTAMTOPO = INCLUDE
IST314I END
```

Displaying a cross-subarea SDLC link:

```
d net,id=a04c08,scope=all
IST097I DISPLAY ACCEPTED
IST075I NAME = A04C08, TYPE = LINE
IST486I STATUS= NEVAC , DESIRED STATE= INACT
IST087I TYPE = LEASED , CONTROL = SDLC, HPDT = *NA*
IST134I GROUP = A04XCA0, MAJOR NODE = A0462ZC
IST396I LNKSTA STATUS CTG GTG ADJNODE ADJSA NETID ADJLS
IST397I A04P08A NEVAC 1 1 0
IST314I END
```

Displaying a cross-subarea channel link:

```
d net,id=012-l,scope=all
IST097I DISPLAY ACCEPTED
IST075I NAME = 012-L, TYPE = LINE
IST486I STATUS= ACTIV----I , DESIRED STATE = ACTIV
IST087I TYPE = LEASED , CONTROL = NCP , HPDT = *NA*
IST134I GROUP = ISTGROUP, MAJOR NODE = A99MPU
IST396I LNKSTA STATUS CTG GTG ADJNODE ADJSA NETID ADJLS
IST397I 012-S ACTIV----I 1 1 A03N43A 3
IST314I END
```

Displaying a cross-subarea channel link station:

```
d net,id=012-s,scope=all
IST097I DISPLAY ACCEPTED
IST075I NAME = 012-S, TYPE = LINK STATION
IST486I STATUS= ACTIV----I , DESIRED STATE = ACTIV
IST081I LINE NAME = 012-L, LINE GROUP = ISTGROUP, MAJNOD = A99MPU
```

```

IST396I LNKSTA      STATUS      CTG GTG ADJNODE  ADJSA  NETID  ADJLS
IST397I 012-S      ACTIV----I   1   1 A03N43A      3
IST610I                                     LINE 012-L   - STATUS ACTIV----I
IST314I END

```

Displaying a cross-subarea SDLC link station:

```

d net,id=a03p644,scope=all
IST097I DISPLAY ACCEPTED
IST075I NAME = A03P644, TYPE = LINK STATION
IST486I STATUS= NEVAC           , DESIRED STATE = INACT
IST081I LINE NAME = A03IN64, LINE GROUP = A03MPRI, MAJNOD = A03N43A
IST396I LNKSTA      STATUS      CTG GTG ADJNODE  ADJSA  NETID  ADJLS
IST397I A03P644    NEVAC          2   2           0
IST610I                                     LINE A03IN64 - STATUS NEVAC
IST314I END

```

Displaying a cross-subarea XCA link station with ALLOWACT=YES coded:

```

d net,id=pu1a12,e
IST097I DISPLAY ACCEPTED
IST075I NAME = PU1A12, TYPE = LINK STATION
IST486I STATUS= ACTIV--W-E, DESIRED STATE= ACTIV
IST081I LINE NAME = LN1A12, LINE GROUP = GP1AS, MAJNOD = XCA1A
IST1500I STATE TRACE = OFF
IST1656I VTAMTOPO = REPORT, NODE REPORTED - YES
IST1657I MAJOR NODE VTAMTOPO = REPORT
IST396I LNKSTA      STATUS      CTG GTG ADJNODE  ADJSA  NETID  ADJLS
IST397I PU1A12    ACTIV--W-E   1   1   NCP12    12    NETA   PU121A
IST610I                                     LINE LN1A12 - STATUS ACTIV----E
IST314I END

```

Displaying a physical unit:

```

d net,id=a03p011,scope=all
IST097I DISPLAY ACCEPTED
IST075I NAME = A03P011, TYPE = PU T2.1
IST486I STATUS= ACTIV           , DESIRED STATE = ACTIV
IST2238I DISCNT = NO - FINAL USE = *NA*
IST081I LINE NAME = A03IN01, LINE GROUP = A03MPRI, MAJNOD = A03N43A
IST654I I/O TRACE = OFF, BUFFER TRACE = OFF
IST355I LOGICAL UNITS:
IST080I A03L011A NEVAC          A03L011B NEVAC          A03L011C NEVAC
IST080I A03L011D NEVAC          A03L011E NEVAC          A03L011F NEVAC
IST080I A03L011G NEVAC          A03L011H NEVAC          A03L011I NEVAC
IST080I A03L011J NEVAC          A03L011K NEVAC          A03L011L NEVAC
IST080I A03L011M NEVAC          A03L011N NEVAC          A03L011O NEVAC
IST314I END

```

Displaying a physical unit with APPN host-to-host connectivity:

```

d net,id=ahhcpu1
IST097I DISPLAY ACCEPTED
IST075I NAME = AHHCPU1, TYPE = PU T2.1
IST486I STATUS= ACTIV, DESIRED STATE= ACTIV
IST1043I CP NAME = SSCP2A, CP NETID = NETA, DYNAMIC LU = YES
IST1589I XNETALS = YES
IST2238I DISCNT = YES - FINAL USE = FINAL
IST1105I RESOURCE STATUS TGN CP-CP TG CHARACTERISTICS
IST1106I AHHCPU1 AC/R    21 YES  988D000000000000000014C00808080
IST1482I HPR = RTP - OVERRIDE = N/A - CONNECTION = YES
IST1510I LLERP = REQUIRED - RECEIVED = REQUIRED
IST136I LOCAL SNA MAJOR NODE = LSAHHC1
IST654I I/O TRACE = OFF, BUFFER TRACE = OFF
IST1500I STATE TRACE = OFF
IST1314I TRLE = TRLE1A      STATUS = ACTIV          CONTROL = MPC
IST314I END

```

DISPLAY ID

Displaying a physical unit with DLUR support:

```
d net,id=aa1pua,scope=all
IST097I DISPLAY ACCEPTED
IST075I NAME = AA1PUA, TYPE = PU_T2
IST486I STATUS= ACTIV      , DESIRED STATE= ACTIV
IST1043I CP NAME = ***NA***, CP NETID = NETA, DYNAMIC LU = YES
IST1589I XNETALS = NO
IST2238I DISCNT = YES - FINAL USE = NOT FINAL
IST1354I DLUR NAME = NNCPA1      MAJNODE = SWDLR1A
IST136I SWITCHED SNA MAJOR NODE = SWDLR1A
IST654I I/O TRACE = OFF, BUFFER TRACE = OFF
IST355I LOGICAL UNITS:
IST080I AA1LUA1  ACT/S      AA1LUA2  ACTIV      AA1LUA3  ACTIV
IST080I AA1LUA4  ACTIV
IST314I END
```

Displaying a Rapid Transport Protocol (RTP) physical unit:

```
d net,id=cnr00004
IST097I DISPLAY ACCEPTED
IST075I NAME = CNR00004, TYPE = PU_T2.1
IST486I STATUS= ACTIV--LX-, DESIRED STATE= ACTIV
IST1043I CP NAME = SSCP2A, CP NETID = NETA, DYNAMIC LU = YES
IST1589I XNETALS = YES
IST2238I DISCNT = DELAY - FINAL USE = FINAL
IST1392I DISCNTIM = 00010 DEFINED AT PU FOR DISCONNECT
IST2178I RPNCB ADDRESS = 126FCA18
IST1963I APPNCOS = #INTER - PRIORITY = HIGH
IST1476I TCID X'1239C4D900000014' - REMOTE TCID X'1239D9D700000016'
IST1481I DESTINATION CP NETA.SSCP2A - NCE X'D000000000000000'
IST1587I ORIGIN NCE X'D000000000000000'
IST1966I ACTIVATED AS ACTIVE ON 05/30/03 AT 09:40:30
IST2237I CNR00004 CURRENTLY REPRESENTS A LIMITED RESOURCE
IST1477I ALLOWED DATA FLOW RATE = 355 KBITS/SEC
IST1516I INITIAL DATA FLOW RATE = 1600 KBITS/SEC
IST1841I ACTUAL DATA FLOW RATE = 85 KBITS/SEC
IST1511I MAXIMUM NETWORK LAYER PACKET SIZE = 16410 BYTES
IST1478I NUMBER OF UNACKNOWLEDGED BUFFERS = 0
IST1479I RTP CONNECTION STATE = CONNECTED - MNPS = NO
IST1959I DATA FLOW STATE: NORMAL
IST1855I NUMBER OF SESSIONS USING RTP = 372
IST1697I RTP PACING ALGORITHM = ARB RESPONSIVE MODE
IST1480I RTP END TO END ROUTE - RSCV PATH
IST1460I TGN  CPNAME      TG TYPE      HPR
IST1461I 21  NETA.SSCP2A  APPN          RTP
IST875I ALSNAME TOWARDS RTP = AHHCPU1
IST1738I ANR LABEL      TP          ER NUMBER
IST1739I 8001000A00000000  *NA*      *NA*
IST231I RTP MAJOR NODE = ISTRTPMN
IST654I I/O TRACE = OFF, BUFFER TRACE = OFF
IST1500I STATE TRACE = ON, OPTION = PU
IST314I END
```

Tip: The REMOTE TCID shown on message IST1476I can be used to correlate a local RTP PU name to the RTP PU name used by the remote (VTAM) partner RTP node (shown on the IST1481I message) to represent the same RTP connection. To determine the RTP PU name used by the remote (VTAM) partner RTP node, first issue the above command on the local node and remember the REMOTE TCID value from the IST1476I message. Then issue the DISPLAY RTPS,TCID=tcid command on the remote (VTAM) partner RTP node using the REMOTE TCID value from the prior display.

Displaying a Rapid Transport Protocol (RTP) physical unit with additional diagnostic information:


```

D NET,ID=CNR00004,HPRDIAG=YES
IST097I DISPLAY ACCEPTED
IST075I NAME = CNR00004, TYPE = PU T2.1
IST486I STATUS= ACTIV--LX-, DESIRED STATE= ACTIV
IST224I HPRDIAG DISPLAY ISSUED ON 10/14/08 AT 09:42:17
IST104I CP NAME = SSCP2A - CP NETID = NETA - DYNAMIC LU = YES
IST158I XNETALS = YES
IST223I DISCNT = DELAY - FINAL USE = FINAL
IST139I DISCNTIM = 00010 DEFINED AT PU FOR DISCONNECT
IST231I RTP MAJOR NODE = ISTRTPMN
IST654I I/O TRACE = OFF, BUFFER TRACE = OFF
IST150I STATE TRACE = OFF
IST217I RPNCB ADDRESS 06639018
IST196I APPNCOS = #INTER - PRIORITY = HIGH
IST147I TCID X'246F137A0001000E' - REMOTE TCID X'246F178B0001000E'
IST148I DESTINATION CP NETA.SSCP2A - NCE X'D000000000000000'
IST158I ORIGIN NCE X'D000000000000000'
IST196I ACTIVATED AS ACTIVE ON 10/14/08 AT 09:34:22
IST147I RTP CONNECTION STATE = CONNECTED - MNPS = NO
IST195I DATA FLOW STATE = NORMAL
IST185I NUMBER OF SESSIONS USING RTP = 10
IST148I RTP END TO END ROUTE - RSCV PATH
IST146I TGN CPNAME TG TYPE HPR
IST146I 21 NETA.SSCP2A APPN RTP
IST875I ALSNAME TOWARDS RTP = AHHCPU1
IST173I ANR LABEL TP ER NUMBER
IST173I 8001000A00000000 *NA* *NA*
IST924I -----
IST196I ARB INFORMATION:
IST184I ARB MODE = GREEN
IST169I RTP PACING ALGORITHM = ARB RESPONSIVE MODE
IST147I ALLOWED DATA FLOW RATE = 1600 KBITS/SEC
IST151I INITIAL DATA FLOW RATE = 1600 KBITS/SEC
IST184I ACTUAL DATA FLOW RATE = 146 KBITS/SEC
IST196I MAXIMUM ACTUAL DATA FLOW RATE = 164 KBITS/SEC
IST186I ARB MAXIMUM SEND RATE = 32 MBITS/SEC
IST184I CURRENT RECEIVER THRESHOLD = 36850 MICROSECONDS
IST184I MAXIMUM RECEIVER THRESHOLD = 37000 MICROSECONDS
IST184I MINIMUM RECEIVER THRESHOLD = 17000 MICROSECONDS
IST197I RATE REDUCTIONS DUE TO RETRANSMISSIONS = 0
IST924I -----
IST197I TIMER INFORMATION:
IST185I LIVENESS TIMER = 180 SECONDS
IST185I SMOOTHED ROUND TRIP TIME = 9 MILLISECONDS
IST197I SHORT REQUEST TIMER = 250 MILLISECONDS
IST222I REFIFO TIMER = 68 MILLISECONDS
IST924I -----
IST197I OUTBOUND TRANSMISSION INFORMATION:
IST197I NUMBER OF NLPS SENT = 173104 ( 173K )
IST197I TOTAL BYTES SENT = 16055969 ( 16M )
IST184I LARGEST NLP SENT = 140 BYTES
IST198I SEQUENCE NUMBER = 8265162 (X'007E1DCA')
IST184I NUMBER OF NLPS RETRANSMITTED = 0
IST224I NLP RETRANSMIT RATE = 0.0000%
IST197I BYTES RETRANSMITTED = 0 ( 0K )
IST147I NUMBER OF UNACKNOWLEDGED BUFFERS = 1
IST195I NUMBER OF ORPHANED BUFFERS = 0
IST184I NUMBER OF NLPS ON WAITING-TO-SEND QUEUE = 0
IST184I NUMBER OF NLPS ON WAITING-FOR-ACKNOWLEDGEMENT QUEUE = 1
IST226I NUMBER OF BYTES ON WAITING-FOR-ACK QUEUE = 15
IST197I MAXIMUM NUMBER OF NLPS ON WAITING-FOR-ACK QUEUE = 19
IST226I MAXIMUM NUMBER OF BYTES ON WAITING-FOR-ACK QUEUE = 879
IST197I WAITING-FOR-ACK QUEUE MAX REACHED ON 10/14/08 AT 09:34:22
IST208I NUMBER OF NLPS ON OUTBOUND WORK QUEUE = 0
IST208I MAXIMUM NUMBER OF NLPS ON OUTBOUND WORK QUEUE = 20
IST208I OUTBOUND WORK QUEUE MAX REACHED ON 10/14/08 AT 09:34:22
IST151I MAXIMUM NETWORK LAYER PACKET SIZE = 16410 BYTES

```

DISPLAY ID

```
IST924I -----
IST1979I INBOUND TRANSMISSION INFORMATION:
IST2059I NUMBER OF NLPS RECEIVED = 184391 ( 184K )
IST1981I TOTAL BYTES RECEIVED = 16696275 ( 16M )
IST1850I LARGEST NLP RECEIVED = 104 BYTES
IST1980I SEQUENCE NUMBER = 8480224 (X'008165E0')
IST1853I NUMBER OF NLPS ON OUT-OF-SEQUENCE QUEUE = 0
IST2230I MAXIMUM NUMBER OF NLPS ON OUT-OF-SEQUENCE QUEUE = 0
IST1854I NUMBER OF NLPS ON INBOUND SEGMENTS QUEUE = 0
IST1982I NUMBER OF NLPS ON INBOUND WORK QUEUE = 0
IST1983I MAXIMUM NUMBER OF NLPS ON INBOUND WORK QUEUE = 27
IST924I -----
IST1984I PATH SWITCH INFORMATION:
IST2271I PATH SWITCH DELAY = 0
IST1856I LAST PATH SWITCH OCCURRENCE WAS ON 10/14/08 AT 09:34:59
IST1937I PATH SWITCH REASON: INITIATED BY REMOTE PARTNER
IST1985I PATH SWITCHES INITIATED FROM REMOTE RTP = 1
IST1986I PATH SWITCHES INITIATED FROM LOCAL RTP = 0
IST1987I PATH SWITCHES DUE TO LOCAL FAILURE = 0
IST1988I PATH SWITCHES DUE TO LOCAL PSRETRY = 0
IST924I -----
IST1857I BACKPRESSURE REASON COUNTS:
IST1858I PATHSWITCH SEND QUEUE MAX STORAGE FAILURE STALLED PIPE
IST2205I -----
IST1859I          0          0          0          0
IST2211I ACK QUEUE MAX
IST2205I -----
IST2212I          0
IST924I -----
IST2250I ALL DIAGNOSTIC COUNTERS CLEARED ON 10/14/08 AT 09:34:22
IST314I END
```

Displaying a Rapid Transport Protocol (RTP) physical unit with the diagnostic information and clearing the diagnostic counters:

```
D NET,ID=CNR00004,HPRDIAG=YES,CLEAR=ALL
IST097I DISPLAY ACCEPTED
IST075I NAME = CNR00004, TYPE = PU_T2.1
IST486I STATUS= ACTIV--LX-, DESIRED STATE= ACTIV
IST2244I HPRDIAG DISPLAY ISSUED ON 10/14/08 AT 09:43:53
IST1043I CP NAME = SSCP2A - CP NETID = NETA - DYNAMIC LU = YES
IST1589I XNETALS = YES
IST2238I DISCNT = DELAY - FINAL USE = FINAL
IST1392I DISCNTIM = 00010 DEFINED AT PU FOR DISCONNECT
IST231I RTP MAJOR NODE = ISTRTPMN
IST654I I/O TRACE = OFF, BUFFER TRACE = OFF
IST1500I STATE TRACE = OFF
IST2178I RPNCB ADDRESS 06639018
IST1963I APPNCOS = #INTER - PRIORITY = HIGH
IST1476I TCID X'246F137A0001000E' - REMOTE TCID X'246F178B0001000E'
IST1481I DESTINATION CP NETA.SSCP2A - NCE X'D000000000000000'
IST1587I ORIGIN NCE X'D000000000000000'
IST1966I ACTIVATED AS ACTIVE ON 10/14/08 AT 09:34:21
IST1479I RTP CONNECTION STATE = CONNECTED - MNPS = NO
IST1959I DATA FLOW STATE = NORMAL
IST1855I NUMBER OF SESSIONS USING RTP = 10
IST1480I RTP END TO END ROUTE - RSCV PATH
IST1460I TGN CPNAME TG TYPE HPR
IST1461I 21 NETA.SSCP2A APPN RTP
IST875I ALSNAME TOWARDS RTP = AHHCPU1
IST1738I ANR LABEL TP ER NUMBER
IST1739I 8001000A00000000 *NA* *NA*
IST924I -----
IST1968I ARB INFORMATION:
IST1844I ARB MODE = GREEN
IST1697I RTP PACING ALGORITHM = ARB RESPONSIVE MODE
IST1477I ALLOWED DATA FLOW RATE = 1600 KBITS/SEC
```

```

IST1516I INITIAL DATA FLOW RATE = 1600 KBITS/SEC
IST1841I ACTUAL DATA FLOW RATE = 148 KBITS/SEC
IST1969I MAXIMUM ACTUAL DATA FLOW RATE = 164 KBITS/SEC
IST1862I ARB MAXIMUM SEND RATE = 32 MBITS/SEC
IST1846I CURRENT RECEIVER THRESHOLD = 36850 MICROSECONDS
IST1846I MAXIMUM RECEIVER THRESHOLD = 37000 MICROSECONDS
IST1846I MINIMUM RECEIVER THRESHOLD = 17000 MICROSECONDS
IST1970I RATE REDUCTIONS DUE TO RETRANSMISSIONS = 0
IST924I -----
IST1971I TIMER INFORMATION:
IST1852I LIVENESS TIMER = 180 SECONDS
IST1851I SMOOTHED ROUND TRIP TIME = 9 MILLISECONDS
IST1972I SHORT REQUEST TIMER = 250 MILLISECONDS
IST2229I REFIFO TIMER = 68 MILLISECONDS
IST924I -----
IST1973I OUTBOUND TRANSMISSION INFORMATION:
IST1974I NUMBER OF NLPS SENT = 210394 ( 210K )
IST1975I TOTAL BYTES SENT = 19553353 ( 19M )
IST1849I LARGEST NLP SENT = 140 BYTES
IST1980I SEQUENCE NUMBER = 10044954 (X'0099461A')
IST1842I NUMBER OF NLPS RETRANSMITTED = 0
IST2249I NLP RETRANSMIT RATE = 0.0000%
IST1976I BYTES RETRANSMITTED = 0 ( 0K )
IST1478I NUMBER OF UNACKNOWLEDGED BUFFERS = 1
IST1958I NUMBER OF ORPHANED BUFFERS = 0
IST1843I NUMBER OF NLPS ON WAITING-TO-SEND QUEUE = 0
IST1847I NUMBER OF NLPS ON WAITING-FOR-ACKNOWLEDGEMENT QUEUE = 1
IST2268I NUMBER OF BYTES ON WAITING-FOR-ACK QUEUE = 15
IST1977I MAXIMUM NUMBER OF NLPS ON WAITING-FOR-ACK QUEUE = 19
IST2269I MAXIMUM NUMBER OF BYTES ON WAITING-FOR-ACK QUEUE = 879
IST1978I WAITING-FOR-ACK QUEUE MAX REACHED ON 10/14/08 AT 09:34:21
IST2085I NUMBER OF NLPS ON OUTBOUND WORK QUEUE = 0
IST2086I MAXIMUM NUMBER OF NLPS ON OUTBOUND WORK QUEUE = 20
IST2087I OUTBOUND WORK QUEUE MAX REACHED ON 10/14/08 AT 09:34:21
IST1511I MAXIMUM NETWORK LAYER PACKET SIZE = 16410 BYTES
IST924I -----
IST1979I INBOUND TRANSMISSION INFORMATION:
IST2059I NUMBER OF NLPS RECEIVED = 224100 ( 224K )
IST1981I TOTAL BYTES RECEIVED = 20319156 ( 20M )
IST1850I LARGEST NLP RECEIVED = 104 BYTES
IST1980I SEQUENCE NUMBER = 10306550 (X'009D43F6')
IST1853I NUMBER OF NLPS ON OUT-OF-SEQUENCE QUEUE = 0
IST2230I MAXIMUM NUMBER OF NLPS ON OUT-OF-SEQUENCE QUEUE = 0
IST1854I NUMBER OF NLPS ON INBOUND SEGMENTS QUEUE = 0
IST1982I NUMBER OF NLPS ON INBOUND WORK QUEUE = 0
IST1983I MAXIMUM NUMBER OF NLPS ON INBOUND WORK QUEUE = 27
IST924I -----
IST1984I PATH SWITCH INFORMATION:
IST2271I PATH SWITCH DELAY = 0
IST1856I LAST PATH SWITCH OCCURRENCE WAS ON 10/14/08 AT 09:34:59
IST1937I PATH SWITCH REASON: INITIATED BY REMOTE PARTNER
IST1985I PATH SWITCHES INITIATED FROM REMOTE RTP = 1
IST1986I PATH SWITCHES INITIATED FROM LOCAL RTP = 0
IST1987I PATH SWITCHES DUE TO LOCAL FAILURE = 0
IST1988I PATH SWITCHES DUE TO LOCAL PSRETRY = 0
IST924I -----
IST1857I BACKPRESSURE REASON COUNTS:
IST1858I PATHSWITCH SEND QUEUE MAX STORAGE FAILURE STALLED PIPE
IST2205I -----
IST1859I          0          0          0          0
IST2211I ACK QUEUE MAX
IST2205I -----
IST2212I          0
IST924I -----
IST2250I ALL DIAGNOSTIC COUNTERS CLEARED ON 10/14/08 AT 09:34:21
IST2248I ALL DIAGNOSTIC COUNTERS CLEARED FOR 1 RTP PIPES
IST314I END

```

DISPLAY ID

Displaying an HPR-capable PU:

```
d net,id=ahhcpu1
IST097I DISPLAY ACCEPTED
IST075I NAME = AHHCPU1, TYPE = PU_T2.1
IST486I STATUS= ACTIV, DESIRED STATE= ACTIV
IST1043I CP NAME = SSCP2A, CP NETID = NETA, DYNAMIC LU = YES
IST1589I XNETALS = YES
IST2238I DISCNT = YES - FINAL USE = NOT FINAL
IST1105I RESOURCE STATUS TGN CP-CP TG CHARACTERISTICS
IST1106I AHHCPU1 AC/R 21 YES 988D000000000000000014C00808080
IST1482I HPR = RTP - OVERRIDE = N/A - CONNECTION = YES
IST1510I LLERP = REQUIRED - RECEIVED = REQUIRED
IST136I LOCAL SNA MAJOR NODE = LSAHHC1
IST654I I/O TRACE = OFF, BUFFER TRACE = OFF
IST1500I STATE TRACE = OFF
IST1314I TRLE = TRLE1A STATUS = ACTIV CONTROL = MPC
IST314I END
```

Displaying a switched link station:

```
d net,id=swpux2a1,e
IST097I DISPLAY ACCEPTED
IST075I NAME = SWPUX2A1, TYPE = PU_T2.1
IST486I STATUS= ACTIV, DESIRED STATE= ACTIV
IST1043I CP NAME = SSCP2A, CP NETID = NETA, DYNAMIC LU = YES
IST1589I XNETALS = YES
IST2238I DISCNT = DELAY - FINAL USE = NOT FINAL
IST1392I DISCNTIM = 00010 DEFINED AT PU FOR DISCONNECT
IST1105I RESOURCE STATUS TGN CP-CP TG CHARACTERISTICS
IST1106I SWPUX2A1 AC/R 22 YES 982D000000000000000017100808080
IST1482I HPR = NONE - OVERRIDE = N/A - CONNECTION = NO
IST136I SWITCHED SNA MAJOR NODE = SWND3AB8
IST081I LINE NAME = LN3AXN11, LINE GROUP = GP3AXN10, MAJNOD = NCP3AB8
IST1068I PHYSICAL RESOURCE (PHYSRSC) = P3AXN10
IST654I I/O TRACE = OFF, BUFFER TRACE = OFF
IST1500I STATE TRACE = OFF
IST1656I VTAMTOPO = NOREPORT, NODE REPORTED - YES
IST1657I MAJOR NODE VTAMTOPO = INCLUDE
IST172I NO LOGICAL UNITS EXIST
IST314I END
```

Displaying a switched PU type 2:

```
d net,id=a04p501,scope=all
IST097I DISPLAY ACCEPTED
IST075I NAME = A04P501, TYPE = PU_T2
IST486I STATUS= CONCT, DESIRED STATE = CONCT
IST2238I DISCNT = YES - FINAL USE = NOT FINAL
IST136I SWITCHED SNA MAJOR NODE = A04SG1
IST1934I IDBLK = 002 IDNUM = 02345
IST654I I/O TRACE = OFF, BUFFER TRACE = OFF
IST1656I VTAMTOPO = REPORT, NODE REPORTED - YES
IST1657I MAJOR NODE VTAMTOPO = INCLUDE
IST355I LOGICAL UNITS:
IST080I A04L501A CONCT A04L501B CONCT A04L501C CONCT
IST080I A04L501D CONCT A04L501E CONCT A04L501F CONCT
IST080I A04L501G CONCT A04L501H CONCT A04L501I CONCT
IST080I A04L501J CONCT A04L501K CONCT A04L501L CONCT
IST080I A04L501M CONCT A04L501N CONCT A04L501O CONCT
IST314I END
```

Displaying a switched PU type 2.1 (LAN capable):

```
D NET,ID=SOE10302,scope=all
IST097I DISPLAY ACCEPTED
IST075I NAME = SOE10302, TYPE = PU_T2.1
IST486I STATUS= ACTIV--LX-, DESIRED STATE= ACTIV
```

```

IST1058I MODEL LU GROUP = LUGR      , LUSEED =
IST1043I CP NAME = SOE10301, CP NETID = GBSOEL00, DYNAMIC LU = YES
IST1589I XNETALS = YES
IST2238I DISCNT = NO - FINAL USE = *NA*
IST1105I RESOURCE STATUS TGN CP-CP TG CHARACTERISTICS
IST1106I SOE10302 AC/R      21 YES  9875000000000000000014C00808080
IST1482I HPR = NONE - OVERRIDE = N/A - CONNECTION = NO
IST956I PU   SAP=  4 MAC=000524E10156 MAXDATA= 1437
IST1935I RIF = 0AB00011910100210050
IST136I SWITCHED SNA MAJOR NODE = ISTDSWMN
IST081I LINE NAME = L530217D, LINE GROUP = G5302      , MAJNOD = SOE53F02
IST654I I/O TRACE = OFF, BUFFER TRACE = OFF
IST1500I STATE TRACE = OFF
IST1656I VTAMTOPO = REPORT      , NODE REPORTED - YES
IST1657I MAJOR NODE VTAMTOPO = REPORT
IST355I LOGICAL UNITS:
IST080I SOE1030I ACTIV---X- SOE1030J ACTIV---X- SOE1030K ACTIV---X-
IST314I END

```

Displaying a switched PU type 2.1 (AS/400®):

```

d net,id=a04p882,scope=all
IST097I DISPLAY ACCEPTED
IST075I NAME = A04P882, TYPE = PU_T2.1
IST486I STATUS= ACTIV--L-- , DESIRED STATE= ACTIV
IST1043I CP NAME = A04P882A, CP NETID = NETY, DYNAMIC LU = YES
IST1589I XNETALS = YES
IST2238I DISCNT = NO - FINAL USE = *NA*
IST1105I RESOURCE STATUS TGN CP-CP TG CHARACTERISTICS
IST1106I A04P882 AC/R      21 YES  802D000000000000000000171000000000
IST136I SWITCHED SNA MAJOR NODE = A04SMNC
IST081I LINE NAME = J000401B, LINE GROUP = A04BLG1, MAJNOD = A0462ZC
IST654I I/O TRACE = OFF, BUFFER TRACE = OFF
IST355I LOGICAL UNITS:
IST080I A04I8823 ACT/S          A04I8822 ACT/S          A04P882A ACT/S----Y
IST080I A04I8821 ACT/S
IST314I END

```

Displaying a local SNA physical unit:

```

d net,id=pua,scope=all
IST097I DISPLAY ACCEPTED
IST075I NAME = PUA, TYPE = PU_T2
IST486I STATUS = ACTIV      , DESIRED STATE= ACTIV
IST2238I DISCNT = YES - FINAL USE = FINAL
IST136I LOCAL      SNA MAJOR NODE = A50LSNA
IST077I SIO = *NA* CUA = 0770
IST654I I/O TRACE = OFF, BUFFER TRACE = OFF
IST355I LOGICAL UNITS:
IST080I LSNALU1  ACTIV      LSNALU2  ACTIV      LSNALU3  ACTIV
IST080I LSNALU4  ACTIV
IST314I END

```

Displaying a dynamic XCF local SNA physical unit:

```

d net,id=istp0001,scope=all
IST097I DISPLAY ACCEPTED
IST075I NAME = ISTP0001, TYPE = PU_T2.1
IST486I STATUS= ACTIV--LX-, DESIRED STATE= ACTIV
IST1043I CP NAME = SSCP2A, CP NETID = NETA, DYNAMIC LU = YES
IST1589I XNETALS = YES
IST2238I DISCNT = NO - FINAL USE = *NA*
IST1105I RESOURCE STATUS TGN CP-CP TG CHARACTERISTICS
IST1106I ISTP0001 AC/R      21 YES  988D00000000000000000014C00808080
IST1482I HPR = NONE - OVERRIDE = N/A - CONNECTION = NO
IST136I LOCAL SNA MAJOR NODE = ISTLSXCF
IST654I I/O TRACE = OFF, BUFFER TRACE = OFF
IST1500I STATE TRACE = OFF

```

DISPLAY ID

```
IST1314I TRLE = ISTT0001 STATUS = ACTIV----E CONTROL = XCF
IST355I LOGICAL UNITS:
IST080I SSCP2A ACT/S----Y
IST314I END
```

Displaying a dynamic XCF local SNA physical unit, specifying the control point name:

```
d net,id=sscp2a,idtype=xcfc
IST097I DISPLAY ACCEPTED
IST075I NAME = ISTD0001, TYPE = PU_T2.1
IST486I STATUS= ACTIV--LX-, DESIRED STATE= ACTIV
IST1043I CP NAME = SSCP2A, CP NETID = NETA, DYNAMIC LU = YES
IST1589I XNETALS = YES
IST2238I DISCNT = YES - FINAL USE = NOT FINAL
IST1105I RESOURCE STATUS TGN CP-CP TG CHARACTERISTICS
IST1106I ISTD0001 AC/R 21 YES 988D000000000000000014C00808080
IST1482I HPR = NONE - OVERRIDE = N/A - CONNECTION = NO
IST136I LOCAL SNA MAJOR NODE = ISTLSXCF
IST654I I/O TRACE = OFF, BUFFER TRACE = OFF
IST1500I STATE TRACE = OFF
IST1314I TRLE = ISTT0001 STATUS = ACTIV----E CONTROL = XCF
IST314I END
```

Displaying a logical unit under an NCP:

```
d net,id=a04dxxx1,scope=all
IST097I DISPLAY ACCEPTED
IST075I NAME = NETA.A04DXXX1, TYPE = LOGICAL UNIT
IST486I STATUS= NEVAC----T, DESIRED STATE= INACT
IST1447I REGISTRATION TYPE = CDSERVR
IST977I MDLTAB=***NA*** ASLTAB=***NA***
IST861I MODETAB=***NA*** USSTAB=***NA*** LOGTAB=***NA***
IST934I DLOGMOD=***NA*** USS LANGTAB=***NA***
IST597I CAPABILITY-PLU INHIBITED,SLU INHIBITED,SESSION LIMIT 00000001
IST081I LINE NAME = A04VXX, LINE GROUP = A04XNPAX, MAJNOD = A0462ZC
IST135I PHYSICAL UNIT = A04NXXX
IST082I DEVTYPE = LU
IST654I I/O TRACE = OFF, BUFFER TRACE = OFF
IST171I ACTIVE SESSIONS = 0000000000, SESSION REQUESTS = 0000000000
IST172I NO SESSIONS EXIST
IST314I END
```

Displaying a switched logical unit:

