



z/OS Communications Server in an ensemble

Version 1 Release 10

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About this document

This document describes the z/OS V1R10 Communications Server access to the following two new internal networks:

- The intranode management network
- The intraensemble data network

This document contains an overview of the support for z/OS Communications Server in an ensemble, followed by the publication updates that are needed for the implementation.

How this document is organized

Except for Chapter 1, "Support for z/OS Communications Server in an ensemble," on page 1, each chapter in this document consists of sections, which are updated for the ensemble network support, from one z/OS V1R10 Communications Server book. Each chapter has the same title as the book from which the information came:

- Chapter 2, "IP Configuration Guide," on page 3
- Chapter 3, "IP Configuration Reference," on page 9
- Chapter 4, "IP System Administrator's Commands," on page 31
- Chapter 5, "IP Programmer's Guide and Reference," on page 35
- Chapter 6, "IP Sockets Application Programming Interface Guide and Reference," on page 37
- Chapter 7, "SNA Network Implementation Guide," on page 39
- Chapter 8, "SNA Resource Definition Reference," on page 43
- Chapter 9, "SNA Operation," on page 47
- Chapter 10, "IP and SNA Codes," on page 51
- Chapter 11, "IP Messages," on page 53
- Chapter 12, "SNA Messages," on page 57

Related information

You can find related information in the z/OS V1R10.0 Communications Server Bookshelf and also in the following books:

- *zEnterprise BladeCenter Extension Installation Manual*
- *System zEnterprise Introduction to Ensembles*
- *System zEnterprise Ensemble Planning Guide*
- *System zEnterprise Ensemble Performance Management Planning Guide*
- *System zEnterprise Ensemble Hardware Management Console and Support Element Operations Guide*

Chapter 1. Support for z/OS Communications Server in an ensemble

IBM® offers communications access to two new internal networks through OSA-Express3 adapters that are configured with an appropriate channel path ID (CHPID) type. The following list describes the two new internal networks:

- The intranode management network. This network provides connectivity between network management applications within the zEnterprise™ node and it can be accessed through 1000BASE-T Ethernet OSA-Express3 adapters that are configured with a CHPID type of OSM.
- The intraensemble data network. This network provides access to other images that are connected to the intraensemble data network and to applications and appliances that are running in an IBM System z® BladeCenter® Extension (zBX). This internal network can be accessed through 10 gigabit OSA-Express3 adapters that are configured with a CHPID type of OSX.

z/OS® V1R10 Communications Server adds support for OSA-Express3 adapters that are configured with the new OSM and OSX CHPID types, thus allowing TCP/IP connectivity to the two new internal networks. This support eases the burden of configuration for these new OSA-Express3 CHPID types because it enables TCP/IP to dynamically find and activate up to two OSA-Express3 adapters that are connected to the intranode management network. The support requires minimal configuration for OSA-Express3 adapters that are connected to the intraensemble data network.

Restrictions:

- Access to the intranode management network is restricted to authorized management applications, and is available only through Port 0 of any OSA-Express3 CHPID configured with type OSM. Port 1 is not available for these communications.
- Connectivity to the intranode management network is restricted to stacks that are enabled for IPv6.
- Connectivity to the intranode management network and to the intraensemble data network is allowed only when zEnterprise is part of an ensemble.

Dependencies:

- This function is limited to OSA-Express3 ethernet features configured with CHPID types of OSX and OSM running on a zEnterprise. See the 2817DEVICE Preventive Service Planning (PSP) bucket for more information.
- This function is dependent upon the z/OS LPAR participating in a zEnterprise ensemble. See *System zEnterprise Ensemble Planning Guide* for more information.

Using the support for z/OS Communications Server for intraensemble networks

If you want to use this function, perform the appropriate tasks in Table 1.

Table 1. Support for z/OS Communications Server for intraensemble networks

Task	Reference
Allow z/OS Communications Server to have connectivity to the intranode management network and to the intraensemble data network by specifying ENSEMBLE=YES as a VTAM® start option.	"ENSEMBLE start option" on page 44
Allow a host management application to have access to the intranode management network by defining the SERVAUTH profile EZB.OSM.sysname.tcpname and by authorizing the host management application to the EZB.OSM.sysname.tcpname resource.	"TCP/IP in an ensemble" on page 4
For any TCP/IP stack needing access to the intraensemble data network, define INTERFACE statements as required for each OSA-Express3 CHPID that is configured with a CHPID type of OSX through which access is needed. Define INTERFACE statements for each IP version to be used (IPv4, IPv6, or both). If you require access over multiple VLANs, define an INTERFACE statement for each VLAN that is accessed over the OSA-Express3 interface.	<ul style="list-style-type: none"> • "INTERFACE — IPAQENET OSA-Express QDIO interfaces statement" on page 10 • "INTERFACE — IPAQENET6 OSA-Express QDIO interfaces statement" on page 19 • "TCP/IP in an ensemble" on page 4
Display information for OSA-Express3 interfaces that are providing connectivity to the internal networks by issuing the Netstat DEvlinks/-d command, DISPLAY NET,ID=trle, or the DISPLAY NET,TRL,TRLE= command.	<ul style="list-style-type: none"> • "Netstat DEvlinks/-d report" on page 32 • "DISPLAY TRL command" on page 47 • "DISPLAY VTAMOPTS command" on page 48 • "MODIFY VTAMOPTS command" on page 48 • "START command" on page 48
If IPsec is configured and you want a security class for IP filtering for intranode management network interfaces, specify OSMSECCLASS on the IPCONFIG6 statement.	<ul style="list-style-type: none"> • "IPCONFIG6 statement" on page 29 • "TCP/IP in an ensemble" on page 4
Display the security class for IP filtering for intranode management network interfaces.	"Netstat CONFIG/-f report" on page 31

Chapter 2. IP Configuration Guide

Overview of z/OS Communications Server

Connectivity and gateway functions

TCP/IP connectivity and gateway functions handle the physical interfaces and the routing of IP data packets called datagrams. The following communication interfaces are supported by z/OS Communications Server:

⋮

MPCIPA

Provides access to:

- TCP/IP hosts using the following:
 - OSA-Express feature: Gigabit Ethernet (GbE), 1000BASE-T Ethernet, Fast Ethernet, HSTR, or ATM in LAN emulation mode
 - OSA-Express2 feature: GbE, 10 GbE, or 1000BASE-T Ethernet
 - OSA-Express3 feature: GbE or 10 GbE
 - HiperSockets™ using the Internal Queued Direct I/O (iQDIO). HiperSockets provides high-speed, low-latency IP message passing between logical partitions (LPARs) within a single IBM eServer™ zSeries® z800, z890, z900, z990, z9®, or z10™ server.

The OSA-Express features support the Queued Direct I/O (QDIO) architecture. IPv6 is supported on all Ethernet features in QDIO mode.

- An intraensemble network using the following:
 - OSA-Express3 feature configured as CHPID type OSX
 - OSA-Express3 feature configured as CHPID type OSM

⋮

The VTAM component of z/OS Communications Server provides the I/O support for each of these communication interfaces, and requires the creation (dynamically or through definition) of Transport Resource List entries (TRLEs) to represent each interface.

- TRLEs must be defined for the following communication interfaces:
 - ATM
 - MPCOSA
 - MPCIPA devices not connected to the intraensemble network
 - MPCPTP

For information about how to define these TRLEs, see *z/OS Communications Server: SNA Resource Definition Reference*.

- For all other communication interfaces, VTAM dynamically creates TRLEs. For information about dynamically created TRLEs for TCP/IP, see *z/OS Communications Server: SNA Network Implementation Guide*.

TCP/IP in an ensemble

OSA-Express Ethernet features in QDIO mode can access the external data network when configured with the OSD channel path ID (CHPID) type. This is the default CHPID type on the IPAQENET and IPAQENET6 INTERFACE statements in the TCP/IP profile.

zEnterprise provides communications access to two internal networks through OSA-Express3 adapters that are configured with the OSM or OSX CHPID types. Communications Server supports OSA-Express3 adapters configured with these CHPID types, thus allowing TCP/IP connectivity to the following internal networks.

- Intraensemble data network (CHPID type OSX)

The intraensemble data network provides access to other images connected to the intraensemble data network, and to applications and appliances running in an IBM System z BladeCenter Extension (zBX). The intraensemble data network can be accessed through 10 gigabit OSA-Express3 adapters configured with CHPID type OSX. OSX interfaces can be IPv4 or IPv6, and must be on a VLAN. To configure OSX interfaces, see “Steps for configuring an interface for the intraensemble data network (CHPID type OSX).”

- Intranode management network (CHPID type OSM)

The intranode management network is an IPv6 network that provides connectivity between network management applications within a zEnterprise node, and can be accessed through 1000BASE-T Ethernet OSA-Express3 adapters configured with CHPID type OSM. OSM interfaces are not configured in the TCP/IP profile, but are generated by the stack and have only link-local IP addresses. The stack does not report OSM interfaces to OMPROUTE, and OMPROUTE is unaware of these interfaces; there are no OMPROUTE configuration considerations for OSM interfaces. To use the intranode management network, see “Steps for using the intranode management network (CHPID type OSM)” on page 5.

Requirement: For access to the intraensemble data network or the intranode management network, the central processor complex (CPC) and the LPAR must be configured as members of an ensemble. For information about using the “ENSEMBLE start option” on page 44 to specify that an LPAR is a member of an ensemble, see Chapter 8, “SNA Resource Definition Reference,” on page 43.

For more information about zEnterprise and ensembles, see the following:

- *zEnterprise BladeCenter Extension Installation Manual*
- *System zEnterprise Introduction to Ensembles*
- *System zEnterprise Ensemble Planning Guide*
- *System zEnterprise Ensemble Performance Management Planning Guide*
- *System zEnterprise Ensemble Hardware Management Console and Support Element Operations Guide*

Steps for configuring an interface for the intraensemble data network (CHPID type OSX)

Before you begin: For access to the intraensemble data network, the central processor complex (CPC) and the LPAR must be configured as members of an ensemble. For information about using the “ENSEMBLE start option” on page 44 to specify that an LPAR is a member of an ensemble, see Chapter 8, “SNA Resource Definition Reference,” on page 43.

Perform the following steps to configure an interface for the intraensemble data network:

1. Specify CHPIDTYPE OSX on the INTERFACE statement for the IPAQENET or IPAQENET6 interface.
2. Include the CHPID parameter to have VTAM dynamically create the associated TRLE definition.
Unlike OSD interfaces, OSX interfaces must be associated with a specific VLAN, and can communicate only with other applications and images that have access to the same VLAN on the intraensemble data network.
3. For IPv6, if you connect an external router on this network, then you can use stateless address autoconfiguration. Otherwise, you need to configure IPv6 addresses and prefixes manually.

Steps for using the intranode management network (CHPID type OSM)

Before you begin: The stack must be enabled for IPv6. For information about configuring a stack for IPv6, see *z/OS Communications Server: IPv6 Network and Application Design Guide*.

For access to the intranode management network, the central processor complex (CPC) and the LPAR must be configured as members of an ensemble. For information about using the “ENSEMBLE start option” on page 44 to specify that an LPAR is a member of an ensemble, see *z/OS Communications Server: SNA Resource Definition Reference*.

