

# Multiservice IGX Cookbook

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# Introduction

This document provides common IGX configuration scenarios that are typically found in real working networks. The majority of these labs are simple, yet effective, in demonstrating the abilities of the multiservice IGX switch.

Several aspects of IGX configuration are covered, including trunk, voice, data, Frame Relay, and Asynchronous Transfer Mode (ATM) permanent virtual circuit (PVC) provisioning.

## Prerequisites

## Requirements

Before attempting this configuration, ensure that you meet the following requirements:

- Basic knowledge of IGX operations and theory.
- Basic knowledge of VoIP configurations on the 3810 and 3600 platforms.
- Solid understanding of the following:
  - ◆ WAN circuits (T1 through OC–3)
  - ◆ Voice theory and technologies
  - ◆ Frame Relay
  - ◆ Data
  - ◆ ATM

## Components Used

The information in this document is based on these hardware and software items:

- The three types of IGX chassis IGX 8410, 8420, and 8430. The primary difference between the chassis is the number of available card slots:
  - ◆ IGX 8410 8 card slots
  - ◆ IGX 8420;6 card slots
  - ◆ IGX 8430;2 card slotsNode and card functionality, bus architecture, throughput, and management are identical among the three node types.
- The system bus backplane on an IGX node supports the following four buses:
  - ◆ Cell a 256 Mbps time division multiplexed (TDM) bus, used by all cards except the Alarm Relay Module (ARM) card. The cell bus transports FastPackets from one card to another.
  - ◆ Control used by the Nodal Processor Module (NPM) to configure and communicate with all the other cards in the node.
  - ◆ Timing used to distribute synchronization signals to all cards in the node.
  - ◆ Power used to distribute 8V DC and ground to all cards in the node.

- Control module Nodal Processor Card (NPM)

The NPM is the central processor for the IGX node and stores system software and all configuration information. The NPM card resides in slot 1 and slot 2 only.

- Trunk modules:
  - ◆ Universal ATM Module (UXM)
  - ◆ Broadband Trunk Module (BTM) supports a single T3, E3, or High-Speed Serial Interface (HSSI), which is a ATM trunk and converts FastPackets into ATM cells.
  - ◆ ATM Line Module Model B (ALM/B) supports the same functions as the BTM at full T3 or E3 rates.
- Voice modules:
  - ◆ Universal Voice Module (UVM) supports a single channelized digital voice line in T1 or E1 format. In addition to optional ADPCM and VAD compression, voice connections terminating on the UVM can be configured for Low Delay-Code Excited Linear Predictive (LD-CELP) compression.
  - ◆ Channelized Voice Module (CVM) supports a single T1, E1, or J1 line and is used to bring in multiplexed digital voice traffic. The CVM can also be used to support transparent data traffic or a combination of voice and data.
- Data modules:
  - ◆ High Speed Data Module (HDM) supports four high-speed serial data ports and creates FastPackets from the incoming transparent data. EIA/TIA-232, V.35, and EIA/TIA-449 interfaces are available.
  - ◆ Low Speed Data Module (LDM) supports four or Eight low-speed serial data ports just like the HDM card. EIA/TIA-232 and Digital Data Service (DDS) interfaces are available.
- Frame Relay modules:
  - ◆ Frame Relay Module (FRM) converts Frame Relay data into FastPackets and supports four serial ports (V.35 or X.21). The FRM takes frame relay frames from multiple end-user devices and segments them into FastPackets. Frame Relay connections terminating on the FRM can be configured to use the ForeSight algorithm. A FRI-V.35 or FRI-X.21 back card is used with the FRM card.
  - ◆ Universal Frame Relay Module Un-channelized (UFMU) supports all of the same functions as the FRM card, in addition the UFMU supports service interworking (SIW) and either 6 or 12 un-channelized lines. The UFI back card is available with a choice of V.35, X.21, or HSSI interfaces.
  - ◆ Universal Frame Relay Module Channelized (UFM-C) supports all of the same functions as the FRM card, in addition the UFM-C supports service interworking (SIW) and either four or eight channelized lines. The UFI back card is available in either T1 or E1 format.
- ATM Card:
  - ◆ Universal ATM Module (UXM)

The information presented in this document was created from devices in a specific lab environment. All of the devices used in this document started with a cleared (default) configuration. If you are working in a live network, ensure that you understand the potential impact of any command before using it.

## Conventions

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

# CLI and Basic Node Configuration

This section describes the command line interface and basic node configuration.

## Getting Help

The **help** command (or **?** command) provides an online help menu. Use the arrow keys to highlight a command category. Use the Return or Enter keys to select the category to list all commands. You can then select a command in the same way. Use the **help** command to find a command or list the parameters associated with the command.

**Note:** The **help** command does not provide information on the use of a command or the meaning of any parameters.

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

## Signing On

There are for main ways to access the IGX node:

- Control port VT100 terminal Emulation (Default)
- Aux port VT100 terminal Emulation
- LAN port via Telnet protocol
- IP Relay via Telnet protocol

The following illustrates an example of a login screen:

Login Screen Example									
i8420-1a	TN	No User	IGX 8420	9.2.33	May	22	2002	01:29	EST
Enter User ID:									

The login screen example above contains the following information:

- i8420-1a = Node name
- TN = Access method to the IGX Telnet
- 9.2.33 = Currently running switch software release number

## Logging Out

To log out of the system, enter the **bye** command. The following illustrates an example of a logout screen:

Logout Screen Example									
i8420-1a	TN	StrataCom	IGX 8420	9.2.33	May	22	2002	01:33	EST
Last Command: <b>bye</b>									

The **bye** command terminates your CLI session and places you back at the login prompt.

## Using the Virtual Terminal Method to Access a Remote Node

Once you add trunks (see the IGX Trunks section), you have the ability to use a virtual terminal (VT) or access a remote node via internodal communication channels (CC traffic).

In order to access a remote node, both nodes must be in the network, although there does not need to be a trunk directly established between the two nodes. User ID s and passwords operate network-wide, so you do not need to log in when a VT session is established to another node.

By default, only one VT session can be active on a node at a time. VT sessions cannot be chained (for example, VT to node B, then VT to node C, then VT to node D).

To end a VT session, use the **bye** command.

The following illustrates an example of a VT session, where IGX-B is the node name with which you want to connect:

VT Session Example Using the vt Command									
IGX-A	TN	Cisco	IGX 8420	9.3.45	May	22	2003	01:41	EST
NodeName Alarm									
IGX-B									
IGX-A									
IGX-C									
This Command: <b>vt IGX-B</b>									

The following illustrates the results of the **vt IGX-B** command you are now in node IGX-B:

VT Session Example IGX Node Accessed									
IGX-B	VT	Cisco	IGX 8410	9.3.45	May	22	2003	01:41	EST
Next Command:									

The VT text in the illustration above indicates that you have access to the IGX node (IGX-B) via virtual terminal.

## Clearing and Redrawing

The **redscrn** command can be used to redraw the active screen. This is useful if your terminal application and/or screen display shows garbled characters, which can occur over modem dial-in lines with poor line quality.

The following illustration shows a screen with garbled characters (in bold):

Garbled Characters										
i8420-1a	TN	StrataCom	IGX 8420	9.2.33	May	22	2002	01:52	EST	
	FrontCard	BackCard		FrontCard	BackCard					
	Type	Rev	Type	Rev	Type	Rev	Type	Rev	Status	
1	NPM	BRS			9	HDM	ACL	T1D	AB	Active
2	NPM	<b>E-@</b>		Upgraded	10	HDM	CFE	V35	AJ	Standby-T
3	ALM	BDH	UAI-T3	AB	Standby	11	Empty			
4	FRM	EMY	FRI-T1	AM	Standby-T	12	Empty			
5	Empty					13	UFMU	AAA	Empty	Standby

6	FRM	JNB	FRI-V35	BH	Standby	14	UVM	EKH	T1-2	AA	Active
7	NTM	FHK	T1	AL	Standby	15	UVM	EDH	T1-2	AA	Active
8	UXM	BER	E1-IMA	AA	Active	16	UVM	EKH	T1-2	AC	<b>Standbt</b>

Last Command: **dspcds**

The following illustration shows the the same screen redrawn with the **redscrn** command to clear the garbled characters:

Redrawn Screen											
i8420-1a	TN	StrataCom	IGX 8420	9.2.33	May 22 2002 01:52 EST						
	FrontCard	BackCard				FrontCard	BackCard				
	Type	Rev	Type	Rev	Status	Type	Rev	Type	Rev	Status	
1	NPM	BRS			Active	9	UFM	ACL	T1D	AB	Active
2	NPM	ERS			Upgraded	10	HDM	CFE	V35	AJ	Standby-T
3	ALM	BDH	UAI-T3	AB	Standby	11	Empty				
4	FRM	EMY	FRI-T1	AM	Standby-T	12	Empty				
5	Empty					13	UFMU	AAA	Empty		Standby
6	FRM	JNB	FRI-V35	BH	Standby	14	UVM	EKH	T1-2	AA	Active
7	NTM	FHK	T1	AL	Standby	15	UVM	EDH	T1-2	AA	Active
8	UXM	BER	E1-IMA	AA	Active	16	UVM	EKH	T1-2	AC	Standby

Last Command: **redscrn**

## Configuring a Node Name

The **cnfname** command specifies the name by which a node is known within a network. You can change a node name at any time the new node name is automatically distributed to other nodes within the network.

**Note:** Node names must start with a letter and contain up to eight alphanumeric characters. You may also use hyphens ( - ), and underscores ( \_ ). Node names are case sensitive and duplicate node names are not allowed in a network.

The following illustration shows the IGX-A node name is identified with the **dspnds** command:

Display Node Name											
IGX-A	TN	Cisco	IGX 8420	9.3.45	May 22 2003 02:01 EST						
NodeName Alarm											
IGX-B											
IGX-A											
IGX-C											

Last Command: **dspnds**

The following illustration shows the IGX-A node name is changed to IGX-NEW with the **cnfname** command:

Changed Node Name											
IGX-NEW	TN	Cisco	IGX 8420	9.3.45	May 22 2003 02:01 EST						
NodeName Alarm Packet Line											
IGX-B											
6-7/IGX-C 4.1-8.1/IGX-NEW 4.2-8.2/IGX-NEW											
IGX-NEW											
8.1-4.1/IGX-B 8.2-4.2/IGX-B											

```
IGX-C
  7-6/IGX-B
```

```
Last Command: cnfname IGX-NEW
```

## Configuring the Time Zone

Use the **cnftmzn** command to set the local time zone for the nodes. Configuring the time zone for a node ensures that the node time is correct for the local area.



**Caution:** If you do not set the node to the correct local time zone, it affects the time stamps in the event, software, and card error logs.

As an example, the **cnftmzn EST** command sets the node to the Eastern Standard Time Zone.

## IGX Trunks

This section contains the following configuration and user information sections:

- Configuring NTM Trunks
- Configuring UXM Trunks
- Configuring UXM IMA Trunks
- Virtual Trunk Overview
- Virtual Trunk Wraparound Example
- Troubleshooting Wraparound Trunks
- Native Virtual Trunks

## Configuring NTM Trunk

Complete the following steps to configure an NTM trunk:

1. Use the **uptrk ntm-slot#** command, where *ntm-slot#* is the slot number in which the NTM card resides, to bring up the NTM trunk. This activates the physical port on this slot, and sends a signal out the interface based on your configurations (see Step 2).
2. Use the **cnftrk ntm-slot#** command, where *ntm-slot#* is the slot number in which the NTM card resides, to configure the NTM trunk as needed:

Configuring an NTM Trunk						
IGX-B	TN	Cisco	IGX 8420	9.3.45	June 23 2003	13:30 CST
TRK 8	Config	T1/24	[8000 pps]	NTM slot:8		
Line DS-0	map:	0-23		Deroute delay time:	0	seconds
Pass sync:		Yes				
Loop clock:		No				
Statistical Reserve:		1000	pps			
Routing Cost:		10				
Idle code:		7F	hex			
Restrict PCC traffic:		No				
Link type:		Terrestrial				
Line framing:		ESF				
Line coding:		B8ZS				
Line cable type:		ABAM				
Line cable length:		0-133	ft.			
Traffic:		V,TS,NTS,FR,FST				
Incremental CDV:		0				

```
Last Command: cnftrk 8 0-23 Y N 1000 10 7F N TERRESTRIAL ESF B8ZS 4 V,TS,NTS,FR,FST 0
```

**Note:** Ensure that the line coding, framing, and DS0 map are identical on both sides.

3. Use the **addtrk** *ntm-slot#* command, where *ntm-slot#* is the slot number in which the NTM card resides, to add the NTM trunk to the network:

Adding the NTM Trunk						
IGX-B	TN	Cisco	IGX 8420	9.3.45	June 23 2003	13:33 CST
TRK	Type	Current Line Alarm Status	Other End			
8	T1/24	Clear - OK	IGX-A/4			
Last Command: <b>addtrk 8</b>						

4. Use the **dspload** *ntm-slot#* command, where *ntm-slot#* is the slot number in which the NTM card resides, to display the NTM trunk loading screen:

Displaying the Configured NTM Trunk Loading						
IGX-B	TN	Cisco	IGX 8420	9.3.45	June 23 2003	13:33 CST
<b>Configured Trunk Loading: TRK IGX-B 8--4 IGX-A</b>						
Load Type	Xmt-p	Rcv-p				
NTS	0	0	Conid In Use+Avail:	0+	213=	213
TS	0	0	VPC conids:	0/256		
Voice	0	0				
BData A	0	0	Trunk type is Terrestrial			
BData B	0	0	Trunk does not support cell routing			
CBR	0	0	Trunk does not use ZCS			
nrt-VBR	0	0	Trunk end doesn't support complex gateway			
rt-VBR	0	0	Traffic: V TS NTS FR			
ABR	0	0	FST			
Total In Use	0	0				
Reserved	1000	1000				
Available	7000	7000				
Total Capacity	8000	8000				
Last Command: <b>dspload 8</b>						

## Configuring UXM Trunks

Complete the following steps to configure a UXM trunk:

1. Use the **uptrk** command on both sides to bring up the UXM trunk. This activates the physical port on this slot, and sends a signal out the interface based on your configurations. Notice that the trunk will be in a RED alarm state until both sides of the trunk are upped, and the two sides are cabled together.

