

Configuring FRAS DLSw Backup

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Introduction

In this sample configuration, a Cisco router configured for Frame Relay Access Support (FRAS) boundary network node (BNN) with Token Ring–attached devices communicates with a Frame Relay–attached front–end processor (FEP).

The objective is to configure and confirm the behavior of the FRAS data–link switching (DLSw) backup feature, introduced in Cisco IOS[®] Software Release 11.2F. This feature provides a secondary path (through DLSw+) that is used when the Frame Relay network becomes unavailable. When the primary FRAS connection fails, DLSw provides the desired connectivity, and the end stations connect to the Host with DLSw. Note that the FEP has a Token Ring connection that goes to the DLSw router.

Prerequisites

Requirements

There are no specific requirements for this document.

Conventions

Refer to Cisco Technical Tips Conventions for more information on document conventions.

Configure

Configuration Notes

In this section, you are presented with the information to configure the features described in this document.

- The FRAS BNN router (AVIMI) to 0 MAC address must be configured as the destination MAC (DMAC) in all the end devices (0100.1111.0000).
- If you use the old support for BNN (pre 11.2), you need to map every end station in the segment/ring.

Note: The MAC address in the FRAS map command represents the end station: smac.

- The FRAS BNN router configuration contains these commands:

```
fras map llc 0000.1111.0000 4 4 Serial0 frame-relay 40 8 4
```

```
fras map llc 0000.3333.0000 4 4 Serial0 frame-relay 40 4 4
```

With these commands, the FRAS BNN router accepts inbound requests from the end stations (0000.1111.0000 and 0000.3333.0000) with SAP 0x04 that tries to connect to 0100.1111.0000 with SAP 0x04. On the Frame Relay side, the router sends data over DLCI 40, with a destination SAP (DSAP) of 0x04 and a SSAP of 0x08 and 0x04, respectively.

- The FRAS BNN router configuration contains this command on interface serial 0:

```
fras backup dlsw 4000.1000.2000 100 4000.3745.0000
```

This command enables the FRAS DLSw backup feature. In case of a failure on the Frame Relay link, the router attempts to connect to the remote MAC 4000.3745.0000 through DLSw with ring 100 (virtual ring of the router). The router uses 4000.1000.2000 as the source MAC address. If multiple sessions need backup through DLSw, the router uses different SAPs for each one (see the Show Command Output section).

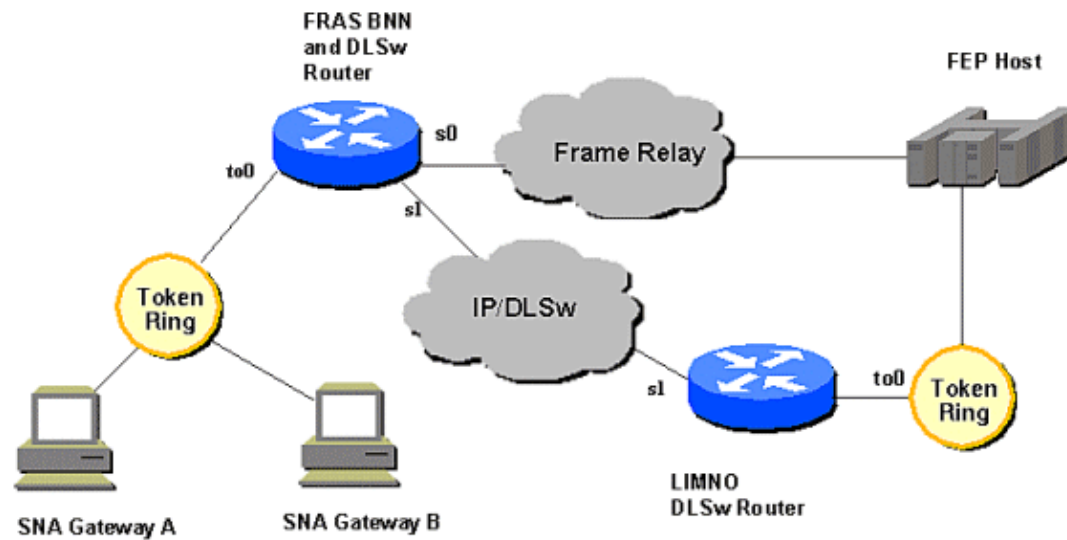
- FRAS backup DLSw is an 11.2F feature of IOS.
- When the main Frame Relay connection (FRAS) comes back up, the SNA sessions are maintained over DLSw. You must clear all the DLSw circuits in order to move them manually .
- For this example, the Frame Relay connection was simulated back-to-back (no Frame Relay switch in the middle).