If the stack is enabled for IPv6 and the LPAR is configured as a member of an ensemble, Communications Server automatically configures, locates, and activates up to two interfaces (named EZ6OSM01 and EZ6OSM02) onto the intranode management network. Each of these interfaces is an IPv6 interface that has only a link-local IP address. You cannot configure static or dynamic routes over OSM interfaces.

The intranode management network is intended for only authorized applications, such as those performing platform performance management functions. For more information about these applications, see *System zEnterprise Ensemble Planning Guide*.

Perform the following steps to use the intranode management network:

1. Authorize the application to the EZB.OSM.sysname.tcpname resource.
To send or receive data over an OSM interface, an application must have READ authorization to the EZB.OSM.sysname.tcpname resource. If used on this image, authorize the application to this resource.
2. Reserve the UDP port that the platform management application is to use to listen for multicast traffic over the intranode management network.
3. Authorize any user IDs to this resource that might issue diagnostic commands, such as Ping and Traceroute, over OSM interfaces to verify connectivity.
4. If you enable IP security for IPv6, you can configure a security class for IP filtering that applies to all OSM interfaces.

Use the OSMSECCLASS parameter on the IPCONFIG6 statement. This enables you to configure filter rules for traffic over the EZ6OSM01 and EZ6OSM02 interfaces.

5. If the multicast address that is used by the platform management application is configured into a network access zone, then give the user ID for this application read permission to the resource profile for that zone.

Routing considerations for the intraensemble data network

If there is an external router attached to the intraensemble data network, dynamic and static routing for OSX interfaces and OSD interfaces are identical. However, if no external router is present on that network, see the following guidelines.

Guidelines:

- Implement the intraensemble data network as a flat network, meaning that all addresses that are reachable through the intraensemble data network are in the same subnet (or IPv6 prefix) as that of the intraensemble data network. In this configuration, a single route (static or dynamic) to this subnet enables all addresses on the intraensemble data network to be reached.
- Static routing might be appropriate in the following cases:
 - The intraensemble data network is implemented as a flat network, in which case a single static route over the OSX interface to the subnet of the intraensemble data network can reach all destinations in the intraensemble data network.
 - A z/OS host will not be routing traffic between external networks and the intraensemble data network, so you do not want to advertise the intraensemble subnet addresses to the external network.

Tip: If you are using static routing over the intraensemble data network and there are destination IP addresses on the IBM System z BladeCenter Extension (zBX) that are not part of the intraensemble subnet, you need to define static routes to those destination IP addresses on the intraensemble network using OSX interfaces.
- Dynamic routing might be appropriate in the following cases:
 - You want destinations on the intraensemble subnet to be reachable from outside the ensemble, and therefore want to advertise the intraensemble data network addresses to the external network.
 - There are destination IP addresses on the zBX that are not part of the intraensemble subnet, and you do not want to have to code individual static routes to reach them (for example, if other hosts on the intraensemble data network have VIPA addresses that are not in the intraensemble subnet).

OMPROUTE considerations for the intraensemble data network

In an ensemble environment with dynamic routing where a z/OS stack is the router for the ensemble, you can control whether the subnet of the intraensemble data network is advertised.

- If you want to prevent external traffic from being routed to this VLAN, then do one of the following so that OMPROUTE does not advertise the intraensemble subnet:
 - Define the OSX interface to OMPROUTE using an INTERFACE statement or IPV6_INTERFACE statement, and do not enable the IMPORT_DIRECT_ROUTES function of AS boundary routing. This function is disabled by default, so ensure that the IMPORT_DIRECT_ROUTES parameter

of the `AS_BOUNDARY_ROUTING` statement or the `IPV6_AS_BOUNDARY_ROUTING` statement is not set to YES.

- Do not define the OSX interface to `OMPROUTE`, and ensure that `GLOBAL_OPTIONS IGNORE_UNDEFINED_INTERFACES` is configured to `OMPROUTE`.

You might also want to install IPsec filter rules to restrict which traffic can flow on this network.

- If you want to allow external traffic to be routed to this VLAN, then define the OSX interface to `OMPROUTE` as an `OSPF_INTERFACE` or `IPV6_OSPF_INTERFACE`, and code a nonzero value for the `ROUTER_PRIORITY` parameter on the interface. As long as no other hosts on that OSX VLAN have coded their interfaces as OSPF interfaces, then `OMPROUTE` advertises the subnet (or IPv6 prefixes) of the intraensemble data network into the OSPF network. This advertisement makes all addresses that fall into the intraensemble subnet (or IPv6 prefixes) reachable using OSPF. In addition, if you have a subset of hosts on the intraensemble data network with VIPAs that are not in the intraensemble subnet, which you want to be able to reach over the intraensemble data network, you can define the OSX interfaces on those hosts as OSPF interfaces; `OMPROUTE` communicates with them (and only them) and can route to their VIPAs, while still preserving the ability to route to the other hosts by subnet only.

Tip: These definitions apply per interface, so you could implement advertising on one VLAN while not advertising on a different VLAN attached to the same z/OS router.

Sysplex distributor considerations for the intraensemble data network

In a sysplex distributor configuration, if the client, sysplex distributor, and at least one sysplex distributor target are all connected over the intraensemble data network, then the client, sysplex distributor, and all potential sysplex distributor targets must be connected to the same VLAN on the intraensemble data network.

Multilevel security and network access control considerations

In a multilevel secure environment, you should treat the intraensemble data network and the OSX interfaces as any other data network with OSA-Express access. However, the intranode management network and the OSM interfaces require special considerations.

If you are using network access control, the intraensemble data network and the OSX interfaces are subject to the same network access control as any other data network with OSA-Express access. However, all traffic to and from the intranode management network over OSM interfaces is exempt from network access control, and is instead subject to OSM access control. Only multicast addresses to which a platform management application binds are subject to network access control.

Chapter 3. IP Configuration Reference

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

INTERFACE — IPAQENET OSA-Express QDIO interfaces statement

Purpose

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.

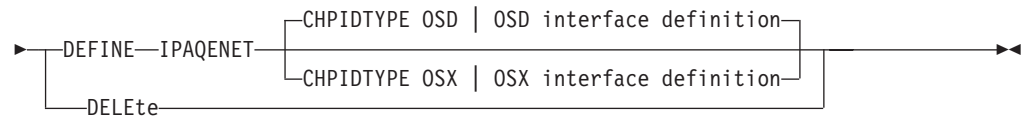
If a datagram is received at the OSA adapter for an unregistered IPv4 address, then the OSA-Express feature routes the datagram to the TCP/IP instance, depending on the setting of a virtual MAC (VMAC) address or definition of an instance as PRIROUTER or SECROUTER. If the datagram is not destined for 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 *System z10, System z9 and zSeries OSA-Express Customer's Guide and Reference*.

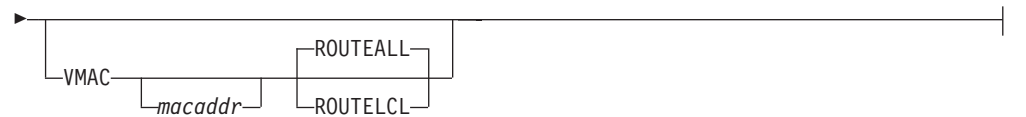
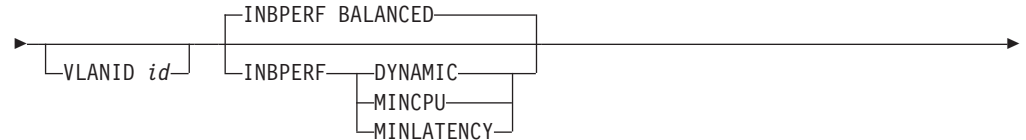
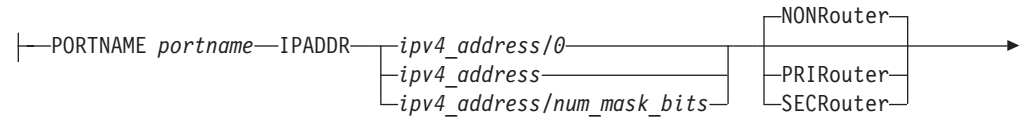
Rule: Specify the required parameters and the CHPIDTYPE parameter in the order shown here. The OSD Interface Definition and OSX Interface Definition parameters can be specified in any order.

Format

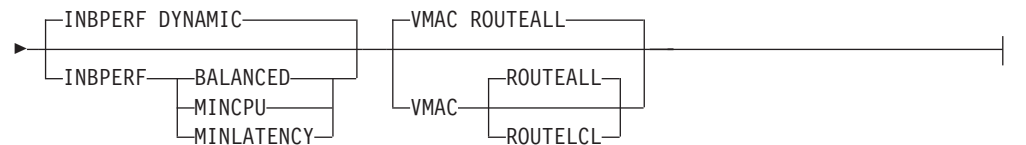
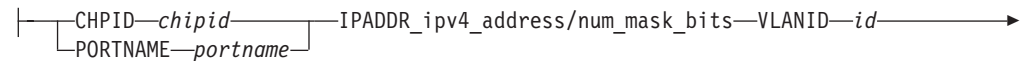
►►—INTERFace—*intf_name*—————►



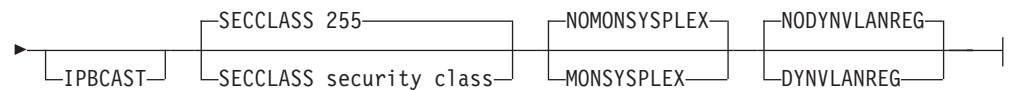
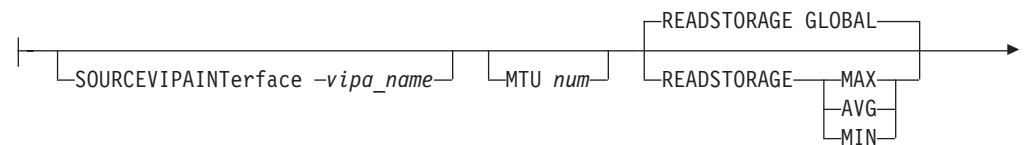
OSD Interface Definition:



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.

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.

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 The external data network. This is the default value.

OSX The intraensemble data network.

SOURCEVIPAINTERFACE *vipa_name*

Specifies which previously defined static VIPA interface is used for SOURCEVIPA (when IPCONFIG SOURCEVIPA is in effect). This parameter is optional.

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.

The *vipa_name* value is the link name for a VIRTUAL link.

Interface-specific values for IPAQENET: The following interface-specific values can be specified for IPAQENET:

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*.

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.

MTU *num*

The maximum transmission unit (MTU), in bytes. This value can be in the

range 576 - 8 992. 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:

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

The MTU default is 1492 for Fast Ethernet; otherwise, it is 8 992.

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 OMPROUTE statement for this interface or if no OMPROUTE statement is specified for this interface, the MTU used by OMPROUTE is the minimum MTU for IPv4 (576).

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 - 4 094. This parameter is optional for CHPIDTYPE OSD and required for CHPIDTYPE OSX.

