



X.25 Station Type for ISDN D-channel Interface

The X.25 Station Type for ISDN D-channel Interface feature permits configuration of the X.25 station type for the ISDN D-channel interface with the **encapsulation x25** command on this interface. This feature allows the mapping of closed user group (CUG) of the X.25 packets that originates from the point-of-sale devices terminating the ISDN-BRI D-channel interface configured as an X.25 data communications equipment (DCE) station of Cisco routers with an ISDN BRI interface.

The default encapsulation of the BRI D-channel interface is X.25 encapsulation in data terminal equipment (DTE) mode. To change the X.25 station type on the ISDN BRI D-channel interface, use the **encapsulation 25** command with the appropriate keyword in the interface configuration mode. If no keyword is specified, the interface will be configured with X.25 encapsulation in DTE mode.

When a router boots up with the new ISDN BRI interface, the encapsulation will not show up explicitly in the ISDN BRI D-channel interface configuration although the encapsulation will be set as an X.25 DTE station, the default for this interface. When the **no encapsulation** command is issued on the ISDN BRI D-channel interface, the interface will be set as an X.25 DTE station, the default. This will show up in the running configuration of the interface as **encapsulation x25**.

Feature History for X.25 Station Type for ISDN D-channel Interface

Release	Modification
12.3(7)XR	This feature was introduced.
12.3(14)T	This feature was integrated into Cisco IOS Release 12.3(14)T.

Finding Support Information for Platforms and Cisco IOS Software Images

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Prerequisites for X.25 Station Type for ISDN D-channel Interface

- The BRI interface needs to be configured for X.25 traffic over an ISDN D-channel using the **isdn x25 dchannel** command in interface configuration mode.

For more details, see the following URL:

http://www.cisco.com/univercd/cc/td/doc/product/software/ios123/123cgcr/dial_r/dia_i2g.htm#1050084

- The ISDN BRI D-channel interface of the peer that is connected to this interface should be a complementary station type.

Information About X.25 Station Type for ISDN D-channel Interface

To configure the X.25 Station Type for ISDN D-channel Interface feature, you should understand the following concepts:

- [Configuring X.25 on ISDN D-channel Interface, page 2](#)
- [X.25 Closed User Groups, page 3](#)

Configuring X.25 on ISDN D-channel Interface

If the D channel of an ISDN BRI interface will carry X.25 traffic, you need to configure the feature that is described in the [Configuring X.25 on ISDN](#) feature guide.

A BRI is an ISDN interface. It consists of two B channels (B1 and B2) and one D-channel. The B channels are used to transfer data, voice, and video. The D channel controls the B channels.

ISDN uses the D-channel to carry signal information. ISDN can also use the D-channel in a BRI to carry X.25 packets. The D-channel has a capacity of 16 kbps; the X.25 over D-channel can use up to 9.6 kbps.

When this feature is configured, a separate X.25-over-D-channel logical interface is created. You can set its parameters without disrupting the original ISDN interface configuration. The original BRI interface will continue to represent the D, B1, and B2 channels.

An interface configured for X.25 traffic over the D channel can be used as a primary interface where low-volume, sporadic, interactive traffic is the normal mode of operation. Supported traffic includes IPX, AppleTalk, transparent bridging, XNS, DECnet, and IP.

For more details on how to configure the X.25 over ISDN D-channel Interface feature, see the following URL:

http://www.cisco.com/univercd/cc/td/doc/product/software/ios113ed/113ed_cr/dial_c/dcp10/dcxisdn.htm

X.25 Closed User Groups

A closed user group (CUG) is a collection of DTE devices for which the network controls access between two members and between a member and a non-member. An X.25 network can support up to 10,000 CUGs (numbered between 0 and 9999), each of which can have any number of member DTE devices. An individual DTE becomes a member of a specific network CUG by subscription. The subscription data includes the local number that the DTE will use to identify the network CUG (which may or may not be the same as the network number, as determined by network administration and the DTE device's requirements), and any restriction that prohibits the DTE from placing a call within the CUG or, conversely, prohibits the network from presenting a call within the CUG to the DTE.

With the X.25 CUGs feature, the router's X.25 DCE interfaces can be configured to perform the standard CUG access controls that are normally associated with a direct attachment to an X.25 network point of presence (POP). The router's DCE interface acts as the boundary between the DTE and the network, and CUG use ensures that only those incoming and outgoing switched virtual circuits (SVCs) consistent with the configured CUG subscriptions are permitted. X.25 CUG configuration commands on the router are specified at every POP, and CUG security decisions are made solely from those commands.