```
d net,id=a31d0711,scope=all
IST097I DISPLAY ACCEPTED
IST075I NAME = A31D0711, TYPE = LOGICAL UNIT
IST486I STATUS= NEVAC, DESIRED STATE= INACT
IST1447I REGISTRATION TYPE = CDSERVR
IST977I MDLTAB=***NA*** ASLTAB=***NA***
IST861I MODETAB=CRYPTLOG USSTAB=AUSSTAB LOGTAB=INTERP
IST934I DLOGMOD=REQENCRP USS LANGTAB=***NA***
IST597I CAPABILITY-PLU INHIBITED,SLU INHIBITED,SESSION LIMIT 00000001
IST136I SWITCHED SNA MAJOR NODE = SMNDDNN
IST135I PHYSICAL UNIT = A31P021
IST082I DEVTYPE = LU
IST654I I/O TRACE = OFF, BUFFER TRACE = OFF
IST1936I LOCADDR = 003
IST171I ACTIVE SESSIONS = 0000000000, SESSION REQUESTS = 0000000000
IST172I NO SESSIONS EXIST
IST314I END
```

Displaying a local SNA logical unit:

```
d net,id=lsnalu1,scope=all
IST097I DISPLAY ACCEPTED
IST075I NAME = NETA.LSNALU1, TYPE = LOGICAL UNIT
```

```

IST486I STATUS= ACTIV      , DESIRED STATE= ACTIV
IST1447I REGISTRATION TYPE = CDSERVR
IST977I MDLTAB=***NA*** ASLTAB=***NA***
IST861I MODETAB=AMODETAB USSTAB=AUSSTAB LOGTAB=***NA***
IST934I DLOGMOD=D4A32782 USS LANGTAB=***NA***
IST597I CAPABILITY-PLU INHIBITED,SLU INHIBITED,SESSION LIMIT 00000001
IST136I LOCAL      SNA MAJOR NODE = A50LSNA
IST135I PHYSICAL UNIT = PUA , CUA = 0770
IST082I DEVTYPE = LU
IST654I I/O TRACE = OFF, BUFFER TRACE = OFF
IST1936I LOCADDR = 003
IST171I ACTIVE SESSIONS = 0000000000, SESSION REQUESTS = 0000000000
IST172I NO SESSIONS EXIST
IST314I END

```

Displaying a local non-SNA logical unit:

```

d net,id=a50a721,scope=all
IST097I DISPLAY ACCEPTED
IST075I NAME = NETA.A50A721, TYPE = LOGICAL UNIT
IST486I STATUS= ACT/S      , DESIRED STATE= ACTIV
IST1447I REGISTRATION TYPE = CDSERVR
IST977I MDLTAB=***NA*** ASLTAB=***NA***
IST861I MODETAB=AMODETAB USSTAB=AUSSTAB LOGTAB=INTERP
IST934I DLOGMOD=M23270I USS LANGTAB=***NA***
IST597I CAPABILITY-PLU INHIBITED,SLU ENABLED ,SESSION LIMIT 00000001
IST351I LOCAL 3270 MAJOR NODE = A50LOCAL
IST077I SIO = 00010 CUA = 0721
IST1131I DEVICE = LU
IST654I I/O TRACE = OFF, BUFFER TRACE = OFF
IST171I ACTIVE SESSIONS = 0000000001, SESSION REQUESTS = 0000000001
IST206I SESSIONS:
IST634I NAME      STATUS      SID      SEND RECV VR TP NETID
IST635I ECHOC1C   ACTIV-P     D73BC0750F6AE8F3 0000 0001 0 0 NETC
IST635I ECH050B   PREALC-P    ECC39EEE2AA3BC6E      NETA
IST314I END

```

Displaying a native ATM permanent virtual channel (PVC):

```

d net,id=lnp1a2a1,scope=all
IST097I DISPLAY ACCEPTED
IST075I NAME = LNP1A2A1, TYPE = LINE
IST486I STATUS= ACTIV, DESIRED STATE= ACTIV
IST087I TYPE = LEASED      , CONTROL = SDLC, HPDT = *NA*
IST1554I PVCNAME = PV11211
IST134I GROUP = GPP1A1, MAJOR NODE = XCAOSA1A
IST1500I STATE TRACE = OFF
IST084I NETWORK RESOURCES:
IST089I PP1A2A1  TYPE = PU_T2.1      , ACTIV
IST314I END

```

Displaying a remote node connected through a native ATM PVC:

```

d net,id=pp1a2a1,scope=all
IST097I DISPLAY ACCEPTED
IST075I NAME = PP1A2A1, TYPE = PU_T2.1
IST486I STATUS= ACTIV, DESIRED STATE= ACTIV
IST1043I CP NAME = SSCP2A, CP NETID = NETA, DYNAMIC LU = YES
IST1589I XNETALS = YES
IST2238I DISCNT = NO - FINAL USE = *NA*
IST1105I RESOURCE STATUS TGN CP-CP TG CHARACTERISTICS
IST1106I PP1A2A1 AC/R      21 YES  182D0000000000000000000017100808080
IST1482I HPR = RTP - OVERRIDE = N/A - CONNECTION = YES
IST1510I LLERP = REQUIRED - RECEIVED = REQUIRED
IST1555I VPCI/VCI = 010100
IST081I LINE NAME = LNP1A2A1, LINE GROUP = GPP1A1, MAJNOD = XCAOSA1A

```


DISPLAY ID

```
IST654I I/O TRACE = OFF, BUFFER TRACE = OFF
IST1500I STATE TRACE = OFF
IST172I NO LOGICAL UNITS EXIST
IST314I END
```

Displaying a remote node connected through a native ATM switched virtual channel (SVC):

```
d net,id=sw1a2a,scope=all
IST097I DISPLAY ACCEPTED
IST075I NAME = SW1A2A, TYPE = PU_T2.1
IST486I STATUS= ACTIV, DESIRED STATE= ACTIV
IST1043I CP NAME = SSCP2A, CP NETID = NETA, DYNAMIC LU = YES
IST1589I XNETALS = YES
IST2238I DISCNT = NO - FINAL USE = *NA*
IST1105I RESOURCE STATUS TGN CP-CP TG CHARACTERISTICS
IST1106I SW1A2A AC/R 22 YES 182D000000000000000017100808080
IST1482I HPR = RTP - OVERRIDE = N/A - CONNECTION = YES
IST1510I LLERP = REQUIRED - RECEIVED = REQUIRED
IST1559I ATM ADDRESS TYPE FORMAT
IST1553I 1111111111111111111111111111111100 LOCAL NSAP
IST1553I 2111111111111111111111111111111110 REMOTE NSAP
IST1555I VPCI/VCI = 010200
IST136I SWITCHED SNA MAJOR NODE = SWXCA1A
IST081I LINE NAME = LN1A2A, LINE GROUP = GP1A2A, MAJNOD = XCAOSA1A
IST654I I/O TRACE = OFF, BUFFER TRACE = OFF
IST1500I STATE TRACE = OFF
IST1656I VTAMTOPO = NOREPORT, NODE REPORTED - YES
IST1657I MAJOR NODE VTAMTOPO = INCLUDE
IST355I LOGICAL UNITS:
IST080I SW1A2AL NEVAC
IST314I END
```

Displaying a remote node connected through Enterprise Extender when the connection uses IPv4 addresses without host names:

```
d net,id=sw1a2a,scope=all
IST097I DISPLAY ACCEPTED
IST075I NAME = SW1A2A, TYPE = PU_T2.1
IST486I STATUS= ACTIV, DESIRED STATE= ACTIV
IST1043I CP NAME = SSCP2A, CP NETID = NETA, DYNAMIC LU = YES
IST1589I XNETALS = YES
IST2238I DISCNT = NO - FINAL USE = *NA*
IST1105I RESOURCE STATUS TGN CP-CP TG CHARACTERISTICS
IST1106I SW1A2A AC/R 22 YES 182D000000000000000017100808080
IST1482I HPR = RTP - OVERRIDE = N/A - CONNECTION = YES
IST1510I LLERP = REQUIRED - RECEIVED = REQUIRED
IST1680I LOCAL IP ADDRESS 9.18.100.2
IST1680I REMOTE IP ADDRESS 223.254.254.1
IST2114I LIVTIME: INITIAL = 10 MAXIMUM = 0 CURRENT = 10
IST136I SWITCHED SNA MAJOR NODE = SWXCA1
IST081I LINE NAME = LN1A2A, LINE GROUP = GP1A2A, MAJNOD = XCAHPR1A
IST654I I/O TRACE = OFF, BUFFER TRACE = OFF
IST1500I STATE TRACE = OFF
IST355I LOCAL UNITS:
IST080I SW1A2AL NEVAC
IST314I END
```

Displaying a remote node connected through Enterprise Extender when the connection uses IPv6 addresses:

```
d net,id=sw1a26a,scope=all
IST097I DISPLAY ACCEPTED
IST075I NAME = SW1A26A, TYPE = PU_T2.1
IST486I STATUS= ACTIV, DESIRED STATE= ACTIV
IST1043I CP NAME = SSCP2A, CP NETID = NETA, DYNAMIC LU = YES
IST1589I XNETALS = YES
```



```

IST2238I DISCNT = NO - FINAL USE = *NA*
IST1105I RESOURCE STATUS TGN CP-CP TG CHARACTERISTICS
IST1106I SW1A26A AC/R 22 YES 182D000000000000000017100808080
IST1482I HPR = RTP - OVERRIDE = N/A - CONNECTION = YES
IST1510I LLERP = REQUIRED - RECEIVED = REQUIRED
IST1680I LOCAL IP ADDRESS 3FFE::9.18.100.2
IST1910I LOCAL HOSTNAME LOCALHOST.DOMAIN.COM
IST1680I REMOTE IP ADDRESS 3FFC:1001:1002:3451:7223:2254:4254:4441
IST1909I REMOTE HOSTNAME REMOTEHOST.DOMAIN.COM
IST2114I LIVTIME: INITIAL = 10 MAXIMUM = 0 CURRENT = 10
IST136I SWITCHED SNA MAJOR NODE = SWXCA1
IST081I LINE NAME = LN1A26A, LINE GROUP = GP1A26A,MAJNOD = XCAHPR1A
IST654I I/O TRACE = OFF, BUFFER TRACE = OFF
IST1500I STATE TRACE = OFF
IST355I LOCAL UNITS:
IST080I SW1A2A6L NEVAC
IST314I END

```

Displaying a remote node connected through Enterprise Extender when the connection uses IPv4 addresses:

```

d net,id=sw1a26b,scope=all
IST097I DISPLAY ACCEPTED
IST075I NAME = SW1A26B, TYPE = PU_T2.1
IST486I STATUS= ACTIV, DESIRED STATE= ACTIV
IST1043I CP NAME = SSCP2A, CP NETID = NETA, DYNAMIC LU = YES
IST1589I XNETALS = YES
IST2238I DISCNT = NO - FINAL USE = *NA*
IST1105I RESOURCE STATUS TGN CP-CP TG CHARACTERISTICS
IST1106I SW1A26B AC/R 22 YES 182D000000000000000017100808080
IST1482I HPR = RTP - OVERRIDE = N/A - CONNECTION = YES
IST1510I LLERP = REQUIRED - RECEIVED = REQUIRED
IST1680I LOCAL IP ADDRESS 9.18.100.2
IST1910I LOCAL HOSTNAME LOCALHOST2.DOMAIN.COM
IST1680I REMOTE IP ADDRESS 09.26.130.4
IST2114I LIVTIME: INITIAL = 10 MAXIMUM = 0 CURRENT = 10
IST136I SWITCHED SNA MAJOR NODE = SWXCA1
IST081I LINE NAME = LN1A26B, LINE GROUP = GP1A26B, MAJNOD = XCAHPR1A
IST654I I/O TRACE = OFF, BUFFER TRACE = OFF
IST1500I STATE TRACE = OFF
IST355I LOCAL UNITS:
IST080I SW1A2B6L NEVAC
IST314I END

```

Displaying a dynamic Enterprise Extender PU:

```

d net,id=e2000018
IST097I DISPLAY ACCEPTED
IST075I NAME = E2000018, TYPE = PU_T2.1
IST486I STATUS= ACTIV---X-, DESIRED STATE= ACTIV
IST1043I CP NAME = SSCP2A - CP NETID = NETA - DYNAMIC LU = YES
IST1589I XNETALS = YES
IST2238I DISCNT = NO - FINAL USE = *NA*
IST1105I RESOURCE STATUS TGN CP-CP TG CHARACTERISTICS
IST1106I E2000018 AC/R 5 YES 9875000000000000000017100808080
IST1482I HPR = RTP - OVERRIDE = N/A - CONNECTION = YES
IST1510I LLERP = NOTPREF - RECEIVED = NOTALLOW
IST1680I LOCAL IP ADDRESS 9.67.1.1
IST1910I LOCAL HOSTNAME VIPA14.SSCP1A
IST1680I REMOTE IP ADDRESS 9.67.1.2
IST2114I LIVTIME: INITIAL = 10 MAXIMUM = 0 CURRENT = 10
IST136I SWITCHED SNA MAJOR NODE = ISTD SWMN
IST081I LINE NAME = LNEE2000, LINE GROUP = GP EE2, MAJNOD = XCAEE2
IST654I I/O TRACE = OFF, BUFFER TRACE = OFF

```

DISPLAY ID

```
IST1500I STATE TRACE = OFF
IST1656I VTAMTOPO = REPORT, NODE REPORTED - YES
IST1657I MAJOR NODE VTAMTOPO = REPORT
IST314I  END
```

Displaying a resource name that is known in several networks:

```
d net,id=*.applb12,max=3
IST097I DISPLAY ACCEPTED
IST075I NAME = NETA.APPLB12, TYPE = APPL
IST486I STATUS= CONCT      , DESIRED STATE= CONCT
IST1447I REGISTRATION TYPE = CDSERV
IST977I MDLTAB=***NA*** ASLTAB=***NA***
IST861I MODETAB=***NA*** USSTAB=***NA*** LOGTAB=***NA***
IST934I DLOGMOD=***NA*** USS LANGTAB=***NA***
IST1938I APPC = NO
IST597I CAPABILITY-PLU INHIBITED,SLU INHIBITED,SESSION LIMIT NONE
IST231I APPL MAJOR NODE = APPL1A
IST654I I/O TRACE = OFF, BUFFER TRACE = OFF
IST271I JOBNAME = ***NA***, STEPNAME = ***NA***, DSPNAME = ***NA***
IST228I ENCRYPTION = OPTIONAL, TYPE = DES
IST1563I CKEYNAME = APPLB12 CKEY = PRIMARY CERTIFY = NO
IST1552I MAC = NONE MACTYPE = NONE
IST1050I MAXIMUM COMPRESSION LEVEL - INPUT = 0, OUTPUT = 0
IST171I ACTIVE SESSIONS = 0000000000, SESSION REQUESTS = 0000000000
IST924I -----
IST075I NAME = NETB.APPLB12, TYPE = CDRSC
IST486I STATUS= ACTIV      , DESIRED STATE= ACTIV
IST1447I REGISTRATION TYPE = CDSERV
IST977I MDLTAB=***NA*** ASLTAB=***NA***
IST861I MODETAB=***NA*** USSTAB=***NA*** LOGTAB=***NA***
IST934I DLOGMOD=***NA*** USS LANGTAB=***NA***
IST1632I VPACING = 7
IST1938I APPC = NO
IST597I CAPABILITY-PLU ENABLED ,SLU ENABLED ,SESSION LIMIT NONE
IST231I CDRSC MAJOR NODE = CDRSC1A
IST479I CDRM NAME = SSCP7B , VERIFY OWNER = NO
IST1131I DEVICE = CDRSC
IST654I I/O TRACE = OFF, BUFFER TRACE = OFF
IST228I ENCRYPTION = NONE, TYPE = DES
IST1563I CKEYNAME = APPLB12 CKEY = PRIMARY CERTIFY = NO
IST1552I MAC = NONE MACTYPE = NONE
IST171I ACTIVE SESSIONS = 0000000000, SESSION REQUESTS = 0000000000
IST924I -----
IST075I NAME = NETC.APPLB12, TYPE = CDRSC
IST486I STATUS= ACTIV      , DESIRED STATE= ACTIV
IST1447I REGISTRATION TYPE = CDSERV
IST977I MDLTAB=***NA*** ASLTAB=***NA***
IST861I MODETAB=***NA*** USSTAB=***NA*** LOGTAB=***NA***
IST934I DLOGMOD=***NA*** USS LANGTAB=***NA***
IST597I CAPABILITY-PLU ENABLED ,SLU ENABLED ,SESSION LIMIT NONE
IST231I CDRSC MAJOR NODE = CDRSC1A
IST479I CDRM NAME = SSCP9C , VERIFY OWNER = NO
IST1131I DEVICE = CDRSC
IST654I I/O TRACE = OFF, BUFFER TRACE = OFF
IST228I ENCRYPTION = NONE, TYPE = DES
IST1563I CKEYNAME = APPLB12 CKEY = PRIMARY CERTIFY = NO
IST1552I MAC = NONE MACTYPE = NONE
IST171I ACTIVE SESSIONS = 0000000000, SESSION REQUESTS = 0000000000
IST314I  END
```

Displaying a generic resource:

```
d net,id=GRAPPL,idtype=generic
IST097I DISPLAY ACCEPTED
IST075I NAME = GRAPPL, TYPE = GENERIC RESOURCE
IST1359I MEMBER NAME      OWNING CP   SELECTABLE  APPC
IST1360I NETA.NETAPPL1    SSCP2A     YES          NO
```

```

IST1360I NETA.APPL1          SSCP1A          NO          NO
IST1360I NETA.APPLAA1        SSCPAA          DEL          NO
IST2210I GR PREFERENCE TABLE ENTRY = **NAMELESS**
IST2202I GREXIT   = YES      WLM             = YES      LOCLU   = YES
IST2204I LOCAPPL   = YES      PASSOLU        = YES
IST1393I GENERIC RESOURCE NAME RESOLUTION EXIT IS ISTEXCGR
IST314I  END

```

Displaying an IP address in dotted decimal format when there is only one TN3270 client connected at this IP address:

```

d net,idtype=ipaddr,ID=9.67.113.58
IST097I DISPLAY ACCEPTED
IST075I NAME = NETA.TCPM1001, TYPE = APPL
IST486I STATUS= ACT/S, DESIRED STATE= ACTIV
IST1447I REGISTRATION TYPE = CDSERV
IST599I REAL NAME = NETA.TCPM1001
IST977I MDLTAB=***NA*** ASLTAB=***NA***
IST861I MODETAB=ISTINCLM USSTAB=***NA*** LOGTAB=***NA***
IST934I DLOGMOD=***NA*** USS LANGTAB=***NA***
IST1632I VPACING = 7
IST1938 APPC = YES
IST597I CAPABILITY-PLU ENABLED ,SLU ENABLED ,SESSION LIMIT 00000001
IST231I APPL MAJOR NODE = TCPAPPLS
IST654I I/O TRACE = OFF, BUFFER TRACE = OFF
IST1500I STATE TRACE = OFF
IST271I JOBNAME = TCPCS, STEPNAME = TCPCS, DSPNAME = ISTD629B
IST228I ENCRYPTION = OPTIONAL, TYPE = DES
IST1563I CKEYNAME = TCPM1001 CKEY = PRIMARY CERTIFY = NO
IST1552I MAC = NONE MACTYPE = NONE
IST1050I MAXIMUM COMPRESSION LEVEL - INPUT = 0, OUTPUT = 0
IST1633I ASRCVLM = 1000000
IST1634I DATA SPACE USAGE: CURRENT = 0 MAXIMUM = 0
IST1669I IPADDR..PORT 9.67.113.58..1029
IST171I ACTIVE SESSIONS = 0000000001, SESSION REQUESTS = 0000000000
IST314I  END

```

Displaying an IP address in colon-hexadecimal format when there is only one TN3270 client connected at this IPv6 address.

```

d net,id=2001:0DB8::9:67:115:17,idtype=ipaddr
IST097I DISPLAY ACCEPTED
IST075I NAME = NETA.TCPM2013, TYPE = DYNAMIC APPL
IST486I STATUS= ACT/S, DESIRED STATE= ACTIV
IST1447I REGISTRATION TYPE = CDSERV
IST599I REAL NAME = NETA.TCPM2013
IST1629I MODSRCH = NEVER
IST977I MDLTAB=***NA*** ASLTAB=***NA***
IST861I MODETAB=ISTINCLM USSTAB=***NA*** LOGTAB=***NA***
IST934I DLOGMOD=***NA*** USS LANGTAB=***NA***
IST1632I VPACING = 7
IST1938I APPC = YES
IST597I CAPABILITY-PLU ENABLED ,SLU ENABLED ,SESSION LIMIT 00000001
IST231I APPL MAJOR NODE = TCPAPPLS
IST1425I DEFINED USING MODEL TCPM*
IST654I I/O TRACE = OFF, BUFFER TRACE = OFF
IST1500I STATE TRACE = OFF
IST271I JOBNAME = TCPCS, STEPNAME = TCPCS, DSPNAME = ISTF27CE
IST228I ENCRYPTION = OPTIONAL , TYPE = DES
IST1563I CKEYNAME = TCPM2013 CKEY = PRIMARY CERTIFY = NO
IST1552I MAC = NONE MACTYPE = NONE
IST1050I MAXIMUM COMPRESSION LEVEL - INPUT = 0, OUTPUT = 0
IST1633I ASRCVLM = 1000000
IST1634I DATA SPACE USAGE: CURRENT = 0 MAXIMUM = 0
IST1669I IPADDR..PORT 2001:0DB8::9:67:115:17..1027
IST171I ACTIVE SESSIONS = 0000000001, SESSION REQUESTS = 0000000000
IST314I  END

```

DISPLAY ID

Displaying a resource with TN3270 characteristics.

```
d net,id=tcpm2013
IST097I DISPLAY ACCEPTED
IST075I NAME = NETA.TCPM2013, TYPE = DYNAMIC APPL
IST486I STATUS= ACT/S, DESIRED STATE= ACTIV
IST1447I REGISTRATION TYPE = CDSERVER
IST1629I MODSRCH = NEVER
IST977I MDLTAB=***NA*** ASLTAB=***NA***
IST861I MODETAB=ISTINCLM USSTAB=***NA*** LOGTAB=***NA***
IST934I DLOGMOD=***NA*** USS LANGTAB=***NA***
IST1632I VPACING = 7
IST1938I APPC = YES
IST597I CAPABILITY-PLU ENABLED ,SLU ENABLED ,SESSION LIMIT 00000001
IST231I APPL MAJOR NODE = TCPAPPLS
IST1425I DEFINED USING MODEL TCPM*
IST654I I/O TRACE = OFF, BUFFER TRACE = OFF
IST1500I STATE TRACE = OFF
IST271I JOBNAME = TCPCS, STEPNAME = TCPCS, DSPNAME = ISTF27CE
IST228I ENCRYPTION = OPTIONAL , TYPE = DES
IST1563I CKEYNAME = TCPM2013 CKEY = PRIMARY CERTIFY = NO
IST1552I MAC = NONE MACTYPE = NONE
IST1050I MAXIMUM COMPRESSION LEVEL - INPUT = 0, OUTPUT = 0
IST1633I ASRCVLM = 1000000
IST1634I DATA SPACE USAGE: CURRENT = 0 MAXIMUM = 0
IST1669I IPADDR..PORT 2001:0DB8::9:67:115:17..1027
IST171I ACTIVE SESSIONS = 0000000001, SESSION REQUESTS = 0000000000
IST314I END
```

Displaying an IP address with multiple TN3270 client connections.

```
d net,id=2001:0DB8::9:67:115:17,idtype=ipaddr
IST097I DISPLAY ACCEPTED
IST1912I IP ADDRESS 2001:0DB8::9:67:115:17 102
IST1913I LUNAME PORT
IST1914I NETA.TCPM2013 1027
IST1914I NETA.TCPM2012 1026
IST314I END
```

Displaying a TSO user ID when the SLU is a Telnet client:

```
d net,tsouser,id=user1
IST097I DISPLAY ACCEPTED
IST075I NAME = USER1, TYPE = TSO USERID
IST486I STATUS= ACTIV, DESIRED STATE= N/A
IST576I TSO TRACE = OFF
IST262I ACBNAME = TS00003, STATUS = ACT/S
IST262I LUNAME = TCPM1002, STATUS = ACT/S
IST1669I IPADDR..PORT 2001:0DB8::9:67:115:17..1026
IST2203I CHARACTER SET 0065 CODE PAGE 0025
IST314I END
```

Displaying a DLUR CDRSC:

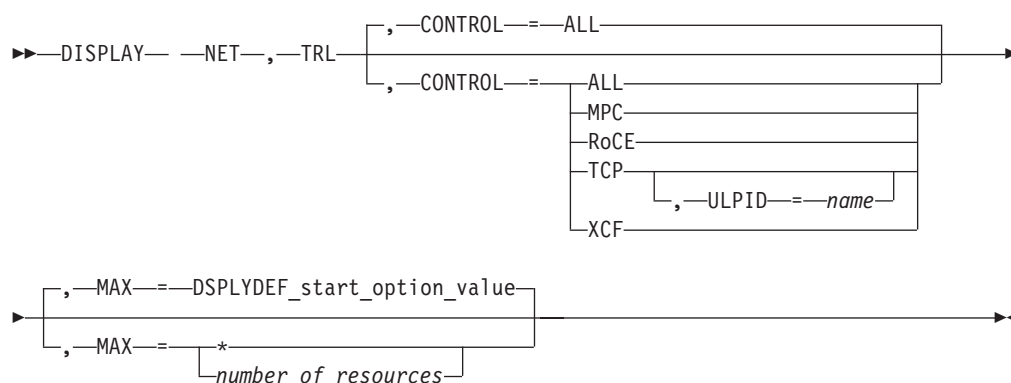
```
d net,id=NNP7
IST075I NAME = D7NET.NNP7 , TYPE = ADJACENT CP
IST486I STATUS= ACT/S----Y, DESIRED STATE= ACTIV
IST1402I SRTIMER = 30 SRCOUNT = 100
IST1447I REGISTRATION TYPE = NO
IST977I MDLTAB=***NA*** ASLTAB=***NA***
IST1333I ADJLIST = ***NA***
IST861I MODETAB=***NA*** USSTAB=***NA*** LOGTAB=***NA***
IST934I DLOGMOD=CPSVCMG USS LANGTAB=***NA***
IST597I CAPABILITY-PLU ENABLED ,SLU ENABLED ,SESSION LIMIT NONE
IST231I CDRSC MAJOR NODE = ISTDY
IST1184I CPNAME = D7NET.NNP7 - NETSRVR = ***NA***
IST1044I ALSLIST = ISTAPNPU
```

```

IST1131I  DEVICE = ILU/CDRSC
IST654I   I/O TRACE = OFF, BUFFER TRACE = OFF
IST1500I  STATE TRACE = OFF
IST171I   ACTIVE SESSIONS = 0000000003, SESSION REQUESTS = 0000000000
IST206I   SESSIONS:
IST1081I  ADJACENT LINK STATION = PBB7N10
IST634I   NAME      STATUS      SID      SEND RECV VR TP NETID
IST635I   CDRMD730 ACTIV/CP-P F8B7DBABF0AB700C 0001 015D 0 0 D7NET
IST1355I  PHYSICAL UNITS SUPPORTED BY DLUR D7NET.NNP7
IST089I   D779AP1  TYPE = PU_T2      , PAPU2
IST924I   -----
IST075I   NAME=D7NET.NNP7      ,TYPE=DIRECTORY ENTRY
IST1186I  DIRECTORY ENTRY = DYNAMIC NN
IST1184I  CPNAME = D7NET.NNP7      -NETSRVR = ***NNA***
IST1402I  SRTIMER = 30          SRCOUNT = 100
IST134I   END
  
```

DISPLAY TRL command

Display the entries in the TRL major nodes:



Display information about a specific user-defined TRLE:

```

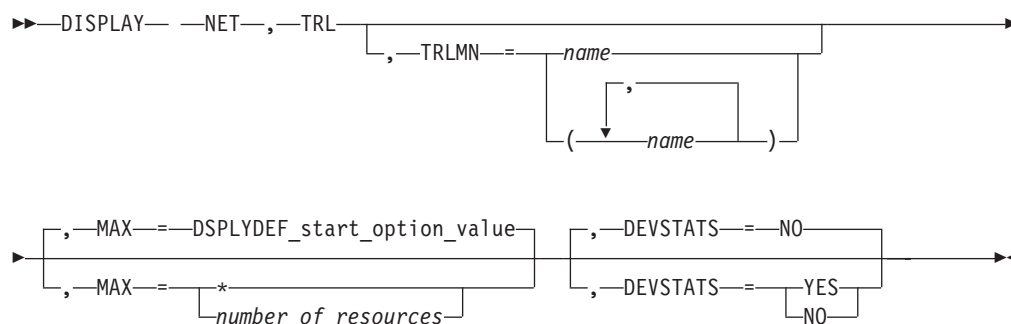
>>> DISPLAY — NET —, —TRL —, —TRLE — = — trl_entry_name —————>>>
  
```

Display information about a dynamic XCF TRLE:

```

>>> DISPLAY — NET —, —TRL —, —XCFCP — = — cp_name —————>>>
  
```

Display the entries in one or more specific TRL major nodes:



Abbreviations

Operand	Abbreviation
DISPLAY	D
DEVSTATS=YES	DEVSTATS

Purpose

The DISPLAY TRL (transport resource list) command provides information about the active TRL major nodes or about a single TRLE (transport resource list entry).

Operands

CONTROL

Specifies the type of connections to display.

CONTROL=ALL

Specifies that information is to be displayed about all TRLEs.

CONTROL=MPC

Specifies that information is to be displayed about user-defined TRLEs only.

CONTROL=RoCE

Specifies that information is to be displayed about RDMA over Converged Ethernet (RoCE) TRLEs only.

CONTROL=TCP

Specifies that information is to be displayed about dynamic TCP/IP TRLEs only.

CONTROL=XCF

Specifies that information is to be displayed about dynamic XCF TRLEs only.

DEVSTATS

Specifies whether statistics for RoCE TRLEs should be collected and displayed. This operand is meaningful only when the TRLE operand is also specified, and the value that is specified for the TRLE operand represents a RoCE TRLE; otherwise, the operand is ignored.

DEVSTATS=YES

Specifies that statistics should be collected for the RoCE TRLE.

DEVSTATS=NO

Specifies that statistics should not be collected for the RoCE TRLE. This is the default setting.

MAX

Specifies the maximum number of TRLEs that VTAM displays for this command.

If you specify the MAX operand, do not specify TRLE.

MAX=*

Specifies that the value of the DSPLYMAX start option is used to limit the display output.

MAX=number_of_resources

Specifies the number of TRLEs to display for this command. The valid range is 1 - value of DSPLYMAX. The default is the value specified for the DSPLYDEF start option.

Specifying MAX limits the display output. VTAM searches only for the number of instances that you have specified. When that number is found, VTAM does not search any further. This saves processing time for the command and gives you control over the amount of display output generated by the command. If fewer TRLEs are found than you have specified on MAX, VTAM displays only the TRLEs that are found.

TRLE=trl_entry_name

Specifies the name of the TRLE to be displayed.

TRLMN=trl_major_node_name

Specifies the name of one or more active TRL major nodes to be displayed.

ULPID=name

Specifies the name of a CS z/OS upper-layer protocol (ULP) to be displayed, for example, the TCP/IP procedure name. The ULPID operand is valid only with CONTROL=TCP.

XCFCP=cp_name

Specifies that information is to be displayed about the TRLE representing the connection to another VTAM in the XCF group. The value of *cp_name* is the CP name or SSCP name of the other VTAM.

Resulting display

The resulting display shows:

- The name and status of all TRLEs in the active TRL major nodes if the TRLE operand is not specified.
- The name and status of the TRLE specified on the TRLE operand. If the status is active and the TRLE is not associated with a 10 GbE RoCE Express interface, the display also includes the address and operational status of the READ, WRITE, and (OSA-Express and HiperSockets only) DATA subchannels. In addition, the following information may be displayed:
 - MPC level and usage (MPC header size, maximum MPC data size, inbound data storage medium)
 - Name of the CS z/OS upper-layer protocols (ULPs) using this TRLE
 - OSA portname, OSA adapter number, and OSA microcode level
 - OSA or HiperSockets channel path id (chpid) type and number
 - Peripheral Component Interconnect Express (PCIe) function ID (PFID) for the 10GbE RoCE Express feature
 - When the RoCE Express feature is operating in a dedicated RoCE environment, the 10GbE RoCE Express microcode level is displayed.
 - When the feature is operating in a shared RoCE environment, the virtual function number (VFN) is displayed.
 - I/O trace status
 - The capability of the connection to perform channel I/O directly to or from communications storage manager (CSM) buffers
 - Storage information about the inbound and outbound queues associated with the DATA subchannels

DISPLAY TRL

- For a dynamic TCP TRLE, an exclusively owned TRLE, only one message with a ULP ID is issued because only one ULP can use each of these TRLEs. For an OSA-Express adapter, one message with a ULP ID is issued for each datapath channel address that a ULP uses. For other TRLEs, more than one ULP ID message can be issued, depending on how many ULPs are using the TRLE.

Rule: Only one message with a ULP ID is generated for a 10GbE RoCE Express feature that operates in a shared RoCE environment.

- The ULP ID will be the jobname for TCP/IP ULPs, the SNA PU name for ANNC ULPs, and the XCA Major Node name for ATM or EE ULPs.
- Message group IST2396I is generated after the base TRL information is displayed when DEVSTATS=YES is specified and the TRLE that is specified on the TRLE operand represents a 10 GbE RoCE Express interface. See z/OS Communications Server: SNA Messages for specifics on the statistics reported in the IST2396I message group.

Examples

Displaying all TRL entries:

```
d net,trl
IST097I DISPLAY ACCEPTED
IST350I DISPLAY TYPE = TRL
IST1954I TRL MAJOR NODE = ISTTRL
IST1314I TRLE = ISTT0001 STATUS = ACTIVE----E CONTROL = XCF
IST1454I 1 TRLE(S) DISPLAYED
IST924I -----
IST1954I TRL MAJOR NODE = TRL1
IST1314I TRLE = TRL1A STATUS = ACTIVE CONTROL = MPC
IST1314I TRLE = TRL1B STATUS = NEVAC CONTROL = MPC
IST1454I 2 TRLE(S) DISPLAYED
IST924I -----
IST1954I TRL MAJOR NODE = TRL2
IST1314I TRLE = TRL2A STATUS = NEVAC CONTROL = XCF
IST1314I TRLE = TRL2B STATUS = ACTIVE CONTROL = XCF
IST1454I 2 TRLE(S) DISPLAYED
IST314I END
```

Displaying two TRL major nodes:

```
d net,trl,trlmn=(trl1,trl2)
IST097I DISPLAY ACCEPTED
IST350I DISPLAY TYPE = TRL
IST1954I TRL MAJOR NODE = TRL1
IST1314I TRLE = TRL1A STATUS = ACTIVE CONTROL = MPC
IST1314I TRLE = TRL1B STATUS = NEVAC CONTROL = MPC
IST1454I 2 TRLE(S) DISPLAYED
IST924I -----
IST1954I TRL MAJOR NODE = TRL2
IST1314I TRLE = TRL2A STATUS = NEVAC CONTROL = XCF
IST1314I TRLE = TRL2B STATUS = ACTIVE CONTROL = XCF
IST1454I 2 TRLE(S) DISPLAYED
IST314I END
```

Displaying an active TRL entry:

```
d net,trl,trle=trle1a
IST097I DISPLAY ACCEPTED
IST075I NAME = TOC01N, TYPE = TRLE
IST1954I TRL MAJOR NODE = TRL1
IST486I STATUS= ACTIV, DESIRED STATE= ACTIV
IST087I TYPE = LEASED, CONTROL = MPC, HPDT = YES
IST1715I MPCLEVEL = HPDT MPCUSAGE = SHARE
IST1717I ULPID = AHHCPU7 ULP INTERFACE = *NA*
```



```
IST1577I HEADER SIZE = 4092 DATA SIZE = 60 STORAGE = ***NA***
IST1221I WRITE DEV = 0CE6 STATUS = ACTIVE      STATE = ONLINE
IST1221I WRITE DEV = 0CE7 STATUS = ACTIVE      STATE = ONLINE
IST1221I WRITE DEV = 0CE8 STATUS = ACTIVE      STATE = ONLINE
IST1221I WRITE DEV = 0CE9 STATUS = ACTIVE      STATE = ONLINE
IST1577I HEADER SIZE = 4092 DATA SIZE = 60 STORAGE = DATASPACE
IST1221I READ  DEV = 0CC6 STATUS = ACTIVE      STATE = ONLINE
IST1221I READ  DEV = 0CC7 STATUS = ACTIVE      STATE = ONLINE
IST1221I READ  DEV = 0CC8 STATUS = ACTIVE      STATE = ONLINE
IST3141I END
```

Displaying an active XCF TRL entry:

```
d net,trl,trl=istt1q2q
IST097I DISPLAY ACCEPTED
IST075I NAME = ISTT1Q2Q, TYPE = TRLE
IST1954I TRL MAJOR NODE = ISTTRL
IST486I STATUS= ACTIV, DESIRED STATE= ACTIV
IST087I TYPE = LEASED          , CONTROL = XCF , HPDT = *NA*
IST1715I MPCLEVEL = HPDT      MPCUSAGE = SHARE
IST1717I ULPID = ISTP1Q2Q ULP INTERFACE = *NA*
IST1503I XCF TOKEN = 02000002001B0002      STATUS = ACTIVE
IST1502I ADJACENT CP = NETA.SSCP2A
IST3141I END
```

Displaying an active TCP TRL entry:

```
d net,trl,trl=iutx0d20
IST097I DISPLAY ACCEPTED
IST075I NAME = IUTX0D20, TYPE = TRLE
IST1954I TRL MAJOR NODE = ISTTRL
IST486I STATUS= ACTIV, DESIRED STATE= ACTIV
IST087I TYPE = LEASED          , CONTROL = TCP , HPDT = *NA*
IST1717I ULPID = TCPCS2 ULP INTERFACE = *NA*
IST1221I READ  DEV = 0D20 STATUS = ACTIVE      STATE = N/A
IST1221I WRITE DEV = 0D21 STATUS = ACTIVE      STATE = N/A
IST3141I END
```

Displaying an inactive TRL entry:

```
d net,trl,trl=trle1c
IST097I DISPLAY ACCEPTED
IST075I NAME = TRLE1C, TYPE = TRLE
IST1954I TRL MAJOR NODE = TRL1
IST486I STATUS= NEVAC, DESIRED STATE= INACT
IST087I TYPE = LEASED          , CONTROL = MPC , HPDT = *NA*
IST1715I MPCLEVEL = NOHPDT    MPCUSAGE = ***N/A***
IST1221I WRITE DEV = 0508 STATUS = RESET      STATE = N/A
IST1221I WRITE DEV = 03F0 STATUS = RESET      STATE = N/A
IST1221I READ  DEV = 0408 STATUS = RESET      STATE = N/A
IST1221I READ  DEV = 02F0 STATUS = RESET      STATE = N/A
IST3141I END
```

Displaying an active OSA Express TRL entry:

```
d net,trl,trl=qdio101
IST097I DISPLAY ACCEPTED
IST075I NAME = QDIO101, TYPE = TRLE
IST1954I TRL MAJOR NODE = TRLCS
IST486I STATUS= ACTIV, DESIRED STATE= ACTIV
IST087I TYPE = LEASED          , CONTROL = MPC , HPDT = YES
IST1715I MPCLEVEL = QDIO      MPCUSAGE = SHARE
IST2263I PORTNAME = QDIO4101  PORTNUM = 0    OSA CODE LEVEL = ABCD
IST2337I CHPID TYPE = OSD  CHPID = C1 PNETID = NETWORK3
IST2184I QDIOSYNC = ALLINOUT - SYNCID = QDIO101 - SAVED = NO
IST1577I HEADER SIZE = 4096 DATA SIZE = 0 STORAGE = ***NA***
IST1221I WRITE DEV = 0E29 STATUS = ACTIVE      STATE = ONLINE
IST1577I HEADER SIZE = 4092 DATA SIZE = 0 STORAGE = ***NA***
```

DISPLAY TRL

```

IST1221I READ DEV = 0E28 STATUS = ACTIVE STATE = ONLINE
IST924I -----
IST1221I DATA DEV = 0E2A STATUS = ACTIVE STATE = N/A
IST1724I I/O TRACE = OFF TRACE LENGTH = *NA*
IST1717I ULPID = TCPCS1 ULP INTERFACE = QDIO4101I
IST2310I ACCELERATED ROUTING DISABLED
IST2331I QUEUE QUEUE READ QUEUE
IST2332I ID TYPE STORAGE STATUS
IST2205I -----
IST2333I RD/1 PRIMARY 4.0M(64 SBALS) ACTIVE
IST2333I RD/2 BULKDATA 4.0M(64 SBALS) ACTIVE
IST2333I RD/3 SYSDIST 4.0M(64 SBALS) ACTIVE
IST2333I RD/4 EE 4.0M(64 SBALS) ACTIVE
IST2331I QUEUE QUEUE READ
IST2332I ID TYPE STORAGE
IST2205I -----
IST2333I RD/1 PRIMARY 1.0M(16 SBALS)
IST2333I RD/2 SYSDIST 1.0M(16 SBALS)
IST2305I NUMBER OF DISCARDED INBOUND READ BUFFERS = 0
IST1757I PRIORITY1: UNCONGESTED PRIORITY2: UNCONGESTED
IST1757I PRIORITY3: UNCONGESTED PRIORITY4: UNCONGESTED
IST2190I DEVICEID PARAMETER FOR OSAENTA TRACE COMMAND = 00-05-00-00
IST1801I UNITS OF WORK FOR NCB AT ADDRESS X'15AD0010'
IST1802I P1 CURRENT = 0 AVERAGE = 0 MAXIMUM = 0
IST1802I P2 CURRENT = 0 AVERAGE = 0 MAXIMUM = 0
IST1802I P3 CURRENT = 0 AVERAGE = 0 MAXIMUM = 0
IST1802I P4 CURRENT = 0 AVERAGE = 0 MAXIMUM = 0
IST924I -----
IST1221I TRACE DEV = 0E2B STATUS = ACTIVE STATE = N/A
IST1724I I/O TRACE = OFF TRACE LENGTH = *NA*
IST1717I ULPID = TCPCS1 ULP INTERFACE = QDIO6101I
IST2310I ACCELERATED ROUTING DISABLED
IST2331I QUEUE QUEUE READ QUEUE
IST2332I ID TYPE STORAGE STATUS
IST2205I -----
IST2333I RD/1 PRIMARY 4.0M(64 SBALS) ACTIVE
IST2331I QUEUE QUEUE READ
IST2332I ID TYPE STORAGE
IST2205I -----
IST2333I RD/1 PRIMARY 4.0M(64 SBALS)
IST2305I NUMBER OF DISCARDED INBOUND READ BUFFERS = 0
IST1757I PRIORITY1: UNCONGESTED PRIORITY2: UNCONGESTED
IST1757I PRIORITY3: UNCONGESTED PRIORITY4: UNCONGESTED
IST1801I UNITS OF WORK FOR NCB AT ADDRESS X'15A92010'
IST1802I P1 CURRENT = 0 AVERAGE = 0 MAXIMUM = 0
IST1802I P2 CURRENT = 0 AVERAGE = 0 MAXIMUM = 0
IST1802I P3 CURRENT = 0 AVERAGE = 0 MAXIMUM = 0
IST1802I P4 CURRENT = 0 AVERAGE = 0 MAXIMUM = 0
IST924I -----
IST1221I DATA DEV = 0E2C STATUS = RESET STATE = N/A
IST1724I I/O TRACE = OFF TRACE LENGTH = *NA*
IST314I END

```

Displaying a TRLE dynamically created for HiperSockets:

```

d net,trl,trl=IUTIQDIO
IST097I DISPLAY ACCEPTED
IST075I NAME = IUTIQDIO, TYPE = TRLE
IST1954I TRL MAJOR NODE = ISTTRL
IST486I STATUS= ACTIV, DESIRED STATE= ACTIV
IST087I TYPE = LEASED , CONTROL = MPC , HPDT = YES
IST1715I MPCLEVEL = QDIO MPCUSAGE = SHARE
IST1716I PORTNAME = IUTIQDFE LINKNUM = 0 OSA CODE LEVEL = *NA*
IST2337I CHPID TYPE = IQD CHPID = FE PNETID = **NA**
IST2319I IQD NETWORK ID = 07B1
IST1577I HEADER SIZE = 4096 DATA SIZE = 16384 STORAGE = ***NA***
IST1221I WRITE DEV = 0E01 STATUS = ACTIVE STATE = ONLINE

```

```

IST1577I HEADER SIZE = 4092 DATA SIZE = 0 STORAGE = ***NA***
IST1221I READ DEV = 0E00 STATUS = ACTIVE STATE = ONLINE
IST924I -----
IST1221I DATA DEV = 0E02 STATUS = ACTIVE STATE = N/A
IST1724I I/O TRACE = OFF TRACE LENGTH = *NA*
IST1717I ULPID = TCPCS1 ULP INTERFACE = IUTIQDIO
IST2310I ACCELERATED ROUTING DISABLED
IST2331I QUEUE QUEUE READ
IST2332I ID TYPE STORAGE
IST2205I -----
IST2333I RD/1 PRIMARY 2.0M(126 SBALS)
IST2331I QUEUE QUEUE READ QUEUE
IST2332I ID TYPE STORAGE STATUS
IST2205I -----
IST2333I RD/1 PRIMARY 2.0M(126 SBALS) ACTIVE
IST2305I NUMBER OF DISCARDED INBOUND READ BUFFERS = 0
IST1757I PRIORITY1: UNCONGESTED PRIORITY2: UNCONGESTED
IST1757I PRIORITY3: UNCONGESTED PRIORITY4: UNCONGESTED
IST1801I UNITS OF WORK FOR NCB AT ADDRESS X'15B18010'
IST1802I P1 CURRENT = 0 AVERAGE = 0 MAXIMUM = 0
IST1802I P2 CURRENT = 0 AVERAGE = 0 MAXIMUM = 0
IST1802I P3 CURRENT = 0 AVERAGE = 0 MAXIMUM = 0
IST1802I P4 CURRENT = 0 AVERAGE = 0 MAXIMUM = 0
IST924I -----
IST1221I DATA DEV = 0E03 STATUS = RESET STATE = N/A
IST1724I I/O TRACE = OFF TRACE LENGTH = *NA*
IST924I -----
IST314I END

```

Displaying a 10GbE RoCE Express TRLE in a dedicated RoCE environment:

```

d net,trl,trl=iut10005
IST097I DISPLAY ACCEPTED
IST075I NAME = IUT10005, TYPE = TRLE
IST1954I TRL MAJOR NODE = ISTTRL
IST486I STATUS= ACTIV, DESIRED STATE= ACTIV
IST087I TYPE = *NA* , CONTROL = ROCE, HPDT = *NA*
IST2361I SMCR PFID = 0005 PCHID = 0500 PNETID = NETWORK3
IST2362I PORTNUM = 1 RNIC CODE LEVEL = 2.11.1200
IST2389I PFIP = 01000300
IST924I -----
IST1717I ULPID = TCPIP1 ULP INTERFACE = EZARIUT10005
IST1724I I/O TRACE = OFF TRACE LENGTH = *NA*
IST1866I TRLE = IUT10005 INOPDUMP = ON
IST924I -----
IST1717I ULPID = TCPIP2 ULP INTERFACE = EZARIUT10005
IST1724I I/O TRACE = OFF TRACE LENGTH = *NA*
IST1866I TRLE = IUT10005 INOPDUMP = ON
IST314I END

```

Displaying a 10GbE RoCE Express TRLE in a shared RoCE environment:

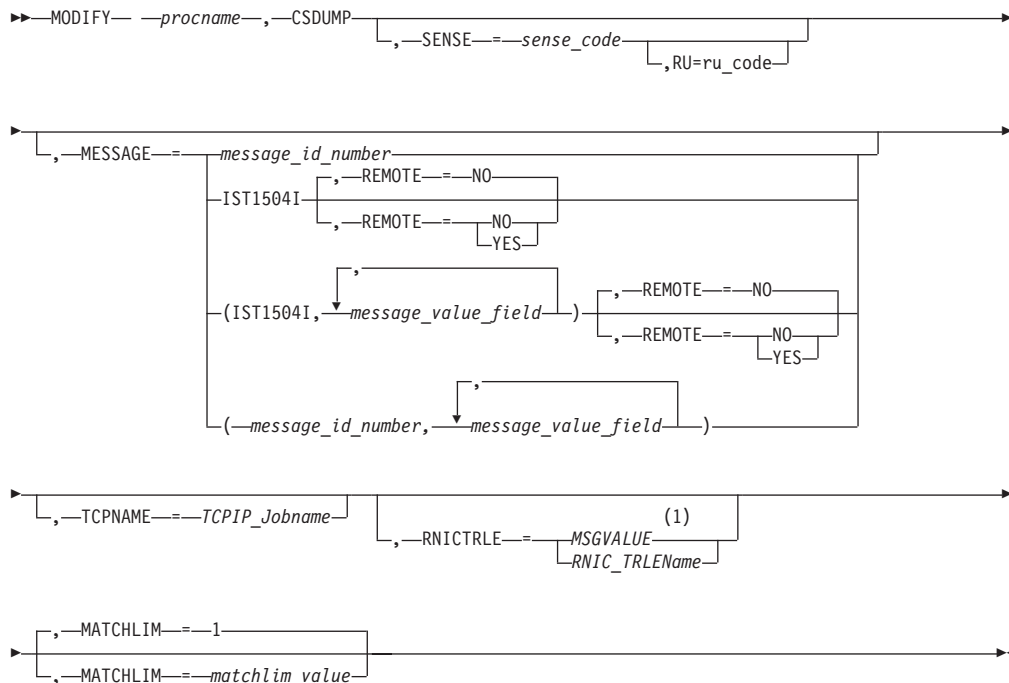
```

d net,trl,trl=iut10011
IST097I DISPLAY ACCEPTED
IST075I NAME = IUT10011, TYPE = TRLE
IST1954I TRL MAJOR NODE = ISTTRL
IST486I STATUS= ACTIV, DESIRED STATE= ACTIV
IST087I TYPE = *NA* , CONTROL = ROCE, HPDT = *NA*
IST2361I SMCR PFID = 0011 PCHID = 0140 PNETID = PNETID1
IST2362I PORTNUM = 1 RNIC CODE LEVEL = **NA**
IST2389I PFIP = 01000300
IST2417I VFN = 0001
IST924I -----
IST1717I ULPID = TCPIP2 ULP INTERFACE = EZARIUT10011
IST1724I I/O TRACE = OFF TRACE LENGTH = *NA*
IST314I END

```

MODIFY CSDUMP command

Set the CSDUMP trigger:



Notes:

- 1 MSGVALUE is valid only when the MESSAGE operand is used and specifies either message IST2391I or IST2406I.

Remove the CSDUMP trigger:



Abbreviations

Operand	Abbreviation
MODIFY	F

Purpose

Set the CSDUMP trigger:

Use the MODIFY CSDUMP command to perform the following actions:

- Take an immediate dump of the current address space. This is the default action that is performed when the MODIFY CSDUMP command is issued with no other operands. Any existing message or sense code trigger set by the MODIFY CSDUMP command or the CSDUMP start option are not affected by issuing this form of the MODIFY CSDUMP command.

- Set a trigger that invokes a dump of the current address space when a particular sense code is issued. The trigger invokes a dump of the VTAM address space if the current address space is not the VTAM address space.
- Set a trigger that invokes a dump of the current address space and possibly a dump of a remote VTAM address space, when a particular message is issued. The trigger invokes a dump of the VTAM address space if the current address space is not the VTAM address space.

You can set only one sense code and one message trigger simultaneously. You cannot set two different message or sense code triggers at the same time. If you have previously set a message trigger using the MODIFY CSDUMP or the CSDUMP start option, and then you enter a different message trigger, the previous message trigger is overwritten.

Tip: You can use the CSDUMP start option to set either a CSDUMP message trigger or a sense code trigger or both. See z/OS Communications Server: SNA Resource Definition Reference for information about the CSDUMP start option.

Remove the CSDUMP trigger:

Using the MODIFY CSDUMP,DELETE command, the user can delete the triggers set previously.

Operands

procname

The procedure name for the command. If *procname* in the START command was specified as *startname.ident*, where *startname* is the VTAM start procedure and *ident* is the optional identifier, either *startname.ident* or *ident* can be specified for *procname*.

If *procname* in the START command was *startname*, *startname* must be specified for *procname*.

Set the CSDUMP trigger:

MATCHLIM=matchlim_value

Specifies that the CSDUMP trigger is to be disabled after *matchlim_value* matches. The *matchlim_value* is an integer in the range 1-255. The default is 1.

MESSAGE=message_id_number

Specifies the ID number of the message that will trigger a dump. Message numbers must be of the format ISTxxxI, ISTxxxxI, or IVTxxxxI.

Rule: If start option MSGLEVEL=BASE has been specified, or if MSGLVL=BASE has been specified in a USS operator message table, the message displayed on the console is the pre-version 4 message. CSDUMP with a message trigger checks the *message_id_number* before it has been swapped to the base *message_id_number*. Therefore, the *message_id_number* used with the CSDUMP command must be the version 4 message number for CSDUMP to match on the *message_id_number* and take the dump. See z/OS Communications Server: SNA Messages for a list of the base messages and their corresponding version 4 numbers.

MESSAGE=(message_id_number,message_value_field,...)

This parameter specifies the message variable text that can be used to trigger a dump. Instead of just matching on a message number, this allows the trigger to be more specific. If variable text is specified, then a dump will be taken only if the message and variable text match. If a variable text field is left blank, then it

is considered a wildcard. See z/OS Communications Server: SNA Messages for more information about message text for VTAM operator messages.

Note: Use an underscore as a substitute for a space in the variable text value of the message operand.

Rules:

1. Each message has the fixed number of message_value_fields. Each message_value_field has the maximum length.
2. The specified number of message_value_fields must be less than or equal to the number of message_value_fields in the specified message.
3. The specified length of the message_value_field must be less than or equal to the maximum length of the specified message_value_field.
4. The leading message_value_field can be skipped using a comma (,) for each message_value_field. The trailing message_value_field is not required.
5. See z/OS Communications Server: SNA Messages to determine the number of message value fields and their maximum lengths.

REMOTE

Specifies whether to request a dump of the remote VTAM when an XCF link that connects the two VTAMs becomes inoperative. This operand can be specified only when MESSAGE=IST1504I is also specified.

REMOTE=NO

A dump of the remote VTAM is not requested when an XCF link becomes inoperative. This is the default behavior.

REMOTE=YES

A dump of the remote VTAM is requested when an XCF link becomes inoperative. The remote VTAM must be z/OS V1R9 or later for the dump to be taken.

RNICTRLE

Specifies that a diagnostic dump of an IBM 10GbE RoCE Express feature needs to be taken under certain conditions. The RNICTRLE operand can be used only with the MESSAGE trigger or as part of an immediate dump.

RNICTRLE=MSGVALUE

MSGVALUE is valid only when the MESSAGE operand is used and specifies either message IST2391I or IST2406I. Specifying the MSGVALUE keyword allows VTAM to collect diagnostic dump information for the 10GbE RoCE Express feature that is identified in these messages.

RNICTRLE=RNIC_TRLEName

The format of *RNIC_TRLEName* must be IUTyxxxx, where xxxx is the Peripheral Component Interconnect Express (PCIe) function ID (PFID) that identifies the IBM 10GbE RoCE Express feature, and y is the port number that is used on the 10GbE RoCE Express interface. The value of y can be 1 or 2.

Usage

The 10GbE RoCE Express diagnostic dump is taken in addition to any other dumps that CSDUMP produces. After the 10GbE RoCE Express diagnostic dump is produced, recovery of the 10GbE RoCE Express feature is attempted.

Notes: No 10GbE RoCE Express diagnostic dump is taken in either of the following cases:

- The 10GbE RoCE Express TRLE is not active when CSDUMP produces the dump.
- A specific RNIC_TRLEName is specified for RNICTRLE but the TRLE is not an RDMA over Converged Ethernet (RoCE) TRLE.

Rules:

- When the 10GbE RoCE Express feature operates in a dedicated RoCE environment, the diagnostic dump deactivates the 10GbE RoCE Express feature, and causes an inoperative condition for all users.
- When the 10GbE RoCE Express feature operates in a shared RoCE environment, the diagnostic dump only affects the TCP/IP stack that configured the PFID value included in the value of RNIC_TRLEName. Other TCP/IP stacks that use the same RoCE Express feature are not affected.

Guideline: Ensure that multiple 10GbE RoCE Express interfaces are active with the same physical network ID to avoid loss of connections during a CSDUMP operation. For more information, see High availability considerations in *z/OS Communications Server: IP Configuration Guide*.

RU=ru_code

Specifies the response unit code that will carry the sense code specified. The RU operand can be used only in combination with the SENSE operand. If the RU operand is used, then the dump will be triggered only if the RU and SENSE codes occur together. The RU code must be 2, 4, or 6 characters in length.

See *z/OS Communications Server: SNA Data Areas Volume 1* for valid RU codes or *SNA Formats*.

SENSE=sense_code

Specifies the sense code that will trigger a dump. It must be 8 characters in length.

See *z/OS Communications Server: IP and SNA Codes* for the valid sense codes.

TCPNAME=TCPIP_Jobname

Specifies to take a dump of the TCPIP job, along with the current address space. The job name must be 1 - 8 characters in length.

Remove the CSDUMP trigger:

DELETE=ALL

Specifies to delete both the message and the sense triggers.

DELETE=MESSAGE

Specifies to delete the message trigger.

DELETE=SENSE

Specifies to delete the sense trigger.

Examples

Using the default option to take the dump now:

```
f vtam,csdump
IST097I MODIFY ACCEPTED
IST223I MODIFY CSDUMP COMMAND COMPLETED
```

Using the default option and tcpname to take the dump of the current address space and the dump of the TCPIP Job now:

MODIFY CSDUMP

```
f vtam,csdump,tcpname=tcpcs
IST097I MODIFY ACCEPTED
IST223I MODIFY CSDUMP COMMAND COMPLETED
```

Using the default option, TCPNAME parameter, and RNICTRLE parameter to take an immediate dump of the current address space, the specified TCP/IP address space, and a 10GbE RoCE Express diagnostic dump of the specified 10GbE RoCE Express feature:

```
f vtam,csdump,tcpname=tcpcs,rnictrle=iut10001
IST097I MODIFY ACCEPTED
IST223I MODIFY CSDUMP COMMAND COMPLETED
```

Using the message option and RNICTRLE parameter to automatically trigger a dump of the current address space and a 10GbE RoCE Express diagnostic dump the next time when message IST2406I is issued. The diagnostic dump of the 10GbE RoCE Express feature associated with the TRLE name in message IST2406I will be taken.

```
f vtam,csdump,message=ist2406i,rnictrle=msgvalue
IST097I MODIFY ACCEPTED
IST223I MODIFY CSDUMP COMMAND COMPLETED
```

Using the message to take the dump:

```
f vtam,csdump,message=ist1386i
IST097I MODIFY ACCEPTED
IST223I MODIFY CSDUMP COMMAND COMPLETED
```

Using the message and tcpname to take the dump of the current address space and the dump of the TCPIP Job:

```
f vtam,csdump,message=ist1386i,tcpname=tcpcs
IST097I MODIFY ACCEPTED
IST223I MODIFY CSDUMP COMMAND COMPLETED
```

Using the message and the first message_value_field to take the dump:

```
f vtam,csdump,message=(ist169i,react)
IST097I MODIFY ACCEPTED
IST223I MODIFY CSDUMP COMMAND COMPLETED
```

Using the message and the first two message_value_fields:

```
f vtam,csdump,message=(ist169i,react,pua)
IST097I MODIFY ACCEPTED
IST223I MODIFY CSDUMP COMMAND COMPLETED
```

Using the message and the second message_value_field to take the dump:

```
f vtam,csdump,message=(ist169i,,pua)
IST097I MODIFY ACCEPTED
IST223I MODIFY CSDUMP COMMAND COMPLETED
```

Using the message and the REMOTE operand to take a dump of this VTAM and of the remote VTAM when an XCF link becomes inoperative:

```
f vtam,csdump,message=ist1504i,remote=yes
IST097I MODIFY ACCEPTED
IST223I MODIFY CSDUMP COMMAND COMPLETED
```

Using the sense code to take the dump:

```
f vtam,csdump,sense=08090000
IST097I MODIFY ACCEPTED
IST223I MODIFY CSDUMP COMMAND COMPLETED
```


Using the sense code and RU code to take the dump:

```
f vtam,csdump,sense=08090000,ru=818641
IST097I MODIFY ACCEPTED
IST223I MODIFY CSDUMP COMMAND COMPLETED
```

Using the sense code, RU code, and matchlim to take the dump 12 times:

```
f vtam,csdump,sense=08090000,ru=818641,matchlim=12
IST097I MODIFY ACCEPTED
IST223I MODIFY CSDUMP COMMAND COMPLETED
```

Using the sense code, RU code, and tcpname to take the dump of the current address space and the dump of the TCPIP Job:

```
f vtam,csdump,sense=08090000,ru=818641,tcpname=tcpcs
IST097I MODIFY ACCEPTED
IST223I MODIFY CSDUMP COMMAND COMPLETED
```

START command

Starting VTAM in an MVS environment:

```
►►—START— —procname—,—,—,—(— Options —)—————►
```

Note:

1. The start options are listed in this information alphabetically; however, you can code them in any order.
2. Precede the option list with three commas and enclose the group of options in parentheses.
3. Start options that are entered on the START command must be separated by commas. Do not leave any blanks between options.

Options:

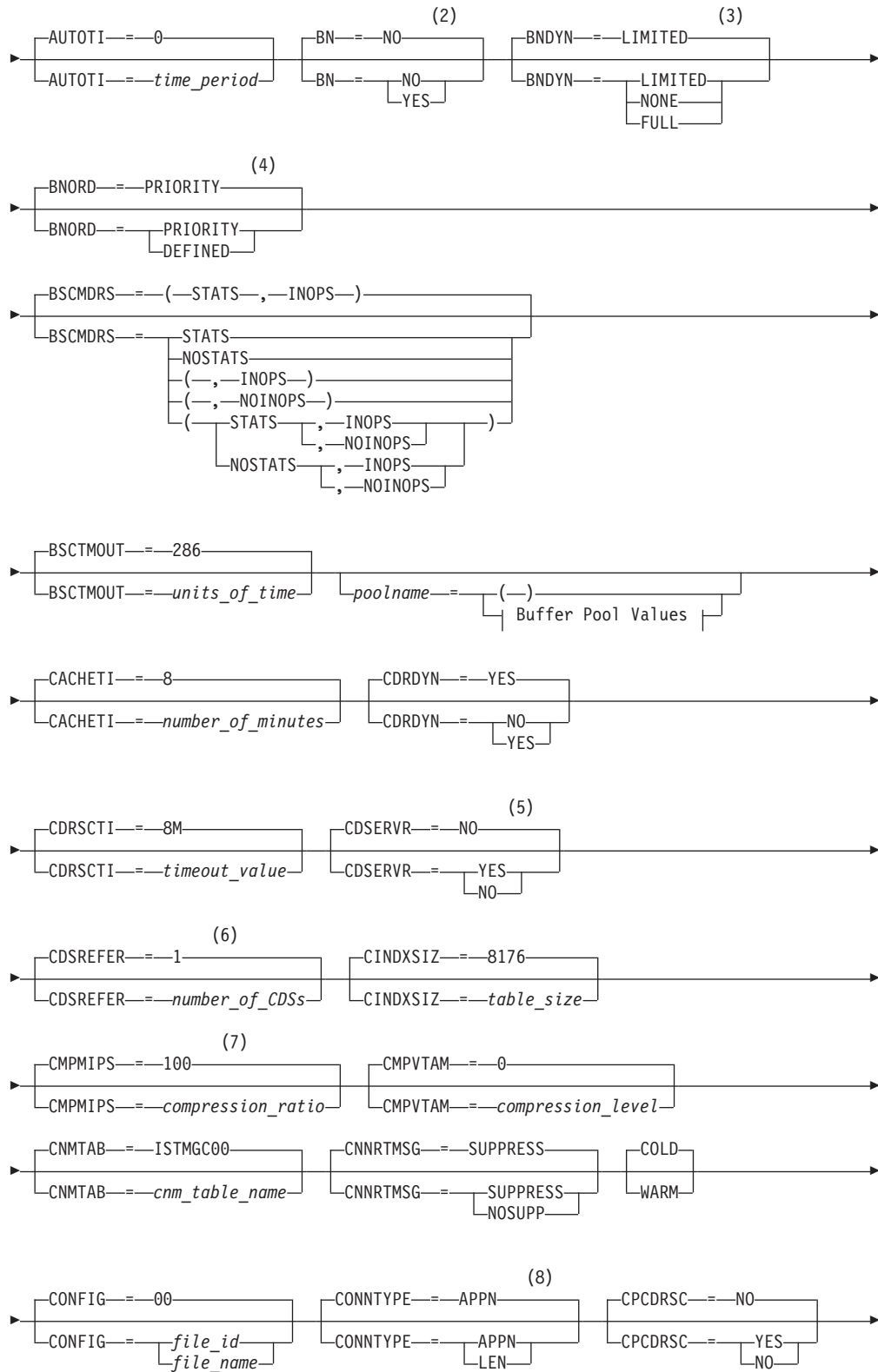
```
|—NETID—==—network_id—SSCPID==—sscp_id—SSCPNAME==—name—————►
```

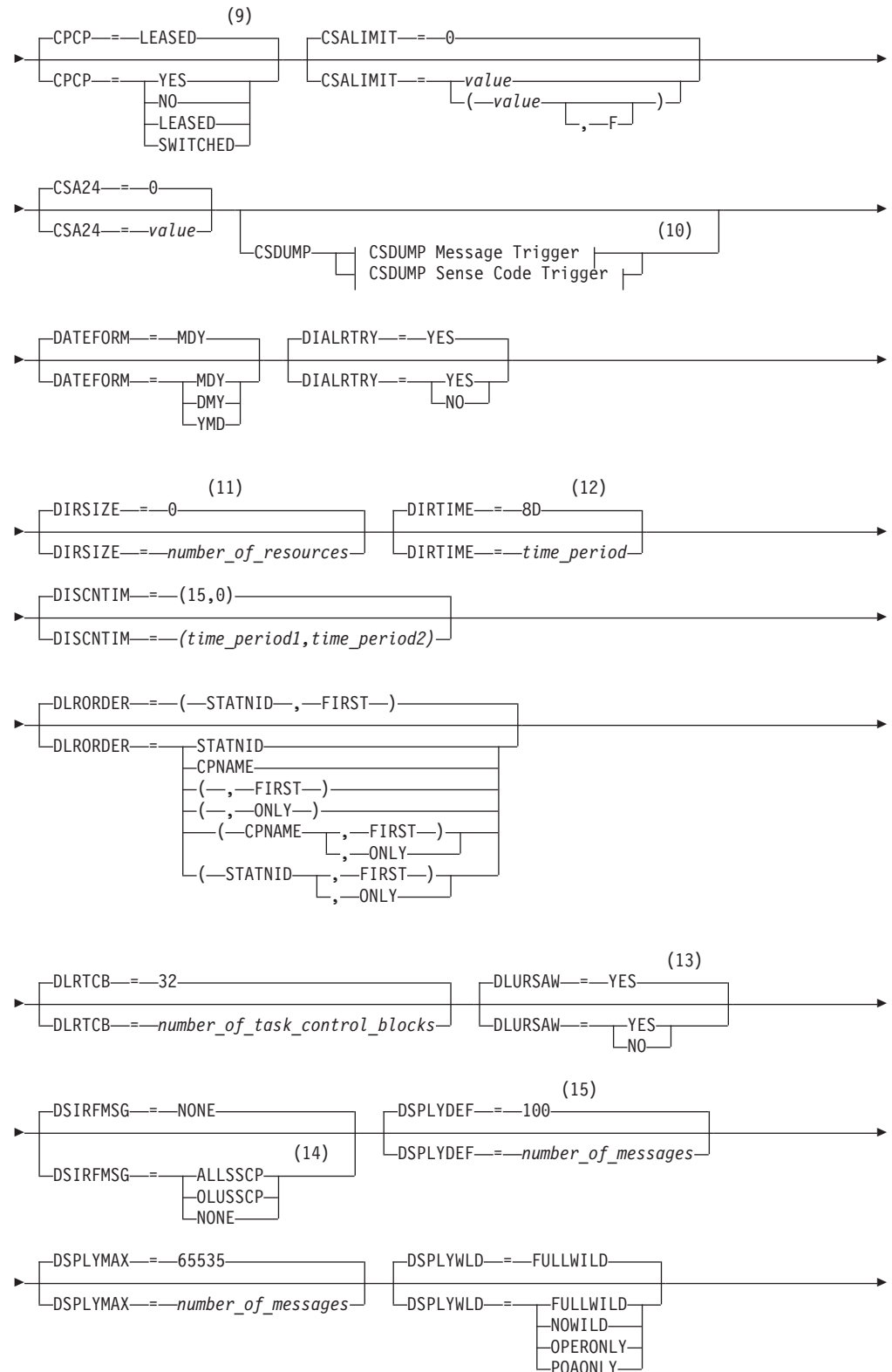
```
► —AFFDELAY==—600—————| —ALSREQ==—NO—————| —API64R==—YES—————|
  —AFFDELAY==—number_of_seconds—| —ALSREQ==—YES—————| —API64R==—NO—————|
                                   —NO—————|
```

