Configuring Dynamic FRAS BNN Router With Ethernet−Connected Devices

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Introduction

This document provides a sample configuration for a Cisco router configured for dynamic Frame Relay Access Support (FRAS) boundary network node (BNN) with an Ethernet−connected end device communicating with a Host attached to another Cisco router configured for FRAS Host.

Note: The FRAS Host router can be replaced with a front−end processor (FEP) with a Frame Relay connection. In this case, the configuration of the FRAS BNN router remains the same.

Using FRAS, Cisco IOS® Software allows branch Systems Network Architecture (SNA) devices to connect directly to a central site FEP over a Frame Relay network. FRAS converts LAN or Synchronous Data Link Control (SDLC) protocols to a Frame Relay format understood by the Network Control Program (NCP) that runs in an FEP. The Cisco IOS Software and the NCP support these two frame formats:

1. RFC 1490 routed format for Logical Link Control, type 2 (LLC2), specified in the FRF.3 agreement from the Frame Relay Forum and known in NCP literature as Frame Relay Boundary Network Node (BNN) support. Support for this feature requires NCP 7.1 or later.
2. RFC 1490 802.5 source−route bridged format, known in NCP literature as Frame Relay Boundary Access Node (BAN) support. Support for this feature requires NCP 7.3 or later.

Dynamic FRAS BNN is a feature of the Cisco IOS Software that became available in Software Release 11.2F. End devices can be added or deleted without reconfiguring the router. When you associate a Logical Link Control (LLC) connection with a Frame Relay Data Link Connection Identifier (DLCI), the router learns the media access control/service access point (MAC/SAP) information as it forwards packets to the host.

Prerequisites

Requirements

Readers of this document should have knowledge of these topics:

- How to configure and manage Cisco routers
- SNA and Frame Relay concepts

Components Used

The information in this document is based on Cisco IOS Software Release 11.2F or later with IBM feature set.

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.

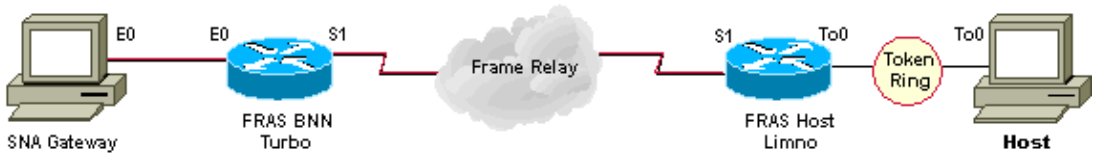
Configure

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

Note: To find additional information on the commands used in this document, use the Command Lookup Tool (registered customers only) .

Network Diagram

This document uses this network setup:



Configuration Notes

- The SNA Gateway is configured with these MAC addresses:

```
smac = 0000.2222.0000 (cannonical)
dmac = 0200.2222.0000 (cannonical)
ssap = 0x04 and dsap = 0x04
```

- The Host uses this MAC address on its Token Ring connection:

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

- The FRAS BNN router (Turbo) Ethernet 0 MAC address must be the destination MAC (dmac) configured in all the end devices (that is, 0200.2222.0000).
- With the enhanced support for BNN, mapping every end station is no longer required. The router configuration contains the **fras map llc 4 serial 1 frame−relay dlci 20 4** command. The router learns by listening to the incoming connections to the MAC address configured in the interface of the router using the SAP specified in the **fras map** command. In this case, incoming connections to 0200.2222.0000 are accepted using SAP 0x04. On the Frame Relay side, the router uses DLCI 20 and

a destination SAP of 0x04.

- The FRAS Host router configuration contains the **fras−host bnn Serial1 fr−lsap 04 vmac 4000.2222.0000 hmac 4000.3745.0000** command. This command must be placed in a virtual Token Ring interface that will make the connection of the FRAS code to the virtual ring of the router. The command enables the FRAS Host function for the BNN router to accept incoming BNN frames arriving at Serial 1 with a destination service access point (DSAP) of 0x04. The router sends LLC frames to the MAC address specified in the HMAC parameter. The HMAC parameter should match the MAC address of the Channel Interface Processor (CIP) adapter or LAN−attached Host. The Virtual Media Access Control (VMAC) parameter is used in combination with the DLCI number to form a unique source MAC address that the router will use to communicate with the host. The DLCI number is appended to the last two bytes of the VMAC value, which is visible in the **show fras−host** command output.
- In this example scenario, the Frame Relay connection is back−to−back without a Frame Relay switch in the middle. There are no keepalives or Local Management Interface (LMI). In a real implementation, a Frame Relay switch would be in the middle.