The X.25 CUGs feature is used for additional X.25 access protection and security. In a setup where DTE devices are attached to a public data network (PDN), you can derive a private subnetwork by subscribing your DTE devices to a set of CUGs, which allows closer control of your DTE devices, such as permitting or restricting which DTE can talk to other DTE devices and for what particular purpose. For example, a distinct CUG can be defined to handle each of the different modes of connectivity, such as following:

- Datagram encapsulation operation between all company sites
- Packet assembler/disassembler (PAD) services for customers seeking public information
- PAD services for system administration internal access to consoles
- Qualified Logical Link Control (QLLC) access restricted to the company financial centers

For more details, see the following URL:

<http://www.cisco.com/univercd/cc/td/doc/product/software/ios120/120newft/120t/120t7/x25scugs.htm>

How to Configure X.25 Encapsulation on ISDN BRI D-channel Interface

This section contains following procedure:

- [Configuring X.25 Encapsulation on ISDN BRI D-channel Interface, page 3](#)

Configuring X.25 Encapsulation on ISDN BRI D-channel Interface

To configure X.25 encapsulation on ISDN BRI D-channel Interface, perform the following steps.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface BRI2/0**
4. **isdn x25 dchannel**
5. **interface BRI2/0:0**
6. **encapsulation X.25 dce**
7. **end**

**Note**

Use the **interface BRI2/0** and **isdn x25 dchannel** commands if the configurable interface for X.25 traffic over ISDN D-channel does not exist.

DETAILED STEPS

	Command or Action	Purpose
Step 1	enable Example: Router> enable	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	configure terminal Example: Router# configure terminal	Enters global configuration mode.
Step 3	interface BRI2/0 Example: Router# interface BRI2/0	(Optional) Specifies an ISDN BRI interface. Note Use this command if the configurable interface for X.25 traffic over ISDN D-channel does not exist.
Step 4	isdn x25 dchannel Example: Router# isdn x25 dchannel	(Optional) Creates a configurable interface for X.25 traffic over the ISDN D-channel. Note Use this command if the configurable interface for X.25 traffic over ISDN D-channel does not exist.
Step 5	interface BRI2/0:0 Example: Router# interface BRI2/0:0	Specify an ISDN BRI D-channel interface.
Step 6	encapsulation x25 dce Example: Router# encapsulation X.25 dce	Enables X.25 encapsulation in DCE mode.
Step 7	end Example: Router# end	(Optional) Exits the configuration mode and returns to privileged EXEC mode.

Examples

The following example configures the X.25 encapsulation in DCE mode on an BRI interface 2/0:0:

```
interface BRI2/0:0
ip address 1.1.1.2 255.255.255.0
 encapsulation X.25 dce
 no ip mroute-cache
 X.25 subscribe cug-service
 X.25 subscribe local-cug 10 network-cug 100
!
```

Configuration Examples for X.25 Encapsulation on ISDN BRI D-channel Interface

This section provides following configuration example:

- [Configuring X.25 Encapsulation on ISDN BRI D-channel Interface, page 3](#)

X.25 Encapsulation on an ISDN BRI D-channel Interface: Example

The following example shows X.25 encapsulation configured on interface BRI2/0:

```
Current configuration: 2275 bytes
!
version 12.3
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
!
hostname Router
!
boot system flash c1700-voice-mz
enable password cisco
!
memory-size iomem 15
tdm clock bri-auto
voice-card 2
!
no aaa new-model
ip subnet-zero
!
!
!
no ftp-server write-enable
isdn switch-type basic-net3
!

no voice hpi capture buffer
no voice hpi capture destination
!
interface FastEthernet0/0
 ip address 10.0.2.199 255.255.255.0
 speed 100
!
interface BRI2/0
no ip address
 isdn switch-type basic-net3
 isdn protocol-emulate network
 isdn layer1-emulate network
 no isdn outgoing display-ie
 isdn x25 static-tei 1
 isdn x25 dchannel
 isdn skipsend-idverify
!
interface BRI2/0:0
no ip address
encapsulation x25 dce
x25 subscribe cug-service incoming-access outgoing-access
x25 subscribe local-cug 5000 network-cug 55 preferential
!
interface BRI2/1
```

```

no ip address
shutdown
isdn switch-type basic-net3
!
ip classless
no ip http server
!
voice-port 2/0
!
voice-port 2/1
!
line con 0
line aux 0
line vty 0 4
login
!
end

```

Additional References

The following sections provide references related to the X.25 Station Type for ISDN D-channel Interface feature.

Related Documents

Related Topic	Document Title
Cisco IOS Release 12.3 Configuration Guides and Command References	Cisco IOS Release 12.3 Configuration Guides and Command References
Cisco IOS Dial Technologies Command Reference, Release 12.3	“Dial Technologies Commands: isdn all through isdn x25” section in Cisco IOS Dial Technologies Command Reference , Release 12.3

Standards

Standards	Title
None	—

MIBs

MIBs	MIBs Link
<ul style="list-style-type: none"> None 	<p>To locate and download MIBs for selected platforms, Cisco IOS releases, and feature sets, use Cisco MIB Locator found at the following URL:</p> <p>http://www.cisco.com/go/mibs</p>

RFCs

RFCs	Title
None	—

Technical Assistance

Description	Link
<p>Technical Assistance Center (TAC) home page, containing 30,000 pages of searchable technical content, including links to products, technologies, solutions, technical tips, and tools. Registered Cisco.com users can log in from this page to access even more content.</p>	<p>http://www.cisco.com/public/support/tac/home.shtml</p>

Command Reference

This feature uses no new or modified commands. All commands used with this feature are documented in the Cisco IOS Release 12.3 command reference publications.