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 eight IPv4 VLAN interfaces to the same OSA-Express feature.

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 adapter 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 adapter.

- AVG** Use this value if you expect a medium inbound workload over this adapter.
- MIN** Use this value if you expect a light inbound workload over this adapter.

INBPERF

An optional parameter indicating how frequently the adapter should interrupt the host for inbound traffic.

There are three supported static settings (MINCPU, MINLATENCY, and BALANCED). 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.

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 OSA-Express3 features on an IBM System z9, z10, or zEnterprise that supports the corresponding Dynamic LAN Idle function. See the appropriate Preventive Service Planning (PSP) bucket for more information about the OSA-Express 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.

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.

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.

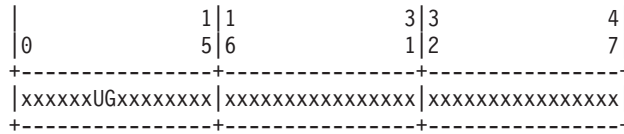
DYNVLANREG

Specifies that if a VLAN ID is configured for this interface, it is dynamically registered with the physical switches on the corresponding LAN.

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 for CHPIDTYPE OSD and cannot be specified for CHPIDTYPE 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:



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.

ROUTELCL

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.

Examples

```
INTERFACE OSAQDI024  
DEFINE IPAQENET  
PORTNAME OSAQDI02  
SOURCEVIPAINIT VIPAV4  
IPADDR 100.1.1.1/24
```

INTERFACE — IPAQENET6 OSA-Express QDIO interfaces statement

Purpose

Use the INTERFACE statement to specify an OSA-Express QDIO Ethernet or Fast Ethernet interface.

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*.

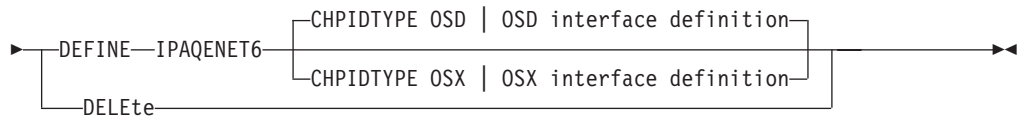
For detailed instructions on setting up an OSA-Express feature, see *System z10, System z9 and zSeries OSA-Express Customer's Guide and Reference*.

Restriction: This statement applies to IPv6 IP addresses only.

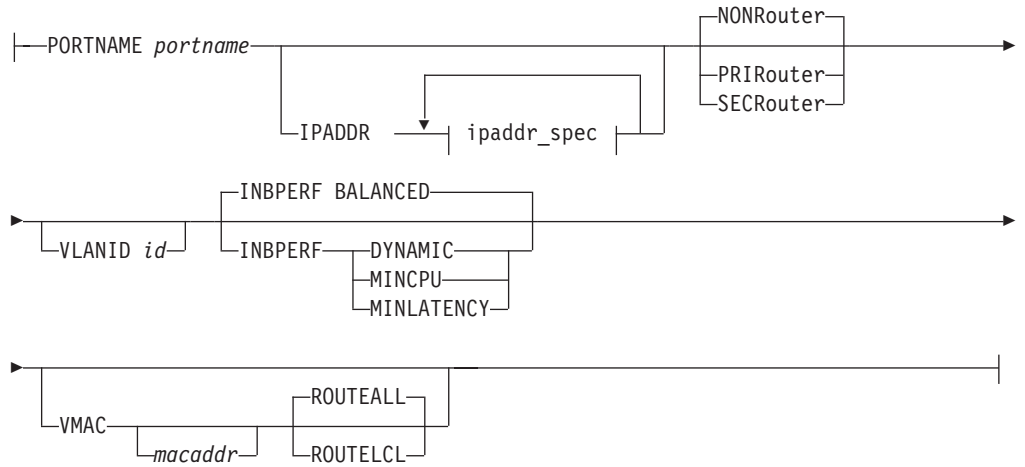
Rule: Specify the required parameters and the CHPIDTYPE parameter in the order shown here. The OSD Interface Definition and OSX Interface Definition parameters can be specified in any order.

Format

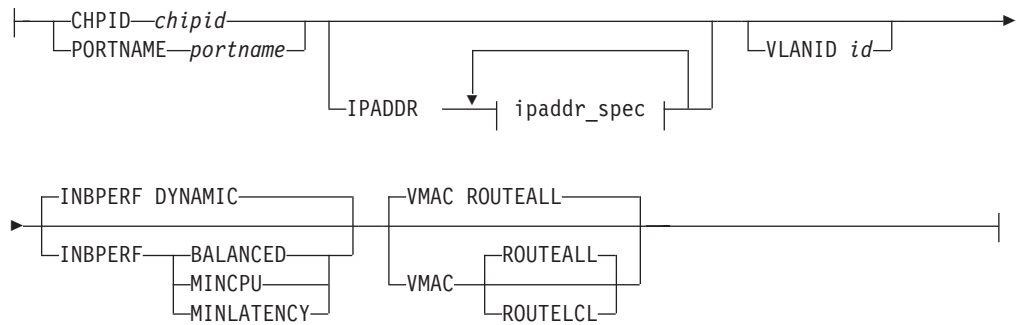
►►—INTERFace—*intf_name*—————►



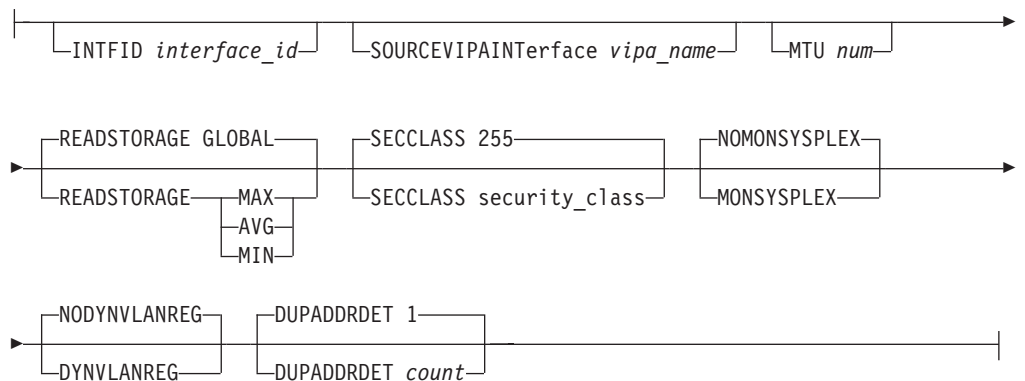
OSD interface definition:



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.

Restriction: Do not specify the value TEMPADDRS for the interface name. TEMPADDRS is a keyword on the SRCIP statement and is not recognized as an IPv6 interface name if it is coded on a 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.

IPADDR *ipaddr_spec*

The following value can be specified for *ipaddr_spec*:

ipv6_address

This parameter can be one of the following:

- *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 only valid 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 only valid 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 only valid 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 only valid 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.

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.

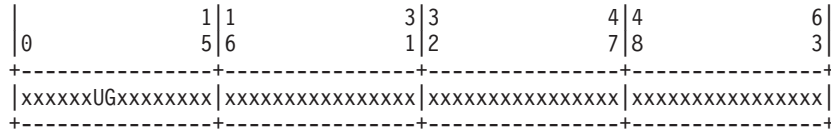
INTFID *interface_id*

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*.

Interface-specific values for IPAQENET6: The following interface-specific values can be specified for IPAQENET6.

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*.

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.

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.

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 9 000. 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:

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

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 - 4 094. This parameter is optional for CHPIDTYPE OSD and required for CHPIDTYPE OSX.

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 eight IPv6 VLAN interfaces to the same OSA-Express feature.

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 adapter 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 adapter

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

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

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 indicating how frequently the adapter should interrupt the host for inbound traffic.

There are three supported static settings (MINCPU, MINLATENCY, and BALANCED). 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. The dynamic setting does not incur additional CPU consumption which might be produced when you specify any of the static settings.

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 OSA-Express3 features on an IBM System z9, z10, or zEnterprise that supports the corresponding Dynamic LAN Idle function. See the appropriate Preventive Service Planning (PSP) bucket for more information about the OSA-Express 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.

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 queuing 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 and INTERFACE statement for the same adapter, then the INBPERF value on the LINK statement must match the INBPERF value on the corresponding INTERFACE statement. If you define a LINK statement that contains a value for INBPERF that conflicts with the INBPERF value for a previous LINK 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 a 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.

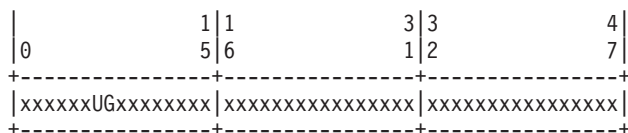
DYNVLANREG

Specifies that if a VLAN ID is configured for this interface, it is dynamically registered with the physical switches on the corresponding LAN.

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:



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.

Examples

```
INTERFACE OSAQDI026 ; OSA QDIO (Fast Ethernet)
DEFINE IPAQENET6
PORTNAME OSAQDI02
SOURCEVIPAINT VIPAV6
IPADDR 2001:0DB8:1:9:67:115:66 ; (Global Address)
```

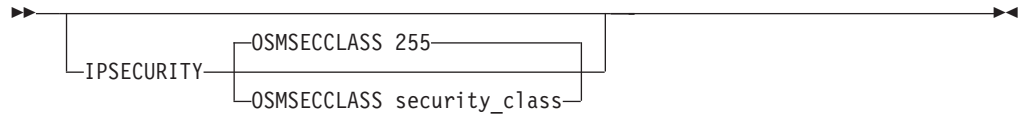
Usage

Restriction: For each interface, the PRIROUTER and SECROUTER attributes can only be in effect for 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 only allows 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: In order to configure a single physical device for both IPv4 and IPv6 traffic, you must use DEVICE/LINK/HOME for the IPv4 definition and INTERFACE for the IPv6 definition, such that the PORTNAME value on the INTERFACE statement matches the device_name on the DEVICE statement.

IPCONFIG6 statement

Format



Parameters

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IPSECURITY

Activates IPv6 IP filtering and IPv6 IPsec tunnel support. This parameter requires the IPSECURITY parameter to be configured for IPv4 on the IPCONFIG statement.

Requirements:

- Use this parameter so that the stack can function with the Communications Server IKE daemon and to enable the stack to receive IPv6 IPsec policy information, such as IP filter rules from the policy agent.
- Use this parameter so that the stack can receive IPv6 defensive filters from the Defense Manager daemon (DMD).

The IPSECURITY parameter is confirmed by the message:

```
EZZ0786I IPV6 SECURITY SUPPORT IS ENABLED
```

Restriction: IPsec functions can be activated only at initial activation of TCP/IP.

OSMSECCLASS *security_class*

Use this parameter to associate a security class for IP filtering with each OSM 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. For more information about OSM interfaces, see the TCP/IP in an intraensemble network section in *z/OS Communications Server: IP Configuration Guide*.

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*.