```
      (1)
► —APPNCOS==—NONE—————| —ASIRFMSG==—OLUSSCP—————|
  —APPNCOS==—class-of-service_name—| —ASIRFMSG==—ALLSSCP—————|
                                   —OLUSSCP—————|
                                   —NONE—————|
```

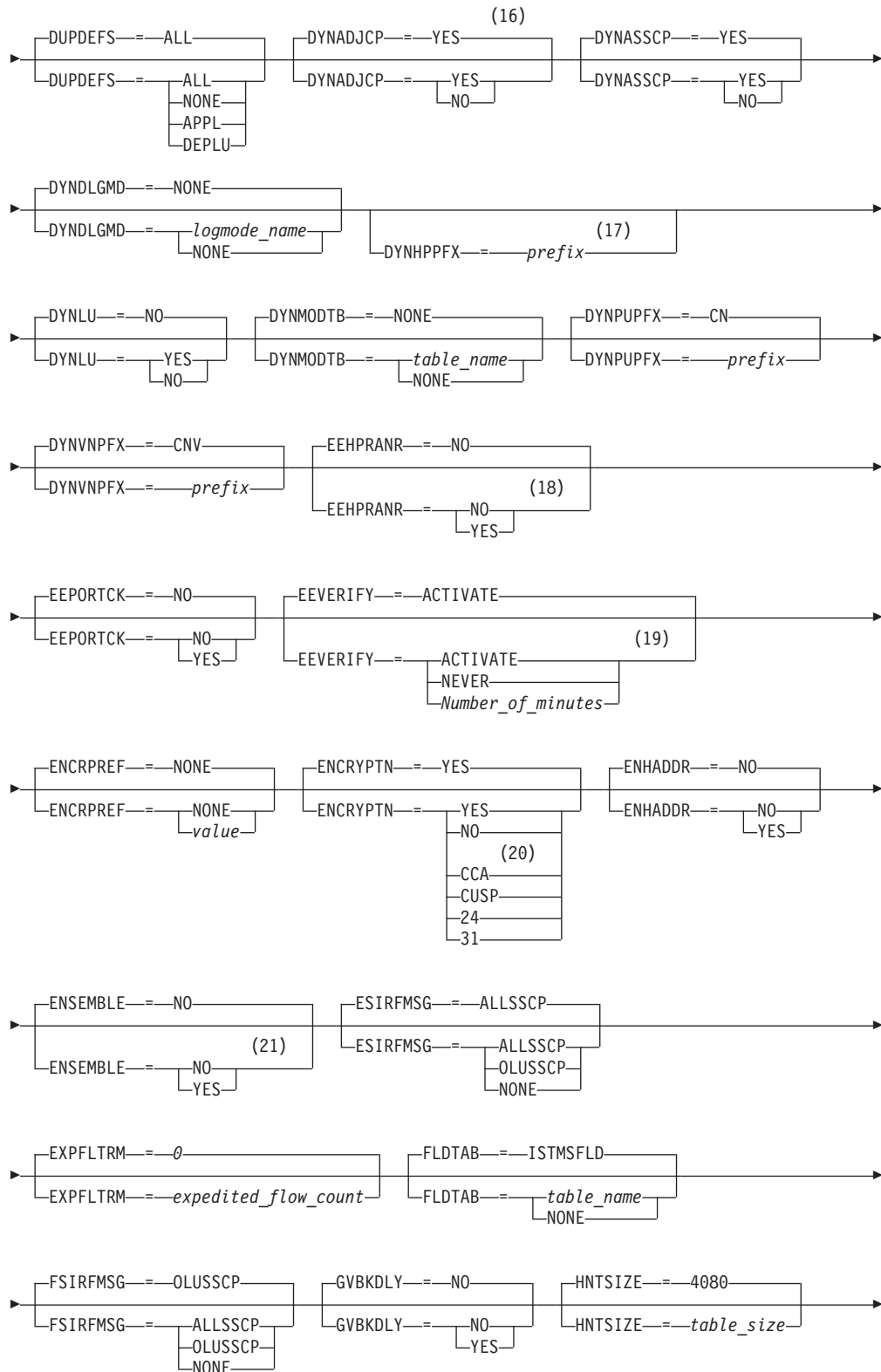
```
► —ASYDE==—TERM—————| —AUTHLEN==—YES—————| —AUTORTRY==—AUTOCAP—————|
  —ASYDE==—KEEP—————| —AUTHLEN==—NO—————| —AUTORTRY==—AUTOCAP—————|
                    —TERM—| —YES—————| —CDRM—————|
                                   —ALL—————|
                                   —NONE—————|
```

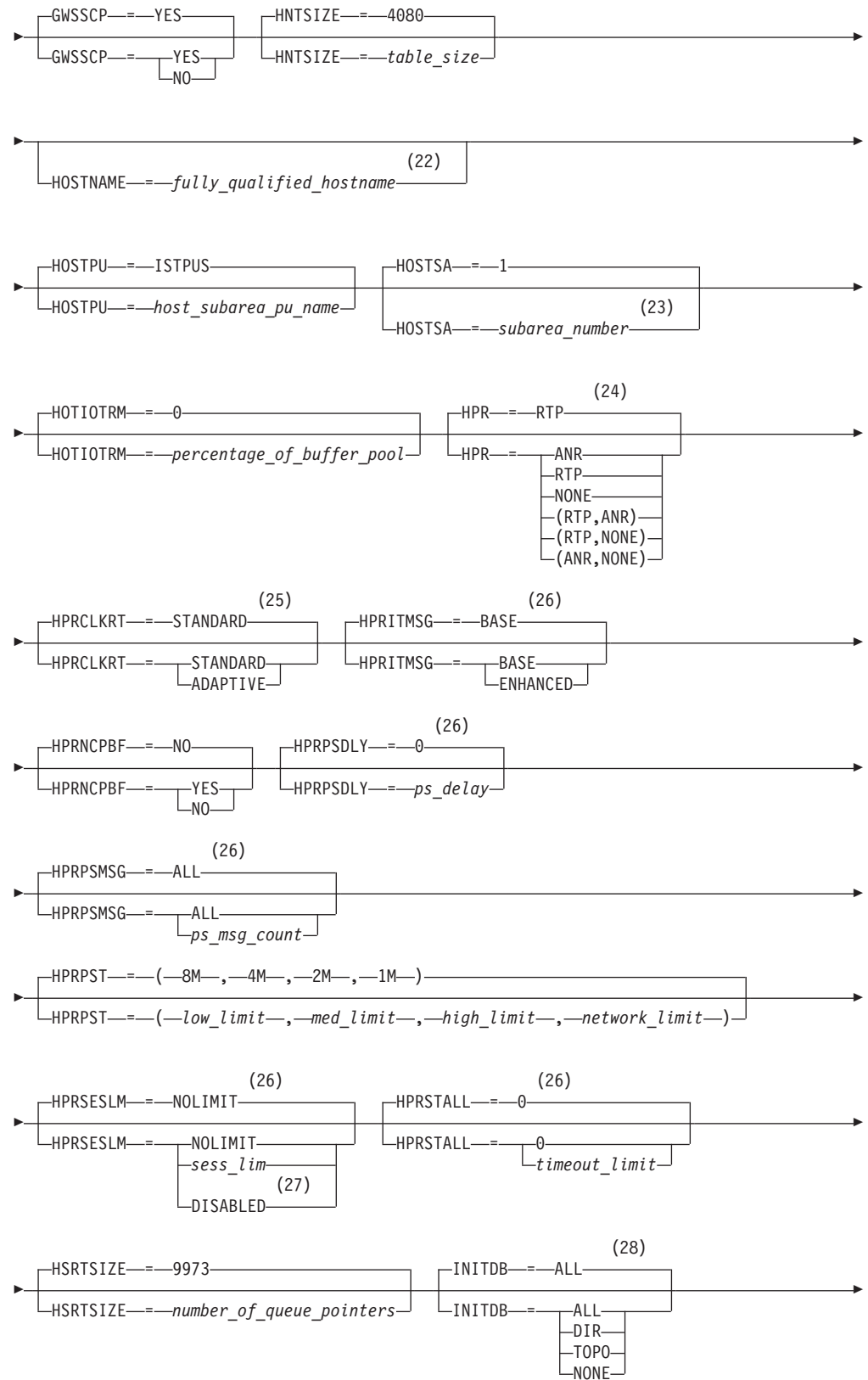
START



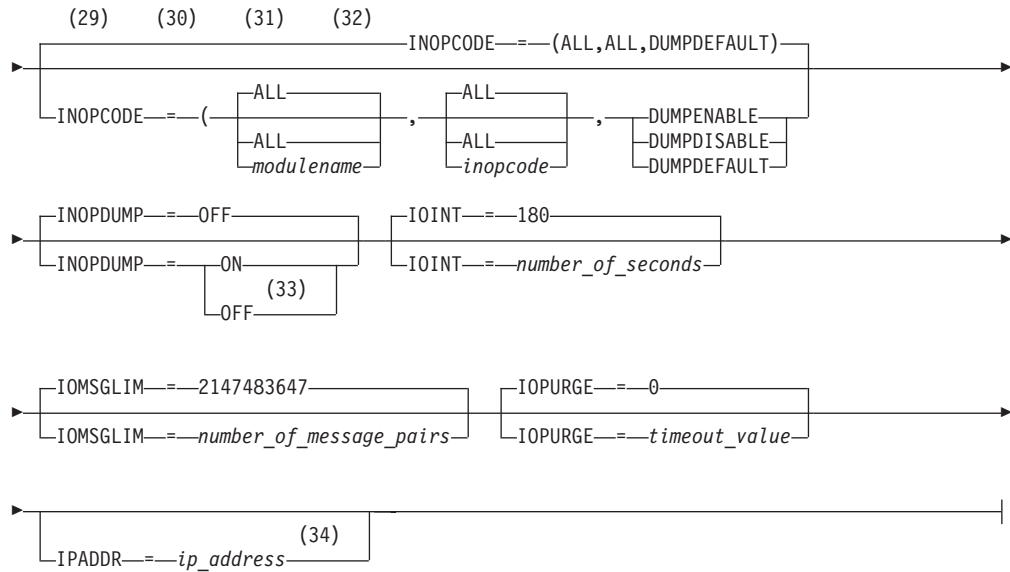


START





START



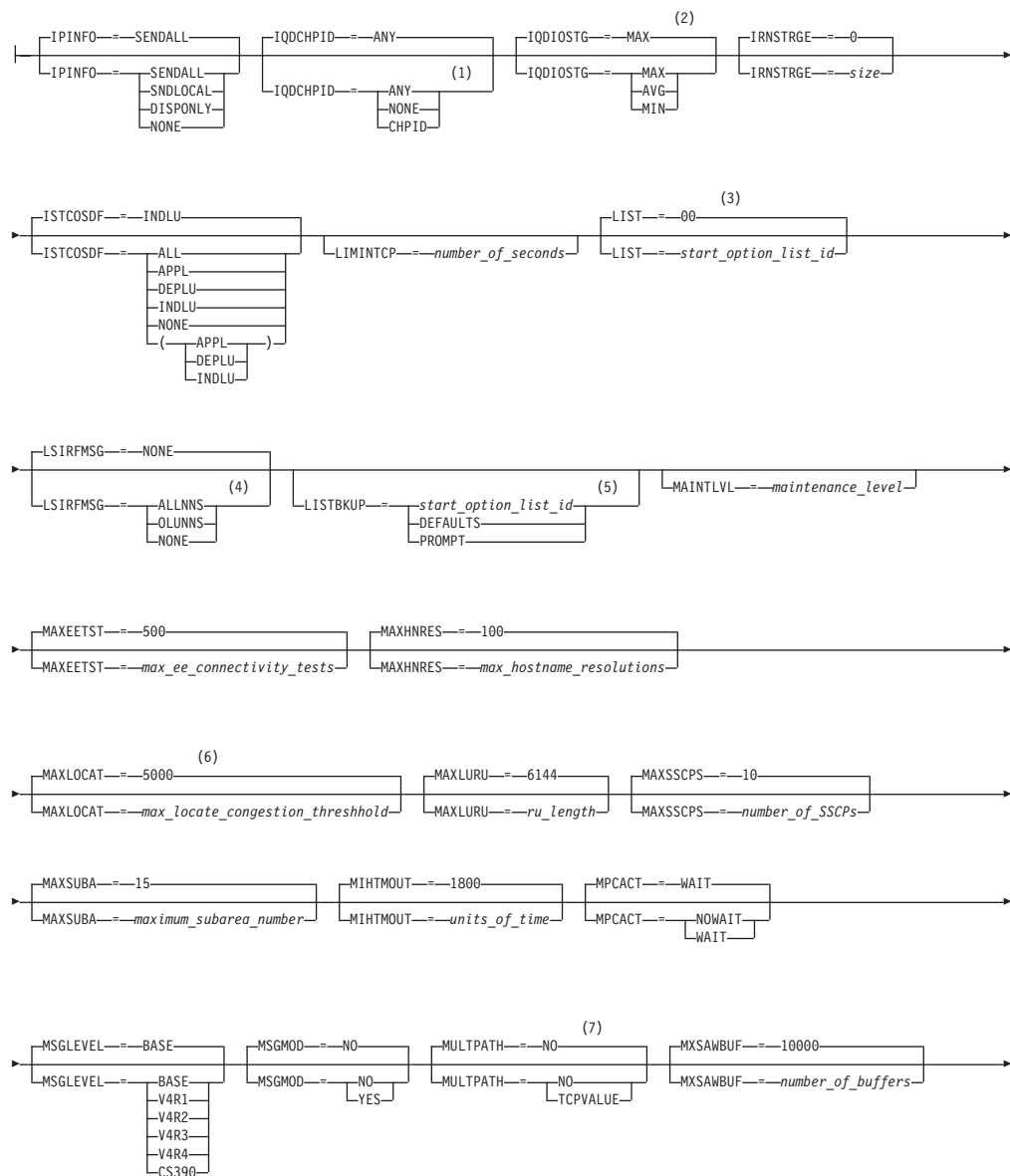
Notes:

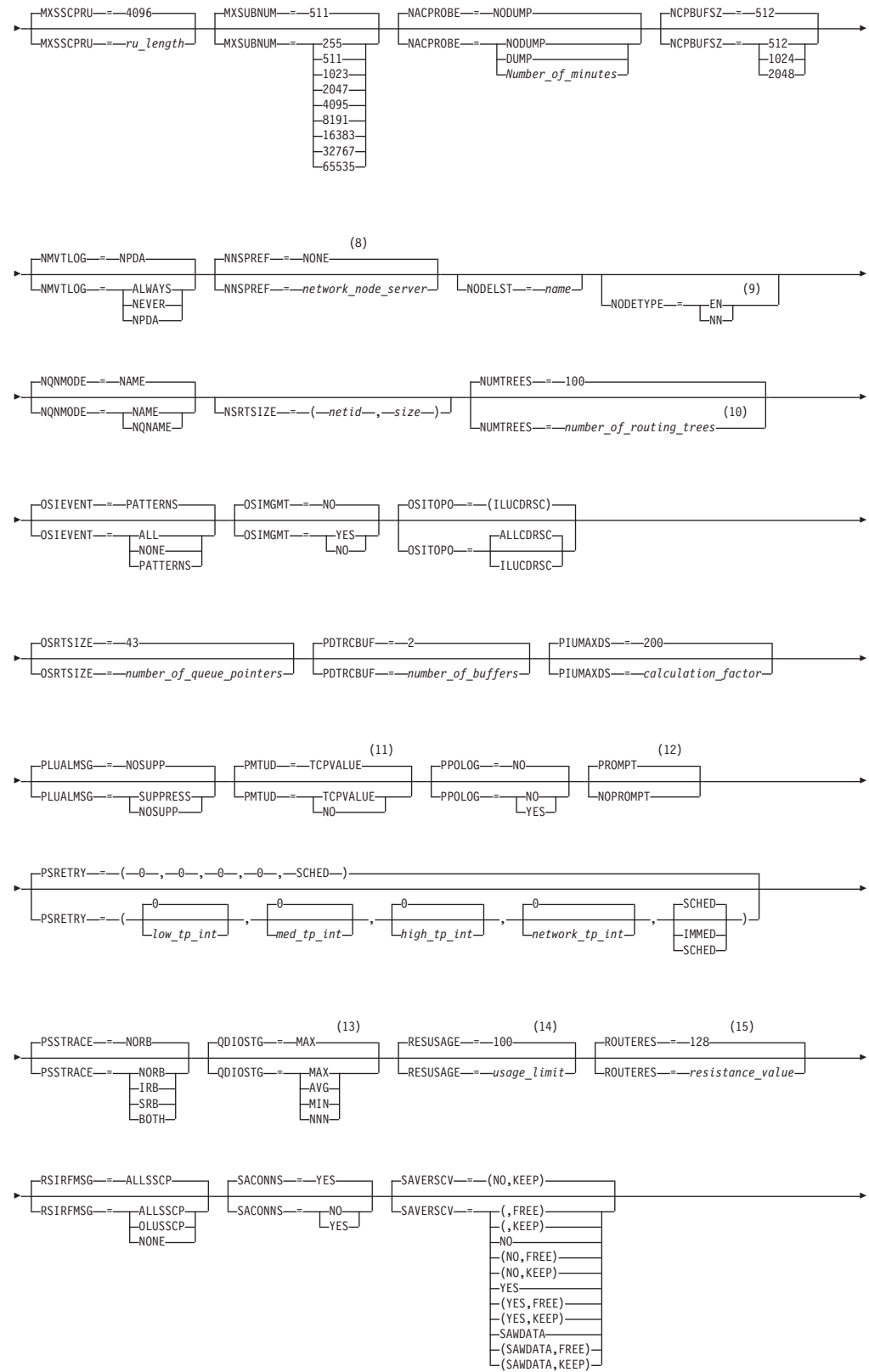
- 1 APPNCOS is meaningful only if the NODETYPE start option is also used.
- 2 BN is meaningful only if the NODETYPE=NN start option is also used.
- 3 BNDYN is meaningful only if the BN=YES start option is also used.
- 4 BNORD is meaningful only if the BN=YES start option is also used.
- 5 CDSERVER is meaningful only if the NODETYPE=NN start option is also used.
- 6 CDSREFER is meaningful only if the NODETYPE=NN and CDSERVER=NO start options are also used.
- 7 The CMPMIPS start option is meaningful only if the value for CMPVTAM is greater than 1.
- 8 CONNTYPE is meaningful only if the NODETYPE start option is also used.
- 9 CPCP is meaningful only if the NODETYPE start option is also used.
- 10 Specify the CSDUMP start option twice to set both message and sense code triggers.
- 11 DIRSIZE is meaningful only if the NODETYPE=NN start option is also used.
- 12 DIRTIME is meaningful only if the NODETYPE=NN start option is also used.
- 13 DLURSAW is meaningful only if the NODETYPE=NN start option is also used.
- 14 Because of the volume of messages that can be generated, it is not recommended that this option be enabled during normal operation. Instead, it is recommended that this option be enabled (using the MODIFY VTAMOPTS command) on all necessary hosts only when trying to diagnose specific problems. After the problem has been diagnosed or documentation has been collected, this option should be disabled once again (using the MODIFY VTAMOPTS command).
- 15 If the DSPLYMAX start option value is less than 100, that value is the default for DSPLYDEF.

- 16 DYNADJCP is meaningful only if the NODETYPE start option is also used.
- 17 Two character prefix.
- 18 EEHPRANR is meaningful only when the NODETYPE=NN start option is also used.
- 19 The EEVERIFY start option is meaningful only if VTAM provides RTP-level HPR support. The NODETYPE start option must be coded and the RTP value must be specified on the HPR start option.
- 20 ENCRYPTN=CCA needs to be coded when Triple Des Encryption is required.
- 21 The ENSEMBLE setting is used to either permit or deny connectivity to the intraensemble data network and the intranode management network. It does this by either allowing or denying activation of OSX and OSM interfaces.
- 22 HOSTNAME is meaningful only if the NODETYPE start option is also used. If neither HOSTNAME nor IPADDR is specified on any of the GROUP definition statements within the Enterprise Extender XCA major node, then either the HOSTNAME, TCPNAME, or IPADDR start options must be specified in order to activate an Enterprise Extender link. The HOSTNAME start option specifies the default hostname to be used for name-to-address resolution as part of activating an Enterprise Extender connection, and must resolve at this node to a static VIPA address associated with a TCP/IP stack at this node. If IPADDR is specified along with HOSTNAME on the START command, the IPADDR value is ignored.
- 23 HOSTSA specifies the subarea number of this VTAM. If HOSTSA is not coded, then a default subarea number of 1 is used.
- 24 HPR is meaningful only if NODETYPE is also used.
- 25 HPRCLKRT=ADAPTIVE is meaningful only in Enterprise Extender configurations that have a defined capacity of 1 Gb (gigabit) or higher access speeds.
- 26 This option is meaningful only if VTAM provides RTP-level HPR support.
- 27 HPRSESLM=DISABLED is meaningful only on interchange nodes.
- 28 INITDB is meaningful only if the NODETYPE=NN start option is also used.
- 29 When specifying an InOpCode for the second parameter, always specify three digits by including any leading zeros.
- 30 If an InOpCode is specified for the second parameter, the first parameter cannot be ALL.
- 31 INOPCODE has no effect unless INOPDUMP is active for the resource when an inoperative condition is detected. See the MODIFY INOPCODE command for more details.
- 32 Multiple INOPCODE parameters can be specified by the START command, and will be processed left to right as they are entered. This is different from specifying the INOPCODE parameter on either the MODIFY INOPCODE command or the MODIFY VTAMOPTS command, where only one INOPCODE parameter is allowed for each entry of these commands.
- 33 INOPDUMP status is propagated to resources that are defined within a TRLE when the entry is activated and the TRLE InOpDump status has not been explicitly set.
- 34 IPADDR is meaningful only if the NODETYPE start option is also used. If neither IPADDR nor HOSTNAME is specified on any of the GROUP

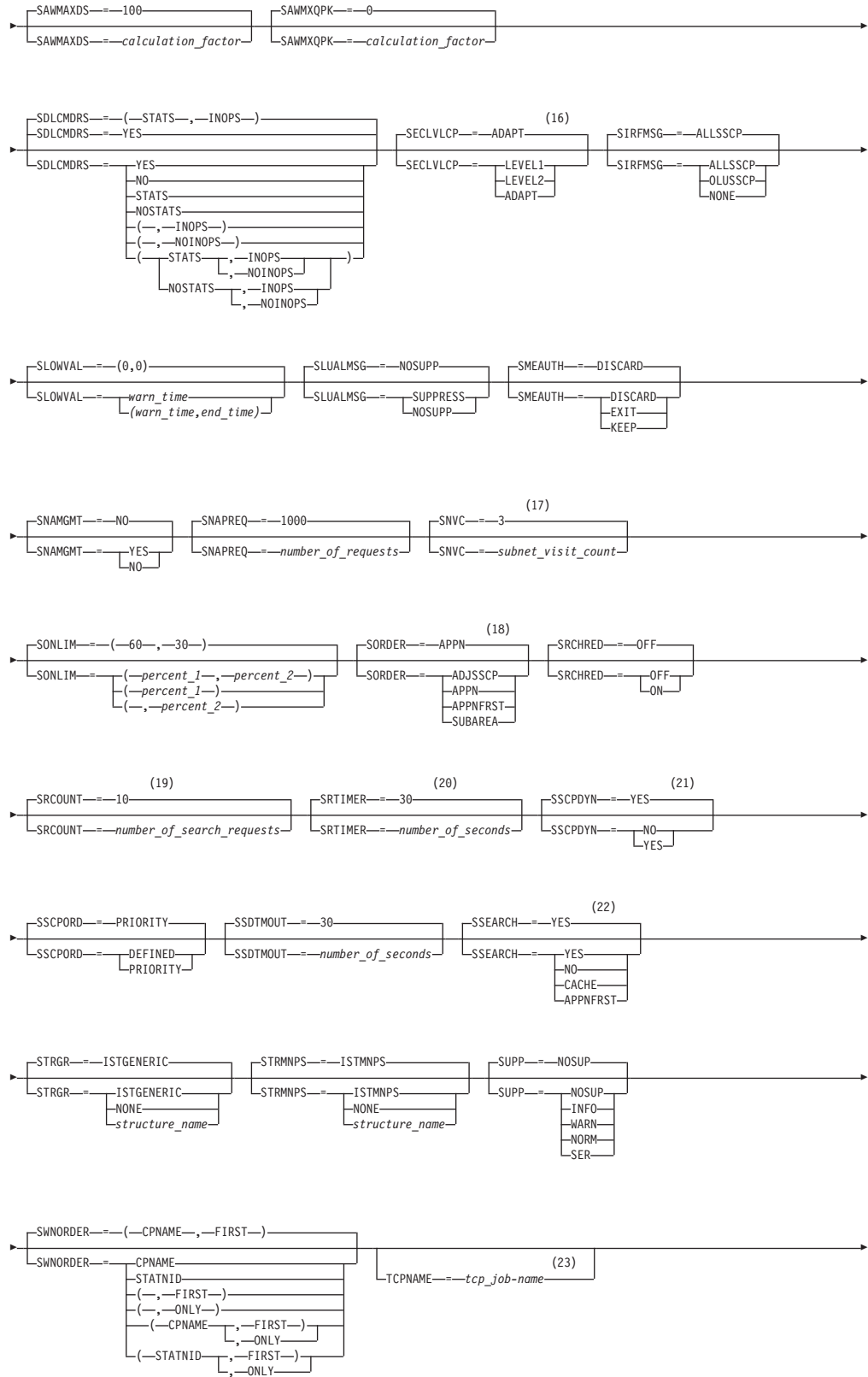
START

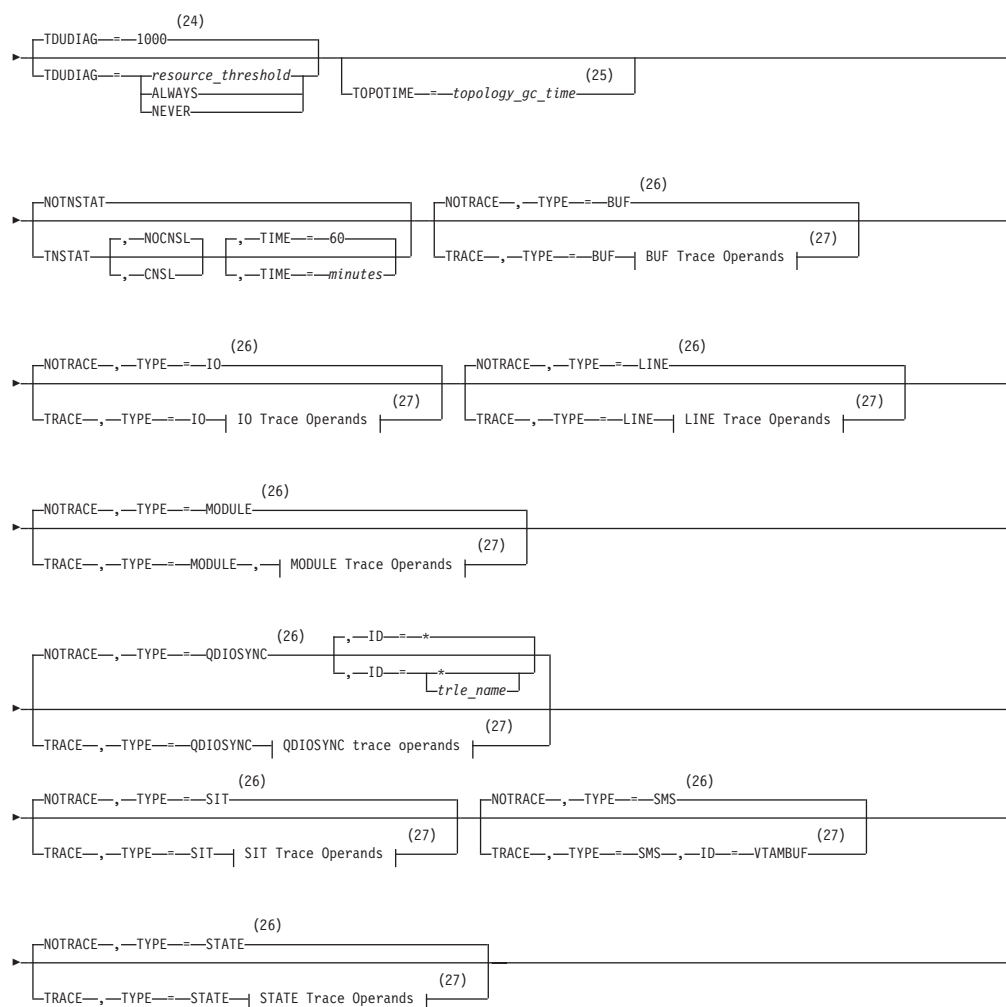
definition statements within the Enterprise Extender XCA major node, then either the HOSTNAME, TCPNAME, or IPADDR start option must be specified in order to activate an Enterprise Extender link. The IPADDR start option specifies the default IPv4 or IPv6 static VIPA address to be used when activating an Enterprise Extender connection. If HOSTNAME is specified along with IPADDR on the START command, the IPADDR value is ignored.





START





Notes:

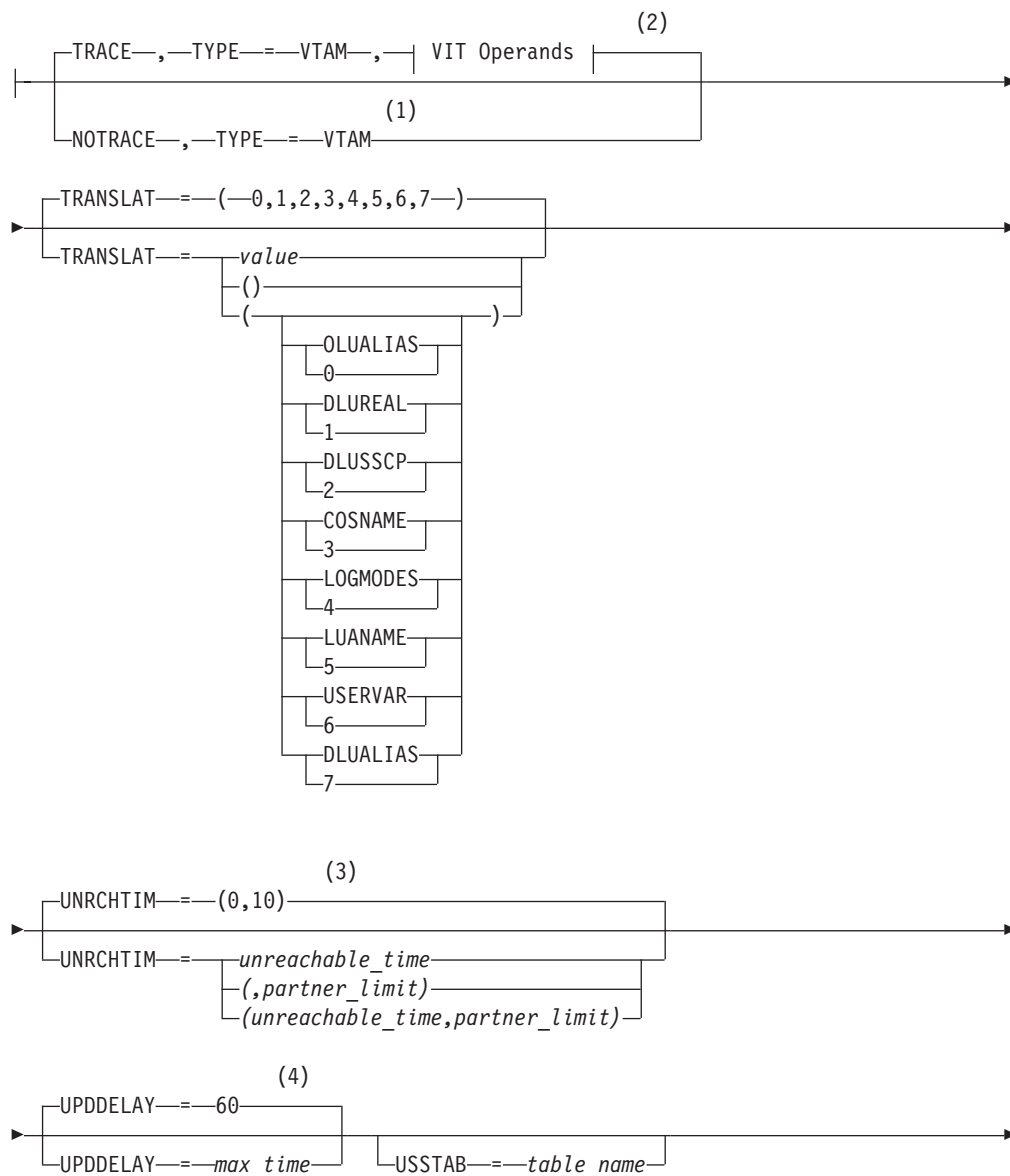
- 1 The IQDCHPID option controls which IQD CHPID (and related subchannel devices) VTAM selects to dynamically build the iQDIO (IUTIQDIO) MPC group. The IUTIQDIO MPC group is used for TCP/IP dynamic XCF communications within System z. Although this option can be modified (and the modification will immediately be displayed) while the IUTIQDIO MPC group is currently active, any modifications have the effects shown in the section called IQD CHPID modifications.
- 2 This option affects only iQDIO devices that use a MFS of 64k. The smaller frame sizes will always use 126 SBALs. You can override this option on a per-device basis using the READSTORAGE parameter on the LINK or INTERFACE statement in the TCP/IP profile. See z/OS Communications Server: IP Configuration Reference for more details.
- 3 LIST can be entered by a VTAM operator only. If LIST is coded in an ATCSTRxx file, it is considered to be an error and is ignored.
- 4 Because of the volume of messages that can be generated, it is not recommended that this option be enabled during normal operation. Instead, it is recommended that this option be enabled (using the MODIFY VTAMOPTS command) on all necessary hosts only when trying to diagnose specific

START

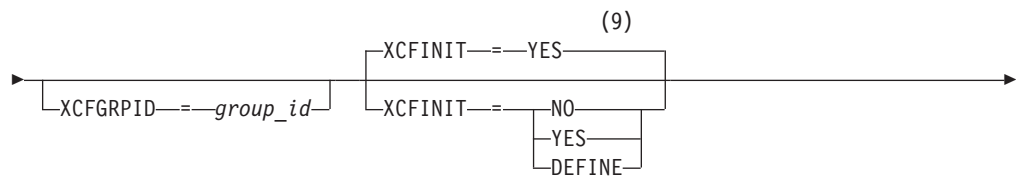
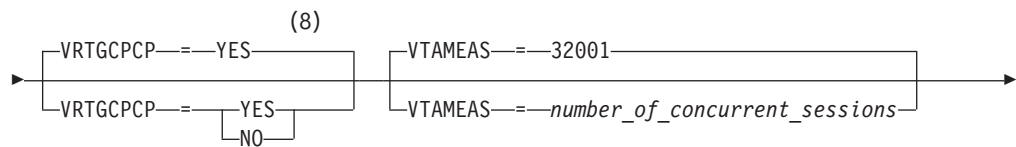
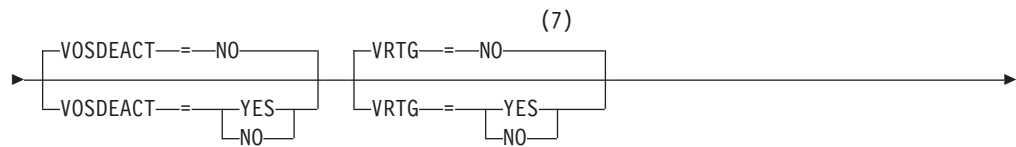
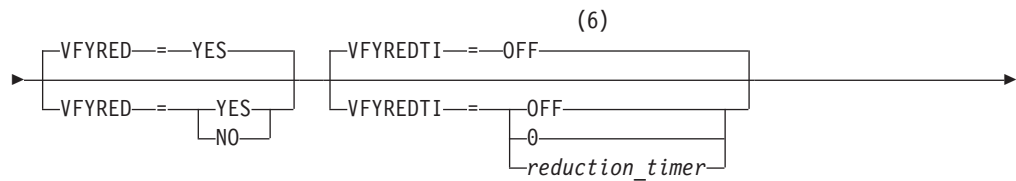
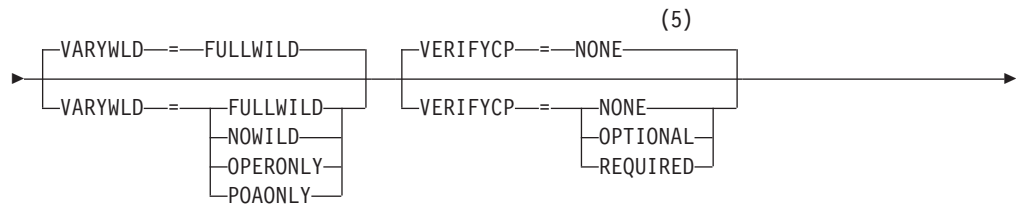
problems. After the problem has been diagnosed or documentation has been collected, this option should be disabled once again (using the MODIFY VTAMOPTS command).

- 5 LISTBKUP can be coded only in a start option file. If you enter it on the START command or at an operator prompt, VTAM will ignore it.
- 6 MAXLOCAT is meaningful only if NODETYPE is specified.
- 7 MULTPATH is meaningful only if the NODETYPE start option is also specified.
- 8 NNSPREF can be specified only if NODETYPE=EN is specified during VTAM START processing.
- 9 NODETYPE enables APPN function. The combination of HOSTSA, NODETYPE, and SACONNS determines the configuration (subarea node, interchange node, migration data host, network node, or end node).
- 10 NUMTREES is meaningful only if the NODETYPE=NN start option is also used.
- 11 PMTUD is meaningful only if the NODETYPE start option is also specified.
- 12 A VTAM operator cannot enter the PROMPT or NOPROMPT start option; it can be coded only in ATCSTR00. The value coded in ATCSTR00 is ignored if start options are entered on the START command or if VTAM finds an error in a start list. Upon finding an error in a start list, VTAM prompts the operator so that the operator can specify the option correctly.
- 13 QDIOSTG defaults to MAX for 64-bit (z/Architecture) machines and MIN for non 64-bit machines. You can override this option on a per-device basis using the READSTORAGE parameter on the LINK or INTERFACE statement in the TCP/IP profile. See z/OS Communications Server: IP Configuration Reference for more details.
- 14 RESUSAGE is meaningful only if the NODETYPE=NN start option is also used.
- 15 ROUTERES is meaningful only if the NODETYPE=NN start option is also used.
- 16 The SECLVLCP start option is meaningful only if the NODETYPE and VERIFYCP start options are also used.
- 17 SNVC is meaningful only if the BN=YES start option is also used.
- 18 SORDER is meaningful only in an interchange node or a migration data host.
- 19 SRCOUNT is meaningful only if the SRCHRED=ON start option is also used.
- 20 SRTIMER is meaningful only if the SRCHRED=ON start option is also used.
- 21 The SSCPDYN start option applies only for interconnected networks (that is, GWSSCP=YES is used).
- 22 SSEARCH is meaningful only if the NODETYPE=NN start option is also used.
- 23 TCPNAME is meaningful only if the NODETYPE start option is also used. If neither IPADDR nor HOSTNAME is specified on any of the GROUP definition statements within the Enterprise Extender XCA major node, then either the HOSTNAME, TCPNAME, or IPADDR start options must be specified in order to activate an Enterprise Extender link.

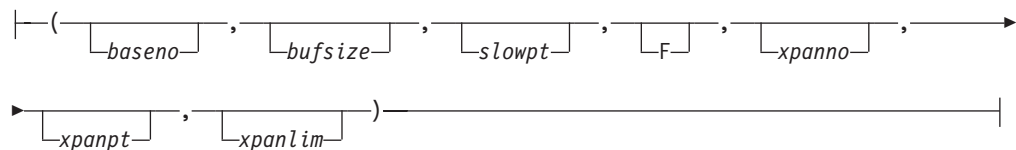
- 24 TDUDIAG is meaningful only if the NODETYPE=NN start option is also available.
- 25 TOPOTIME is meaningful only if the NODETYPE start option is also used.
- 26 Do not use NOTRACE when starting VTAM, except to override a TRACE start option coded in a predefined list.
- 27 You can code TRACE and its qualifiers through position 71, even if you are in the middle of the start option. Continue the remainder of the item in the next record. Code the TYPE qualifier immediately after you code the TRACE start option.



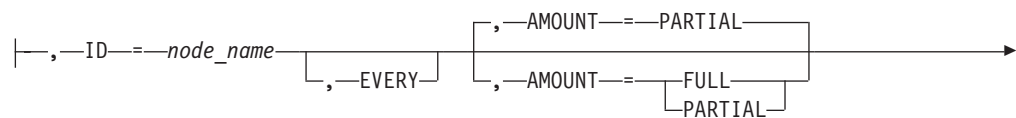
START

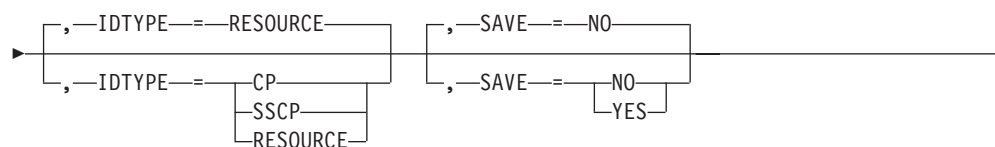


Buffer Pool Values:

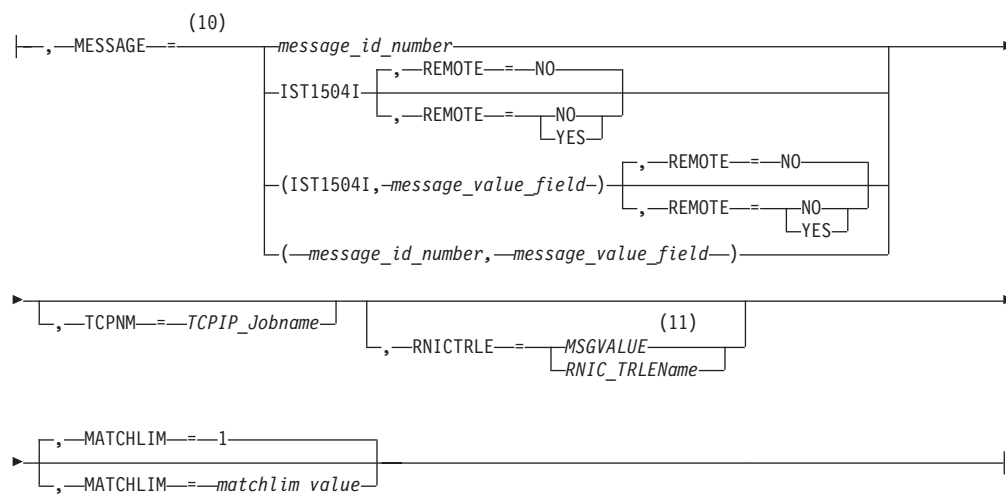


BUF Trace Operands:

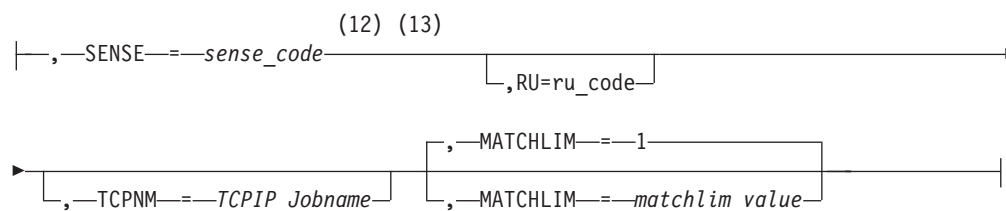




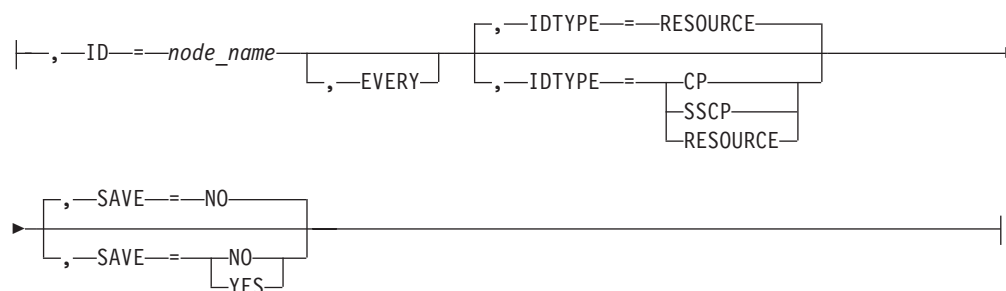
CSDUMP message trigger:



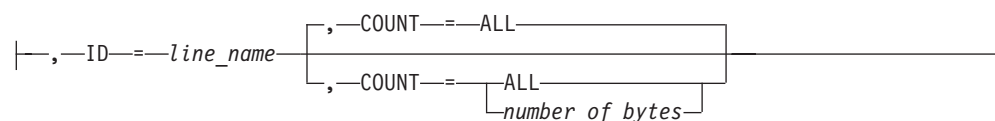
CSDUMP sense code trigger:



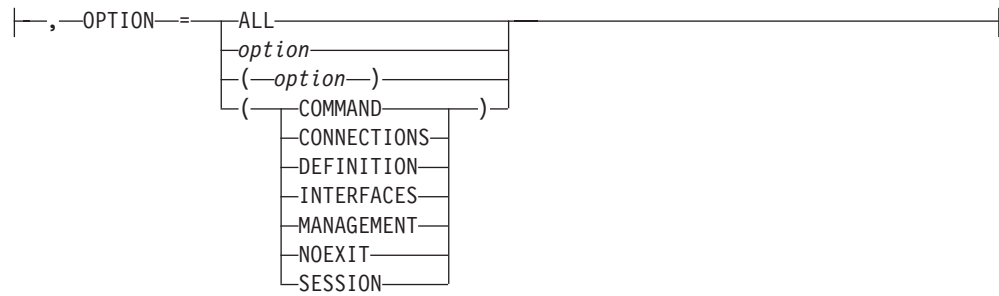
IO Trace Operands:



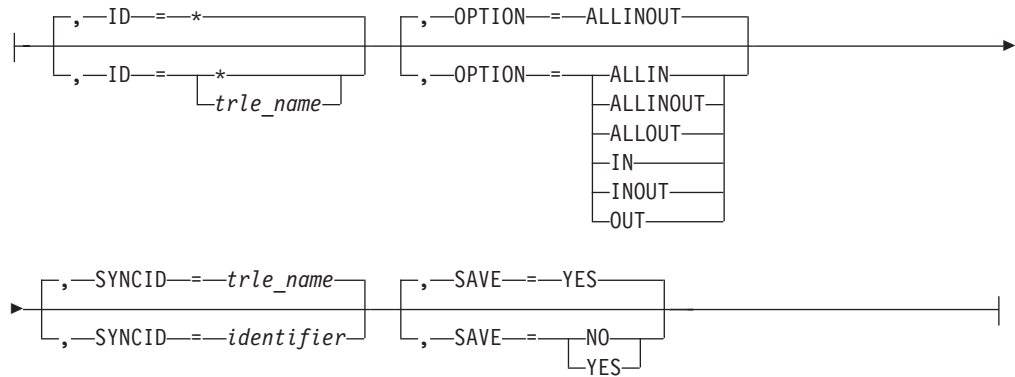
LINE Trace Operands:



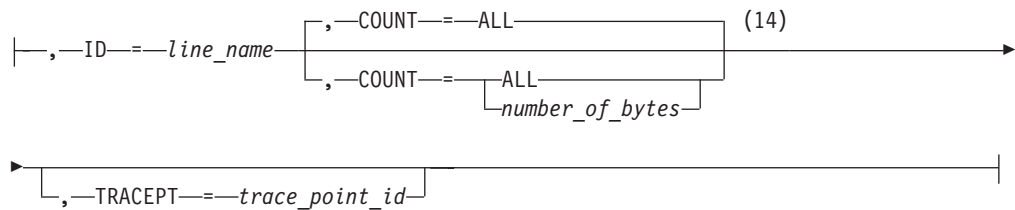
MODULE Trace Operands:



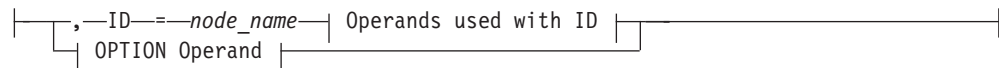
QDIOSYNC trace operands:



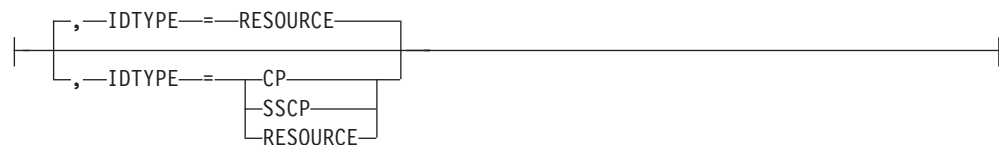
SIT Trace Operands:

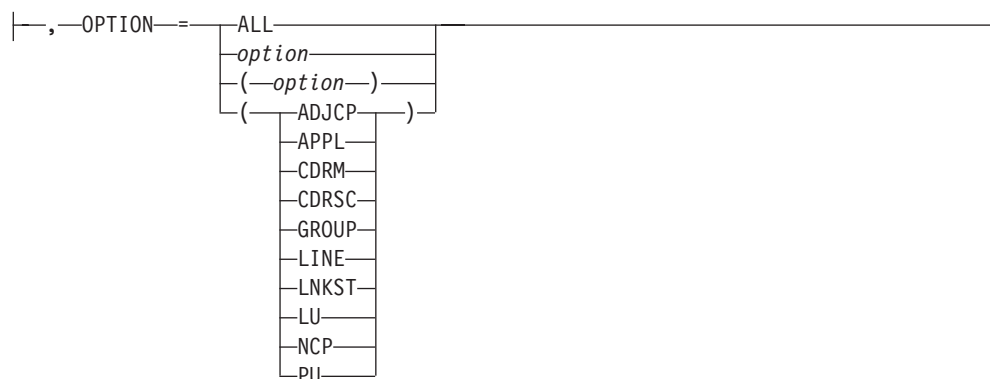


STATE Trace Operands:



Operands used with ID:

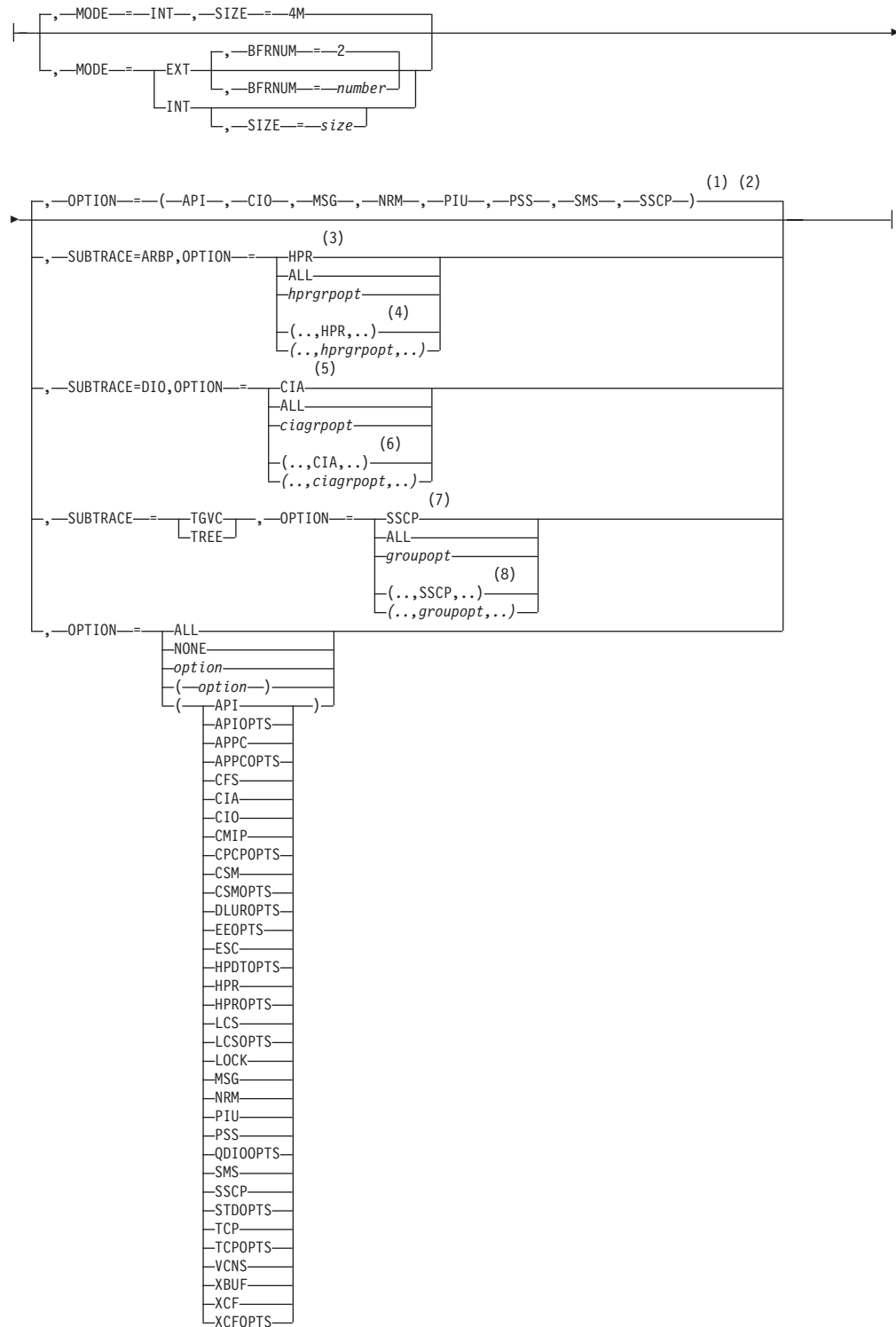


OPTION Operand:**Notes:**

- 1 NOTRACE,TYPE=VTAM is accepted but ignored. Tracing is started with the default trace table size and the default options.
- 2 You can code TRACE and its qualifiers through position 71, even if you are in the middle of the start option. Continue the remainder of the item in the next record. Code the TYPE qualifier immediately after you code the TRACE start option.
- 3 UNRCHTIM is meaningful only if the NODETYPE start option is also used.
- 4 UPDDELAY is meaningful only if the OSIMGMT=YES start option is also used.
- 5 The VERIFYCP start option is meaningful only if the NODETYPE start option is also used.
- 6 VFYREDTI is meaningful only if the NODETYPE=NN start option is also used.
- 7 VRTG is meaningful only if the NODETYPE and HOSTSA start options are also used.
- 8 VRTGCPCP is meaningful only if the NODETYPE and HOSTSA start options are also used.
- 9 XCFINIT=YES is the default if VTAM is started as an APPN node (that is, the NODETYPE start option has been specified). XCFINIT=YES is not valid for pure subarea nodes. XCFINIT=DEFINE is the default if VTAM is started as a pure subarea node (the NODETYPE start option has not been specified).
- 10 When the same parameter is entered multiple times on a CSDUMP message trigger, only the last occurrence is accepted.
- 11 MSGVALUE is valid only when the MESSAGE operand is used and specifies either message IST2391I or IST2406I.
- 12 When an error message is received on any parameter of the CSDUMP start option, the remaining parameters for this CSDUMP start option are ignored. Enter the complete CSDUMP start option again when you are prompted.
- 13 When the same parameter is entered multiple times on a CSDUMP sense trigger, only the last occurrence is accepted.
- 14 COUNT applies only to the IBM 3720 and 3745 Communication Controllers.

START

VIT Operands:



Notes:

- 1 The default options apply only to `MODE=INT`.
- 2 `PSS` and `SMS` can be turned off.
- 3 When you specify `SUBTRACE=ARBP` and you code a single `OPTION` value,

the OPTION value must be HPR, ALL, or one of the group options (*hprgrpopt*) that include HPR as an individual option equivalent. The applicable group options are DLUROPTS, EEOPTS, HPDPTOPTS, HPROPTS, QDIOOPTS, and XCFOPTS.

- 4 When SUBTRACE=ARBP is coded and you code multiple trace options in parentheses, you must code either HPR or one of the group options (*hprgrpopt*) that include HPR as an individual option equivalent inside the parentheses.
- 5 When you specify SUBTRACE=DIO and you code a single OPTION value, the OPTION value must be CIA, ALL, or one of the group options (*ciagrpopt*) that include CIA as an individual option equivalent. The applicable group options are EEOPTS, HPDPTOPTS, HPROPTS, QDIOOPTS, TCPOPTS and XCFOPTS.
- 6 When SUBTRACE=DIO is coded and you code multiple trace options in parentheses, you must code either CIA or one of the group options (*ciagrpopt*) that include CIA as an individual option equivalent inside the parentheses.
- 7 When you code SUBTRACE=TGVC or SUBTRACE=TREE and you code a single OPTION value, the OPTION value must be either SSCP, ALL, or one of the group options (*groupopt*), all of which include SSCP as an individual option equivalent. The group options are APIOPTS, APPCOPTS, CPCPOPTS, CSMOPTS, DLUROPTS, EEOPTS, HPDPTOPTS, HPROPTS, LCSOPTS, QDIOOPTS, STDOPST, TCPOPTS, and XCFOPTS.
- 8 When you code SUBTRACE=TGVC or SUBTRACE=TREE and you code multiple trace options in parentheses, you must code either SSCP or one of the group options (*groupopt*) inside the parentheses.

IQD CHPID modifications

While the IUTIQDIO MPC group is currently active, any modifications to the IQDCHPID option have the following effects:

- Modified from ANY (or CHPID) to NONE - no effect on current usage but blocks subsequent activations
- Modified from NONE to ANY (or CHPID) - no effect on current usage but allows subsequent activations
- Modified from CHPID_X to CHPID_Y - no effect on current usage

Note: VTAM uses the CHPID value only when building the IUTIQDIO MPC group. To change CHPIDs for an active MPC group, the following must be done:

1. All TCP/IP iQDIO (HiperSocket) devices must be stopped.
2. Make any necessary HCD/IOCDS changes.
3. Verify that new subchannel devices are varied online.
4. Verify that the MPC group has deactivated (with no usage, it times out after approximately two minutes).
5. Modify IQDCHPID=CHPID (to new CHPID).
6. Restart the TCP/IP iQDIO device or devices.

Note: In order to use iQDIO communications, the processor must have the necessary hardware support. If the processor does not support iQDIO communications, then modifications to this start option will not be accepted and the IQDCHPID option will not be displayed (displayed as ***NA***).

Abbreviations

Operand	Abbreviation
START	S
AMOUNT=FULL	AMT=F
AMOUNT=PARTIAL	AMT=P
DATEFORM	DATEFRM
EVERY	E
MSGLEVEL	MSGLVL
OPTION	OPT
OPTION=COMMAND	OPT=CMD
OPTION=CONNECTION	OPT=CON
OPTION=DEFINITION	OPT=DEF
OPTION=INTERFACES	OPT=INT
OPTION=MANAGEMENT	OPT=MGMT
OPTION=SESSION	OPT=SES
PLUALMSG=NOSUPP	PLUALMSG=NOSUP
PLUALMSG=SUPPRESS	PLUALMSG=SUPP
SECLVLCP=LEVEL1	SECLVLCP=LVL1
SECLVLCP=LEVEL2	SECLVLCP=LVL2
SLUALMSG=NOSUPP	SLUALMSG=NOSUP
SLUALMSG=SUPPRESS	SLUALMSG=SUPP
TRANSLAT=COSNAME	TRANSLAT=3
TRANSLAT=DLUALIAS	TRANSLAT=7
TRANSLAT=DLUREAL	TRANSLAT=1
TRANSLAT=DLUSSCP	TRANSLAT=2
TRANSLAT=LOGMODES	TRANSLAT=4
TRANSLAT=LUANAME	TRANSLAT=5
TRANSLAT=OLUALIAS	TRANSLAT=0
TRANSLAT=USERVAR	TRANSLAT=6

When using an abbreviation in place of an operand, code the abbreviation exactly as shown in the table. For example, when coding the abbreviation for PLUALMSG=SUPPRESS, code only PLUALMSG=SUPP.

Purpose

VTAM is started with the START command.

You can enter the START command only at the master or a secondary system console.

Operands

procname

Procedure name for the command.

procname can be specified as either *startname.ident* or *startname*, where *startname* is the name of the JCL procedure used to start VTAM and *ident* is an optional identifier.

procname used for this command determines the *procname* used for all MODIFY commands as follows:

- If *procname* in the START command was specified as *startname.ident*, where *startname* is the VTAM start procedure and *ident* is the optional identifier, then either *startname.ident* or *ident* can be specified for *procname*.
- If *procname* in the START command was *startname*, then *startname* must be specified for *procname*.

Therefore, if you use NET as the optional identifier on this command, you can consistently use NET as *procname* for all VTAM commands.

options

VTAM start options supplied by the system programmer. The VTAM operator can enter one or more options. For a description of the start options, see z/OS Communications Server: SNA Resource Definition Reference.

If more than one line is necessary for the start options, enter a comma and a closing parenthesis after the last option.

The values established by the start options go into effect when VTAM is started and remain in effect until VTAM is halted. Many of the options, however, can be modified with the MODIFY VTAMOPTS command while VTAM is running. You can use the DISPLAY VTAMOPTS command to display the values of the start options.

Examples