- encapsulation x25
- x25 subscribe cug-service
- x25 subscribe local cug
- debug x25
- show x25 cug

encapsulation x25

To specify a serial interface's operation as an X.25 device, use the **encapsulation x25** command in interface configuration mode. To remove the specification, use the **no** form of this command.

encapsulation x25 [**dte** | **dce**] [**ddn** | **bfe** | **ietf**]

no encapsulation x25 [**dte** | **dce**] [**ddn** | **bfe** | **ietf**]

Syntax Description

dte	(Optional) Specifies operation as a data terminal equipment (DTE). This is the default X.25 mode.
dce	(Optional) Specifies operation as a data communications equipment (DCE).
ddn	(Optional) Specifies Defense Data Network (DDN) encapsulation on an interface using DDN X.25 Standard Service.
bfe	(Optional) Specifies Blacker Front End (BFE) encapsulation on an interface attached to a BFE device.
ietf	(Optional) Specifies that the interface's datagram encapsulation defaults to use of the Internet Engineering Task Force (IETF) standard method, as defined by RFC 1356.

Defaults

The default serial encapsulation is High-Level Data Link Control (HDLC). You must explicitly configure an X.25 encapsulation method.

DTE operation is the default X.25 mode. Cisco's traditional X.25 encapsulation method is the default.

Command Modes

Interface configuration

Command History

Release	Modification
10.0	This command was introduced.
10.3	The following keywords were added: <ul style="list-style-type: none"> • dte • dce • ddn • bfe • ietf
12.3(14)T	This command was integrated into Cisco IOS Release 12.3(14)T.

Usage Guidelines

One end of an X.25 link must be a logical DCE device and the other end a logical DTE device. (This assignment is independent of the interface's hardware DTE or DCE identity.) Typically, when connecting to a public data network (PDN), the customer equipment acts as the DTE device and the PDN attachment acts as the DCE.

Cisco has long supported the encapsulation of a number of datagram protocols, using a standard means when available and a proprietary means when necessary. The IETF adopted a standard, RFC 1356, for encapsulating most types of datagram traffic over X.25. X.25 interfaces use Cisco's traditional method unless explicitly configured for IETF operation; if the **ietf** keyword is specified, that standard is used unless Cisco's traditional method is explicitly configured. For details see the **x25 map** command.

You can configure a router attaching to the DDN or to a BFE device to use their respective algorithms to convert between IP and X.121 addresses by using the **ddn** or **bfe** option, respectively. An IP address must be assigned to the interface, from which the algorithm will generate the interface's X.121 address. For proper operation, this X.121 address must not be modified.

A router DDN attachment can operate as either a DTE or a DCE device. A BFE attachment can operate only as a DTE device. The **ietf** option is not available if either the **ddn** or **bfe** option is selected.

Examples

The following example configures the interface for connection to a BFE device:

```
interface serial 0
 encapsulation x25 bfe
```

Related Commands

Command	Description
x25 map	Sets up the LAN protocols-to-remote host mapping.

x25 subscribe cug-service

To enable and control standard closed user group (CUG) service, use the **x25 subscribe cug-service** command in the appropriate interface, line, or X.25 profile configuration mode. To disable standard CUG service, use the **no** form of this command.

```
x25 subscribe cug-service [incoming-access] [outgoing-access] [suppress preferential |
suppress all]
```

```
no x25 subscribe cug-service [incoming-access | outgoing-access] [suppress preferential |
suppress all]
```

Syntax Description

incoming-access	(Optional) Allows incoming access from the open network to the data terminal equipment (DTE) device.
outgoing-access	(Optional) Allows outgoing access from the data terminal equipment (DTE) device to the open network.
suppress preferential	(Optional) Suppresses CUG selection facility for the preferred CUG. This option is not available when configuring terminal lines.
suppress all	(Optional) Suppresses CUG selection facility for all CUGs. This option is not available when configuring terminal lines.

Defaults

No incoming access and no outgoing access. (This is the most restrictive setting.) CUG selection facilities are not suppressed.

Command Modes

Interface configuration
Line configuration
X.25 profile configuration

Command History

Release	Modification
12.0(7)T	This command was introduced.
12.1(5)T	The suppress preferential and suppress all keywords were added to enable CUG selection facility suppression.
12.2(13)T	This command was modified to configure support for X.25 CUG service on terminal lines.
12.3(14)T	This command was integrated into Cisco IOS Release 12.3(14)T.

Usage Guidelines

When entering this command, specify the **incoming-access** or the **outgoing-access** keyword or both, unless you intend to have neither incoming nor outgoing access on the interface.

This command assumes that an X.25 network connection is being implemented and observes rules defined by X.25 and X.301 for CUG access. This command is enabled on a per-interface or per-line basis. Use this command to modify existing specified options without otherwise affecting the CUGs already defined.

The **x25 subscribe cug-service** command can be used to configure CUG security on synchronous X.25 data communications equipment (DCE) interfaces or terminal lines. A CUG service can be applied to console lines, auxiliary lines, standard asynchronous lines, and virtual terminal lines. A line configured for CUG service will apply CUG security to packet assembler/disassembler (PAD), X.28 mode, and protocol translation sessions. CUG protection is applied to incoming calls destined for the terminal line and call requests specified from the line.