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OSAENTA statement

Parameters

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PORTNAME=*osa_port_name*

| Specifies the required port name of the OSA-Express for which you want to
| enable tracing. This is the same port name that is either defined on the
| PORTNAME keyword of the VTAM TRLE statement or is dynamically created
| by VTAM for OSX interfaces (configured with the CHPID parameter) or for
| OSM interfaces. For more information about OSM and OSX interfaces, see the
| "TCP/IP in an intraensemble network" section in *z/OS Communications Server:
| IP Configuration Guide*.

| **Tip:** You do not also have to define the OSA-Express to TCP/IP using the
| DEVICE or LINK statements or INTERFACE statement or activate it on the
| tracing stack in order to collect trace data from other stacks using that
| OSA-Express. For an OSX interface configured with the CHPID parameter or
| for an OSM interface, specify the port name according to the VTAM naming
| convention for these dynamic TRLEs, and VTAM will dynamically create the
| TRLE when you activate the OSAENTA interface. See the "Defining an
| OSA-Express device to z/OS Communications Server using QDIO" section in
| *z/OS Communications Server: SNA Network Implementation Guide* for details on
| the naming convention for these dynamically generated TRLEs.

| **Restriction:** OSA-Express does not allow multiple stacks to concurrently use
| the tracing function for a given OSA-Express feature.

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Chapter 4. IP System Administrator's Commands

Operator commands and system administration

VARY TCPIP,,OSAENTA

Parameters

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PORTNAME=*osa_port_name*

| Specifies the name of the OSA port for which tracing is desired. This is the
| same port name that is either defined on the VTAM TRLE statement
| PORTNAME keyword or is dynamically created by VTAM for OSX interfaces
| (configured with the CHPID parameter) or for OSM interfaces. This parameter
| is required. For more information about OSM and OSX interfaces, see "TCP/IP
| in an ensemble" on page 4.

Tips:

- You are not required to also define OSA-Express to TCP/IP using the DEVICE/LINK or INTERFACE statement or activate it on the tracing stack in order to collect trace data from other stacks using that OSA-Express. For an OSX interface configured with the CHPID parameter or for an OSM interface, specify the port name according to the VTAM naming convention for these dynamic TRLEs, and VTAM will dynamically create the TRLE when you activate the OSAENTA interface. For details about the naming convention for these dynamically generated TRLEs, see "Defining an OSA-Express device to z/OS Communications Server using QDIO" on page 39.

Restriction: Multiple stacks cannot use the tracing function concurrently for a given OSA.

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Monitoring the TCP/IP network

Netstat CONFIG/-f report

Report examples

The following examples are generated by using TSO NETSTAT command. Using the OS/390 UNIX **netstat** command displays the data in the same format as the TSO NETSTAT command.

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IPv6-enabled or request for LONG format:

```

NETSTAT CONFIG
:
IPv6 Configuration Table:
Forwarding: Yes HopLimit: 00255 IgRedirect: No
SourceVipa: Yes MultiPath: Conn IcmperrLim: 00003
IgRtrHopLimit: No
IpSecurity: Yes
OSMSecClass: 255
DynamicXCF: Yes
IpAddr: 2001:db8::9:67:115:5
IntfID: 0009:0067:0011:0001
SrcVipaInt: IPV6SRCVIPA
SecClass: 008
:

```

Report field descriptions

- **IPv6 Configuration Table if the TCP/IP stack is IPv6-enabled**

Displays the following configured IPv6 information that is defined in the IPCONFIG6 profile statement.

IpSecurity

Indicates whether the IP filtering and IPsec tunnel support is enabled.

Yes Indicates that IP security is in effect (the IPSECURITY parameter was defined on the IPCONFIG6 profile statement). When IP security is in effect, the following information is displayed:

OSMSecClass

Indicates the IP Security security class value that is associated with the OSM interfaces. Valid values are in the range 1- 255.

No Indicates that IP security is not in effect.

Netstat DEvlinks/-d report

Report examples

The following examples are generated by using TSO NETSTAT command. Using the OS/390 UNIX **netstat** command displays the data in the same format as the TSO NETSTAT command.

Not IPv6-enabled (SHORT format):

```

NETSTAT DEVLINKS
:
IntfName: OSAQDIOINTF      IntfType: IPAQENET   IntfStatus: Ready
PortName: OSAQDIO2      Datapath: 0E2A      DatapathStatus: Ready
ChpidType: OSD
Speed: 0000000100
IpBroadcastCapability: No
VMacAddr: 020629DC21BD  VMacOrigin: Cfg  VMacRouter: All
:

```

IPv6-enabled or request for LONG format:

```

NETSTAT DEVLINKS
:
IntfName: OSAQDIO46      IntfType: IPAQENET6  IntfStatus: Ready
PortName: OSAQDIO4      Datapath: 0E2B      DatapathStatus: Ready
ChpidType: OSD
QueSize: 0 Speed: 0000000100
VMacAddr: 000629DC21BC  VMacOrigin: Cfg  VMacRouter: All

```



```

:
IntfName: OSAQDIOINTF      IntfType: IPAQENET  IntfStatus: Ready
  PortName: OSAQDIO2  Datapath: 0E2A      DatapathStatus: Ready
  ChpidType: OSD
  Speed: 0000000100
  IpBroadcastCapability: No
  VMacAddr: 020629DC21BD  VMacOrigin: Cfg  VMacRouter: All
:
IntfName: OSAQDIOINTF      IntfType: IPAQENET  IntfStatus: Ready
  PortName: OSAQDIO2  Datapath: 0E2A      DatapathStatus: Ready
  ChpidType: OSD
  Speed: 0000000100
  IpBroadcastCapability: No
  VMacAddr: 020629DC21BD  VMacOrigin: Cfg  VMacRouter: All

```

Report field descriptions

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 intraensemble data network
- OSM** A CHPID with connectivity to the intranode management network

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.

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

Chapter 5. IP Programmer's Guide and Reference

Appendix A: TCP/IP in the sysplex

The internal indication is returned only when the partner is part of the same cluster. This means that the data flows to the partner over a link or interface that is never exposed outside the cluster (sysplex), and the link or interface type is one of the following:

- CTC
- HiperSockets (iQDIO)
- MPCPTP (including XCF and IUTSAMEH)
- OSA-Express QDIO with CHPID type OSX or OSM
- Loopback
- Both connection partners are owned by the same multi-homed stack

⋮

If the TCP/IP stacks within a sysplex have been partitioned using a sysplex subplex, then results from the `SO_CLUSTERCONNTYPE` socket option request are impacted in the following ways depending on what is reported:

- ⋮

- Internal indicator

If two TCP/IP stacks are in separate subplexes, connections between them no longer have this indicator on if CTC, MPCPTP (including XCF and IUTSAMEH), OSA-Express QDIO with CHPID type OSX, or HiperSockets is used.

Connections using Loopback, OSA-Express QDIO with CHPID type OSM, or one of the local interfaces on a stack will continue to have this indicator on.

- ⋮

The reason the indicators can no longer be set is because when stacks are in different subplexes, they do not appear to each other to be in the same image or cluster.

Chapter 6. IP Sockets Application Programming Interface Guide and Reference

C Socket application programming interface

C socket calls

This topic lists the syntax, parameters, and other information appropriate to each C socket call supported by TCP/IP.

getsockopt()

The following options are recognized at the socket level (SOL_SOCKET):

Option	Description
--------	-------------

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SO_CLUSTERCONNTYPE

Returns a bit mapped 32-bit value. One or more than one of the following will be returned:

- No Conn means that the socket is not connected.
- None means that the socket is active, but the partner is not in the same cluster. If this indicator is set, the other 3 indicators are 0.
- Same cluster means that the connection partners are in the same cluster.
- Same image means that the connection partners are in the same MVS image. SO_CLUSTERCONNTYPE_SAME_CLUSTER will also be set. If the connection partner is a distributed DVIPA, the same image bit will not be on since the exact hosting stack is not known.
- Internal means that communication from this node to the stack hosting the partner application is not sent on links/interfaces exposed outside the cluster (sysplex). To determine if both ends of the connection flow over internal links/interfaces, the partner application must also issue this getsockopt() and both ends exchange their results from this socket call (through an application-dependent method).

Note: If the destination IP address for a connection (partner's IP address) is a dynamic VIPA or distributed dynamic VIPA residing in the cluster, the internal indicator will not be on because traffic for these connections can be forwarded to the target TCP/IP stacks over links or interfaces that are external to the cluster.

An internal indicator means that for this side of the connection, the link/interface type is one of the following:

- CTC
- HiperSockets (iQDIO)
- MPCPTP (including XCF and IUTSAMEH connections)

- |
- OSA-Express QDIO with CHPID type OSX or OSM
- Loopback
- Or both partners are owned by the same multi-homed stack
- ⋮

Chapter 7. SNA Network Implementation Guide

OSA-Express

OSA-Express overview

To use the OSA-Express feature to communicate using TCP/IP, IBM recommends defining the device to use the QDIO interface. To do this, you must code a TRLE definition that contains a QDIO TRLE. To define the OSA-E for IPv4, use device type MPCIPA or interface type IPAQENET in the TCP/IP profile. To define the OSA-E for IPv6, use interface type IPAQENET6 in the TCP/IP profile.

Table 2. OSA-Express support

OSA feature	OSA mode ¹	OAT type (Input)	OAT type (Display)	VTAM TRLE resource definition MPCLEVEL ³	TCP/IP profile (device type) ²	TCP/IP profile (link type) ²	TCP/IP profile (interface type) ⁴	VTAM resource definitions	NDS definitions	Protocol
OSA-Express Gigabit Ethernet	QDIO (IP) ^a	N/A	MPC (QDIO)	QDIO ^k	MPCIPA ⁱ	IPAQENET ^j	IPAQENET ^l	N/A	N/A	IP
OSA-Express ATM 155 (using TR or ENET LANE)	TCP/IP Passthru ^b	Passthru	Passthru	N/A	LCS ⁱ	ETHERNet, 802.3, ETHERor802.3, IBMTR ^l	N/A	N/A	N/A	IP
OSA-Express ATM 155 (using TR or ENET LANE)	SNA ^b	SNA	SNA	N/A	N/A	N/A	N/A	XCA/SWNET	N/A	SNA
OSA-Express ATM 155 (using ENET LANE)	QDIO (IP) ^c	N/A	MPC (QDIO)	QDIO	MPCIPA ⁱ	IPAQENET ^j	N/A	N/A	N/A	IP
OSA-Express ATM 155	HPDT ATM Native ^d	MPC	MPC	HPDT	ATM ⁱ	ATM ^l	N/A	N/A	N/A	IP
OSA-Express ATM 155	HPDT ATM Native ^d	MPC	MPC	HPDT	N/A	N/A	N/A	XCA/SWNET	N/A	SNA
OSA-Express FENET	TCP/IP Passthru ^e	Passthru	Passthru	N/A	LCS ⁱ	ETHERNet, 802.3, ETHERor802.3 ^l	N/A	N/A	N/A	IP
OSA-Express FENET	SNA ^e	SNA	SNA	N/A	N/A	N/A	N/A	XCA/SWNET	N/A	SNA
OSA-Express FENET	HPDT MPC (IP) ^e	MPC	MPC (IP)	HPDT	MPCOSA ⁱ	OSANET ^j	N/A	N/A	N/A	IP
OSA-Express FENET	HPDT MPC (IP) ^e	MPC	MPC (IP)	HPDT	N/A	N/A	N/A	N/A	N/A	IP
OSA-Express FENET	QDIO (IP) ^f	N/A	MPC (QDIO)	QDIO	MPCIPA ⁱ	IPAQENET ^j	N/A	N/A	N/A	IP
OSA-Express TR	TCP/IP Passthru ^g	Passthru	Passthru	N/A	LCS	IBMTR	N/A	N/A	N/A	IP
OSA-Express TR	SNA ^g	SNA	SNA	N/A	N/A	N/A	N/A	XCA/SWNET	N/A	SNA
OSA-Express TR	QDIO (IP) ^h	N/A	MPC (QDIO)	QDIO	MPCIPA	IPAQTR	N/A	N/A	N/A	IP

Notes:

1. The superscripts a through h in the OSA mode column indicate which modes can run concurrently on a single OSA feature. Modes with identical superscripts can run concurrently on a single OSA feature.
2. The superscripts i and j in the device and link type columns represent the IPv4 definitions. To define the OSA for IPv6, use the interface type IPAQENET6 in the TCP/IP profile.
3. The superscript k in the VTAM TRLE resource definition MPCLEVEL column indicates that a VTAM TRLE is not configured for QDIO OSM interfaces or for QDIO OSX interfaces that are defined with the CHPID parameter.
4. The superscript l in the interface type column represents IPv4 definitions that might be used as an alternative to device and link. To define the OSA for IPv6, use the interface type IPAQENET6 in the TCP/IP profile.