Using the uptrk Command						
IGX-A	TN	Cisco	IGX 8420	9.3.45	June 13 2003	15:10 EST
TRK	Type	Current Line Alarm Status	Other End			
16.1	OC3	Major - Loss of Sig (RED)	-			
Last Command: <b>uptrk 16.1</b>						

### Using the uptrk Command



IGX-B	TN	Cisco	IGX 8420	9.3.45	June 13 2003 14:10 CST
TRK	Type	Current Line Alarm Status	Other End		
13.1	OC3	Major - Loss of Sig (RED)	-		
This Command: <b>uptrk 13.1</b>					

2. Wait until both sides are "Clear – OK" and then use the **addtrk 16.1** command to add a UXM trunk to the network:

Adding a UXM Trunk					
IGX-B	TN	Cisco	IGX 8420	9.3.45	June 13 2003 14:12 CST
TRK	Type	Current Line Alarm Status	Other End		
13.1	T1/24	Clear - OK	IGX-A/16.1		
Last Command: <b>addtrk 13.1</b>					

## Configuring UXM IMA Trunks

This section describes how to build and configure UXM inverse multiplexing over ATM (IMA) trunks between nodes, and how to configure retained links.

**Note:** In the IMA protocol, "retained links" are the minimum number of links (T1s or E1s) that must be active for the entire IMA group to stay active.

1. Use the **uptrk** command with two T1s in the IMA group to bring up the UXM IMA trunk:

Using the uptrk Command					
IGX-A	TN	Cisco	IGX 8420	9.3.45	June 13 2003 15:22 EST
TRK	Type	Current Line Alarm Status	Other End		
16.1(2)	T1/47	Clear - OK	-		
Last Command: <b>uptrk 16.1-2</b>					

Using the uptrk Command					
IGX-B	TN	Cisco	IGX 8420	9.3.45	June 13 2003 14:22 CST
TRK	Type	Current Line Alarm Status	Other End		
13.1(2)	T1/47	Clear - OK	-		
Last Command: <b>uptrk 13.1-2</b>					

2. Use the **cnftrk** command to configure the UXM IMA trunk with one line configured for retained links:

Using the cnftrk Command					
IGX-A	TN	Cisco	IGX 8420	9.3.45	June 13 2003 15:24 EST
TRK 16.1(2) Config	T1/47	[7094 cps]	UXM slot:16		
IMA Group Member(s):	1-2		Line coding:	B8ZS	
Retained links:	1		Line cable type:	ABAM	
Transmit Trunk Rate:	7094	cps	Line cable length:	0-131 ft.	
Rcv Trunk Rate:	7094	cps	HCS Masking:	Yes	
Pass sync:	Yes		Payload Scramble:	No	

```

Loop clock:          No          Connection Channels: 256
Statistical Reserve: 1000 cps    Gateway Channels:   200
Header Type:        NNI          Traffic:V,TS,NTS,FR,FST,CBR,N&RVBR,ABR
VPI Address:        1            Incremental CDV:    0
Routing Cost:       10           IMA Protocol Option: Enabled
Idle code:          7F hex       IMA Max. Diff. Dly: 200 msec.
Restrict PCC traffic: No         IMA Clock Mode:    CTC
Link type:          Terrestrial   Deroute delay time: 0 seconds
Line framing:       ESF           VC Shaping:         No
TRK 16.1(2) Config T1/47 [7094 cps] UXM slot:16
VPC Conns disabled: No

Last Command: cnftrk 16.1 1-2 1 7094 7094 Y N 1000 NNI 1 10 7F N TERRESTRIAL
ESF 1 Y N 200 V,TS,NTS,FR,FST,CBR,NRT-VBR,ABR,RT-VBR 0 200 NN

```

3. Use the **addrtrk** command to add the UXM IMA trunk to the network:

Using the addrtrk Command							
IGX-B	TN	Cisco	IGX 8420	9.3.45	June 13 2003	14:31	CST
TRK	Type	Current	Line Alarm	Status	Other End		
13.1(2)	T1/47	Clear	- OK		IGX-A/16.1(2)		
16.1.1	OC3	Clear	- OK		IGX-A/15.1.1		
Last Command: <b>addrtrk 13.1</b>							

Points of interest you should be aware of in this configuration:

- ◆ Available bandwidth = 7094 (2 T1s – IMA overhead):

- ◇ 1 DS0 = 151 CPS

- ◇ 1 T1 = 3622 CPS

- ◆ IMA overhead:

- ◇ 1 DS0 for 1 to 4 T1s in the IMA group

- ◇ 2 DS0 for 5 to 8 T1s in the IMA group

## Virtual Trunk Overview

The following compatibility issues should be followed:

- A virtual trunk is simply a trunk defined over a public ATM cloud. Within the cloud, one virtual trunk is equivalent to one Virtual Path Connection (VPC) or Virtual Circuit Connection (VCC). There are some rules to be concerned with when building virtual trunks.

The following virtual trunk pairs are allowed:

- ◆ Broadband Switch Module (BXM)/BXM
- ◆ BXM/UXM
- ◆ UXM/UXM
- ◆ Broadband Network Interface (BNI)/BNI

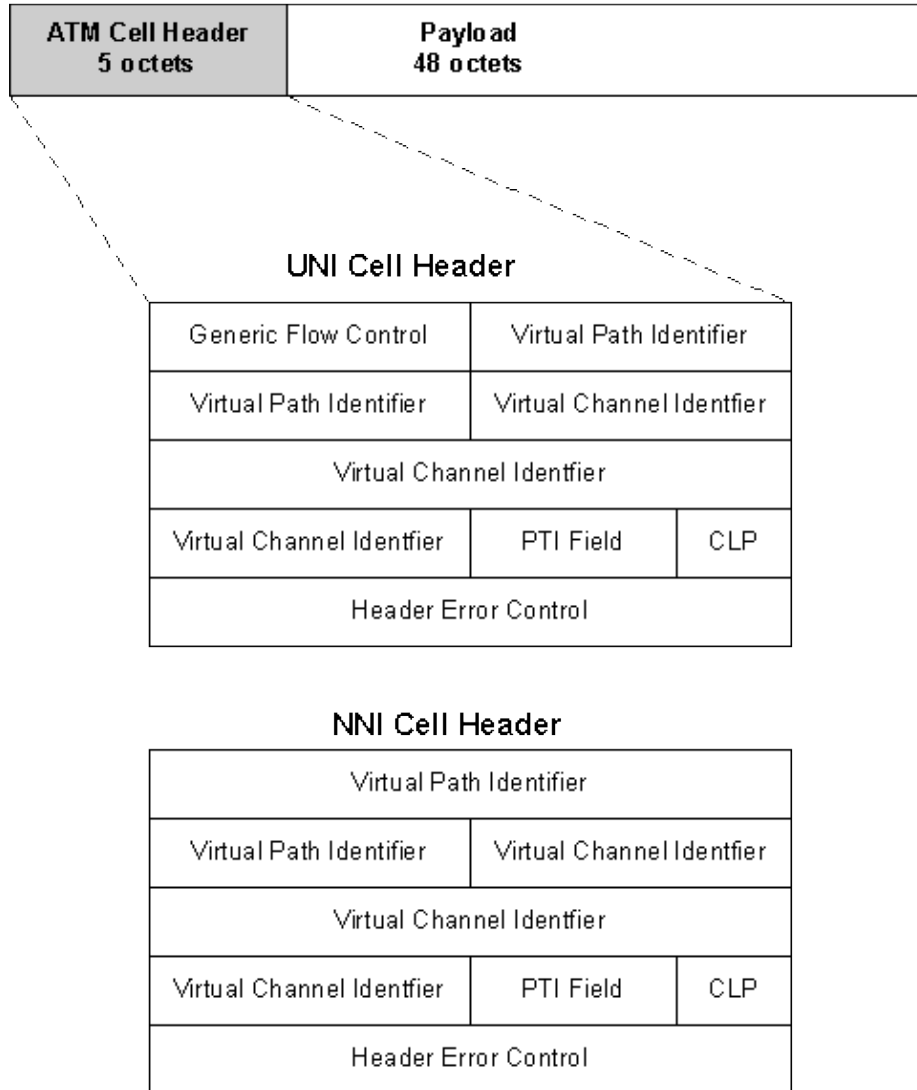
The following virtual trunk pairs are not allowed because of the different cell structures used between the three cards. The BNI uses a Stratacom Trunk Interface (STI) cell format, whereas the BXM and UXM use a standards format User Network Interface (UNI)/Network Node Interface (NNI) cell format.

- ◆ BXM/BNI

◆ UXM/BNI

The following illustration shows cell formats:

**Standard ATM Cell Format**

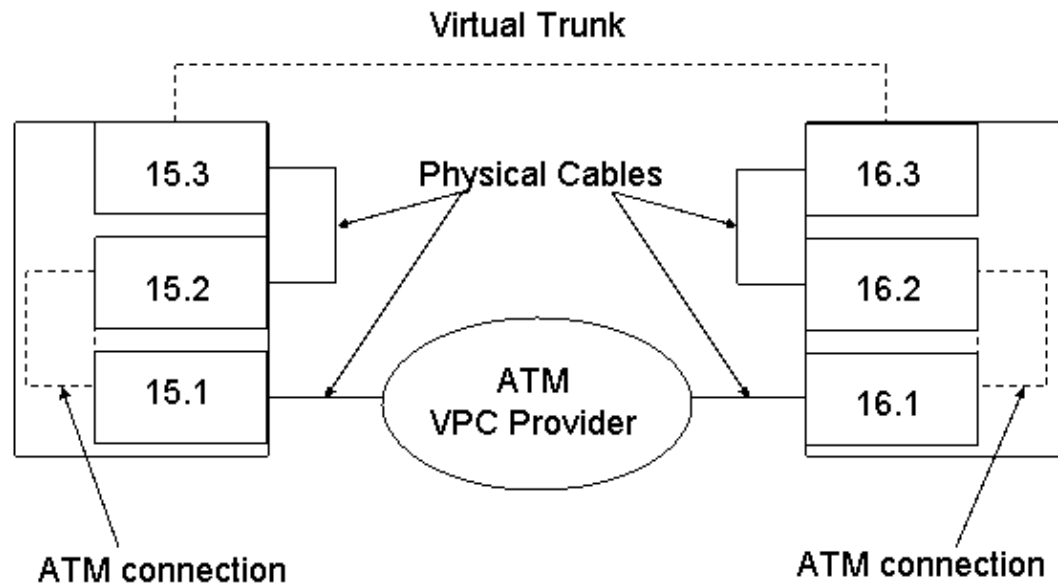


**Virtual Trunk Wraparound Example**

This sections describes how to use a virtual trunk wraparound solution to build a VT between two IGX nodes. In this example, the Virtual Path Connection (VPC) that is usually purchased from an ATM provider, has the following:

- Constant Bit Rate (CBR) traffic type
- A Virtual Path Identifier (VPI) of 1

## Virtual Trunk Wrap-Around Example



**Note:** Typically, the VT wraparound solution was used in 9.1.x based networks, as 9.1.x switch software did not support a native virtual trunk.

