

Troubleshooting DLSw: Token Ring and SRB Internetworking

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Introduction

Prerequisites

Requirements

Components Used

Conventions

Token Ring and SRB Internetworking Issues

Router Is Unable to Connect to Token Ring

Routing in SRB Network Fails Unexpectedly

No Communication over SRB

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Related Information

Introduction

This document helps you to troubleshoot Token Ring and Source–Route Bridging (SRB) internetworking problems in Data–Link Switching (DLSw). This document identifies three symptoms and provides possible causes and suggested actions to resolve them.

Prerequisites

Requirements

There are no specific requirements for this document.

Components Used

This document is not restricted to specific software or hardware versions.

The information in this document was created from the devices in a specific lab environment. All of the devices used in this document started with a cleared (default) configuration. If your network is live, make sure that you understand the potential impact of any command.

Conventions

For more information on document conventions, refer to the Cisco Technical Tips Conventions.

Token Ring and SRB Internetworking Issues

These symptoms pertain to Token Ring and SRB internetworking problems:

- Router Is Unable to Connect to Token Ring
- Routing in SRB Network Fails Unexpectedly
- No Communication over SRB

To troubleshoot Token Ring interfaces, refer to Troubleshooting Cisco Router Token Ring Interfaces.

Router Is Unable to Connect to Token Ring

When you install a new router in a Token Ring environment, you might find that the router does not connect to the ring. This section outlines possible causes and suggested actions to take, when the router is unable to connect to the Token Ring.

Relay Open in MAU

The relay might be open in the Multistation Access Unit (MAU), which causes the connection problem. Follow this procedure:

1. If, at system power-on, an `open lobe fault` message appears on the console (or vty) that is connected to the router, then check the cable connection to the MAU.
2. Issue the **clear interface** privileged EXEC command, to reset the Token Ring interface and reinsert the router into the ring.

For all Token Ring cards, except the CiscoBus Token Ring and low-end routers, you must issue the **clear interface** command to re-initialize the Token Ring interface when the interface is down.

3. Issue the **show interfaces token** EXEC command, to verify that the interface and the line protocol are up.
4. If the interface is operational, but the `open lobe fault` message persists and the router continues to fail to connect to its ring, then connect the router to a different MAU port.
5. If the `open lobe fault` message continues to appear, disconnect all devices from the MAU and reset the MAU relay with the tool provided by the MAU vendor.
6. Re-attach the router and determine if it can connect to the ring.

If a relay reset does not remedy the problem, try to replace the MAU with one that is known to be operational.

7. If the router still can not connect to the ring, check the internal cable connections of the router Token Ring cards.

Ensure that the cables that are associated with the respective port numbers and applique numbers are correctly wired, and ensure that they are not swapped.

8. If the router still can not connect to the ring, replace the cables that connect the router to the MAU with cables that work.
9. Issue the **clear interface** command to reset the interface, and re-insert the router into the ring.

Issue the **show interfaces token** command to verify that the interface and the line protocol are up.

10. Alternatively, you can connect the router to a spare MAU to which no stations are connected.

If the router is able to attach to the ring, the original MAU should be replaced.

Duplicate MAC Address Relay

The router-to-ring connection problem might be caused by a duplicate MAC address relay. A duplicate MAC address might occur when routers attempt to generate a MAC address. Follow this procedure:

1. Use a network analyzer to check all of the MAC addresses of the stations that are on the ring.
2. Re-initialize one of the nodes that has a duplicate address, to change its MAC address.

LNM Is Blocking Insertion

The LAN Network Manager (LNM) might be blocking insertion and, thus, causing the connection problem. Follow this procedure:

1. Disable LNM on the ring.
2. Attempt to insert the router into the ring again.
3. If you are able to insert the router into the ring, then reconfigure your LNM table to include the address of the router, as needed.

Congested Ring

The ring might be congested. Follow this procedure to clear the problem:

1. Insert the router during an off-peak period.
2. If insertion is successful during off-peak periods but unsuccessful during peak load, segment your internetwork to distribute traffic.

