



X.25 Dual Serial Line Management

Feature History

Release	Modification
12.2(13)T	This feature was introduced.

This document describes the X.25 Dual Serial Line Management feature in Cisco IOS Release 12.2(13)T. It includes the following sections:

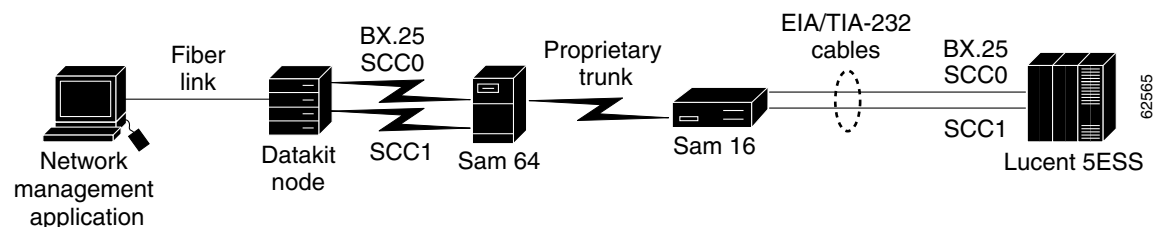
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Feature Overview

Telco service providers use data communications networks (DCNs) to provide communications between network management applications (also called operations support systems or OSSs) and network elements. The telco DCNs use the X.25 protocol (or a variation of X.25) to send network management information across the DCN.

[Figure 1](#) shows a typical DCN that uses the BX.25 protocol developed by Bell Communications Research (now Telcordia Technologies). The Lucent 5ESS switch in this network uses the BX.25 protocol for monitoring, provisioning and collecting billing data.

Figure 1 Network Management Application Monitors Lucent 5ESS Switch over Datakit Network

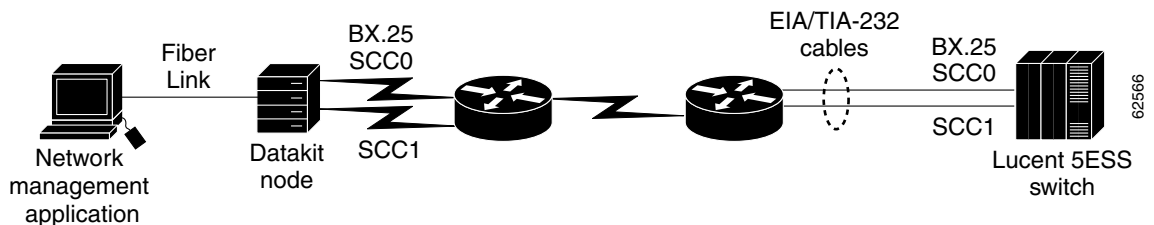


The Datakit node provides the communications front end to a network management application and provides two links, SCC0 and SCC1, for link redundancy. One link is active and passes data across the network; the other remains in standby mode.

The Datakit node acts as a transport, so that to the network management application and the Lucent 5ESS switch, the node looks like it has two individual circuits. The network management application host is supplying leads on both interfaces but ignoring Set Asynchronous Balanced Mode (SABM) messages on the standby interface. If communication is lost on the active interface, the network management application host responds to the SABM messages on the standby interface and it becomes the active interface.

In the past, incumbent local exchange carriers (ILECs) have built either Lucent Datakit or X.25 networks to carry the network management data. Large ILEC customers are currently replacing the Lucent Datakit portion of the networks with Cisco IP core routers in their DCN. [Figure 2](#) shows a typical migration path using X.25 over TCP/IP (XOT) and the Cisco Serial Tunneling (STUN) features.