The virtual terminal wraparound configuration steps are listed below:

1. Cabling for VT wraparound consists of 2 physical connections to be made on each IGX UXM card (see illustration above):

- ◆ For For IGX-A:

- ◇ 15.1 => Cabled to ATM Provider
- ◇ 15.2 => 15.3

- ◆ For IGX-B:

- ◇ 16.1 => Cabled to ATM provider
- ◇ 16.2 => 16.3

2. Bring up two lines and ports:

- a. Use the following command on the IGX-A:

- ◇ **upln 15.1**
- ◇ **upln 15.2**
- ◇ **upport 15.1**
- ◇ **upport 15.2**

b. Use the following command on the IGX-B:

- ◇ **upln 16.1**
- ◇ **upln 16.2**
- ◇ **upport 16.1**
- ◇ **upport 16.2**

You can verify the line configuration with the **dsplncnf** command:

Using the dsplncnf Command					
IGX-B	TN	Cisco	IGX 8420	9.3.45	June 26 2003 12:09 EST
LN 16.1 Config		OC3			UXM slot:16
Loop clock:		No			
Line framing:		STS-3C			
Idle code:		7F hex			
HCS Masking:		Yes			
Payload Scramble:		Yes			
Frame Scramble:		Yes			
Last Command: <b>dsplncnf 16.1</b>					

You can verify the port configuration with the **dspport** command:

Using the dspport Command					
IGX-B	TN	Cisco	IGX 8420	9.3.45	June 26 2003 12:09 EST
Port:	16.1	[ACTIVE ]			
Interface:		OC3		CAC Override:	Enabled
Type:		UNI		%Util Use:	Disabled
Speed:		353208 (cps)		GW LCNs:	200
SIG Queue Depth:		640		Reserved BW:	0 (cps)
Alloc Bandwidth:		353208 (cps)		VC Shaping:	Disabled
Protocol:		NONE			
Last Command: <b>dspport 16.1</b>					

3. Add a VPC connection on each IGX between lines 2 and 3:

a. Use the following command to add the connection for IGX-A:

```
addcon 15.1.1.* IGX-A 15.2.1.* cbr 10000 * * 5 * * *
```

You can use the **dspon** command to display the added VPC:

Displaying the VPC Connection for IGX-A						
IGX-A	TN	Cisco	IGX 8420	9.3.45	June 26 2003 12:13 EST	
Conn:	15.1.1.*		IGX-A	15.2.1.*	cbr	Status:OK
	PCR(0+1)	% Util	CDVT(0+1)	Policing		
	10000/10000	100/100	10000/10000	5/5		
Pri:	L	Test-RTD:	255 msec			
Path:	Route information not applicable for local connections					
	PCR(0+1)	% Util	CDVT(0+1)	Policing	VC Qdepth	CLP Hi
	10000/10000	100/100	10000/10000	5	160/160	80/80
CLP Lo						
35/35						

```
Last Command: dspcon 15.1.1.*
```

b. Use the following command to add the connection for IGX-B:

```
addcon 16.1.1.* IGX-B 16.2.1.* cbr 10000 * * 5 * * *
```

You can use the **dspcon** command to display the added VPC:

Displaying the VPC Connection for IGX-B						
IGX-B	TN	Cisco	IGX 8420	9.3.45	June 26 2003	12:14 EST
Conn:	16.1.1.*	IGX-B	16.2.1.*	cbr	Status:OK	
	PCR(0+1)	% Util	CDVT(0+1)	Policing		
	10000/10000	100/100	10000/10000	5/5		
Pri:	L	Test-RTD:	255 msec			
Path:	Route information not applicable for local connections					
	PCR(0+1)	% Util	CDVT(0+1)	Policing	VC Qdepth	CLP Hi
	10000/10000	100/100	10000/10000	5	160/160	80/80
CLP Lo						
	35/35					
Last Command: dspcon 16.1.1.*						

**Note:** The policing for the two different connections is intentionally set to 5, which turns policing off for these connections. Setting policing off for these connections causes the trunk to act as the policing function, not the wraparound connection.

4. Use the **addtrk** command to add the trunk to the network:

Adding the Trunk to the Network						
IGX-B	TN	Cisco	IGX 8420	9.3.45	June 26 2003	12:15 EST
TRK	Type	Current Line	Alarm Status		Other End	
16.3.1	OC3	Clear - OK			IGX-A/15.3.1	
Last Command: addtrk 16.3.1						

You can use the **dspload** command to display the trunk information:

Using the dspload Command						
IGX-B	TN	Cisco	IGX 8420	9.3.45	June 26 2003	12:15 EST
Configured Trunk Loading: TRK IGX-B 16.3.1--15.3.1 IGX-A						
Load Type		Xmt-c	Rcv-c			
NTS		0	0	Conid In Use+Avail:	0+256=	256
TS		0	0	VPC conids:		0/256
Voice		0	0			
BData A		0	0	Trunk type is	Terrestrial	
BData B		0	0	Trunk supports	cell routing	
CBR		0	0	Trunk does not	use ZCS	
nrt-VBR		0	0	Trunk end	supports all gateway	
				types		
rt-VBR		0	0	Gateway conns:	0/200	
ABR		0	0	Traffic:	V TS NTS FR FST CBR NRT-VBR	
ABR RT-VBR						
Total In Use		0	0			
Reserved		1000	1000			

Available	8962	8962
Total Capacity	9962	9962
Last Command: <b>dspload 16.3.1</b>		

You can use the **dsptrks** command to display the added trunks:

Using the dsptrks Command						
IGX-B	TN	Cisco	IGX 8420	9.3.45	June 26 2003	12:16 EST
TRK	Type	Current Line Alarm Status	Other End			
8	T1/24	Clear - OK	IGX-A/4			
13.1(2)	T1/47	Clear - OK	IGX-A/16.1(2)			
<b>16.3.1</b>	<b>OC3</b>	<b>Clear - OK</b>	<b>IGX-A/15.3.1</b>			
Last Command: <b>dsptrks</b>						

## Troubleshooting Wraparound Trunks

This section describes common failures and verifications you can perform to resolve the failures.

If an **addtrk** command fails with a No response from other node or a Comm Fail message, communication between the two adjacent nodes failed. Use the following methods to resolve the failure:

- Use the **cnftrk** command to verify correct payload scrambling.
- Verify correct VPI values they must match what the VPC provider is using.
- Investigate the local connection for problems.
- Investigate the ATM provider for dropped ATM cells.

## Native Virtual Trunks

This section describes how to use a native virtual trunk configuration to build a constant bit rate (CBR) virtual trunk between two IGX switches.

In this procedure:

- The VPC is provided as the ATM cloud, via a BPX VP connection
- CBR traffic type is used
- VPI of 1 is used

1. Use the **uptrk** command to bring up the VT:

Using the uptrk Command						
IGX-B	TN	Cisco	IGX 8420	9.3.45	June 26 2003	11:27 EST
TRK	Type	Current Line Alarm Status	Other End			
16.1.1	OC3	Clear - OK	-			
Last Command: <b>uptrk 16.1.1</b>						

2. Use the **cnftrk** command to configure the trunk with CBR traffic, class, and VPI of 1:

Using the cnftrk Command						
IGX-B	TN	Cisco	IGX 8420	9.3.45	June 26 2003	11:28 EST
TRK 16.1.1	Config	OC3	[353207cps]	UXM slot:16		

```

Transmit Trunk Rate: 353207 cps
Rcv Trunk Rate: 353207 cps
Pass sync: No
Loop clock: No
Statistical Reserve: 1000 cps
Header Type: UNI
Routing Cost: 10
Idle code: 7F hex
Restrict PCC traffic: No
Link type: Terrestrial
Line framing: STS-3C
HCS Masking: Yes
Payload Scramble: Yes
Connection Channels: 256

Gateway Channels: 200
Traffic: V, TS, NTS, FR, FST, CBR, N&RVBR, ABR
Vtrk Type / VPI: CBR / 1
Incremental CDV: 0
Frame Scramble: Yes
Deroute delay time: 0 seconds
VC Shaping: No
ILMI run on the card: No
F4 AIS Detection: No

Last Command: cnftrk 16.1.1 353207 353207 N N 1000 UNI 10 7F N TERRESTRIAL
STS-3C Y Y 200 V, TS, NTS, FR, FST, CBR, NRT-VBR, ABR, RT-VBR CBR 1 0 Y N N N

```

3. Use the **addtrk** command to add the trunk to the network:

Using the addtrk Command						
IGX-B	TN	Cisco	IGX 8420	9.3.45	June 26 2003	11:33 EST
TRK	Type	Current Line Alarm Status				Other End
16.1.1	OC3	Clear - OK				IGX-A/15.1.1
Last Command: <b>addtrk 16.1.1</b>						

You can use the **dspload** command to display your configuration:

Using the dspload Command						
IGX-B	TN	Cisco	IGX 8420	9.3.45	June 26 2003	11:41 EST
Configured Trunk Loading: TRK IGX-B 16.1.1--15.1.1 IGX-A						
Load Type		Xmt-c	Rcv-c			
NTS		0	0	Conid In Use+Avail: 0+256= 256		
TS		0	0	VPC conids: 0/256		
Voice		0	0			
BData A		0	0	Trunk type is Terrestrial		
BData B		0	0	Trunk supports cell routing		
CBR		0	0	Trunk does not use ZCS		
nrt-VBR		0	0	Trunk end supports all gateway types		
rt-VBR		0	0	Gateway conns: 0/200		
ABR		0	0	Traffic: V TS NTS FR FST CBR		
NRT-VBR ABR RT-VBR						
Total In Use		0	0			
Reserved		1000	1000			
Available		352207	352207			
Total Capacity		353207	353207			
Last Command: <b>dspload 16.1.1</b>						

## Voice

The following sections describe the basics of IGX voice cards and the configuration of several types of typical setups:

- UVM Card Overview
- T1 to T1 CAS Example



- T1 to T1 CCS Example
- T1 to E1 CAS Example

To emulate PBXs, we use 3810s with MultiFlex Trunk Modules (MFT) directly connected to the UVM. Standard POTS lines are connected to FXS ports on the 3810.

## UVM Card Overview

The dual-purpose UVM provides both voice services and circuit data services. As a high-performance voice module, it is typically connected to PBX or voice switches. UVM fully interworks with CVM modules, with or without echo cancellation. The UVM contains the following features:

- Two T1/E1/J1 interfaces per module
- 64 kbps pulse code modulation (PCM) encoding
- Adaptive differential pulse code modulation (ADPCM) compression:
  - ◆ 32 kbps G.721, 32 channels per card
  - ◆ 24 kbps G.723, 32 channels per card
  - ◆ 16 kbps G.726, 32 channels per card
- 16 kbps Low Delay-Code Excited Linear Prediction (LD-CELP) compression, G.728, 16 channels per card
- Conjugate Structure-Algebraic Code Excited Linear Protection (CS-ACELP) compression:
  - ◆ 8 kbps G.729, 16 channels per card
  - ◆ 8 kbps G.729A, 32 channels per card
- Per-channel selectable voice compression
- D-channel compression
- Voice Activity Detection (VAD)
- Integrated echo cancellation
- Programmable voice circuit gain of between 8 dB and +6 dB
- A-law and  $\mu$ -law conversion
- Fax relay and modem detection
- Voice switching capability in conjunction with Virtual Network Switching (VNS)
- 1:1 redundancy via Y cable

The UVM contains the following limitations:

- A total 16 DSPs per UVM card
- One codec image can exist on a DSP at one time
- Six image types:
  - ◆ Basic voice image, which contains the following p, v, a32, c32, a24, c24, 116, 116v
  - ◆ g729r8/V
  - ◆ g729ar8/V
  - ◆ Nx64
  - ◆ Fax Relay
  - ◆ td (compressed data channel)

UVM packet rates and types are described in the following table:

**Note:** Signaling packets on voice channels are time stamped packets.

Codec Type	Rate	FastPacket	FastPacket Rate
------------	------	------------	-----------------

		Type	(packets/sec)
P (PCM)	64K	NTS (Non Timestamped)	381
V (Voice)	64K	Voice	381
A32 (ADPCM 32 non-VAD)	32K	NTS	191
C32 (ADPCM 32 with VAD)	32K	Voice	191
A24 (ADPCM 24 non-VAD)	24K	NTS	143
C24 (ADPCM 24 with VAD)	24K	Voice	143
L16 (LD-CELP 16 non-VAD)	16K	NTS	100
L16v (LD-CELP 16 with VAD)	16K	Voice	100
G729r8	8K	NTS	50
G729r8V	8K	Voice	50
G729ar8	8K	NTS	50
G729ar8v	8K	Voice	50
32K transient (modem)	32K	NTS	191
64K transient (mode)	64K	NTS	381
Fax Relay (transient)	9.6K	NTS	58 average (not CBR)
1x64 (8/8)	64K	NTS	381
1x64 (7/8)	64K	NTS	435
8x64 (8/8)	8x64K	NTS	3048
8x64 (7/8)	8x64K	NTS	3483

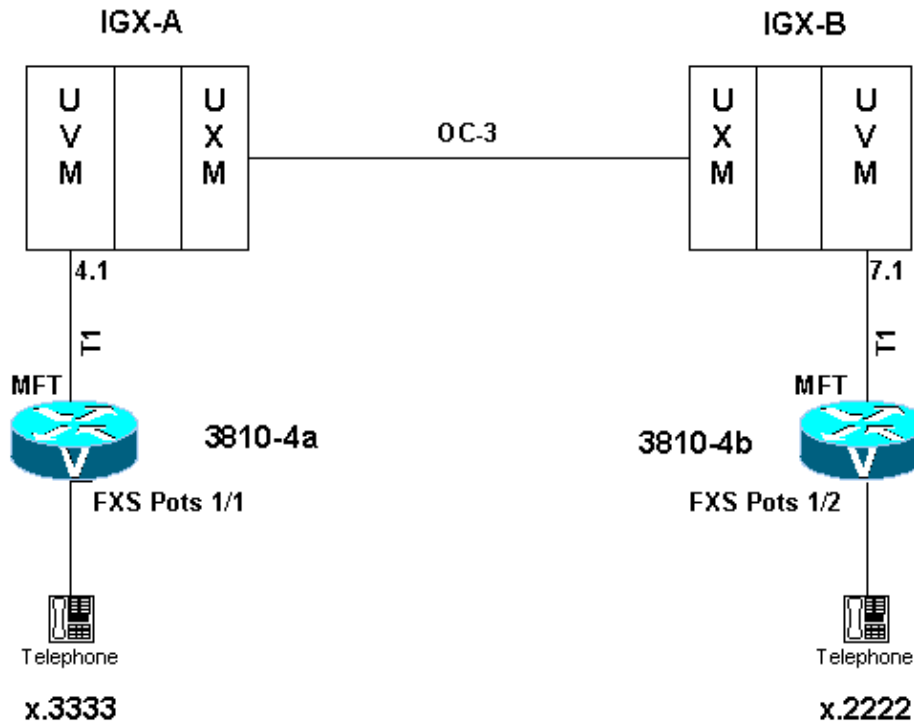
3 bit packet types:

- 010 Voice (VAD)
- 110 NTS
- 111 Time stamped
- 100 Special packet type for idle code suppression on Nx64 type connections