The CUG selection facility suppression options are not available for terminal lines because incoming PAD calls are terminated by the line.

Use the **x25 subscribe cug-service** command with the **suppress preferential** or **suppress all** keywords to configure CUG selection facility suppression. The CUG selection facility suppression options are available on synchronous X.25 DCE interfaces only; they are not available on terminal lines because incoming PAD calls are terminated by the line.

The following restrictions apply to the **x25 subscribe cug-service** command:

- Disabling this command deconfigures all the CUGs defined for the device and disables all CUG-related commands, but it does not terminate the associated CUG switched virtual circuit (SVC) connections.
- The DTE cannot call the open part of the network unless the **outgoing-access** option is configured. Even if **outgoing-access** is permitted, the DCE will enforce any additional CUG requirements when handling an outgoing call (call request) from the DTE.
- The DTE will not receive calls from the open part of the network unless the **incoming-access** option is configured. Even if **incoming-access** is permitted, the DCE will enforce any additional CUG requirements before presenting an incoming call to the DTE.

Examples

CUG Service on a Terminal Line Example

The following example shows the configuration of CUG behavior on asynchronous line 1 and virtual terminal lines 0 to 9. The users of virtual terminal lines 0 to 9 have access only within the corporate CUGs designated for engineering (CUG 1102 or 1103); any call from a network X.25-class service destined for the line will be refused unless the inbound point of presence (POP) has validated it as a member of one of those two CUGs.

```
line vty 0 9
  Location Company A. Engineering Access
  x25 subscribe cug-service
  x25 subscribe local-cug 2 network-cug 1102 preferential
  x25 subscribe local-cug 3 network-cug 1103
```

CUG Service with CUG Selection Facility Suppression and Incoming Access Example

In the following example, CUG selection facility suppression and incoming access are configured for all CUGs, including the preferred CUG on the X.25 profile:

```
x25 profile CUG-SUPRS-ALL dce
  x25 subscribe cug-service incoming-access suppress all
  x25 subscribe local-cug 0 network-cug 10 preferential
  x25 subscribe local-cug 20 network-cug 202
  x25 subscribe local-cug 40 network-cug 40
```

CUG Service with Incoming and Outgoing Access Example

The following example shows subscribing to both incoming and outgoing CUG service on the interface:

```
interface serial0
  encapsulation x25 dce
  x25 subscribe cug-service incoming-access outgoing-access
```

Related Commands	Command	Description
	show x25 cug	Displays information about all CUGs or specific CUGs.
	x25 facility	Forces facilities on a per-call basis for calls originated by the router.
	x25 map	Sets the maximum number of virtual circuits that a protocol can have open simultaneously to one host.
	x25 subscribe local-cug	Configures subscription to a specific CUG.

x25 subscribe local-cug

To configure subscription to a specific closed user group (CUG), use the **x25 subscribe local-cug** command in interface configuration or line configuration mode. To remove the CUG subscription, use the **no** form of this command.

x25 subscribe local-cug *number* **network-cug** *number* [**no-incoming** | **no-outgoing** | **preferential**]

no x25 subscribe local-cug *number* **network-cug** *number* [**no-incoming** | **no-outgoing** | **preferential**]

Syntax Description	
<i>number</i>	Specific local CUG number (0 to 9999).
network-cug	Network translated CUG identifier.
<i>number</i>	Specific network CUG number (0 to 9999).
no-incoming	(Optional) Bars calls to data terminal equipment (DTE) within the specified CUG, unless x25 subscribe cug-service incoming-access is configured.
no-outgoing	(Optional) Bars calls from DTE within the specified CUG, unless x25 subscribe cug-service outgoing-access is configured.
preferential	(Optional) Specified on only one CUG, which is the assumed CUG when none is provided in call setup. (A single CUG listed at the interface is automatically considered a preferred CUG.)

Defaults
Incoming and outgoing access.
Preferential (if this is the only CUG specified).

Command Modes
Interface configuration
Line configuration

Command History	Release	Modification
	12.0(7)T	This command was introduced.
	12.2(13)T	This command was modified to configure X.25 CUG subscription on terminal lines.
	12.3(14)T	This command was integrated into Cisco IOS Release 12.3(14)T.

Usage Guidelines
The first **x25 subscribe local-cug** command in a group of configurations will automatically enable CUG service behavior on the interface or line, if it is not already enabled, with the default setting of no public access.

The **x25 subscribe cug-service** command can be used to configure CUG subscription on X.25 synchronous data communications equipment (DCE) interfaces, console lines, auxiliary lines, standard asynchronous lines, and virtual terminal lines. A line configured for CUG service will apply CUG

security to packet assembler/disassembler (PAD), X.28 mode, and protocol translation sessions. CUG protection is applied to incoming calls destined for the terminal line and call requests specified from the line.