Figure 2 Network Management Application Monitors Lucent 5ESS Switch Using XOT and STUN

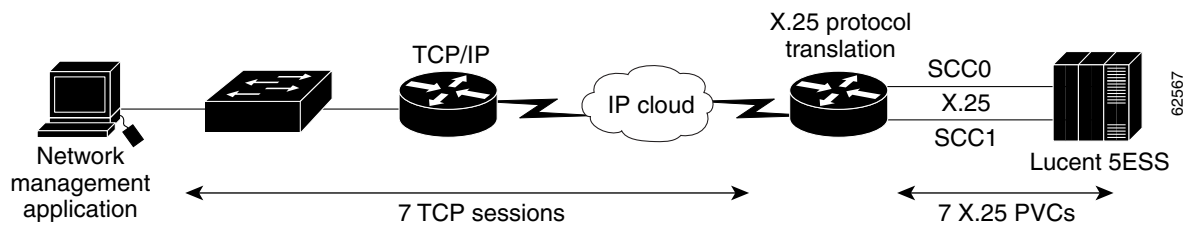


Although the solution shown in [Figure 2](#) eliminates some of the Lucent Datakit network elements in ILEC networks, the network still requires a Lucent Datakit node as a front end to the network management application from the Lucent 5ESS switch.

Additionally, competitive local exchange carriers (CLECs) do not have DCNs or have very limited ones. Furthermore, the CLECs are not interested in purchasing the legacy Lucent Datakit solution shown in [Figure 1](#), nor do they want to install a network management application with a Lucent Datakit front end as shown in [Figure 2](#).

Both the CLECs and the ILECs want the DCN based on IP intranet technologies shown in [Figure 3](#).

Figure 3 Network Management Application Monitors Lucent 5ESS Switch over IP Network



As [Figure 3](#) shows, Cisco offers solutions that allow telco service providers to reduce operating costs, translate and migrate existing X.25-based DCNs to IP-based DCNs, and bridge traditional telephony operations to newer ones. The X.25 Dual Serial Line Management feature is a part of the Cisco IOS Telco Feature Set, a bundle of applications specific to the DCN environment. Specifically, this feature

supports X.25-to-TCP protocol translation, and provides dual serial interfaces to preserve the redundancy and monitoring capability available from the SCC0 and SCC1 links on the Lucent 5ESS switch in the DCN network.

Benefits

The X.25 Dual Serial Line Management feature provides the following benefits:

- Preserves the redundancy and monitoring capability available from the SCC0 and SCC1 links on the Lucent 5ESS switch in the DCN network.
- Allows telco service providers to reduce operating costs by migrating existing X.25-based DCNs to IP-based DCNs.

Additionally, the Cisco IOS **translate tcp** command has been updated with the **dynamic** keyword for PVC options. The **dynamic** keyword provides a backup facility for PVC applications. Dynamic PVCs can be made part of an active backup configuration by using the dual serial line management feature.

Restrictions

The X.25 Dual Serial Line Management feature is used in DCN networks utilizing the Lucent 5ESS switch and running the X.25 protocol.

Related Documents

The chapter “Configuring X.25 and LAPB” in the [Cisco IOS Wide-Area Networking Configuration Guide](#), Release 12.2, describes how to configure X.25.

The Cisco protocol translation feature is described in the [Cisco IOS Terminal Services Configuration Guide](#), Release 12.2, in the chapter, “Configuring Protocol Translation and Virtual Asynchronous Devices.”

The **translate** command used for protocol translation is described in the [Cisco IOS Terminal Services Command Reference](#), Release 12.2T.

The section “[Switch Monitoring Networks: Cisco X.25 BAI OSS Connectivity Solution](#)” in the “Cisco Network Solutions for the Telco DCN: Telephone Switch Environments” white paper provides tasks and examples for configuring a backup interface using dual serial lines in a telco DCN.

The “[X.25 Record Boundary Preservation for Data Communications Networks](#)” feature module provides related information about X.25 Record Boundary Preservation.

Supported Platforms

- Cisco 2500 series
- Cisco 2600 series
- Cisco 2600 XM series
- Cisco 3600 series
- Cisco 3725 router
- Cisco 3745 router

- Cisco 7100 series
- Cisco 7200 series
- Cisco 7400 series
- Cisco 7500 series
- Cisco AS5350 access server
- Cisco AS5300 access server
- Cisco AS5400 access server
- Cisco AS5800 access server
- Cisco IGX 8400 Universal Router Module
- Cisco MC3810 router
- Cisco MGX 8850 Route Processor Module

Determining Platform Support Through Feature Navigator

Cisco IOS software is packaged in feature sets that support specific platforms. To get updated information regarding platform support for this feature, access Feature Navigator. Feature Navigator dynamically updates the list of supported platforms as new platform support is added for the feature.

