

X.25 Remote Failure Detection

This document contains the following sections:

- Feature Overview on page 1
- Supported Platforms on page 3
- Supported Standards, MIBs, and RFCs on page 3
- Prerequisites on page 4
- Configuration Tasks on page 4
- Configuration Examples on page 6
- Command Reference on page 8
- Glossary on page 11

Feature Overview

Static routes are used over a packet-switched data network (PSDN) in order to reduce the network's volume-based costs. Until now, if two routers were connected via multiple X.25 links (a primary and a secondary), a router could not detect failure of the primary link. If a failure occurred, the data was not transferred to the second link because X.25 was unable to determine whether remote links were up or down. Therefore X.25 could not use an alternate connection to a destination.

X.25 remote failure detection is an important feature for X.25 users because now, after a primary link failure, the router can establish a secondary link and continue sending data. This feature is a way for the router to detect a call failure and to use a secondary route to send subsequent packets to the remote destination, at the same time as making periodic attempts to reconnect to its primary link.

X.25 remote failure detection controls the number of these attempts and the interval between such attempts using the **x25 retry** command. The down link is marked up again when any of the following occurs:

- An attempt via the retry mechanism to reestablish the link is successful
- An incoming call is received on the subinterface
- The X.25 packet layer on the interface is restarted

X.25 remote failure detection needs to be manually configured on each subinterface you intend to use this option. However, because it is a per-destination configuration rather than a per-user configuration, you only need it enabled on the subinterface needing the retry option—typically your primary interface.

If you issue the **clear x25** command for the interface configured with X.25 remote failure detection or if a call comes in during retry, the **x25 retry** command will discontinue and the subinterface will be marked “up.” An incoming call can be conducted in a similar way that the **ping** command is used to check connectivity (by definition, a successful incoming call indicates that connectivity is functioning). Also, if the router reaches its retry attempts limit, the **x25 retry** command will discontinue and the subinterface will remain down.

The **x25 retry** command is activated by a call failure notification. Retry only occurs with calls initiated on a subinterface configured with the **x25 retry** command. This command only works when no VCs are up. When reconnection occurs, traffic begins to reuse the primary interface. This resetting of the line protocol to up is the last activity that the **x25 retry** command conducts.

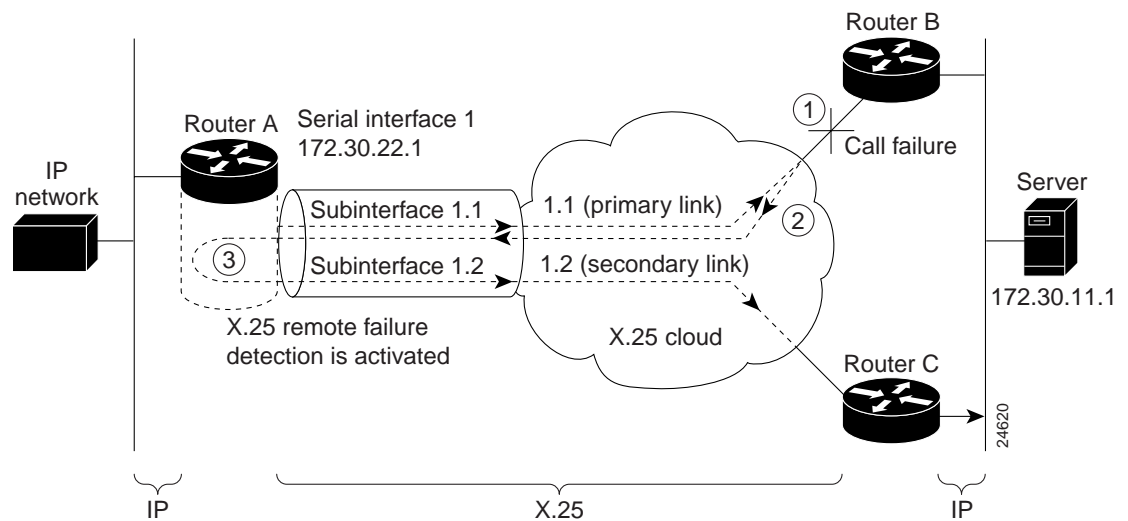
X.25 remote failure detection is designed to work with any network layer routed protocol. However, the feature depends on the ability of the protocol to handle more than one static route to the same destination at the same time. Currently, only IP can accomplish this multi-static route handling. Alternatively, X.25 remote failure detection can be used to activate a backup link should the subinterface configured for retry be marked down via the retry mechanism. See the “Configuring X.25 Remote Failure Detection and the Backup Interface” section for further details.