RPS Conflict

There might be a conflict between Ring Parameter Server (RPS) implementations, which causes the connection problem. To determine it, follow this procedure:

1. Issue the **no lnm rps** interface configuration command, to disable the RPS function on the router that you are attempting to insert into the ring.
2. Attempt to insert the router into the ring again.
3. If you can insert the router with the RPS disabled, a conflict exists between RPS implementations. Contact your router technical support representative for more information.

Bad Ring Speed Specification

Ring speed might be improperly specified, which causes the problem. Follow this procedure:

1. Issue the **show interfaces token EXEC** command, to determine the status of the interface.
2. If the status line indicates that the interface and the line protocol are not up, then check the cable from the router to the MAU.
3. Ensure that the cable is operational. Replace it, if necessary.
4. If the **show interfaces token EXEC** command indicates that the interface and the line protocol are up, then issue the **ping** command between the routers, to test connectivity.
5. If the remote router does not respond, then check the ring speed specification on all of the nodes that are attached to the Token Ring backbone.

- The ring speed for all of the nodes must be the same. Ring speed conflicts cause the ring to beacon.
6. Modify ring speed specifications for clients, servers, and routers, as necessary.

For routers that support software that enables you to set the ring speed, issue the **ring-speed** interface configuration command. Change jumpers, as needed, for modular router platforms. For more information about ring speed specification, refer to the hardware installation and maintenance manual for your system.

Routing in SRB Network Fails Unexpectedly

The routing might function properly in an environment that is dominated by SRB links, then halt without any known administrative changes in the network. This section outlines a possible cause and suggested actions to

take, when routing in an SRB network fails unexpectedly.

Software Bug or Misconfigured End System

The problem might be caused by a software bug, or the end system might be misconfigured. Follow this procedure:

1. Issue the **show interfaces EXEC** command, to determine whether the protocol is up.

If the protocol is up, the 5-minute I/O rate has not dropped to zero, and there are no input or output errors, then check the ring status.

2. If the last ring status line shows a soft error, then issue the **show controllers token EXEC** command, to determine whether there have been any line or burst errors on the ring.

If no errors appear, then skip Step 3 (go to Step 4).

3. Place a network analyzer on the ring, to determine which node is injecting errors into the ring.

Contact your router technical support representative for additional assistance.

4. Issue the **show rif EXEC** command, to determine if the MAC address for an end system is missing from the Routing Information Field (RIF) table.
5. If the MAC address for an end system is missing, then issue the **clear rif-cache** command.
6. If the end system is not responding, then use a network analyzer to look for Exchange Identification (XID)-to-null Service Access Point (SAP) packets (Link SAP [LSAP] value of 00) sent by the originating station to the end system.

If you see the XID packet and the end system does not reply, then there is probably a bug in the end system software or there is an incorrect configuration.

7. Trace the RIF of the frame on a hop-by-hop basis, to determine how far it is travelling.

This might also help you to detect duplicate ring numbers.

8. As a last resort, issue the **debug token ring** privileged EXEC command.

This command can provide useful information, but it generates traffic that can break poorly performing networks. For more information about the **debug token ring** command, refer to the Using the 1100 Access List Debug Filter Utility on an SRB Interface section of this document.

No Communication over SRB

A router that is configured to operate as an SRB that connects two or more Token Rings might not forward SRB traffic. This section outlines possible causes of this problem and suggested actions to take, when no communication is exchanged over an SRB.

Misconfigured Router or Ring Number Mismatch

The communication failure might be caused by a misconfigured router or mismatched ring numbers. Follow this procedure:

1. Obtain the ring number (specified in hexadecimal) from IBM SRBs and other non-Cisco devices, if applicable.
2. Issue the **write terminal** privileged EXEC command. Look for the **source-bridge local-ring# bridge-number# remote-ring#** interface configuration commands that assign ring numbers (displayed in decimal) to the rings that are connected to the router interfaces.

Note: Although you can enter the ring number in hexadecimal or decimal, it always appears in the configuration as a decimal number.

Note: Parallel bridges that are situated between the same two rings must have different bridge numbers.

3. Convert IBM SRB ring numbers to decimal, and verify that the ring numbers for all internetworking nodes agree. You should configure all nodes that are attached to the same ring with the same ring number.
4. If the ring numbers do not agree, reconfigure the router interface so that its ring number matches that of the IBM SRB and the other Cisco and non-Cisco devices (if applicable) that are sharing the same ring.
5. If you still can not communicate over the SRB, issue the **debug source error** command.