Defining an OSA-Express device to z/OS Communications Server using QDIO

When z/OS Communications Server participates in an ensemble environment, QDIO TRLE definitions are dynamically generated for connectivity to the intraensemble data network (CHPID type OSX) if the QDIO interface is defined

with CHPIDTYPE OSX and the CHPID parameter. For each dynamic TRLE for OSX, the TRLE name is IUTXT0xx and the corresponding portname is IUTXP0xx (where xx is the configured CHPID parameter).

Tip: If the values that are chosen for the dynamically created TRLE definitions do not suit your needs (for example, you need more than 17 DATAPATH devices), you can define your own QDIO TRLE and configure the QDIO interface with the PORTNAME parameter. See INTERFACE -- IPAQENET OSA-Express QDIO interfaces statement and INTERFACE -- IPAQENET6 OSA-Express QDIO interfaces statement in *z/OS Communications Server: IP Configuration Reference* for more information.

Restrictions:

- If the QDIO interface that is used for connectivity to the intraensemble data network is defined with the PORTNAME parameter, you must define a QDIO TRLE definition. The PORTNAME parameter value on the TRLE definition must match the PORTNAME parameter value. For information about restrictions on the TRLE name, see Transport resource list major node in *z/OS Communications Server: SNA Resource Definition Reference*.
- If z/OS Communications Server runs as a guest on z/VM and guest LAN definitions is used for connectivity to the intraensemble data network, you must define the QDIO interface with the PORTNAME parameter.

QDIO TRLE definitions are always dynamically generated for connectivity to the intranode management network (CHPID type OSM). For each dynamic TRLE for OSM, the TRLE name is IUTMT0xx and the corresponding portname is IUTMP0xx (where xx is the value of the OSM CHPID). See TCP/IP in an intraensemble network in *z/OS Communications Server: IP Configuration Guide* for more information.

Operating VTAM

Activating resources

Resources automatically activated by VTAM

Certain resources are automatically activated by VTAM. Some internally maintained resources are automatically activated when the message "VTAM INITIALIZATION COMPLETE" is issued. These resources can be displayed, but cannot be activated or deactivated by an operator.

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VTAM dynamically builds and activates TRLEs within the ISTTRL major node for some TCP/IP communication interfaces. All of these TRLEs are created when needed, but cannot be deleted. These dynamic TRLEs are created with the following naming convention:

IUTSAMEH

This TRLE is created for communication between multiple TCP/IP stacks on the same MVS image, and for communication between TCP/IP and VTAM for Enterprise Extender.

IUTIQDIO

This TRLE is created for TCP/IP dynamic XCF communications over HiperSockets devices.

|
| **IUTIQD***xx*

| This TRLE is created when TCP/IP activates an MPCIPA HiperSockets
| DEVICE with a CHPID parameter of *xx*.

|
| **IUTXT0***xx*

| This TRLE is created when TCP/IP activates an MPCIPA INTERFACE with
| CHPIDTYPE OSX and a CHPID parameter of *xx*.

|
| **IUTMT0***xx*

| This TRLE is created when TCP/IP activates a dynamically defined OSM
| interface, where VTAM assigned CHPID *xx* for this communication.

|
| **ISTT***lsrs*

| TRLEs of this name are created when VTAM is started with either
| XCFINIT=YES (the default) or XCFINIT=DEFINE and another VTAM joins
| the XCF group (ISTXCF).

- | • *ls* is the two character &SYSCclone value of the VTAM on the local
| MVS image
- | • *rs* is the two character &SYSCclone value of the VTAM on the partner
| MVS image.

| TCP/IP uses these TRLEs in one of the following situations:

- | • DYNAMICXCF is specified on the IPCONFIG or IPCONFIG6 statement
| and device or interface definitions are dynamically created to other
| VTAMs with XCF connectivity.
- | • DEVICE/LINK statements of type MPCPTP contain a device name that
| is the CPNAME or SSCPNAME of another VTAM with XCF
| connectivity.
- | • INTERFACE definitions of type MPCPTP6 contain a TRLENAME that is
| the CPNAME or SSCPNAME of another VTAM with XCF connectivity.

|
| **IUT***tddd*

| This TRLE is created when TCP/IP activates a CDLC, CLAW,
| Hyperchannel, CTC, or LCS device.

- | • *t* identifies the type of device that is dynamically created:
 - | – C - TCP/IP CDLC
 - | – W - TCP/IP CLAW
 - | – H - TCP/IP Hyperchannel
 - | – X - TCP/IP CTC
 - | – L - TCP/IP LCS
- | • *ddd* identifies the read device address for this device.

Chapter 8. SNA Resource Definition Reference

VTAM start options

Connectivity start options

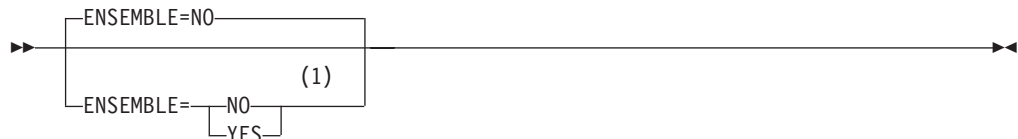
Table 3. Start options that affect connectivity. These start options affect session establishment, termination, or search order, and can be displayed as a group with the `DISPLAY VTAMOPTS,FUNCTION=CONNECT` command.

Start option	Description
ALSREQ	Whether adjacent link station names are required to be in the default ALS list of independent LUs
AUTHLEN	Whether VTAM is enabled to pass transmission priority from one LEN node to another
CONNTYPE	Whether a LEN connection or an APPN connection is established with type 2.1 PUs
CPCP	The types of connections on which CP-CP sessions are allowed with adjacent nodes
DISCNTIM	Amount of time VTAM delays deactivation of SSCP-PU session when there are no outstanding LU-LU session requests
DYNHPPFX	Indicates if DYNHPPFX is not specified, then dynamic PUs created for HPR will be prefixed with the three characters, CNR. If DYNHPPFX=cc where cc is the desired two character prefix, then dynamic PUs created for HPR will be prefixed with the two characters, cc. In these two cases, respectively, the dynamic PU names will have the format of CNRxxxxx or ccxxxxxx.
DYNPUPFX	Specifies a two character prefix that is used in creating the dynamic PUs. This prefix will be used when generating names for these dynamically built PUs. The prefix defined by the start option will be used if DYNPUPFX is not coded on the group statement for the line under which the PU is built. A unique value will then be generated and concatenated to the defined prefix to create an eight character PU name.
DYNVNPFEX	Specifies the prefix to be used when generating the name for dynamic connection network PUs
ENSEMBLE	Specifies whether this z/OS Communications Server will permit connectivity to the intraensemble data network and to the intranode management network. Access to these networks is through OSA-Express3 features that are configured in OSX and OSM modes.
HPR	Specifies the level of High-Performance Routing (HPR) support provided by VTAM
HPRNCPBF	Specifies whether HPR can be used although it may cause session data to travel through an NCP twice
IQDCHPID	Specifies superfast connectivity replacing XCF links

Table 3. Start options that affect connectivity (continued). These start options affect session establishment, termination, or search order, and can be displayed as a group with the DISPLAY VTAMOPTS,FUNCTION=CONNECT command.

Start option	Description
MPCACT	Specifies whether activations of MPC subchannel groups are to be suspended if the minimum number of read and write subchannels is not available, either because they are offline or because no valid path exists to the connecting host. VTAM automatically resumes activation when the minimum number of subchannels becomes available. This option applies only to MPC groups consisting of CTC connections.
NNSPREF	Specifies the name of the preferred network node server for this end node
SACONNS	Specifies if subarea connections will be used
SLOWVAL	Specifies that a network node which has been placed in a SLOWDOWN mode can now allow a maximum SLOWDOWN time to be set
SNVC	Maximum number of networks searched for a resource by this border node
SSDTMOUT	The amount of time that a switched PU can go without a session before the connection is dropped
VRTG	Whether virtual-route-based transmission groups connections are requested when SSCP-SSCP session is established
VRTGCPCP	Whether CP-CP sessions are supported over the virtual-route-based transmission group
XCFGRPID	Specifies the group ID suffix that VTAM will use when joining groups in the sysplex. VTAM will join groups ISTXCF vv and ISTCFS vv , where vv is the value provided with XCFGRPID
XCFINIT	Specifies whether VTAM will join a sysplex group at VTAM initialization and establish the capability for XCF connectivity to other VTAM nodes in the sysplex
XNETALS	Whether VTAM can establish sessions with LUs in adjacent networks

ENSEMBLE start option



Notes:

- 1 The ENSEMBLE setting is used to either permit or deny connectivity to the intraensemble data network and the intranode management network by allowing or denying activation of OSX and OSM interfaces.

When the zEnterprise node is configured at the Hardware Management Console (HMC) as a member of an ensemble, then the ENSEMBLE start option determines whether this specific z/OS image should be included as a member of the ensemble. When the zEnterprise node is not configured at the HMC as a member

| of an ensemble, this start option has no meaning. See *z/OS Communications Server: IP Configuration Guide* for details about configuring a zEnterprise node to participate in an ensemble.

| **ENSEMBLE=NO**

| Specifies that this z/OS Communications Server does not permit connectivity to either the intraensemble data network or the intranode management network by denying activation of OSX and OSM interfaces. The default value for the ENSEMBLE start option is NO.

| **ENSEMBLE=YES**

| Specifies that this z/OS Communications Server permits connectivity to the intraensemble data network and to the intranode management network. Access to these networks is through OSA-Express3 features that are configured with the following CHPID types:

- | • OSX (intraensemble data network)
- | • OSM (intranode management network)

| When the zEnterprise node is configured at the HMC as a member of an ensemble, you can change the value of the ENSEMBLE start option with the MODIFY VTAMOPTS command while VTAM is running.

| **Result:** The ENSEMBLE setting is used to either permit or deny activation attempts for OSX and OSM interfaces. Modifying the ENSEMBLE start option from YES to NO does not cause z/OS Communications Server to take action on any active OSX or OSM interfaces.