X.25 remote failure detection is not necessary if you are running IP routing, because IP routing already implements alternate routing. This feature is targeted at environments that have static IP routing across an X.25 network, where these static IP routes currently need to be manually added to the route tables.

Figure 1 shows how X.25 remote failure detection works:

- 1 The data cannot reach its destination using its primary route.
- 2 A call failure notification is sent to the transmitting router.
- 3 The **x25 retry** command is activated, and IP then activates the preassigned secondary route in its route table and begins sending data. The **x25 retry** command also shuts down subinterface 1.1 and begins its retry attempts on this link.

Figure 1 X.25 Remote Failure Detection in Action over an X.25 Cloud



Benefits

- Cost savings on the network because IP routing updates, which require dynamic but costly network connectivity, are not necessary.
- Improved responsiveness and versatility of X.25 primary and alternate links
- More robust networking options for data transmission

Restrictions

The X.25 Remote Failure Detection feature has the following restrictions:

- Works only on switched virtual circuits (SVCs)
- Applies only to point-to-point subinterfaces
- Is not automatically enabled
- Responds only to outgoing call attempts that end in failure

Related Features and Technologies

Other features that have a relation to X.25 remote failure detection are Asynchronous Serial Traffic over UDP, L2TP Dialout, and Frame Relay End-to-End Keepalive.

Supported Platforms

- Cisco 1000 series
- Cisco 1600 series
- Cisco 2500 series
- Cisco 2600 series
- Cisco Catalyst 3000 series
- Cisco 3600 series
- Cisco MC3810 Multiservice Concentrator
- Cisco 4000 series (Cisco 4000, 4000-M, 4500, 4500-M, 4700, 4700-M)
- Cisco 7000 series
- Cisco 7200 series
- Cisco 7500 series

Supported Standards, MIBs, and RFCs

MIBs

No new or modified MIBs are supported by this feature.

For descriptions of supported MIBs and how to use MIBs, see the Cisco MIB web site on CCO at <http://www.cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml>.

RFCs

None

Standards

None

Prerequisites

You must have X.25 encapsulation activated for X.25 remote failure detection to function. You must also have IP static routes or a backup link configured for X.25 encapsulation. Details of configuring IP static routes and backup links can be found in the Cisco IOS Release 12.0 *Wide-Area Networking Configuration Guide*.

Configuration Tasks

To configure X.25 remote failure detection, perform either one of the following tasks:

- Configuring X.25 Remote Failure Detection with IP Static Routes (optional).
- Configuring X.25 Remote Failure Detection and the Backup Interface (optional).

Configuring X.25 Remote Failure Detection with IP Static Routes

To configure X.25 remote failure detection with IP static routes, perform the following steps beginning in configuration mode:

Step	Command	Purpose
1	Router(config)# interface <i>number</i>	Enters specified interface configuration mode.
2	Router(config-if)# encapsulation x25	Enables X.25 encapsulation on the interface.
3	Router(config-if)# x25 address <i>x121-address</i>	Sets X.121 address of the network interface.
4	Router(config-if)# interface <i>subinterface number</i> point-to-point	Enters specified subinterface and enables point-to-point for it.
5	Router(config-subif)# ip address <i>address mask</i>	Creates IP address and mask for the subinterface.
6	Router(config-subif)# x25 map <i>ipaddress x121address</i>	Maps IP address to an X.121 address.
7	Router(config-subif)# x25 retry interval <i>seconds</i> attempts <i>count</i>	Enables the X.25 retry option on the subinterface.
8	Router(config)# ip route <i>address mask</i> serial <i>subinterface number</i> <i>weight</i>	Configures static route from point-to-point interface specified to a destination.
9	Router(config)# ip route <i>address mask</i> serial <i>nextsubinterface number</i> <i>weight</i>	Configures static route from next point-to-point interface specified for the same destination.

Configuring X.25 Remote Failure Detection and the Backup Interface

To configure X.25 remote failure detection and create a backup interface, perform the following steps beginning in configuration mode. Note that IP static routes need not be configured because this backup route is only being configured as a secondary route.

