show smds addresses

To display the individual addresses and the interface they are associated with, use the **show smds addresses** privileged EXEC command.

show smds addresses

Syntax Description

This command has no arguments or keywords.

Command Modes

Privileged EXEC

Command History

Release	Modification
10.0	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Examples

The following is sample output from the **show smds addresses** command:

```
Router# show smds addresses

SMDS address - Serial0   c141.5555.1212.FFFF
```

Table 59 describes the fields shown in the display.

Table 59 show smds addresses Field Descriptions

Field	Description
Serial0	Interface to which this SMDS address has been assigned.
c141.5555.1212	SMDS address that has been assigned to the interface.

show smds map

To display all Switched Multimegabit Data Service (SMDS) addresses that are mapped to higher-level protocol addresses, use the **show smds map** privileged EXEC command.

show smds map

Syntax Description

This command has no arguments or keywords.

Command Modes

Privileged EXEC

Command History

Release	Modification
10.0	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Examples

The following is sample output from the **show smds map** command:

```
Router# show smds map

Serial0: ARP maps to e180.0999.9999.FFFF multicast
Serial0: IP maps to e180.0999.9999.FFFF 172.16.42.112 255.255.255.0 multicast
Serial0: IPX 1ABC.000.0c00.d8db maps to c111.1111.1111.1111 -- dynamic, TTL: 4 min
```

Table 60 describes the fields shown in the output.

Table 60 show smds map Field Descriptions

Field	Description
Serial0	Name of interface on which SMDS has been enabled.
ARP maps to	Higher-level protocol address that maps to this particular SMDS address.
e180.0999.9999.FFFF	SMDS address. Includes all SMDS addresses entered with either the **smds static-map** command (static) or **smds multicast** command (multicast).
172.16.42.112	IP address.
255.255.255.0	Subnet mask for the IP address.
static/dynamic	The address was obtained from a static map or dynamic map.
TTL	Time to live.

show smds traffic

To display statistics about Switched Multimegabit Data Service (SMDS) packets the router has received, use the **show smds traffic** privileged EXEC command.

show smds traffic

Syntax Description

This command has no arguments or keywords.

Command Modes

Privileged EXEC

Command History

Release	Modification
10.0	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Examples

The following is sample output from the **show smds traffic** command:

```
Router# show smds traffic

624363 Input packets
759695 Output packets
2 DXI heartbeat sent
0 DXI heartbeat received
0 DXI DSU polls received
0 DXI DSU polls sent
0 DXI invalid test frames
0 Bad BA size errors
0 Bad Header extension errors
65 Invalid address errors
1 Bad tag errors
```

Table 61 describes the fields shown in the output.

Table 61 show smds traffic Field Descriptions

Field	Description
Input packets	Number of input packets.
Output packets	Number of output packets.
DXI heartbeat sent	Number of Data Exchange Interface (DXI) heartbeat polls transmitted.
DXI heartbeat received	Number of DXI heartbeat polls received.
DXI DSU polls sent	Number of DXI Data Service Unit (DSU) polls sent.
DXI DSU polls received	Number of DXI DSU polls received.
DXI invalid test frames	Number of invalid test frames seen.

Table 61 show smds traffic Field Descriptions (continued)

Field	Description
Bad BA size errors	Number of packets that have a size less than 32 or greater than 9188 bytes.
DXI Header extension errors	Number of extended SMDS Interface Protocol (SIP) Layer 3 header errors.
DXI Invalid address errors	Number of address errors.
Bad tag errors	Status indicating the number of errors that occur when there is a mismatch between the Tag value in the header and the BeTag value in the trailer of an SMDS frame. This usually indicates that there is a misconfiguration (that is, a DXI is connected to a non-DXI) or that the SMDS data service unit (SDSU) is scrambling the Layer 2 protocol data units (PDUs).

show srcp

To display Simple Resource Coordination Protocol (SRCP) information, use the **show srcp** command in user EXEC or privileged EXEC mode.

show srcp

Syntax Description

This command has no arguments or keywords.

Command Modes

User EXEC (>)
Privileged EXEC (#)

Command History

Release	Modification
12.4(24)T	This command was introduced in a release earlier than Cisco IOS Release 12.4(24)T.

Examples

The following is sample output for **show srcp** command:

```
Router# show srcp

SRCP Admin State ACTIVE, Oper State ACTIVE
SRCP UDP port 2428
```

Table 62 describes the fields shown in the display.

Table 62 show srcp Field Descriptions

Field	Description
SRCP Admin State	Administrative state of the SRCP daemon.
Oper State	Operational state of the SRCP daemon.
SRCP UDP Port	The User Datagram Protocol (UDP) port used for the specified connection.

Related Commands

Command	Description
debug srcp	Enables debug traces for SRCP errors, events, media, packets, and parser.
srcp	Allocates resources for the SRCP and starts the daemon.

show vc-group

To display the names of all virtual circuit (VC) groups, use the **show vc-group** command in user EXEC or privileged EXEC mode.

show vc-group [*group-name*]

Syntax Description

group-name	(Optional) Name defined by the **vc-group** command. If this argument is not specified, the names of all VC groups in the system are displayed.

Defaults

The names of all VC groups in the system are displayed.

Command Modes

User EXEC
Privileged EXEC

Command History

Release	Modification
12.1(2)T	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Examples

The following example shows the default display of the **show vc-group** EXEC command:

```
Router# show vc-group

Name of All VC Groups:
======================
network-1
```

Related Commands

Command	Description
show atm pvc	Displays all ATM PVCs, SVCs, and traffic information.
show frame-relay pvc	Displays statistics about Frame Relay interfaces.
vc-group	Assigns multiple Frame Relay DLCIs to a VC group.

show vfi

To display information related to a virtual forwarding instance (VFI), use the **show vfi** command in privileged EXEC mode.

Command Syntax in Releases 12.0(31)S, 12.2(28)SB, 12.2(33)SRA, 12.2(33)SRB, and 12.2SX

show vfi *vfi-name*

Command Syntax in Release 12.2(33)SRC

show vfi name *vfi-name*

Command Syntax in Release 12.2(33)SRE

show vfi [**checkpoint** [**summary**] | **mac static address** | **memory** [**detail**] | **name** *vfi-name* [**checkpoint** | **mac static address**] | **neighbor** *ip-addr* **vcid** *vcid* **mac static address**]

Syntax Description

vfi-name	(Optional) Name of a specific VFI.
checkpoint	(Optional) Displays VFI checkpoint information.
summary	(Optional) Displays a summary of VFI checkpoint information.
mac	(Optional) Displays MAC address data.
static	(Optional) Displays static MAC address data.
address	(Optional) Displays static MAC addresses in a bridge domain.
memory	(Optional) Displays VFI memory usage.
detail	(Optional) Displays details of VFI memory usage.
name	(Optional) Displays the name of a specific VFI.
neighbor	(Optional) Displays VFI neighbor information.
ip-addr	(Optional) IP address of the neighbor (remote peer).
vcid	(Optional) Displays the virtual circuit ID for a peer.
vcid	(Optional) Integer from 1 to 4294967295 that identifies the virtual circuit.

Command Modes

Privileged EXEC (#)

Command History

Release	Modification
12.0(31)S	This command was introduced.
12.2(28)SB	This command was integrated into Cisco IOS Release 12.2(28)SB.
12.2(33)SRA	This command was updated to display the Virtual Private Network (VPN) ID.
12.2(33)SRB	This command was updated to display virtual private LAN service (VPLS) autodiscovery information.
12.2(33)SRC	This command was modified. The **name** keyword was added.

Release	Modification
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.
12.2(33)SRE	This command was modified. The command syntax was changed, and support was added for the following keywords: **address**, **checkpoint**, **detail**, **mac**, **memory**, **neighbor**, **static**, **summary**, and **vcid**. Support was also added for the following arguments: *ip-addr* and *vcid*.

Usage Guidelines

Use this command to verify VFI configurations and for troubleshooting.

Examples

This example shows status for a VFI named VPLS-2. The virtual circuit ID in the output represents the VPN ID; the virtual circuit is identified by the combination of the destination address and the virtual circuit ID.

```
Router# show vfi VPLS-2

VFI name: VPLS-2, state: up
  VPN ID: 100
  Local attachment circuits:
    Vlan2
  Neighbors connected via pseudowires:
  Peer Address     VC ID     Split-horizon
  10.1.1.1          2             Y
  10.1.1.2          2             Y
  10.2.2.3          2             N
```

Table 63 describes the significant fields shown in the display.

Table 63 show vfi Field Descriptions

Field	Description
VFI name	The name assigned to the VFI.
state	The status of the VFI (up or down).
Local attachment circuits	The interface or VLAN assigned to the VFI.
Peer Address	The IP address of the peer router.
VC ID	The virtual circuit ID assigned to the pseudowire.
Split-horizon	Whether split horizon is enabled (Y) or disabled (N).

For the VPLS autodiscovery feature, the command output from the **show vfi** command includes autodiscovery information, as shown in the following example:

```
Router# show vfi

Legend: RT= Route-target, S=Split-horizon, Y=Yes, N=No

VFI name: VPLS1, state: up, type: multipoint
  VPN ID: 10, VPLS-ID: 9:10
  RD: 9:10, RT: 10.10.10.10:150
  Local attachment circuits:
```

```
    Ethernet0/0.2
  Neighbors connected via pseudowires:
  Peer Address      VC ID       Discovered Router ID       S
  10.7.7.1           10          10.7.7.1                  Y
  10.7.7.2           10          10.1.1.2                  Y
  10.7.7.3           10          10.1.1.3                  Y
  10.7.7.4           10          10.1.1.4                  Y
  10.7.7.5           10          -                         Y

VFI name: VPLS2 state: up, type: multipoint
  VPN ID: 11, VPLS-ID: 10.9.9.9:2345
  RD: 10:11, RT: 10.4.4.4:151
  Local attachment circuits:
    Ethernet0/0.3
  Neighbors connected via pseudowires:
  Peer Address      VC ID       Discovered Router ID      S
  10.7.7.1           11          10.7.7.1                 Y
  10.7.7.2           11          10.1.1.5                 Y
```

Table 64 describes the significant fields in the output related to VPLS autodiscovery.

Table 64 show vfi Field Descriptions for VPLS Autodiscovery

Field	Description
VPLS-ID	The identifier of the VPLS domain. VPLS autodiscovery automatically generates a VPLS ID using the Border Gateway Protocol (BGP) autonomous system number and the configured VFI VPN ID.
RD	The route distinguisher (RD) to distribute endpoint information. VPLS autodiscovery automatically generates an RD using the BGP autonomous system number and the configured VFI VPN ID.
RT	The route target (RT). VPLS autodiscovery automatically generates a route target using the lower 6 bytes of the RD and VPLS ID.
Discovered Router ID	A unique identifier assigned to the PE router. VPLS autodiscovery automatically generates the router ID using the Multiprotocol Label Switching (MPLS) global router ID.

This example shows output from the **show vfi** command using the **memory** and **detail** keywords and the command syntax for Cisco IOS Release 12.2(33)SRE:

```
Router# show vfi memory detail

  VFI memory                   In-use Asked-For/Allocated Count  Size  Cfg/Max
  ------------------------------------------------------------------------------

  VFI structs                  In-use Asked-For/Allocated Count  Size  Cfg/Max
  ------------------------------------------------------------------------------
  vfi_context_t           :        --        --/--           --    52   --/--
  vfi_circuit_retry       :        --        --/--           --    24   --/--

  Total allocated: 0.000 Mb, 0 Kb, 0 bytes
```

Table 65 describes the significant fields in the output from the command using the **memory** and **detail** keywords.

Table 65 show vfi Field Descriptions in Cisco IOS Release 12.2(33)SRE

Field	Description
VFI memory	Amount of memory available for use.
In-use	Amount of memory actively used.
Asked-For/Allocated	Amount of memory originally requested/amount of memory allocated.
Count	Number of pieces of this named memory that exist.
Size	Size of the memory allocated by the system for this chunklet.
Config/Max	Number of chunklets per chunk.
VFI structs	Data structures being used.
Total allocated	Total allocated memory.

Related Commands

Command	Description
show xconnect	Displays information about xconnect attachment circuits and pseudowires.

show waas alarms

To display WAAS Express status and alarms, use the **show waas alarms** command in privileged EXECmode.

show waas alarms

Syntax Description

This command has no arguments or keywords.

Command Modes

Privileged EXEC (#)

Command History

Release	Modification
15.1(2)T	This command was introduced.

Usage Guidelines

Use this command to display the status of the WAAS Express device and display the alarms that are enabled in the system.

Examples

The following output from the **show waas alarms** command shows that the alarms are turned on when the WAAS Express feature license has expired:

```
Router> enable
Router# show waas alarms

Alarms
    Connection limit exceeded:              off
    Too many peers discovered:              off
    WAAS license expired:                   off
    WAAS license revoked:                   off
    WAAS license deleted:                   on
    High CPU:                               off
```

Table 66 describes the significant fields shown in the display.

Table 66 show waas alarms Field Descriptions

Field	Description
Connection limit exceeded	Device exceeds the connection limit.
Too many peers discovered	Device exceeds the peer limit.
WAAS license expired	WAAS Express license has expired.
WAAS license revoked	WAAS Express license is revoked.
WAAS license deleted	WAAS Express license is deleted.
High CPU	CPU reaches maximum utilization.

Related Commands

Command	Description
clear waas	Clears WAAS Express statistics and closed connections information.
debug waas	Displays debugging information for different WAAS Express modules.
show waas auto-discovery	Displays information about WAAS Express autodiscovery.
show waas connection	Displays information about WAAS Express connections.
show waas statistics aoim	Displays WAAS Express peer information and negotiated capabilities.
show waas statistics application	Displays WAAS Express policy application statistics.
show waas statistics auto-discovery	Displays WAAS Express autodiscovery statistics.
show waas statistics class	Displays statistics for the WAAS Express class map.
show waas statistics dre	Displays WAAS Express DRE statistics.
show waas statistics errors	Displays WAAS Express error statistics.
show waas statistics global	Displays global WAAS Express statistics.
show waas statistics lz	Displays WAAS Express LZ statistics.
show waas statistics pass-through	Displays WAAS Express connections placed in a pass-through mode.
show waas statistics peer	Displays inbound and outbound statistics for peer WAAS Express devices.
show waas status	Displays the status of WAAS Express.
show waas token	Displays the value of the configuration token used by the WAAS Central Manager.
waas cm-register url	Registers a device with the WAAS Central Manager.

show waas auto-discovery

To display autodiscovery information for the WAAS Express device, use the **show waas auto-discovery** command in privileged EXEC mode.

show waas auto-discovery {**list** | **blacklist**}

Syntax Description

list	Displays the relevant autodiscovery states for the current connections.
blacklist	Displays the autodiscovery blacklist including the server address and state (grey or black).

Command Default

Autodiscovery information for the WAAS Express device is displayed with the associated connection states.

Command Modes

Privileged EXEC (#)

Command History

Release	Modification
15.1(2)T	This command was introduced.

Usage Guidelines

Use this command to display connections being optimized and connections on which optimization is being negotiated.

Examples

The following is sample output from the **show waas auto-discovery list** command:

```
Router> enable
Router# show waas auto-discovery list

E: Established, S: Syn, A: Ack, F: Fin, R: Reset M: eMbryonic
s: sent, r: received, O: Options, P: Passthrough
    Src-IP:Port           Dst-IP:Port           Orig-St     Term-St
    192.168.111.111:65531 192.168.200.200:65531 Sr          SOs
```

Table 67 describes the significant fields shown in the display.

Table 67 show waas auto-discovery list Field Descriptions

Field	Description
Src-IP:Port	Source IP port number
Dst-IP:Port	Destination IP port number
Orig-St	Originating state
Term-St	Terminating state

The following is sample output from the **show waas auto-discovery blacklist** command:

```
Router> enable
Router# show waas auto-discovery blacklist

        Server IP                    Insert Time               State
        192.168.111.111:65531        Tue Jul 27 16:16:19 2010  Grey
```

Table 68 describes the significant fields shown in the display.

Table 68 show waas auto-discovery blacklist Field Descriptions

Field	Description
Server IP	The server address.
Insert Time	The blacklist insert time.
State	• Grey indicates that one acknowledgment was received without option 33. Grey also indicates that WAAS Express is in the validation state to add the IP address to the blacklist. • Black indicates that two acknowledgments were received without option 33. Black also indicates that packets are dropped with WAAS Express TCP options and are added to the blacklist. This enables WAAS Express to perform optimization.

Related Commands

Command	Description
clear waas	Clears WAAS Express statistics and closed connections information.
debug waas	Displays debugging information for different WAAS Express modules.
show waas alarms	Displays WAAS Express status and alarms.
show waas connection	Displays information about WAAS Express connections.
show waas statistics aoim	Displays WAAS Express peer information and negotiated capabilities.
show waas statistics application	Displays WAAS Express policy application statistics.
show waas statistics auto-discovery	Displays WAAS Express autodiscovery statistics.
show waas statistics class	Displays statistics for the WAAS Express class map.
show waas statistics dre	Displays WAAS Express DRE statistics.
show waas statistics errors	Displays WAAS Express error statistics.
show waas statistics global	Displays global WAAS Express statistics.
show waas statistics lz	Displays WAAS Express LZ statistics.
show waas statistics pass-through	Displays WAAS Express connections placed in a pass-through mode.
show waas statistics peer	Displays inbound and outbound statistics for peer WAAS Express devices.

Command	Description
show waas status	Displays the status of WAAS Express.
show waas token	Displays the value of the configuration token used by the WAAS Central Manager.
waas cm-register url	Registers a device with the WAAS Central Manager.

show waas connection

To display WAAS Express connection details, use the **show waas connection** command in privileged EXEC mode.

show waas connection [**closed**] [**conn-id** *conn-id*] [**client-ip** *client-ip*] [**client-port** *client-port*] [**server-ip** *server-ip*] [**server-port** *server-port*] [**peer-id** *peer-id*] [**brief** | **detailed**]

Syntax Description

closed	(Optional) Displays the list of closed connections.
conn-id *conn-id*	(Optional) Displays connection information based on the connection ID.
client-ip *client-ip*	(Optional) Displays connection information based on client details.
client-port *client-port*	(Optional) Displays connection information based on client port details.
server-ip *server-ip*	(Optional) Displays connection information based on server details.
server-port *server-port*	(Optional) Displays connection information based on server port details.
peer-id *peer-id*	(Optional) Displays connection information based on peer details.
brief	(Optional) Displays information in brief format.
detailed	(Optional) Displays information in detailed format.

Command Default

For each connection, the following is displayed:

- Connection ID
- Destination IP address and port number
- Negotiated policies
- Peer ID
- Source IP address and port number

Command Modes

Privileged EXEC (#)

Command History

Release	Modification
15.1(2)T	This command was introduced.

Usage Guidelines

Use this command to display the following WAAS Express connection::

- The client and server information.
- The compression used to optimize the traffic.
- The time when the connection was initiated and closed.
- The reason for closing the connection.

Examples

The following is sample output from the **show waas connection** command:

```
Router> enable
Router# show waas connection

ConnID  Source IP:Port         Dest IP:Port           PeerID             Accel
1       192.168.20.99:51558    192.168.40.99:80       0021.5586.13df     TLD
```

Table 69 describes the significant fields shown in the display.

Table 69 show waas connection Field Descriptions

Field	Description
ConnID	The connection ID.
Source IP:Port	The source IP address and port number.
Dest IP:Port	The destination IP address and port number.
PeerID	The peer ID.

The following is sample output from the **show waas connection brief** command:

```
Router> enable
Router# show waas connection brief

Connection ID:                12345
    Peer Id:                  11:22:33:44:55:66
    Connection Type:          External Server
    Start Time:               Mar 10 15:10:30 2009
    Source IP Address:        192.168.111.111
    Source Port Number:       65535
    Destination IP Address:   192.168.111.111
    Destination Port Number:  65535
    Application Name:         web
    Classifier Name:          http
    Negotiated Policy:        LZ, DRE
    Accelerators:             TFO Only
    Orig-St                   ESTABLISHED
    Term-St                   ESTABLISHED
    Bytes Read Orig:          2147483648
    Bytes Written Orig:       2147483648
    Bytes Read Opt:           1610612736
    Bytes Written Opt:        1610612736
    TFO EOT State:            CONN_CLOSE
    TFO EOT:                  RS AR RR AS LFS
```

Table 70 describes the significant fields shown in the display.

Table 70 show waas connection brief Field Descriptions

Field	Description
Connection ID	Connection ID.
Peer Id:	Peer ID.
Connection Type:	External server and external client.
Start Time:	First synchronization received.
Source IP Address:	The source IP address.

Table 70 show waas connection brief Field Descriptions (continued)

Field	Description
Source Port Number:	The source IP port number.
Destination IP Address:	The destination IP address.
Destination Port Number:	The destination IP port number.
Application Name:	The application used for connection. This is web.
Classifier Name:	The name of the class-map that matches this flow.
Negotiated Policy:	The negotiated policy, such as LZ or DRE.
Accelerators:	The accelerators in the connection. In this example, it is TFO Only.
Orig-St	Originating state.
Term-St	Terminating state.
Bytes Read Orig:	Bytes received on the unoptimized side (LAN).
Bytes Written Orig:	Bytes sent on the unoptimized side.
Bytes Read Opt:	Bytes received on the optimized side (WAN).
Bytes Written Opt:	Bytes sent on the optimized side (WAN).
TFO EOT State:	State of closed connection between two WAAS peers.