This command displays only SRB errors; no output is displayed in SRB networks that are working. Before you attempt this debug command, refer to Important Information on Debug Commands.

End System Does Not Support RIF

The SRB communication failure might be the result of an end system that does not support RIF. Follow this procedure:

1. Place a network analyzer on the same ring to which the end system is connected.
2. Look for any frames sent from the end system with the first bit of the source MAC address set to 1.

If no such frames are found, the end system does not support RIF and is not able to participate in source routing. If the protocol is routable, then you can configure the router to act as a Source-Route Transparent (SRT) bridge and route the protocol.

3. If your environment requires SRB, then contact your workstation or server vendor for SRB drivers or for information about how to set up SRB on your workstation or server.

End System Configured to Send Spanning Explorers, but Router Not Configured to Forward Them

In this case, the end system might be configured to send spanning explorers, but the router might not be configured to forward them. Follow the next procedure.

Note: A spanning explorer is equivalent to a single-route broadcast.

1. Place a network analyzer on the same ring to which the end system is connected.
2. Look for any frames sent from the end system with the first bit of the source address set to 1.
3. If such frames are found, then determine whether the frames are spanning all-ring frames (that is, the first two bits are set to 1).
4. If you find spanning tree explorer frames, then determine whether the router is configured to forward spanning explorers.

To do this, issue the **source-bridge spanning** interface configuration command.

5. If necessary, issue the **source-bridge spanning** interface configuration command on any router that is required to pass spanning explorers.
6. Issue the **show source-bridge EXEC** command to determine if the explorer count is incrementing.
7. If sessions still can not be successfully established over the SRB network, then refer to the Using the 1100 Access List Debug Filter Utility on an SRB Interface section of this document.

Using the 1100 Access List Debug Filter Utility on an SRB Interface

This section discusses how to troubleshoot when two MAC addresses do not connect. To solve a problem like this, you can use the 1100 access list, a debug filter utility that uses extended access list configuration commands. This debug filter utility is available on routers that run Cisco IOS® Software Release 10.3 and later.

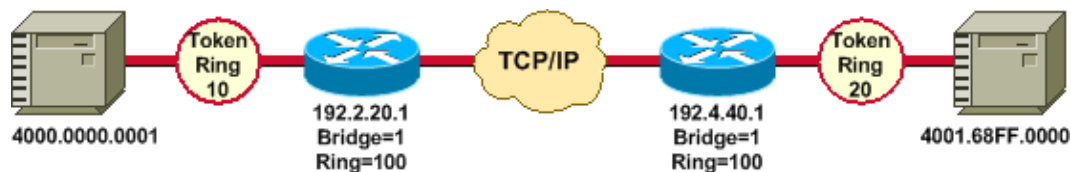
The debug utility does not block traffic; rather, you build an access list, then use it along with two **debug** commands: **debug list 1100** and **debug token ring**. The result is a small, sniffer-like trace of what is happening on the router for the MAC address pairs that are listed in the access list.

You can use this debug utility in SRB, Remote Source-Route Bridging (RSRB), and DLSw. The important aspect is not how traffic reaches this router, but how traffic leaves and returns to the Token Ring interface. This utility is useful, if these statements are true:

- There is an SRB Token Ring interface on your router.
- The traffic with which you are concerned is using that interface.
- The router is running Cisco IOS Software Release 10.3 or later.

Example

The example provided in this document is DLSw-oriented. However, the 1100 access list is for SRB traffic, so the DLSw aspect is not important.



In this example, 4001.68FF.0000 is not able to establish a session with 4000.0000.0001.

1. Build the 1100 access list for the router on the left:

```
!--- Enter these access-list lines on one line each.
access-list 1100 permit 4001.68FF.0000 8000.0000.0000
                        4000.0000.0001 0000.0000.0000
access-list 1100 permit 4000.0000.0001 8000.0000.0000
                        4001.68FF.0000 0000.0000.0000
```

2. Go to the command line of that router, and apply it:

```
taz# debug list 1100

taz# debug token ring

Token Ring Interface debugging is on
      for access list: 1100
```

The debugs are taken from the router on the left.