A CUG number has only local significance. Because CUG service is a cooperative process among the network attachments (DCE devices), the local CUG number may have to be translated into a number that is significant to the network as a whole. For instance, two DTE devices may use CUG numbers 1 and 5 to refer to the global CUG number 1043 of the network. In this instance, both DCE devices would be configured to translate between the local CUG number of their DTE and the network CUG number. Duplicate network CUG identifiers are permitted for different local CUG identifiers.

A DTE subscription to a CUG that also includes the **no-incoming** option prevents incoming calls on that CUG (however, the DTE may still receive calls within other CUGs to which it is subscribed, or from the open network if incoming public access is subscribed).

CUG subscription of a DTE will not permit an outgoing call (call request) from the CUG if the **no-outgoing** option is configured.

The CUG will be assumed to be set to **preferential** (preferred) if there is only one CUG subscribed on that interface.

Examples

X.25 CUG Subscription on an Interface Example

The following example subscribes local CUGs 5000, 100, 200, and 300 to networks 55, 11, 22, and 33, respectively, with local CUG 5000 being set as the preferred CUG:

```
Router(config)# interface serial0
Router(config-if)# encapsulation x25 dce
Router(config-if)# x25 subscribe cug-service incoming-access outgoing-access
Router(config-if)# x25 subscribe local-cug 5000 network-cug 55 preferential
Router(config-if)# x25 subscribe local-cug 100 network-cug 11
Router(config-if)# x25 subscribe local-cug 200 network-cug 22
Router(config-if)# x25 subscribe local-cug 300 network-cug 33
```

X.25 CUG Subscription on a Terminal Line Example

The following example shows the configuration of CUG behavior on asynchronous line 1 and virtual terminal lines 0 to 9. The users of virtual terminal lines 0 to 9 have access only within the corporate CUGs designated for engineering (CUG 1102 or 1103); any call from a network X.25-class service destined for the line will be refused unless the inbound POP has validated it as a member of one of those two CUGs.

```
Router(config)# line vty 0 9
Router(config-line)# Location Company A. Engineering Access
Router(config-line)# x25 subscribe cug-service
Router(config-line)# x25 subscribe local-cug 2 network-cug 1102 preferential
Router(config-line)# x25 subscribe local-cug 3 network-cug 1103
```

Related Commands	Command	Description
	show x25 cug	Displays information about all or specific (defined by the local or network CUG number) CUGs.
	x25 facility	Forces facilities on a per-call basis for calls originated by the router (switched calls are not affected).
	x25 map	Sets the maximum number of virtual circuits a protocol can have open simultaneously to one host.
	x25 subscribe cug-service	Enables and controls standard CUG behavior on an X.25 DCE interface.

debug x25

To display information about all X.25 traffic or a specific X.25 service class, use the **debug x25** command in privileged EXEC mode. To disable debugging output, use the **no** form of this command.

debug x25 [**only** | **cmns** | **xot**] [**events** | **all**] [**dump**]

no debug x25 [**only** | **cmns**] [**events** | **all**] [**dump**]

Syntax Description

only	(Optional) Displays information about X.25 services only.
cmns	(Optional) Displays information about CMNS services only.
xot	(Optional) Displays information about XOT services only.
events	(Optional) Displays all traffic except Data and Receiver Ready (RR) packets.
all	(Optional) Displays all traffic. This is the default.
dump	(Optional) Displays the encoded packet contents in hexadecimal and ASCII formats.

Defaults

All traffic is displayed.

Command Modes

Privileged EXEC

Command History

Release	Modification
10.0	This command was introduced.
12.0(5)T	For Domain Name System (DNS)-based X.25 routing, additional functionality was added to the debug x25 events command to describe the events that occur while the X.25 address is being resolved to an IP address using a DNS server. The debug domain command can be used along with debug x25 events to observe the whole DNS-based X.25 routing data flow.
12.0(7)T	For the X.25 Closed User Groups (CUGs) feature, functionality was added to the debug x25 events command to describe events that occur during CUG activity.
12.2(8)T	The debug x25 events command was enhanced to display events specific to Record Boundary Preservation protocol.
12.3(2)T	The dump keyword was added.
12.3(14)T	This command was integrated into Cisco IOS Release 12.2(14)T.

Usage Guidelines

Caution

The X.25 debug commands can generate large amounts of debugging output. If logging of debug output to the router console is enabled (the default condition), this output may fill the console buffer, preventing the router from processing packets until the contents of the console buffer have been printed.

The **debug x25**, **debug x25 interface**, **debug x25 vc**, and **debug x25 xot** commands all generate the same basic output. The **debug x25 interface**, **debug x25 vc**, and **debug x25 xot** commands narrow the scope of the **debug x25** output to specific virtual circuits or types of traffic.

This command is particularly useful for diagnosing problems encountered when placing calls. The **debug x25 all** output includes data, control messages, and flow control packets for all virtual circuits of the router.

All **debug x25** commands can take either the **events** or the **all** keyword. The keyword **all** is the default and causes all packets meeting the other debug criteria to be reported. The keyword **events** omits reports of any Data or RR flow control packets; the normal flow of data and RR packets is commonly large and less interesting to the user, so event reporting can significantly decrease the processor load induced by debug reporting.