## T1 to T1 CAS Example

This section contains a T1 to T1 channel associated signaling (CAS) example. The following illustration shows the connections for this example:

## T1 to T1 CAS Example



1. Use the **upln** command to bring up the UVM lines.

Using the upln Command					
IGX-A	TN	Cisco	IGX 8420	9.3.45	June 24 2003 08:42 GMT
LN	4.1	Config	T1/24		UVM slot:4
Loop clock:			No		
Line framing:			D4		
Line coding:			ZCS		
Line encoding:			u-LAW		
Line T1 signaling:			ABAB		
Line cable type:			ABAM		
Line length:			0-133 ft.		
Line 56KBS Bit Pos:			msb		
Line pct fast modem:			20		
Line cnfg:			External		
Line cnf slot.line:			--		
Line CAS-Switching:			Off		
Line SVC-Caching:			Off		
Last Command: <b>upln 4.1</b>					

2. Use the **cnfln** command to configure line 4.1 with the following parameters:

- ◆ Extended Superframe Format (ESF)
- ◆ Bipolar 8 Zero Substitution (B8ZS)
- ◆  $\mu$ -law

**Note:** These parameters must match those on the attached device (PBX). These configurations are only an example.

Using the cnfln Command
-------------------------

```

IGX-A      TN      Cisco      IGX 8420  9.3.45    June 24 2003 08:42 GMT

LN  4.1 Config      T1/24          UVM slot:4
Loop clock:          No
Line framing:        ESF
Line coding:         B8ZS
Line encoding:       u-LAW
Line T1 signaling:   ABAB
Line cable type:     ABAM
Line length:         0-133 ft.
Line 56KBS Bit Pos: msb
Line pct fast modem: 20
Line cnfg:           External
Line cnf slot.line:  --
Line CAS-Switching: Off
Line SVC-Caching:   Off

Last Command: cnfln 4.1 N ESF B8ZS U-LAW ABAB 4 msb 20 N

```

3. Use the **addcon** command to add voice connections using your choice of compression; your commands should be similar to the following:

- ◆ **addcon 4.1.1-16 IGX-B 7.1.1-16 c32**
- ◆ **addcon 4.1.17-24 IGX-B 7.1.17-24 c32**

**Note:** You can not use a compression type that uses a full DSP per channel (l16/v, g729r8v) because of the limitations listed above (16 DSPs for 24 connections).

You can use the **dspchcnf** command and the **dspchec** command to display your channel configurations:

Using the dspchcnf Command													
IGX-A	TN	Cisco	IGX 8420	9.3.45	June 24 2003 10:14 GMT								
	%	Adaptive	Gain (dB)	Dial	Interface	OnHk	Cond						
Channels	Util	Voice	Fax	In	Out	Type	Type	A	B	C	D	Crit	
4.1.1-16	60	Enabled	Disabled	0	0	Inband	4W E&M	0	X	-	-	a	
4.1.17-24	60	Enabled	Disabled	0	0	Inband	4W E&M	0	X	-	-	a	
Last Command: <b>dspchcnf 4.1.1-15</b>													

Using the dspchec Command									
IGX-A	TN	Cisco	IGX 8420	9.3.45	June 24 2003 10:15 GMT				
	Echo	Echo	Return	Tone	Conver-	Non-Linear	Voice	Bkgrnd	
Channels	Cancel	Loss(.1	dBs)	Disabler	gence	Processing	Tmpl	Filter	
4.1.1-24	Enabled	-	Enabled	-	Enabled	-	Enabled		
4.2.1-24	Disabled	-	Enabled	-	Enabled	-	Enabled		
Last Command: <b>dspchec 4.1.1-15</b>									

The Cisco 3810 router configuration has the following physical setup:

- 3810-4a, T1 card: phone > FXS port 1/1 > MFT T1 > IGX UVM T1 card
- 3810-4b, T1 card: phone > FXS port 1/2 > MFT T1 > IGX UVM T1 card

In this example, the RJ11s plug into the FXS ports on the Cisco MC3810, and T1s run directly to the IGX UVM back cards.

To dial from the T1/3810-1a phone:

1. Dial 8, listen for two beep tones, and then another dial tone (which comes from 3810–4b).
2. Dial 2222, which rings the other phone.

To dial from the T1/3810–4b phone:

1. Dial 9, listen for two beep tones, and then another dial tone (which comes from 3810–4a).
2. Dial 3333, which rings the other phone.

The following shows the Multiflex Trunk (MFT)/voice configurations for the T1 3810–4a router:

#### **3810–4a T1 Router, Showing MFT/Voice Configurations Only**

```
controller T1 0
  framing esf
  linecode b8zs
  mode cas
  voice-group 1 timeslots 1-24 type e&m-immediate-start
  !
voice-port 0/1
  define Tx-bits idle 0001
  define Rx-bits idle 0001
  timeouts call-disconnect 0
  operation 4-wire
  !
voice-port 0/2
  timeouts call-disconnect 0

  !
dial-peer voice 1 pots
  destination-pattern 8
  port 0/1
  !
dial-peer voice 2 pots
  destination-pattern 3333
  port 1/1
  !
end
```

The following shows the T1 3810–4b router configuration:

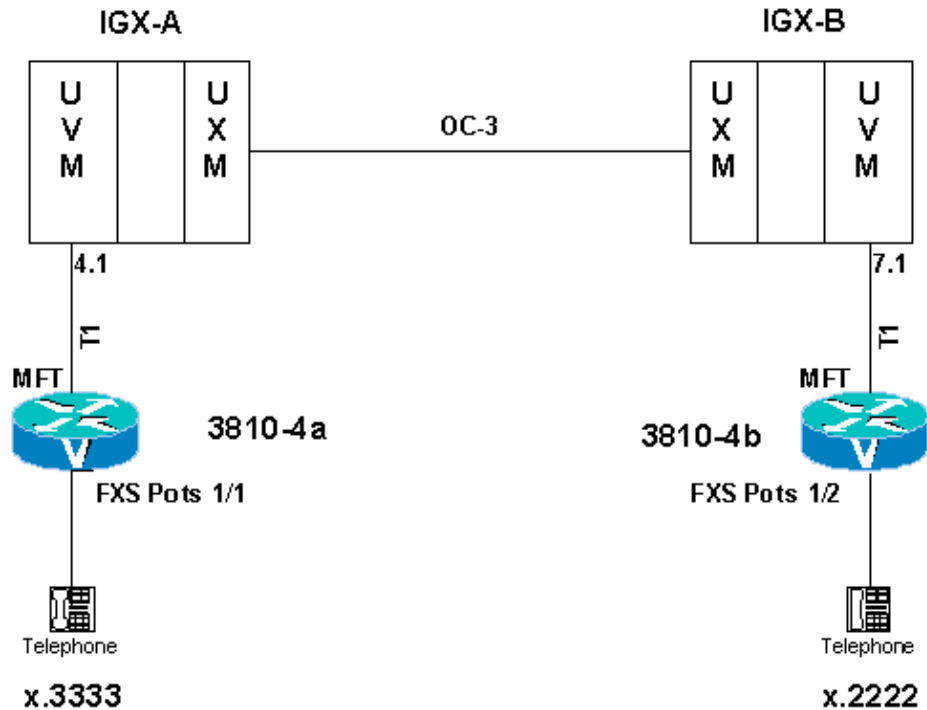
#### **3810–4b T1 Router Configuration**

```
controller T1 0
  framing esf
  linecode b8zs
  mode cas
  voice-group 1 timeslots 1-24 type e&m-immediate-start
  !
voice-port 0/1
  define Tx-bits idle 0001
  define Rx-bits idle 0001
  timeouts call-disconnect 0
  operation 4-wire
  !
dial-peer voice 1 pots
  destination-pattern 9
  port 0/1
  !
dial-peer voice 2 pots
  destination-pattern 2222
  port 1/2
  !
end
```

## T1 to T1 CCS Example

This section contains a T1 to T1 common channel signaling (CCS) example. The example builds a simple CCS voice connection(s) between two phones, using the CCS signaling type. The following illustration shows the connections for this example:

### T1 to T1 CCS Example



1. Use the **upln** command to bring up the UVM lines.
2. Use the **cnfln** command to configure line 4.1 with the following parameters:
  - ◆ Extended Superframe Format (ESF)
  - ◆ Bipolar 8 Zero Substitution (B8ZS)
  - ◆  $\mu$ -law
3. Use the **addcon** command to add voice connections using your choice of compression; your configurations should be similar to the following:
  - ◆ **addcon 4.1.1-16 IGX-B 7.1.1-16 c32**
  - ◆ **addcon 4.1.17-23 IGX-B 7.1.17-23 c32**
  - ◆ **addcon 4.1.24 IGX-B 7.1.24 t (transparent channel for signaling)**

You can use the **dspchcnf** command and the **dspchec** command to display your channel configurations:

Using the dspchcnf Command											
IGX-A	TN	Cisco	IGX 8420	9.3.45	June 24 2003 10:14	GMT					
	%	Adaptive		Gain (dB)	Dial	Interface			OnHk	Cond	
Channels	Util	Voice	Fax	In Out	Type	Type	A	B	C	D	Crit
4.1.1-16	60	Disabled	Disabled	0 0	Inband	4W E&M	0	X	-	-	a
4.1.17-24	60	Disabled	Disabled	0 0	Inband	4W E&M	0	X	-	-	a

Last Command: **dspchcnf 4.1.1-15**

### Using the dspchec Command

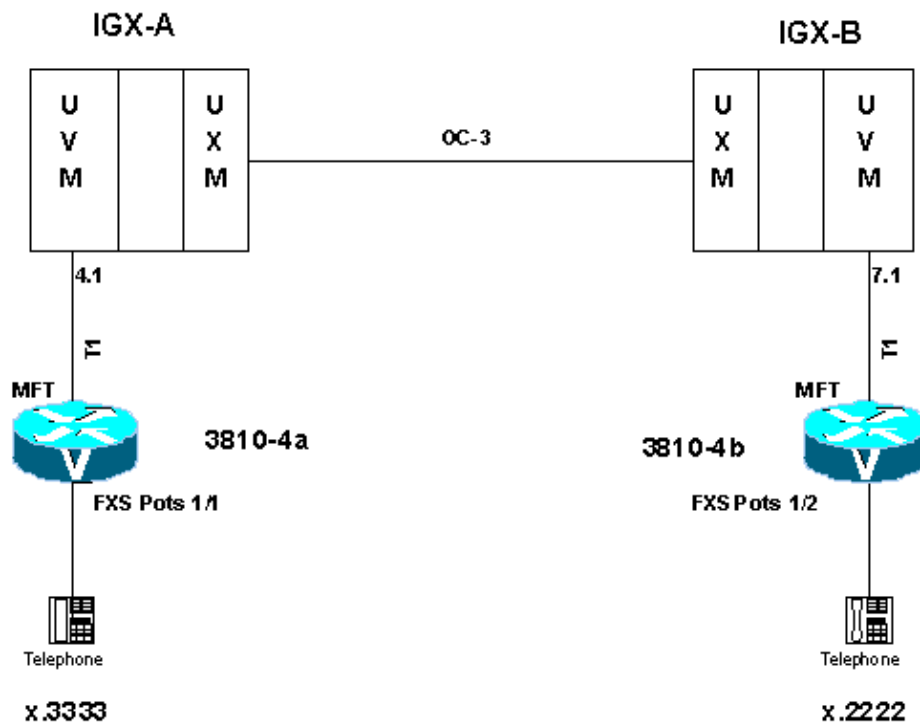
IGX-A	TN	Cisco	IGX 8420	9.3.45	June 24 2003 10:15 GMT
Channels	Echo Cancel	Echo Return Loss(.1 dBs)	Tone Disabler	Conver-	Non-Linear Voice Bkgrnd Processing Tmplt Filter
4.1.1-23	Enabled	-	Enabled	-	Enabled - Enabled
4.1.24	Disabled	-	Enabled	-	Enabled - Enabled
4.2.1-24	Disabled	-	Enabled	-	Enabled - Enabled

Last Command: **dspchec 4.1.1-15**

## T1 to E1 CAS Example

This example builds a simple channel associated signaling (CAS) voice connection(s) between two phones. One side uses a T1 and the other side uses an E1 circuit. This example demonstrates how to perform a T1 to E1 conversion using IGX voice modules. The following illustration shows the connections for this example:

### T1 to E1 CAS Example



1. Use the **upln** command to bring up the UVM lines.
2. Use the **cnfln** command to configure the T1 line 4.1 with the following parameters:
  - ◆ Extended Superframe Format (ESF)
  - ◆ Bipolar 8 Zero Substitution (B8ZS)
3. Use the **cnfln** command to configure the E1 line 7.1 with High Density Bipolar 3 (HDB3) coding.