Feature Navigator is a web-based tool that enables you to quickly determine which Cisco IOS software images support a specific set of features and which features are supported in a specific Cisco IOS image.

To access Feature Navigator, you must have an account on Cisco.com. If you have forgotten or lost your account information, send a blank e-mail to cco-locksmith@cisco.com. An automatic check will verify that your e-mail address is registered with Cisco.com. If the check is successful, account details with a new random password will be e-mailed to you. Qualified users can establish an account on Cisco.com by following the directions at <http://www.cisco.com/register>.

Feature Navigator is updated regularly when major Cisco IOS software releases and technology releases occur. For the most current information, go to the Feature Navigator home page at the following URL:

<http://www.cisco.com/go/fn>

Supported Standards, MIBs, and RFCs

Standards

None

MIBs

None

To obtain lists of supported MIBs by platform and Cisco IOS release, and to download MIB modules, go to the Cisco MIB website on Cisco.com at the following URL:

<http://www.cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml>

RFCs

None

Configuration Tasks

See the following sections for the configuration tasks for the X.25 Dual Serial Line Management feature. Each task in the list is identified as either required or optional:

- [Configuring X.25 Dual Serial Line Management](#) (required)
- [Verifying X.25 Dual Serial Line Management](#) (optional)
- [Troubleshooting Tips](#) (optional)
- [Monitoring and Maintaining X.25 Dual Serial Line Management](#) (optional)

Configuring X.25 Dual Serial Line Management

To configure the X.25 Dual Serial Line Management feature, you must configure dual serial lines running the X.25 protocol, and activate a backup function on one of the interfaces. To enter these configurations, use the following commands beginning in global configuration mode:

	Command	Purpose
Step 1	Router(config)# interface serial <i>x/y</i>	Begins interface configuration on a serial interface (serial1/6, for example, which could be the primary interface).
Step 2	Router(config-if)# backup active interface serial <i>x/y</i>	Assigns a serial interface (serial 1/7, for example) as backup or standby, for the primary serial interface.
Step 3	Router(config-if)# encapsulation x25 dce	Specifies operation of a serial interface as an X.25 DCE device.
Step 4	Router(config-if)# x25 address <i>address</i>	(Optional) Sets the X.121 address on the interface.

Refer to the documents listed in the “[Related Documents](#)” section for additional configuration information. The section “[X.25 Dual Serial Line Management Configuration Example](#)” also lists commands that you might enter to configure X.25 and X.25-to-TCP protocol translation.

Verifying X.25 Dual Serial Line Management

The verification process described in this section is based on the following configuration:

```
!
interface Serial0/0
  description connects to X.25 switch
  ip address 10.10.0.15 255.255.255.0
  encapsulation x25 dce
  backup active interface Serial0/1
  x25 ltc 10
  clockrate 64000
```

To verify correct operation of the X.25 Dual Serial Line Management feature, perform the following steps in EXEC mode:

Step 1 Use the **show backup** command to display which interface is the active backup:

```
Router# show backup
```

```
Primary Interface   Secondary Interface   Status
-----
Serial0/0          Serial0/1             active backup
```