The following is sample output from the **show waas connection detailed** command:

```
Router> enable
Router# show waas connection detailed

connection  ID:                          100
Peer Id:                                 0021.5586.1399
Connection Type:                         External
Start Time:                              01:41:54 UTC Jun 16 2010
End Time :                              01:41:59 UTC Jun 16 2010
End Reason:                              Closed
Source IP Address:                       192.168.21.99
Source Port Number:                      50894
Destination IP Address:                  192.168.41.99
Destination Port Number:                 80
Application Name:                        Web
Classifier Name:                         HTTP
Peer Policy:                             TFO, LZ, DRE
Configured Policy:                       TFO, LZ, DRE
Negotiated Policy:                       TFO, LZ, DRE
Accelerators:                            TFO ONLY
Bytes Read Orig:                         166
Bytes Written Orig:                      4577563
Bytes Read Opt:                          299867
Bytes Written Opt:                       1240
Auto-discovery information:
    Orig-St                              E
    Term-St                              EO
TFO information:
    TFO Frames Read:                     81
    TFO Frames Written:                  1
LZ section

    Encode stats
```

```
        Bytes in                    0
        Bytes out                   0
        Bypass bytes                209
        Compression gain            0%
        Avg Latency in Cef          0 usec
        Avg Latency in Proc         15 usec

    Decode stats
        Bytes in                    298613
        Bytes out                   4250094
        Bypass bytes                94
        Compression gain            92%
        Avg Latency in Cef          3 usec
        Avg Latency in Proc         407 usec
DRE section

    Encode stats
        Bytes in                    0
        Bytes out                   0
        Bypass bytes                166
        Compression gain            0%
        Avg latency                 0 usec

    Decode stats
        Bytes in                    4250147
        Bytes out                   4613677
        Bypass bytes                0
        Compression gain            7%
        Avg latency                 993 usec
Connection Status:
    WAN-LAN Status:
        Pending Data Read  : 59640
        LAN window event pending (36114)
        Last read notification (59640) received 8 ms ago
        Last write attempted 4 ms ago
        Last window notification received 4 ms ago
        Last attempted len : 17976
        Last error         : 11
        Last bytes accepted: -1
    LAN-WAN Status:
        Pending Data Read  : 0
        Last read notification (166) received 2476 ms ago
        Last write attempted 36 ms ago
        Last window notification received 132 ms ago
        Last attempted len : 15
        Last error         : 0
        Last bytes accepted: 15
```

Table 71 describes the significant fields shown in the display.

Table 71 show waas connection detailed Field Descriptions

Field	Description
connection ID	Connection ID.
Peer Id:	The IP address of the peer.
Connection Type:	External server, external client, internal server, and internal client.
Start Time:	First synchronization received.
End Time:	Last synchronization received.

Table 71 show waas connection detailed Field Descriptions (continued)

Field	Description
End Reason:	The reason why the synchronization ended.
Source IP Address:	The source IP address.
Source Port Number:	The source IP port number.
Destination IP Address:	The destination IP address.
Destination Port Number:	The destination IP port number.
Application Name:	The application used for connection. This is web.
Classifier Name:	The protocol used in the application. This is normally http.
Peer Policy:	The peer policy.
Configured Policy:	The configured policy.
Negotiated Policy:	The negotiated policy, such as LZ or DRE.
Accelerators:	The accelerators in the connection. In this example, it is TFO Only.
Orig-St	Originating state.
Term-St	Terminating state.
Bytes Read Orig:	Bytes received on the non optimized side (LAN).
Bytes Written Orig:	Bytes sent on the non optimized side.
Bytes Read Opt:	Bytes received on the optimized side (WAN).
Bytes Written Opt:	Bytes sent on the optimized side (WAN).
LZ section	Displays LZ compression/decompression statistics.
Encode stats Bytes in Bytes out	Displays the number of bytes encoded using the LZ compression and resulting output bytes.
Encode LZ Bypass Bytes	Number of bytes that bypassed the LZ module due to low compressibility.
Encode Avg Latency	The interval of number of bytes encoded using the LZ compression.
Decode Bytes in Bytes out	Displays the number of bytes decoded using the DRE compression and resulting output bytes.
Decode LZ Bypass Bytes	Number of bytes that bypassed by the LZ module due to low compressibility.
Decode Avg Latency	The interval of number of bytes decoded using the LZ compression
DRE section	Displays DRE compression/decompression statistics
Decode Avg latency	The interval of number of bytes encoded using the DRE compression.

Table 71 show waas connection detailed Field Descriptions (continued)

Field	Description
WAN-LAN Status:	Displays the connection status between the WAN and LAN interfaces.
Pending Data Read:	The number of bytes that are yet to be read.
LAN window event pending	The number of bytes that are yet to be processed by the LAN window event.
Last read notification received	The milliseconds since the notification was sent about the bytes that was read.
Last write attempted	The milliseconds since the byte sent was written.
Last window notification received	The milliseconds since the window notification was received.
Last attempted len:	The byte length that was attempted to write.
Last error:	The error that occurred while writing the bytes.
Last bytes accepted:	The last byte that was accepted.
LAN-WAN Status:	Displays connection status between the LAN and WAN interfaces.

Related Commands

Command	Description
clear waas	Clears WAAS Express statistics and closed connections information.
debug waas	Displays debugging information for different WAAS Express modules.
show waas alarms	Displays WAAS Express status and alarms.
show waas auto-discovery	Displays information about WAAS Express autodiscovery.
show waas statistics aoim	Displays WAAS Express peer information and negotiated capabilities.
show waas statistics application	Displays WAAS Express policy application statistics.
show waas statistics auto-discovery	Displays WAAS Express autodiscovery statistics.
show waas statistics class	Displays statistics for the WAAS Express class map.
show waas statistics dre	Displays WAAS Express DRE statistics.
show waas statistics errors	Displays WAAS Express error statistics.
show waas statistics global	Displays global WAAS Express statistics.
show waas statistics lz	Displays WAAS Express LZ statistics.
show waas statistics pass-through	Displays WAAS Express connections placed in a pass-through mode.
show waas statistics peer	Displays inbound and outbound statistics for peer WAAS Express devices.
show waas status	Displays the status of WAAS Express.

Command	Description
show waas token	Displays the value of the configuration token used by the WAAS Central Manager.
waas cm-register url	Registers a device with the WAAS Central Manager.

show waas statistics aoim

To display WAAS Express peer information and negotiated capabilities, use the **show waas statistics aoim** command in privileged EXEC mode.

show waas statistics aoim

Syntax Description

This command has no arguments or keywords.

Command Modes

Privileged EXEC (#)

Command History

Release	Modification
15.1(2)T	This command was introduced.

Usage Guidelines

This command displays information about the peer and the negotiations.

Examples

The following example shows how to display WAAS peer information and negotiated capabilities:

```
Router> enable
Router# show waas statistics aoim

Total number of peer syncs:                     1
Current number of peer syncs in progress:       0
Number of peers:                                1
Number of local application optimizations (AO): 1
Number of AO discovery successful:              1
Number of AO discovery failure:                 0

Local AO statistics
AO type:                                        TFO
Total number of incompatible connections:       0

Peer AOIM Statistics
Number of Peers :                               1
Peer:                                           0021.5586.13df
Peer IP:                                        40.0.0.2
Peer Expiry Time:                               00:12:28
Peer Compatible:                                Yes
Peer active connections:                        0
Peer Aoim Version:                              1.0
Peer sync in progress:                          FALSE
Peer valid:                                     Yes
Peer Software Version:                          4.2.1(b31)
```

Table 72 describes the significant fields shown in the display.

Table 72 show waas statistics aoim Field Descriptions

Field	Description
Total number of peer syncs	Total number of peers synchronized.
Current number of peer syncs in progress	The number of peers for which synchronization is in progress.
Number of peers	The number of peers.
Number of local application optimizations (AO)	The number of local application optimizations (AOs) in the network
Number of AO discovery successful	The number of successful AOs.
Number of AO discovery failure	The number of failed AOs.
Local AO statistics	The statistics of the local AO.
AO type	The type of application optimization. In this case, it is TFO.
Total number of incompatible connections	The number of connections that were incompatible.
Peers:	Information about the peers.
Peer IP	The IP address of the peer.
Peer active connections	The number of active connections with the peer.
Peer sync in progress	Indicates peer synchronization in progress.
Peer valid	Indicates the validity of the entry in the peer table.
Peer Software Version	The software version in the peer system.

Related Commands

Command	Description
clear waas	Clears WAAS Express statistics and closed connections information.
debug waas	Displays debugging information for different WAAS Express modules.
show waas alarms	Displays WAAS Express status and alarms.
show waas auto-discovery	Displays information about WAAS Express autodiscovery.
show waas connection	Displays information about WAAS Express connections.
show waas statistics application	Displays WAAS Express policy application statistics.
show waas statistics auto-discovery	Displays WAAS Express autodiscovery statistics.
show waas statistics class	Displays statistics for the WAAS Express class map.
show waas statistics dre	Displays WAAS Express DRE statistics.
show waas statistics errors	Displays WAAS Express error statistics.
show waas statistics global	Displays global WAAS Express statistics.
show waas statistics lz	Displays WAAS Express LZ statistics.

Command	Description
show waas statistics pass-through	Displays WAAS Express connections placed in a pass-through mode.
show waas statistics peer	Displays inbound and outbound statistics for peer WAAS Express devices.
show waas status	Displays the status of WAAS Express.
show waas token	Displays the value of the configuration token used by the WAAS Central Manager.
waas cm-register url	Registers a device with the WAAS Central Manager.

show waas statistics application

To display WAAS Express policy application statistics, use the **show waas statistics application** command in privileged EXEC mode.

show waas statistics application [**app-name** *app-name*]

Syntax Description

app-name *app-name*	(Optional) Displays statistics for a specific WAAS policy application.

Command Default

Statistics are displayed for all WAAS policy applications.

Command Modes

Privileged EXEC (#)

Command History

Release	Modification
15.1(2)T	This command was introduced.

Usage Guidelines

Use this command to display statistical information about the WAAS policies.

Examples

The following is sample output from the **show waas statistics application** command::

```
Router> enable
Router# show waas statistics application waas-default

Application:     waas-default
TCP Data Volumes
Connection Type     Inbound                              Outbound
Opt TCP Plus        5054526                              13969693
Orig TCP Plus       35202552                             35202552
Opt TCP Only        0                                           0
Orig TCP Only       0                                           0
Internal Client     0                                           0
Internal Server     0                                           0

TCP Connection Counts
Connection Type     Active               Completed
Opt TCP Plus        0                           18
Opt TCP Only        0                            0
Internal Client     0                            0
Internal Server     0                            0

Pass Through Connection Counts
Connection Type     Completed
PT Asymmetric       0
PT Capabilities     0
PT Intermediate     0
PT_Other            0
Connection Reset:   0
Cleared connections 0
```

Table 73 describes the significant fields shown in the display.

Table 73 show waas statistics application Field Descriptions

Field	Description
Opt TCP Plus Bytes	Inbound/outbound optimized (WAN) TCP bytes.
Opt TCP Plus Packets	Inbound/outbound optimized (WAN) TCP packets.
Orig TCP Plus Bytes	Inbound/outbound originating (LAN) TCP bytes.
Orig TCP Plus Packets	Inbound/outbound originating (LAN) TCP packets.
Opt TCP Only Bytes	Inbound/outbound optimized (WAN) TCP bytes.
Opt TCP Only Packets	Inbound/outbound optimized (WAN) TCP packets.
Orig TCP Only Bytes	Inbound/outbound originating (LAN) TCP bytes.
Orig TCP Only Packets	Inbound/outbound originating (LAN) TCP packets
Internal Client Bytes	Packets terminating at the router where the router is a client.
Internal Server Bytes	Packets terminating at the router where the router is the server (WCM-NGWO).
Opt TCP Plus	Optimized TCP plus connection count.
Opt TCP Only	Optimized TCP only connection count.
Internal Client	Internal client connection count.
Internal Server	Internal server connection count.
PT Asymmetric	Pass-through asymmetric connection count.
PT Capabilities	Pass-through incompatible connection count.
PT Intermediate	Pass-through intermediate connection count.
PT_Other	Pass-through other connection count.

Related Commands

Command	Description
clear waas	Clears WAAS Express statistics and closed connections information.
debug waas	Displays debugging information for different WAAS Express modules.
show waas alarms	Displays WAAS Express status and alarms.
show waas auto-discovery	Displays information about WAAS Express autodiscovery.
show waas connection	Displays information about WAAS Express connections.
show waas statistics aoim	Displays WAAS Express peer information and negotiated capabilities.
show waas statistics auto-discovery	Displays WAAS Express autodiscovery statistics.
show waas statistics class	Displays statistics for the WAAS Express class map.
show waas statistics dre	Displays WAAS Express DRE statistics.
show waas statistics errors	Displays WAAS Express error statistics.

Command	Description
show waas statistics global	Displays global WAAS Express statistics.
show waas statistics lz	Displays WAAS Express LZ statistics.
show waas statistics pass-through	Displays WAAS Express connections placed in a pass-through mode.
show waas statistics peer	Displays inbound and outbound statistics for peer WAAS Express devices.
show waas status	Displays the status of WAAS Express.
show waas token	Displays the value of the configuration token used by the WAAS Central Manager.
waas cm-register url	Registers a device with the WAAS Central Manager.

show waas statistics auto-discovery

To display the autodiscovery statistics for a WAAS Express device, use the **show waas statistics auto-discovery** command in privileged EXEC mode.

show waas statistics auto-discovery [**blacklist**]

Syntax Description

blacklist	(Optional) Displays blacklist tables lookups, size, and the maximum hold time.

Command Modes

Privileged EXEC (#)

Command History

Release	Modification
15.1(2)T	This command was introduced.

Usage Guidelines

Use this command to display statistics for autodiscovery states, success, and failures.

Examples

The following is sample output from the **show waas statistics auto-discovery** command:

```
Router> enable
Router# show waas statistics auto-discovery

Packets:
Total Sent:                          3
Total Received:                      3
Ack dropped in synack received state: 0
Non Syn dropped in nostate state:    0
Aoim sync syn-ack drop:              0
Aoim sync ack drop:                  0

Auto discovery failure:
Total Failure:                       0
Insufficient option space:           0
Invalid connection state:            0
Sequence number override:            0
Connection split failed:             0
Set sequence number failed:          0
Get sequence number failed:          0
Setting BIC failed:                  0
External module init failed:         0
Deleting options failed:             0
Set window size failed:              0
AOIM handover failed:                0
AOIM force sync failed:              0
AOIM peer addition failed:           0
AOIM synchronization reset:          0
TFO handover failed:                 0
Setting timestamp failed:            0
Setting window scale failed:         0
Setting send window failed:          0
```

```
Setting sack failed:                  0
Setting keepalive failed:             0
FD association failed:                0

Auto discovery success SYN retransmission:
Zero retransmit:                      1
One retransmit:                       0
Two+ retransmit:                      0

Auto discovery Miscellaneous:
RST received:                         0
SYNs with our device id:              0
Zero device ID:                       0
Non standard option length:           0
Replication mode turned on:           0
ADM mode turned on:                   0
Capabilities mismatch:                0
Intermediate device:                  0
Invalid option content:               0
Version mismatch:                     0
Peer AOIM incompatible:               0
Peer AOIM in progress:                0
AOIM peertable full:                  0
AOIM multiple sync request passthrough:0
No peer:                              0
Missing Ack conf:                     0
```

Table 74 describes the significant fields shown in the display.

Table 74 show waas statistics auto-discovery Field Descriptions

Field	Description
Packets: Total Sent	Packets sent by autodiscovery.
Total Received	Packets received by autodiscovery.
Ack dropped in synack received state	Acknowledgment packet dropped within an AD state.
Non Syn dropped in nostate state	Nonsynchronization control packet dropped since no synchronization packet has been received.
Aoim sync syn-ack drop	Sychronization and acknowledgment dropped while AOIM synchronization is in progress.
Aoim sync ack drop	Acknowledgment dropped while AOIM synchronization is in progress.
Auto discovery failure: Total Failure	Number of failed flows.
Insufficient option space	Unable to add TCP options.
Invalid connection state	Connection state invalid.
Sequence number override	Sequence numbers out of sync.
Connection split failed	Unable to connect to a proxy.
Set sequence number failed	Sequence number bump failed.
Get sequence number failed	Unable to read sequence number.

Table 74 show waas statistics auto-discovery Field Descriptions (continued)

Field	Description
Setting BIC failed	Binary Increased Congestion Control (BIC) initialization failure.
External module init failed	Module initialization failure.
Deleting options failed	WAAS Express TCP option deletion failure.
Set window size failed	Window size adjustment failure.
AOIM handover failed	AOIM handover failure.
AOIM force sync failed	AOIM sync failure.
AOIM peer addition failed	AOIM peer could not be added.
TFO handover failed	TFO handover failure.
Setting timestamp failed	Unable to set the time stamp.
Setting window scale failed	Unable to set the windows scale.
Setting send window failed	Unable to set send the window on connection.
Setting sack failed	Unable to set the Selective Acknowledgment (SACK) on connection.
Setting keepalive failed	Failure to initialize keepalive.
FD association failed	Unable to associate file descriptor.
Auto discovery success SYN retransmission: Zero retransmit	Connections optimized for which a single synchronization was received.
One retransmit	Connections optimized for which a retransmitted synchronization was received.
Two+ retransmit	Two or more synchronization retransmissions.
Auto discovery Miscellaneous: RST received	Reset received during autodiscovery.
SYNs with our device id	Indicates synchronization with the WAAS Express device.
Zero device ID	Zero device ID advertised.
Non standard option length	Invalid WAAS Express TCP option.
Replication mode turned on	Connection bypass due to replication mode turned on.
ADM mode turned on	Connection bypass due to directed mode turned on.
Capabilities mismatch	Advertised capability mismatch.
Intermediate device	Intermediate WAAS Express device.
Invalid option content	Invalid WAAS Express TCP option.
Version mismatch	Administrative distance (AD) version mismatch.
Peer AOIM incompatible	Peer AOIM incompatible.
Peer AOIM in progress	Peer AOIM synchronization in progress.
AOIM peertable full	AOIM peer table full.

Table 74 show waas statistics auto-discovery Field Descriptions (continued)

Field	Description
AOIM multiple sync request passthrough	Pass through requested due to multiple simultaneous AOIM synchronization requests.
No peer	No peer for this connection.
Missing Ack conf	Missing autodiscovery confirmation.

The following is sample output from the **show waas statistics auto-discovery blacklist** command:

```
Router> enable
Router# show waas statistics auto-discovery blacklist

Auto-Discovery Blacklist Table Statistics
Operation Status:                       1
Total Lookups:                          0
Hits:                                   0
Miss (Grey Entry):                      0
Miss (No Entry):                        0
Table Insertions:                       0
Total Entries (Free & Used):            1024
Current Free Entries:                   1024
Current Used Entries:                   0
Peak Used Entries:                      0
Oldest Entry Hold Time (sec):           3600
IP Address Retrieval Failure:           0
Unexpected Threshold:                   0
```

Table 75 describes the significant fields shown in the display.

Table 75 show waas statistics auto-discovery blacklist Field Descriptions

Field	Description
Operation Status	Indicates whether the blacklist is enabled, which is 1.
Total Lookups	Total number of blacklist lookups.
Hits	Blacklist hits.
Miss (Grey Entry)	Hits in the grey list.
Miss (No Entry)	No blacklist found.
Table Insertions	Blacklist insertions.
Total Entries (Free & Used)	Total possible entries.
Current Free Entries	Free entries.
Current Used Entries	Used entries.
Peak Used Entries	Peak used entries.
Oldest Entry Hold Time (sec)	Active entry time period.
IP Address Retrieval Failure	Unable to locate IP address.
Unexpected Threshold	Invalid blacklist threshold.

Related Commands

Command	Description
clear waas	Clears WAAS Express statistics and closed connections information.
debug waas	Displays debugging information for different WAAS Express modules.
show waas alarms	Displays WAAS Express status and alarms.
show waas auto-discovery	Displays information about WAAS Express autodiscovery.
show waas connection	Displays information about WAAS Express connections.
show waas statistics aoim	Displays WAAS Express peer information and negotiated capabilities.
show waas statistics application	Displays WAAS Express policy application statistics.
show waas statistics class	Displays statistics for the WAAS Express class map.
show waas statistics dre	Displays WAAS Express DRE statistics.
show waas statistics errors	Displays WAAS Express error statistics.
show waas statistics global	Displays global WAAS Express statistics.
show waas statistics lz	Displays WAAS Express LZ statistics.
show waas statistics pass-through	Displays WAAS Express connections placed in a pass-through mode.
show waas statistics peer	Displays inbound and outbound statistics for peer WAAS Express devices.
show waas status	Displays the status of WAAS Express.
show waas token	Displays the value of the configuration token used by the WAAS Central Manager.
waas cm-register url	Registers a device with the WAAS Central Manager.

show waas statistics class

To display statistical information about the class in WAAS Express, use the **show waas statistics class** command in privileged EXEC mode.

show waas statistics class [**class-name** *class-name*]

Syntax Description

class-name *class-name*	(Optional) Specifies the class-name.

Command Modes

Privileged EXEC (#)

Command History

Release	Modification
15.1(2)T	This command was introduced.

Usage Guidelines

This command displays statistical information about the class specified in WAAS Express. If a class name is not specified, the command displays the output for all the classes in WAAS Express.

Examples

The following is sample output from the **show waas statistics class** command:

```
Router> enable
Router# show waas statistics class

Number of Classes :             3
Class          FTP-Control
TCP Data Volumes
Connection Type     Inbound                                 Outbound
Opt TCP Plus        0                                              0
Orig TCP Plus       0                                              0
Opt TCP Only        0                                              0
Orig TCP Only       0                                              0
Internal Client     0                                              0
Internal Server     0                                              0

TCP Connection Counts
Connection Type     Active               Completed
Opt TCP Plus        0                            0
Opt TCP Only        0                            0
Internal Client     0                            0
Internal Server     0                            0

Pass Through Connection Counts
Connection Type     Completed
PT Asymmetric       0
PT Capabilities     11
PT Intermediate     0
PT_Other            0
Connection Reset:   0

Class          waas-default
TCP Data Volumes
```

```
Connection Type     Inbound                              Outbound
Opt TCP Plus        0                                           0
Orig TCP Plus       0                                           0
Opt TCP Only        0                                           0
Orig TCP Only       0                                           0
Internal Client     0                                           0
Internal Server     0                                           0

TCP Connection Counts
Connection Type     Active               Completed
Opt TCP Plus        0                            0
Opt TCP Only        0                            0
Internal Client     0                            0
Internal Server     0                            0

Pass Through Connection Counts
Connection Type     Completed
PT Asymmetric       0
PT Capabilities     0
PT Intermediate     0
PT_Other            0
Connection Reset:   0

Class          FTP-Data
TCP Data Volumes
Connection Type     Inbound                              Outbound
Opt TCP Plus        722                                       573
Orig TCP Plus       0                                          24
Opt TCP Only        0                                           0
Orig TCP Only       0                                           0
Internal Client     0                                           0
Internal Server     0                                           0

TCP Connection Counts
Connection Type     Active               Completed
Opt TCP Plus        0                            4
Opt TCP Only        0                            0
```

Table 76 describes the significant fields shown in the display.