Chapter 9. SNA Operation

VTAM operator commands

DISPLAY TRL command

Results

The resulting display shows:

- The name and status of the TRLE specified on the TRLE operand. If the status is active, the display also includes the address and operational status of the READ, WRITE, and (OSA-Express and
:
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
 - 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

Examples

:
:

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
IST2319I IQD NETWORK ID = 07B1
IST1577I HEADER SIZE = 4096, DATA SIZE = 64, STORAGE = ***NA***
IST1221I WRITE DEV = 0E29, STATUS = ACTIVE, STATE = ONLINE
IST1577I HEADER SIZE = 4092, DATA SIZE = 64, STORAGE = DATASPACE
IST1221I READ DEV = 0E28, STATUS = ACTIVE, STATE = ONLINE
IST1221I DATA DEV = 0E2A, STATUS = ACTIVE, STATE = N/A
IST1724I I/O TRACE = OFF, TRACE LENGTH = *NA*
IST1717I ULPID = TCPCS2
IST2310I ACCELERATED ROUTING DISABLED
IST1221I DATA DEV = 0E2B, STATUS = RESET, STATE = N/A
IST1724I I/O TRACE = OFF, TRACE LENGTH = *NA*
IST314I END
```

DISPLAY VTAMOPTS

DISPLAY VTAMOPTS command

Parameters

⋮

FUNCTION

Specifies a group of related start options to display. If you specify FUNCTION, do not specify OPTION on the same command.

FUNCTION=CONNECT

Displays the start options that affect connectivity. The start options displayed using FUNCTION=CONNECT are:

ALSREQ	AUTHLEN	CONNTYPE
CPCP	DISCNTIM	DYNHPPFX
DYNPUPFX	DYNVNPFX	ENSEMBLE
HPR	HPRNCPBF	IQDCHPID
MPCACT	NNSPREF	SACONNS
SLOWVAL	SNVC	SSDTMOUT
VRTG	VRTGCPCP	XCFGRPID
XCFINIT	XNETALS	

⋮

MODIFY VTAMOPTS command

Format



The ENSEMBLE setting is used to either permit or deny connectivity to the intraensemble data network and the intranode management network. The ensemble setting permits or denies connectivity by either allowing or denying activation of OSX and OSM interfaces. Modifying the ENSEMBLE start option does not cause z/OS Communications Server to take action on active OSX or OSM interfaces.

START command

Format

Starting VTAM in an MVS environment:

Options:



| 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.

START

Chapter 10. IP and SNA Codes

Table 4. Bytes 2 and 3 (completion code) of the DLC status code

Hexadecimal Code	Meaning
X'0067'	<p>iQDIO or QDIO Devices Not Available</p> <p>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).</p>
X'006F'	<p>QDIO or IQDIO CHPID Not Available</p> <p>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).</p>
X'0070'	<p>QDIO device control channels not available</p> <p>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).</p>
X'3035'	<p>QDIO CHPID type mismatch</p> <p>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.</p>
X'3036'	<p>Secondary OSM Interface activated before primary</p> <p>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.</p>

Table 4. Bytes 2 and 3 (completion code) of the DLC status code (continued)

Hexadecimal Code	Meaning
X'3037'	<p data-bbox="610 285 1118 317">OSX or OSM Interface activation not permitted</p> <p data-bbox="610 338 1398 485">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 data-bbox="610 499 1118 531">OSX or OSM Interface activation not permitted</p> <p data-bbox="610 552 1398 632">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>

Chapter 11. IP Messages

EZD0001I SETTING VLAN ID NOT SUPPORTED FOR DEVICE *device_name*

Explanation: TCP/IP could not set the VLAN ID for this device. The OSA-Express adapter microcode level does not support setting the VLAN ID.

device_name is the name of the device.

| **System action:** TCP/IP prevents the device from activating.

Operator response: Inform the system programmer about the error.

System programmer response: Install a level of OSA-Express microcode that supports the VLAN ID function. Use the VTAM DISPLAY TRL command to determine the OSA-Express microcode level. For more information about the VTAM DISPLAY TRL command, see *z/OS Communications Server: SNA Operation*.

Module: TCPIP

Destination: EZBIFIND

EZD0002I ERROR SETTING VLAN ID FOR DEVICE *device_name*

Explanation: An unexpected error occurred while setting the VLAN ID for the device.

device_name is the name of the device.

| **System action:** TCP/IP prevents the device from activating.

Operator response: Inform the system programmer about the error.

System programmer response: Obtain a TCP/IP CTRACE with the VTAM option and contact IBM software support services.

Module: TCPIP

Destination: EZBIFIND

EZD0003I SETTING VLAN ID NOT SUPPORTED FOR INTERFACE *interface_name*

Explanation: TCP/IP could not set the VLAN ID for this interface. The OSA-Express adapter microcode level does not support setting the VLAN ID.

interface_name is the name of the interface.

| **System action:** TCP/IP prevents the device from activating.

Operator response: Inform the system programmer about the error.

System programmer response: Install a level of OSA-Express microcode that supports the VLAN ID function. Use the VTAM DISPLAY TRL command to determine the OSA-Express microcode level. For more information about the VTAM DISPLAY TRL command, see *z/OS Communications Server: SNA Operation*.

Module: TCPIP

Destination: EZBIFIND

EZD0004I ERROR SETTING VLAN ID FOR INTERFACE *interface_name*

Explanation: An unexpected error occurred while setting the VLAN ID for the interface.

| If the interface is configured with CHPID type OSX, one possible reason for this error is that the VLAN ID is not authorized for the ensemble virtual network.

interface_name is the name of the interface.

| **System action:** TCP/IP prevents the interface from activating.

Operator response: Inform the system programmer about the error.

System programmer response: Obtain a TCP/IP CTRACE with the VTAM option and contact IBM software support services.

| If the interface is configured with CHPID type OSX, ensure that the virtual network you created through the network virtualization function specifies the same VLAN ID as the OSX interface.

| **Module:** TCPIP

| **Destination:** EZBIFIND

| **EZZ0401I** *event* IN FILE: *filename* ON LINE: *lineno* AT: *token*

| **Explanation:** The specified event occurred while processing the file. The token shown was found at the specified line number in the named file. The actual event might be associated with this token, the previous token, or the previous statement.

| In the message text:

| *event*

| The event that caused the error.

| *filename*

| The configuration file where the event occurred.

| *lineno*

| The line number in the configuration file where the event occurred.

| *token*

| The token in the configuration file that was being processed when the event occurred.

| **Example:**

| EZZ0401I SYNTAX ERROR IN FILE: DD:PROFILE ON LINE: 96 AT: 'BADVAL'

| **System action:** Profile processing continues.

| **Operator response:** If an error is indicated, correct the statement.

| **System programmer response:** None.

| **Module:** EZACFPTV, EZACFPPR, EZACFPAR, EZACFPV6

| **Destination:** Telnet/Vtam parser

| **EZZ0832I** *parm1* ON LINE *linenum* MUST BE SPECIFIED IMMEDIATELY AFTER *parm2*

| **Explanation:** While processing a TCP/IP profile, a parameter that must be specified immediately after another parameter was found in a different location. The statement is ignored.

| In the message text:

| *parm1*

| The parameter that was found at an incorrect location.

| *linenum*

| The line number in the configuration file where the error was found.

| *parm2*

| The parameter after which the incorrectly located parameter must be specified.

| **Example:**

| EZZ0832I CHPIDTYPE ON LINE 98 MUST BE SPECIFIED IMMEDIATELY AFTER IPAQENET

| **System action:** TCP/IP continues. The statement is ignored.

| **Operator response:** Contact the system programmer.

| **User response:** Not applicable.

| **System programmer response:** Move the incorrectly located parameter to the correct location in the statement and

| rerun the profile. See the *z/OS Communications Server: IP Configuration Reference* for more information.

| **Problem determination:** Not applicable.

| **Source:** z/OS Communications Server TCP/IP: Configuration & Initialization

| **Module:** EZACFPV6

| **Routing code:** 8

| **Descriptor code:** 12

| **Automation:** Not applicable.

| **EZZ0835I** CANNOT MODIFY *statement* : *parameters*

| **Explanation:** The VARY TCPIP,,OBEYFILE command was invoked to modify the value of a TCP/IP profile statement parameter, but the value can only be set in the TCP/IP initial profile. See TCP/IP profile (PROFILE.TCPIP) and configuration statements in *z/OS Communications Server: IP Configuration Reference* for information about the statement and parameters mentioned in the message.

| In the message text:

| *statement*

| The TCP/IP profile statement whose parameter values cannot be modified.

| *parameters*

| The parameters whose values cannot be modified.

| **Example:**

| EZB0835I CANNOT MODIFY IPCONFIG6 : IPSECURITY OSMSECCLASS

| **System action:** TCP/IP continues but the parameter is ignored.

| **Operator response:** Contact the system programmer.

| **User response:** Not applicable.

| **System programmer response:** Specify the value on the profile statement in the TCP/IP initial profile and restart TCP/IP.

| **Problem determination:** Not applicable.

| **Source:** z/OS Communications Server TCP/IP: Configuration & Initialization

| **Module:** EZACFMS1

| **Routing code:** *

| **Descriptor code:** 5

| **Automation:** Not applicable.

Chapter 12. SNA Messages

IST1221I *chtyp DEV = device_address STATUS = status STATE = system_state*

Explanation: VTAM issues this message as part of a message group in response to:

- A DISPLAY ID command to identify the operational status of all **READ** and **WRITE** subchannels.
- A DISPLAY ID command for an MPC line or a transport resource list entry (TRLE).
- A DISPLAY TRL command for an active TRL entry.

The message group varies if the TRLE is using the Queued Direct I/O (QDIO) interface to either an IBM OSA-Express Adapter or a HiperSockets device. If the message group is for a TRLE that is not using QDIO, the message group will look as follows:

This message group displays a TRLE that does not represent an OSA-Express adapter or HiperSockets interface.