Step 2 Use the **show interfaces** command to monitor the serial interfaces. In the following display, serial interface 0/1 is up (active), and its backup interface is serial interface 0/0:

```
Router# show interfaces s0/1
```

```
Serial0/1 is up, line protocol is up
  Hardware is PowerQUICC Serial
  Description: connects to X.25 switch
  Internet address is 10.10.0.30/24
  Backup interface Serial0/0, failure delay 0 sec, secondary disable
  delay 0 sec,
  kickin load not set, kickout load not set
  MTU 1500 bytes, BW 1544 Kbit, DLY 20000 usec,
    reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation X25, loopback not set
  X.25 DCE, address 3034, state R1, modulo 8, timer 0
    Defaults: idle VC timeout 0
      cisco encapsulation
        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 10-1024, Outgoing-only none
    RESTARTs 2/0 CALLs 4+0/2+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 1, VR 1, tx NR 1, Remote VR 1, Retransmissions 0
  Queues: U/S frames 0, I frames 0, unack. 0, reTx 0
    IFRAMES 130/130 RNRs 0/0 REJs 0/0 SABM/Es 2/1 FRMRs 0/0 DISCs 0/0
  Last input never, output 1w3d, output hang never
  Last clearing of "show interface" counters 2w2d
  Queueing strategy: fifo
  Output queue 0/40, 0 drops; input queue 0/75, 0 drops
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
    242 packets input, 4224 bytes, 0 no buffer
    Received 0 broadcasts, 0 runts, 0 giants, 0 throttles
    2 input errors, 0 CRC, 2 frame, 0 overrun, 0 ignored, 0 abort
    183 packets output, 1337 bytes, 0 underruns
    0 output errors, 0 collisions, 131 interface resets
    0 output buffer failures, 0 output buffers swapped out
    5 carrier transitions
  DCD=up DSR=up DTR=up RTS=up CTS=up
```

Troubleshooting Tips

To troubleshoot operation of the X.25 Dual Serial Line Management feature, use the **debug backup** privileged EXEC command.

Monitoring and Maintaining X.25 Dual Serial Line Management

To monitor and maintain the X.25 Dual Serial Line Management feature, use the commands and steps listed in the [“Verifying X.25 Dual Serial Line Management”](#) section.

X.25 Dual Serial Line Management Configuration Example

In the following example, dual serial lines (serial 1/6 and 1/7) are configured for the X.25 protocol. Serial interface 1/6 is configured as the primary interface, and serial interface 1/7 is configured as the backup interface. X.25-to-TCP protocol translation is also configured.

```
interface Serial1/6
  description SCC0
  backup active interface serial 1/7
  encapsulation x25 dce
  x25 address 66666666
  x25 ltc 8
  x25 ips 256
  x25 ops 256
  clockrate 9600
!
interface Serial1/7
  description SCC1
  encapsulation x25 dce
  x25 address 66666666
  x25 ltc 8
  x25 ips 256
  x25 ops 256
  clockrate 9600
!
x25 route ^66666666 interface Serial1/6
x25 route ^66666666 interface Serial1/7
!
translate tcp 172.20.21.188 port 1025 x25 66666666 pvc 1 dynamic max-users 1
translate tcp 172.20.21.188 port 1026 x25 66666666 pvc 2 dynamic max-users 1
translate tcp 172.20.21.188 port 1027 x25 66666666 pvc 3 dynamic max-users 1
translate tcp 172.20.21.188 port 1028 x25 66666666 pvc 4 dynamic max-users 1
translate tcp 172.20.21.188 port 1029 x25 66666666 pvc 5 dynamic max-users 1
translate tcp 172.20.21.188 port 1030 x25 66666666 pvc 6 dynamic max-users 1
translate tcp 172.20.21.188 port 1031 x25 66666666 pvc 7 dynamic max-users 1
```

Command Reference

This section documents the new X.25 Dual Serial Line Management feature commands. All other commands used with this feature are documented in the Cisco IOS Release 12.2 command reference publications.

- **backup active interface**
- **debug backup**
- **show backup**

backup active interface

To activate primary and backup lines on specific X.25 interfaces, use the **backup active interface** command in interface configuration mode. To disable active backup behavior on the X.25 interface, use the **no** form of this command.

backup active interface *X.25-interface number*

no backup active interface *X.25-interface number*

Syntax Description

X.25-interface number X.25 interface type and number, such as serial 1/3.

Defaults

No default behavior or values.

Command Modes

Interface configuration

Command History

Release	Modification
12.2(13)T	This command was introduced.

Usage Guidelines

The **backup active interface** command is only available on serial interfaces configured for the X.25 protocol. Use this command to activate dual serial lines (a primary and a backup) to maintain the redundancy and monitoring capability available from the SCC0 and SCC1 links on a Lucent 5ESS switch in a telco data communication network (DCN). The DCN provides telco service providers with communications for network management applications.