Table 76 show waas statistics class Field Descriptions

Field	Description
Class	The class name.
TCP Data Volumes	Indicates the volume of data in terms of connections, optimizations, and so on.
Connection Type	The type of connection.
Opt TCP Plus	Optimized TCP plus connection count.
Orig TCP Plus	Inbound/outbound originating TCP packets.
Opt TCP Only	Optimized TCP only connection count.
Orig TCP Only	Inbound/outbound originating TCP packets.
Internal Client	Internal client connection count.
Internal Server	Internal server connection count.
PT Asymmetric	Pass-through asymmetric connection count.
PT Capabilities	Pass-through incompatible connection count.

Table 76 show waas statistics class Field Descriptions (continued)

Field	Description
PT Intermediate	Pass-through intermediate connection count.
PT_Other	Pass-through other connection count.

Related Commands

Command	Description
clear waas	Clears WAAS Express statistics and closed connections information.
debug waas	Displays debugging information for different WAAS Express modules.
show waas alarms	Displays WAAS Express status and alarms.
show waas auto-discovery	Displays information about WAAS Express autodiscovery.
show waas connection	Displays information about WAAS Express connections.
show waas statistics aoim	Displays WAAS Express peer information and negotiated capabilities.
show waas statistics application	Displays WAAS Express policy application statistics.
show waas statistics auto-discovery	Displays WAAS Express autodiscovery statistics.
show waas statistics dre	Displays WAAS Express DRE statistics.
show waas statistics errors	Displays WAAS Express error statistics.
show waas statistics global	Displays global WAAS Express statistics.
show waas statistics lz	Displays WAAS Express LZ statistics.
show waas statistics pass-through	Displays WAAS Express connections placed in a pass-through mode.
show waas statistics peer	Displays inbound and outbound statistics for peer WAAS Express devices.
show waas status	Displays the status of WAAS Express.
show waas token	Displays the value of the configuration token used by the WAAS Central Manager.
waas cm-register url	Registers a device with the WAAS Central Manager.

show waas statistics dre

To display Data Redundancy Elimination (DRE) statistics for a WAAS Express device, use the **show waas statistics dre** command in privileged EXEC mode.

show waas statistics dre [**peer**]

Syntax Description

peer	(Optional) Specifies the peer in the DRE.

Command Modes

Privileged EXEC (#)

Command History

Release	Modification
15.1(2)T	This command was introduced.

Examples

The following example shows how to display WAAS Express DRE statistics:

```
Router> enable
Router# show waas statistics dre

DRE Status:                                 Enabled

Cache
    Cache Status:                           Ready
    Oldest data age:                        00:07:35
    Total data storage size:                1468006400
    Total index size:                       11513600

WaitQ size:                                 0
WaitQ in storage:                           0

Connections
    Total:                                  24
    Active:                                 0

Encode Statistics
    Dre msgs:                               0
    Bytes in:                               0
    Bytes out:                              0
    Bypass bytes:                           14857511
    Compression gain:                       0%
    Average latency:                        2 usec

Decode Statistics
    Dre msgs:                               318
    Nacks generated:                        0
    Bytes in:                               8494760
    Bytes out:                              13780812
    Bypass bytes:                           35556
    Compression gain:                       38%
    Average latency:                        1471 usec

    Decode Message Size Distribution:
        0-1K   = 4              %
```

```
1-5K    = 0                 %
5-15K   = 5                 %
15-25K = 9                  %
25-40K = 23                 %
>40K    = 55                %
```

Table 77 describes the significant fields shown in the display.

Table 77 show waas statistics dre Field Descriptions

Field	Description
Cache:	Display DRE cache statistics.
Connection:	Total number of connection completed.
Message size distribution:	Indicates the distribution of messages across bytes in percentages.

Related Commands

Command	Description
clear waas	Clears WAAS Express statistics and closed connections information.
debug waas	Displays debugging information for different WAAS Express modules.
show waas alarms	Displays WAAS Express status and alarms.
show waas auto-discovery	Displays information about WAAS Express autodiscovery.
show waas connection	Displays information about WAAS Express connections.
show waas statistics aoim	Displays WAAS Express peer information and negotiated capabilities.
show waas statistics application	Displays WAAS Express policy application statistics.
show waas statistics auto-discovery	Displays WAAS Express autodiscovery statistics.
show waas statistics class	Displays statistics for the WAAS Express class map.
show waas statistics errors	Displays WAAS Express error statistics.
show waas statistics global	Displays global WAAS Express statistics.
show waas statistics lz	Displays WAAS Express LZ statistics.
show waas statistics pass-through	Displays WAAS Express connections placed in a pass-through mode.
show waas statistics peer	Displays inbound and outbound statistics for peer WAAS Express devices.
show waas status	Displays the status of WAAS Express.
show waas token	Displays the value of the configuration token used by the WAAS Central Manager.
waas cm-register url	Registers a device with the WAAS Central Manager.

show waas statistics errors

To display error statistics for a WAAS Express device, use the **show waas statistics errors** command in privileged EXEC mode.

show waas statistics errors

Syntax Description

This command has no arguments or keywords.

Command Modes

Privileged EXEC (#)

Command History

Release	Modification
15.1(2)T	This command was introduced.

Examples

The following example shows how to display WAAS Express Data Redundancy Elimination (DRE) statistics. The fields in the output are self-explanatory.

```
Router> enable
Router# show waas statistics errors

Unexpected EOT message:                       0
DRE message delayed for transmission:         0
Invalid input for TFO decode:                 0
RST ignored because EOT ACK sent:             0
RST ignored because EOT REQ sent:             0
Unknown TCP Control packet received:          0
DRE encode failed:                            0
Connection reset by peer:                     0
Connection timed out:                         0
No data to read:                              0
Buffer allocation failed:                     0
Error reading input particle:                 0
Error in semaphore acquisition:               0
Received control packet when expecting data:  0
Return value not handled:                     0
Lock condition:                               0
Out of transmit buffers:                      0
Error received from L4F:                      0
Error writing data:                           0
Error processing data:                        0
Error processing control packet:              0
Error sending data:                           0
Unable to find peer in table:                 0
```

Related Commands

Command	Description
clear waas	Clears WAAS Express statistics and closed connections information.
debug waas	Displays debugging information for different WAAS Express modules.
show waas alarms	Displays WAAS Express status and alarms.

Command	Description
show waas auto-discovery	Displays information about WAAS Express autodiscovery.
show waas connection	Displays information about WAAS Express connections.
show waas statistics aoim	Displays WAAS Express peer information and negotiated capabilities.
show waas statistics application	Displays WAAS Express policy application statistics.
show waas statistics auto-discovery	Displays WAAS Express autodiscovery statistics.
show waas statistics class	Displays statistics for the WAAS Express class map.
show waas statistics dre	Displays WAAS Express DRE statistics.
show waas statistics global	Displays global WAAS Express statistics.
show waas statistics lz	Displays WAAS Express LZ statistics.
show waas statistics pass-through	Displays WAAS Express connections placed in a pass-through mode.
show waas statistics peer	Displays inbound and outbound statistics for peer WAAS Express devices.
show waas status	Displays the status of WAAS Express.
show waas token	Displays the value of the configuration token used by the WAAS Central Manager.
waas cm-register url	Registers a device with the WAAS Central Manager.

show waas statistics global

To display global statistics for a WAAS Express device, use the **show waas statistics global** command in privileged EXEC mode.

show waas statistics global

Syntax Description

This command has no arguments or keywords.

Command Modes

Privileged EXEC (#)

Command History

Release	Modification
15.1(2)T	This command was introduced.

Examples

The following example shows how to display global statistics for a WAAS Express device:

```
Router> enable
Router# show waas statistics global

TCP Data Volumes
Connection Type           Inbound     Outbound
Opt TCP Plus              765708      2698
Orig TCP Plus             335         10486305
Opt TCP Only              0           0
Orig TCP Only             0           0
Internal Client           0           0
Internal Server           0           0

TCP Connection Counts
Connection Type           Active      Completed
Opt TCP Plus              0           2
Opt TCP Only              0           0
Internal Client           0           0
Internal Server           0           0

Pass Through Connection Counts
Connection Type                       Completed
PT Asymmetric                         0
PT Capabilities                       0
PT Intermediate                       0
PT_Other                              0
Connection Reset:                     1
Connection Closed:                    0
```

Table 78 describes the significant fields shown in the display.

Table 78 show waas statistics global Field Descriptions

Field	Description
TCP Data Volumes	Indicates the volume of data in terms of connections, optimizations, and so on.

Table 78 show waas statistics global Field Descriptions (continued)

Field	Description
Connection Type	The type of connection.
Opt TCP Plus	Optimized TCP plus connection count.
Orig TCP Plus	Inbound/outbound originating TCP packets.
Opt TCP Only	Optimized TCP only connection count.
Orig TCP Only	Inbound/outbound originating TCP packets.
Internal Client	Internal client connection count.
Internal Server	Internal server connection count.

Related Commands

Command	Description
clear waas	Clears WAAS Express statistics and closed connections information.
debug waas	Displays debugging information for different WAAS Express modules.
show waas alarms	Displays WAAS Express status and alarms.
show waas auto-discovery	Displays information about WAAS Express autodiscovery.
show waas connection	Displays information about WAAS Express connections.
show waas statistics aoim	Displays WAAS Express peer information and negotiated capabilities.
show waas statistics application	Displays WAAS Express policy application statistics.
show waas statistics auto-discovery	Displays WAAS Express autodiscovery statistics.
show waas statistics class	Displays statistics for the WAAS Express class map.
show waas statistics dre	Displays WAAS Express DRE statistics.
show waas statistics errors	Displays WAAS Express error statistics.
show waas statistics lz	Displays WAAS Express LZ statistics.
show waas statistics pass-through	Displays WAAS Express connections placed in a pass-through mode.
show waas statistics peer	Displays inbound and outbound statistics for peer WAAS Express devices.
show waas status	Displays the status of WAAS Express.
show waas token	Displays the value of the configuration token used by the WAAS Central Manager.
waas cm-register url	Registers a device with the WAAS Central Manager.

show waas statistics lz

To display the Lempel-Ziv compression statistics for a WAAS Express device, use the **show waas statistics lz** command in privileged EXEC mode.

show waas statistics lz

Syntax Description

This command has no arguments or keywords.

Command Modes

Privileged EXEC (#)

Command History

Release	Modification
15.1(2)T	This command was introduced.

Examples

The following example shows how to display WAAS Express LZ statistics:

```
Router> enable
Router# show waas statistics lz

LZ Status:                          Enabled

Memory used                         30328 KB

Connections
    Total:                          75
    Active:                         0

Encode Statistics
    Bytes in:                       0
    Bytes out:                      0
    Bypass bytes:                   10886
    Compression gain:               0%
    Average latency in CEF path:    0 usec
    Average latency in process path:  293 usec
Decode Statistics
    Bytes in:                       25595
    Bytes out:                      71977
    Bypass bytes:                   776
    Compression gain:               64%
    Average latency in CEF path:    37 usec
    Average latency in process path:  9 usec
```

Table 79 describes the significant fields shown in the display.

Table 79 show waas statistics lz Field Descriptions

Field	Description
Memory used	Memory usage
Connections:	LZ connection statistics

Table 79 show waas statistics lz Field Descriptions (continued)

Field	Description
Encode Statistics	Displays the number of bytes encoded using the LZ compression, and the resulting output bytes.
Bypass bytes	Number of bytes that bypassed the LZ module due to low compressibility.
Compression gain	Compression gain achieve by encoding or decoding. This does not include bytes that LZ bypassed.
Average latency in CEF path	The interval, in milliseconds, between bytes encoded using the LZ compression.
Average latency in process path	The interval, in milliseconds, between bytes encoded using the LZ compression.
Decode Statistics	Displays the number of bytes decoded and the resulting output bytes.

Related Commands

Command	Description
clear waas	Clears WAAS Express statistics and closed connections information.
debug waas	Displays debugging information for different WAAS Express modules.
show waas alarms	Displays WAAS Express status and alarms.
show waas auto-discovery	Displays information about WAAS Express autodiscovery.
show waas connection	Displays information about WAAS Express connections.
show waas statistics aoim	Displays WAAS Express peer information and negotiated capabilities.
show waas statistics application	Displays WAAS Express policy application statistics.
show waas statistics auto-discovery	Displays WAAS Express autodiscovery statistics.
show waas statistics class	Displays statistics for the WAAS Express class map.
show waas statistics dre	Displays WAAS Express DRE statistics.
show waas statistics errors	Displays WAAS Express error statistics.
show waas statistics global	Displays global WAAS Express statistics.
show waas statistics pass-through	Displays WAAS Express connections placed in a pass-through mode.
show waas statistics peer	Displays inbound and outbound statistics for peer WAAS Express devices.
show waas status	Displays the status of WAAS Express.
show waas token	Displays the value of the configuration token used by the WAAS Central Manager.
waas cm-register url	Registers a device with the WAAS Central Manager.

show waas statistics pass-through

To display the pass-through statistics for a WAAS Express device, use the **show waas statistics pass-through** command in privileged EXEC mode.

show waas statistics pass-through

Syntax Description

This command has no arguments or keywords.

Command Modes

Privileged EXEC (#)

Command History

Release	Modification
15.1(2)T	This command was introduced.

Examples

The following is sample output from the **show waas statistics pass-through** command:

```
Router> enable
Router# show waas statistics pass-through

Pass Through Statistics:
Overall:                                1
No Peer:                                0
Rejected due to Capabilities:           0
Rejected due to Resources:              0
Interface Application config:           1
Interface Global config:                0
Asymmetric setup:                      0
Peer sync was in progress:              0
IOS WAAS is intermediate router:        0
Internal error:                         0
Other end is in black list:            0
AD version mismatch:                    0
Incompatable AO:                        0
Connection limit exceeded:              0
AOIM peertable full:                    0
AOIM multiple sync request passthrough: 0
Others:                                 0
```

Table 80 describes the significant fields shown in the display.

Table 80 show waas statistics pass-through Field Descriptions

Field	Description
Overall	Overall connection pass-through's.
No Peer	No peer found for the connection.
Rejected due to Capabilities	Pass-through due to mismatch of capabilities.
Rejected due to Resources	Pass-through due to lack of resources.
Interface Application config	Interface application pass-through.

Table 80 show waas statistics pass-through Field Descriptions (continued)

Field	Description
Interface Global config	Global configuration pass-through.
Asymmetric setup	Possible asymmetric setup.
Peer sync was in progress	Pass-through due to AOIM synchronization in progress.
IOS WAAS is intermediate router	Intermediate WAAS Express device.
Internal error	Internal error.
Other end is in black list	Blacklist passthrough.
AD version mismatch	Autodiscovery version mismatch.
Incompatable AO	Incompatible optimization.
Connection limit exceeded	Connection limited exceeded.
AOIM peertable full	Unable to add more AOIM peers.
AOIM multiple sync request passthrough	Pass through requested due to multiple simultaneous AOIM synchronization requests.
Others	Other conditions.

Related Commands

Command	Description
clear waas	Clears WAAS Express statistics and closed connections information.
debug waas	Displays debugging information for different WAAS Express modules.
show waas alarms	Displays WAAS Express status and alarms.
show waas auto-discovery	Displays information about WAAS Express autodiscovery.
show waas connection	Displays information about WAAS Express connections.
show waas statistics aoim	Displays WAAS Express peer information and negotiated capabilities.
show waas statistics application	Displays WAAS Express policy application statistics.
show waas statistics auto-discovery	Displays WAAS Express autodiscovery statistics.
show waas statistics class	Displays statistics for the WAAS Express class map.
show waas statistics dre	Displays WAAS Express DRE statistics.
show waas statistics errors	Displays WAAS Express error statistics.
show waas statistics global	Displays global WAAS Express statistics.
show waas statistics lz	Displays WAAS Express LZ statistics.
show waas statistics peer	Displays inbound and outbound statistics for peer WAAS Express devices.
show waas status	Displays the status of WAAS Express.

Command	Description
show waas token	Displays the value of the configuration token used by the WAAS Central Manager.
waas cm-register url	Registers a device with the WAAS Central Manager.

show waas statistics peer

To display inbound and outbound statistics for peer Wide-area Application Engines (WAEs) devices, use the **show waas statistics peer** command in privileged EXEC mode.

show waas statistics peer [**id** *peer-id* [**conn**]]

Syntax Description

id *peer-id*	(Optional) Displays statistics for that peer ID.
conn	(Optional) Displays current optimized connections to that peer.

Command Default

Inbound and outbound statistics are displayed for all peer WAE devices. Current optimized connections are not displayed.

Command Modes

Privileged EXEC (#)

Command History

Release	Modification
15.1(2)T	This command was introduced.

Usage Guidelines

Use this command to display inbound and outbound statistics for all peer WAE devices.

Examples

The following is sample output from the **show waas statistics peer** command:

```
Router> enable
Router# show waas statistics peer

Number of Peers :          1
Peer:                      0021.5586.13df
TCP Data Volumes
Connection Type            Inbound        Outbound
Opt TCP Plus               765708         2698
Orig TCP Plus              335            10486305
Opt TCP Only               0              0
Orig TCP Only              0              0
Internal Client            0              0
Internal Server            0              0

TCP Connection Counts
Connection Type            Active         Completed
Opt TCP Plus               0              2
Opt TCP Only               0              0
Internal Client            0              0
Internal Server            0              0

Pass Through Connection Counts
Connection Type            Completed
PT Asymmetric              0
PT Capabilities            0
```

```
PT Intermediate           0
PT_Other                  0
Connection Reset:         1
Connection Closed:        0
```

Table 81 describes the significant fields shown in the display.

Table 81 show waas statistics peer Field Descriptions

Field	Description
Peer	MAC address of peer
TCP Data Volumes	Indicates the volume of data in terms of connections, optimizations, and so on.
Connection Type	The type of connection.
Opt TCP Plus	Inbound/outbound optimized (WAN) TCP bytes.
Orig TCP Plus	Inbound/outbound originating (LAN) TCP bytes.
Opt TCP Only	Inbound/outbound optimized (WAN) TCP bytes.
Orig TCP Only	Inbound/outbound originating (LAN) TCP bytes.
Internal Client	Packets terminating at the router where the router is a client.
Internal Server	Packets terminating at the router where the router is the server (WCM-NGWO).
Opt TCP Plus	Optimized TCP plus connection count.
Opt TCP Only	Optimized TCP only connection count.
Internal Client	Internal client connection count.
Internal Server	Internal server connection count.
PT Asymmetric	Pass-through asymmetric connection count.
PT Capabilities	Pass-through incompatible connection count.
PT Intermediate	Pass-through intermediate connection count.
PT_Other	Pass-through other connection count.

Related Commands

Command	Description
clear waas	Clears WAAS Express statistics and closed connections information.
debug waas	Displays debugging information for different WAAS Express modules.
show waas alarms	Displays WAAS Express status and alarms.
show waas auto-discovery	Displays information about WAAS Express autodiscovery.
show waas connection	Displays information about WAAS Express connections.
show waas statistics aoim	Displays WAAS Express peer information and negotiated capabilities.
show waas statistics application	Displays WAAS Express policy application statistics.
show waas statistics auto-discovery	Displays WAAS Express autodiscovery statistics.

Command	Description
show waas statistics class	Displays statistics for the WAAS Express class map.
show waas statistics dre	Displays WAAS Express DRE statistics.
show waas statistics errors	Displays WAAS Express error statistics.
show waas statistics global	Displays global WAAS Express statistics.
show waas statistics lz	Displays WAAS Express LZ statistics.
show waas statistics pass-through	Displays WAAS Express connections placed in a pass-through mode.
show waas status	Displays the status of WAAS Express.
show waas token	Displays the value of the configuration token used by the WAAS Central Manager.
waas cm-register url	Registers a device with the WAAS Central Manager.

show waas status

To display the status of Wide-Area Application Services (WAAS) Express, use the **show waas status** command in privileged EXEC mode.

show waas status

Syntax Description

This command has no arguments or keywords.

Command Modes

Privileged EXEC (#)

Command History

Release	Modification
15.1(2)T	This command was introduced.

Examples

The following example shows the status of WAAS Express. The fields in the output are self-explanatory.

```
Router> enable
Router# show waas status

IOS Version: 15.1(20110128:013523)
WAAS Express Version: 1.1.0

WAAS Enabled Interface        Policy Map
FastEthernet8                 waas_global

WAAS Feature License
    License Type:                          Permanent

DRE Status                       : Enabled
LZ Status                        : Enabled + Entropy

Maximum Flows                    : 100
Total Active connections         : 0
Total optimized connections      : 0
```

Related Commands

Command	Description
clear waas	Clears WAAS Express statistics and closed connections information.
debug waas	Displays debugging information for different WAAS Express modules.
show waas alarms	Displays WAAS Express status and alarms.
show waas auto-discovery	Displays information about WAAS Express autodiscovery.
show waas connection	Displays information about WAAS Express connections.
show waas statistics aoim	Displays WAAS Express peer information and negotiated capabilities.
show waas statistics application	Displays WAAS Express policy application statistics.