```
IST075I NAME = nodename, TYPE = LINE
| IST486I STATUS = currentstatus, DESIRED STATE = desiredstate
IST087I TYPE = line_type, CONTROL = line_control, HPDT = hpdvalue
IST1954I TRL MAJOR NODE = trl_major_node_name
IST1715I MPCLEVEL = mpc_level MPCUSAGE = mpc_usage
IST1717I ULPID = ulp_id
[IST2219I resource ACTIVATION WAITING FOR MINIMUM NUMBER OF DEVICES]
| [IST1801I UNITS OF WORK FOR NCB AT ADDRESS stor_addr]
| [IST1802I pn CURRENT = cur AVERAGE = avg MAXIMUM = max]
[IST1577I HEADER SIZE = hpsize DATA SIZE = dsize STORAGE = storage]
IST1221I chtyp DEV = device_address STATUS = status STATE = system_state
.
.
[IST1577I HEADER SIZE = hpsize DATA SIZE = dsize STORAGE = storage]
[IST1221I chtyp DEV = device_address STATUS = status STATE = system_state]
.
.
IST314I END
```

Note: VTAM displays all **WRITE** subchannel addresses for *nodename*, followed by all **READ** subchannel addresses for *nodename*. For TCP/IP channel DLC connections, there is only one **R/W** subchannel.

The following is an example of the message group if it is for a TRLE that uses QDIO:

```
IST075I NAME = nodename, TYPE = LINE
| IST486I STATUS = currentstatus, DESIRED STATE = desiredstate
IST087I TYPE = line_type, CONTROL = line_control, HPDT = hpdvalue
IST1954I TRL MAJOR NODE = trl_major_node_name
IST1715I MPCLEVEL = mpc_level MPCUSAGE = mpc_usage
[IST1716I PORTNAME = port_name LINKNUM = link_num OSA CODE LEVEL = code_level]
[IST2263I PORTNAME = port_name PORTNUM = port_num OSA CODE LEVEL = code_level]
| [IST2337I CHPID TYPE = ch_type CHPID = chpid_num]
| [IST2184I QDIOSYNC = ALLINOUT - SYNCID = TRAP01 - SAVED = YES]
[IST1577I HEADER SIZE = hpsize DATA SIZE = dsize STORAGE = storage]
IST1221I chtyp DEV = device_address STATUS = status STATE = system_state
.
.
[IST1577I HEADER SIZE = hpsize DATA SIZE = dsize STORAGE = storage]
[IST1221I chtyp DEV = device_address STATUS = status STATE = system_state]
.
.
IST924I -----
[IST1221I DATA DEV = device_address STATUS = status STATE = system_state]
[IST1724I I/O TRACE = iotrc TRACE LENGTH = length]
[IST1717I ULPID = ulp_id]
[IST2309I ACCELERATED ROUTING ENABLED]
[IST2310I ACCELERATED ROUTING DISABLED]
[IST2305I NUMBER OF DISCARDED INBOUND READ BUFFERS = sbalcnt]
[IST1757I PRIORITYx: congstate PRIORITYx: congstate]
```