Configurations

This document uses these configurations:

- FRAS BNN
- FRAS Host

FRAS BNN

```
turbo# show running−config

Building configuration...
!
hostname turbo
!
!
interface Ethernet0
 mac−address 0200.2222.0000
 ip address 5.5.5.1 255.255.255.0
 no ip directed−broadcast
 fras map llc 4 Serial1 frame−relay dlci 20 4
!
interface Serial1
 ip address 2.2.2.1 255.255.255.0
 no ip directed−broadcast
 encapsulation frame−relay IETF
 no keepalive
 frame−relay map llc2 20
 frame−relay interface−dlci 20
!
end
```

FRAS Host

```
limno# show running−config

Building configuration...
!
hostname limno
!
source−bridge ring−group 500
!
interface Serial1
 ip address 2.2.2.2 255.255.255.0
```

```
 no ip directed-broadcast
 encapsulation frame-relay IETF
 no keepalive
 clockrate 4000000
 frame-relay map llc2 20
 frame-relay interface-dlci 20
!
interface TokenRing0
 ip address 4.4.4.2 255.255.255.0
 no ip directed-broadcast
 ring-speed 16
 source-bridge 10 1 500
!
interface Virtual-TokenRing0
 no ip address
 no ip directed-broadcast
 ring-speed 16
 source-bridge 400 1 500
 source-bridge spanning
 fras-host bnn Serial1 fr-lsap 04 vmac 4000.2222.0000 hmac 4000.3745.0000
!
end
```

Debug and Verification Tips

This section provides information that you can use to confirm that your configuration is working properly.

Note: Before issuing **debug** commands, refer to Important Information on Debug Commands.

You can turn on these debugs in the FRAS BNN router:

- **debug fras error** Displays information about FRAS protocol errors.
- **debug fras state** Displays information about FRAS data link control link state changes.
- **debug fras message** Displays general information about FRAS messages.

You can turn on these debugs in the FRAS HOST router:

- **debug fras-host packet** Shows what LLC2 session frames are being handled by the FRAS Host. Use this command with great care. If many LLC2 sessions are active and passing data, this command may generate a tremendous amount of output to the console and impact performance.
- **debug fras-host error** Enables the FRAS Host to send error messages to the console.
- **debug fras-host activation** Displays the LLC2 session activation and deactivation frames that are being handled by the FRAS Host, such as exchange identification (XID), Set Asynchronous Balanced Mode Extended (SABME), disconnect (DISC), and unnumbered acknowledgement (UA). If several LLC2 sessions are being activated or deactivated at one time, this command may generate large amounts of output to the console.

show Command Output

Issue these **show** commands to verify the configuration and status of the connection.

Certain **show** commands are supported by the Output Interpreter Tool (registered customers only) , which allows you to view an analysis of **show** command output.

FRAS BNN Router

```
turbo# show fras

Boundary Network Node (BNN):

DLCI: 20
Type    Destination    Int    LSap    RSap    Role    State
llc     0000.2222.0000 Et0    4       4       P       ls_Contacted
fr      –              Se1    8       4       S       ls_Contacted

Boundary Access Node (BAN):

turbo# show llc2

LLC2 Connections: total of 2 connections
Serial1 DTE: 20 14 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 8100/10000
rej timer 0/3200 busy timer 0/9600
akdelay timer 0/100 txQ count 0/200

Ethernet0 DTE: 0000.2222.0000 0200.2222.0000 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 7530/10000
rej timer 0/3200 busy timer 0/9600
akdelay timer 0/100 txQ count 0/200
```

FRAS Host Router

```
limno# show fras–host

Number of Active Control Blocks = 1
Number of Available Control Blocks in Pool = 127

Port  Dlci  Type  FrRsap  FrLsap  HostSap  FrMac / VMac   HostMac
Se1   20    BNN   14      04      04       4000.2222.0014 4000.3745.0000

limno# show fras–host Serial1

Number of Active Control Blocks = 1
Number of Available Control Blocks in Pool = 127

Port  Dlci  Type  FrRsap  FrLsap  HostSap  FrMac / VMac   HostMac
Se1   20    BNN   14      04      04       4000.2222.0014 4000.3745.0000

limno# show fras–host detail

Number of Active Control Blocks = 1
Number of Available Control Blocks in Pool = 127

Port = Se1, Dlci = 20, Type = BNN, FrRsap = 14, FrLsap = 04, HostSap = 04
Host Mac = 4000.3745.0000, Rif = 0810.1901.1F41.00A0
Frames Fwd to Host = 33, Last Rcvd From Frad = 3 sec
Fr Mac = 4000.2222.0014, Rif = NONE
Frames Fwd to Frad = 34, Last Rcvd from Host = 3 sec

limno# show fras–host dlci 20

Number of Active Control Blocks = 1
Number of Available Control Blocks in Pool = 127
```

```
Port  Dlci  Type  FrRsap  FrLsap  HostSap  FrMac / VMac   HostMac
Se1   20    BNN   14      04      04       4000.2222.0014 4000.3745.0000

limno# show llc2

No LLC2 connections.
```

FRAS States

Refer to FRAS States Defined for the definitions of the possible states for the FRAS connection and for the order in which the states occur during a successful connection sequence. The output of the **show fras** command displays the current state.

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