This configuration requires that both serial interfaces be on the same Cisco router. Once the **backup active interface** command is configured, the router will bring up leads on the backup X.25 interface, but will ignore Set Asynchronous Balanced Mode (SABM) messages from the Lucent 5ESS switch until the primary interface fails.

Examples

The following partial example shows how to configure a primary and backup X.25 interface for dual serial line management of the Lucent 5ESS switch in a DCN:

```
interface serial 1/0
  description SCC0
  backup active interface serial 1/1
  encapsulation x25 dce
  x25 address 66666666
  x25 ltc 8
  x25 ips 256
  x25 ops 256
  clockrate 9600
!
```

```
interface serial 1/1
description SCC1
encapsulation x25 dce
x25 address 66666666
x25 ltc 8
x25 ips 256
x25 ops 256
clockrate 9600
.
.
.
```

Related Commands

Command	Description
debug backup	Monitors the transitions of an interface going down then back up.
show backup	Displays interface backup status.

debug backup

To monitor the transitions of an interface going down then back up, use the **debug backup** command in privileged EXEC mode. To disable this transition report, use the **no** form of this command.

debug backup

no debug backup

Syntax Description This command has no arguments or keywords.

Defaults No default behavior or values.

Command Modes Privileged EXEC

Command History	Release	Modification
	12.0	This command was introduced.

Usage Guidelines The **debug backup** command is useful for monitoring dual X.25 interfaces configured as primary and backup in a telco data communication network (DCN).

Examples The following example shows how to start the **debug backup** command:

```
Router# debug backup
```

Related Commands	Command	Description
	backup active interface	Activates primary and backup lines on specific X.25 interfaces.
	show backup	Displays interface backup status.

show backup

To display interface backup status, use the **show backup** command in EXEC mode.

show backup

Syntax Description This command has no arguments or keywords.

Defaults No default behavior or values.

Command Modes EXEC

Command History	Release	Modification
	12.0	This command was introduced.
	12.2(13)T	This command was enhanced to show primary and secondary interfaces configured as backup interfaces.

Usage Guidelines Use the **show backup** command to display the status of backup interfaces. This command is especially useful when dual serial X.25 interfaces are configured as primary and backup in a telco data communication network (DCN).

Examples The following example shows a typical display from the **show backup** command:

```
Router# show backup

Primary Interface   Secondary Interface   Status
-----
Serial0/0          Serial0/1              active backup
```

Related Commands	Command	Description
	backup active interface	Activates primary and backup lines on specific X.25 interfaces.
	debug backup	Monitors the transitions of an interface going down then back up.

Glossary

data communications network—See DCN.

DCN—data communications network. An out-of-band network that provides connectivity between network elements and their respective operations support system (OSS). Its primary function is enabling the surveillance and the status of a telco network, yet it also facilitates network operations and management functions such as provisioning, billing, planning, and service assurance.

CLEC—competitive local exchange carrier. Company that builds and operates communication networks in metropolitan areas and provides its customers with an alternative to the local telephone company.

competitive local exchange carrier—See CLEC.

ILEC—incumbent local exchange carrier. The local telephone company that controls the cable that makes up the telephone network.

incumbent local exchange carrier—See ILEC.

Lucent 5ESS switch—A Class 5 local telephony switch that connects a local subscriber to a telephone network.

network element—A single piece of telecommunications equipment used to perform a function or service integral to the underlying network.

network management application—A application for managing elements in a service providers' network. For a Class 5 local telephony switch, the applications are used monitor the switch, provision the switch, collect call detail records, and collect traffic data. Examples of these applications include an OSS such as Lucent's Network Fault Management (NFM) application and Telcordia Technologies' Network Monitoring and Assurance (NMA) System.

operations support system—See OSS.

OSS—operations support system. DCN network management and operations applications.

SABM—Set Asynchronous Balanced Mode. Link Access Procedure, Balanced (LAPB) data link layer message that sets the operational mode of a link.

Set Asynchronous Balanced Mode—See SABM.

telco—Abbreviated form of the two words “telephone company.”

X.25 protocol—ITU-T standard that defines how connections between data terminal equipment and data communications equipment are maintained for remote terminal access and computer communications in a network.