Step	Command	Purpose
1	Router(config)# interface <i>number</i>	Enters specified interface configuration mode.
2	Router(config-if)# encapsulation x25	Enables X.25 encapsulation on the interface.
3	Router(config-if)# x25 address <i>x121-address</i>	Sets X.121 address of the network interface.
4	Router(config)# interface <i>subinterface number</i> point-to-point	Enters specified subinterface and configures point-to-point for it.
5	Router(config-subif)# ip address <i>address mask</i>	Creates IP address and mask for the subinterface.
6	Router(config-subif)# x25 map <i>ipaddress x121address</i>	Maps IP address to an X.121 address.
7	Router(config-subif)# x25 retry interval <i>seconds attempts count</i>	Enables the X.25 retry option on the subinterface.
8	Router(config-subif)# backup interface <i>serial number</i>	Configures specified interface as the backup.
9	Router(config)# interface <i>number</i>	Enters specified interface configuration mode to configure the backup.
10	Router(config-if)# encapsulation x25	Enables X.25 encapsulation on the interface.
11	Router(config-if)# x25 address <i>x121-address</i>	Sets X.121 address of the network interface.
12	Router(config-if)# ip address <i>address mask</i>	Creates IP address and mask for the subinterface.
13	Router(config-if)# x25 map <i>ipaddress x121address</i>	Maps IP address to an X.121 address.

Verifying X.25 Remote Failure Detection

To verify that X.25 remote failure detection is configured, use the **show interface** command on whichever interface you have configured the **x25 retry** command. The line indicated with an arrow in the following output shows the X.25 retry mechanism currently in action on subinterface 1.1, which is currently down—as indicated by the “(retry in progress)” statement—and which has “tried” once out of its possible 100 retry attempts.

```
Router# show interface serial1
Serial1 is up, line protocol is up
  Hardware is QUICC Serial
  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 DTE, address 11111, state R1, modulo 8, timer 0
    Defaults:idle VC timeout 0
      cisco encapsulation
        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
        RESTARTs 2/0 CALLs 0+0/0+0/0+0 DIAGs 0/0
→ Interface Serial1.1:retry-interval 5, attempts 100, tried 1 (retry in progress)
  LAPB DTE, state CONNECT, modulo 8, k 7, N1 12056, N2 20
    T1 3000, T2 0, interface outage (partial T3) 0, T4 0
    VS 2, VR 0, tx NR 0, Remote VR 2, Retransmissions 0
    Queues:U/S frames 0, I frames 0, unack. 0, reTx 0
    IFRAMES 18/16 RNRs 0/0 REJs 0/0 SABM/Es 0/1 FRMRs 0/0 DISCs 0/0
  Last input 00:00:11, output 00:00:02, output hang never
  Last clearing of "show interface" counters 00:01:03
  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
    34 packets input, 398 bytes, 0 no buffer
    Received 0 broadcasts, 0 runts, 0 giants, 0 throttles
    0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
    27 packets output, 424 bytes, 0 underruns
    0 output errors, 0 collisions, 1 interface resets
    0 output buffer failures, 0 output buffers swapped out
    1 carrier transitions
  DCD=down DSR=up DTR=up RTS=up CTS=up
```

To verify which route is currently in use by IP, use the **show ip route** command.

The **debug x25 events** command can be also activated, so that you can see a call being attempted by the X.25 retry mechanism every configured interval.

Configuration Examples

These configuration examples show the **x25 retry** command only being used with a secondary route. However, the **x25 retry** command can be configured for as many subinterfaces that require an alternative route. Use either one of the following examples to configure X.25 remote failure detection:

- Configuring X.25 Remote Failure Detection with IP Static Routes
- Configuring X.25 Remote Failure Detection and the Backup Interface

Configuring X.25 Remote Failure Detection with IP Static Routes

The following is an example of X.25 remote failure detection being configured on subinterfaces 1.1 and 1.2 using the **x25 retry** command. Subinterface 1.1 has been set at a retry every 60 seconds up to a maximum of 10 attempts.