Command	Description
show waas statistics auto-discovery	Displays WAAS Express autodiscovery statistics.
show waas statistics class	Displays statistics for the WAAS Express class map.
show waas statistics dre	Displays WAAS Express DRE statistics.
show waas statistics errors	Displays WAAS Express error statistics.
show waas statistics global	Displays global WAAS Express statistics.
show waas statistics lz	Displays WAAS Express LZ statistics.
show waas statistics pass-through	Displays WAAS Express connections placed in a pass-through mode.
show waas statistics peer	Displays inbound and outbound statistics for peer WAAS Express devices.
show waas token	Displays the value of the configuration token used by the WAAS Central Manager.

show waas token

To display the value of the WAAS Express configuration token, use the **show waas alarms** command in privileged EXEC mode.

show waas token

Syntax Description

This command has no arguments or keywords.

Command Modes

Privileged EXEC (#)

Command History

Release	Modification
15.1(2)T	This command was introduced.

Usage Guidelines

Use this command to display the values of the WAAS Express configuration token.

Examples

The following is sample output from the **show waas token** command:

```
Router> enable
Router# show waas token

Config Token:1292
```

Table 82 describes the significant field shown in the display.

Table 82 show waas token Field Descriptions

Field	Description
Config Token	Monotonically increasing 32-bit number (unsigned integer).

Related Commands

Command	Description
clear waas	Clears WAAS Express statistics and closed connections information.
debug waas	Displays debugging information for different WAAS Express modules.
show waas alarms	Displays WAAS Express status and alarms.
show waas auto-discovery	Displays information about WAAS Express autodiscovery.
show waas connection	Displays information about WAAS Express connections.
show waas statistics aoim	Displays WAAS Express peer information and negotiated capabilities.
show waas statistics application	Displays WAAS Express policy application statistics.

Command	Description
show waas statistics auto-discovery	Displays WAAS Express autodiscovery statistics.
show waas statistics class	Displays statistics for the WAAS Express class map.
show waas statistics dre	Displays WAAS Express DRE statistics.
show waas statistics errors	Displays WAAS Express error statistics.
show waas statistics global	Displays global WAAS Express statistics.
show waas statistics lz	Displays WAAS Express LZ statistics.
show waas statistics pass-through	Displays WAAS Express connections placed in a pass-through mode.
show waas statistics peer	Displays inbound and outbound statistics for peer WAAS Express devices.
show waas status	Displays the status of WAAS Express.
waas cm-register url	Registers a device with the WAAS Central Manager.

show x25 context

To display operating configuration status details of an X.25 link, use the **show x25 context** command in privileged EXEC mode.

show x25 context [**xot** | **interface serial** *number* [**dlci** *number*] | *cmns-interface-type number* [**mac** *mac-address*]]

Syntax Description

xot	(Optional) Displays information specific to X.25 over TCP (XOT) contexts.
interface serial *number*	(Optional) Specific serial interface.
dlci *number*	(Optional) Specific data-link connection identifier (DLCI) link.
cmns-interface-type number	(Optional) Local Connection Mode Network Service (CMNS) interface type and number. CMNS interface types are Ethernet, Token Ring, and FDDI. The interface numbering scheme depends on the router interface hardware.
mac *mac-address*	(Optional) Hardware address of the CMNS interface.

Command Modes

Privileged EXEC

Command History

Release	Modification
12.0(3)T	This command was introduced.
12.1(5)T	This command was modified to display information about X.25 failover.
12.2(8)T	The **xot** keyword was added to display information specific to XOT contexts.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Examples

XOT: Example

The following is sample output from the **show x25 context** command with the **xot** keyword:

```
Router# show x25 context xot

XOT Access-group 2
PROFILE mod128 station DXE/DTE, address 2222, state R1, modulo 128, timer 0
      Defaults: idle VC timeout 0
        input/output window sizes 80/80, packet sizes 256/256
      Timers: T20 180, T21 200, T22 180, T23 180
      RESTARTs 0/0 CALLs 5+0/7+0/0+0 DIAGs 0/0
XOT Access-group 3
station DXE/DTE, address <none>, state R1, modulo 8, timer 0
      Defaults: idle VC timeout 0
        input/output window sizes 2/2, packet sizes 128/128
      Timers: T20 180, T21 200, T22 180, T23 180
      RESTARTs 0/0 CALLs 21+0/50+0/0+0 DIAGs 0/0
```

Serial Interface: Example

The following is sample output from the **show x25 context** command:

```
Router# show x25 context interface serial 1

Serial1 DLCI 20
PROFILE DCE, address <none>, state R1, modulo 8, timer 0
      Defaults: idle VC timeout 0
        input/output window sizes 2/2, packet sizes 128/128
      Timers: T10 60, T11 180, T12 60, T13 60
      Channels: Incoming-only none, Two-way 1-1024, Outgoing-only none
      RESTARTs 1/0 CALLs 0+0/0+0/0+0 DIAGs 0/0
  LAPB DCE, state CONNECT, modulo 8, k 7, N1 12056, N2 20
      T1 3000, T2 0, interface outage (partial T3) 0, T4 0
      VS 7, VR 6, tx NR 6, Remote VR 7, Retransmissions 0
      Queues: U/S frames 0, I frames 0, unack. 0, reTx 0
      IFRAMEs 111/118 RNRs 0/0 REJs 0/0 SABM/Es 14/1 FRMRs 0/0 DISCs 0/0
```

X.25 Failover: Example

The following is sample output from the **show x25 context** command when the X.25 Failover feature is configured. The "Fail-over delay" field appears when the primary interface has gone down and come back up again. The number of seconds indicates the time remaining until the secondary interface will reset.

```
Router# show x25 context

Serial1 DLCI 33
  PROFILE dxe/DCE, address 3032, state R1, modulo 8, timer 0
      Defaults:idle VC timeout 0
        input/output window sizes 2/2, packet sizes 128/128
      Timers:T20 180, T21 200, T22 180, T23 180
      Channels:Incoming-only none, Two-way 1-4095, Outgoing-only none
      RESTARTs 12/0 CALLs 5+4/0+0/0+0 DIAGs 0/0
      Fail-over delay:16 seconds remaining on Dialer0
  LAPB dxe/DCE, state CONNECT, modulo 8, k 7, N1 12056, N2 20
      T1 3000, T2 0, interface outage (partial T3) 0, T4 0
      VS 1, VR 1, tx NR 1, Remote VR 1, Retransmissions 0
      Queues:U/S frames 0, I frames 0, unack. 0, reTx 0
      IFRAMEs 97/88 RNRs 0/0 REJs 0/0 SABM/Es 55490/12 FRMRs 186/0 DISCs
```

Table 83 describes significant fields shown in the displays.

Table 83 show x25 context Field Descriptions

Field	Description
XOT Access-group	Number of the XOT access group.
PROFILE	X.25 profile associated with the XOT access group.
address	Address to which the interface is connected.
state	State of the interface. Possible values are as follows: R1— normal ready state R2—DTE[1] restarting state R3—DCE[2] restarting state If the state is R2 or R3, the interface is awaiting acknowledgment of a Restart packet.
modulo	Modulo packet sequence numbering scheme.

Table 83 show x25 context Field Descriptions (continued)

Field	Description
timer	Interface timer value (zero unless the interface state is R2 or R3).
Defaults: idle VC timeout	Inactivity time before clearing the virtual circuit.
input/output window sizes	Default window sizes (in packets) for the interface. The **x25 facility** interface configuration command can be used to override these default values for the switched virtual circuits originated by the router.
packet sizes	Default maximum packet sizes (in bytes) for the interface. The **x25 facility** interface configuration command can be used to override these default values for the switched virtual circuits originated by the router.
Timers	Values of the X.25 timers are as follows: T10 through T13 for a DCE device T20 through T23 for a DTE device
Channels	Virtual circuit ranges for this interface.
RESTARTs	Restart packet statistics for the interface using the format Sent/Received.
CALLs	(number of successful calls sent + calls failed)/(calls received + calls failed)/(calls forwarded + calls failed). Calls forwarded are counted as calls sent.
DIAGs	Number of diagnostic messages sent and received.
Fail-over delay	Number of seconds remaining until secondary interface resets.

1. DTE = data terminal equipment
2. DCE = data communications equipment

Related Commands

Command	Description
show x25 profile	Displays information about configured X.25 profiles.
show x25 vc	Displays information about active X.25 virtual circuits.
x25 profile	Configures an X.25 profile without allocating any hardware-specific information.

show x25 cug

To display information about all closed user groups (CUGs) or specific CUGs (defined by the local or network CUG number), use the **show x25 cug** command in privileged EXEC mode.

show x25 cug {**local-cug** [*number*] | **network-cug** [*number*]}

Syntax Description

local-cug	Displays CUGs by locally significant CUG identifier.
number	(Optional) Local CUG number (0 to 9999). If you do not specify a CUG number, information for all CUGs will be displayed.
network-cug	Displays CUGs by network-translated CUG identifier.
number	(Optional) Network CUG number (0 to 9999). If you do not specify a CUG number, information for all CUGs will be displayed.

Command Modes

Privileged EXEC

Command History

Release	Modification
12.0(7)T	This command was introduced.
12.1(5)T	This command was modified to show information about CUG selection facility suppression.
12.2(13)T	This command was modified to display information about all or specific CUGs configured on terminal lines.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines

You must designate either the local CUG or the network CUG by the choice of keyword. Within that designation you can view all CUGs or a specific CUG defined by its local or network CUG identifier.

Examples

CUG Selection Facility Suppress Option: Example

The following is sample output for the **show x25 cug** command when CUG selection facility is suppressed for all CUGs on serial interface 1/2 and for the preferential CUG on the X.25 profile named "cug".

```
Router# show x25 cug local-cug

X.25 Serial1/2, 2 CUGs subscribed with no public access
  CUG selection facility suppressed for all CUGs
  local-cug 100 <-> network-cug 10
  local-cug 1 <-> network-cug 11
PROFILE cug, 2 CUGs subscribed with incoming public access
  CUG selection facility suppressed for preferential CUG
  local-cug 0 <-> network-cug 0 , preferential
```

```
  local-cug 100 <-> network-cug 100
  local-cug 200 <-> network-cug 200
```

Local CUG: Example

The following sample output from the **show x25 cug local-cug** command displays information about all local CUGs on configured on the router.

```
Router# show x25 cug local-cug

X.25 Serial1/1, 3 CUGs subscribed with no public access
  local-cug 99 <-> network-cug 9999, no-incoming, preferential
  local-cug 100 <-> network-cug 1000
  local-cug 101 <-> network-cug 1001
PROFILE cugs, 2 CUGs subscribed with with incoming public access
  local-cug 1 <-> network-cug 10, no-outgoing
  local-cug 2 <-> network-cug 20, no-incoming, preferential
Line: 129 aux 0  , 1 CUGs subscribed with outgoing public access
  local-cug 1 <-> network-cug 10
Line: 130 vty 0  , 4 CUGs subscribed with incoming and outgoing public access
  local-cug 1 <-> network-cug 10
  local-cug 50 <-> network-cug 5, preferential
  local-cug 60 <-> network-cug 6, no-incoming
  local-cug 70 <-> network-cug 7, no-outgoing
Line: 131 vty 1   , 1 CUGs subscribed with no public access
  local-cug 1 <-> network-cug 10
```

Network CUG: Example

The following is sample output from the **show x25 cug network-cug** command specifically for network number 10 showing that local CUG 1 is associated with it.

```
Router# show x25 cug network-cug 10

X.25 Serial1/2, 5 CUGs subscribed with no public access
  network-cug 10 <-> local-cug 1
PROFILE cugs, 2 CUGs subscribed with no public access
  network-cug 10 <-> local-cug 1 , no-outgoing
Line: 129 aux 0   , 1 CUGs subscribed with no public access
  network-cug 10 <-> local-cug 1
Line: 130 vty 0   , 4 CUGs subscribed with incoming and outgoing public access
  network-cug 10 <-> local-cug 1
Line: 131 vty 1   , 1 CUGs subscribed with no public access
  network-cug 10 <-> local-cug 1
```

Table 84 describes the significant fields shown in the displays.

Table 84 show x25 cug Field Descriptions

Field	Description
X.25 Serial...	DCE interface with X.25 CUG service subscription.
PROFILE	X.25 profile with X.25 CUG service subscription.
Line	Terminal line with X.25 CUG service subscription.
local-cug	Local CUG details.
network-cug	Network CUG details.
preferential	Identifies which CUG, if any, is preferred. A single CUG listed for an interface is assumed to be preferred.

Related Commands

Command	Description
x25 subscribe cug-service	Enables and controls standard CUG behavior on an X.25 DCE interface.
x25 subscribe local-cug	Configures a DCE X.25 interface for a specific CUG subscription.

show x25 hunt-group

To display hunt groups and view detailed interface statistics and distribution methods, use the **show x25 hunt-group** command in privileged EXEC mode.

show x25 hunt-group [*name*]

Syntax Description

name	(Optional) Displays the specific hunt group named.

Command Modes

Privileged EXEC

Command History

Release	Modification
12.0(3)T	This command was introduced.
12.0(5)T	The command output status field was modified to include “unoperational” as a type of interface status.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines

Use the **clear counters** or the **clear x25** commands in EXEC mode to clear the count of VCs in use in the “status” field and the number of bytes of data transmitted and received in the “traffic” field. Since the “uses” field is a hunt-group-specific counter, it will not be cleared using the **clear counters** or **clear x25** commands. The “uses” field is only cleared at boot time or when the hunt group is defined.

Examples

The following is sample output from the **show x25 hunt-group** command:

```
Router# show x25 hunt-group

   ID      Type      Target                    uses      status    traffic(out/in)
 ================================================================================
 HG1       rotary    Serial1                   2         next      1158/1691
                     Serial2                   2         next      1328/2146
                     xot 172.17.125.54         2         last_used 137/3154
                     xot 172.17.125.34         1         next      137/3154


 HG2       vc-count  Serial2                   4         5 VCs     6921/1364
                     Serial3                   2         1 VC      70/1259
```

Table 85 describes significant fields shown in the display.

Table 85 show x25 hunt-group Field Descriptions

Field	Description
ID	Hunt group name.
Type	Method of load balancing (rotary or vc-count).
Target	Range of interfaces that a call within the hunt group can go to.
uses	Total number of call attempts (failed plus successful) made to the interface.
status	State of interface at that moment. The status of an interface may be one of the following: • next—Interface will be used next for rotary distribution method. • last used—Interface was just used for rotary distribution method. • unavailable—Interface is shutdown. • full—All logical channels on the interface are in use. • # VC—(vc-count only) Number of VCs currently in use on the interface. • unoper—All VCs on the interface are unoperational.
traffic (out/in)	Number of data bytes transmitted through the interface.

Related Commands

Command	Description
clear x25	Restarts an X.25 or CMNS service, clears an SVC, or resets a PVC.
x25 hunt-group	Creates and maintains a hunt group.

show x25 interface

To display information about virtual circuits (VCs) that use an X.25 interface and, optionally, about a specified virtual circuit, use the **show x25 interface** EXEC command.

show x25 interface [**serial** *number* | *cmns-interface* **mac** *mac-address*]

Syntax Description

serial *number*	(Optional) Keyword **serial** and number of the serial interface used for X.25.
cmns-interface **mac** *mac-address*	(Optional) Local CMNS interface type and number, plus the MAC address of the remote device. CMNS interface types are Ethernet, Token Ring, or FDDI. The interface numbering scheme depends on the router interface hardware.

Command Modes

EXEC

Command History

Release	Modification
11.2	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Examples

The following **show x25 interface** sample output displays X.25 information about VCs on serial interface 0:

```
Router# show x25 interface serial 0

SVC 1,  State: D1,  Interface: Serial0
  Started 00:13:52, last input 00:00:05, output never
  Connects 3334 <-> ip 3.3.3.4
  Call PID ietf, Data PID none
  Window size input: 7, output: 7
  Packet size input: 512, output: 512
  PS: 0  PR: 6  ACK: 1  Remote PR: 0  RCNT: 5  RNR: no
  P/D state timeouts: 0  timer (secs): 0
  data bytes 0/2508 packets 0/54 Resets 0/0 RNRs 0/0 REJs 0/0 INTs 0/0
SVC 32,  State: D1,  Interface: Serial0.11
  Started 00:16:53, last input 00:00:37, output 00:00:28
  Connects 3334 <-> clns
  Call PID cisco, Data PID none
  Window size input: 7, output: 7
  Packet size input: 512, output: 512
  PS: 5  PR: 4  ACK: 4  Remote PR: 4  RCNT: 0  RNR: no
  P/D state timeouts: 0  timer (secs): 0
  data bytes 378/360 packets 21/20 Resets 0/0 RNRs 0/0 REJs 0/0 INTs 0/0
```

show x25 map

To display information about configured address maps, use the **show x25 map** command in privileged EXEC mode.

show x25 map

Syntax Description

This command has no arguments or keywords.

Command Modes

Privileged EXEC

Command History

Release	Modification
10.0	This command was introduced.
12.2(8)T	This command was modified to display record boundary preservation information for address maps.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines

The **show x25 map** command displays information about the following:

- Configured maps (defined by the **x25 map** command)
- Maps implicitly defined by encapsulation permanent virtual circuits (PVCs) (defined by the encapsulating version of the **x25 pvc** command)
- Dynamic maps (from the X.25 Defense Data Network [DDN] or Blacker Front End [BFE] operations)

Examples

Record Boundary Preservation: Examples

The following is sample output of the **show x25 map** command for a router that is configured with record boundary preservation (RBP) using the **x25 pvc rbp remote** command:

```
Router# show x25 map

Serial1/0:-> rbp, destination host 10.0.0.33 port 9999
  PVC, 1 VC:1/P
```

The following is sample output of the **show x25 map** command for a router that is configured with RBP using the **x25 map rbp remote** command:

```
Router# show x25 map

Serial3/0:12132 -> rbp, destination host 10.0.0.32 port 9999
  permanent, 1 VC:1024
```

The following is sample output of the **show x25 map** command for a router that is configured with RBP using the **x25 pvc rbp local** command:

```
Router# show x25 map

Serial3/0:<- rbp, listening at port 9999
  PVC, 1 VC:2/P
```

The following is sample output of the **show x25 map** command for a router that is configured with RBP using the **x25 map rbp local** command:

```
Router# show x25 map

Serial1/0:12131 <- rbp, listening at port 9999
  permanent, 1 VC:1
```

Table 86 describes significant fields shown in the display.

Table 86 show x25 map Field Descriptions for Maps That Use Record Boundary Preservation

Field	Description
Serial1/0	Interface on which this map is configured.
12131	(For SVCs only) X.121 address of the remote host. If any call user data is configured, it will appear in this field also.
-> rbp	Indicates an outgoing TCP session that is configured to use RBP.
<- rbp	Indicates an incoming TCP session that is configured to use RBP.
destination host 10.0.0.32 port 9999	IP address and port number of the destination host for an outgoing TCP session.
listening at port 9999	Port number on which the router is listening for a TCP connection request for incoming TCP sessions.
permanent	Indicates that the address map was explicitly configured using the **x25 map rbp local** or **x25 rbp remote** command.
PVC	Indicates that the address map was created when a PVC was configured using the **x25 pvc rbp local** or **x25 pvc rbp remote** command.
1 VC:1	Number of circuits associated with the map, followed by a list of circuit numbers. /P indicates a PVC.

Typical X.25 Maps: Example

The following is sample output from the **show x25 map** for five maps that were configured with the **x25 map** command:

```
Router# show x25 map

Serial0: X.121 1311001 <--> ip 172.20.170.1
  PERMANENT, BROADCAST, 2 VCS: 3 4
Serial0: X.121 1311005 <--> appletalk 128.1
  PERMANENT
Serial1: X.121 2194441 cud hello <--> pad
  PERMANENT, windowsize 5 5, accept-reverse, idle 5
Serial1: X.121 1311005 <--> bridge
  PERMANENT, BROADCAST
Serial2: X.121 001003 <--> apollo 1.3,
         appletalk 1.3,
```

```
        ip 172.20.1.3,
        decnet 1.3,
        novell 1.0000.0c04.35df,
        vines 00000001:0003,
        xns 1.0000.0c04.35df,
        clns
PERMANENT, NVC 8, 1 VC: 1024
```

The display shows that five maps have been configured for a router: two for serial interface 0, two for serial interface 1, and one for the serial interface 2 (which maps eight protocols to the host).

Table 87 describes significant fields shown in the display.

Table 87 show x25 map Field Descriptions for Typical X.25 Maps

Field	Description
Serial0	Interface on which this map is configured.
X.121 1311001	X.121 address of the mapped encapsulation host.
ip 172.20.170.1	Type and address of the higher-level protocols mapped to the remote host. Bridge maps do not have a higher-level address; all bridge datagrams are sent to the mapped X.121 address. Connectionless Network Service (CLNS) maps refer to a configured neighbor as identified by the X.121 address.
PERMANENT	Address-mapping type that has been configured for the interface in this entry. Possible values include the following: • CONSTRUCTED—Derived with the DDN or BFE address conversion scheme. • PERMANENT—Map was entered with the **x25 map** interface configuration command. • PVC—Map was configured with the **x25 pvc** interface command.
BROADCAST	If any options are configured for an address mapping, they are listed; the example shows a map that is configured to forward datagram broadcasts to the mapped host.
2 VCs:	If the map has any active virtual circuits, they are identified.
3 4	Identifies the circuit number of the active virtual circuits. Note that a single protocol virtual circuit can be associated with a multiprotocol map.

show x25 profile

To view details of X.25 profiles on your router, use the **show x25 profile** command in privileged EXEC mode.

show x25 profile [*name*]

Syntax Description

name	(Optional) Name of X.25 profile.

Command Modes

Privileged EXEC

Command History

Release	Modification
12.0(3)T	This command was introduced.
12.2(8)T	This command was modified to display the XOT access groups associated with an X.25 profile.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines

When the X.25 profile name is not specified, the output shows all configured profiles for a given interface.