You can display your configurations using the **dsplncnf** command for the T1 and E1 lines:

### Using the dsplncnf Command for T1 Display

```
IGX-A      TN      Cisco      IGX 8420  9.3.45   June 24 2003 08:42 GMT

LN 4.1 Config T1/24 UVM slot:4
Loop clock: No Line framing: ESF
Line coding: B8ZS
Line encoding: u-LAW
Line T1 signaling: ABAB
Line cable type: ABAM
Line length: 0-133 ft.
Line 56KBS Bit Pos: msb
Line pct fast modem: 20
Line cnfg: External
Line cnf slot.line: --
Line CAS-Switching: Off
Line SVC-Caching: Off

Last Command: dsplncnf 4.1
```

### Using the dsplncnf Command for E1 Display

```
IGX-B      TN      Cisco      IGX 8420  9.3.45   June 24 2003 08:42 GMT

Line 7.1 Config E1/30 UVM slot:7
LN 7.1 Config E1/30 UVM slot:7
Loop clock: No
Line framing: On
Line coding: HDB3
Line CRC: No
Line recv impedance: 75 ohm + gnd
Line E1/J1 signal: CAS
Line encoding: A-LAW
Line 56KBS Bit Pos: msb
Line pct fast modem: 20
Line cnfg: Passing
Line cnf slot.line: 8.1
Line CAS-Switching: Off
Line SVC-Caching: Off

Last Command: dsplncnf 7.1
```

4. Use the **addcon** command to add voice connections using your choice of compression; your commands should be similar to the following:

- ◆ **addcon 4.1.1-16 IGX-B 7.1.1-15 c32**
- ◆ **addcon 4.1.1-17 IGX-B 7.1.1.17-25 c32**

**Note:** We skipped DS0 number 16, which is used for E1 signaling.

You can use the **dspchcnf** command to display your T1 and E1 channel configurations:

### Using the dspchcnf Command for T1 Display

```
IGX-A      TN      Cisco      IGX 8420  9.3.45   June 24 2003 11:14 GMT

          %  Adaptive          Gain (dB)  Dial  Interface      OnHk Cond
Channels Util Voice    Fax    In  Out  Type  Type          A  B  C  D Crit
4.1.1-16  60  Disabled Disabled  0  0  Inband  4W E&M      0  X  -  -  a
4.1.17-24 60  Disabled Disabled  0  0  Inband  4W E&M      0  X  -  -  a

Last Command: dspchcnf 4.1.1-15
```

### Using the dspchcnf Command for E1 Display



IGX-B	TN	Cisco	IGX 8420	9.3.45	June 24 2003	11:14	GMT								
	%	Adaptive	Gain (dB)	Dial	Interface	OnHk	Cond								
Channels	Util	Voice	Fax	In	Out	Type	Type	A	B	C	D	Crit			
7.1.1-15	60	Disabled	Disabled	0	0	Inband	4W E&M	0	X	-	-	a			
7.1.17-31	60	Disabled	Disabled	0	0	Inband	4W E&M	0	X	-	-	a			
Last Command: <b>dspchcnf 4.1.1-15</b>															

## Basic Voice Troubleshooting

This section describes basic troubleshooting techniques for the following voice issues:

- Clocking
- Clipping
- Background noise
- Echo
- Delay

### Clocking

The usual clocking condition to the PBX is normal, which implies that the UVM monitors the transmit data and expects the receive data frequency to match. This means that the UVM is providing clocking to the PBX and the PBX is using the receive timing to clock transmit data out to the UVM. Use the **cnfln** command to configure a loop clock, not on the IGX 8400 and PBX. If the PBX is connected to a digital ISDN service or a Building Integrated Timing Supply (BITS) clock, then it is acquiring a clocking reference from another source. In this case, declare the PBX to be a clocking source to IGX using the **cnfelksrc** command. If the PBX is not connected to ISDN, BITS, or another known clock source, do not declare it as a clock source.

Complete the following steps to ensure that the PBX clocking is consistent with the configuration:

1. Use the **dsplnerrs** command to ensure the clocking is not causing frame slips. The **cnfln** command may be required to adjust the clock configuration to Loop or Local.
2. Verify that the PBX is not detecting frame slips.
3. Use the **cnflnal** command to make the alarm of both circuit line and trunk more sensitive so the operator is made aware of any problems.

### Clipping

If speech syllables are getting clipped, especially at the beginning of a spoken sentence, use the **cnfvmchparm** command to lower the VAD threshold from 0 dBm (default) to -10 dBm or -20 dBm. With a lower VAD threshold, the **cnfchutl** should be increased to 60% or 70%.

If clipping occurs during busy hour (trunk congestion), check for packet drops on the trunk. Verify that channel utilization is correctly configured. If the number of VAD voice channels sharing a common trunk bandwidth is small (for example, 24 or less), the peak voice bandwidth utilization may often exceed the allocated trunk bandwidth. This situation is more likely to occur on a subrate trunk. To resolve the problem, increase the channel utilization and trunk bandwidth.

### Background Noise

If the noise level during silent periods seems too high, use the **cnfvmchparm** command to lower the noise injection level to -10 dBm or -20 dBm. If there is adequate noise being generated by the external equipment (such as channel bank), the noise injection may be set to -100 dBm.

### Echo

A critical parameter in echo cancellation performance is the echo return loss (ERL) as seen by the UVM:

ERL seen by UVM = 4w/2w hybrid ERL + loss in the external equipment.

If echo remains for a few seconds at the beginning of a conversation, it is usually caused by slow convergence of echo canceller on calls with low ERL (6 to 10 dB as seen by the UVM card). Decrease the upper convergence speed threshold (UCST) value using the **cnfvmchparm** command (parameter 8). Lowering the UCST (to 12 dB, for example) would reduce initial echo, but may cause a slight echo/distortion during double talk, especially if the talker levels on the two ends are very different.

If echo cancellation does not converge because of very poor ERL (less than 5 dB), use the **cnfvmchparm** command to configure the double talk detection threshold (DTDT) value (parameter 9). You should set the DTDT to approximately 1 dB lower than the circuit ERL seen by the UVM card.

If echo or distortion/static is heard during double talk, it may be the opposite of ERL problem above. Echo cancellation may be diverging during low level double talk. Increase the UCST one notch (for example, by 6 dB).

If residual echo is heard with a large network delay, use the **cnfchec** command to verify that non-linear processing is enabled.

## Delay

Delay is the amount of time it takes for one party's speech to reach the other party's ear. Packet networks tend to have somewhat greater delay than TDM based networks. Also some compressions contribute greater delay than others. As a rule, the higher the compression ratio (or lower the bandwidth used per voice connection) the greater the incremental delay. For example, g729r8 has greater delay than L16, which in turn has greater delay than a32. Studies have shown that one-way delay up to 150 msec is generally imperceptible in a normal conversation.

Refer to Voice Parameters and Tuning Guide for the IGX 8400, VISM, 3810, FastPAD, and VNS for more information on voice tuning and configuration.

## Data Connections

This section describes the capabilities of the IGX switch LDM and HDM cards, and contains the following sections:

- Data Port Clocking Modes
- Interface Control Templates
- V.35 HDLC Data Connection Lab
- Data Connection Troubleshooting

The following serial ports are supported on HDM/LDM cards:

- Data communications equipment (DCE)
- Data terminal equipment (DTE)

The following table describes the available interfaces on the LDM and HDM cards:

Interface	Description
EIA/TIA-232	Formerly RS-232

V.35	Standard V.35 interface
EIA/TIA-449/X.21	Formerly RS-449
DDS	Digital Data Service

Refer to the following for more card details and specifications:

- The Components Used section of this document.
- The Card Installation and Node Startup chapter of Cisco IGX 8400 Series Installation, Release 8.5.

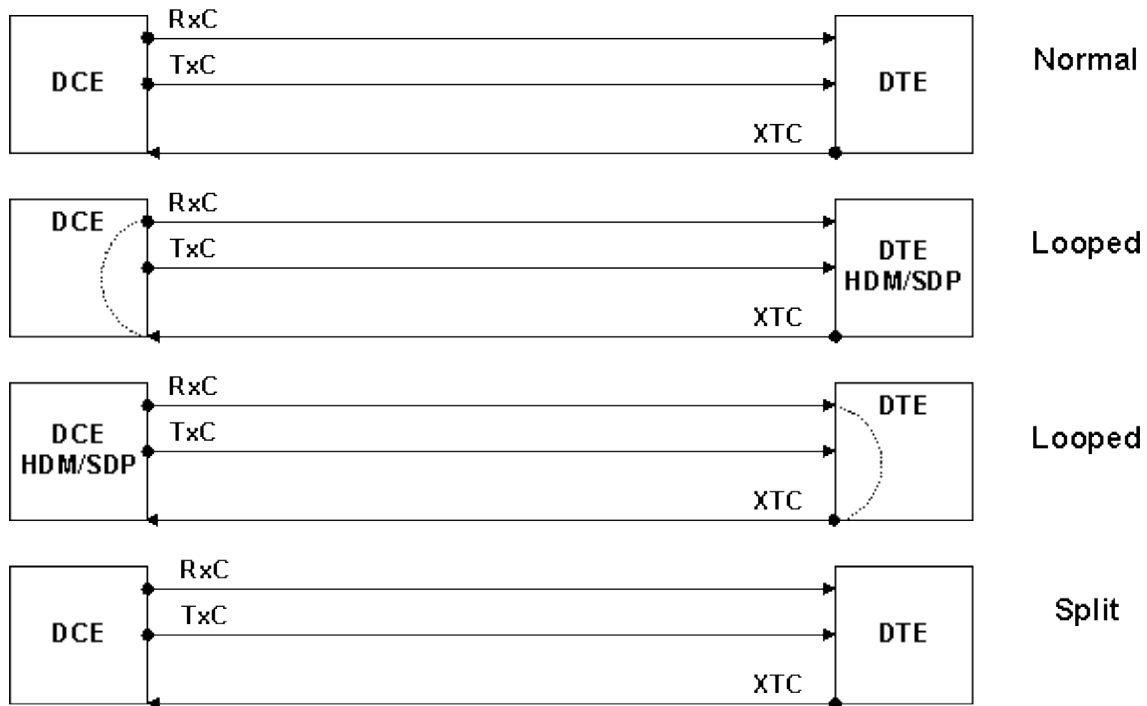
## Data Port Clocking Modes

The DCE is generally responsible for clocking the data. The clocking between two devices can be configured in one of two ways:

- Normal mode The DCE provides both the transmit and the receive clock. The DCE is the clock master and the DTE is the clock slave.
- Looped The DCE provides only the receive clock, and the DTE provides the transmit clock. In most cases, one of the devices is locking onto the clock from the other end and is recreating it as its own clock signal.

The following illustration shows the data port clocking modes:

### Data Port Clocking Modes



Use the **cnfdclk** command to configure the data port clock mode.

## Interface Control Templates

Interface control templates (ICTs) are used to define the outbound control leads on a data channel based on

the current state of the associated connection. The ICT provides option end-to-end control lead continuity by manipulating output control leads. Use the **cnfict** command to modify ICTs. following table lists the available ICT templates and their corresponding statuses:

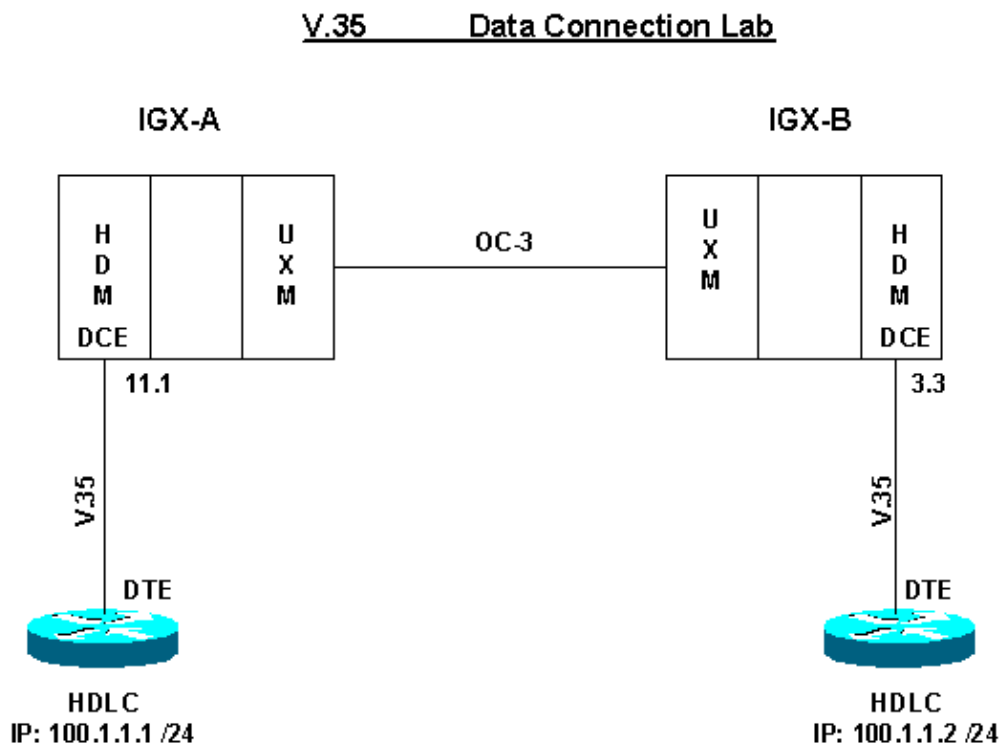
Condition	Connection Status
Active	OK
Conditioned	Failed or down
Looped	A software configured loop is in progress
Near	A near external modem loop is in progress
Far	A far external modem loop is in progress

Control lead options for ICTs are listed below:

- Follow a local input or output lead
- Follow a remote input or output lead
- Stay high
- Stay low

## V.35 HDLC Data Connection Lab

This example describes how to configure the HDM card to build and pass data. The following illustration shows the connections for this lab:



1. Connect cables to the V.35 ports. Ensure that you verify the DTE/DCE sides.

**Note:** Routers typically are the DTE. The IGX is is the DCE.

2. Use the **addcon** command to add the data connection from the IGX-A side:

```
addcon 11.1 IGX-B 3.1 256 8/8
```

This step adds a 256K data connection between the HDMs using 8/8 encoding.