```

[IST1757I PRIORITYx: congstate PRIORITYx: congstate]
[IST2190I DEVICEID PARAMETER FOR OSAENTA TRACE COMMAND = deviceid]
| [IST1801I UNITS OF WORK FOR NCB AT ADDRESS stor_addr]
| [IST1802I pn CURRENT = cur AVERAGE = avg MAXIMUM = max]
| [IST924I -----]
| :
| [IST1221I TRACE DEV = device_address STATUS = status STATE = system_state]
| [IST1724I I/O TRACE = iotrc TRACE LENGTH = length]
| [IST1717I ULPID = ulp_id]
| [IST2319I IQD NETWORK ID = netid]
| [IST2309I ACCELERATED ROUTING ENABLED]
| [IST2310I ACCELERATED ROUTING DISABLED]
| [IST2305I NUMBER OF DISCARDED INBOUND READ BUFFERS = sbalcnt]
| [IST1757I PRIORITY1: congstate PRIORITY2: ****NA****]
| [IST1757I PRIORITY3: ****NA**** PRIORITY4: ****NA****]
| [IST1801I UNITS OF WORK FOR NCB AT ADDRESS stor_addr]
| [IST1802I pn CURRENT = cur AVERAGE = avg MAXIMUM = max]
| [IST924I -----]
| :
| [IST314I END

```

Note: VTAM displays all **WRITE** subchannel addresses for the node specified by the *nodename* value, followed by all **READ** subchannel addresses for that node, followed by all **DATA** subchannel addresses, followed by all **TRACE** subchannel addresses. DATA subchannel addresses and TRACE subchannel addresses are displayed only for an OSA-Express TRLE. For each DATA and TRACE subchannel address that is currently being used by an upper-layer protocol (ULP), the name of the z/OS Communications Server ULP (for example, the TCP/IP procedure name) using that data subchannel is displayed.

IST075I

nodename is the name of the resource that was entered on the DISPLAY ID command.

Node type is always **LINE** for this message group.

IST087I

line_type is always **LEASED** for this message group.

line_control is always **MPC** (multipath channel) for this message group.

hpdvalue can have one of the following values:

YES

Indicates the connection is capable of performing channel I/O directly to or from communications storage manager (CSM) buffers.

NO

Indicates the connection is not capable of performing channel I/O directly to or from communications storage manager (CSM) buffers.

NA

Is displayed when the connection is not active.

IST486I

currentstatus is the current status of the node. See the *z/OS Communications Server: IP and SNA Codes* for status information.

desiredstate is 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*****.

IST1221I

chtyp is the type of subchannel and can be **READ**, **WRITE**, **R/W**, **DATA**, or **TRACE**.

device_address is the hexadecimal address of the subchannel that is displayed.

status is the condition or state of the subchannel that is displayed. Possible values are:

ACTIVE

Subchannel is active.

INOP Subchannel path is inoperative.

RESET Subchannel path is not ready.

SLOWDN

Subchannel path is in slowdown.

ACTPEND

DLC is in the process of activation.

OPEN.PEND

DLC is in the process of opening a connection.

IDX.PEND

DLC is in the process of IDXINIT for a DATA channel.

START.PEND

DLC is in the process of starting data flow for a connection.

INACT.PEND

DLC is in the process of deactivation.

system_state can be one of the following:

ONLINE

An MVS VARY ONLINE command for the subchannel has completed successfully and the channel is now available for use.

OFFLINE

An MVS VARY OFFLINE command has been issued for the subchannel and the command has completed successfully. The subchannel is no longer available for use.

PEND_OFFLINE

An MVS VARY OFFLINE command has been issued for the subchannel and the subchannel is in the process of completing the command.

N/A The *system_state* cannot be known for DATA subchannel addresses. This state is also displayed in cases where VTAM has not allocated or could not allocate the UCB for the subchannel.

Tip: If the MVS status of the subchannel is required, then the MVS display command may be used (for example, D U,,,xxxx)

IST1577I

This message is displayed only when HPDT=YES in message IST087I. This message is not displayed if the TRLE is IUTSAMEH, the TRLE for same-host communication.

hpsize is the MPC header segment size, in bytes.

dsize is the maximum MPC data segment size, in kilobytes.

storage indicates the storage medium that is used for inbound data (on READ subchannels) and can have one of the following values:

ECSA

An extended common service area buffer provided by the communications storage manager (CSM).

DATASPACE

A data space buffer provided by the communications storage manager (CSM).

*****NA*****

Not applicable. This value is issued for WRITE subchannels.

IST1715I

mpc_level indicates the level of MPC connection, and can be one of the following:

HPDT

Indicates that the connection is capable of performing channel I/O directly to or from communications storage manager (CSM) buffers.

NOHPDT

Indicates that the connection is not capable of performing channel I/O directly to or from communications storage manager (CSM) buffers.

QDIO

(Queued Direct I/O) Indicates that the connection performs channel I/O operations using direct IO instead of CCW channel operations. An MPCLEVEL of QDIO implies the connection is also HPDT capable, and can therefore perform the direct IO to or from communications storage manager (CSM) buffers.

mpc_usage indicates whether the MPC connection can be used exclusively by only one ULP, or shared by multiple ULPs. It can be one of the following:

SHARE

Indicates that the connection can be shared by multiple ULPs.

EXCLUSIVE

Indicates that the connection can only be used by the first ULP that requests usage of the MPC connection.

IST1716I

This message is displayed only for TRLEs representing an IBM OSA-Express Adapter or an IBM Open Systems Adapter used for native access to an ATM network.

port_name is the port name to be assigned to the port on the IBM Open Systems Adapter. Each IBM Open Systems Adapter has one *port_name* that is represented by one TRLE.

link_num indicates the relative adapter number of the OSA-Express Adapter port represented by this TRLE. For an IBM Open Systems Adapter used for native access to an ATM network, the *link_num* will be N/A.

code_level indicates the OSA processor code level of the OSA-Express. For some versions of OSA-Express, *code_level* will be N/A. For detailed instructions about setting up an OSA-Express feature, see the *System z10, System z9 and zSeries OSA-Express Customer's Guide and Reference*.

IST1717I

This message is displayed for all TRLEs that are currently being used by at least one ULP. A separate IST1717I message will be displayed for each ULP using this TRLE. For a dynamic TCP TRLE, or an exclusively owned TRLE, only one message with ULPID will be issued, since there can only be one ULP using each of these TRLEs. For an OSA-Express Adapter, one message with ULPID will be issued for each Datapath channel address in use by a ULP. For other TRLEs, more than one ULPID message may be issued, depending on how many upper-layer protocols are using the TRLE.

ulp_id specifies the name of a z/OS Communications Server upper-layer protocol (ULP) that is using the TRLE or using one of the datapath channels of an OSA-Express TRLE.

- For TCP/IP ULPs, the *ulp_id* will be the job name.
- For ANNC ULPs, the *ulp_id* will be the SNA PU name.
- For ATM or EE ULPs, the *ulp_id* will be the XCA major node name.

IST1724I

This message is issued in response to DISPLAY ID or DISPLAY TRL commands. This message appears for a TRLE representing an OSA-Express adapter.

- *iotrc* specifies whether I/O Trace is active for this OSA-Express data device (ON or OFF).
- *length* specifies the number of bytes being recorded for I/O Trace for this OSA-Express data device.

For information about setting up an OSA-Express feature, see *System z10, System z9 and zSeries OSA-Express Customer's Guide and Reference*.

IST1757I

This message is issued in response to DISPLAY ID or DISPLAY TRL commands. This message will appear for a TRLE representing an OSA-Express Adapter.

x specifies the write priority level.

congstate specifies the congestion state of that priority level. *congstate* will be **CONGESTED** when, at least once in the last congestion reporting window, all 128 writes for the priority level were unavailable. Otherwise *congstate* will be **UNCONGESTED**.

IST1954I

trl_major_node_name is the name of the TRL major node defining the TRLE.

IST2190I

This message is issued in response to DISPLAY ID or DISPLAY TRL commands for a TRLE configured with an MPCLEVEL of QDIO representing an OSA-Express adapter. This message appears for each active datapath channel if the OSA supports the OSA-Express network traffic analyzer (OSAENTA) trace function. The message displays the

DEVICEID parameter, a number that uniquely identifies this datapath channel to the OSA-Express adapter. When a TCP/IP stack is performing the OSAENTA trace function for this OSA, this DEVICEID parameter can be specified on a TCP/IP OSAENTA profile configuration statement or a VARY TCPIP,OSAENTA command to limit the tracing to just the user of this data device. See OSA-Express network traffic analyzer trace in *z/OS Communications Server: IP Configuration Guide* for more information about the OSAENTA trace function.

- *deviceid* is of the form *cs-mf-cl-us*, where
 - cs* is the Channel subsystem ID for this data path device.
 - mf* is the LPAR Multiple Image Facility ID for the LPAR using this data path device.
 - cl* is the control unit logical identifier for this data path device.
 - ua* is the unit address for this data path device.Each identifier is a 2 digit hexadecimal value between 00 and FF

IST2219I

This message is issued if the *resource* value defines an MPC CTC group, the activation of which is presently suspended waiting for the minimum required number of read and write devices to become available.

In the message text:

resource

The name of the TRLE or MPC subarea line that defines the MPC group.

IST2263I

This message is displayed if either of the following scenarios is true:

- PORTNUM is specified on the QDIO TRLE definition statement.
- VTAM detected it is connected to an IBM OSA-Express3 feature in QDIO mode.

In the message text:

port_name

The port name to be assigned to the port on the IBM Open Systems Adapter. Each IBM Open Systems Adapter has one port name that is represented by one TRLE.

port_num

The OSA-Express3 physical port number to be used for this QDIO MPC group. For OSA-Express2 and earlier adapters, only one physical port is available, so the *port_num* value will be 0.

code_level

The OSA processor code level of the OSA-Express. For some versions of OSA-Express, the *code_level* value will be N/A.

IST2305I

This is issued in response to DISPLAY NET,ID=*trlename* or DISPLAY NET,TRL,TRLE=*trlename* commands when the TRLE represents HiperSockets or an OSA-Express adapter.

In the message text:

sbalcnt

The number of storage block address lists (SBAL) that have been discarded since the activation of the device.

IST2309I

This message indicates that the upper-layer protocol (ULP) that is using the datapath channel of the OSA-Express or HiperSockets TRLE is using accelerated routing. If the ULP is a TCP/IP stack, then you can display the accelerator routing table by issuing the Netstat ROUTe/-r command with the QDIOACCEL modifier for a particular TCP/IP stack. For details about how to display the accelerator routing table, see the Netstat ROUTe/-r report in *z/OS Communications Server: IP System Administrator's Commands*.

IST2310I

This message indicates that the upper-layer protocol (ULP) that is using the datapath channel of the OSA-Express or HiperSockets TRLE is not using accelerated routing.

IST2319I

This message is issued if the TRLE that is displayed represents an IBM iQDIO Adapter (CHPID).

In the message text:

netid

The internal QDIO (IQD) Network ID is an internal system generated identifier that represents the internal logical network. The ID is associated with the IQD CHPID and can span the entire central processor complex (CPC), based on the system configuration of the IQD CHPID. Operating Systems that are running on this CPC, which are connected to the same IQD Network ID, are using the same internal logical network and therefore have network connectivity. The ID is subject to change during a power-on reset of the CPC, or with dynamic I/O updates for the IQD CHPID.

| IST2337I

| This message is issued in response to DISPLAY NET,ID=*trlename* or DISPLAY NET,TRL,TRLE=*trlename* commands
| when the TRLE represents HiperSockets or an OSA-Express adapter.

| In the message text:

| *chpid_type*

| The type of channel path identifier (CHPID) used by this TRLE:

| **OSD**

| Channel type for an OSA-Express CHPID configured in QDIO mode.

| **OSM**

| Channel type for an OSA-Express CHPID configured for attachment to the intranode management network.

| **OSX**

| Channel type for an OSA-Express CHPID configured for attachment to the intraensemble data network.

| **IQD**

| Channel type for HiperSockets (Internal Queued Direct I/O) communications.

| *chpid_num*

| The hexadecimal channel path identifier (CHPID) for the OSA adapter or HiperSockets device.

System action: Processing continues.

Operator response: For MPC or TRLE configurations defined with multiple READ and multiple WRITE devices, MPC dynamics enables an operator to dynamically add and remove subchannels to and from the MPC/TRLE group.

- If a READ or WRITE MPC or TRLE subchannel displays as OFFLINE, issue an MVS ONLINE command (for example, VARY cua,ONLINE) to dynamically add the device back to the MPC or TRLE group.
- If a READ or WRITE MPC or TRLE subchannel displays as ONLINE, and you want to remove the subchannel from the group, issue the MVS OFFLINE command (for example, VARY cua,OFFLINE) to dynamically remove the device from the MPC or TRLE group.

Restriction: For Subarea MPC connections, the MPCDYN=YES operand must be coded on the MPC GROUP or LINE definition to enable MPC dynamics.

System programmer response: None.

Routing code: 2

Descriptor code: 5

IST1631I *resource* **SUBCHANNEL** *cua* *status*

Explanation: This message is issued when the status of a subchannel that uses multipath channel (MPC) changes. *resource* is the name of the TRLE or MPC subarea line that contains the subchannel.

cua is the subchannel address.

status is the subchannel address status, and can be one of the following:

DEVICE ALREADY ALLOCATED

The subchannel is already in use.

DEVICE NOT FOUND

The subchannel was not found by MVS.

INVALID DEVICE TYPE

The subchannel device type does not match the characteristics of the *resource* value.

INVALID QDIO PORT NUMBER

The port number (PORTNUM) specified on the QDIO TRLE definition exceeds the number of physical ports available on the OSA-Express3 CHPID.

IQDIO CULA UNAVAILABLE

The data subchannel for HiperSockets (IQDIO) is missing the control unit logical address (CULA).

NO PATH AVAILABLE

There is no path available to the subchannel.

NO STORAGE TO ALLOCATE

There is insufficient storage available to activate the subchannel.

NOT ADDED TO VIRTUAL NET

An ensemble virtual network does not include this host and this OSA-Express interface.

NOT AN ENSEMBLE MEMBER

Either the central processing complex (CPC) is not configured as a member of an ensemble, or this specific z/OS image is not included as a member of the ensemble because the VTAM start option ENSEMBLE is set to the value NO. z/OS Communications Server will not permit connectivity to either the intraensemble data network or the intranode management network. z/OS Communications Server denies this connectivity by denying the activation of OSX and OSM interfaces.

OFFLINE

Deactivation processing has completed and MVS acknowledges that the subchannel is off line.

OFFLINE.PENDING

An MVS VARY OFFLINE command is issued for a subchannel and VTAM and MVS are in the process of completing deallocation for the subchannel.

ONLINE

An MVS VARY ONLINE command is issued for a subchannel and VTAM successfully completes activation for the subchannel.

OPEN FOR DEVICE FAILED

The attempt to activate the subchannel failed.

QDIO CULA UNAVAILABLE

The data subchannel for an OSA-Express adapter is missing the Control Unit Logical Address (CULA).

QDIO DEVICE NOT FOUND

The data subchannel for an OSA-Express adapter was not found by MVS.

QDIO DEVICE PATH INVALID

The subchannel for an OSE-Express adapter, or iQDIO device has a path that is not valid, or is not online to MVS.

QDIO DEVICE TYPE NOT OSD

The subchannel for an OSA-Express adapter is not of type OSD.

| **QDIO DEVICE TYPE NOT OSM**

| The subchannel for an OSA-Express adapter is not an OSM subchannel.

| **QDIO DEVICE TYPE NOT OSX**

| The subchannel for an OSA-Express adapter is not an OSX subchannel.

QDIO INVALID SUBCHANNEL

 There was a channel subsystem call (CHSC) failure for a QDIO device.

QDIO UCBINFO UNAVAILABLE

 The subchannel for an OSA-Express adapter has a path that is not valid.

REACCESSIBLE

 An INOP situation occurs and MVS deactivates and then reactivates a subchannel without operator intervention.

System action: None.

Operator response: Depending on the value of *status*, take the following action:

NO PATH AVAILABLE

 Ensure that all devices are on line and have PATHs available.

OFFLINE

 Issue an MVS VARY ONLINE command to use this subchannel for this device.

If activation succeeded or is pending for this resource, no further response is needed. The subchannel will be dynamically made available to the resource when it comes online. If activation failed, attempt reactivation after making the previously described adjustments.

System programmer response: Depending on the value of *status*, take the following action:

DEVICE ALREADY ALLOCATED

 Ensure that the same subchannel is not used for multiple devices.

DEVICE NOT FOUND

 Ensure that the subchannel address indicated has been defined to MVS.

INVALID DEVICE TYPE

| Ensure that the subchannel address indicated was defined to MVS with a type that matches the *resource*
| value containing this subchannel. For example, if the *resource* value is a transport resource list element
| (TRLE) with LNCTL=MPC, ensure that the type of the subchannel is for a channel-to-channel adapter
| connection.

INVALID QDIO PORT NUMBER

 Issue the D NET,TRL,TRLE=*trlename* command. Locate message IST2263I in the display output. Ensure that the displayed PORTNUM value does not exceed the number of physical ports available with OSA-Express3. For instance, if OSA-Express3 supports 2 physical ports, the only valid PORTNUM values are 0 and 1.

IQDIO CULA UNAVAILABLE

 Contact the IBM Software Support Center.

NO STORAGE TO ALLOCATE

 A storage shortage unrelated to this device activation has occurred. Attempt to determine the reason for the storage shortage.

| **NOT ADDED TO VIRTUAL NET**

| Use the network virtualization function to perform the following steps:

- | 1. Create a virtual network.
- | 2. Add this z/OS image as a host to that virtual network.
- | 3. Specify the OSA-Express OSX interface corresponding to the TRLE in this message as a network interface.
- | 4. Ensure that the VLANID parameter for the TCP/IP interface that is being activated is the VLAN ID of the virtual network that you created.

OPEN FOR DEVICE FAILED

 Contact the IBM Software Support Center.

QDIO CULA UNAVAILABLE

Contact the IBM Software Support Center.

QDIO DEVICE NOT FOUND

Ensure that the subchannel address indicated has been defined to MVS.

QDIO DEVICE PATH INVALID

Ensure that the subchannels on the TRLE for an OSA-Express or HiperSockets adapter have been correctly defined. For an OSA-Express device, the subchannels should be type OSD, OSX, or OSM. For a HiperSockets device, the subchannels should be type IQD.

QDIO INVALID SUBCHANNEL

Contact the IBM Software Support Center.

QDIO DEVICE TYPE NOT OSD

The subchannel is not connected to an OSA-Express adapter that is configured in QDIO mode. Ensure that the READ, WRITE, and DATAPATH subchannels that are associated with the TRLE are defined as type OSD.

QDIO DEVICE TYPE NOT OSM

The subchannel is not connected to the intranode management network. Ensure that the CHPID that is defined has an OSM channel type of OSM.

QDIO DEVICE TYPE NOT OSX

An OSX INTERFACE is being activated by TCP/IP, but the subchannel address is not connected to the intraensemble data network. If the OSXCHPID parameter is defined on the INTERFACE, ensure that the CHPID that is defined has a channel type of OSX. If the OSXPORTNAME parameter is defined on the INTERFACE statement, ensure that the subchannel addresses on the TRLE that match the PORTNAME are of type OSX.

QDIO UCBINFO UNAVAILABLE

Ensure that the specified subchannel address was defined to MVS with a type that matches the QDIO TRLE that contains this subchannel. For example, if the subchannel is to an OSA adapter, ensure that the subchannel type is OSD, OSX, or OSM.

Routing code: 2

Descriptor code: 5

IST2337I CHPID TYPE = *chpid_type* CHPID = *chpid_num*

Explanation: This message is part of several message groups that VTAM issues in response to a DISPLAY ID or DISPLAY TRL command. See "IST1221I" on page 57 for a complete description.

Routing code: 2

Descriptor code: 5

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