Examples

The following sample output from the **show x25 profile** command displays details about the X.25 profile called “XOT-DEFAULT”:

```
Router# show x25 profile XOT-DEFAULT

X.25 profile name: XOT-DEFAULT
In use by:
  Access-group 2
  Access-group 10
PROFILE dxe/DTE, address 12345, state R/Inactive, modulo 128, timer 0
Defaults: idle VC timeout 0
input/output window sizes 20/20, packet sizes 256/256
Timers: T20 180, T21 200, T22 180, T23 180
Channels: Incoming-only none, Two-way 1-4095, Outgoing-only none
```

The following sample output from the **show x25 profile** command displays all profiles configured on the same interface:

```
Router# show x25 profile

X.25 profile name:NetworkNodeA
  Number of references:2
  In use by:
      Annex G:Serial1 DLCI 20
      Annex G:Serial1 DLCI 30
```

```
  PROFILE DCE, address <none>, state R/Inactive, modulo 128, timer 0
      Defaults:idle VC timeout 5
        input/output window sizes 2/2, packet sizes 128/128
      Timers:T10 60, T11 180, T12 60, T13 60
      Channels:Incoming-only none, Two-way 1-128, Outgoing-only none
  LAPB DCE, modulo 8, k 7, N1 default, N2 20
      T1 3000, T2 0, interface outage (partial T3) 0, T4 0

X.25 profile name:NetworkNodeB
  Number of references:1
  In use by:
      Annex G:Serial1 DLCI 40
  PROFILE DTE, address 1111, state R/Inactive, modulo 8, timer 0
      Defaults:idle VC timeout 0
        input/output window sizes 2/2, packet sizes 128/128
      Timers:T20 180, T21 200, T22 180, T23 180
      Channels:Incoming-only none, Two-way 1-1024, Outgoing-only none
LAPB DTE, modulo 8, k 7, N1 default, N2 20
      T1 3000, T2 0, interface outage (partial T3) 0, T4 0
```

Table 88 describes significant fields shown in the display.

Table 88 show x25 profile Field Descriptions

Field	Description
Number of references	Number of X.25 connections using this profile.
In use by	Shows the interface, XOT access group, and X.25 service using this profile.
address	Address to which interface is connected.
state	State of the interface. Possible values are as follows: R1—normal ready state R2—DTE[1] restarting state R3—DCE[2] restarting state If the state is R2 or R3, the interface is awaiting acknowledgment of a Restart packet.
modulo	Value that determines the packet sequence numbering scheme used.
timer	Interface timer value (zero unless the interface state is R2 or R3).
Defaults: idle VC timeout	Inactivity time before clearing the virtual circuit.
input/output window sizes	Default window sizes (in packets) for the interface. The **x25 facility** interface configuration command can be used to override these default values for the switched virtual circuits originated by the router.
packet sizes	Default maximum packet sizes (in bytes) for the interface. The **x25 facility** interface configuration command can be used to override these default values for the switched virtual circuits originated by the router.

Table 88 show x25 profile Field Descriptions (continued)

Field	Description
Timers	Values of the X.25 timers are as follows: T10 through T13 for a DCE device T20 through T23 for a DTE device
Channels:	Virtual circuit ranges for this interface.

1. DTE = data terminal equipment
2. DCE = data communications equipment

Related Commands

Command	Description
show x25 context	Displays details of an Annex G DLCI link.
show x25 vc	Displays information about active X.25 virtual circuits.
x25 profile	Configures an X.25 profile without allocating any hardware-specific information.

show x25 remote-red

Note Effective with Cisco IOS Release 12.2, the **show x25 remote-red** command is not available in Cisco IOS Software.

To display the one-to-one mapping of the host IP addresses and the remote Blacker Front End (BFE) device's IP addresses, use the **show x25 remote-red** command in privileged EXEC mode.

show x25 remote-red

Syntax Description

This command has no arguments or keywords.

Command Modes

Privileged EXEC (#)

Command History

Release	Modification
10.0	This command was introduced.
12.2	This command became unsupported.

Examples

The following is sample output from the **show x25 remote-red** command:

```
Router# show x25 remote-red

Entry       REMOTE-RED      REMOTE-BLACK    INTERFACE
1           21.0.0.3        21.0.0.7        serial3
2           21.0.0.10       21.0.0.6        serial1
3           21.0.0.24       21.0.0.8        serial3
```

Table 89 describes significant fields shown in the display.

Table 89 show x25 remote-red Field Descriptions

Field	Description
Entry	Address mapping entry.
REMOTE-RED	Host IP address.
REMOTE-BLACK	IP address of the remote BFE device.
INTERFACE	Name of interface through which communication with the remote BFE device will take place.

show x25 route

To display the X.25 routing table, use the **show x25 route** command in privileged EXEC mode.

show x25 route

Syntax Description

This command has no arguments or keywords.

Command Modes

Privileged EXEC

Command History

Release	Modification
10.0	This command was introduced.
12.0(5)T	The **dns** keyword was added.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Examples

The following example shows output from the **show x25 route** command:

```
Router# show x25 route

# Match                       Substitute              Route To
1 dest ^1311001$                                      Serial0, 0 uses
2 dest ^1311002$                                      xot 172.20.170.10
3 dest 444                                            xot dns \0
4 dest 555                                            xot dns \0
```

Table 90 describes significant fields shown in the display.

Table 90 show x25 route Field Descriptions

Field	Description
#	Number identifying the entry in the X.25 routing table.
Match	The match criteria and patterns associated with this entry.
Route To	Destination to which the router will forward a call; X.25 destinations identify an interface; CMNS destinations identify an interface and host MAC address; XOT destinations either identify up to six IP addresses (#2), or the **x25 route** pattern for retrieving up to six IP addresses from the DNS (#3 and #4).

Related Commands

Command	Description
x25 route	Creates an entry in the X.25 routing table (to be consulted for forwarding incoming calls and for placing outgoing PAD or protocol translation calls).

show x25 services

To display information pertaining to the X.25 services, use the **show x25 services** command in user EXEC or privileged EXEC mode.

show x25 services

Syntax Description

This command has no arguments or keywords.

Command Modes

User EXEC
Privileged EXEC

Command History

Release	Modification
11.2	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines

This command is the default form of the **show x25** command.

Examples

The following is sample output from the **show x25 services** command:

```
Router# show x25 services

X.25 software, Version 3.0.0.
  3 configurations supporting 3 active contexts
  VCs allocated, freed and in use: 7 - 0 = 7
  VCs active and idle: 4, 3
XOT software, Version 2.0.0.
  VCs allocated, freed and in use: 2 - 1 = 1
  connections in-progress: 0 outgoing and 0 incoming
  active VCs: 1, connected to 1 remote hosts
```

Related Commands

Command	Description
show x25 interface	Displays information about VCs that use an X.25 interface and, optionally, about a specified VC.
show x25 map	Displays information about configured address maps.
show x25 route	Displays the X.25 routing table.
show x25 vc	Displays information about active SVCs and PVCs.

show x25 vc

To display information about active switched virtual circuits (SVCs) and permanent virtual circuits (PVCs), use the **show x25 vc** command in privileged EXEC mode.

show x25 vc [*lcn*]

Syntax Description

lcn	(Optional) Logical channel number (LCN).

Command Modes

Privileged EXEC

Command History

Release	Modification
8.3	This command was introduced in a release prior to Release 8.3.
12.2(8)T	This command was modified to display information about record boundary preservation.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines

To examine a particular virtual circuit number, add an LCN argument to the **show x25 vc** command.

This command displays information about virtual circuits (VCs). VCs may be used for a number of purposes, such as the following:

- Encapsulation traffic
- Traffic switched between X.25 services (X.25, Connection-Mode Network Service [CMNS], and X.25 over TCP/IP [XOT])
- PAD traffic
- QLLC traffic

The connectivity information displayed will vary according to the traffic carried by the VC. For multiprotocol circuits, the output varies depending on the number and identity of the protocols mapped to the X.121 address and the encapsulation method selected for the circuit.

Examples

Record Boundary Preservation: Example

The following is sample output of the **show x25 vc** command for a PVC configured with record boundary preservation (RBP):

```
Router# show x25 vc

PVC 2,  State:D1,  Interface:Serial3/0
  Started 00:08:08, last input 00:00:01, output 00:00:01
  recordsize:1500, connected
  local address 10.0.0.1 port 9999; remote address 10.0.0.5 port 11029
  deferred ack:1
```

```
Window size input:2, output:2
Packet size input:128, output:128
PS:2  PR:2  ACK:1  Remote PR:2  RCNT:1  RNR:no
P/D state timeouts:0  timer (secs):0
data bytes 8000/8000 packets 80/80 Resets 9/0 RNRs 0/0 REJs 0/0 INTs 0/0
```

Table 91 describes the fields shown in the sample output that are typical for virtual circuits.

Table 91 show x25 vc Field Descriptions

Field	Description
SVC *n* or PVC *n*	Identifies the type of virtual circuit (switched or permanent) and its LCN (also called its "virtual circuit number").
State	State of the virtual circuit (which is independent of the states of other virtual circuits); D1 is the normal ready state. See the International Telecommunication Union Telecommunication Standardization Sector (ITU-T)[1] X.25 Recommendation for a description of virtual circuit states.
Interface	Interface or subinterface on which the virtual circuit is established.
Started	Time elapsed since the virtual circuit was created.
last input	Time of last input.
output	Time of last output.
Connects...<-->..	Traffic-specific connection information. See Table 93, Table 94, Table 95, and Table 96 for more information.
D-bit permitted	Indicates that the X.25 D-bit (Delivery Confirmation) may be used on this circuit (displayed as needed).
Fast select VC	Indicates that the Fast Select facility was present on the incoming call (displayed as needed).
Reverse charged	Indicates reverse charged virtual circuit (displayed as needed).
Window size	Window sizes for the virtual circuit.
Packet size	Maximum packet sizes for the virtual circuit.
PS	Current send sequence number.
PR	Current receive sequence number.
ACK	Last acknowledged incoming packet.
Remote PR	Last receive sequence number received from the other end of the circuit.
RCNT	Count of unacknowledged input packets.
RNR	State of the Receiver Not Ready flag; this field is true if the network sends a Receiver-not-Ready packet.
Window is closed	This line appears if the router cannot transmit any more packets until the X.25 Layer 3 peer has acknowledged some outstanding packets.
P/D state timeouts	Number of times a supervisory packet (Reset or Clear) has been retransmitted.
Timer	A nonzero time value indicates that a control packet has not been acknowledged yet or that the virtual circuit is being timed for inactivity.
Reassembly	Number of bytes received and held for reassembly. Packets with the M-bit set are reassembled into datagrams for encapsulation virtual circuits; switched X.25 traffic is not reassembled (and is displayed only when values are not zero).

Table 91 show x25 vc Field Descriptions (continued)

Field	Description
Held Fragments/Packets	Number of X.25 data fragments to transmit to complete an outgoing datagram, and the number of datagram packets waiting for transmission (displayed only when values are not zero).
data bytes *m*/*n* packets *p*/*q*	Total number of data bytes sent (m), data bytes received (n), data packets sent (p), and data packets received (q) since the circuit was established.
Resets *t*/*r*	Total number of reset packets transmitted/received since the circuit was established.
RNRs *t*/*r*	Total number of Receiver Not Ready packets transmitted/received since the circuit was established.
REJs *t*/*r*	Total number of Reject packets transmitted/received since the circuit was established.
INTs *t*/*r*	Total number of Interrupt packets transmitted/received since the circuit was established.

1. The ITU-T carries out the functions of the former Consultative Committee for International Telegraph and Telephone (CCITT).

Table 92 describes the fields specific to VCs configured with record boundary preservation.

Table 92 show x25 vc Field Descriptions for VCs That Use Record Boundary Preservation

Field	Description
recordsize	Maximum record size for the session.
connected	Connection status.
local address; port	IP address and port number of the local end of the TCP session.
remote address; port	IP address and port number of the remote end of the TCP session.
input queue	Number of inbound X.25 data packets not yet processed. This field appears in the display only when the value is not zero.
record buffer	Number of bytes of X.25 data in the current partial record (not including data packets in the input queue). This field appears in the display only when the value is not zero.
deferred ack	Number of X.25 data packets that have been received and processed but not yet acknowledged. This field appears in the display only when the value is not zero.

Encapsulated Traffic: Example

The following is sample output of the **show x25 vc** command used on an encapsulated traffic circuit:

```
Router# show x25 vc 1024

SVC 1024, State: D1, Interface: Serial0
 Started 0:00:31, last input 0:00:31, output 0:00:31
 Connects 170090 <-->
    compressedtcp 172.20.170.90
    ip 172.20.170.90
 Call PID multi, Data PID ietf
 Reverse charged
```

```
Window size input: 2, output: 2
Packet size input: 128, output: 128
PS: 5 PR: 5 ACK: 4 Remote PR: 5 RCNT: 1 RNR: FALSE
Window is closed
P/D state timeouts: 0 Timer (secs): 0
 data bytes 505/505 packets 5/5 Resets 0/0 RNRs 0/0 REJs 0/0 INTs 0/0
```

Table 93 describes the connection fields specific to encapsulation traffic.

Table 93 show x25 vc Encapsulation Traffic Field Descriptions

Field	Description
170090	The X.121 address of the remote host.
ip 172.20.170.90	The higher-level protocol and address values that are mapped to the virtual circuit.
Call PID	Identifies the method used for protocol identification (PID) in the Call User Data (CUD) field. Because PVCs are not set up using a Call packet, this field is not displayed for encapsulation PVCs. The available methods are as follows: • cisco—Cisco's traditional method was used to set up a single protocol virtual circuit. • ietf—The IETF's standard RFC 1356 method was used to set up a single protocol virtual circuit. • snap—The IETF's Subnetwork Access Protocol (SNAP) method for IP encapsulation was used. • multi—the IETF's multiprotocol encapsulation method was used.
Data PID	Identifies the method used for PID when sending datagrams. The available methods are as follows: • none—The virtual circuit is a single-protocol virtual circuit; no PID is used. • ietf—The IETF's standard RFC 1356 method for identifying the protocol is used. • snap—The IETF's SNAP method for identifying IP datagrams is used.

Locally Switched X.25 Traffic: Example

The following is sample output of the **show x25 vc** command used on a virtual circuit carrying locally switched X.25 traffic:

```
Router# show x25 vc

PVC 1, State: D1, Interface: Serial2
  Started 0:01:26, last input never, output never
  PVC <--> Serial1 PVC 1, connected
  Window size input: 2, output: 2
  Packet size input: 128, output: 128
  PS: 0 PR: 0 ACK: 0 Remote PR: 0 RCNT: 0 RNR: FALSE
  P/D state timeouts: 0 Timer (secs): 0
  data bytes 0/0 packets 0/0 Resets 0/0 RNRs 0/0 REJs 0/0 INTs 0/0

SVC 5, State: D1, Interface: Serial2
  Started 0:00:16, last input 0:00:15, output 0:00:15
  Connects 170093 <--> 170090 from Serial1 VC 5
  Window size input: 2, output: 2
```

```
  Packet size input: 128, output: 128
  PS: 5 PR: 5 ACK: 4 Remote PR: 5 RCNT: 1 RNR: FALSE
  P/D state timeouts: 0 Timer (secs): 0
  data bytes 505/505 packets 5/5 Resets 0/0 RNRs 0/0 REJs 0/0 INTs 0/0
```

Table 94 describes the connection fields for virtual circuits carrying locally switched X.25 traffic.

Table 94 show x25 vc Local Traffic Field Descriptions

Field	Description
PVC <-->	Indicates a switched connection between two PVCs.
Serial1 PVC 1	Identifies the other half of a local PVC connection.
connected	Identifies connection status for a switched connection between two PVCs. See Table 97 for PVC status messages.
170093	Identifies the Calling (source) Address of the connection. If a Calling Address Extension was encoded in the call facilities, it is also displayed. If the source host is a CMNS host, its MAC address is also displayed.
170090	Identifies the Called (destination) Address of the connection. If a Called Address Extension was encoded in the call facilities, it is also displayed. If the destination host is a CMNS host, its MAC address is also displayed.
from Serial1	Indicates the direction of the call and the connecting interface.
VC 5	Identifies the circuit type and LCN for the connecting interface. VC indicates an SVC, and PVC indicates a PVC. If the connecting host is a CMNS host, its MAC address is also displayed.

X.25 Traffic Locally Switched Between PVCs and SVCs: Example

The following is sample output of the **show x25 vc** command used on a virtual circuit carrying locally switched PVC-to-SVC X.25 traffic:

```
Router# show x25 vc

PVC 5,  State: D1,  Interface: Serial0
  Started 4d21h, last input 00:00:14, output 00:00:14
  Connects 101600 <--> 201700 from Serial2 VC 700
  D-bit permitted
  Window size input: 2, output: 2
  Packet size input: 128, output: 128
  PS: 5  PR: 5  ACK: 4  Remote PR: 5  RCNT: 1  RNR: no
  P/D state timeouts: 0  timer (secs): 0
  data bytes 1000/1000 packets 10/10 Resets 1/0 RNRs 0/0 REJs 0/0 INTs 0/0

SVC 700,  State: D1,  Interface: Serial2
  Started 00:00:16, last input 00:00:16, output 00:00:16
  Connects 101600 <--> 201700 from Serial0 PVC 5
  Window size input: 2, output: 2
  Packet size input: 128, output: 128
  PS: 5  PR: 5  ACK: 5  Remote PR: 4  RCNT: 0  RNR: no
  P/D state timeouts: 0  timer (secs): 103
  data bytes 500/500 packets 5/5 Resets 0/0 RNRs 0/0 REJs 0/0 INTs 0/0
```

Table 95 describes the connection fields for virtual circuits carrying locally switched X.25 traffic between PVCs and SVCs.

Table 95 show x25 vc Locally Switched PVC-to-SVC Traffic Field Descriptions

Field	Description
101600	Identifies the Calling (source) Address of the connection. If a Calling Address Extension was encoded in the call facilities, it is also displayed. If the source host is a CMNS host, its MAC address is also displayed.
201700	Identifies the Called (destination) Address of the connection. If a Called Address Extension was encoded in the call facilities, it is also displayed. If the destination host is a CMNS host, its MAC address is also displayed.
from Serial2	Indicates the direction of the call and the connecting interface.
VC 700	Identifies the circuit type and LCN for the connecting interface. VC indicates an SVC and PVC indicates a PVC. If the remote host is a CMNS host, its MAC address is also displayed.

Remotely Switched X.25 Traffic: Example

The following is sample output from the **show x25 vc** command used on a virtual circuit carrying remotely switched X.25 traffic:

```
Router# show x25 vc

PVC 2, State: D1, Interface: Serial2
 Started 0:01:25, last input never, output never
 PVC <--> [172.20.165.92] Serial2/0 PVC 1 connected
 XOT between 172.20.165.95, 1998 and 172.20.165.92, 27801
 Window size input: 2, output: 2
 Packet size input: 128, output: 128
 PS: 0 PR: 0 ACK: 0 Remote PR: 0 RCNT: 0 RNR: FALSE
 P/D state timeouts: 0 Timer (secs): 0 Reassembly (bytes): 0
 Held Fragments/Packets: 0/0
 data bytes 0/0 packets 0/0 Resets 0/0 RNRs 0/0 REJs 0/0 INTs 0/0

SVC 6, State: D1, Interface: Serial2
 Started 0:00:04, last input 0:00:04, output 0:00:04
 Connects 170093 <--> 170090 from
 XOT between 172.20.165.91, 1998 and 172.20.165.92, 27896
 Window size input: 2, output: 2
 Packet size input: 128, output: 128
 PS: 5 PR: 5 ACK: 4 Remote PR: 5 RCNT: 1 RNR: FALSE
 P/D state timeouts: 0 Timer (secs): 0 Reassembly (bytes): 0
 Held Fragments/Packets: 0/0
 data bytes 505/505 packets 5/5 Resets 0/0 RNRs 0/0 REJs 0/0 INTs 0/0
```

Table 96 describes the connection fields for virtual circuits carrying remotely switched X.25 traffic.

Table 96 show x25 vc Remote X.25 Traffic Field Descriptions

Field	Description
PVC	Flags PVC information.
[172.20.165.92]	Indicates the IP address of the router remotely connecting the PVC.
Serial 2/0 PVC 1	Identifies the remote interface and PVC number.
connected	Identifies connection status for a switched connection between two PVCs. See Table 97 for PVC status messages.

Table 96 show x25 vc Remote X.25 Traffic Field Descriptions (continued)

Field	Description
170093	Identifies the Calling (source) Address of the connection. If a Calling Address Extension was encoded in the call facilities, it is also displayed.
170090	Identifies the Called (destination) Address of the connection. If a Called Address Extension was encoded in the call facilities, it is also displayed.
from	Indicates the direction of the call.
XOT between...	Identifies the IP addresses and port numbers of the X.25-over-TCP (XOT) connection.

Table 97 lists the PVC states that can be reported. These states are also reported by the **debug x25** command in PVC-SETUP packets (for remote PVCs only). Some states apply only to remotely switched PVCs.

Table 97 X.25 PVC Status Messages

Status Message	Description
awaiting PVC-SETUP reply	A remote PVC has initiated an XOT TCP connection and is waiting for a reply to the setup message.
can't support flow control values	The window sizes or packet sizes of the PVC cannot be supported by one of its two interfaces.
connected	The PVC is up.
dest. disconnected	The other end has disconnected the PVC.
dest interface is not up	The target interface's X.25 service is down.
dest PVC config mismatch	The targeted PVC is already connected.
mismatched flow control values	The configured flow control values do not match.
no such dest. interface	The remote destination interface was reported to be in error by the remote router.
no such dest. PVC	The targeted PVC does not exist.
non-X.25 dest. interface	The target interface is not configured for X.25.
PVC/TCP connect timed out	A remote PVC XOT TCP connection attempt timed out.
PVC/TCP connection refused	A remote PVC XOT TCP connection was tried and refused.
PVC/TCP routing error	A remote PVC XOT TCP connection routing error was reported.
trying to connect via TCP	A remote PVC XOT TCP connection is established and is in the process of connecting.
waiting to connect	The PVC is waiting to be processed for connecting.

show x25 xot

To display information for all X.25 over TCP (XOT) virtual circuits that match a given criterion, use the **show x25 xot** command in privileged EXEC mode.

show x25 xot [**local** *ip-address* [**port** *port*]] [**remote** *ip-address* [**port** *port*] | **access-group** [*access-group-number*]]

Syntax Description

local *ip-address* [**port** *port*]	(Optional) Local IP address and optional port number.
remote *ip-address* [**port** *port*]	(Optional) Remote IP address and optional port number.
access-group	(Optional) Displays configuration information about XOT access groups.
access-group-number	(Optional) Displays configuration information about a specific XOT access group.