Observe the weighting of 100 on subinterface 1.1 over 200 on subinterface 1.2 in the **ip route** command, because subinterface 1.1 is the primary route and 1.2 is the secondary route—the latter only becomes activated when subinterface 1.1 is unable to function. Weights make for predictable routing events and, therefore, promote the concept of primary and secondary routes.

```
Router(config)# interface serial1
Router(config-if)# encapsulation x25
Router(config-if)# x25 address 11111
Router(config-if)# no shut
Router(config-if)# exit
Router(config)# interface serial1.1 point-to-point
Router(config-subif)# ip address 172.30.22.1 255.255.255.0
Router(config-subif)# x25 map ip 172.30.22.2 22222
Router(config-subif)# x25 retry interval 60 attempts 10
Router(config-subif)# no shut
Router(config-subif)# exit
Router(config)# interface serial1.2 point-to-point
Router(config-subif)# ip address 172.30.22.1 255.255.255.0
Router(config-subif)# x25 map ip 172.30.22.4 44444
Router(config-subif)# no shut
Router(config-subif)# exit
Router(config)# ip route 172.30.11.1 255.255.255.0 serial1.1 100
Router(config)# ip route 172.30.11.1 255.255.255.0 serial1.2 200
```

Configuring X.25 Remote Failure Detection and the Backup Interface

The following is an alternative configuration example to the method previously described. X.25 remote failure detection is configured on subinterface 1.1, and interface 2 is made the backup interface. The **x25 retry** command has been set with an interval of 50 seconds up to a maximum of 20 attempts. In this example, there is no need to configure any IP static routes (as is done with the above configuration) because the backup interface is functioning as the secondary route. In other situations, there may be a need for static IP routes depending on how the backup interface is configured.

For more details about backup, see the **backup interface serial** command in the “Interface Commands” chapter in the Cisco IOS Release 12.0 *Configuration Fundamentals Command Reference* publication.

```
Router(config)# interface serial1
Router(config-if)# encapsulation x25
Router(config-if)# x25 address 11111
Router(config-if)# no shut
Router(config-if)# exit
Router(config)# interface serial1.1 point-to-point
Router(config-subif)# ip address 172.30.22.1 255.255.255.0
Router(config-subif)# x25 map ip 172.30.22.2 22222
Router(config-subif)# x25 retry interval 50 attempts 20
Router(config-subif)# backup interface serial2
Router(config-subif)# no shut
Router(config-subif)# exit
Router(config)# interface serial2
Router(config-if)# encapsulation x25
Router(config-if)# x25 address 11111
Router(config-if)# ip address 172.30.22.1 255.255.255.0
Router(config-if)# x25 map ip 172.30.22.3 33333
Router(config-if)# no shut
Router(config-if)# exit
```

Command Reference

This section documents the new **x25 retry** command. All other commands used with this feature are documented in the Cisco IOS Release 12.0 command references.

- **x25 retry**

x25 retry

To implement secondary X.25 routing while also retrying failed primary X.25 routes, use the **x25 retry** interface configuration command. To discontinue implementing secondary X.25 routes and retrying of primary X.25 routes, use the **no** form of this command.

x25 retry interval *seconds* **attempts** *count*

no x25 retry interval *seconds* **attempts** *count*

Syntax Description

interval	Keyword defining interval between attempts.
<i>seconds</i>	Number of seconds between attempts.
attempts	Keyword defining number of attempts.
<i>count</i>	Number of attempts to reestablish the closed link before discontinuing.

Defaults

No default behavior or values.

Command Modes

Interface configuration

Command History

Release	Modification
12.0(5)T	This command was introduced.

Usage Guidelines

The **x25 retry** command is triggered when no SVCs are up, and an outgoing call fails.

The retry attempts will continue until any of the following happens:

- The configured retry attempts limit is reached
- The attempt to reestablish the link is successful
- An incoming call is received on the subinterface
- The X.25 packet layer on the interface is restarted

If the number of retry attempts exceeds the configured limit, the interface will remain marked “down” until any of the following happens:

- An incoming call is received on the subinterface
- The X.25 packet layer on the interface is restarted

Examples

The following example shows the **x25 retry** command being configured on subinterface 1.1 with a retry interval of 60 seconds up to a maximum of 10 attempts:

```
Router(config)# interface serial1.1 point-to-point  
Router(config-if)# x25 retry interval 60 attempts 10
```

Related Commands

Command	Description
clear x25	Restarts an X.25 service or Connection-Mode Network Service (CMNS), or clears an SVC or PVC.

Glossary

CMNS—Connection-Mode Network Service. Extends local X.25 switching to a variety of media (Ethernet, FDDI, Token Ring).

PSDN—packet-switched data network.