Note: There are no Local Management Interfaces (LMIs) or keepalives configured.

Note: Use the Command Lookup Tool (registered customers only) to find more information on the commands used in this document.

Network Diagram

This document uses this network setup:



Network Diagram Notes

- SNA Gateway A is configured with this Media Access Control (MAC) value:

```
smac = 0000.1111.0000 (non-cannonical)
dmac = 0100.1111.0000 (non-cannonical)
ssap = 0x04 and dsap = 0x04
```

- SNA Gateway B is configured with this MAC value:

```
smac = 0000.3333.0000 (non-cannonical)
dmac = 0100.1111.0000 (non-cannonical)
ssap = 0x04 and dsap = 0x04
```

- FEP has this MAC address on its Token Ring interface:

```
smac = 4000.3745.0000 (non-cannonical)
```

- FRAS BNN router (AVIMI) has configured this MAC on its Token Ring interface:

```
smac = 0100.1111.0000 (non-cannonical)
```

- For this test, the SNA Gateways connect to the Host with FRAS BNN through Serial 0 on the FRAS BNN router. The objective of FRAS DLSw backup is to keep connectivity to the Host with DLSw (through Serial 1) in case the main Frame Relay link goes down.

Configurations

This document uses these configurations:

| FRAS BNN Router |
|---|
| <pre>avimimus#show running-config Current configuration: ! hostname avimimus ! source-bridge ring-group 100 dlsw local-peer peer-id 10.10.15.1 dlsw remote-peer 0 tcp 10.10.16.1</pre> |

```

!
interface Loopback0
 ip address 10.10.15.1 255.255.255.0
 no ip directed-broadcast
!
interface Serial0
 no ip address
 no ip directed-broadcast
 encapsulation frame-relay IETF
 no ip mroute-cache
 no keepalive
 no fair-queue
 clockrate 2000000
 frame-relay map llc2 40
 frame-relay interface-dlci 40
 fras backup dlsw 4000.1000.2000 100 4000.3745.0000
!
interface Serial1
 no ip address
 no ip directed-broadcast
 encapsulation frame-relay IETF
 no keepalive
!
interface Serial1.1 point-to-point
 ip address 10.10.11.5 255.255.255.252
 no ip directed-broadcast
 frame-relay interface-dlci 20
!
interface TokenRing0
 mac-address 0100.1111.0000
 no ip address
 no ip directed-broadcast
 ring-speed 16
 source-bridge 2 8 100
 fras map llc 0000.1111.0000 4 4 Serial0 frame-relay 40 8 4
 fras map llc 0000.3333.0000 4 4 Serial0 frame-relay 40 4 4
!
router eigrp 10
 network 10.0.0.0
!
end

```

DLSw Router at Host Side

```

limno#show running-config

Building configuration...
Current configuration:
!
hostname limno
!
source-bridge ring-group 500
dlsw local-peer peer-id 10.10.16.1
dlsw remote-peer 0 tcp 10.10.15.1
!
interface Loopback0
 ip address 10.10.16.1 255.255.255.0
 no ip directed-broadcast
!
interface Serial1
 no ip address
 no ip directed-broadcast
 encapsulation frame-relay IETF

```

```

no ip route-cache
no ip mroute-cache
no keepalive
clockrate 4000000
!
interface Serial1.1 point-to-point
ip address 10.10.11.6 255.255.255.252
no ip directed-broadcast
no ip route-cache
no ip mroute-cache
frame-relay interface-dlci 20
!
interface TokenRing0
ip address 170.186.86.43 255.255.255.0 secondary
ip address 10.10.12.1 255.255.255.0
no ip directed-broadcast
no ip route-cache
no ip mroute-cache
ring-speed 16
source-bridge 10 1 500
source-bridge spanning
!
router eigrp 10
network 10.0.0.0
!
end

```

Verify

Debug and Verification Tips

- **debug fras error** – Displays information about FRAS protocol errors.
- **debug fras state** – Displays information about FRAS data link control link state changes. These are the possible states: reset, request open station is sent, exchange xid, connection request is sent, signal station wait, connection response wait, connection response sent, connection established, disconnect wait, and number of link states.
- **debug fras message** – Displays general information about FRAS messages.