Command Modes

Privileged EXEC

Command History

Release	Modification
11.2	This command was introduced.
12.2(8)T	Access group options were added.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Examples

The following **show x25 xot** sample output displays information about all XOT virtual circuits:

```
Router# show x25 xot

SVC 11,  State: D1,  Interface: [10.2.2.2,1998/10.2.2.1,11002]
  Started 00:00:08, last input 00:00:08, output 00:00:08

  Line: 0   con 0    Location:  Host: 5678
  111 connected to 5678 PAD <--> XOT 2.2.2.2,1998

  Window size input: 2, output: 2
  Packet size input: 128, output: 128
  PS: 2  PR: 3  ACK: 3  Remote PR: 2  RCNT: 0  RNR: no
  P/D state timeouts: 0  timer (secs): 0
  data bytes 54/18 packets 2/3 Resets 0/0 RNRs 0/0 REJs 0/0 INTs 0/0\
```

The following example shows sample output for the **show x25 xot** command with the **access-group** keyword:

```
Router# show x25 xot access-group

 xot access-group 1 using built-in default configuration
 xot access-group 10 using x.25 profile ocean
 xot access-group 55 using x.25 profile river
```

Related Commands

Command	Description
show x25 interface	Displays information about VCs that use an X.25 interface and, optionally, about a specified VC.
show x25 services	Displays information pertaining to the X.25 services.

show x28 hunt-group

To display the members and status of each member in an X.28 hunt group, use the **show x28 hunt-group** command in user EXEC or privileged EXEC mode.

show x28 hunt-group [*group-num*]

Syntax Description

group-num	(Optional) Identification number of a particular hunt group.

Command Default

The members of all X.28 hunt groups in the router are displayed.

Command Modes

User EXEC
Privileged EXEC

Command History

Release	Modification
12.3(11)YN	This command was introduced.
12.4(4)T	This command was integrated into Cisco IOS Release 12.4(4)T.

Examples

The following example displays the configuration of four hunt ("rotary") groups and the current status of their member lines:

```
Router# show x28 hunt-group

    ID  Type    HG-Address TTy      Address Uses   status
    ================================================================================
    1   RRA         23456      97      34567   2       INUSE
                               98      12345   0      NXTUSE
                               100     -       0       INUSEO
                               102     456789  0        IDLE
    2    QBR,FIF    -          99       -      0       UNAVL
    3   QUE,FIF     -          101     -       0      NXTUSE
    4   FIF         56789      103     67890   0       UNAVL
                               104     789012  0       UNAVL
```

Table 98 show x28 hunt-group Field Descriptions

Field	Description
ID	The identification number of the hunt group.
Type	The line-selection mechanism used within the group: • **FIF** (First Idle First): Lines are searched in increasing order of their line (absolute) number, and the first idle line found is given the incoming call. • **RRA** (Round-Robin): The incoming call is given to the line whose line number is the next highest from the line that received the last call. • **QUE** (Queued): If all lines in the group are busy when a call request arrives, that call is queued and given to the first line that frees up. (Not implementable with Multi-PAD X.25 addressing.) • **QBR** (Queued By Role): Same as "Queued," except that calls belonging to priority users are placed at the head of the queue. (Not implementable with Multi-PAD X.25 addressing.)
HG-Address	X.28 address assigned to the hunt group.
TTy	Absolute number of the line.
Address	X.121 address assigned to that line.
Uses	How many calls have been placed on that line.
status	Current status of the line: • **IDLE**: available • **NXTUSE**: idle and next to be used • **INUSE**: busy in a PAD call • **INUSEO**: busy in a non-PAD call • **UNAVL**: unavailable (either because of inactive modem control signals or because PAD transport is unavailable)

show x29 access-lists

To display X.29 access lists, use the **show x29 access-lists** command in user EXEC or privileged EXEC mode.

show x29 access-lists [*access-list-number*]

Syntax Description

access-list-number	(Optional) Standard x29 access list number. The range is from 0 to 500.

Command Default

If no argument is specified, information for all X.29 access lists is displayed.

Command Modes

User EXEC (>)
Privileged EXEC (#)

Command History

Release	Modification
12.0	This command was introduced in a release earlier than Cisco IOS Release 12.0.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2(33)SXH	This command was integrated into Cisco IOS Release 12.2(33)SXH.
Cisco IOS XE Release 2.1	This command was implemented on the Cisco ASR 1000 series routers.

Examples

The following is sample output from the **show x29 access-lists** command:

```
Router# show x29 access-lists

X29 access list 10
    permit 192.0.2.0
X29 access list 20
    deny 192.0.2.255
X29 access list 50
    permit 192.0.2.10
```

Table 99 describes the significant fields shown in the display.

Table 99 show x29 access-lists Field Descriptions

Field	Description
X29 access list	Displays the access list number which is configured to be allowed or denied access.

Table 99 show x29 access-lists Field Descriptions (continued)

Field	Description
permit	Displays the source IP address of the incoming packet which is permitted to have access to the protocol translator.
deny	Displays the source IP address of the incoming packet which is configured to deny access and clear call requests immediately.

Related Commands

Command	Description
x29 access-list	Limits access to the access server from certain X.25 hosts.

show xconnect

To display information about xconnect attachment circuits and pseudowires, use the **show xconnect** command in user EXEC or privileged EXEC mode.

show xconnect {{**all** | **interface** *type number*} [**detail**] | **peer** *ip-address* {**all** | **vcid** *vcid-value*} [**detail**] | **pwmib** [**peer** *ip-address vcid-value*]}

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show xconnect {{**all** | **interface** *type number* | **memory** | **rib**} [**detail**] [**checkpoint**] | **peer** *ip-address* {**all** | **vcid** *vcid-value*} [**detail**] | **pwmib** [**peer** *ip-address vcid-value*]}

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show xconnect {**all** | **peer** *ip-address* {**all** | **vcid** *vcid-value*} | **pwmib** [**peer** *ip-address vcid-value*]} [**detail**]

Syntax Description

all	Displays information about all xconnect attachment circuits and pseudowires.
interface	Displays information about xconnect attachment circuits and pseudowires on the specified interface.
type	Interface type. For more information, use the question mark (?) online help function. Valid values for the *type* argument are as follows: • **atm** *number*—Displays xconnect information for a specific ATM interface or subinterface. • **atm** *number* **vp** *vpi-value*—Displays virtual path (VP) xconnect information for a specific ATM virtual path identifier (VPI). This command will not display information about virtual circuit (VC) xconnects using the specified VPI. • **atm** *number* **vc** *vpi-value*/*vci-value*—Displays VC xconnect information for a specific ATM VPI and virtual circuit identifier (VCI) combination. • **ethernet** *number*—Displays port-mode xconnect information for a specific Ethernet interface or subinterface. • **fastethernet** *number*—Displays port-mode xconnect information for a specific Fast Ethernet interface or subinterface. • **serial** *number*—Displays xconnect information for a specific serial interface. • **serial** *number dlci-number*—Displays xconnect information for a specific Frame Relay data-link connection identifier (DLCI).
number	Interface or subinterface number. For more information about the numbering syntax for your networking device, use the question mark (?) online help function.
detail	(Optional) Displays detailed information about the specified xconnect attachment circuits and pseudowires.

checkpoint	(Optional) Displays the autodiscovered pseudowire information that is checkpointed to the standby Route Processor (RP).
peer	Displays information about xconnect attachment circuits and pseudowires associated with the specified peer.
ip-address	The IP address of the peer.
all	Displays all xconnect information associated with the specified peer IP address.
vcid	Displays xconnect information associated with the specified peer IP address and the specified VC ID.
vcid-value	VC ID value.
pwmib	Displays information about the pseudowire Management Information Base (MIB).
memory	Displays information about the xconnect memory usage.
rib	Displays information about the pseudowire Routing Information Base (RIB).

Command Modes

User EXEC (>)
Privileged EXEC (#)

Command History

Release	Modification
12.0(31)S	This command was introduced.
12.2(28)SB	This command was integrated into Cisco IOS Release 12.2(28)SB.
12.4(11)T	This command was integrated into Cisco IOS Release 12.4(11)T.
12.2(33)SRB	This command was modified. The **rib** keyword was added.
12.2(33)SXI	This command was integrated into Cisco IOS Release 12.2(33)SXI.
Cisco IOS XE Release 2.1	This command was integrated into Cisco IOS XE Release 2.1.
12.4(24)T	This command was modified in a release earlier than Cisco IOS Release 12.4(24)T. The **pwmib** keyword was added.
12.2(33)SRC	This command was modified in a release earlier than Cisco IOS Release 12.2(33)SRC. The **memory** keyword was added.
12.2(33)SCC	This command was integrated into Cisco IOS Release 12.2(33)SCC.
15.1(1)S	This command was integrated into Cisco IOS Release 15.1(1)S. The output of the **show xconnect rib** command and the **show xconnect rib detail** command was modified to support dynamic pseudowire switching on Autonomous System Boundary Routers (ASRBs). The **checkpoint** keyword was added.

Usage Guidelines

The **show xconnect** command can be used to display, sort, and filter basic information about all xconnect attachment circuits and pseudowires.

You can use the **show xconnect** command output to help determine the appropriate steps required to troubleshoot an xconnect configuration problem. More specific information about a particular type of xconnect can be displayed using the commands listed in the "Related Commands" table.

Examples

The following example shows the **show xconnect all** command output in the brief (default) display format:

```
Router# show xconnect all

Legend: XC ST=Xconnect State, S1=Segment1 State, S2=Segment2 State
UP=Up, DN=Down, AD=Admin Down, IA=Inactive, SB=Standby, RV=Recovering, NH=No Hardware
XC ST     Segment 1                         S1 Segment 2                          S2
------+---------------------------------+--+---------------------------------+--
UP     ac   Et0/0(Ethernet)              UP mpls 10.55.55.2:1000              UP
UP     ac   Se7/0(PPP)                   UP mpls 10.55.55.2:2175              UP
UP pri ac   Se6/0:230(FR DLCI)           UP mpls 10.55.55.2:2230              UP
IA sec ac   Se6/0:230(FR DLCI)           UP mpls 10.55.55.3:2231              DN
UP     ac   Se4/0(HDLC)                  UP mpls 10.55.55.2:4000              UP
UP     ac   Se6/0:500(FR DLCI)           UP l2tp 10.55.55.2:5000              UP
UP     ac   Et1/0.1:200(Eth VLAN)        UP mpls 10.55.55.2:5200              UP
UP pri ac   Se6/0:225(FR DLCI)           UP mpls 10.55.55.2:5225              UP
IA sec ac   Se6/0:225(FR DLCI)           UP mpls 10.55.55.3:5226              DN
IA pri ac   Et1/0.2:100(Eth VLAN)        UP ac   Et2/0.2:100(Eth VLAN)        UP
UP sec ac   Et1/0.2:100(Eth VLAN)        UP mpls 10.55.55.3:1101              UP
UP     ac   Se6/0:150(FR DLCI)           UP ac   Se8/0:150(FR DLCI)           UP
```

The following example shows the **show xconnect all** command output in the detailed display format:

```
Router# show xconnect all detail

Legend: XC ST=Xconnect State, S1=Segment1 State, S2=Segment2 State
UP=Up, DN=Down, AD=Admin Down, IA=Inactive, SB=Standby, RV=Recovering, NH=No HardwareXC
ST     Segment 1                         S1 Segment 2                          S2
------+---------------------------------+--+---------------------------------+--
UP     ac   Et0/0(Ethernet)              UP mpls 10.55.55.2:1000              UP
            Interworking: ip                      Local VC label 16
                                                  Remote VC label 16
                                                  pw-class: mpls-ip
UP     ac   Se7/0(PPP)                   UP mpls 10.55.55.2:2175              UP
            Interworking: ip                      Local VC label 22
                                                  Remote VC label 17
                                                  pw-class: mpls-ip
UP pri ac   Se6/0:230(FR DLCI)           UP mpls 10.55.55.2:2230              UP
            Interworking: ip                      Local VC label 21
                                                  Remote VC label 18
pw-class: mpls-ip
IA sec ac   Se6/0:230(FR DLCI)           UP mpls 10.55.55.3:2231              DN
            Interworking: ip                      Local VC label unassigned
                                                  Remote VC label 19
                                                  pw-class: mpls-ip
SB ac   Se4/0:100(FR DLCI)           UP mpls 10.55.55.2:4000              SB
            Interworking: none                    Local VC label 18
                                                  Remote VC label 19
                                                  pw-class: mpls
UP     ac   Se6/0:500(FR DLCI)           UP l2tp 10.55.55.2:5000              UP
            Interworking: none                    Session ID: 34183
                                                  Tunnel ID: 62083
                                                  Peer name: pe-iou2
                                                  Protocol State: UP
                                                  Remote Circuit State: UP
                                                  pw-class: l2tp
UP     ac   Et1/0.1:200(Eth VLAN)        UP mpls 10.55.55.2:5200              UP
            Interworking: ip                      Local VC label 17
                                                  Remote VC label 20
                                                  pw-class: mpls-ip
UP pri ac   Se6/0:225(FR DLCI)           UP mpls 10.55.55.2:5225              UP
            Interworking: none                    Local VC label 19
                                                  Remote VC label 21
```

```
                                                pw-class: mpls
IA sec ac   Se6/0:225(FR DLCI)          UP mpls 10.55.55.3:5226              DN
            Interworking: none                  Local VC label unassigned
                                                Remote VC label 22
                                                pw-class: mpls
IA pri ac   Et1/0.2:100(Eth VLAN)       UP ac   Et2/0.2:100(Eth VLAN)       UP
            Interworking: none                  Interworking: none
UP sec ac   Et1/0.2:100(Eth VLAN)       UP mpls 10.55.55.3:1101              UP
            Interworking: none                  Local VC label 23
                                                Remote VC label 17
                                                pw-class: mpls
UP     ac   Se6/0:150(FR DLCI)          UP ac   Se8/0:150(FR DLCI)          UP
            Interworking: none                  Interworking: none
```

Sample Output for All Xconnect Attachment Circuits and Pseudowires on a Cisco uBR10012 Router in the Brief Display Format

The following is sample output from the **show xconnect** command in the brief (default) display format for all xconnect attachment circuits and pseudowires on a Cisco uBR10012 router:

```
Router# show xconnect all

Legend:    XC ST=Xconnect State  S1=Segment1 State  S2=Segment2 State
  UP=Up       DN=Down            AD=Admin Down      IA=Inactive
  SB=Standby  RV=Recovering      NH=No Hardware

XC ST  Segment 1                         S1 Segment 2                         S2
------+--------------------------------+--+--------------------------------+--
UP     ac   Bu254:2001(DOCSIS)           UP mpls 10.76.1.1:2001               UP
UP     ac   Bu254:2002(DOCSIS)           UP mpls 10.76.1.1:2002               UP
UP     ac   Bu254:2004(DOCSIS)           UP mpls 10.76.1.1:2004               UP
DN     ac   Bu254:22(DOCSIS)             UP mpls 101.1.0.2:22                 DN
```

Sample Output for All Xconnect Attachment Circuits and Pseudowires on a Cisco uBR10012 Router in the Detailed Display Format

The following is sample output from the **show xconnect** command in the detailed display format for all xconnect attachment circuits and pseudowires on a Cisco uBR10012 router:

```
Router# show xconnect all detail

Legend:    XC ST=Xconnect State  S1=Segment1 State  S2=Segment2 State
  UP=Up       DN=Down            AD=Admin Down      IA=Inactive
  SB=Standby  RV=Recovering      NH=No Hardware

XC ST  Segment 1                         S1 Segment 2                         S2
------+--------------------------------+--+--------------------------------+--
UP     ac   Bu254:2001(DOCSIS)           UP mpls 10.76.1.1:2001               UP
            Interworking: ethernet              Local VC label 40
                                                Remote VC label 110
                                                pw-class:
UP     ac   Bu254:2002(DOCSIS)           UP mpls 10.76.1.1:2002               UP
            Interworking: ethernet              Local VC label 41
                                                Remote VC label 88
                                                pw-class:
UP     ac   Bu254:2004(DOCSIS)           UP mpls 10.76.1.1:2004               UP
            Interworking: ethernet              Local VC label 42
                                                Remote VC label 111
                                                pw-class:
```

```
DN      ac    Bu254:22(DOCSIS)              UP mpls 101.1.0.2:22                 DN
              Interworking: ethernet                Local VC label 39
                                                    Remote VC label unassigned
                                                    pw-class:
```

Table 100 describes the significant fields shown in the displays.

Table 100 show xconnect all Field Descriptions

Field	Description
XC ST	State of the xconnect attachment circuit or pseudowire. The valid states are: • DN—The xconnect attachment circuit or pseudowire is down. Either segment 1, segment 2, or both segments are down. • IA—The xconnect attachment circuit or pseudowire is inactive. This state is valid only when pseudowire redundancy is configured. • NH—One or both segments of this xconnect no longer have the required hardware resources available to the system. • UP—The xconnect attachment circuit or pseudowire is up. Both segment 1 and segment 2 must be up for the xconnect to be up.
Segment1 or Segment2	Information about the type of xconnect, the interface type, and the IP address the segment is using. The types of xconnects are as follows: • ac—Attachment circuit • l2tp—Layer 2 Tunnel Protocol • mpls—Multiprotocol Label Switching • pri ac—Primary attachment circuit • sec ac—Secondary attachment circuit
S1 or S2	State of the segment. The valid states are: • AD—The segment is administratively down. • DN—The segment is down. • HS—The segment is in hot standby mode. • RV—The segment is recovering from a graceful restart. • SB—The segment is in a standby state. • UP—The segment is up.

The additional fields displayed in the detailed output are self-explanatory.

VPLS Autodiscovery Feature Example

For the VPLS Autodiscovery feature, issuing the **show xconnect** command with the **rib** keyword provides RIB details, as shown in the following example:

```
Router# show xconnect rib

Local Router ID: 10.9.9.9

Legend: O=Origin, P=Provisioned, TID=Target ID, B=BGP, Y=Yes, N=No
O P  VPLS/VPWS-ID         TID        Next-Hop        Route-Target
-+-+--------------------+-----------+---------------+--------------------
B Y 10:123                192.0.2.0    192.0.2.5     10:123
```

```
B N 10:123                192.0.2.1    192.0.2.6     10:123
B Y 10.100.100.100:1234   192.0.2.3    192.0.2.7     10.111.111.111:12345
                                       192.0.2.8     10.8.8.8:345
                                       192.0.2.9
B Y 192.0.3.1:1234        192.0.2.4 10.1.1.1         10.111.111.111:12345
```

Table 101 describes the significant fields shown in the display.

Table 101 show xconnect rib Field Descriptions

Field	Description
Local Router ID	A unique router identifier. Virtual Private LAN Service (VPLS) Autodiscovery automatically generates a router ID using the MPLS global router ID.
O	Origin of the route.
P	Indicates whether the pseudowire has been provisioned using a learned route.
VPLS/WPWS-ID	Virtual Private LAN Service (VPLS) domain. VPLS Autodiscovery automatically generates a VPLS ID using the Border Gateway Protocol (BGP) autonomous system number and the configured VFI VPN ID.
TID	Target ID. The IP address of the destination router.
Next-Hop	IP address of the next hop router.
Route-Target	Route target (RT). VPLS Autodiscovery automatically generates a route target using the lower 6 bytes of the route distinguisher (RD) and VPN ID.

For VPLS Autodiscovery, issuing the **show xconnect** command with the **rib** and **detail** keywords provides more information about the routing information base, as shown in the following example:

```
Router# show xconnect rib detail

Local Router ID: 10.9.9.9

VPLS-ID 10:123, TID 10.7.7.7
  Next-Hop: 10.7.7.7
  Hello-Source: 10.9.9.9
  Route-Target: 10:123
  Incoming RD: 10:10
  Forwarder: vfi VPLS1
  Origin: BGP
  Provisioned: Yes
VPLS-ID 10:123, TID 10.7.7.8
  Next-Hop: 10.7.7.8
  Hello-Source: 10.9.9.9
  Route-Target: 10:123
  Incoming RD: 10:11
  Forwarder: vfi VPLS1
  Origin: BGP
  Provisioned: No
VPLS-ID 10.100.100.100:1234, TID 0.0.0.2
  Next-Hop: 10.2.2.2, 10.3.3.3, 10.4.4.4
  Hello-Source: 10.9.9.9
  Route-Target: 10.111.111.111:12345, 10.8.8.8:345
  Incoming RD: 10:12
  Forwarder: vfi VPLS2
```

```
  Origin: BGP
  Provisioned: Yes
VPLS-ID 10.100.100.100:1234, TID 10.13.1.1
  Next-Hop: 10.1.1.1
  Hello-Source: 10.9.9.9
  Route-Target: 10.111.111.111:12345
  Incoming RD: 10:13
  Forwarder: vfi VPLS2
  Origin: BGP
  Provisioned: Yes
```

Table 102 describes the significant fields shown in the display.

Table 102 show xconnect rib detail Field Descriptions

Field	Description
Hello-Source	Source IP address used when Label Distribution Protocol (LDP) hello messages are sent to the LDP peer for the autodiscovered pseudowire.
Incoming RD	Route distinguisher for the autodiscovered pseudowire.
Forwarder	VFI to which the autodiscovered pseudowire is attached.