Use the **dump** keyword to display the entire contents, including user data, of X.25 packets. The encoded X.25 packet contents are displayed after the standard packet description. The output includes the offset into the packet and the display of the data in both hexadecimal and ASCII formats.

Caution

The X.25 packet information that is reported by using the **dump** keyword may contain sensitive data; for example, clear-text account identities and passwords. The network access policies and router configuration should be controlled appropriately to address this risk.

Examples

The following is sample output from the **debug x25** command, displaying output concerning the functions X.25 restart, call setup, data exchange, and clear:

```
Router# debug x25

Serial0: X.25 I R/Inactive Restart (5) 8 lci 0
      Cause 7, Diag 0 (Network operational/No additional information)
Serial0: X.25 O R3 Restart Confirm (3) 8 lci 0
Serial0: X.25 I P1 Call (15) 8 lci 1
From(6): 170091 To(6): 170090
      Facilities: (0)
      Call User Data (4): 0xCC000000 (ip)
Serial0: X.25 O P3 Call Confirm (3) 8 lci 1
Serial0: X.25 I D1 Data (103) 8 lci 1 PS 0 PR 0
Serial0: X.25 O D1 Data (103) 8 lci 1 PS 0 PR 1
Serial0: X.25 I P4 Clear (5) 8 lci 1
      Cause 9, Diag 122 (Out of order/Maintenance action)
Serial0: X.25 O P7 Clear Confirm (3) 8 lci 1
```

debug x25 events for DNS-Based X.25 Routing: Example

The following example of the **debug x25** command with the **events** keyword shows output related to the DNS-Based X.25 Routing feature. It shows messages concerning access to the DNS server. In the example, nine alternate addresses for one XOT path are entered into the DNS server database. All nine addresses are returned to the host cache of the router by the DNS server. However, only six addresses will be used during the XOT switch attempt because this is the limit that XOT allows.

```
Router# debug x25 events

00:18:25:Serial1:X.25 I R1 Call (11) 8 lci 1024
00:18:25: From (0): To (4):444
00:18:25: Facilities:(0)
00:18:25: Call User Data (4):0x01000000 (pad)
00:18:25:X.25 host name sent for DNS lookup is "444"
00:18:26:%3-TRUNCATE_ALT_XOT_DNS_DEST:Truncating excess XOT addresses (3)
returned by DNS
```

```

00:18:26:DNS got X.25 host mapping for "444" via network
00:18:32:[10.1.1.8 (pending)]:XOT open failed (Connection timed out; remote host not
responding)
00:18:38:[10.1.1.7 (pending)]:XOT open failed (Connection timed out; remote host not
responding)
00:18:44:[10.1.1.6 (pending)]:XOT open failed (Connection timed out; remote host not
responding)
00:18:50:[10.1.1.5 (pending)]:XOT open failed (Connection timed out; remote host not
responding)
00:18:56:[10.1.1.4 (pending)]:XOT open failed (Connection timed out; remote host not
responding)
00:20:04:[10.1.1.3,1998/10.1.1.3,11007]:XOT O P2 Call (17) 8 lci 1
00:20:04: From (0): To (4):444
00:20:04: Facilities:(6)
00:20:04: Packet sizes:128 128
00:20:04: Window sizes:2 2
00:20:04: Call User Data (4):0x01000000 (pad)
00:20:04:[10.1.1.3,1998/10.1.1.3,11007]:XOT I P2 Call Confirm (11) 8 lci 1
00:20:04: From (0): To (0):
00:20:04: Facilities:(6)
00:20:04: Packet sizes:128 128
00:20:04: Window sizes:2 2
00:20:04:Serial1:X.25 O R1 Call Confirm (5) 8 lci 1024
00:20:04: From (0): To (0):
00:20:04: Facilities:(0)

```

Record Boundary Preservation: Examples

The following examples show output for the **x25 debug** command with the **events** keyword when record boundary preservation (RBP) has been configured using the **x25 map rbp local** command.

The following display shows establishment of connection:

```

X25 RBP:Incoming connection for port 9999 from 10.0.155.30 port 11001
Serial0/1:X.25 O R1 Call (10) 8 lci 64
  From (5):13133 To (5):12131
  Facilities:(0)
Serial0/1:X.25 I R1 Call Confirm (3) 8 lci 64

```

The following display shows that the X.25 call was cleared by the X.25 host:

```

Serial0/1:X.25 I R1 Clear (5) 8 lci 64
  Cause 0, Diag 122 (DTE originated/Maintenance action)
X25 RBP:X.25 circuit cleared
Serial0/1:X.25 O R1 Clear Confirm (3) 8 lci 64

```

The following display shows that the TCP session has terminated:

```

[10.0.155.30,11000/10.0.155.33,9999]:TCP receive error, End of data transfer
X25 RBP:End of data transfer
Serial0/1:X.25 O R1 Clear (5) 8 lci 64
  Cause 9, Diag 122 (Out of order/Maintenance action)
Serial0/1:X.25 I R1 Clear Confirm (3) 8 lci 64

```

The following examples show output of the **x25 debug** command with the **events** keyword when RBP has been configured using the **x25 pvc rbp local** command.