- Use the **cnfdclk** command to configure the clocking mode in this lab, we use the normal mode:

```

Using the cnfdclk Command
IGX-A      TN      Cisco      IGX 8420  9.3.45   July 8 2003  23:36 EST

Data Channel:      11.1
Interface:         V35   DCE
Clocking:      Normal

                Interface Control Template for Connection while ACTIVE
Lead   Output Value      Lead   Output Value
RI (J) OFF              DSR (E) ON
CTS (D) ON              TM (K) OFF
DCD (F) ON

Last Command: cnfdclk 11.1 normal

```

```

Using the cnfdclk Command
IGX-B      TN      Cisco      IGX 8420  9.3.45   July 8 2003  23:37 EST

Data Channel:      3.3
Interface:         V35   DCE
Clocking:      Normal

                Interface Control Template for Connection while ACTIVE
Lead   Output Value      Lead   Output Value
RI (J) OFF              DSR (E) ON
CTS (D) ON              TM (K) OFF
DCD (F) ON

Last Command: cnfdclk 3.3 normal

```

- Use the **dspbob** command to verify the Break-out Box (BOB) lead settings:

```

Using the dspbob Command
IGX-A      TN      Cisco      IGX 8420  9.3.45   July 8 2003  23:39 EST

Port:         11.1
Interface:    V35   DCE
Clocking:  Normal      (255999 Baud)

                Inputs from User Equipment          Outputs to User Equipment
Lead Pin State  Lead Pin State  Lead Pin State  Lead Pin State
RTS  C   On      CTS  D   On
DTR  H   On      DSR  E   On
TxD  P/S Active  DCD  F   On
TT   U/W Unused  RI   J   Off
                                TM   K   Off
                                RxD  R/T Active
                                RxC  V/X Active
                                TxC  Y/a Active

This Command: dspbob 11.1

```

```

Using the dspbob Command
IGX-B      TN      Cisco      IGX 8420  9.3.45   July 8 2003  23:41 EST

Port:         3.3
Interface:    V35   DCE

```

```

Clocking:          Normal          (255999 Baud)

      Inputs from User Equipment          Outputs to User Equipment
Lead Pin State  Lead Pin State  Lead Pin State  Lead Pin State
RTS  C   On          CTS  D   On
DTR  H   On          DSR  E   On
TxD  P/S Active     DCD  F   On
TT   U/W Unused     RI   J   Off
                                TM   K   Off
                                RxD  R/T Active
                                RxC  V/X Active
                                TxC  Y/a Active

This Command:  dspbob 3.3

```

5. Use the **ping** command to test IP connectivity based on the following router configurations:

```

wsw-3810-7d# ping 100.1.1.1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 100.1.1.1, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 32/33/37 ms
wsw-3810-7d#

```

```

wsw-3810-7a# ping 100.1.1.2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 100.1.1.2, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 32/33/36 ms
wsw-3810-7a#

```

3810-7d router configuration:

```

!
interface Serial1
 ip address 100.1.1.2 255.255.255.0
!

```

3810-7a router configuration:

```

!
interface Serial0
 ip address 100.1.1.1 255.255.255.0
 no ip directed-broadcast
 no ip mroute-cache
 no fair-queue
!

```

You can verify that the serial interfaces are up by using the **show interface** command, and looking for up/up, and the lead statuses at the bottom of the output. The router is the DTE, and when configured properly, you should see all the lead statuses as UP.

```

wsw-3810-7a# sh int s1
Serial1 is up, line protocol is up
  Hardware is PQIICC Serial
  MTU 1500 bytes, BW 1544 Kbit, DLY 20000 usec,
    reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation HDLC, crc 16, loopback not set
  Keepalive set (10 sec)
  Scramble enabled
  Last input 00:00:03, output 00:00:16, output hang never
  Last clearing of "show interface" counters 1d03h
  Input queue: 0/75/0 (size/max/drops); Total output drops: 0
  Queueing strategy: fifo

```

```

Output queue: 0/1000/64/0 (size/max total/threshold/drops)
5 minute input rate 0 bits/sec, 0 packets/sec
5 minute output rate 0 bits/sec, 0 packets/sec
  0 packets input, 0 bytes, 0 no buffer
  Received 0 broadcasts, 0 runts, 0 giants, 0 throttles
  1 input errors, 0 CRC, 1 frame, 0 overrun, 0 ignored, 0 abort
  66 packets output, 858 bytes, 0 underruns
  0 output errors, 0 collisions, 0 interface resets
  0 output buffer failures, 0 output buffers swapped out
  0 carrier transitions
Cable attached: V.35 (DTE)
Hardware config: V.35; DTE; DSR= UP DTR= UP RTS= UP CTS= UPD CD= UP

```

```

wsw-3810-7d# sh int s0
Serial0 is up, line protocol is up
Hardware is PQIICC Serial
MTU 1500 bytes, BW 1544 Kbit, DLY 20000 usec,
  reliability 255/255, txload 1/255, rxload 1/255
Encapsulation HDLC, crc 16, loopback not set
Keepalive set (10 sec)
Scramble enabled
Last input never, output never, output hang never
Last clearing of "show interface" counters 1d23h
Input queue: 0/75/0/0 (size/max/drops/flushes); Total output drops: 0
Queueing strategy: weighted fair
Output queue: 0/1000/64/0 (size/max total/threshold/drops)
  Conversations 0/0/256 (active/max active/max total)
  Reserved Conversations 0/0 (allocated/max allocated)
5 minute input rate 0 bits/sec, 0 packets/sec
5 minute output rate 0 bits/sec, 0 packets/sec
  0 packets input, 0 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
  0 packets output, 0 bytes, 0 underruns
  0 output errors, 0 collisions, 0 interface resets
  0 output buffer failures, 0 output buffers swapped out
  0 carrier transitions
Cable attached: V.35 (DTE)
Hardware config: V.35; DTE; DSR= UP DTR= UP RTS= UP CTS= UP DCD= UP

```

## Data Connection Troubleshooting

Complete the following steps for data connection troubleshooting assistance:

1. Use the **dspon** command to verify the connection status. Is connection down or failed?

Using the dspon Command							
IGX-A	TN	Cisco	IGX 8420	9.3.45	July 9 2003	00:10	EST
Conn:	11.1		IGX-B	3.3		256	8/8
<b>Status:OK</b>							
<i>! --- Connection is okay.</i>							
Ownr:LOCAL Restr:NONE COS:0 Compr:NONE							
<b>Path: IGX-A16.1--13.1IGX-B</b>							
Pref: Not Configured							
IGX-A	HDM:	OK	IGX-B	HDM:	OK		
	SDI:	OK		SDI:	OK		
	Clock:	OK		Clock:	OK		

```
Last Command: dspcon 11.1
```

2. Use the **dspchcnf** command to verify channel configuration. Ensure parameters match on both sides of the connection.

Using the dspchcnf Command							
IGX-B	TN	Cisco	IGX 8420	9.3.45	July 8 2003	23:42	EST
Channels	Maximum EIA Update Rate	% Util	DFM Pattern Length	DFM Status	Idle Code Suppr	PreAge (usec)	
3.3-4	2	100	8	Enabled	-	0	
Last Command: <b>dspchcnf 3.3</b>							

Using the dspchcnf Command							
IGX-A	TN	Cisco	IGX 8420	9.3.45	July 8 2003	23:43	EST
Channels	Maximum EIA Update Rate	% Util	DFM Pattern Length	DFM Status	Idle Code Suppr	PreAge (usec)	
11.1-4	2	100	8	Enabled	-	0	
Last Command: <b>dspchcnf 11.1</b>							

3. Use the **dspbob** command to verify the following lead status elements:

- ◆ Ensure no leads are down or inhibited.
- ◆ Verify correct interface types (DTE or DCE).
- ◆ Verify correct clocking configuration.

Using the dspbob Command											
IGX-A	TN	Cisco	IGX 8420	9.3.45	July 9 2003	00:15	EST				
Port:	11.1										
Interface:	V35 DCE										
Clocking:	Normal (255999 Baud)										
Inputs from User Equipment					Outputs to User Equipment						
Lead	Pin	State	Lead	Pin	State	Lead	Pin	State	Lead	Pin	State
RTS	C	On				CTS	D	On			
DTR	H	On				DSR	E	On			
TxD	P/S	Active				DCD	F	On			
TT	U/W	Unused				RI	J	Off			
						TM	K	Off			
						RxD	R/T	Active			
						RxC	V/X	Active			
						TxC	Y/a	Active			
This Command: <b>dspbob 11.1</b>											

4. Refer to V.35/RS449 Cable Length Recommendations to verify proper cabling and cable lengths are in effect.
5. Use the **dspcurelk** command on each endpoint to find the network clock source for the endpoint to investigate the possibility of periodic bursts. When HDM or LDM circuits suffer from periodic bursts of errors, node synchronization may be the issue. If the clocks are not synchronized, such bursts of errors are expected.

## Frame Relay

This section describes the Frame Relay capabilities for the various frame relay based cards in the IGX, and



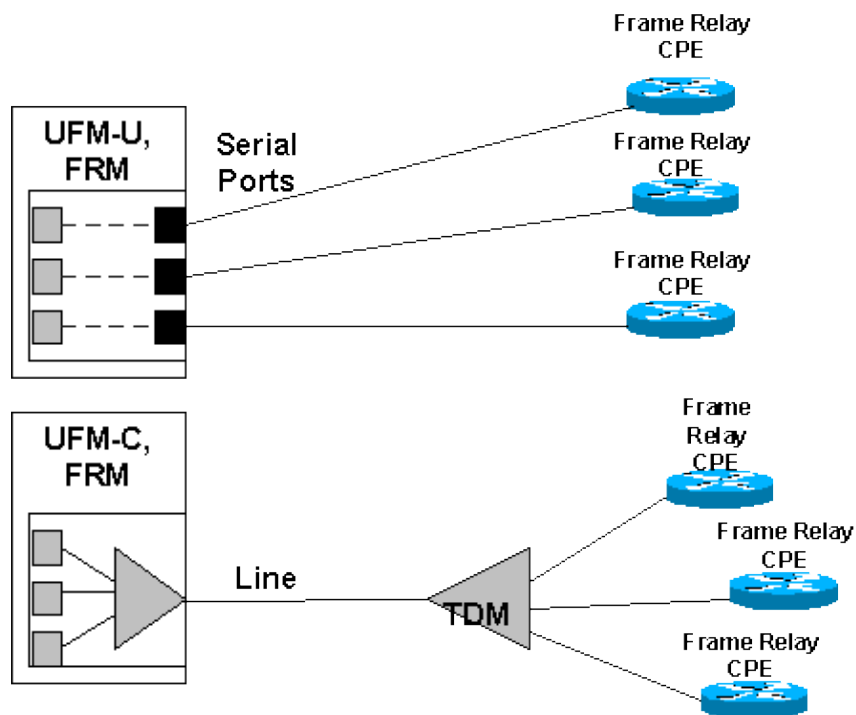
contains these sections:

- Virtual Circuit Port Queueing
- Frame Relay Data Link Connection Identifiers
- Frame Relay Signaling
- Universal Frame Relay Module Mode Configuration
- Frame Relay Labs

This document uses the UFM-U card in the lab setups. Refer to the following for more Frame Relay card information:

- The Components Used section of this document
- The Line Interface Cards chapter of Cisco IGX 8400 Series Reference, Release 9.3.0

The following illustration shows the UFM-U and UFM-C card lines, ports and connection devices:

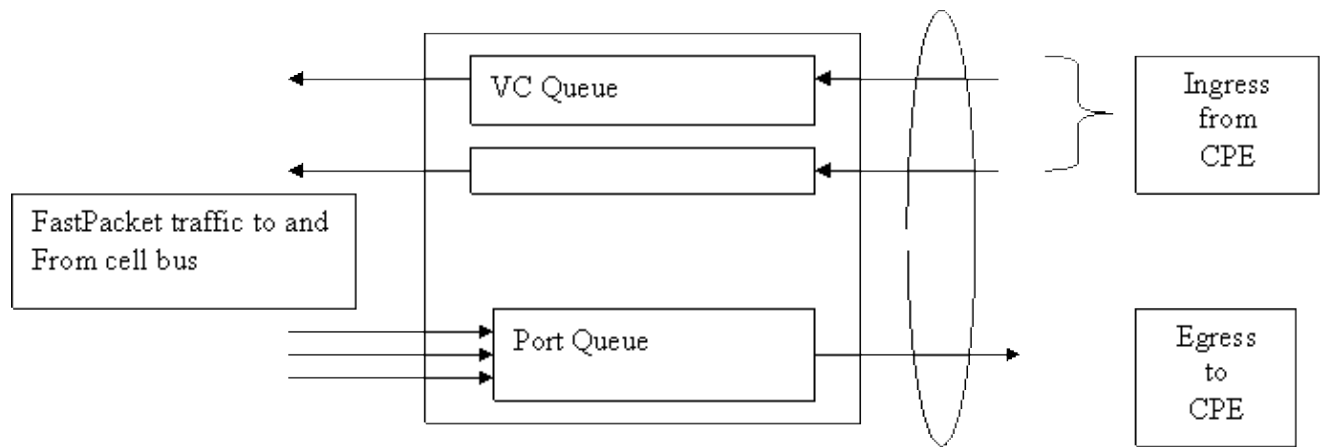


Frame Relay ports are provided on UFM/UFM-U cards. There are two types of Frame Relay ports:

- Physical Frame Relay ports on UFM-U/FRM cards with V.35 or X.21 interfaces.
- Logical Frame Relay ports on UFM/FRM cards with T1 or E1 interfaces. Use the **addport** command to create logical ports.