Show Command Output

You can use these **show** commands to verify the configuration.

| FRAS BNN router before the DLSw backup was activated | | | | | | |
|--|----------------|-----|------|------|------|--------------|
| avimimus# show fras | | | | | | |
| Boundary Network Node (BNN): | | | | | | |
| DLCI: 40 | | | | | | |
| Type | Destination | Int | LSap | RSap | Role | State |
| llc | 0000.1111.0000 | To0 | 4 | 4 | P | ls_Contacted |
| fr | - | Se0 | 8 | 4 | S | ls_Contacted |
| DLCI: 40 | | | | | | |
| Type | Destination | Int | LSap | RSap | Role | State |
| llc | 0000.3333.0000 | To0 | 4 | 4 | P | ls_Contacted |

Boundary Access Node (BAN):

avimimus#show llc2 brief

LLC2 Connections: total of 4 connections
Se0 NORMAL 40 04 04
Se0 NORMAL 40 08 04
To0 NORMAL 0000.1111.0000 0100.1111.0000 04 04
To0 NORMAL 0000.3333.0000 0100.1111.0000 04 04

avimimus#show llc2

LLC2 Connections: total of 4 connections
Serial0 DTE: 40 04 04 state NORMAL
V(S)=1, V(R)=1, Last N(R)=1, Local window=7, Remote Window=127
akmax=3, n2=10,
xid-retry timer 0/0 ack timer 0/1000
p timer 0/1000 idle timer 2370/10000
rej timer 0/3200 busy timer 0/9600
akdelay timer 0/100 txQ count 0/200

Serial0 DTE: 40 08 04 state NORMAL
V(S)=1, V(R)=1, Last N(R)=1, Local window=7, Remote Window=127
akmax=3, n2=10,
xid-retry timer 0/0 ack timer 0/1000
p timer 0/1000 idle timer 6590/10000
rej timer 0/3200 busy timer 0/9600
akdelay timer 0/100 txQ count 0/200

TokenRing0 DTE: 0000.1111.0000 0100.1111.0000 04 04 state NORMAL
V(S)=1, V(R)=1, Last N(R)=1, Local window=7, Remote Window=127
akmax=3, n2=10,
xid-retry timer 0/0 ack timer 0/1000
p timer 0/1000 idle timer 8950/10000
rej timer 0/3200 busy timer 0/9600
akdelay timer 0/100 txQ count 0/200

TokenRing0 DTE: 0000.3333.0000 0100.1111.0000 04 04 state NORMAL
V(S)=1, V(R)=1, Last N(R)=1, Local window=7, Remote Window=127
akmax=3, n2=10,
xid-retry timer 0/0 ack timer 0/1000
p timer 0/1000 idle timer 7370/10000
rej timer 0/3200 busy timer 0/9600
akdelay timer 0/100 txQ count 0/200

Note: At this stage there are no DLSw circuits. All connectivity is through FRAS BNN.

avimimus#show dlsw peer

| Peers: | state | pkts_rx | pkts_tx | type | drops | ckts | TCP | uptime |
|----------------|---------|---------|---------|------|-------|------|-----|----------|
| TCP 10.10.16.1 | CONNECT | 46 | 46 | conf | 0 | 0 | 0 | 00:20:31 |

Total number of connected peers: 1
Total number of connections: 1

FRAS BNN router after the DLSw backup was activated

avimimus#show fras

Boundary Network Node (BNN):

DLCI: 40

| Type | Destination | Int | LSap | RSap | Role | State |
|------|----------------|-----|------|------|------|-------------------------------------|
| dlsw | - | Se0 | 8 | 4 | S | ls_Contacted (Backup is enabled) |
| llc | 0000.1111.0000 | To0 | 4 | 4 | P | ls_Contacted |

DLCI: 40

| Type | Destination | Int | LSap | RSap | Role | State |
|------|----------------|-----|------|------|------|-------------------------------------|
| dlsw | - | Se0 | 4 | 4 | S | ls_Contacted (Backup is enabled) |
| llc | 0000.3333.0000 | To0 | 4 | 4 | P | ls_Contacted |