Note: The 1100 access list typically picks up incoming packets in both the SRB and the fast-switching code and bridging code. For the sake of simplicity, all of the SRB and fast-switching lines in this example have been deleted.

3. Use the Systems Network Architecture (SNA) suite of protocols to bridge.

The basic SNA start-up sequence is:

- a. TEST
- b. TEST+rsp
- c. XID (this can be just a few lines or many lines)
- d. Set Asynchronous Balanced Mode Extended (SABME)
- e. Unnumbered Acknowledgement (UA)

In this example, the TEST portion is a MAC address ping, because you want to ensure that the MAC address actually exists before you begin XID negotiations with it.

```
To0: out: MAC: acfc: 0x0040 Dst: 4000.0000.0001 Src: c001.68ff.0000 bf: 0x00
0x3150E0C
To0: out: RIF: C630.0641.00A0

!--- SRE (ring100.bridge1.ring10).

To0: out: LLC: 0004F300 000848B4 03032630 001C0F41 002E6004 0012DD5C ln: 23

!--- TEST.

To0: br: MAC: acfc: 0x1040 Dst: 4001.68ff.0000 Src: c000.0000.0001 bf: 0x82
0x3151778
To0: br: RIF: 8230

!--- ARE (from 4000.0000.0001).

To0: br: LLC: 0401F3C0 E338C800 08020000 3052A302 C851749F 0A01E000 ln: 19

!--- TEST+rsp.

TR0: br:          riflcn 2, rd_offset 0, llc_offset 16
```

From that output, you can see that the TEST and the TEST+rsp worked. If this phase had failed, you would need to determine why. No operations occur unless the TEST and TEST+rsp works.

4. After you determine that the MAC address exists, you can start to communicate with it.

Both ends must agree upon the rules to which to adhere, when they talk; this is what occurs during the XID portion. Some devices do not allow both ends to actively participate in the exchange of rules.

With a PU 2.0 device, the XID is typically short.

5. After the TEST and TEST+rsp are complete, look for the XID (BF), then a SABME (7F) and UA (73) combination.

A PU 2.0 XID is shown in this output:

```
To0: out: MAC: acfc: 0x8040 Dst: 4000.0000.0001 Src: c001.68ff.0000 bf: 0x82
0x3150E0C
To0: out: RIF: 06B0.00A1.0640
To0: out: LLC: 0404BF00 01000000 00000400 13531C00 12039400 00000400 ln: 23

!--- Null XID.

To0: br: MAC: acfc: 0x1040 Dst: 4001.68ff.0000 Src: c000.0000.0001 bf: 0x02
0x3151778
To0: br: RIF: 0630.00A1.0640
To0: br: LLC: 0405BFF8 66584300 00000258 0E5EC001 0A01E000 000A0205 ln: 23
TR0: br:          riflcn 6, rd_offset 16, llc_offset 20
To0: out: MAC: acfc: 0x8040 Dst: 4000.0000.0001 Src: c001.68ff.0000 bf: 0x82
0x3150E0C
To0: out: RIF: 06B0.00A1.0640
To0: out: LLC: 0404BF02 00096000 01004000 00000001 C6300641 00A00000 ln: 29
To0: br: MAC: acfc: 0x1040 Dst: 4001.68ff.0000 Src: c000.0000.0001 bf: 0x02
```

```

0x3151778
To0: br: RIF: 0630.00A1.0640
To0: br: LLC: 04047F77 F5090600 00000258 0E5EC001 0A01E000 000A0205 ln: 23

!--- SABME.

TR0: br:          riflen 6, rd_offset 16, llc_offset 20
To0: out: MAC: acfc: 0x8040 Dst: 4000.0000.0001 Src: c001.68ff.0000 bf: 0x82
      0x3150E0C
To0: out: RIF: 06B0.00A1.0640
To0: out: LLC: 04057300 00000000 085C0003 03263000 1E8D0000 0C600200 ln: 23

!--- UA.

To0: br: MAC: acfc: 0x1040 Dst: 4001.68ff.0000 Src: c000.0000.0001 bf: 0x02
      0x3151778
To0: br: RIF: 0630.00A1.0640
To0: br: LLC: 04040101 A0E62B93 66DD69D8 00F5C3F5 711D6011 40403C4B ln: 24
TR0: br:          riflen 6, rd_offset 16, llc_offset 20