## Virtual Circuit Port Queueing

The following illustration shows VC port queueing:



You need to be aware of the following important port queuing tips:

- The outbound frames pass through the port queues only.
- The inbound frames pass through the VC queues only.
- Port queues are in the egress direction toward customer premises equipment (CPE).
- The port queue provides traffic management from multiple virtual circuits on a single physical interface.
- You can configure the following port queue parameters with the **cnfport** command:
  - ◆ Queue Depth Determines the total number of bytes that are buffered by this port.
  - ◆ Discard Eligibility (DE) Threshold Determines whether DE frames are dropped.
  - ◆ Explicit Congestion Notification (ECN) Threshold Determines whether frames are marked with Forward Explicit Congestion Notification (FECN) or Backward Explicit Congestion Notification (BECN).

## Frame Relay Data Link Connection Identifiers

Each PVC between frame relay devices is locally assigned a data link connection identifier (DLCI) to differentiate between PVC termination on the same port.

You should be aware of the following when you assign a DLCI to a connection:

- DLCIs are locally significant, except if you are using a global addressing scheme
- DLCIs from 16 to 1007 are available for user services
- Reserved DLCIs (0 to 15 and 1008 to 1023) are used for signaling protocols or other management functions
- The maximum number of Frame Relay connections on a UFM is 1000

Locally significant DLCIs are generally used when provisioning Frame Relay PVCs. With locally significant DLCIs, the DLCI number is the local PVC identifier between the CPE and the switch. The DLCI number is not unique throughout the entire Frame Relay cloud (assuming more than one switch is being used to route the PVC).

Using a global addressing scheme, a unique identification number is assigned to each port in the network. Subsequently, PVCs are added with DLCIs chosen based on the port ID at each end. The DLCI assigned to each end of the PVC is made equal to the port ID of the port at the other end of the PVC. This numbering convention has the advantage that all frames submitted to the network with a given DLCI are delivered to the same port, regardless of their source.

## Frame Relay Signaling

It is desirable to have some intelligent signaling protocol between the devices at either end of a frame relay link as the Local Management Interface (LMI). Signaling is used for the following purposes:

- Status information to ensure the correct operation of each device.
- Status information to ensure the correct operation of the link between the devices.
- Administrative information such as the addition, deletion, or failure of one or more PVCs.
- Flow control information to regulate the flow of traffic between devices to prevent or react to congestion.

The following signaling protocols are widely used:

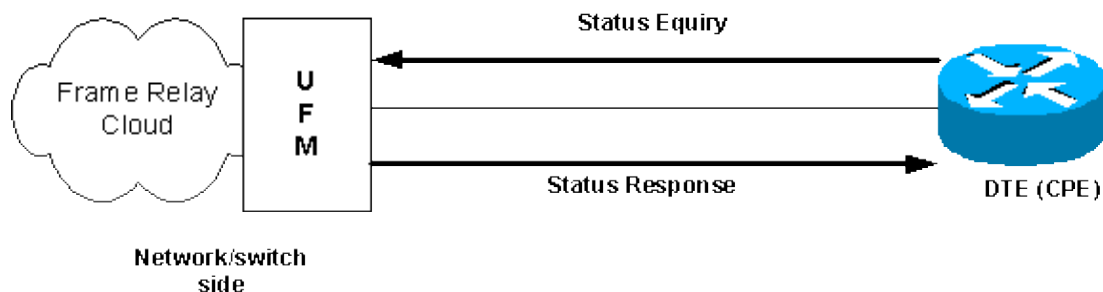
- Cisco/StrataCom Uses DLCI 1023, UNI only.
- ITU Q.933, Annex A Uses DLCI 0, NNI or UNI.
- ANSI T1.617, Annex D Uses DLCI 0, NNI or UNI.

**Note:** The original LMI differs from ANSI to ITU-T in two ways:

- The number of connections for LMI is limited to 992. ANSI and ITU-T are limited to 976.
- LMI uses DLCI 1023. ANSI and ITU-T use DLCI 0.

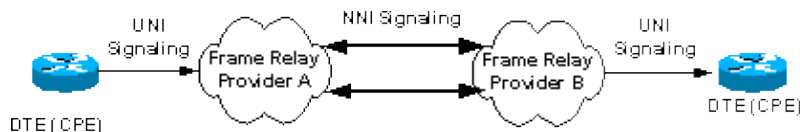
UNI applications apply signaling conventions on a local interface between the user equipment and the network. The signaling is strictly unidirectional only one device may request information from the other. The DTE (CPE side) is usually the interface, which performs all the status requests with the network side responding to the requests.

### UNI Frame Relay Signaling



NNI is a bidirectional signaling protocol, typically used between different network providers. Using NNI enables control information and traffic to pass at the border of two networks (Provider A and B). Both networks send status inquiry frames, and both networks respond with short or long response frames.

### NNI Frame Relay Signaling



# Universal Frame Relay Module Mode Configuration

When configuring ATM-to-Frame Relay service interworking (SIW)/network interworking (NIW) connections, Frame Relay connections can take the transparent and translational modes.

In transparent mode, the Frame Relay header is stripped off and the data is sent transparently to the network as FastPackets. These FastPackets are usually encapsulated within ATM cells when traversing an ATM. This type of connection is used when the encapsulation method is compatible between the terminal equipment only.

In translational mode, the method for carrying multiple upper layer user protocols over a Frame Relay PVC is the RFC 1490 standard, and the method for carrying multiple upper layer user protocols over a Frame Relay ATM PVC is the RFC 1483 standard. The interworking function performs mapping between the two encapsulations, which supports the interworking of routed and bridged protocols.

## Frame Relay Labs

This section provides basic lab setups, which demonstrate the Frame Relay information described in this document. The labs are based on UFM and UFMU cards, and the following connection types are demonstrated:

- Lab 1: Frame Relay to Frame Relay via UNI
- Lab 2: Frame Relay to Frame Relay via NNI
- Lab 3: Frame Relay to ATM using AFTX Mode
- Lab 4: Frame Relay to ATM using ATFT Mode
- Lab 5: Frame Forwarding

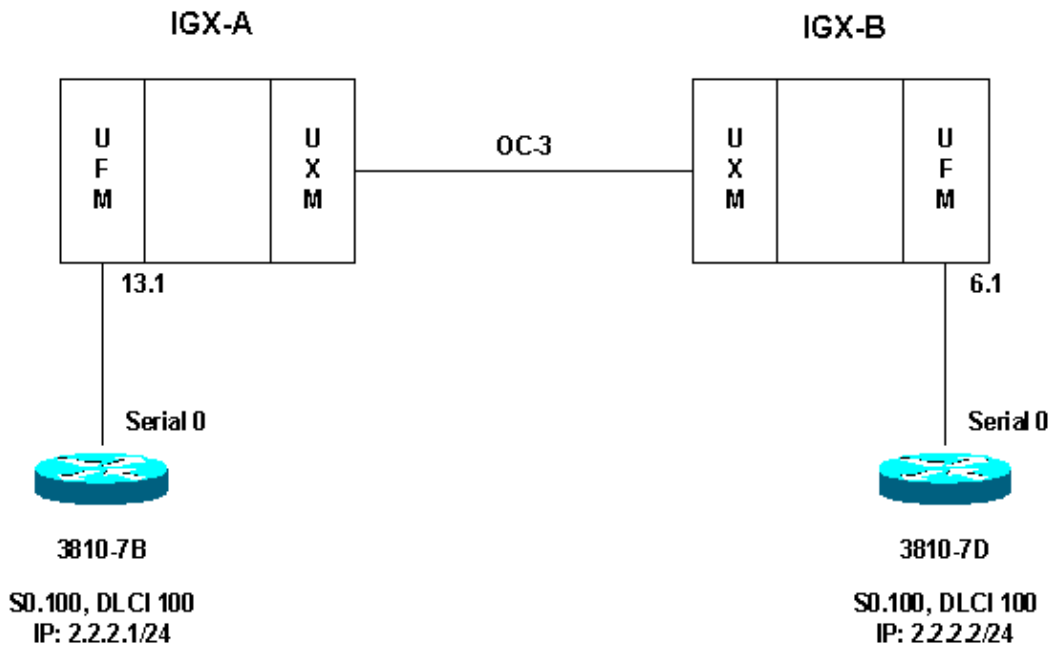
### Lab 1: Frame Relay to Frame Relay via UNI

Setup a Frame Relay to Frame Relay connection using the following parameters:

- DLCI = 100 (both sides)
- Maximum Information Rate (MIR) = 1024
- No Foresight
- Cisco LMI signaling
- UNI connection

The following illustration shows the topology for this lab:

## UFMU Frame Relay --> Frame Relay UNI Connection



Complete the following steps for IGX-A port configuration:

1. Use the **uport 13.1** command.
2. Use the **cnfport** command to configure the port with the following parameters:
  - ◆ 1536 Kbps
  - ◆ Cisco LMI type
  - ◆ DCE interface type

```
cnfport 13.1 DCE 1536 NORMAL 0 65535 65535 100 s N 15 3 4 N 75 25 3 N N Y 1 N
```
3. Use the **dspport 13.1** command to display your configuration:

Using the dspport Command			
IGX-A	TN	Cisco	IGX 8420 9.3.45 July 20 2003 16:40 EST
Port:	13.1		[ACTIVE ]
Interface:	V35	DCE	Configured Clock: 1536 Kbps
Clocking:	Normal		Measured Rx Clock: 1536 Kbps
Neighbor IP Add:	0.0.0.0		Neighbor IfIndex: 0
Port ID		0	Min Flags / Frames 1
Port Queue Depth		65535	OAM Pkt Threshold 3 pkts
ECN Queue Threshold		65535	T391 Link Intg Timer 10 sec
DE Threshold		100 %	N391 Full Status Poll 6 cyl
Signalling Protocol		Cisco LMI	EFCI Mapping Enabled No
Asynchronous Status		No	CLLM Enabled/Tx Timer No/ 0 msec
T392 Polling Verif Timer		15	IDE to DE Mapping Yes
N392 Error Threshold		3	Interface Control Template
N393 Monitored Events Count		4	Lead CTS DSR DCD
Communicate Priority		No	State ON ON ON
Upper/Lower RNR Thresh		75%/ 25%	Advertise Intf Info Disable
Last Command: <b>dspport 13.1</b>			

Complete the following steps for IGX-B port configuration:

1. Use the **upport 6.1** command.
2. Use the **cnfport** command to configure the port with the following parameters:

- ◆ 1536 Kbps
- ◆ Cisco LMI type
- ◆ DCE interface type

```
cnfport 6.1 DCE 1536 NORMAL 0 65535 65535 100 s N 15 3 4 N 75 25 3 N N Y 1 N
```

3. Use the **dspport** command to display your configuration:

Using the dspport Command							
IGX-B	TN	Cisco	IGX 8420	9.3.45	July 20	2003 16:40	EST
Port:	6.1			[ACTIVE	]		
Interface:	V35	DCE		Configured Clock:		1536 Kbps	
Clocking:	Normal			Measured Rx Clock:		1536 Kbps	
Neighbor IP Add:	0.0.0.0			Neighbor IfIndex:		0	
Port ID			0	Min Flags / Frames		1	
Port Queue Depth			65535	OAM Pkt Threshold		3 pkts	
ECN Queue Threshold			65535	T391 Link Intg Timer		10 sec	
DE Threshold			100 %	N391 Full Status Poll		6 cyl	
Signalling Protocol	Cisco	LMI		EFCI Mapping Enabled		No	
Asynchronous Status			No	CLLM Enabled/Tx Timer	No/	0 msec	
T392 Polling Verif Timer			15	IDE to DE Mapping		Yes	
N392 Error Threshold			3	Interface Control Template			
N393 Monitored Events Count			4	Lead	CTS	DSR	DCD
Communicate Priority			No	State	ON	ON	ON
Upper/Lower RNR Thresh	75%/	25%		Advertise Intf Info		Disable	
Last Command: <b>dspport 6.1</b>							

Complete the following steps to build the Frame Relay PVC:

1. Use the **addcon** command on the IGX-A side:

```
addcon 13.1.100 IGX-B 6.1.100 10
```

**Note:** 10 = Predefined Frame Relay class.

2. Use the **dspon** command to display your configuration:

Using the dspon Command							
IGX-A	TN	Cisco	IGX 8420	9.3.45	July 20	2003 16:41	EST
Conn:	13.1.100		IGX-B	6.1.100		fr	Status:OK
MIR	CIR	VC Q Depth	PIR	Cmax	ECN QThresh	QIR	
1024/1024	1024/1024	65535/65535	1536/1536	10/10	65535/65535	1024/1024	
Ownr:	LOCAL	Restr:	NONE	COS:	0	FST:	n % Util: 100/100
Pri:	L	Test-RTD:	0 msec				
Path:	IGX-A15.3.1--16.3.1	IGX-B					
Pref:	Not Configured						
IGX-A	UFMU:	OK		IGX-B	UFMU:	OK	
	UFI:	OK			UFI:	OK	
Last Command: <b>dspon 13.1.100</b>							

**Note:** You only need to issue the **addcon** command on one side.

3. Use the **dspon** command on the other side to display your configuration:

## Using the dspcon Command

```

IGX-B      TN      Cisco  IGX 8420  9.3.45    July 20 2003 16:41 EST

Conn:  6.1.100          IGX-A  13.1.100          fr      Status:OK
MIR      CIR      VC Q Depth      PIR      Cmax  ECN QThresh      QIR
1024/1024  1024/1024  65535/65535  1536/1536  10/10  65535/65535  1024/1024

Ownr:REMOTE Restr:NONE COS:0          FST: n  % Util: 100/100
Pri: L  Test-RTD: 0 msec
Path:  IGX-B|6.3.1--15.3.1IGX-A
Pref:  Not Configured

IGX-B  UFMU:  OK          IGX-A  UFMU:  OK
      UFI:  OK          UFI:  OK

Last Command: dspcon 6.1.100

```

#### 4. Perform the following router configurations:

##### Router configuration for 3810-7b:

```

!
interface Serial0
  no ip address
  encapsulation frame-relay IETF
  no ip mroute-cache
  no fair-queue
  clockrate line 1536000
  frame-relay lmi-type cisco
!
interface Serial0.100 point-to-point
  ip address 2.2.2.1 255.255.255.0
  frame-relay interface-dlci 100
!