```
s net,,, (list=01) s net,,, (list=01)
...
IST020I VTAM INITIALIZATION COMPLETE FOR level
IST1349I COMPONENT ID IS dddd-ddddd-ddd
IST1348I VTAM STARTED AS nodetype
```

For further information about these messages, see z/OS Communications Server: SNA Messages.

START

Chapter 10. SNA Messages

Conventions and terminology that are used in this document

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

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

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

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

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

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

- RDMA network interface card (RNIC), which is used to refer to the IBM 10GbE RoCE Express feature.
- Shared RoCE environment, which means that the 10GbE RoCE Express feature operates on an IBM z13 (z13) or later system, and that the feature can be used concurrently, or shared, by multiple operating system instances. The RoCE Express feature is considered to operate in a shared RoCE environment even if you use it with a single operating system instance.

For definitions of the terms and abbreviations that are used in this document, you can view the latest IBM terminology at the IBM Terminology website.

Clarification of notes

Information traditionally qualified as Notes is further qualified as follows:

Note Supplemental detail

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

Guideline

Customary way to perform a procedure

Rule Something you must do; limitations on your actions

Restriction

Indicates certain conditions are not supported; limitations on a product or facility

Requirement

Dependencies, prerequisites

Result Indicates the outcome

IST2361I SMCR PFID = *pfid* PCHID = *pchid* PNETID = *network_id*

Explanation: VTAM issues this message as part of a message group in response to a DISPLAY ID or DISPLAY TRL command for a TRLE that is associated with an IBM 10GbE RoCE Express interface.

A complete description of the message group follows the example:

```
IST075I NAME = nodename, TYPE = TRLE
IST1954I TRL MAJOR NODE = trl_major_node_name
IST486I STATUS= current_status, DESIRED STATE= desired_state
IST087I TYPE = *NA* , CONTROL = ROCE , HPDT = *NA*
IST2361I SMCR PFID = pfid PCHID = pchid PNETID = network_id
IST2362I PORTNUM = port RNIC CODE LEVEL = code_level
IST2389I PFIP = pci_path
[IST2417I VFN = virtual_function_number]
IST924I -----
IST1717I ULPID = ulp_id ULP INTERFACE = ulp_interface
IST1724I I/O TRACE = iotrc TRACE LENGTH = length
[IST924I -----]
[IST1717I ULPID = ulp_id ULP INTERFACE = ulp_interface]
[IST1724I I/O TRACE = iotrc TRACE LENGTH = length]
```

IST075I

This message displays the resource name and resource type.

nodename

The name of the resource that was entered on the DISPLAY command.

nodetype

The resource type of the major or minor node. The *nodetype* value is always **TRLE** for this message group.

IST087I

This message displays line information associated with *nodename*.

line_type

The *line_type* value is always ***NA*** for this message group.

line_control

The *line_control* value is always **ROCE** (RDMA over Converged Ethernet) for this message group.

hpdtvalue

The *hpdtvalue* is always ***NA*** for this message group.

IST486I

This message displays status information for *nodename*.

current_status

The current status of the node. See the z/OS Communications Server: IP and SNA Codes for status information.

desired_state

The node state that is desired. See the z/OS Communications Server: IP and SNA Codes for status information. If VTAM cannot determine the desired state, *desiredstate* is *****NA*****.

IST1717I

This message is displayed for all TRLEs that are currently being used by at least one Upper-layer Protocol (ULP). A separate IST1717I message is displayed for each ULP that is using the 10GbE RoCE Express TRLE.

ulp_id

The name of a z/OS Communications Server ULP that is using the 10GbE RoCE Express TRLE. In this message group, the *ulp_id* value is always the TCP/IP job name.

ulp_interface

The name of the interface associated with the 10GbE RoCE Express TRLE.

IST1724I

This message displays trace information for *nodename*.

iotrc Specifies whether I/O Trace is active for this 10GbE RoCE Express interface (ON or OFF).

length Specifies the number of bytes being recorded for I/O Trace for this 10GbE RoCE Express interface.

IST1954I

This message displays the TRL major node name.

trl_major_node_name

The name of the TRL major node defining the 10GbE RoCE Express TRLE.

IST2361I

This message provides configuration information for the adapter associated with *nodename*.

pfid The 2-byte hexadecimal Peripheral Component Interconnect Express (PCIe) function ID for the 10GbE RoCE Express feature associated with *nodename*.

pchid The 2-byte hexadecimal physical channel ID (PCHID) for the 10GbE RoCE Express feature associated with *nodename*.

network_id

The physical network identifier for the 10GbE RoCE Express interface associated with *nodename*.

IST2362I

This message provides configuration and operational information about the adapter associated with *nodename*.

port A decimal representation of the 10GbE RoCE Express port number associated with *nodename*.

code_level

The processor code level of the 10GbE RoCE Express feature. The code level is in the form **xxxxx.yyyyy.zzzzz** if the 10GbE RoCE Express feature is operating in a dedicated RoCE environment.

xxxxx Major version.

yyyyy Minor version.

zzzzz Subminor version.

The code level is ****NA**** if the 10GbE RoCE Express feature is operating in a shared RoCE environment.

IST2389I

This message displays additional configuration information for the adapter associated with *nodename*.

pci_path

The PCI-function internal path (PFIP) value for the 10GbE RoCE Express feature associated with *nodename*.

IST2417I

This message displays the virtual function number (VFN) that is associated with *nodename*. This message is displayed only when the 10GbE RoCE Express feature operates in a shared RoCE environment.

virtual_function_number

The VFN value for the 10GbE RoCE Express feature that is associated with *nodename*.

System action: Processing continues.

Operator response: None.

IST2396I

System programmer response: None.

User response: None.

Problem determination: Not applicable.

Source: z/OS Communications Server SNA

Module: Use the modifiable VTAM start option MSGMOD=YES (*f procname,vtamopts,msgmod=yes* or *f procname,msgmod=yes*) to display the issuing module when a message is issued. See z/OS Communications Server: SNA Operation and z/OS Communications Server: SNA Resource Definition Reference for more information about start options.

Routing code: 2

Descriptor code: 5

Automation: This message is not a candidate for automation.

Example:

```
| IST097I DISPLAY ACCEPTED
| IST075I NAME = IUT2001D, TYPE = TRLE
| IST1954I TRL MAJOR NODE = ISTTRL
| IST486I STATUS= ACTIV, DESIRED STATE= ACTIV
| IST087I TYPE = *NA*           , CONTROL = ROCE, HPDT = *NA*
| IST2361I SMCR PFID = 001D PCHID = 0138 PNETID = NETWORK1
| IST2362I PORTNUM = 2 RNIC CODE LEVEL = *NA*
| IST2389I PFIP = 08040101
| IST2417I VFN = 0002
| IST924I -----
| IST1717I ULPID = TCPCS ULP INTERFACE = EZARIUT2001D
| IST1724I I/O TRACE = OFF TRACE LENGTH = *NA*
| IST314I END
```

IST2396I RNIC STATISTICS FOR *trlenam*e

Explanation: VTAM issues this group of messages in response to a DISPLAY TRL,TRLE=*trlenam*e,DEVSTATS command when *trlenam*e represents an IBM 10GbE RoCE Express interface.

A complete description of the message group follows:

```
IST2396I RNIC STATISTICS FOR trlenam
IST2397I DESCRIPTION OVERFLOW COUNT
IST2398I description overflow count
...
IST314I END
```

Many of the statistics reported using message IST2398I have both a count and an overflow. Both the count and overflow are maintained in unsigned 32-bit variables (unless otherwise indicated). Because an unsigned 32-bit variable can contain only a value up to and including 4294967295 ('FFFFFFFF'X), the variable will wrap through 0 if an increment results in exceeding this value. When such a wrap occurs, the overflow is incremented by 1. Therefore, the total count is determined as follows:

Total = (overflow * 4294967296) + count

IST2396I

This is the first message in the message group.

*trlenam*e

The name of the resource that was specified on the DISPLAY TRL command. Use this value to correlate the 10GbE RoCE Express statistics in this message group with the message group IST2361I output generated by the DISPLAY TRL,TRLE=*trlenam*e command.

IST2397I

This message is a header message for the statistics displayed with message IST2398I.

IST2398I

This message displays the number of occurrences for the statistic described by *description*. The possible combinations of *overflow*, *count*, and *description* are:

- **INBOUND FRAMES DROPPED** = *overflow count*

Represents the number of inbound Ethernet frames that were dropped on this 10GbE RoCE Express interface.

- **INBOUND FRAME ERRORS** = *overflow count*

Represents the number of inbound Ethernet frames that had errors on this 10GbE RoCE Express interface.

Restriction: This value is always 0 when the 10GbE RoCE Express adapter operates in a shared RoCE environment.

- **INBOUND RDMA FRAMES** = *overflow count*

Represents the number of Ethernet frames received on this 10GbE RoCE Express interface.

- **INBOUND RDMA OCTETS** = *overflow count*

Represents the number of Ethernet octets received on this 10GbE RoCE Express interface.

- **OUTBOUND FRAMES DROPPED** = *overflow count*

Represents the number of outbound Ethernet frames that were dropped on this 10GbE RoCE Express interface.

- **OUTBOUND FRAME ERRORS** = *overflow count*

Represents the number of outbound Ethernet frames that had errors on this 10GbE RoCE Express interface.

Restriction: This value is always 0 when the 10GbE RoCE Express adapter operates in shared RoCE environment.

- **OUTBOUND RDMA FRAMES** = *overflow count*

Represents the number of Ethernet frames sent on this 10GbE RoCE Express interface.

- **OUTBOUND RDMA OCTETS** = *overflow count*

Represents the number of Ethernet octets sent on this 10GbE RoCE Express interface.

- **LINK OUTAGE NOTIFICATIONS** = *overflow count*

Represents the number of times that VTAM was notified of lost connectivity to the 10GbE RoCE Express port.

System action: Processing continues.

Operator response: None.

System programmer response: None.

User response: None.

Problem determination: None.

Source: z/OS Communications Server SNA

Module: Use the modifiable VTAM start option MSGMOD=YES (*f procname,vtamopts,msgmod=yes* or *f procname,msgmod=yes*) to display the issuing module when a message is issued. See z/OS Communications Server: SNA Operation and z/OS Communications Server: SNA Resource Definition Reference for more information about start options.

Routing code: 2

Descriptor code: 5

Automation: Not applicable.

Example: This message group displays statistics for the 10GbE RoCE Express port 2 on the adapter that operates in a dedicated RoCE environment and is represented by Peripheral Component Interconnect Express (PCIe) function ID (PFID) 001D:

```
IST2396I RNIC STATISTICS FOR IUT2001D
IST2397I DESCRIPTION                                OVERFLOW      COUNT
IST924I -----
IST2398I INBOUND RDMA FRAMES                        1             65535
IST2398I INBOUND RDMA OCTETS                       65535        4294967295
IST2398I INBOUND FRAME ERRORS                       0              1
IST2398I INBOUND DROPPED FRAMES                     0              3
```

IST2397I • IST2398I

IST2398I	OUTBOUND RDMA FRAMES	3	4042322160
IST2398I	OUTBOUND RDMA OCTETS	1	1414812756
IST2398I	OUTBOUND FRAME ERRORS	0	2
IST2398I	OUTBOUND DROPPED FRAMES	0	4
IST2398I	LINK OUTAGE NOTIFICATIONS	0	3
IST314I	END		

IST2397I DESCRIPTION OVERFLOW COUNT

Explanation: VTAM issues this message as part of a group of messages that displays statistics for the IBM 10GbE RoCE Express interfaces in response to a DISPLAY TRL,TRLE=*trlename*,DEVSTATS command. The first message in the group is IST2396I. See message “IST2396I” on page 244 for a complete description.

System action: Not applicable.

Operator response: Not applicable.

System programmer response: Not applicable.

User response: Not applicable.

Problem determination: Not applicable.

Source: z/OS Communications Server SNA

Module: Use the modifiable VTAM start option MSGMOD=YES (*f procname,vtamopts,msgmod=yes* or *f procname,msgmod=yes*) to display the issuing module when a message is issued. See z/OS Communications Server: SNA Operation and z/OS Communications Server: SNA Resource Definition Reference for more information about start options.

Routing code: 2

Descriptor code: 5

Automation: Not applicable.

Example:

IST2397I	DESCRIPTION	OVERFLOW	COUNT
----------	-------------	----------	-------

IST2398I *Description overflow count*

Explanation: VTAM issues this message as part of a group of messages that displays statistics for the IBM 10GbE RoCE Express interfaces in response to a DISPLAY TRL,TRLE=*trlename*,DEVSTATS command. The first message in the group is IST2396I. See message “IST2396I” on page 244 for a complete description.

System action: Not applicable.

Operator response: Not applicable.

System programmer response: Not applicable.

User response: Not applicable.

Problem determination: Not applicable.

Source: z/OS Communications Server SNA

Module: Use the modifiable VTAM start option MSGMOD=YES (*f procname,vtamopts,msgmod=yes* or *f procname,msgmod=yes*) to display the issuing module when a message is issued. See z/OS Communications Server: SNA Operation and z/OS Communications Server: SNA Resource Definition Reference for more information about start options.

Routing code: 2

Descriptor code: 5

Automation: Not applicable.

Example:

IST2398I INBOUND RDMA FRAMES	1	65535
IST2398I INBOUND RDMA OCTETS	65535	4294967295
IST2398I INBOUND FRAME ERRORS	0	1
IST2398I INBOUND DROPPED FRAMES	0	3
IST2398I OUTBOUND RDMA FRAMES	3	4042322160
IST2398I OUTBOUND RDMA OCTETS	1	1414812756
IST2398I OUTBOUND FRAME ERRORS	0	2
IST2398I OUTBOUND DROPPED FRAMES	0	4
IST2398I LINK OUTAGE NOTIFICATIONS	0	3

| **IST2417I** **VFN** = *virtual_function_number*

| **Explanation:** VTAM issues this message as part of a message group in response to a DISPLAY ID or DISPLAY TRL command for a TRLE that is associated with an IBM 10GbE RoCE Express interface, which operates in a shared RoCE environment.

| See message IST2361I for an explanation of the message group.

| **System action:** Processing continues.

| **Operator response:** None.

| **System programmer response:** None.

| **User response:** None.

| **Problem determination:** Not applicable.

| **Source:** z/OS Communications Server SNA

| **Module:** Use the modifiable VTAM start option MSGMOD=YES (*f procname,vtamopts,msgmod=yes* or *f procname,msgmod=yes*) to display the issuing module when a message is issued. See z/OS Communications Server: SNA Operation and z/OS Communications Server: SNA Resource Definition Reference for more information about start options.

| **Routing code:** 2

| **Descriptor code:** 5

| **Automation:** This message is not a candidate for automation.

| **Example:**

| IST2417I VFN = 0002

Chapter 11. Quick Reference

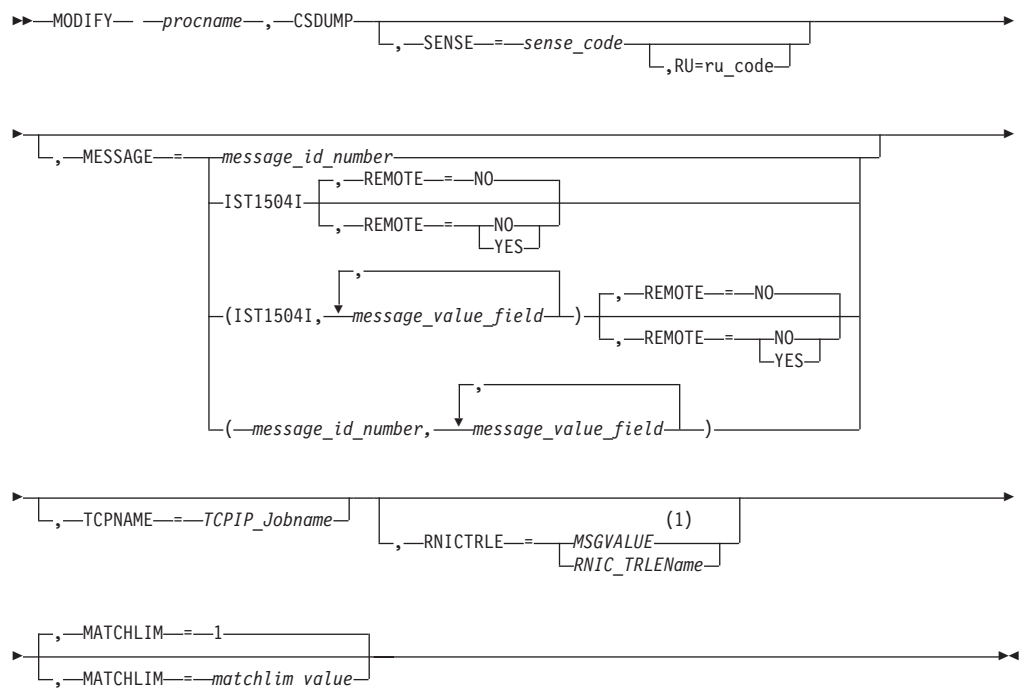
VTAM commands

Operator modify commands

F CSDUMP command

Dump the current address space and VIT data space now, or set up a trigger that invokes a dump of the current address space and VIT data space and possibly a dump of a remote VTAM, when either a particular sense code or a particular message is issued:

Set the CSDUMP trigger:



Notes:

- 1 MSGVALUE is valid only when the MESSAGE operand is used and specifies either message IST2391I or IST2406I.

Tip: You can use the CSDUMP start option to set a CSDUMP message trigger, a sense code trigger, or both.

Remove the CSDUMP trigger:



Start options

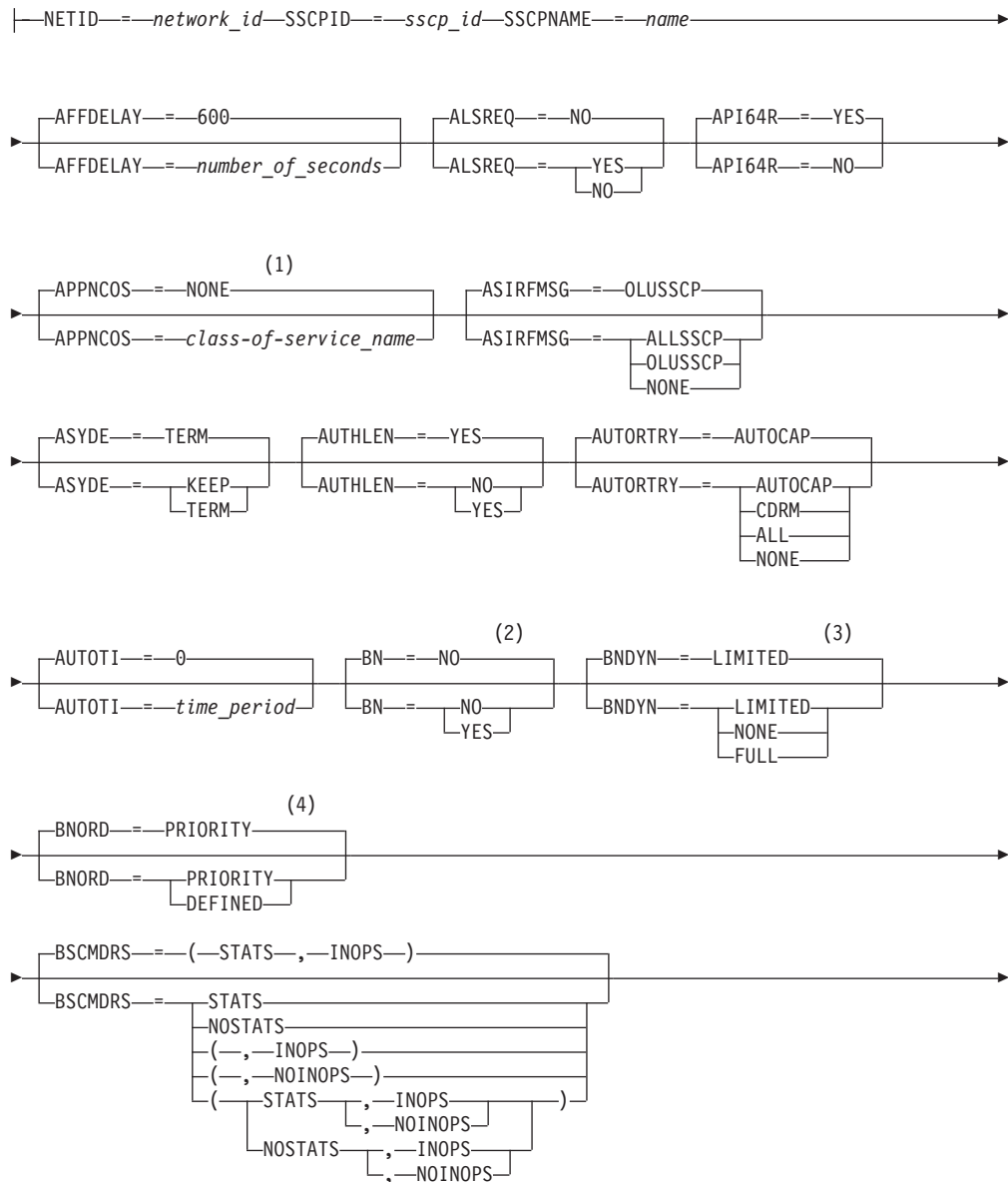
Start options are listed in this section alphabetically; however, you can code them in any order.

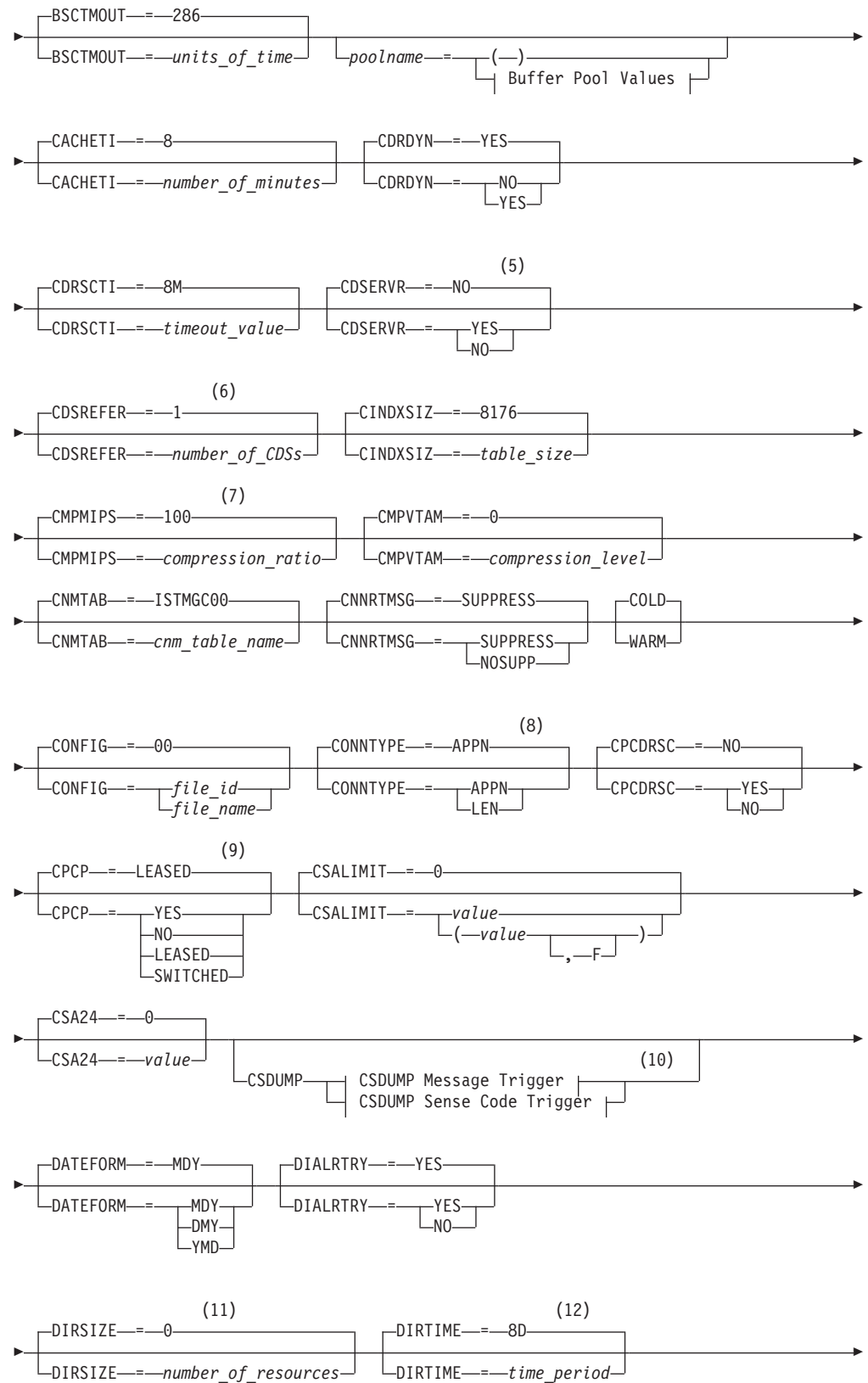
Precede the option list with three commas and enclose the group of options in parentheses.

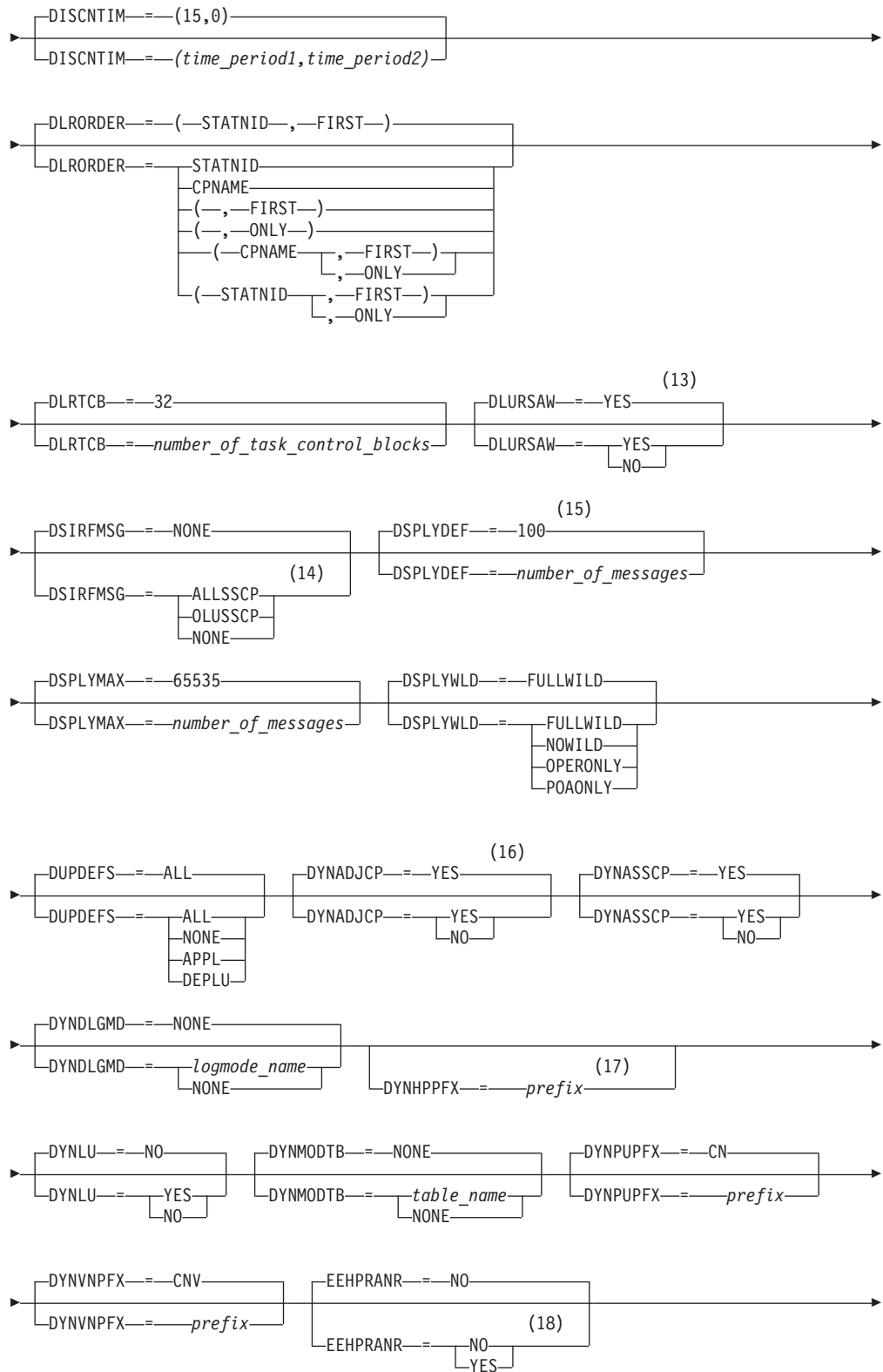
Start options that are entered on the START command must be separated by commas. Do not leave any blanks between options.

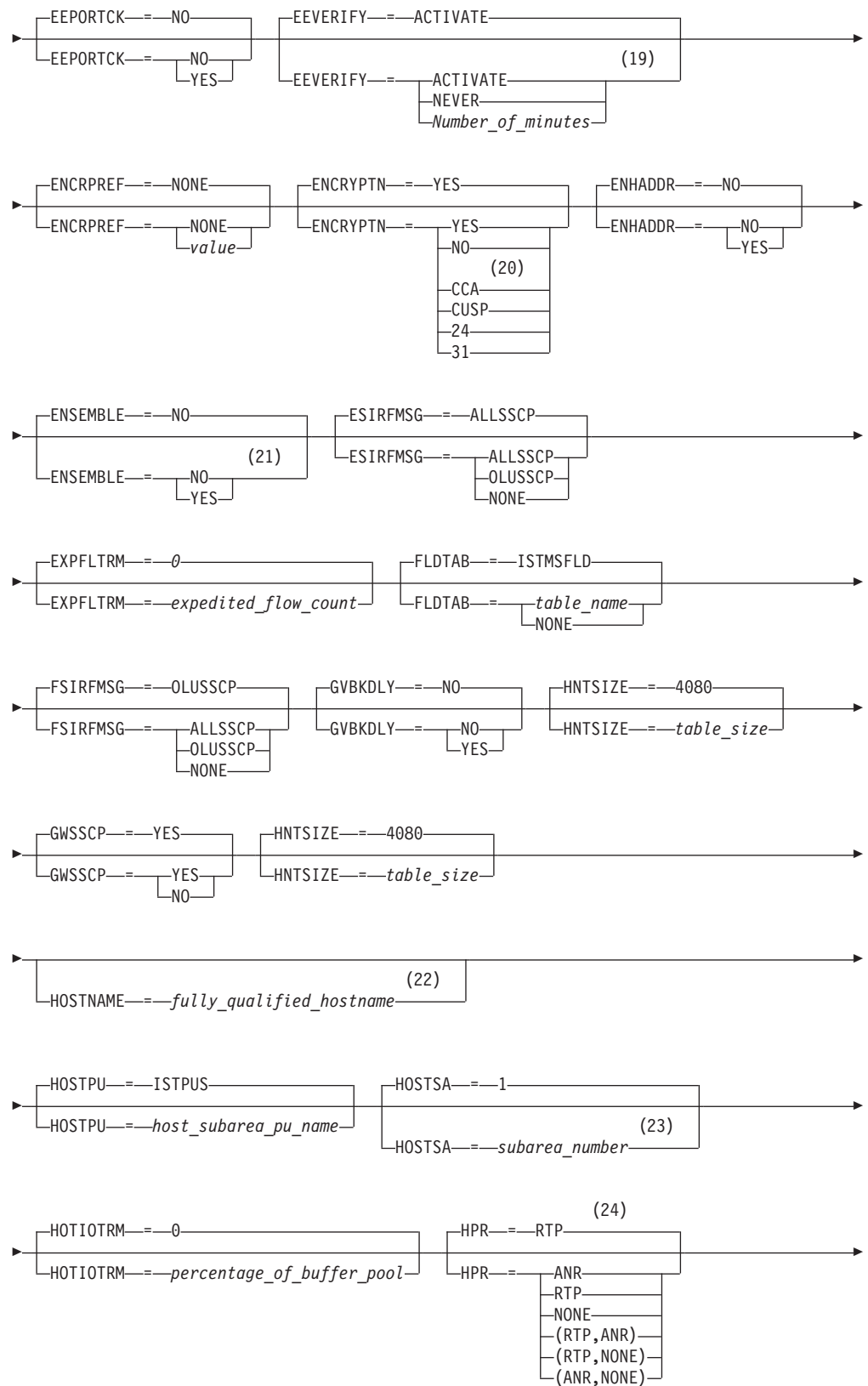
For more information on the START command, see *z/OS Communications Server: SNA Operation*.

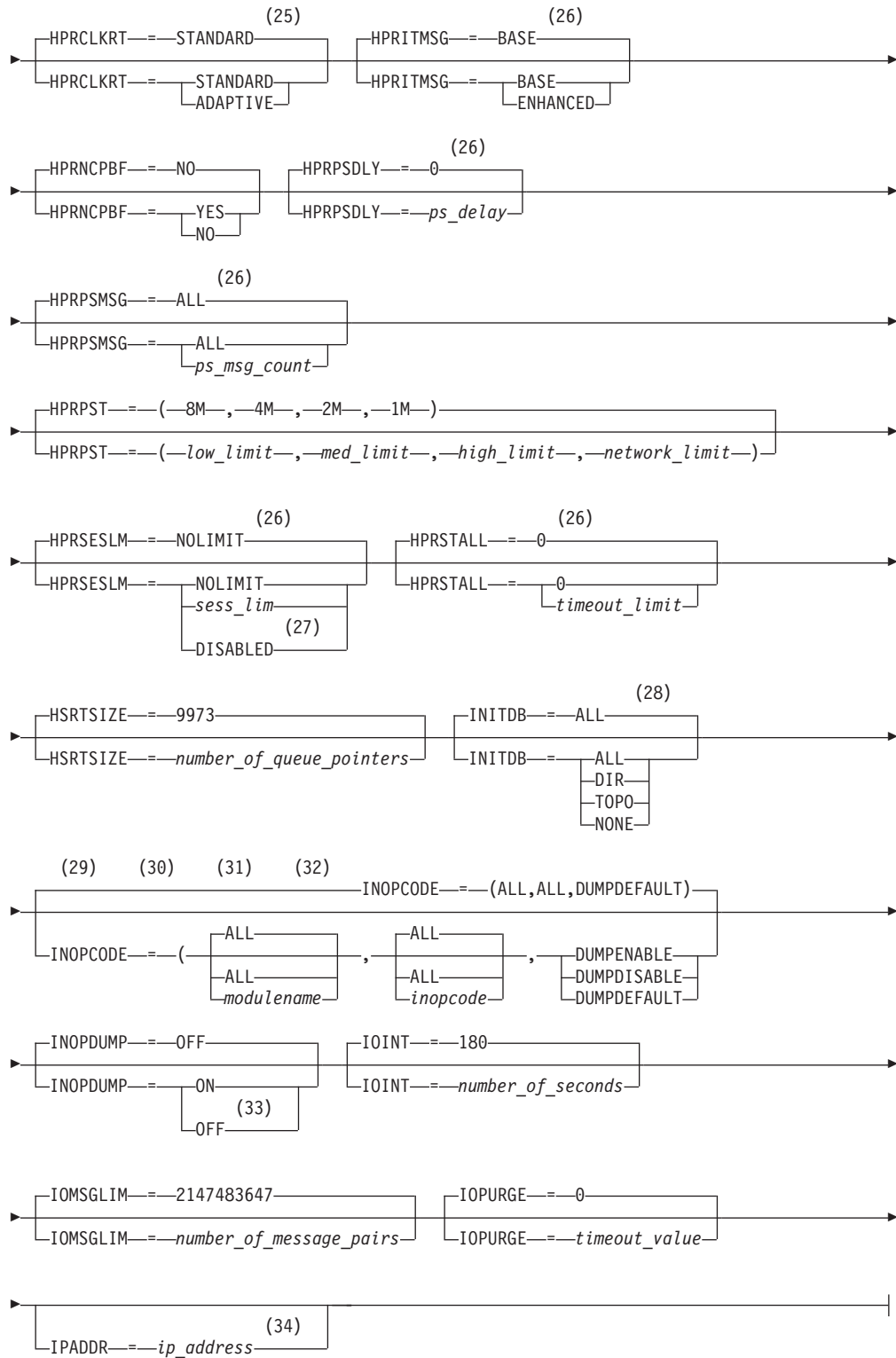
Options:









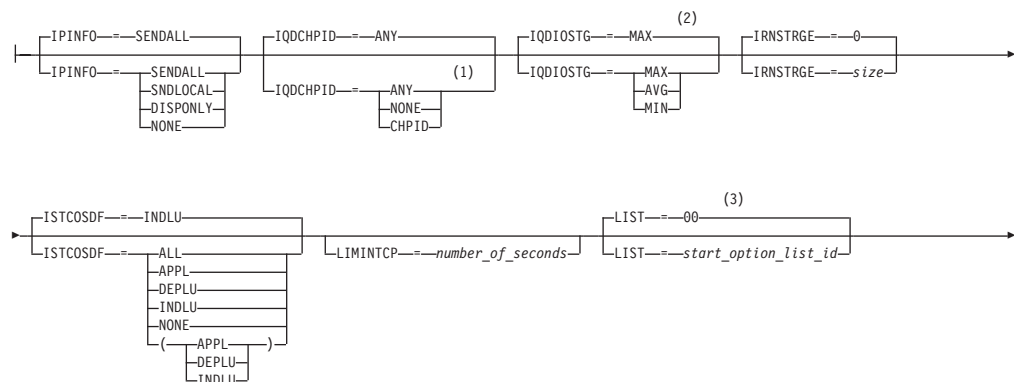


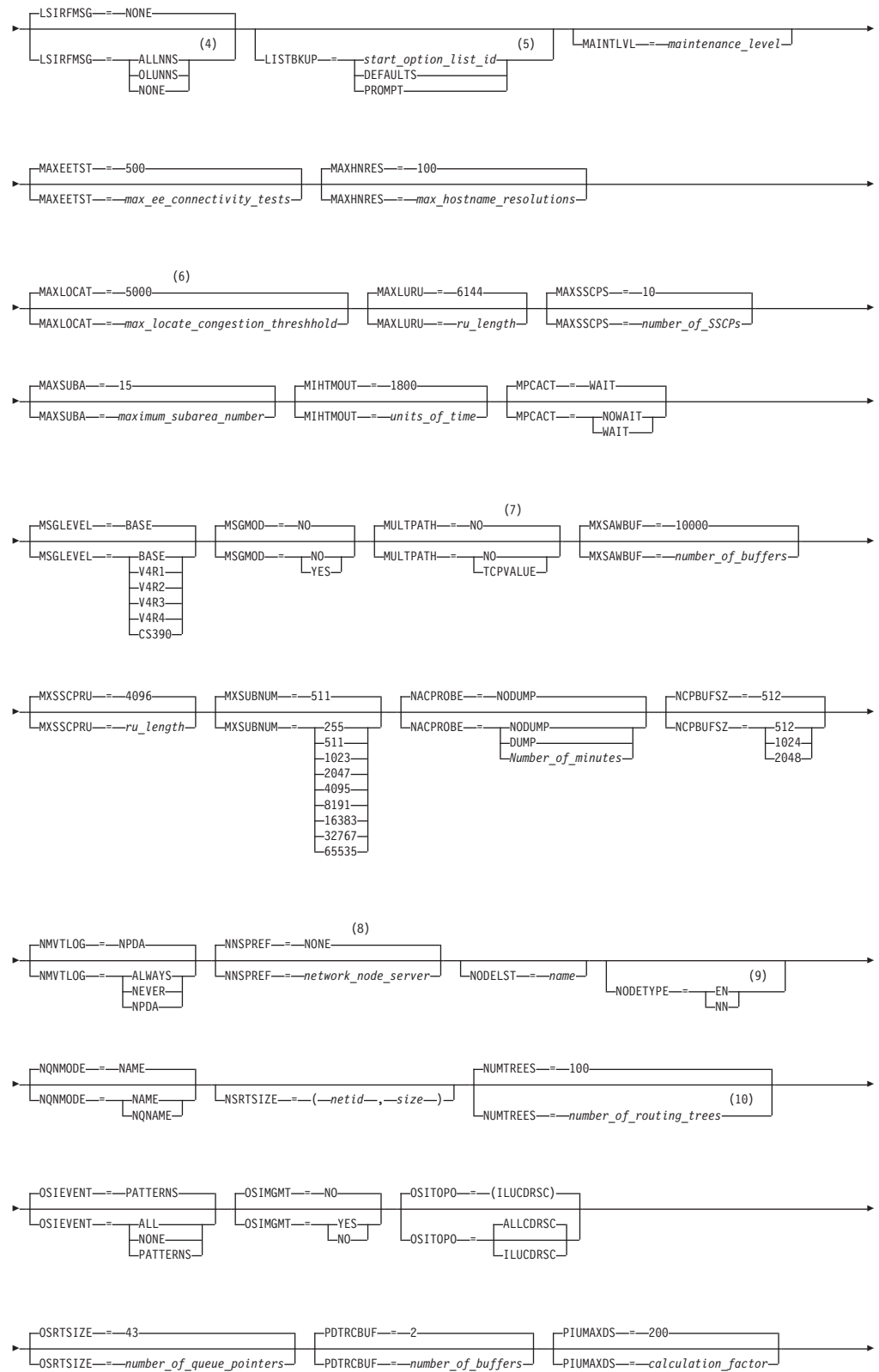
Notes:

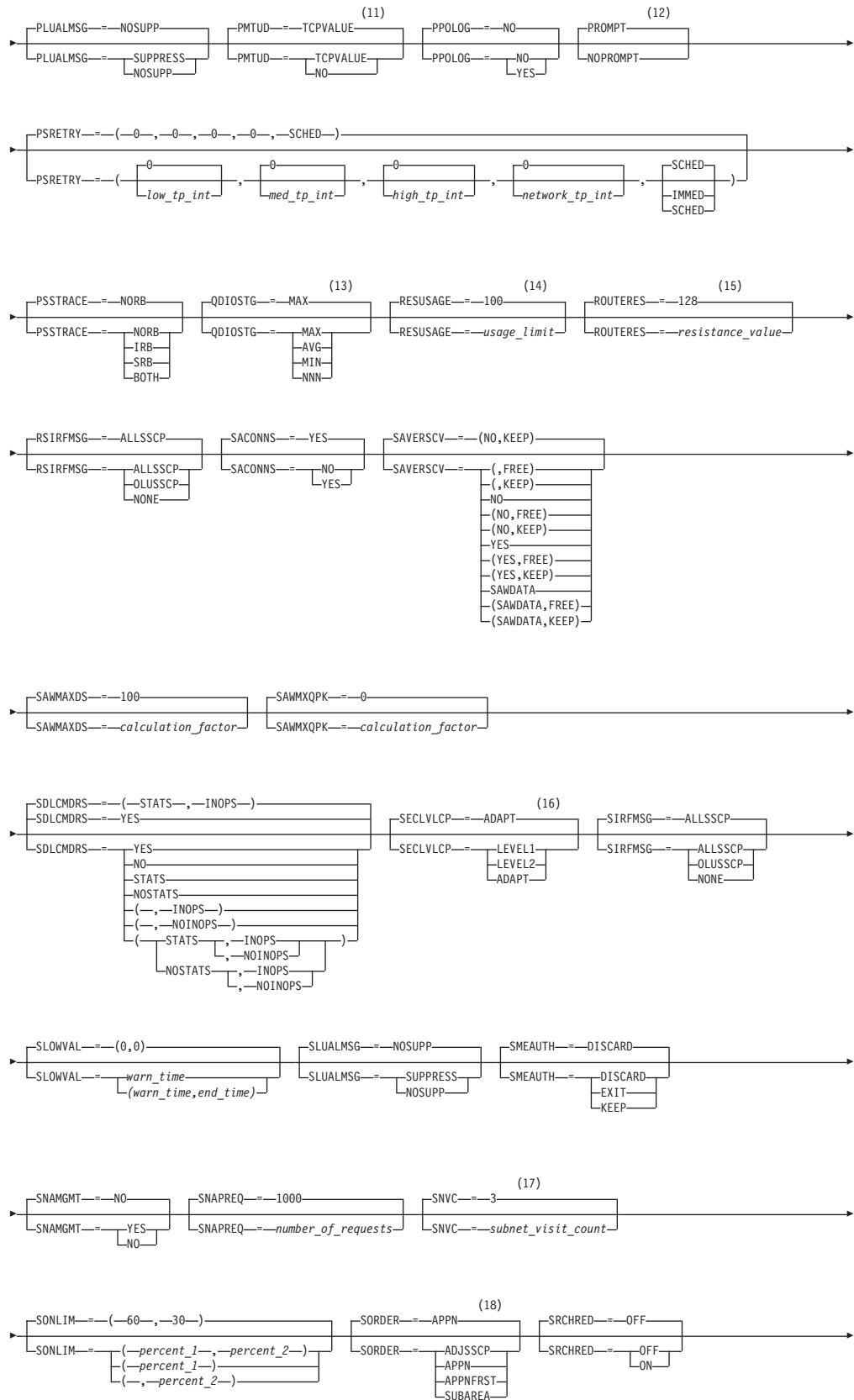
- 1 APPNCOS is meaningful only if the NODETYPE start option is also used.
- 2 BN is meaningful only if the NODETYPE=NN start option is also used.
- 3 BNDYN is meaningful only if the BN=YES start option is also used.

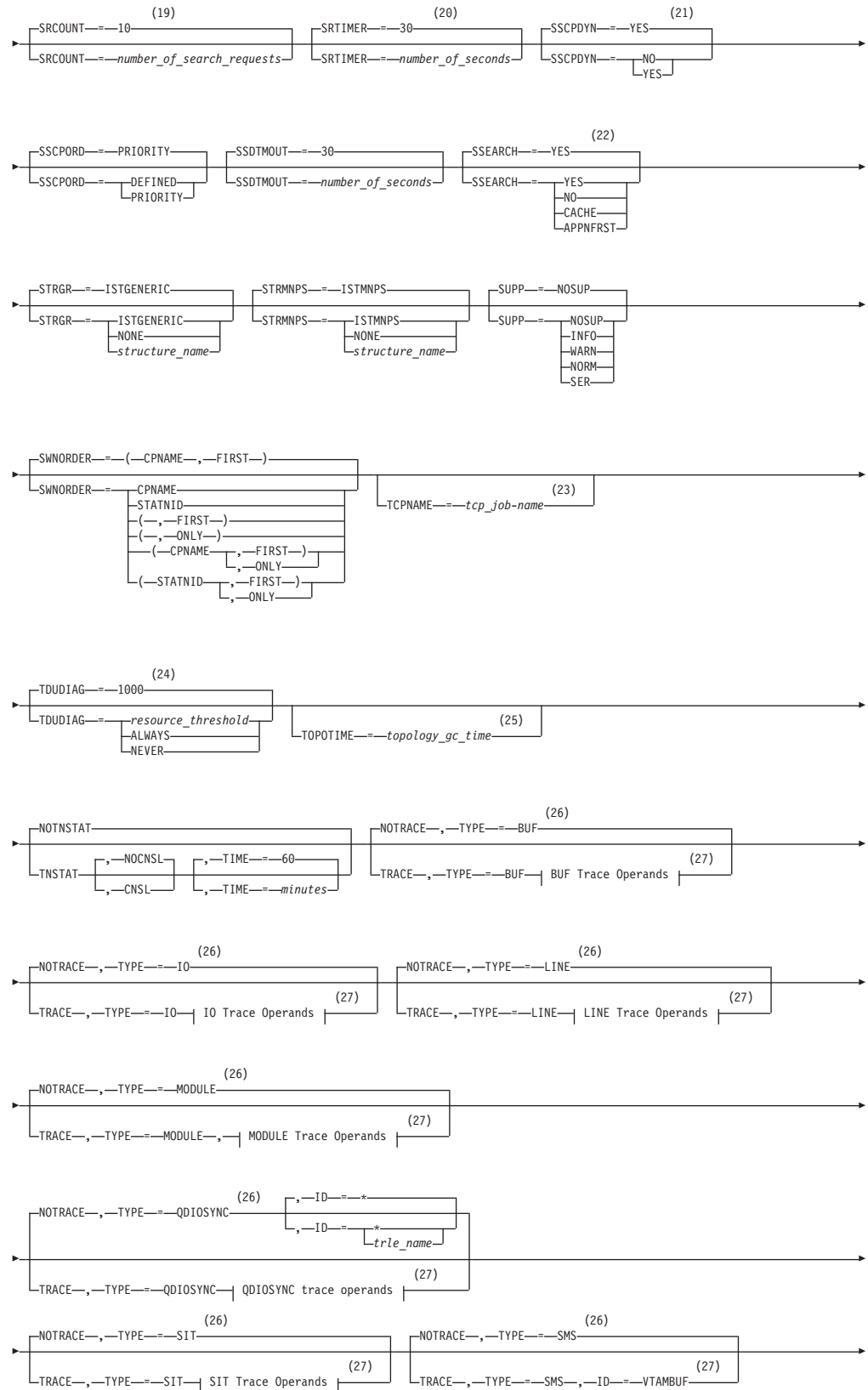
- 4 BNORD is meaningful only if the BN=YES start option is also used.
- 5 CDSERVER is meaningful only if the NODETYPE=NN start option is also used.
- 6 CDSREFER is meaningful only if the NODETYPE=NN and CDSERVER=NO start options are also used.
- 7 The CMPMIPS start option is meaningful only if the value for CMPVTAM is greater than 1.
- 8 CONNTYPE is meaningful only if the NODETYPE start option is also used.
- 9 CPCP is meaningful only if the NODETYPE start option is also used.
- 10 Specify the CSDUMP start option twice to set both message and sense code triggers.
- 11 DIRSIZE is meaningful only if the NODETYPE=NN start option is also used.
- 12 DIRTIME is meaningful only if the NODETYPE=NN start option is also used.
- 13 DLURSAW is meaningful only if the NODETYPE=NN start option is also used.
- 14 Because of the volume of messages that can be generated, it is not recommended that this option be enabled during normal operation. Instead, it is recommended that this option be enabled (using the MODIFY VTAMOPTS command) on all necessary hosts only when trying to diagnose specific problems. After the problem has been diagnosed or documentation has been collected, this option should be disabled once again (using the MODIFY VTAMOPTS command).
- 15 If the DSPLYMAX start option value is less than 100, that value is the default for DSPLYDEF.
- 16 DYNADJCP is meaningful only if the NODETYPE start option is also used.
- 17 Two character prefix.
- 18 EEHPRANR is meaningful only when the NODETYPE=NN start option is also used.
- 19 The EEVERIFY start option is meaningful only if VTAM provides RTP-level HPR support. The NODETYPE start option must be coded and the RTP value must be specified on the HPR start option.
- 20 ENCRYPTN=CCA needs to be coded when Triple Des Encryption is required.
- 21 The ENSEMBLE setting is used to either permit or deny connectivity to the intraensemble data network and the intranode management network. It does this by either allowing or denying activation of OSX and OSM interfaces.
- 22 HOSTNAME is meaningful only if the NODETYPE start option is also used. If neither HOSTNAME nor IPADDR is specified on any of the GROUP definition statements within the Enterprise Extender XCA major node, then either the HOSTNAME, TCPNAME, or IPADDR start options must be specified in order to activate an Enterprise Extender link. The HOSTNAME start option specifies the default hostname to be used for name-to-address resolution as part of activating an Enterprise Extender connection, and must resolve at this node to a static VIPA address associated with a TCP/IP stack at this node. If IPADDR is specified along with HOSTNAME on the START command, the IPADDR value is ignored.

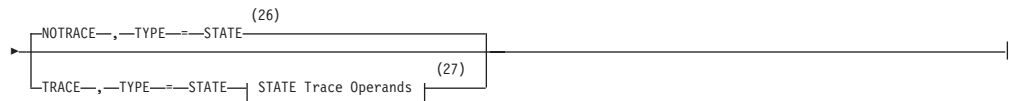
- 23 HOSTSA specifies the subarea number of this VTAM. If HOSTSA is not coded, then a default subarea number of 1 is used.
- 24 HPR is meaningful only if NODETYPE is also used.
- 25 HPRCLKRT=ADAPTIVE is meaningful only in Enterprise Extender configurations that have a defined capacity of 1 Gb (gigabit) or higher access speeds.
- 26 This option is meaningful only if VTAM provides RTP-level HPR support.
- 27 HPRSESLM=DISABLED is meaningful only on interchange nodes.
- 28 INITDB is meaningful only if the NODETYPE=NN start option is also used.
- 29 When specifying an InOpCode for the second parameter, always specify three digits by including any leading zeros.
- 30 If an InOpCode is specified for the second parameter, the first parameter cannot be ALL.
- 31 INOPCODE has no effect unless INOPDUMP is active for the resource when an inoperative condition is detected. See the MODIFY INOPCODE command for more details.
- 32 Multiple INOPCODE parameters can be specified by the START command, and will be processed left to right as they are entered. This is different from specifying the INOPCODE parameter on either the MODIFY INOPCODE command or the MODIFY VTAMOPTS command, where only one INOPCODE parameter is allowed for each entry of these commands.
- 33 INOPDUMP status is propagated to resources that are defined within a TRLE when the entry is activated and the TRLE InOpDump status has not been explicitly set.
- 34 IPADDR is meaningful only if the NODETYPE start option is also used. If neither IPADDR nor HOSTNAME is specified on any of the GROUP definition statements within the Enterprise Extender XCA major node, then either the HOSTNAME, TCPNAME, or IPADDR start option must be specified in order to activate an Enterprise Extender link. The IPADDR start option specifies the default IPv4 or IPv6 static VIPA address to be used when activating an Enterprise Extender connection. If HOSTNAME is specified along with IPADDR on the START command, the IPADDR value is ignored.









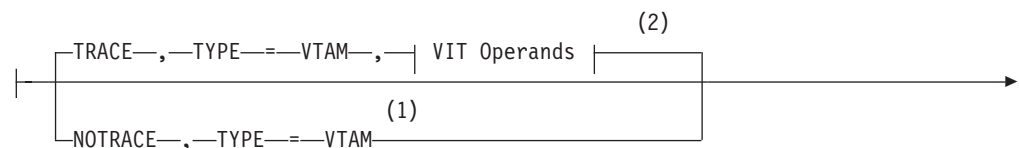


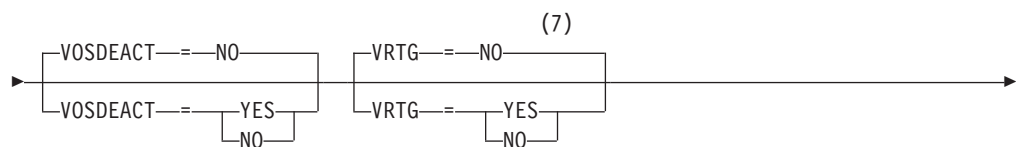
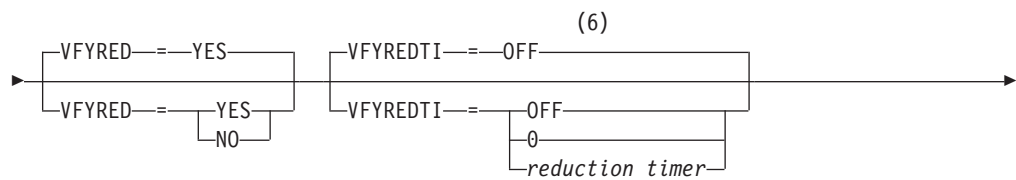
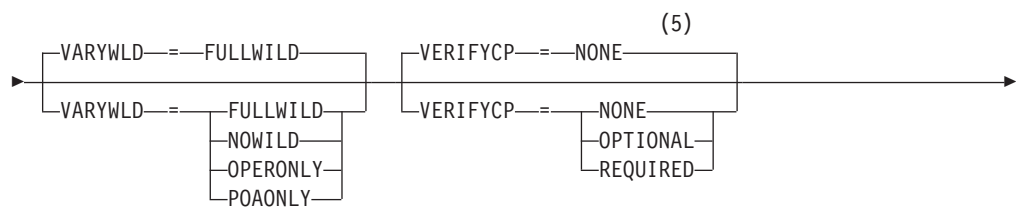
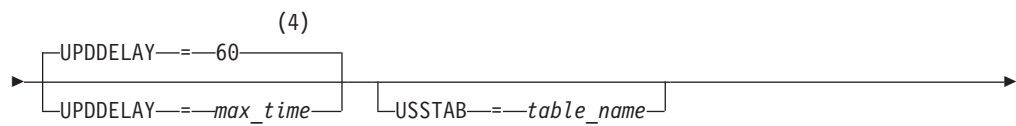
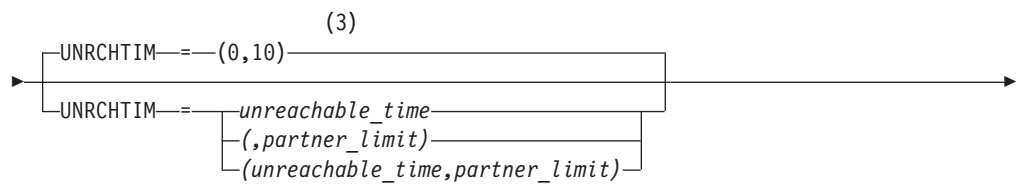
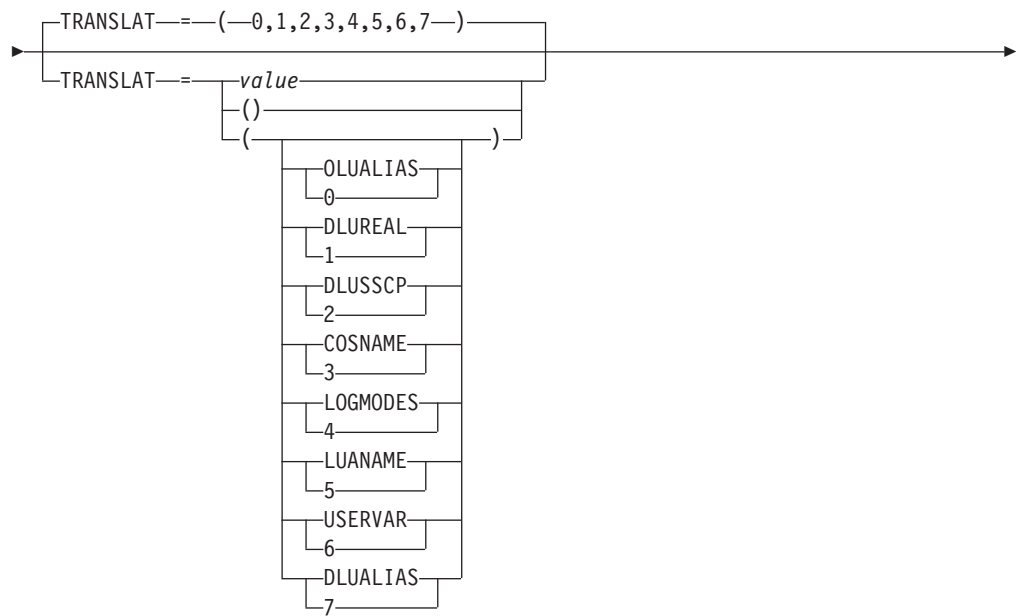
Notes:

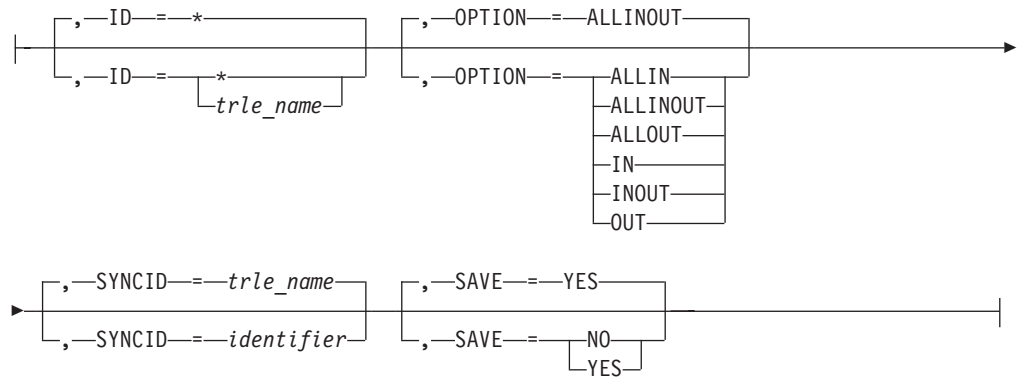
- 1 The IQDCHPID option controls which IQD CHPID (and related subchannel devices) VTAM selects to dynamically build the iQDIO (IUTIQDIO) MPC group. The IUTIQDIO MPC group is used for TCP/IP dynamic XCF communications within System z. Although this option can be modified (and the modification will immediately be displayed) while the IUTIQDIO MPC group is currently active, any modifications have the effects shown in the section called IQD CHPID modifications.
- 2 This option affects only iQDIO devices that use a MFS of 64k. The smaller frame sizes will always use 126 SBALs. You can override this option on a per-device basis using the READSTORAGE parameter on the LINK or INTERFACE statement in the TCP/IP profile. See z/OS Communications Server: IP Configuration Reference for more details.
- 3 LIST can be entered by a VTAM operator only. If LIST is coded in an ATCSTRxx file, it is considered to be an error and is ignored.
- 4 Because of the volume of messages that can be generated, it is not recommended that this option be enabled during normal operation. Instead, it is recommended that this option be enabled (using the MODIFY VTAMOPTS command) on all necessary hosts only when trying to diagnose specific problems. After the problem has been diagnosed or documentation has been collected, this option should be disabled once again (using the MODIFY VTAMOPTS command).
- 5 LISTBKUP can be coded only in a start option file. If you enter it on the START command or at an operator prompt, VTAM will ignore it.
- 6 MAXLOCAT is meaningful only if NODETYPE is specified.
- 7 MULTPATH is meaningful only if the NODETYPE start option is also specified.
- 8 NNSPREF can be specified only if NODETYPE=EN is specified during VTAM START processing.
- 9 NODETYPE enables APPN function. The combination of HOSTSA, NODETYPE, and SACONNS determines the configuration (subarea node, interchange node, migration data host, network node, or end node).
- 10 NUMTREES is meaningful only if the NODETYPE=NN start option is also used.
- 11 PMTUD is meaningful only if the NODETYPE start option is also specified.
- 12 A VTAM operator cannot enter the PROMPT or NOPROMPT start option; it can be coded only in ATCSTR00. The value coded in ATCSTR00 is ignored if start options are entered on the START command or if VTAM finds an error in a start list. Upon finding an error in a start list, VTAM prompts the operator so that the operator can specify the option correctly.
- 13 QDIOSTG defaults to MAX for 64-bit (z/Architecture) machines and MIN for non 64-bit machines. You can override this option on a per-device basis using

the READSTORAGE parameter on the LINK or INTERFACE statement in the TCP/IP profile. See z/OS Communications Server: IP Configuration Reference for more details.

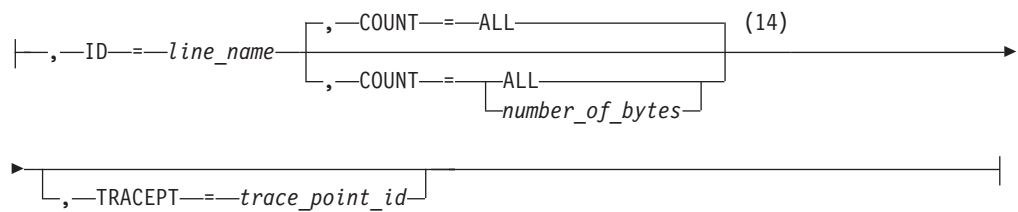
- 14 RESUSAGE is meaningful only if the NODETYPE=NN start option is also used.
- 15 ROUTERES is meaningful only if the NODETYPE=NN start option is also used.
- 16 The SECLVLCP start option is meaningful only if the NODETYPE and VERIFYCP start options are also used.
- 17 SNVC is meaningful only if the BN=YES start option is also used.
- 18 SORDER is meaningful only in an interchange node or a migration data host.
- 19 SRCOUNT is meaningful only if the SRCHRED=ON start option is also used.
- 20 SRTIMER is meaningful only if the SRCHRED=ON start option is also used.
- 21 The SSCPDYN start option applies only for interconnected networks (that is, GWSSCP=YES is used).
- 22 SSEARCH is meaningful only if the NODETYPE=NN start option is also used.
- 23 TCPNAME is meaningful only if the NODETYPE start option is also used. If neither IPADDR nor HOSTNAME is specified on any of the GROUP definition statements within the Enterprise Extender XCA major node, then either the HOSTNAME, TCPNAME, or IPADDR start options must be specified in order to activate an Enterprise Extender link.
- 24 TDUDIAG is meaningful only if the NODETYPE=NN start option is also available.
- 25 TOPOTIME is meaningful only if the NODETYPE start option is also used.
- 26 Do not use NOTRACE when starting VTAM, except to override a TRACE start option coded in a predefined list.
- 27 You can code TRACE and its qualifiers through position 71, even if you are in the middle of the start option. Continue the remainder of the item in the next record. Code the TYPE qualifier immediately after you code the TRACE start option.



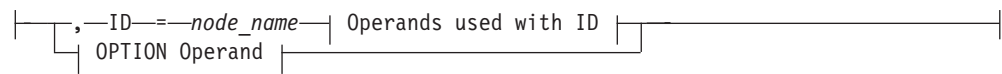




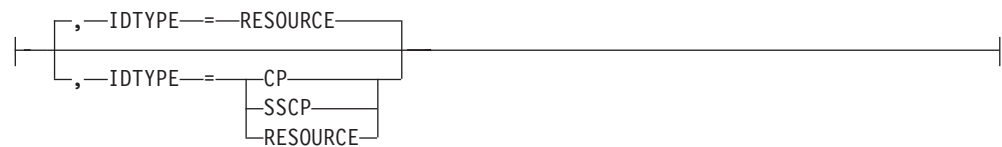
SIT Trace Operands:



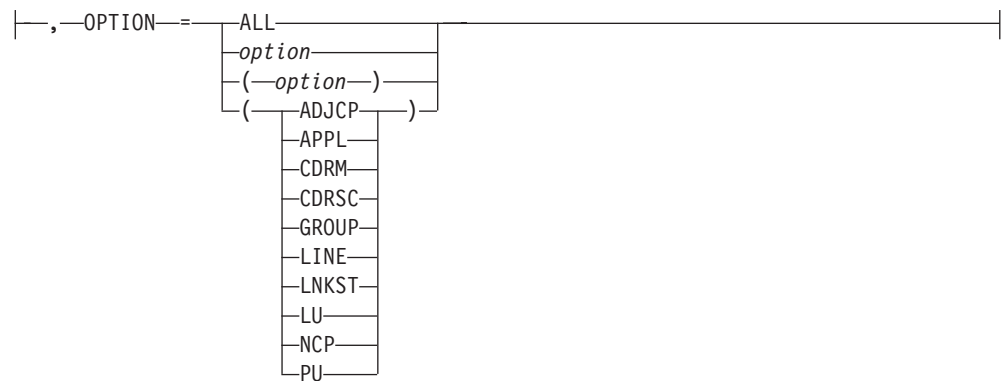
STATE Trace Operands:



Operands used with ID:



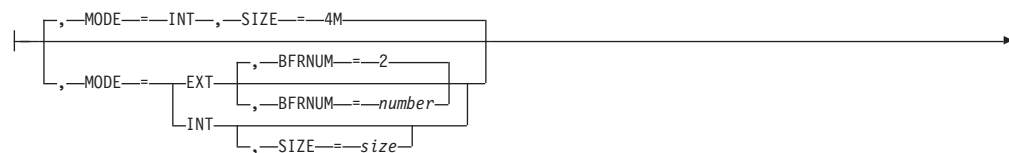
OPTION Operand:

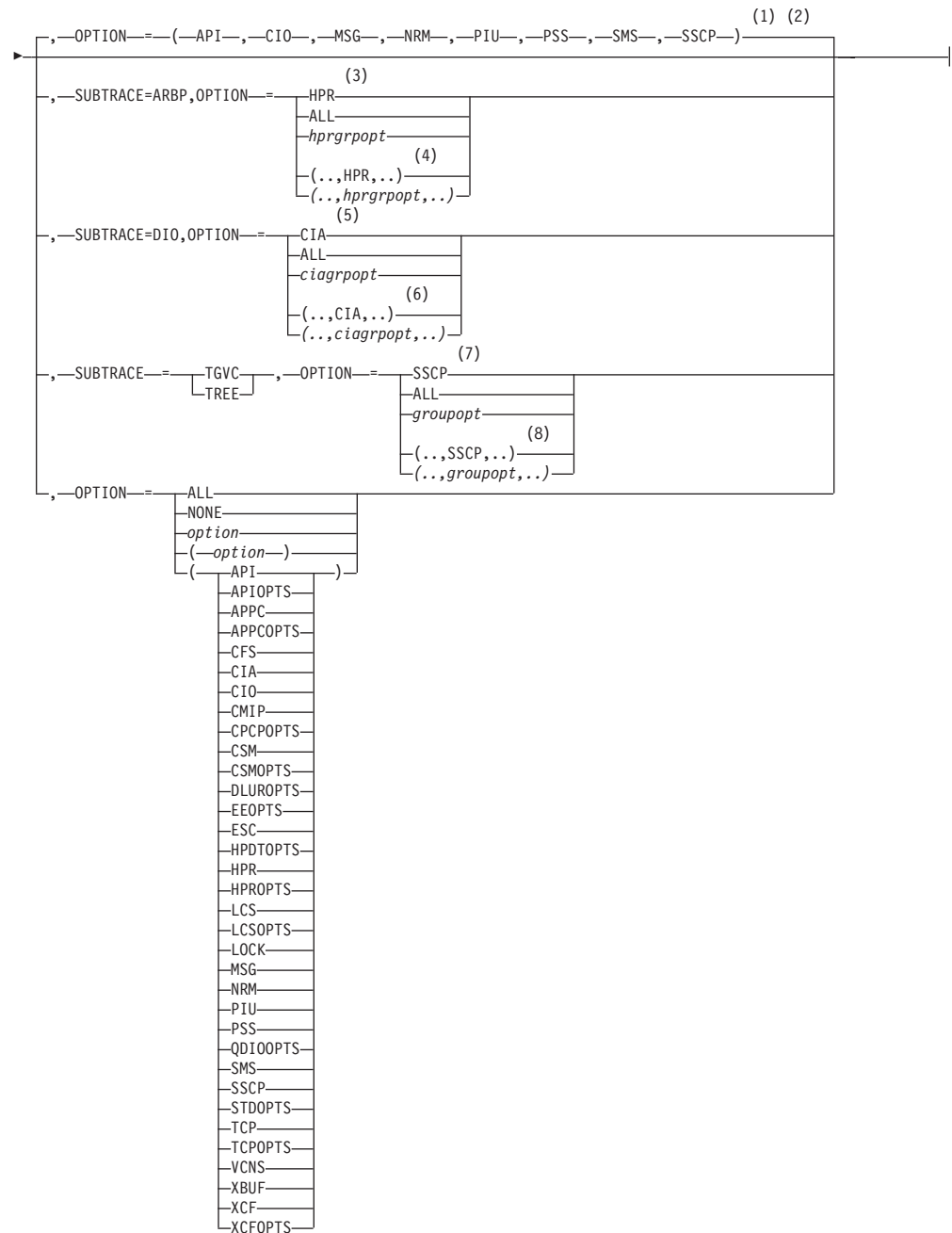


Notes:

- 1 NOTRACE,TYPE=VTAM is accepted but ignored. Tracing is started with the default trace table size and the default options.
- 2 You can code TRACE and its qualifiers through position 71, even if you are in the middle of the start option. Continue the remainder of the item in the next record. Code the TYPE qualifier immediately after you code the TRACE start option.
- 3 UNRCHTIM is meaningful only if the NODETYPE start option is also used.
- 4 UPDDELAY is meaningful only if the OSIMGMT=YES start option is also used.
- 5 The VERIFYCP start option is meaningful only if the NODETYPE start option is also used.
- 6 VFYREDTI is meaningful only if the NODETYPE=NN start option is also used.
- 7 VRTG is meaningful only if the NODETYPE and HOSTSA start options are also used.
- 8 VRTGCPCP is meaningful only if the NODETYPE and HOSTSA start options are also used.
- 9 XCFINIT=YES is the default if VTAM is started as an APPN node (that is, the NODETYPE start option has been specified). XCFINIT=YES is not valid for pure subarea nodes. XCFINIT=DEFINE is the default if VTAM is started as a pure subarea node (the NODETYPE start option has not been specified).
- 10 When the same parameter is entered multiple times on a CSDUMP message trigger, only the last occurrence is accepted.
- 11 MSGVALUE is valid only when the MESSAGE operand is used and specifies either message IST239II or IST2406I.
- 12 When an error message is received on any parameter of the CSDUMP start option, the remaining parameters for this CSDUMP start option are ignored. Enter the complete CSDUMP start option again when you are prompted.
- 13 When the same parameter is entered multiple times on a CSDUMP sense trigger, only the last occurrence is accepted.
- 14 COUNT applies only to the IBM 3720 and 3745 Communication Controllers.

VIT Operands:





Notes:

- 1 The default options apply only to MODE=INT.
- 2 PSS and SMS can be turned off.
- 3 When you specify SUBTRACE=ARBP and you code a single OPTION value, the OPTION value must be HPR, ALL, or one of the group options (*hprgrpopt*) that include HPR as an individual option equivalent. The applicable group options are DLUROPTS, EEOPTS, HPDTPPTS, HPROPTS, QDIOOPTS, and XCFOPPTS.
- 4 When SUBTRACE=ARBP is coded and you code multiple trace options in parentheses, you must code either HPR or one of the group options (*hprgrpopt*) that include HPR as an individual option equivalent inside the parentheses.

- 5 When you specify SUBTRACE=DIO and you code a single OPTION value, the OPTION value must be CIA, ALL, or one of the group options (*ciagrpopt*) that include CIA as an individual option equivalent. The applicable group options are EEOPTS, HPDТОPTS, HPROPTS, QDIOOPTS, TCPOPTS and XCFOPTS.
- 6 When SUBTRACE=DIO is coded and you code multiple trace options in parentheses, you must code either CIA or one of the group options (*ciagrpopt*) that include CIA as an individual option equivalent inside the parentheses.
- 7 When you code SUBTRACE=TGVC or SUBTRACE=TREE and you code a single OPTION value, the OPTION value must be either SSCP, ALL, or one of the group options (*groupopt*), all of which include SSCP as an individual option equivalent. The group options are APIOPTS, APPCOPTS, CPCPOPTS, CSMOPTS, DLUROPTS, EEOPTS, HPDТОPTS, HPROPTS, LCSOPTS, QDIOOPTS, STDОPTS, TCPOPTS, and XCFOPTS.
- 8 When you code SUBTRACE=TGVC or SUBTRACE=TREE and you code multiple trace options in parentheses, you must code either SSCP or one of the group options (*groupopt*) inside the parentheses.

Chapter 12. z/OS SMIC

Communications Server summary of interface changes

Communications Server IP summary of interface changes

PROFILE.TCPIP configuration file

PROFILE.TCPIP statement and parameter changes: Table 9 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 9. Summary of new and changed Communications Server PROFILE.TCPIP configuration statements and parameters

Statement	Release	Description	Reason for change
ATMARPSV, ATMLIS, ATMPVC	V2R1	Because support for the ATM device type will be dropped in a future release, these profile statements will no longer be supported then.	IBM Health Checker for legacy device types
AUTOLOG	V2R1	Message EZZ0621I or EZZ0622I will be issued on the first cancel of an autologged procedure.	Release update
DEFADDRTABLE	V1R12	New profile statement used to configure the default address selection policy table.	Configurable default address selection policy table
DELETE PORT DELETE PORTRANGE	V2R1	For TCP ports, if no reservation is found for the port or the reservation was deleted in the current profile processing, error message EZZ0328I is issued instead of message EZZ0395I. Message EZZ0395I will continue to be issued for other errors. Update your message automation for this change.	Release update
DEVICE and LINK	V2R1	Support for the DEVICE and LINK profile statements for the following TCP/IP legacy device types will be dropped in a future release: <ul style="list-style-type: none">• ATM• CDLC• CLAW• HYPERchannel• SNALINK (LU0 and LU6.2)• X.25	IBM Health Checker for legacy device types

Table 9. Summary of new and changed Communications Server PROFILE.TCPIP configuration statements and parameters (continued)

Statement	Release	Description	Reason for change
GATEWAY	V2R1	Support for this profile statement will be dropped in a future release. Use the BEGINROUTES/ENDROUTES configuration block to replace your GATEWAY statements. To assist in converting your GATEWAY statements to BEGINROUTES statements, you can take a dump of the TCP/IP stack address space and use the CONVERT parameter on the IPCS TCPIP PROFILE subcommand. The TCPIP command output will contain the information that is specified on the GATEWAY statements converted to the equivalent BEGINROUTES/ENDROUTES statements. See "TCPIP PROFILE" in the IP Diagnosis Guide for more information.	IBM Health Checker for z/OS GATEWAY statement check
GLOBALCONFIG	V2R1	The SMCR parameter is defined to enable and configure Shared Memory Communications over Remote Direct Memory Access (SMC-R) function. The SMCR parameter includes the PFID, PORTNUM, MTU, FIXEDMEMORY, and TCPKEEPMININTERVAL sub-parameters. The NOSMCR parameter is defined to disable SMC-R function.	Shared Memory Communications over Remote Direct Memory Access
	V1R13	Deprecated the SEGMENTATIONOFFLOAD and NOSEGMENTATIONOFFLOAD parameters.	OSA-Express4S QDIO IPv6 checksum and segmentation offload
	V1R13	Added the AUTOIQDX and NOAUTOIQDX parameters. The AUTOIQDX parameter includes the ALLTRAFFIC and NOLARGEDATA sub-parameters.	HiperSockets optimization for intraensemble data networks
	V1R12	A new NOJOIN subparameter is added on the SYSPLEXMONITOR parameter. If NOJOIN is configured in the initial profile, the TCP/IP stack does not join the sysplex group when the stack is started.	Control joining the sysplex XCF group

Table 9. Summary of new and changed Communications Server PROFILE.TCPIP configuration statements and parameters (continued)

Statement	Release	Description	Reason for change
INTERFACE	V2R1	Can be used to configure IPv4 HiperSockets interfaces (IPAQIDIO) instead of the DEVICE, LINK, and HOME statements.	IPv4 INTERFACE statement for HiperSockets and Static VIPAs
	V2R1	Can be used to configure IPv4 static VIPA interfaces (VIRTUAL) instead of the DEVICE, LINK, and HOME statements.	IPv4 INTERFACE statement for HiperSockets and Static VIPAs
	V2R1	For IPAQENET interface types, added new TEMPIP parameter to allow an interface to activate without an IP address assigned. Applications which implement DHCP client support can communicate over the interface to obtain an IP address.	Enable DHCP clients on OSA Interfaces
	V2R1	The SMCR parameter is defined to enable Shared Memory Communications - RDMA (SMC-R) function for IPAQENET and IPAQENET6 statements. The SMCR parameter is valid only for CHPIDTYPE OSD definitions. The NOSMCR parameter is defined to disable SMC-R function.	Shared Memory Communications over Remote Direct Memory Access
	V1R12	For IPAQENET and IPAQENET6 interface types, added new WORKLOADQ and NOWORKLOADQ subparameters to the INBPERF parameter value DYNAMIC to enable or disable the QDIO inbound workload queueing function.	Performance improvements for sysplex distributor connection routing
	V1R12	For IPAQENET and IPAQENET6 interface types, added CHPIDTYPE and CHPID parameters to define interfaces onto the intraensemble data network.	z/OS Communications Server in an ensemble
IPCONFIG	V2R1	You can enable QDIOACCELERATOR when IPSECURITY is enabled.	QDIO acceleration coexistence with IP filtering
	V2R1	The SOURCEVIPAINTERFACE parameter is added for IPv4 DYNAMICXCF interfaces.	IPv4 INTERFACE statement for HiperSockets and Static VIPAs
	V1R13	Added CHECKSUMOFFLOAD and NOCHECKSUMOFFLOAD and SEGMENTATIONOFFLOAD and NOSEGMENTATIONOFFLOAD parameters.	OSA-Express4S QDIO IPv6 checksum and segmentation offload
IPCONFIG6	V1R13	Added CHECKSUMOFFLOAD and NOCHECKSUMOFFLOAD and SEGMENTATIONOFFLOAD and NOSEGMENTATIONOFFLOAD parameters.	OSA-Express4S QDIO IPv6 checksum and segmentation offload

Table 9. Summary of new and changed Communications Server PROFILE.TCPIP configuration statements and parameters (continued)

Statement	Release	Description	Reason for change
IPCONFIG6 (continued)	V1R13	If you do not specify the IGNOREREDIRECT parameter and you are using Intrusion Detection Services (IDS) policy to detect and discard Redirect packets, ICMPv6 Redirect packets are discarded while the policy is active.	Expanded Intrusion Detection Services
	V1R12	Added OSMSECCLASS parameter to define a security class for IP filtering for OSM interfaces.	z/OS Communications Server in an ensemble
IPSEC	V2R1	The DVIPSEC parameter enables the support for Sysplex-Wide Security Associations (SWSA) for IPv6 on a stack that also has the IPSECURITY parameter specified on the IPCONFIG6 statement.	Sysplex-Wide Security Associations for IPv6
NETACCESS	V2R1	The CACHEALL, CACHEPERMIT, and CACHESAME parameters are added to control the level of caching that is used for the results of network access control checks.	Improve auditing of NetAccess rules
NETMONITOR	V2R1	The PROFILE and NOPROFILE subparameters control the creation of both the TCP/IP stack SMF 119 profile record (subtype 4) and the new TN3270E Telnet server SMF 119 profile record (subtype 24).	NMI and SMF enhancements for TCP/IP applications