Boundary Access Node (BAN):

avimimus#show llc brief

LLC2 Connections: total of 2 connections
 To0 NORMAL 0000.1111.0000 0100.1111.0000 04 04
 To0 NORMAL 0000.3333.0000 0100.1111.0000 04 04

avimimus#show llc

LLC2 Connections: total of 2 connections
 TokenRing0 DTE: 0000.1111.0000 0100.1111.0000 04 04 state NORMAL
 V(S)=1, V(R)=1, Last N(R)=1, Local window=7, Remote Window=127
 akmax=3, n2=10,
 xid-retry timer 0/0 ack timer 0/1000
 p timer 0/1000 idle timer 2210/10000
 rej timer 0/3200 busy timer 0/9600
 akdelay timer 0/100 txQ count 0/200

TokenRing0 DTE: 0000.3333.0000 0100.1111.0000 04 04 state NORMAL
 V(S)=1, V(R)=1, Last N(R)=1, Local window=7, Remote Window=127
 akmax=3, n2=10,
 xid-retry timer 0/0 ack timer 0/1000
 p timer 0/1000 idle timer 8900/10000
 rej timer 0/3200 busy timer 0/9600
 akdelay timer 0/100 txQ count 0/200

Note: After the FRAS failure, the LLC sessions terminated by the router are still between the end stations and the MAC configured in Token Ring 0 (0100.1111.0000), but the DLSw circuits are shown between the MAC addresses configured in the **fras backup dlsw** command

avimimus#show dlsw circuit detail

Index local addr(lsap) remote addr(dsap) state uptime
 1442840576 4000.1000.2000(04)4000.3745.0000(04) CONNECTED 00:04:07
 PCEP: 617BE454 UCEP: 6170CFB8
 Port:VDLC100 peer 10.10.16.1(2065)
 Flow-Control-Tx CW:20, Permitted:19; Rx CW:20, Granted:39; Op: Repeat
 Congestion: Low(02), Flow Op: Half: 0/0 Reset 0/0
 RIF = --no rif--
 Bytes: 229/18 Info-frames: 1/1
 XID-frames: 3/1 UInfo-frames: 0/0

1962934273 4000.1000.2000(08) 4000.3745.0000(04) CONNECTED 00:03:34
 PCEP: 6170D5F8 UCEP: 6175BC68
 Port:VDLC100 peer 10.10.16.1(2065)
 Flow-Control-Tx CW:20, Permitted:19; Rx CW:20, Granted:39; Op: Repeat
 Congestion: Low(02), Flow Op: Half: 0/0 Reset 0/0
 RIF = --no rif--

```
Bytes: 229/18 Info-frames: 1/1
XID-frames: 3/1 UInfo-frames: 0/0
Total number of circuits connected: 2
```

```
avimimus#show dlsw circuit
```

| Index | local addr(lsap) | remote addr(dsap) | state | uptime |
|------------|--------------------|--------------------|-----------|----------|
| 1442840576 | 4000.1000.2000(04) | 4000.3745.0000(04) | CONNECTED | 00:13:39 |
| 1962934273 | 4000.1000.2000(08) | 4000.3745.0000(04) | CONNECTED | 00:13:06 |

```
Total number of circuits connected: 2
```

DLSw Router at Host Side

This is the data taken before the DLSw backup feature started.

No DLSw circuits for this case.

```
limno#show dlsw peer
```

| Peers: | state | pkts_rx | pkts_tx | type | drops | ckts TCP | uptime |
|----------------|---------|---------|---------|------|-------|----------|----------|
| TCP 10.10.15.1 | CONNECT | 48 | 48 | conf | 0 | 0 0 | 00:21:35 |

```
Total number of connected peers: 1
```

```
Total number of connections: 1
```