L2VPN VPLS Inter-AS Option B Examples

The following is sample output from the **show xconnect rib** command when used in an L2VPN VPLS Inter-AS Option B configuration:

```
Router# show xconnect rib

Local Router ID: 10.9.9.9

+- Origin of entry  (i=iBGP/e=eBGP)
| +- Provisioned    (Yes/No)?
| | +- Stale entry  (Yes/No)?
| | |
v v v
O P S        VPLS-ID         Target ID       Next-Hop        Route-Target
-+-+-+------+---------------+---------------+---------------+-------------
i Y N        1:1             10.11.11.11     10.11.11.11     1:1
i Y N        1:1             10.12.12.12     10.12.12.12     1:1
```

Table 103 describes the significant fields shown in the display.

Table 103 show xconnect rib Field Descriptions

Field	Description
Local Router ID	A unique router identifier. Virtual Private LAN Service (VPLS) Autodiscovery automatically generates a router ID using the MPLS global router ID.
Origin of entry	Origin of the entry. The origin can be “i” for internal BGP or “e” for external BGP.
Provisioned	Indicates whether the pseudowire has been provisioned using a learned route; Yes or No.
Stale entry	Stale entry; Yes or No.

Table 103 show xconnect rib Field Descriptions (continued)

Field	Description
VPLS-ID	Virtual Private LAN Service (VPLS) domain. VPLS Autodiscovery automatically generates a VPLS ID using the Border Gateway Protocol (BGP) autonomous system number and the configured VFI VPN ID.
Target ID	Target ID. The IP address of the destination router.
Next-Hop	IP address of the next hop router.
Route-Target	Route target (RT). VPLS Autodiscovery automatically generates a route target using the lower 6 bytes of the route distinguisher (RD) and VPN ID.

The following is sample output from the **show xconnect rib detail** command when used in an ASBR configuration. On an ASBR, the **show xconnect rib detail** command displays the Layer 2 VPN BGP network layer reachability information (NLRI) received from the BGP peers. The display also shows the signaling messages received from the targeted Label Distribution Protocol (LDP) sessions for a given target attachment individual identifier (TAII).

```
Router# show xconnect rib detail

Local Router ID: 10.1.1.3

VPLS-ID: 1:1, Target ID: 10.1.1.1
  Next-Hop: 10.1.1.1
  Hello-Source: 10.1.1.3
  Route-Target: 2:2
  Incoming RD: 10.0.0.0:1
  Forwarder:
  Origin: BGP
  Provisioned: Yes
  SAII: 10.0.0.1, LDP Peer Id: 10.255.255.255, VC Id: 1001 ***
  SAII: 10.1.0.1, LDP Peer Id: 10.255.255.255, VC Id: 1002 ***
```

After the passive TPE router receives the BGP information (and before the passive TPE router receives the LDP label), the peer information will be displayed in the output of the **show xconnect rib** command. The peer information will not be displayed in the **show mpls l2transport vc** command because the VFI AToM xconnect has not yet been provisioned.

Therefore, for passive TPEs, the entry “Passive : Yes” is added to the output from the **show xconnect rib detail** command. In addition, the entry “Provisioned: Yes” is displayed after the neighbor xconnect is successfully created (without any retry attempts).

In the sample output, the two lines beginning with “SAII” show that this ASBR is stitching two provider PE routers (10.0.0.1 and 10.1.0.1) to the TAII 10.1.1.1.

Table 104 describes the significant fields shown in the display.

Table 104 show xconnect rib detail (for the ASBR) Field Descriptions

Field	Description
VPLS-ID	VPLS identifier.
Target ID	Target ID. The IP address of the destination router.
Next-Hop	IP address of the next hop router.

Table 104 show xconnect rib detail (for the ASBR) Field Descriptions (continued)

Field	Description
Hello-Source	Source IP address used when LDP hello messages are sent to the LDP peer for the autodiscovered pseudowire.
Route-Target	Route target (RT). VPLS Autodiscovery automatically generates a route target using the lower 6 bytes of the route distinguisher (RD) and VPN ID.
Incoming RD	Route distinguisher for the autodiscovered pseudowire.
Forwarder	VFI to which the autodiscovered pseudowire is attached.
Origin	Origin of the entry.
Provisioned	Indicates whether the neighbor xconnect was successfully created (without any retry attempts).
SAII	Source attachment individual identifier.

The following is sample output from the **show xconnect rib checkpoint** command. Autodiscovered pseudowire information is checkpointed to the standby Route Processor (RP). The **show xconnect rib checkpoint** command displays that pseudowire information.

```
Router# show xconnect rib checkpoint

Xconnect RIB Active RP:
  Checkpointing   : Allowed
  Checkpoing epoch: 1
  ISSU Client id: 2102, Session id: 82, Compatible with peer

  Add entries send ok     :          0
  Add entries send fail   :          0
  Delete entries send ok  :          0
  Delete entries send fail:          0

  +- Checkpointed to standby (Y/N)?
  | +- Origin of entry (i=iBGP/e=eBGP)
  | |
  v v
  C O       VPLS-ID        Target ID         Next-Hop      Route-Target
  -+-+---------------------+---------------+---------------+----------------
  N e 1:1                    10.1.1.2         10.1.1.2         2:2
  N e 1:1                    10.1.1.1         10.1.1.3         2:2
```

Table 105 describes the significant fields shown in the display.

Table 105 show xconnect rib checkpoint Field Descriptions

Field	Description
Checkpointing	Indicates whether checkpointing is allowed.
Checkpointing epoch	Checkpointing epoch number.
Checkpointed to standby	Indicates whether the autodiscovered pseudowire information is checkpointed to the standby RP.
Origin of entry	Origin of the entry; “i” for internal BGP or “e” for external BGP.
VPLS-ID	VPLS identifier.

Table 105 show xconnect rib checkpoint Field Descriptions (continued)

Field	Description
Target ID	Target ID. The IP address of the destination router.
Next-Hop	IP address of the next hop router.
Route-Target	Route target (RT). VPLS Autodiscovery automatically generates a route target using the lower 6 bytes of the RD and VPN ID.

Related Commands

Command	Description
show atm pvc	Displays all ATM PVCs and traffic information.
show atm vc	Displays all ATM PVCs and SVCs and traffic information.
show atm vp	Displays the statistics for all VPs on an interface or for a specific VP.
show connect	Displays configuration information about drop-and-insert connections that have been configured on a router.
show frame-relay pvc	Displays statistics about PVCs for Frame Relay interfaces.
show interfaces	Displays statistics for all interfaces configured on the router or access server.
show l2tun session	Displays the current state of Layer 2 sessions and protocol information about L2TP control channels.
show mpls l2transport binding	Displays VC label binding information.
show mpls l2transport vc	Displays information about AToM VCs that have been enabled to route Layer 2 packets on a router.

shutdown (FR-ATM)

To shut down a Frame Relay-ATM Network Interworking (FRF.5) connection or a Frame Relay-ATM Service Interworking (FRF.8) connection, use the **shutdown** command in FRF.5 or FRF.8 connect configuration mode. To disable disconnection, use the **no** form of this command.

shutdown

no shutdown

Syntax Description

This command has no arguments or keywords.

Defaults

No default behavior or values

Command Modes

FRF.5 connect configuration
FRF.8 connect configuration

Command History

Release	Modification
12.1(2)T	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines

An FRF.5 or FRF.8 connection must be manually shut down once the interworking connection is created by use of the **shutdown** command.

Examples

FRF.5 Shutdown: Example

The following example shows how to shut down an FRF.5 connection:

```
Router(config)# connect network-2 interface serial0/1 16 atm3/0 0/32 network-interworking
.
.
.
Router(config-frf5)# shutdown
```

FRF.8 Shutdown: Example

The following example shows how to shut down an FRF.8 connection:

```
Router(config)# connect serial0 100 atm3/0 1/35 service-interworking
.
.
.
Router(config-frf8)# shutdown
```

Related Commands

Command	Description
connect (FRF.5)	Connects a Frame Relay DLCI or VC group to an ATM PVC.

smds address

To specify the Switched Multimegabit Data Service (SMDS) individual address for a particular interface, use the **smds address** command in interface configuration mode. To remove the address from the configuration file, use the **no** form of this command.

smds address *smds-address*

no smds address *smds-address*

Syntax Description

smds-address	Individual address provided by the SMDS service provider. It is protocol independent.

Defaults

No address is specified.

Command Modes

Interface configuration

Command History

Release	Modification
10.0	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines

All addresses for SMDS service are assigned by the service provider, and can be assigned to individuals and groups.

Addresses are entered in the Cisco SMDS configuration software using an E prefix for *multicast* addresses and a C prefix for *unicast* addresses. Cisco IOS software expects the addresses to be entered in E.164 format, which is 64 bits. The first 4 bits are the address type, and the remaining 60 bits are the address. If the first 4 bits are 1100 (0xC), the address is a unicast SMDS address, which is the address of an individual SMDS host. If the first 4 bits are 1110 (0xE), the address is a multicast SMDS address, which is used to broadcast a packet to multiple end points. The 60 bits of the address are in binary-coded decimal (BCD) format. Each 4 bits of the address field presents a single telephone number digit, allowing for up to 15 digits. At a minimum, you must specify at least 11 digits (44 bits). Unused bits at the end of this field are filled with ones.

Note If bridging is enabled on any interface, the SMDS address is erased and must be reentered.

Examples

The following example specifies an individual address in Ethernet-style notation:

```
interface serial 0
 smds address c141.5797.1313.FFFF
```

smds dxi

To enable the Data Exchange Interface (DXI) version 3.2 support, use the **smds dxi** command in interface configuration mode. To disable the DXI 3.2 support, use the **no** form of this command.

smds dxi

no smds dxi

Syntax Description

This command has no arguments or keywords.

Defaults

Enabled

Command Modes

Interface configuration

Command History

Release	Modification
10.0	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines

Adding this command to the configuration enables the DXI version 3.2 mechanism and encapsulates SMDS packets in a DXI frame before they are transmitted. DXI 3.2 adds an additional 4 bytes to the SMDS packet header to communicate with the SMDS data service unit (SDSU). These bytes specify the frame type. The interface expects all packets to arrive with DXI encapsulation.

The DXI 3.2 support also includes the heartbeat process as specified in the SIG-TS-001/1991 standard, revision 3.2. The heartbeat (active process) is enabled when both DXI and keepalives are enabled on the interface. The echo (passive process) is enabled when DXI is enabled on the interface. The heartbeat mechanism automatically generates a heartbeat poll frame every 10 seconds. This default value can be changed with the **keepalive** (LMI) command.

Fast switching of DXI frames is supported, but Interim Local Management Interface (ILMI) is not.

Note If you are running serial lines back-to-back, disable keepalive on SMDS interfaces. Otherwise, DXI declares the link down.

Note Switching in or out of DXI mode causes the IP cache to be cleared. This clearing process is necessary to remove all cached IP entries for the serial line being used. Stale entries must be removed to allow the new MAC header with or without DXI framing to be installed in the cache. This clearing process is not frequently done and is not considered to be a major performance penalty.

Examples

The following example enables DXI 3.2 on interface HSSI 0:

```
interface hssi 0
 encapsulation smds
 smds dxi
 smds address C120.1111.2222.FFFF
 ip address 172.20.1.30 255.255.255.0
 smds multicast ip E180.0999.9999
 smds enable-arp
```

Related Commands

Command	Description
keepalive (**LMI**)	Enables the LMI mechanism for serial lines using Frame Relay encapsulation.

smds enable-arp

To enable dynamic Address Resolution Protocol (ARP), use the **smds enable-arp** interface configuration command. The multicast address for ARP must be set before this command is issued. To disable the interface once ARP has been enabled, use the **no** form of this command.

smds enable-arp

no smds enable-arp

Syntax Description

This command has no arguments or keywords.

Defaults

Disabled

Command Modes

Interface configuration

Command History

Release	Modification
10.0	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Examples

The following example enables the dynamic ARP routing table:

```
interface serial 0
 ip address 172.20.1.30 255.255.255.0
 smds multicast IP E180.0999.9999.2222
 smds enable-arp
```

Related Commands

Command	Description
arp	Enables ARP entries for static routing over the SMDS network.

smds glean

To enable dynamic address mapping for Internet Packet Exchange (IPX) over Switched Multimegabit Data Service (SMDS), use the **smds glean** interface configuration command. To disable dynamic address mapping for IPX over SMDS, use the **no** form of this command.

smds glean *protocol* [*timeout-value*] [**broadcast**]

no smds glean *protocol*

Syntax Description

protocol	Protocol type. Only IPX is supported.
timeout-value	(Optional) Time to live (TTL) value. Value can be from 1 to 65535 minutes. The default is 5 minutes. This value indicates how long a gleaned dynamic map is stored in the SMDS map table.
broadcast	(Optional) Marks the gleaned protocol address as a candidate for broadcast packets. All broadcast requests are sent to the unicast SMDS address.

Defaults

Disabled

Command Modes

Interface configuration

Command History

Release	Modification
11.1	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines

The **smds glean** command uses incoming packets to dynamically map SMDS addresses to higher-level protocol addresses. Therefore the need for static map configuration for the IPX protocol is optional rather than mandatory. However, any static map configuration overrides the dynamic maps.

If a map is gleaned and it already exists as a dynamic map, the timer for the dynamic map is reset to the default value or the user-specified value.

Examples

The following example enables dynamic address mapping for IPX on interface serial 0 and sets the time to live (TTL) to 14 minutes:

```
interface serial 0
 encapsulation smds
 smds address c141.5797.1313.FFFF
 smds multicast ipx e1800.0999.9999.FFFF
 smds glean ipx 14
```

smds multicast

To assign a multicast Switched Multimegabit Data Service (SMDS) E.164 address to a higher-level protocol, use the **smds multicast** command in interface configuration mode. To remove an assigned multicast address, use the **no** form of this command.

smds multicast *protocol smds-address*

no smds multicast *protocol smds-address*

Syntax Description

protocol	Protocol type. See Table 106 for a list of supported protocols and their keywords.
smds-address	SMDS address. Because SMDS does not incorporate broadcast addressing, a group address for a particular protocol must be defined to serve the broadcast function.

Defaults

No mapping is defined.

Command Modes

Interface configuration

Command History

Release	Modification
10.0	This command was introduced.
12.2(13)T	The **vines** and **xns** arguments were removed because Banyan VINES and Xerox Network Systems are no longer available in the Cisco IOS software.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines

When configuring DECnet, you must enter all four DEC keywords (**decnet**, **decnet_router-L1**, **decnet_router-L2**, and **decnet_node**) in the configuration.

Table 106 lists the high-level protocols supported by the **smds multicast** command.

Table 106 smds multicast Supported Protocols

Keyword	Protocol
aarp	AppleTalk Address Resolution Protocol
appletalk	AppleTalk
arp	Address Resolution Protocol
bridge	Transparent bridging
clns	International Organization for Standardization (ISO) Connectionless Network Service (CLNS)
clns_es	Multicast address for all CLNS end systems
clns_is	Multicast address for all CLNS intermediate systems
decnet	DECnet
decnet_node	DECnet multicast address for all end systems
decnet_router-L1	DECnet multicast address for all Level 1 (intra-area) routers
decnet_router-L2	DECnet multicast address for all Level 2 (interarea) routers
ip	Internet Protocol (IP)
ipx	Novell IPX

For IP, the IP NETwork and MASK fields are no longer required. The Cisco IOS software accepts these arguments, but ignores the values. These were required commands for the previous multiple logical IP subnetworks configuration. The software continues to accept the arguments to allow for backward compatibility, but ignores the contents.

Examples

The following example maps the IP broadcast address to the SMDS group address E180.0999.9999:

```
interface serial 0
 smds multicast IP E180.0999.9999.FFFF
```

smds multicast arp

To map the Switched Multimegabit Data Service (SMDS) address to a multicast address, use the **smds multicast arp** interface configuration command. To disable this feature, use the **no** form of this command.

smds multicast arp *smds-address* [*ip-address mask*]

no smds multicast arp *smds-address* [*ip-address mask*]

Syntax Description

smds-address	SMDS address in E.164 format.
ip-address	(Optional) IP address.
mask	(Optional) Subnet mask for the IP address.

Defaults

No mapping is defined.

Command Modes

Interface configuration

Command History

Release	Modification
10.0	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines

This command is used only when an Address Resolution Protocol (ARP) server is present on a network. When broadcast ARPs are sent, SMDS first attempts to send the packet to all multicast ARP SMDS addresses. If none exist in the configuration, broadcast ARPs are sent to all multicast IP SMDS multicast addresses. If the optional ARP multicast address is missing, each entered IP multicast command is used for broadcasting.

Examples

The following example configures broadcast ARP messages:

```
interface serial 0
 smds multicast arp E180.0999.9999.2222
```

Related Commands

Command	Description
smds multicast ip	Maps an SMDS group address to a secondary IP address.

smds multicast bridge

To enable spanning-tree updates, use the **smds multicast bridge** interface configuration command. To disable this function, use the **no** form of this command.

smds multicast bridge *smds-address*

no smds multicast bridge *smds-address*

Syntax Description

smds-address	SMDS multicast address in E.164 format.

Defaults

No multicast SMDS address is defined. Spanning tree updates are disabled for transparent bridging across SMDS networks.

Command Modes

Interface configuration

Command History

Release	Modification
10.0	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines

To allow transparent bridging of packets across serial and High-Speed Serial Interface (HSSI) interfaces in an SMDS network, the SMDS interface must be added to an active bridge group. Also, standard bridging commands are necessary to enable bridging on an SMDS interface.

When the **smds multicast bridge** command is added to the configuration, broadcast packets are encapsulated with the specified SMDS multicast address configured for bridging. Two broadcast Address Resolution Protocol (ARP) packets are sent to the multicast address. One is sent with a standard (SMDS) ARP encapsulation, while the other is sent with the ARP packet encapsulated in an 802.3 MAC header. The native ARP is sent as a regular ARP broadcast.

Cisco's implementation of IEEE 802.6i transparent bridging for SMDS supports 802.3, 802.5, and FDDI frame formats. The router can accept frames with or without frame check sequence (FCS). Fast-switched transparent bridging is the default and is not configurable. If a packet cannot be fast switched, it is process switched.

In Cisco IOS Release 10.2 software (or earlier), bridging over multiple logical IP subnetworks is not supported. Bridging of IP packets in a multiple logical IP subnetworks environment is unpredictable.

Examples

In the following example, all broadcast bridge packets are sent to the configured SMDS multicast address:

```
interface hssi 0
 encapsulation smds
 smds address C120.1111.2222.FFFF
 ip address 172.16.0.0 255.255.255.0
 smds multicast bridge E180.0999.9999.FFFF
 bridge-group 5
```

Related Commands

Command	Description
bridge-group	Assigns each network interface to a bridge group.

smds multicast ip

To map a Switched Multimegabit Data Service (SMDS) group address to a secondary IP address, use the **smds multicast ip** interface configuration command. To remove the address map, use the **no** form of this command.

smds multicast ip *smds-address* [*ip-address mask*]

no smds multicast ip *smds-address* [*ip-address mask*]

Syntax Description

smds-address	SMDS address in E.164 format.
ip-address	(Optional) IP address.
mask	(Optional) Subnet mask for the IP address.

Defaults

The IP address and mask default to the primary address of the interface if they are left out of the configuration.

Command Modes

Interface configuration

Command History

Release	Modification
10.0	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines

This command allows a single SMDS interface to be treated as multiple logical IP subnetworks. If taking advantage of the multiple logical IP subnetworks support in SMDS, you can use more than one multicast address on the SMDS interface (by entering multiple commands). However, each **smds multicast ip** command entry must be associated with a different IP address on the SMDS interface.

Broadcasts can be sent on the SMDS interface by means of the multicast address. By sending broadcasts in this manner, the router is not required to replicate broadcasts messages to every remote host.

In addition, the higher-level protocols such as Open Shortest Path First (OSPF) and Intermediate System-to-Intermediate System (IS-IS) can use the multicast capability by sending one update packet or routing packet to the multicast address.

If the optional IP address and mask arguments are not present, the SMDS address and multicast address are associated with the primary IP address of the interface. This association allows the command to be backward compatible with earlier versions of the software.

If an Address Resolution Protocol (ARP) multicast address is missing, each entered IP multicast command is used for broadcasting. The ARP multicast command has the same format as the IP multicast command and is typically used only when an ARP server is present in the network.

Note All routers at the other end of the SMDS cloud must have the multiple logical IP subnetworks capability enabled. If you allocate a different SMDS subinterface for each logical IP subnetwork on the SMDS interface, you do not have to configure secondary IP addresses.

Examples

The following example configures an interface with two subinterfaces to support two different IP subnets with different multicast addresses to each network:

```
interface serial 2/0
 encapsulation smds
 smds address C120.1111.2222.4444

interface serial 2/0.1 multipoint
 smds addr c111.3333.3333.3333
 ip address 2.2.2.1 255.0.0.0
 smds multicast ip e222.2222.2222.2222
 smds enable-arp

interface serial 2/0.2 multipoint
 smds addr c111.2222.3333.3333.3333
 ip address 2.3.3.3 255.0.0.0
 smds multicast ip E180.0999.9999.FFFF
 smds enable-arp
```

Related Commands

Command	Description
smds multicast arp	Maps the SMDS address to a multicast address.

smds static-map

To configure a static map between an individual Switched Multimegabit Data Service (SMDS) address and a higher-level protocol address, use the **smds static-map** command in interface configuration mode. To remove the map, use the **no** form of this command with the appropriate arguments.

smds static-map *protocol protocol-address smds-address* [**broadcast**]

no smds static-map *protocol protocol-address smds-address* [**broadcast**]

Syntax Description

protocol	Higher-level protocol. It can be one of the following values: **appletalk**, **clns**, **decnet**, **ip**, or **ipx**.
protocol-address	Address of the higher-level protocol.
smds-address	SMDS address, to complete the mapping.
broadcast	(Optional) Marks the specified protocol address as a candidate for broadcast packets. All broadcast requests are sent to the unicast SMDS address.

Defaults

No mapping is defined.

Command Modes

Interface configuration

Command History

Release	Modification
10.0	This command was introduced.
12.2(13)T	The **vines** and **xns** arguments were removed because Banyan VINES and Xerox Network Systems are no longer available in the Cisco IOS software.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines

The **smds static-map** command provides *pseudobroadcasting* by allowing the use of broadcasts on those hosts that cannot support SMDS multicast addresses.