The following display shows data on the permanent virtual circuit (PVC) before the TCP session has been established:

```

X25 RBP:Data on unconnected PVC
Serial1/0:X.25 O D1 Reset (5) 8 lci 1
  Cause 0, Diag 113 (DTE originated/Remote network problem)
Serial1/0:X.25 I D2 Reset Confirm (3) 8 lci 1

```

The following display shows establishment of connection:

```
X25 RBP:Incoming connection for port 9998 from 2.30.0.30 port 11002
Serial1/0:X.25 O D1 Reset (5) 8 lci 1
Cause 0, Diag 0 (DTE originated/No additional information)
Serial1/0:X.25 I D2 Reset Confirm (3) 8 lci 1
```

The following display shows termination of connection when the X.25 PVC was reset:

```
Serial1/0:X.25 I D1 Reset (5) 8 lci 1
Cause 15, Diag 122 (Network operational (PVC)/Maintenance action)
X25 RBP:Reset packet received
Serial1/0:X.25 O D3 Reset Confirm (3) 8 lci 1
```

The following display shows that the TCP session has terminated:

```
[2.30.0.30,11003/2.30.0.33,9998]:TCP receive error, End of data transfer
X25 RBP:End of data transfer
Serial1/0:X.25 O D1 Reset (5) 8 lci 1
Cause 0, Diag 113 (DTE originated/Remote network problem)
Serial1/0:X.25 I D2 Reset Confirm (3) 8 lci 1
```

The following examples show output of the **x25 debug** command with the **events** keyword when RBP has been configured using the **x25 map rbp remote** command.

The following display shows that the X.25 call was cleared:

```
Serial0/1:X.25 I R1 Clear (5) 8 lci 1024
Cause 0, Diag 122 (DTE originated/Maintenance action)
X25 RBP:X.25 circuit cleared
Serial0/1:X.25 O R1 Clear Confirm (3) 8 lci 1024
```

The following display shows that the X.25 call was reset:

```
Serial0/1:X.25 I D1 Reset (5) 8 lci 1024
Cause 0, Diag 122 (DTE originated/Maintenance action)
X25 RBP:Reset packet received
Serial0/1:X.25 O R1 Clear (5) 8 lci 1024
Cause 9, Diag 122 (Out of order/Maintenance action)
Serial0/1:X.25 I R1 Clear Confirm (3) 8 lci 1024
```

The following examples show output of the **x25 debug** command with the **events** keyword when RBP has been configured using the **x25 pvc rbp remote** command.

The following display shows that the X.25 PVC has been reset:

```
Serial0/0:X.25 I D1 Reset (5) 8 lci 1
Cause 0, Diag 122 (DTE originated/Maintenance action)
X25 RBP:Reset packet received
Serial0/0:X.25 O D2 Reset Confirm (3) 8 lci 1
```

The following display shows that the connection was terminated when the X.25 interface was restarted:

```
Serial0/0:X.25 I R1 Restart (5) 8 lci 0
Cause 0, Diag 122 (DTE originated/Maintenance action)
X25 RBP:X.25 PVC inactive
Serial0/0:X.25 O R2 Restart Confirm (3) 8 lci 0
Serial0/0:X.25 O D1 Reset (5) 8 lci 1
Cause 1, Diag 113 (Out of order (PVC)/Remote network problem)
Serial0/0:X.25 I D3 Reset Confirm (3) 8 lci 1
```

debug x25 dump Example

The following is sample output for the **debug x25 dump** command. The encoded X.25 packet contents are displayed after the standard packet description. The output includes the offset into the packet and the display of the data in both hexadecimal and ASCII formats.

```
Router# debug x25 dump

Serial1: X.25 O R/Inactive Restart (5) 8 lci 0
Cause 0, Diag 0 (DTE originated/No additional information)
0: 1000FB00 00 ..{..
Serial1: X.25 I R2 Restart (5) 8 lci 0
Cause 7, Diag 0 (Network operational/No additional information)
0: 1000FB ..{
3: 0700 ..
Serial1: X.25 I R1 Call (13) 8 lci 1
From (4): 2501 To (4): 2502
Facilities: (0)
Call User Data (4): 0xCC000000 (ip)
0: 10010B 44250225 0100CC00 ...D%.%.L.
11: 0000 ..
Serial1: X.25 O R1 Call Confirm (3) 8 lci 1
0: 10010F ...
Serial1: X.25 I D1 Data (103) 8 lci 1 PS 0 PR 0
0: 100100 45000064 00000000 ...E..d....
11: FF01A764 0A190001 0A190002 0800CBFB ..'d.....K{
27: 0B1E22CA 00000000 00028464 ABCDABCD .."J.....d+M+M
43: ABCDABCD ABCDABCD ABCDABCD ABCDABCD +M+M+M+M+M+M+M+M
59: ABCDABCD ABCDABCD ABCDABCD ABCDABCD +M+M+M+M+M+M+M+M
75: ABCDABCD ABCDABCD ABCDABCD ABCDABCD +M+M+M+M+M+M+M+M
91: ABCDABCD ABCDABCD ABCDABCD +M+M+M+M+M+M
Serial1: X.25 O D1 Data (103) 8 lci 1 PS 0 PR 1
0: 100120 45000064 00000000 .. E..d....
11: FF01A764 0A190002 0A190001 0000D3FB ..'d.....S{
27: 0B1E22CA 00000000 00028464 ABCDABCD .."J.....d+M+M
43: ABCDABCD ABCDABCD ABCDABCD ABCDABCD +M+M+M+M+M+M+M+M
59: ABCDABCD ABCDABCD ABCDABCD ABCDABCD +M+M+M+M+M+M+M+M
75: ABCDABCD ABCDABCD ABCDABCD ABCDABCD +M+M+M+M+M+M+M+M
91: ABCDABCD ABCDABCD ABCDABCD +M+M+M+M+M+M
Serial1: X.25 I R1 Clear (5) 8 lci 1
Cause 9, Diag 122 (Out of order/Maintenance action)
0: 100113 097A ....z
Serial1: X.25 O R1 Clear Confirm (3) 8 lci 1
0: 100117 .
```