This is the data after the DLSw backup feature starts to work.

```
limno#show dlsw circuit
```

| Index | local addr(lsap) | remote addr(dsap) | state | uptime |
|------------|--------------------|--------------------|-----------|----------|
| 3338666589 | 4000.3745.0000(04) | 4000.1000.2000(04) | CONNECTED | 00:03:51 |
| 1459618398 | 4000.3745.0000(04) | 4000.1000.2000(08) | CONNECTED | 00:03:18 |

```
Total number of circuits connected: 2
```

```
limno#show dlsw circuit detail
```

| Index | local addr(lsap) | remote addr(dsap) | state | uptime |
|------------|--------------------|--------------------|-----------|----------|
| 3338666589 | 4000.3745.0000(04) | 4000.1000.2000(04) | CONNECTED | 00:04:01 |

```
PCEP: 54E3D0 UCEP: 54DOB4
```

```
Port:To0 peer 10.10.15.1(2065)
```

```
Flow-Control-Tx CW:20, Permitted:39; Rx CW:20, Granted:19; Op: Repeat
```

```
Congestion: Low(02), Flow Op: Half: 0/0 Reset 0/0
```

```
RIF = 0630.1F41.00A0
```

```
Bytes: 18/229 Info-frames: 1/1
```

```
XID-frames: 1/3 UInfo-frames: 0/0
```

| | | | | |
|------------|--------------------|--------------------|-----------|----------|
| 1459618398 | 4000.3745.0000(04) | 4000.1000.2000(08) | CONNECTED | 00:03:29 |
|------------|--------------------|--------------------|-----------|----------|

```
PCEP: F7958 UCEP: 54BE94
```

```
Port:To0 peer 10.10.15.1(2065)
```

```
Flow-Control-Tx CW:20, Permitted:39; Rx CW:20, Granted:19; Op: Repeat
```

```
Congestion: Low(02), Flow Op: Half: 0/0 Reset 0/0
```

```
RIF = 0630.1F41.00A0
```

```
Bytes: 18/229 Info-frames: 1/1
```

```
XID-frames: 1/3 UInfo-frames: 0/0
```

```
Total number of circuits connected: 2
```

```
limno#show llc
```

```
LLC2 Connections: total of 2 connections
```

```
TokenRing0 DTE: 4000.3745.0000 4000.1000.2000 04 04 state NORMAL
```

```
V(S)=1, V(R)=1, Last N(R)=1, Local window=7, Remote Window=127
```

```
akmax=3, n2=8,  
xid-retry timer 0/0 ack timer 0/1000  
p timer 0/1000 idle timer 8200/10000  
rej timer 0/3200 busy timer 0/9600  
akdelay timer 0/100 txQ count 0/200  
RIF: 0630.1F41.00A0
```

```
TokenRing0 DTE: 4000.3745.0000 4000.1000.2000 08 04 state NORMAL  
V(S)=1, V(R)=1, Last N(R)=1, Local window=7, Remote Window=127
```

```
akmax=3, n2=8,  
xid-retry timer 0/0 ack timer 0/1000  
p timer 0/1000 idle timer 430/10000  
rej timer 0/3200 busy timer 0/9600  
akdelay timer 0/100 txQ count 0/200  
RIF: 0630.1F41.00A0
```

```
limno#show llc brief
```

```
LLC2 Connections: total of 2 connections  
To0 NORMAL 4000.3745.0000 4000.1000.2000 04 04  
RIF: 0630.1F41.00A0  
To0 NORMAL 4000.3745.0000 4000.1000.2000 08 04  
RIF: 06
```

The Output Interpreter Tool (registered customers only) (OIT) supports certain **show** commands. Use the OIT to view an analysis of **show** command output.

FRAS States

These are the possible states for the FRAS connection. The output of `show fras` displays the current state. The states listed here appear in the same order as they happen in a successful connection sequence.

- **LS_RESET** – Initial state.
- **LS_RQOPNSTNSENT** – **TEST** frame sent; request to open a connection end point.
- **LS_EXCHGXID** – **XID** negotiation takes place.
- **LS_CONNRQSENT** – **SABME** sent (side that connects).
- **LS_SIGSTNWAIT** – Waits for signal to clean up the congestion, and responds to polling with an RNR.
- **LS_CONNRSPWAIT** – Waits for the other CEP (connection end point) to bring up the link.
- **LS_CONNRSPSENT** – A UA has been sent and the router waits for an RR to clear up the flow.
- **LS_CONTACTED** – Everything is connected.
- **LS_DISCWAIT** – Wait for acknowledgement to disconnect request.

Troubleshoot

There is currently no specific troubleshooting information available for this configuration.

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Cisco – Configuring FRAS DLSw Backup

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