```

What would the XID portion look like if the end devices attempted to have a PU 2.1-type conversation? PU 2.1-capable devices allow the end stations more flexibility to negotiate the rules. One device can send an XID3 (BF3) with the rules that it wants to follow. The other end can receive it, make some changes, and send it back to the first device. This continues until the negotiation reaches the SABME and UA combination, or it might terminate. If it does not reach the SABME and UA portion, a configuration issue might be preventing the two devices from synchronizing. For example, one device might send a signal that communicates that it wants to be the primary and that it is not negotiable on that point. But, if the other side also wants to be the primary and is not negotiable on that point, then the two sides never reach SABME and UA.

A PU 2.1 XID is shown in this output:

```

To0: out: MAC: acfc: 0x8040 Dst: 4000.0000.0001 Src: c001.68ff.0000 bf: 0x82
      0x3150E0C
To0: out: RIF: 06B0.00A1.0640
To0: out: LLC: 0404BF00 01000000 00000400 13531C00 12039400 00000400 ln: 23

!--- Null XID.

To0: br: MAC: acfc: 0x1040 Dst: 4001.68ff.0000 Src: c000.0000.0001 bf: 0x02
      0x3151778
To0: br: RIF: 0630.00A1.0640
To0: br: LLC: 0405BFF8 66584301 686901B4 CBE07DA8 0A01E000 000A0205 ln: 23
TR0: br:          riflen 6, rd_offset 16, llc_offset 20
To0: out: MAC: acfc: 0x8040 Dst: 4000.0000.0001 Src: c001.68ff.0000 bf: 0x82
      0x3150E0C
To0: out: RIF: 06B0.00A1.0640
To0: out: LLC: 0404BF32. 5C096000 01000080 08C10000 00008000 010B7100 ln: 115

!--- XID 3.

To0: br: MAC: acfc: 0x1040 Dst: 4001.68ff.0000 Src: c000.0000.0001 bf: 0x02
      0x3151778
To0: br: RIF: 0630.00A1.0640
To0: br: LLC: 0405BF32 47FFFFFF FC000010 8A000000 00000000 010B7100 ln: 94

!--- XID 3.

TR0: br:          riflen 6, rd_offset 16, llc_offset 20
To0: out: MAC: acfc: 0x8040 Dst: 4000.0000.0001 Src: c001.68ff.0000 bf: 0x82
      0x3150E0C
To0: out: RIF: 06B0.00A1.0640
To0: out: LLC: 0404BF32. 5C096000 01000080 04C10000 00008000 010B7100 ln: 115

!--- XID 3.

```

To0: br: MAC: acfc: 0x1040 Dst: 4001.68ff.0000 Src: c000.0000.0001 bf: 0x02
0x3151778

To0: br: RIF: 0630.00A1.0640

To0: br: LLC: 0405BF32 47FFFFFF FC000010 86000000 00000000 010B5100 ln: 94

!--- XID 3.

TR0: br: riflcn 6, rd_offset 16, llc_offset 20

To0: out: MAC: acfc: 0x8040 Dst: 4000.0000.0001 Src: c001.68ff.0000 bf: 0x82
0x3150E0C

To0: out: RIF: 06B0.00A1.0640

To0: out: LLC: 0404BF32. 5C096000 01000080 04C10000 00008000 010B4100 ln: 115

!--- XID 3.

To0: br: MAC: acfc: 0x1040 Dst: 4001.68ff.0000 Src: c000.0000.0001 bf: 0x02
0x3151778

To0: br: RIF: 0630.00A1.0640

To0: br: LLC: 04047F77 F5090688 997817FF CBE07DA8 0A01E000 000A0205 ln: 23

!--- SABME.

TR0: riflcn 6, rd_offset 16, llc_offset 20

To0: out: MAC: acfc: 0x8040 Dst: 4000.0000.0001 Src: c001.68ff.0000 bf: 0x82
0x3150E0C

To0: out: RIF: 06B0.00A1.0640

To0: out: LLC: 04057300 00000000 0845BC03 03263000 1E8D000 0C600200 ln: 23

!--- UA.

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