Table 1 describes significant fields shown in the displays.

Table 1 debug x25 Field Descriptions

Field	Description
Serial0	Interface on which the X.25 event occurred.
X.25	Type of event this message describes.
I	Letter indicating whether the X.25 packet was input (I) or output (O) through the interface.

Table 1 *debug x25 Field Descriptions (continued)*

Field	Description
R3	State of the service or virtual circuit (VC). Possible values follow: R/Inactive—Packet layer awaiting link layer service R1—Packet layer ready R2—Data terminal equipment (DTE) restart request R3—DCE restart indication P/Inactive—VC awaiting packet layer service P1—Idle P2—DTE waiting for DCE to connect CALL P3—DCE waiting for DTE to accept CALL P4—Data transfer P5—CALL collision P6—DTE clear request P7—DCE clear indication D/Inactive—VC awaiting setup D1—Flow control ready D2—DTE reset request D3—DCE reset indication Refer to Annex B of the <i>ITU-T Recommendation X.25</i> for more information on these states.

Table 1 *debug x25 Field Descriptions (continued)*

Field	Description
Restart	<p>The type of X.25 packet. Possible values follow:</p> <p>R Events</p> <ul style="list-style-type: none"> • Restart • Restart Confirm • Diagnostic <p>P Events</p> <ul style="list-style-type: none"> • Call • Call Confirm • Clear • Clear Confirm <p>D Events</p> <ul style="list-style-type: none"> • Reset • Reset Confirm <p>D1 Events</p> <ul style="list-style-type: none"> • Data • Receiver Not Ready (RNR) • RR (Receiver Ready) • Interrupt • Interrupt Confirm <p>XOT Overhead</p> <ul style="list-style-type: none"> • PVC Setup <p>Refer to RFC 1613 <i>Cisco Systems X.25 over TCP (XOT)</i> for information about the XOT PVC Setup packet type.</p>
(5)	Number of bytes in the packet.
8	Modulo of the virtual circuit. Possible values are 8 and 128.
lci 0	VC number. Refer to Annex A of the <i>ITU-T Recommendation X.25</i> for information on VC assignment.
Cause 7	Code indicating the event that triggered the packet. The Cause field can appear only in entries for Clear, Reset, and Restart packets. Possible values for the Cause field can vary, depending on the type of packet. Refer to the appendix “X.25 Cause and Diagnostic Codes” for an explanation of these codes.
Diag 0	Code providing an additional hint of what, if anything, went wrong. The Diag field can appear only in entries for Clear, Diagnostic (as “error 0”), Reset, and Restart packets. Refer to the appendix “X.25 Cause and Diagnostic Codes” for an explanation of these codes.
(Network operational/ No additional information)	The standard explanations of the Cause and Diagnostic codes (<i>causediag</i>).

Table 1 *debug x25 Field Descriptions (continued)*

Field	Description
From (6):170091	Source address. (6) indicates the number of digits in the address that follows. The source address is part of the address block that may be encoded in Call Setup packets.
To (6): 170090	Destination address. (6) indicates the number of digits in the address that follows. The destination address is part of the address block that may be encoded in Call Setup packets.
Facilities:(0)	Indicates that a facilities block is encoded and that it consists of 0 bytes. A breakdown of the encoded facilities (if any) follows.
Call User Data (4):	Indicates that the Call User Data (CUD) field is present and consists of 4 bytes.
0xCC000000 (ip)	Protocol identifier (PID). This subfield of the CUD field is presented in the output as a hexadecimal string followed by the name of the protocol (in this case, IP) that the string represents. Any bytes following the PID are designated “user data” and may be used by an application separately from the PID.

Related Commands

Command	Description
debug x25 interface	Displays information about a specific X.25 or CMNS context or virtual circuit.
debug x25 vc	Displays information about traffic for all virtual circuits that use a given number.
debug x25 xot	Displays information about traffic to or from a specific XOT host.

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 EXEC mode.

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

Syntax Description

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

Command Modes

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.
12.3(14)T	This command was integrated into Cisco IOS Release 12.3(14)T.

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 52](#) describes the significant fields shown in the displays.

Table 2 *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.

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