	V1R12	New CSMAIL, NOCSMAIL, CSSMTP and NOCSSMTP subparameters added for the SMFSERVICE parameter to enable applications to receive the new SMF 119 subtype 48, 49, 50, 51, and 52 records for CSSMTP events.	Management data for CSSMTP
	V1R12	New DVIPA and NODVIPA subparameters added for the SMFSERVICE parameter to enable applications to receive the new SMF 119 records (subtypes 32 - 37) for DVIPA events.	SMF event records for sysplex events
PORT	V2R1	The NOSMCR parameter is defined to disable SMC-R function for the specified port.	Shared Memory Communications over Remote Direct Memory Access
PORTRANGE	V2R1	The NOSMCR parameter is defined to disable SMC-R function for the specified port range.	Shared Memory Communications over Remote Direct Memory Access
	V1R13	The <i>jobname</i> parameter can now include a 1-7 character prefix followed by a wildcard character (*), enabling all job names that match the prefix to access the ports in the range.	Wildcard support for the PORTRANGE statement

Table 9. Summary of new and changed Communications Server PROFILE.TCPIP configuration statements and parameters (continued)

Statement	Release	Description	Reason for change
SMFCONFIG	V2R1	The SMCRGROUPSTATISTICS and the NOSMCRGROUPSTATISTICS parameters are defined to create SMF 119 subtype 41 interval records for SMC-R link group and link statistics.	Shared Memory Communications over Remote Direct Memory Access
	V2R1	The SMCRLINKEVENT and the NOSMCRLINKEVENT parameters are defined to create SMF 119 subtype 42 and subtype 43 event records for SMC-R link start and end events.	Shared Memory Communications over Remote Direct Memory Access
	V2R1	The IFSTATISTICS and the NOIFSTATISTICS parameters is updated to control the creation of the SMF 119 subtype 44 interval records for IBM 10GbE RoCE Express interface statistics.	Shared Memory Communications over Remote Direct Memory Access
	V1R12	New DVIPA and NODVIPA parameters added to create new SMF 119 records (subtypes 32 - 37) for DVIPA events.	SMF event records for sysplex events
SOMAXCONN	V2R1	Default changed from 10 to 1024.	Enhanced TCP protocol configuration options and default settings
SRCIP	V1R12	The source for a JOBNAME entry can be configured as PUBLICADDRS to control the use of IPv6 public addresses.	Configurable default address selection policy table
TCPCONFIG	V2R1	The PFID operand on the SMCR statement is changed to accept a range of values between X'0000' and X'0FFF'.	Shared Memory Communications over RDMA adapter (RoCE) virtualization
	V2R1	Added the following new parameters: <ul style="list-style-type: none"> • CONNECTTIMEOUT • CONNECTINITINTERVAL • FRRTHRESHOLD • KEEPALIVEPROBES • KEEPALIVEPROBEINTERVAL • MAXIMUMRETRANSMITTIME • NAGLE and NONAGLE • QUEUEDRTT • RETRANSMITATTEMPTS • TCPMAXSENDBUFRSIZE • TIMEWAITINTERVAL 	Enhanced TCP protocol configuration options and default settings
	V2R1	SELECTIVEACK and NOSELECTIVEACK parameters are added.	TCP support for selective acknowledgements
	V2R1	The EPHEMERALPORTS parameter is added.	User control of Ephemeral Port Ranges
UDPCONFIG	V2R1	The EPHEMERALPORTS parameter is added.	User control of Ephemeral Port Ranges
VIPABACKUP	V1R12	A new prefix length value is added that can be specified with an IPv6 address to enable the definition of an IPv6 subnet.	Extend sysplex distributor support for DataPower for IPv6

Table 9. Summary of new and changed Communications Server PROFILE.TCPIP configuration statements and parameters (continued)

Statement	Release	Description	Reason for change
VIPADefine	V1R12	A new prefix length value is added that can be specified with an IPv6 address to enable the definition of an IPv6 subnet.	Extend sysplex distributor support for DataPower for IPv6
VIPADISTRIBUTE	V1R12	The following new keywords are added to support the new HotStandby distribution method: <ul style="list-style-type: none"> HOTSTANDBY option on the DISTMETHOD parameter. It indicates the hot standby distribution method. PREFERRED or BACKUP option on the DESTIP parameter. It indicates the server type and a rank value after BACKUP, which shows the rank of a backup target. AUTOSWITCHBACK and NOAUTOSWITCHBACK options for HOTSTANDBY on the DISTMETHOD parameter. They indicate whether the distributor should switch back to the preferred target when it becomes available. HEALTHSWITCH and NOHEALTHSWITCH options for HOTSTANDBY on the DISTMETHOD parameter. They indicate whether the distributor should switch to a backup target when the active target has health problems. 	Sysplex distributor support for hot-standby server
	V1R12	A new keyword ENCAP is added to support distribution to non-z/OS IPv6 targets.	Extend sysplex distributor support for DataPower for IPv6
VIPARANGE	V1R13	A new SAF parameter and its associated <i>resname</i> value are supported. You can use the SAF parameter to restrict the creation of a dynamic VIPA in the specified VIPARANGE subnet to permitted applications. The maximum number of VIPARANGE statements for one stack is now 1024; prior to V1R13, the maximum number was 256.	Improved security granularity for VIPARANGE DVIPAs

Communications Server SNA summary of interface changes

Start options

Table 10 on page 275 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 10. Summary of new and changed Communications Server start options

Start option	Release	Description of update	Reason for change
CSDUMP	V2R1	The RNICTRLE operand is changed to accept the value MSGVALUE.	Shared Memory Communications over RDMA adapter (RoCE) virtualization
	V2R1	Changed to accept a new value RNICTRLE as part of a message trigger.	Shared Memory Communications over Remote Direct Memory Access
EEVERIFY	V1R12	New start option that specifies whether VTAM should automatically send an LDLC probe to the remote partner to determine if all ports are accessible during the activation of the Enterprise Extender (EE) connection. This option also specifies the time interval at which VTAM should send the probe on active EE connections.	Enterprise Extender connection health verification
ENSEMBLE	V1R12	New start option that specifies whether this z/OS Communications Server will permit connectivity to the intraensemble data network and the intranode management network. Access to these networks is through OSA-Express3 features configured in OSX and OSM modes.	z/OS Communications Server in an ensemble
IPADDR	V2R1	Changed to accept an IPv6 address or an IPv4 address	Enterprise Extender IPv6 address configuration
MULTPATH	V1R12	New start option that specifies whether VTAM allows multipath for IPv4 and IPv6 Enterprise Extender connections.	Multipath control for Enterprise Extender
PSRETRY	V2R1	Changed to accept a new IMMED operand value to trigger immediate path switch attempts when a TG is activated or changes status.	Enterprise Extender IPv6 address configuration
TRACE	V1R13	Existing start option. The VIT operand DSPSIZE was used to set the size of the VIT data space when TYPE=VTAM was specified; it is not supported in V1R13 and later.	Increased CTRACE and VIT capacity
	V1R13	Existing start option. The VIT operand SIZE, used when TYPE=VTAM is specified, is changed to specify the number of megabytes of HVCommon instead of the number of pages of ECSA. The new valid range of values is 4M to 2048M, inclusive.	Increased CTRACE and VIT capacity
	V1R12	Start option that is changed to accept a new SUBTRACE=DIO option when the TYPE=VTAM OPTION is specified.	Performance improvements for sysplex distributor connection routing

Commands

Table 11 on page 276 lists the new and changed SNA commands.

For complete information about SNA commands, refer to z/OS Communications Server: SNA Operation.

Table 11. Summary of new and changed Communications Server commands

Command	Release	Description	Reason for change
DISPLAY EE	V2R1	Added a new CPNAME filter.	Serviceability Enhancements
	V1R12	Added a new LIST=EEVERIFY option. When this option is specified, general Enterprise Extender information and EE Health Verification information is displayed at the local IP address level.	Enterprise Extender connection health verification
DISPLAY TOPO	V1R12	A new TDUDIAG value on the LIST operand displays the following information: <ul style="list-style-type: none"> A summary of TDU diagnostic information; displayed when no other operands are specified. TDU diagnostic information that is specific to the node; displayed when the ID operand is also specified. TDU diagnostic information specific to the TG; displayed when the ORIG, DEST, and TGN operands are also specified. 	Enhancements to topology database diagnostics
DISPLAY TRL	V2R1	If the TRLE represents an OSA-Express in QDIO mode or in Hipersockets device, the display includes an additional message (IST2386I).	QDIO outbound flood prevention
	V2R1	A new value is defined for the CONTROL parameter. Specifying CONTROL=RoCE displays all the 10GbE RoCE Express TRLEs.	Shared Memory Communications over Remote Direct Memory Access
	V2R1	A new DEVSTATS operand is accepted. Specifying DEVSTATS=YES requests that VTAM obtain and display operational statistics for a 10GbE RoCE Express TRLE.	Shared Memory Communications over Remote Direct Memory Access
MODIFY CSDUMP	V2R1	The RNICTRLE operand is changed to accept the value MSGVALUE.	Shared Memory Communications over RDMA adapter (RoCE) virtualization
	V2R1	A new RNICTRLE operand is accepted. Specifying RNICTRLE requests that VTAM take a 10GbE RoCE Express diagnostic dump of the 10GbE RoCE Express interface represented by RNICTRLE in addition to any other diagnostic information requested.	Shared Memory Communications over Remote Direct Memory Access
MODIFY NOTRACE	V1R12	A new SUBTRACE value, DIO, is accepted when TYPE=VTAM is specified.	Performance improvements for sysplex distributor connection routing
MODIFY TOPO	V1R13	A new value, FUNCTION=CLRTREES, clears APPN routing trees. You should use this function only when advised by IBM service to do so.	Improved APPN routing resilience
MODIFY TRACE	V2R1	The maximum value of the BFRNUM operand when TYPE=ROUTE is specified is increased from 100 to 500 to allow up to 500 40K buffers for the APPN route selection trace.	SNA serviceability enhancements
	V1R12	A new SUBTRACE value, DIO, is accepted when TYPE=VTAM is specified.	Performance improvements for sysplex distributor connection routing

Table 11. Summary of new and changed Communications Server commands (continued)

Command	Release	Description	Reason for change
MODIFY VTAMOPTS	V2R1	Changed to accept an IPv6 address or an IPv4 address for the IPADDR start option.	Enterprise Extender IPv6 address configuration
	V1R12	This command can be used to change the value of the ENSEMBLE start option.	z/OS Communications Server in an ensemble
	V1R12	This command can be used to change the value of the EEVERIFY start option.	Enterprise Extender connection health verification
	V1R12	This command can be used to change the value of the MULTIPATH start option.	Multipath control for Enterprise Extender

Command behavior changes

Table 12 lists the SNA commands that have changed behavior.

For complete information about SNA commands, refer to z/OS Communications Server: SNA Operation.

Table 12. Summary of new and changed Communications Server commands with changed behavior

Command	Release	Description of behavior change	Reason for change
DISPLAY EE	V2R1	IST2346I is added to output that contains information about a remote IP address or a remote host name.	Serviceability Enhancements
DISPLAY EEDIAG	V1R13	When TEST=YES and LIST=SUMMARY are specified together, messages IST2137I and IST2138I now have *NA for the hop count. Previously, IST2137I and IST2138I were displayed with the actual hop count.	Enterprise Extender firewall-friendly connectivity test
DISPLAY ID	V2R1	If ID=rnictrle_name is specified and the 10GbE RoCE Express feature that rnictrle_name represents is operating in a shared RoCE environment, message IST2417I appears in the command output to display the associated virtual function number (VFN).	Shared Memory Communications over RDMA adapter (RoCE) virtualization
	V2R1	If the resource that is being displayed is a RNIC TRLE, a new message group (IST2361I) is generated to display information that is unique to the 10GbE RoCE Express interface.	Shared Memory Communications over Remote Direct Memory Access
	V2R1	When the ID represents a high performance routing (HPR) physical unit name, IST2395I is issued if the base mode adaptive rate-based (ARB) pacing algorithm is used.	Serviceability Enhancements

Table 12. Summary of new and changed Communications Server commands with changed behavior (continued)

Command	Release	Description of behavior change	Reason for change
DISPLAY ID	V1R13	When ID= <i>trlenam</i> e is specified for an active QDIO TRLE, messages IST2331I, IST2332 and one or more IST2333I are issued. For messages IST2331I, IST2332I, and IST2333I, a new QUEUE STATUS column now shows the current status of each read queue.	Performance improvements for Enterprise Extender traffic
	V1R13	The command is enhanced in the following ways: <ul style="list-style-type: none"> Displays information about IQDX TRLEs Includes the associated interface name on message IST1717I 	HiperSockets optimization for intraensemble data networks
	V1R12	When ID= <i>trlenam</i> e is specified for an active QDIO TRLE, messages IST2331I, IST2332 and one or more IST2333I are issued. Previously message IST1918I was issued. Message IST924I is added to separate data device information.	Performance improvements for sysplex distributor connection routing
	V1R12	When ID= <i>trlenam</i> e is specified for an active QDIO TRLE, message IST2337I describing the chpid type and number is issued.	z/OS Communications Server in an ensemble
	V1R12	When the ID represents a high performance routing (HPR) physical unit name or line of the Enterprise Extender XCA major node (MEDIUM=HPRIP), the display output is enhanced to optionally include the additional messages IST2327I, IST2328I, IST2329I, IST2339I, IST2340I, IST2341I and IST2343I.	Enterprise Extender connection health verification
DISPLAY STATS	V2R1	When you specify TYPE=CFS,STRNAME=EZBDVIPA, entries can also be displayed for IPv6 addresses.	Sysplex-Wide Security Associations for IPv6
	V1R13	When TYPE=VTAM is specified, existing message IST1227I displays the VIT size in megabytes. Message IST1227I for the status value 2 displays the VIT size. IST1227I for the status value 163 is retired.	Increased CTRACE and VIT capacity
DISPLAY TOPO	V1R13	When LIST=SUMMARY is specified and APPN routing trees were cleared, new message IST2360I displays the date and time of the last clear operation.	Improved APPN routing resilience
	V1R12	When ID= <i>cpname</i> ,LIST=ALL is specified, the display output is enhanced to include additional messages.	Enhancements to topology database diagnostics
	V1R12	When ORIG= <i>orig</i> ,DEST= <i>dest</i> is specified, the display output is enhanced to include additional messages.	Enhancements to topology database diagnostics
	V1R12	When LIST=TDUINFO is specified, the display output is enhanced to include, in addition to information about TDUs received, the following information: <ul style="list-style-type: none"> Information about corrupted control vectors. Information about TDUs sent. In addition, when LIST=TDUINFO,SCOPE=ACTIVITY is specified, the display output is enhanced to include information about RSN updates. Also, when a new FORMAT operand is specified on LIST=TDUINFO, the output is displayed in an expanded format.	Enhancements to topology database diagnostics

Table 12. Summary of new and changed Communications Server commands with changed behavior (continued)

Command	Release	Description of behavior change	Reason for change
DISPLAY TRL	V2R1	If TRLE= <i>rnictrle_name</i> is specified and the 10GbE RoCE Express feature that <i>rnictrle_name</i> represents is operating in a shared RoCE environment, message IST2417I appears in the command output to display the associated virtual function number (VFN).	Shared Memory Communications over RDMA adapter (RoCE) virtualization
	V2R1	When the TRLE operand specifies a RNIC TRLE, a new message group (IST2361I) is generated to display information that is unique to the 10GbE RoCE Express interface.	Shared Memory Communications over Remote Direct Memory Access
	V1R13	When TRLE= <i>trlename</i> is specified for an active QDIO TRLE, messages IST2331I, IST2332 and one or more IST2333I are issued. For messages IST2331I, IST2332I, and IST2333I a new QUEUE STATUS column now shows the current status of each read queue.	Performance improvements for Enterprise Extender traffic
	V1R13	The command is enhanced in the following ways: <ul style="list-style-type: none"> Displays information about IQDX TRLEs Includes the associated interface name on message IST1717I 	HiperSockets optimization for intraensemble data networks
	V1R12	When TRLE= <i>trlename</i> is specified for an active QDIO TRLE, messages IST2331I, IST2332 and one or more IST2333I are issued. Previously message IST1918I was issued. Message IST924I is added to separate data device information.	Performance improvements for sysplex distributor connection routing
	V1R12	When TRLE= <i>trlename</i> is specified for an active QDIO TRLE, message IST2337I describing the chpid type and number is issued.	z/OS Communications Server in an ensemble
DISPLAY VTAMOPTS	V2R1	When FORMAT=CURRENT is specified and the current IPADDR start option value is larger than 17 characters, message IST1904I is displayed instead of IST1189I.	Enterprise Extender IPv6 address configuration
	V2R1	When FORMAT=COMPLETE or FORMAT=MODIFIED is specified, and the IPADDR start option value is currently larger than 17 characters or was larger than 17 characters when VTAM was started, messages IST1905I, IST1906I, IST1907I, and IST1908I are displayed instead of IST1310I.	Enterprise Extender IPv6 address configuration
MODIFY TRACE	V1R13	A SIZE specification that is not specified in the valid range of 4M - 2048M inclusive is rejected. DSPSIZE is rejected.	Increased CTRACE and VIT capacity
MODIFY VTAMOPTS	V2R1	When you specify the new PSRETRY IMMED operand value, activation of a TG or a change in the status of a TG triggers immediate path switch processing of HPR pipes.	HPR PSRETRY Enhancement

VTAM internal trace entries

In V1R13, the VTAM internal trace (VIT) table is relocated to 64-bit common (HCOMMON) storage. As a result, the IPCS subcommand VERBEXIT VTAMMAP functions are changed. VITAL does not support the ALL and ECSA operands and VTVIT does not set the DVIT, DVITC, DVITE, DVITL, and DVITO symbols. See Increased CTRACE and VIT capacity in z/OS Communications Server: New Function Summary for more information.

For complete information about VIT entries, refer to z/OS Communications Server: SNA Diagnosis Vol 2, FFST Dumps and the VIT.

Table 13 lists the new and changed VIT entries.

Table 13. Summary of new and changed Communications Server VTAM internal trace (VIT) entries

VIT entry	Release	Description	Related support
AFSM	V2R1	Changed: VIT record, SMC-R information added.	Shared Memory Communications over Remote Direct Memory Access
CCR and CCR2	V2R1	New: VIT records to trace communication channel operations of 10GbE RoCE Express feature.	Shared Memory Communications over RDMA adapter (RoCE) virtualization
COPY and COP2	V1R13	Deleted: COPY and COP2 records are replaced with TOD record.	Increased CTRACE and VIT capacity
C64Q	V2R1	New: VIT record for IUTC64QM macro invocations.	Shared Memory Communications over Remote Direct Memory Access
C642	V2R1	New: VIT record, a continuation of the C64Q record.	Shared Memory Communications over Remote Direct Memory Access
DRBx	V2R1	New: VIT record for RoCE doorbell operations.	Shared Memory Communications over Remote Direct Memory Access
HCR	V2R1	New: VIT record for RoCE hardware command operations when the 10GbE RoCE Express feature operates in a dedicated RoCE environment.	Shared Memory Communications over Remote Direct Memory Access
HCR2	V2R1	New: VIT record, a continuation of the HCR record.	Shared Memory Communications over Remote Direct Memory Access
HCR3	V2R1	New: VIT record, a continuation of the HCR record.	Shared Memory Communications over Remote Direct Memory Access
HCR4	V2R1	New: VIT record, a continuation of the HCR record.	Shared Memory Communications over Remote Direct Memory Access
HCR5	V2R1	New: VIT record, a continuation of the HCR record.	Shared Memory Communications over Remote Direct Memory Access
IOSP	V2R1	New: VIT record for invocations of z/OS Peripheral Component Interconnect Express (PCIe) services.	Shared Memory Communications over Remote Direct Memory Access
IOS2	V2R1	New: VIT record, a continuation of the IOSP record.	Shared Memory Communications over Remote Direct Memory Access
IOS3	V2R1	New: VIT record, a continuation of the IOSP record.	Shared Memory Communications over Remote Direct Memory Access
IUTR	V2R1	New: A variation of the IUTx VIT record, specifically for IUTIL-R invocations.	Shared Memory Communications over Remote Direct Memory Access
IUTX	V2R1	Changed: Added SMC-R information in existing VIT record.	Shared Memory Communications over Remote Direct Memory Access
ODPK	V1R12	Changed: Added an indicator of the read queue identifier for inbound packets.	Performance improvements for sysplex distributor connection routing
ODTE	V2R1	Changed: Added SMC-R information in existing VIT record.	Shared Memory Communications over Remote Direct Memory Access

Table 13. Summary of new and changed Communications Server VTAM internal trace (VIT) entries (continued)

VIT entry	Release	Description	Related support
PCIR	V2R1	New: A variation of the PCIx record, specifically for interrupts of the 10GbE RoCE Express feature.	Shared Memory Communications over Remote Direct Memory Access
P64Q	V2R1	New: VIT record for IUTP64QM macro invocations.	Shared Memory Communications over Remote Direct Memory Access
P642	V2R1	New: VIT record, a continuation of the P64Q record.	Shared Memory Communications over Remote Direct Memory Access
QAPL	V1R12	New: OSA-Express QDIO or HiperSockets accelerator parameter list.	Performance improvements for sysplex distributor connection routing
QDIP	V1R12	Changed: Enabled using the DIO subtrace type under the CIA trace option. You must specify SUBTRACE=DIO,OPT=CIA to enable this trace entry. Previously, this trace entry was enabled under the CIA trace option.	Performance improvements for sysplex distributor connection routing
QSRB	V2R1	Changed: Added SMC-R information in existing VIT record.	Shared Memory Communications over Remote Direct Memory Access
	V1R12	New: OSA-Express QDIO or HiperSockets Service Request Block (SRB) event.	Performance improvements for sysplex distributor connection routing
QSR2	V1R12	New: OSA-Express QDIO or HiperSockets Service Request Block (SRB) event (part 2).	Performance improvements for sysplex distributor connection routing
RAPB	V2R1	New: VIT record for RoCE anchor cell operations.	Shared Memory Communications over Remote Direct Memory Access
RAP2	V2R1	New: VIT record, a continuation of the RAPB record.	Shared Memory Communications over Remote Direct Memory Access
RCPI	V2R1	New: VIT record for RoCE input parameter list information.	Shared Memory Communications over Remote Direct Memory Access
RCPO	V2R1	New: VIT record for RoCE output parameter list information.	Shared Memory Communications over Remote Direct Memory Access
RCP2	V2R1	New: VIT record, a continuation of the RCPI and RCPO records.	Shared Memory Communications over Remote Direct Memory Access
RCP3	V2R1	New: VIT record, a continuation of the RCPO record.	Shared Memory Communications over Remote Direct Memory Access
RPLx	V2R1	New: VIT record for RoCE Poll operation completion.	Shared Memory Communications over Remote Direct Memory Access
RPLA	V2R1	New: VIT record, a continuation of the RPLx record.	Shared Memory Communications over Remote Direct Memory Access
RPLI	V2R1	New: VIT record, a continuation of the RPLA record.	Shared Memory Communications over Remote Direct Memory Access
RPLP	V2R1	New: VIT record, a continuation of the RPLx record.	Shared Memory Communications over Remote Direct Memory Access
RPSA	V2R1	New: VIT record, a continuation of the RPST record.	Shared Memory Communications over Remote Direct Memory Access
RPSI	V2R1	New: VIT record, a continuation of the RPSA record.	Shared Memory Communications over Remote Direct Memory Access

Table 13. Summary of new and changed Communications Server VTAM internal trace (VIT) entries (continued)

VIT entry	Release	Description	Related support
RPSP	V2R1	New: VIT record, a continuation of the RPST record.	Shared Memory Communications over Remote Direct Memory Access
RPST	V2R1	New: VIT record for RoCE Post operation completion.	Shared Memory Communications over Remote Direct Memory Access
RPS2	V2R1	New: VIT record, a continuation of the RPSA record.	Shared Memory Communications over Remote Direct Memory Access
RSLK	V2R1	New: VIT record for RoCE shared lock operations.	Shared Memory Communications over Remote Direct Memory Access
SBAL	V1R12	Changed: Added direction indicator and write queue priority for outbound packets and added a read queue identifier for inbound packets.	Performance improvements for sysplex distributor connection routing
SLSB	V1R12	Changed: Added direction indicator and read queue identifier for inbound packets.	Performance improvements for sysplex distributor connection routing
TOD	V2R1	Changed: Added CPU ID information.	Shared Memory Communications over Remote Direct Memory Access
	V1R13	New: Time of day snapshot.	Increased CTRACE and VIT capacity
VHCR, VHC2, VHC3, VHC4 and VHC5	V2R1	New: VIT records to trace VHCR commands of the 10GbE RoCE Express feature when the feature operates in a shared RoCE environment.	Shared Memory Communications over RDMA adapter (RoCE) virtualization

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