Examples

The following example illustrates how to enable pseudobroadcasting. The router at address C120.4444.9999 will receive a copy of the broadcast request because the broadcast keyword is specified with the **smds static-map** command. The host at address 172.16.1.15 is incapable of receiving multicast packets. The multicasting is simulated with this feature.

```
interface hssi 0
 encapsulation smds
 smds address C120.1111.2222.FFFF
 ip address 172.16.1.30 255.255.255.0
 smds static-map ip 172.16.1.15 C120.4444.9999.FFFF broadcast
 smds enable-arp
```

The following example illustrates how to enable multicasting. In addition to IP and ARP requests to E100.0999.9999, the router at address C120.4444.9999 will also receive a copy of the multicast request. The host at address 172.16.1.15 is incapable of receiving broadcast packets.

```
interface hssi 0
 encapsulation smds
 smds address C120.1111.2222.FFFF
 ip address 172.16.1.30 255.255.255.0
 smds multicast ip E100.0999.999.FFFF
 smds static-map ip 172.16.1.15 C120.4444.9999.FFFF
 smds enable-arp
```

status admin-down disconnect

To configure Layer 2 tunneling (L2TUN) sessions to disconnect upon attachment circuit (AC) shutdown, use the **status admin-down disconnect** command in pseudowire class configuration mode. To disable disconnection of L2TUN sessions upon AC shutdown, use the **no** form of this command.

status admin-down disconnect

no status admin-down disconnect

Syntax Description

This command has no arguments or keywords.

Command Default

Layer 2 tunneling sessions do not disconnect upon attachment circuit (AC) shutdown.

Command Modes

Pseudowire class configuration (config-pw)

Command History

Release	Modification
12.2(33)SRC	This command was introduced.

Usage Guidelines

Use the **show l2tp session** command to determine whether the sessions are disconnected.

Examples

The following example shows how to enter pseudowire class configuration mode to configure a pseudowire configuration template named ether-pw and configure L2TUN sessions to disconnect on AC shutdown.

```
Router> enable
Password:
Router# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)# pseudowire-class ether-pw
 Router(config-pw)# status admin-down disconnect
 Router(config-pw)# end
```

Related Commands

Command	Description
pseudowire-class	Specifies the name of a Layer 2 pseudowire class and enter pseudowire class configuration mode.
show l2tp session	Displays information about L2TP sessions.
show l2tun tunnel	Displays the current state of Layer 2 Tunneling Protocol (L2TP) tunnels and information about configured tunnels, including local and remote hostnames, aggregate packet counts, and control channel information.

tfo auto-discovery blacklist

To configure a blacklist with autodiscovery for WAAS Express, use the **tfo auto-discovery blacklist** command in parameter-map configuration mode. To remove the configuration, use the **no** form of this command.

tfo auto-discovery blacklist {**enable** | **hold-time** *minutes*}

no tfo auto-discovery blacklist {**enable** | **hold-time** *minutes*}

Syntax Description

enable	Enables a blacklist.
hold-time *minutes*	Configures a blacklist hold time, in minutes. The range is 1 to 10080.

Command Default

Blacklist with autodiscovery is not enabled.

Command Modes

Parameter-map configuration (config-profile)

Command History

Release	Modification
15.1(2)T	This command was introduced.

Usage Guidelines

Use this command to enable, configure, and integrate a blacklist with autodiscovery and specify the hold time for a blacklist in WAAS Express. Blacklists enable you to get the benefit of WAAS Express if there are devices in your network that discard packets with TCP options.

Autodiscovery allows the WAAS Express device to automatically discover and connect to a new file server when a Common Internet File System (CIFS) request is received. The autodiscovery of peer WAAS Express devices is achieved using TCP options. These TCP options are recognized and understood only by WAAS Express devices and are ignored by non-WAAS Express devices.

Examples

The following example configures autodiscovery by enabling the blacklist and setting the hold time for 100 minutes:

```
Router(config)# parameter-map type waas waas_global
Router(config-profile)# tfo auto-discovery blacklist enable
Router(config-profile)# tfo auto-discovery blacklist hold-time 100
```

Related Commands

Command	Description
cpu-threshold	Sets the CPU threshold limit.
lz entropy	Enables entropy checking to turn on Lempel-Ziv (LZ) compression.
parameter-map type waas	Defines a WAAS Express parameter map.

Command	Description
policy-map type waas	Configures WAAS Express policy map.
tfo optimize	Configures compression for WAAS Express.

tfo optimize

To configure the compression for WAAS Express, use the **tfo optimize** command in parameter-map configuration mode. To remove the compression, use the **no** form of this command.

tfo optimize {**full** | **dre** {**no** | **yes**} {**compression** {**lz** | **none**}}

no tfo optimize [**full** | **dre** {**no** | **yes**} {**compression** {**lz** | **none**}]

Syntax Description

full	Turns on Data Redundancy Elimination (DRE) and compression.
dre	Enables DRE.
no	Turns off DRE.
yes	Turns on DRE.
compression	Turns on compression.
lz	Turns on Lempel-Ziv (LZ) compression.
none	Turns off LZ compression.

Command Default

Compression is not configured.

Command Modes

Parameter-map configuration (config-profile)

Command History

Release	Modification
15.1(2)T	This command was introduced.

Usage Guidelines

Use this command to specify a compression technology to reduce the size of data. WAAS Express uses the following compression technologies to help you transmit data over your WAN:

- DRE
- LZ

These compression technologies reduce the size of transmitted data by removing redundant information before sending the shortened data stream over the WAN. By reducing the amount of transferred data, WAAS compression can reduce network utilization and application response times.

LZ compression operates on smaller data streams and keeps limited compression history. DRE operates on significantly larger streams (typically tens to hundreds of bytes or more) and maintains a much larger compression history. Large chunks of redundant data is common in file system operations when files are incrementally changed from one version to another or when certain elements are common to many files, such as file headers and logos.

Examples

The following example turns off the DRE compression and turns on the LZ compression:

```
Router(config)# parameter-map type waas waas_global
Router(config-profile)# tfo optimize dre no compression lz
```

Related Commands

Command	Description
cpu-threshold	Sets the CPU threshold limit.
lz entropy-check	Enables entropy checking to turn on LZ compression.
parameter-map type waas	Defines a WAAS Express parameter map.
policy-map type waas	Configures WAAS Express policy map.
tfo auto-discovery blacklist	Configures black list with autodiscovery for WAAS Express.

threshold de

To configure the threshold at which discard eligible (DE)-marked packets will be discarded from switched permanent virtual circuits (PVCs) on the output interface, use the **threshold de** command in Frame Relay congestion management configuration mode. To remove the threshold configuration, use the **no** form of this command.

threshold de *percentage*

no threshold de *percentage*

Syntax Description

percentage	Threshold at which DE-marked packets will be discarded, specified as a percentage of maximum queue size.

Defaults

100%

Command Modes

Frame Relay congestion management configuration

Command History

Release	Modification
12.1(2)T	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines

You must enable Frame Relay congestion management on the interface before congestion management parameters will be effective. To enable Frame Relay congestion management and to enter Frame Relay congestion management configuration mode, use the **frame-relay congestion-management** interface command.

You must enable Frame Relay switching, using the **frame-relay switching** global command, before the **threshold de** command will be effective on switched PVCs.

Examples

The following example shows how to configure a DE threshold of 40% on serial interface 1.

```
interface serial1
 encapsulation frame-relay
 frame-relay congestion-management
  threshold de 40
```

Related Commands

Command	Description
frame-relay congestion-management	Enables Frame Relay congestion management functions on all switched PVCs on an interface, and enters congestion management configuration mode.
frame-relay congestion threshold de	Configures the threshold at which DE-marked packets will be discarded from the traffic-shaping queue of a switched PVC.
frame-relay congestion threshold ecn	Configures the threshold at which ECN bits will be set on packets in the traffic-shaping queue of a switched PVC.
frame-relay switching	Enables PVC switching on a Frame Relay DCE or NNI.
threshold ecn	Configures the threshold at which ECN bits will be set on packets in switched PVCs on the output interface.

threshold ecn

To configure the threshold at which explicit congestion notification (ECN) bits will be set on packets in switched permanent virtual circuits (PVCs) on the output interface, use the **threshold ecn** command in Frame Relay congestion management configuration mode. To remove the threshold configuration, use the **no** form of this command.

For Frame Relay Switching

threshold ecn {**bc** | **be**} *percentage*

no threshold ecn {**bc** | **be**} *percentage*

For Frame Relay over MPLS

threshold ecn *percentage*

no threshold ecn *percentage*

Syntax Description

bc	Specifies threshold for committed traffic. This keyword is not available for Frame Relay over MPLS.
be	Specifies threshold for excess traffic. This keyword is not available for Frame Relay over MPLS.
percentage	Threshold at which ECN bits will be set on packets, specified as a percentage of maximum queue size. Default is 100 percent.

Defaults

An ECN threshold is not configured.

Command Modes

Frame Relay congestion management configuration

Command History

Release	Modification
12.1(2)T	This command was introduced.
12.0(26)S	This command was modified for Frame Relay over MPLS.
12.2(27)SXA	This command was integrated into Cisco IOS Release 12.2(27)SXA.
12.2(28)SB	This command was integrated into Cisco IOS Release 12.2(28)SB.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.

Usage Guidelines

You must enable Frame Relay congestion management on the interface before congestion management parameters will be effective. To enable Frame Relay congestion management and to enter Frame Relay congestion management configuration mode, use the **frame-relay congestion-management** interface command.

Frame Relay Switching Guidelines

- You must enable Frame Relay switching, using the **frame-relay switching** global command, before the **threshold ecn** command will be effective on switched PVCs.
- You can configure separate queue thresholds for committed and excess traffic.
- Configure the BECN threshold so that it is greater than or equal to zero and less than or equal to the BECN threshold. Configure the BECN threshold so that it is less than or equal to 100.

Examples

Frame Relay Switching: Example

The following example shows how to configure a Be threshold of 0 and a Bc threshold of 20 percent on serial interface 1.

```
interface serial1
    encapsulation frame-relay
    frame-relay congestion-management
        threshold ecn be 0
        threshold ecn bc 20
```

Frame Relay over MPLS: Example

The following example shows a configuration of interface serial2/1 for a threshold of 50 percent.

```
interface Serial2/1
    bandwidth 50000
    service-policy output output-policy
    frame-relay congestion-management
        threshold ecn 50
```

Related Commands

Command	Description
frame-relay congestion-management	Enables Frame Relay congestion management functions on all switched PVCs on an interface, and enters congestion management configuration mode.
frame-relay switching	Enables PVC switching on a Frame Relay DCE or NNI.

timeout setup

To configure the amount of time allowed to set up a control channel with a remote provider edge (PE) router at the other end of a Layer 2 pseudowire, use the **timeout setup** command in L2TP class configuration mode. To disable the configured value, use the **no** form of this command.

timeout setup *seconds*

no timeout setup *seconds*

Syntax Description

seconds	The number of seconds allowed to set up a Layer 2 control channel. The valid values range from 60 to 6000. The default value is 300 seconds.

Command Default

The default number of seconds allowed to set up a control channel is 300.

Command Modes

L2TP class configuration

Command History

Release	Modification
12.0(23)S	This command was introduced.
12.3(2)T	This command was integrated into Cisco IOS Release 12.3(2)T.
12.2(25)S	This command was integrated into Cisco IOS Release 12.2(25)S.
12.2(27)SBC	Support for this command was integrated into Cisco IOS Release 12.2(27)SBC.

Usage Guidelines

Use this command to configure the amount of time that can be spent attempting to establish a control channel.

Examples

The following example sets a timeout period of 200 seconds to establish a control channel with a remote peer in Layer 2 pseudowires that have been configured with the L2TP class named l2tp-class:

```
Router(config)# l2tp-class l2tp-class1
Router(config-l2tp-class)# timeout setup 200
```

Related Commands

Command	Description
l2tp-class	Creates a template of L2TP control plane configuration settings that can be inherited by different pseudowire classes and enters L2TP class configuration mode.

vc-group

To assign multiple Frame Relay data-link connection identifiers (DLCIs) to a virtual circuit (VC) group for Frame Relay-to-ATM Network Interworking (FRF.5), use the **vc-group** command in global configuration mode. To disable the VC group assignments, use the **no** form of this command.

vc-group *group-name*

no vc-group *group-name*

The **vc-group** command requires that you enter the following arguments in VC-group configuration mode to provide a map between Frame Relay DLCIs and Frame Relay-SSCS DLCIs:

fr-interface-name fr-dlci [*fr-sscs-dlci*]

Syntax Description

group-name	A VC group name entered as an 11-character maximum string.

The following syntax description applies to the VC-group entries:

fr-interface-name	Frame Relay interface; for example, serial0/0.
fr-dlci	Frame Relay DLCI number, in the range 16 to 1007.
fr-sscs-dlci	(Optional) Frame Relay SSCS DLCI number, in the range of 16 to 991. Default is 1022.

Defaults

No default behavior or values

Command Modes

Global configuration
VC-group configuration

Command History

Release	Modification
12.1(2)T	This command was introduced.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.

Usage Guidelines

This command specifies the Frame Relay DLCIs in the VC group and maps them to the Frame Relay-SSCS DLCIs. If the optional FR-SSCS DLCI value is not specified, its value is the same as the Frame Relay DLCI.

Examples

The following example shows how to configure an FRF.5 many-to-one connection. The **vc-group** command maps Frame Relay DLCI 16, 17, 18, and 19 to a VC group named “friends”:

```
Router(config)# vc-group friends
Router(config-vc-group)# serial0 16 16
Router(config-vc-group)# serial0 17 17
Router(config-vc-group)# serial0 18 18
Router(config-vc-group)# serial0 19 19
```

Related Commands

Command	Description
show vc-group	Displays the names of all VC groups.

vpls-id

To assign an identifier to the Virtual Private LAN Service (VPLS) domain, use the **vpls-id** command in L2 VFI configuration mode. To revert to the default VPLS ID, use the **no** form of this command.

vpls-id {*autonomous-system-number*:*nn* | *ip-address*:*nn*}

no vpls-id {*autonomous-system-number*:*nn* | *ip-address*:*nn*}

Syntax Description

autonomous-system-number:*nn*	Specifies a 16-bit autonomous system number and 32-bit arbitrary number. The autonomous system number need not match the local autonomous system number.
ip-address:*nn*	Specifies a 32-bit IP address and a 16-bit arbitrary number. Only IPv4 addresses are supported.

Command Default

The VPLS ID is generated automatically by VPLS Autodiscovery.

Command Modes

L2 VFI configuration

Command History

Release	Modification
12.2(33)SRB	This command was introduced.

Usage Guidelines

VPLS Autodiscovery automatically generates a VPLS ID using the Border Gateway Protocol BGP autonomous system number and the configured VFI VPN ID. You can use the **vpls-id** command to change the automatically generated VPLS ID.

The Label Distribution Protocol (LDP) uses the VPLS ID when signaling VPLS autodiscovered neighbors. The VPLS ID identifies the VPLS domain.

Only one VPLS ID can be configured per virtual forwarding instance (VFI), and the same VPLS ID cannot be configured in multiple VFIs on the same provider edge (PE) router.

The manually configured VPLS ID replaces the internally generated VPLS ID. The manually configured VPLS ID also changes the automatically generated route target (RT).

The **vpls-id** command defines the attachment group identifier (AGI) for the VPLS domain. Therefore, all provider edge (PE) routers in the same VPLS domain must use the same VPLS ID.

For interautonomous system configurations, you must manually configure the VPLS ID instead of using the automatically generated VPLS ID, because all PE routers do not share the same autonomous system number.

Examples

The following example sets the VPLS ID to the autonomous system and network number 5:300:

```
vpls-id 5:300
```

```
The following example sets the VPLS ID to IP address and network number 10.4.4.4:70:
```

```
vpls-id 10.4.4.4:70
```

Related Commands

Command	Description
rd	Creates routing and forwarding tables for a VRF.

waas cm-register url

To register a device with the WAAS Central Manager, use the **waas cm-register url** command in privileged EXEC mode.

waas cm-register url *url port-number*

Syntax Description

url *url*	URL of the device to be registered.
port-number	The port number.

Command Default

No devices are registered with the WAAS Central Manager.

Command Modes

Privileged EXEC (#)

Command History

Release	Modification
15.1(2)T	This command was introduced.

Usage Guidelines

Use this command to register a device with the WAAS Central Manager. Before enabling this command, the WCM certificate must be installed on the router.

Note The registration may fail if the port number is not specified.

The values for the *url* argument can be one of the following:

- **archive**
- **cns**
- **flash**
- **ftp**
- **http**
- **https**
- **null**
- **nvram**
- **rcp**
- **scp**
- **system**
- **tar**
- **tftp**
- **tmpsys**

- **xmodem**
- **ymodem**

Examples

The following example shows how to register a device with the WAAS Central Manager:

```
Router> enable
Router# waas cm-register url https://192.0.2.1:8443/wcm/register
```

Related Commands

Command	Description
clear waas	Clears WAAS Express statistics and closed connections information.
debug waas	Displays debugging information for different WAAS Express modules.
show waas alarms	Displays WAAS Express status and alarms.
show waas auto-discovery	Displays information about WAAS Express autodiscovery.
show waas connection	Displays information about WAAS Express connections.
show waas statistics aoim	Displays WAAS Express peer information and negotiated capabilities.
show waas statistics application	Displays WAAS Express policy application statistics.
show waas statistics auto-discovery	Displays WAAS Express autodiscovery statistics.
show waas statistics class	Displays statistics for the WAAS Express class map.
show waas statistics dre	Displays WAAS Express DRE statistics.
show waas statistics errors	Displays WAAS Express error statistics.
show waas statistics global	Displays global WAAS Express statistics.
show waas statistics lz	Displays WAAS Express LZ statistics.
show waas statistics pass-through	Displays WAAS Express connections placed in a pass-through mode.
show waas statistics peer	Displays inbound and outbound statistics for peer WAAS Express devices.
show waas status	Displays the status of WAAS Express.
show waas token	Displays the value of the configuration token used by the WAAS Central Manager.

waas config

To restore or remove WAAS Express default configurations, use the **waas config** command in privileged EXEC mode.

waas config {**restore-default** | **remove-all**}

Syntax Description

restore-default	Restores the default configuration.
remove-all	Removes all configurations.

Command Default

WAAS Express default configurations are not modified.

Command Modes

Privileged EXEC (#)

Command History

Release	Modification
15.1(2)T	This command was introduced.

Usage Guidelines

Use this command to either restore the default configurations or remove the configurations. This command works only if WAAS Express is not enabled on any interface.

Examples

The following example shows how to restore the WAAS Express default configuration:

```
Router> enable
Router# waas config restore-default
```

Related Commands

Command	Description
class-map type waas	Configures a WAAS Express class map.
parameter-map type waas	Configures WAAS Express global parameters.
policy-map type waas	Configures a WAAS Express policy map.
waas enable	Enables WAAS Express on a network interface of a router.
waas export	Associates a NetFlow exporter with WAAS Express.

waas export

To associate a NetFlow exporter with WAAS Express, use the **waas export** command in global configuration mode. To remove the association, use the **no** form of this command.

waas export {**name** *exporter-name* | **timeout** *seconds*}

no waas export {**name** *exporter-name* | **timeout** *seconds*}

Syntax Description

name *exporter-name*	Specifies the name of the exporter.
timeout *seconds*	Specifies the timeout value, in seconds. The default is 300.

Command Default

No NetFlow exporter is associated.

Command Modes

Global configuration (config)

Command History

Release	Modification
15.1(2)T	This command was introduced.

Usage Guidelines

Use this command to associate a NetFlow exporter with WAAS Express and export fields to NetFlow v9 records. Use the *seconds* argument to set the timeout value for exporting a long-living connection.

Examples

The following example shows how to associate a NetFlow exporter named exporter1:

```
Router> enable
Router# configure terminal
Router(config)# waas export name exporter1
Router(config)# destination 192.168.1.1
```

Related Commands

Command	Description
class-map type waas	Configures a WAAS Express class map.
flow-sampler	Defines a flow sampler map for random sampled NetFlow accounting to an interface.
flow exporter	Creates a flow exporter.
parameter-map type waas	Configures WAAS Express global parameters.
policy-map type waas	Configures a WAAS Express policy map.
waas config	Restores or removes WAAS Express default configurations.
waas enable	Applies WAN optimization on a network interface of a device.

waas export

To associate a NetFlow exporter with WAAS Express which is used to export WAAS fields in the NetFlow v9 records, use the **waas export** command in global configuration mode. To remove the association, use the **no** form of this command.

waas export {**name** *exporter-name* | **timeout** *timeout-value*}

no waas export {**name** *exporter-name* | **timeout** *timeout-value*}

Syntax Description

name *exporter-name*	Specifies the name of the exporter.
timeout *timeout-value*	Specifies the timeout value. The default is 300 seconds.

Command Default

NetFlow exporter is not associated.

Command Modes

Global configuration (config)

Command History

Release	Modification
15.1(2)T	This command was introduced.

Usage Guidelines

Use this command to associate a NetFlow exporter with WAAS Express and export fields to NetFlow v9 records. Use the *timeout* argument to set the timeout value for exporting long living connection.

Examples

The following example shows how to associate a NetFlow exporter named exporter1.

```
Router> enable
Router# configure terminal
Router(config)# flow exporter exporter1
Router(config)# destination 209.165.200.225
Router(config)# waas export name exporter1
```

Related Commands

Command	Description
class-map type waas	Configures WAAS Express class-map.
flow-sampler	Defines a flow sampler map for random sampled NetFlow accounting to an interface.
flow exporter	Creates a flow exporter.
parameter-map type waas	Configures WAAS Express global parameters.
policy-map type waas	Configures an WAAS Express policy-map.
waas config	Restores or removes WAAS Express default configurations.
waas enable	Applies WAN optimization on a network interface of a device.