```

##### Router configuration for 3810-7d:

```

!
interface Serial0
  no ip address
  encapsulation frame-relay IETF
  no ip mroute-cache
  clockrate line 1536000
  frame-relay lmi-type cisco
!
interface Serial0.100 point-to-point
  ip address 2.2.2.2 255.255.255.0
  frame-relay interface-dlci 100
!

```

#### 5. Perform the following ping command tests:

##### Ping test for 2.2.2.2:

```

wsw-3810-7b# ping 2.2.2.2

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2.2.2.2, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 8/8/8 ms
wsw-3810-7b# ping 2.2.2.2

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2.2.2.2, timeout is 2 seconds:
!!!!

```

Success rate is 100 percent (5/5), round-trip min/avg/max = 4/7/12 ms

### Ping test for 2.2.2.1:

```
wsw-3810-7d# ping 2.2.2.1
```

```
Type escape sequence to abort.
```

```
Sending 5, 100-byte ICMP Echos to 2.2.2.1, timeout is 2 seconds:
```

```
!!!!!
```

```
Success rate is 100 percent (5/5), round-trip min/avg/max = 4/7/8 ms
```

```
wsw-3810-7d# ping 2.2.2.1
```

```
Type escape sequence to abort.
```

```
Sending 5, 100-byte ICMP Echos to 2.2.2.1, timeout is 2 seconds:
```

```
!!!!!
```

```
Success rate is 100 percent (5/5), round-trip min/avg/max = 4/7/8 ms
```

### 6. Perform the following verifying operations:

You can use the **dspchstats** and **dspportstats** commands to verify your configurations for this lab:

Using the dspchstats Command							
IGX-A	TN	Cisco	IGX 8420	9.3.45	July 20	2003 16:44	EST
Channel Statistics: 13.1.100		Cleared: July 20 2003 16:43		(/)			
MIR: 1024/1024 kbps		Collection Time: 0 day(s) 00:00:26		Corrupted: NO			
	Frames	Avg Size	Avg	Util	Packets	Avg	
		(bytes)	(fps)	(%)			(pps)
From Port:	15	106	0	0			
To Network:	15	106	0	0	90	3	
Discarded:	0	0	0	0			
From Network:	15	106	0	0	90	3	
To Port:	15	106	0	0			
Discarded:	0	0	0	0	0	0	
ECN Stats: Avg Rx VC Q:		0		ForeSight RTD		--	
Min-Pk bytes rcvd: --		FECN Fram		0		FECN Ratio (%) 0	
Minutes Congested: --		BECN Frames: 0		BECN Ratio (%)		0	
Frames rcvd in excess of CIR:0		Bytes rcvd in excess of CIR:		0			
Frames xmtd in excess of CIR:0		Bytes xmtd in excess of CIR:		0			
This Command: <b>dspchstats 13.1.100 1</b>							

Using the dspchstats Command							
IGX-B	TN	Cisco	IGX 8420	9.3.45	July 20	2003 16:44	EST
Channel Statistics: 6.1.100		Cleared: July 20 2003 16:44		(/)			
MIR: 1024/1024 kbps		Collection Time: 0 day(s) 00:02:49		Corrupted: NO			
	Frames	Avg Size	Avg	Util	Packets	Avg	
		(bytes)	(fps)	(%)			(pps)
From Port:	37	117	0	0			
To Network:	37	117	0	0	244	1	
Discarded:	0	0	0	0			
From Network:	37	117	0	0	244	1	
To Port:	37	117	0	0			
Discarded:	0	0	0	0	0	0	
RTD --							
Min-Pk bytes rcvd: --		FECN Frames: 0		FECN Ratio (%)		0	
Minutes Congested: --		BECN Frames: 0		BECN Ratio (%)		0	
Frames rcvd in excess of CIR: 0		Bytes rcvd in excess of CIR: 0					
Frames xmtd in excess of CIR: 0		Bytes xmtd in excess of CIR: 0					
This Command: <b>dspchstats 6.1.100 1</b>							



### Using the dspportstats Command

```

IGX-A      TN      Cisco      IGX 8420  9.3.45   July 20 2003 16:44 EST

Port Statistics for 13.1      Cleared: July 20 2003 16:43
Port Speed: 1536 kbps      Collection Time: 0 day(s) 00:04:43      Corrupted: NO
Sig Protocol: Cisco LMI

          Bytes      Average (kbps)      Util (%)      Frames
From Port:      10502      0      0      84
To Port:      7492      0      0      74

Frame Errors      LMI Receive Protocol Stats      Misc Statistics
Invalid CRC      0      Status Enq Rcvd      28      Avg Tx Port Q      0
Invalid Alignment      0      Status Xmit      28      FECN Frames      0
Invalid Frm Length      0      Asynch Xmit      0      Ratio (%)      0
Invalid Frm Format      0      Seq # Mismatches      0      BECN Frames      0
Unknown DLCIs      0      Timeouts      0      Ratio (%)      0
Last Unknown DLCI      0      Invalid Req      0      Rsrc Overflow      0
                                          DE Frms Dropt      0

This Command: dspportstats 13.1 1

```

### Using the dspportstats Command

```

IGX-A      TN      Cisco      IGX 8420  9.3.45   July 20 2003 16:44 EST

Port Statistics for 13.1      Cleared: July 20 2003 16:43
Port Speed: 1536 kbps      Collection Time: 0 day(s) 00:04:50      Corrupted: NO
Sig Protocol: Cisco LMI

          Bytes      Average (kbps)      Util (%)      Frames
From Port:      10517      0      0      85
To Port:      7507      0      0      75

LMI Receive Protocol Stats      LMI Transmit Protocol Stats      CLLM (ForeSight) Stats
Status Enq Rcvd      29      Status Enq Xmit      --      Frames Rcvd      --
Status Xmt      29      Status Rcd      --      Bytes Rcvd      --
Asynch Xmit      0      Asynch Rcvd      --      Frames Xmt      --
Seq # Mismatches      0      Seq # Mismatches      --      Bytes Xmt      --
Timeouts      0      Timeouts      --      CLLM Failures      --
Invalid Frames      0
Elmi Ver Req      0      Elmi Ver Rsp      0
Elmi QOS Req      0      Elmi QOS Rsp      0

This Command: dspportstats 13.1 1

```

### Using the dspportstats Command

```

IGX-B      TN      Cisco      IGX 8420  9.3.45   July 20 2003 16:45 EST

Port Statistics for 6.1      Cleared: July 20 2003 16:44
Port Speed: 1536 kbps      Collection Time: 0 day(s) 00:04:10      Corrupted: NO
Sig Protocol: Cisco LMI

          Bytes      Average (kbps)      Util (%)      Frames
From Port:      6621      0      0      68
To Port:      6685      0      0      68

Frame Errors      LMI Receive Protocol Stats      Misc Statistics
Invalid CRC      0      Status Enq Rcvd      25      Avg Tx Port Q      0
Invalid Alignment      0      Status Xmit      25      FECN Frames      0
Invalid Frm Length      0      Asynch Xmit      0      Ratio (%)      0
Invalid Frm Format      0      Seq # Mismatches      0      BECN Frames      0
Unknown DLCIs      0      Timeouts      0      Ratio (%)      0
Last Unknown DLCI      0      Invalid Req      0      Rsrc Overflow      0
                                          DE Frms Dropt      0

This Command: dspportstats 6.1 1

```

### Using the dspportstats Command

```
IGX-B          TN      Cisco  IGX 8420  9.3.45    July 20 2003 16:45 EST

Port Statistics for 6.1          Cleared: July 20 2003 16:44
Port Speed: 1536 kbps  Collection Time: 0 day(s) 00:04:16      Corrupted: NO
Sig Protocol: Cisco LMI

          Bytes  Average (kbps)    Util (%)          Frames
From Port:      6636      0                0                69
To Port:        7017      0                0                70
LMI Receive Protocol Stats LMI Transmit Protocol Stats CLLM (ForeSight) Stats
Status Enq Rcvd      26 Status Enq Xmit  -- Frames Rcvd      --
Status Xmt           26 Status Rcd       -- Bytes Rcvd       --
Asynch Xmit          0 Asynch Rcvd     -- Frames Xmt       --
Seq # Mismatches     0 Seq # Mismatches -- Bytes Xmt        --
Timeouts             0 Timeouts        -- CLLM Failures    --
Invalid Frames       0
Elmi Ver Req         0 Elmi Ver Rsp     0
Elmi QOS Req         0 Elmi QOS Rsp     0

This Command: dspportstats 6.1 1
```

## Lab 2: Frame Relay to Frame Relay via NNI

This lab builds a Frame Relay connection over an NNI link between two IGX systems, which emulates two different Frame Relay provider networks.

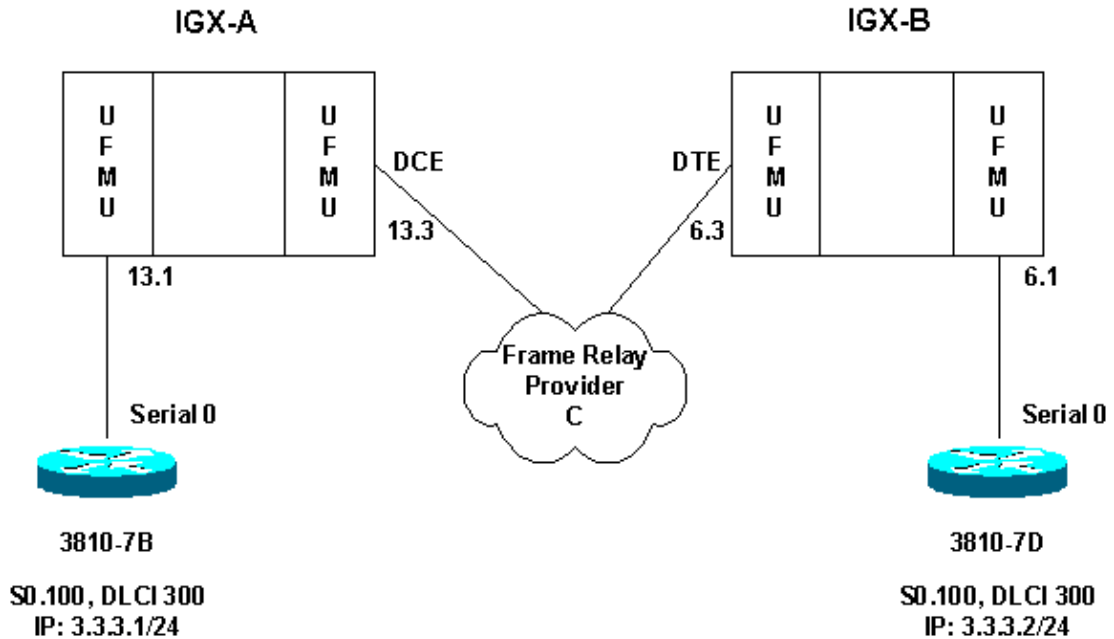
**Note:** The connection does not traverse a trunk, and uses only the NNI link to pass traffic.

This lab uses the following parameters:

- NNI Link established between 2 UFMU ports (13.3-IGX-A and 6.3-IGX-B)
- NNI signaling will use Annex D NNI
- DLCI = 300
- StrataCom LMI signaling on local CPE side(s)

The following illustration shows the topology for this lab:

## UFMU Frame Relay --> Frame Relay NNI Connection



Complete the following steps for IGX-A port configuration:

1. Use the **upport 13.3** command.
2. Use the **cnfport** command to configure the port with the following parameters:
  - ◆ 1536 Kbps
  - ◆ Port signaling type = Annex D NNI
  - ◆ Interface type = DCE

```
cnfport 13.3 DCE 1536 NORMAL 0 65535 65535 100 d y N 15 3 4 3 10 6 N N Y 1 N
```
3. Use the **dspport** command to display your configuration:

Using the dspport Command					
IGX-A	TN	Cisco	IGX 8420	9.3.45	July 20 2003 16:49 EST
Port:	13.3		[ACTIVE	]	
<b>Interface:</b>	<b>V35</b>	<b>DCE</b>		Configured Clock:	1536 Kbps
Clocking:	Normal			Measured Rx Clock:	1536 Kbps
Neighbor IP Add:	0.0.0.0			Neighbor IfIndex:	0
Port ID		0		Min Flags / Frames	1
Port Queue Depth		65535		OAM Pkt Threshold	3 pkts
ECN Queue Threshold		65535		T391 Link Intg Timer	10 sec
DE Threshold		100 %		N391 Full Status Poll	6 cyl
<b>Signalling Protocol</b>	<b>Annex D</b>	<b>NNI</b>		EFCI Mapping Enabled	No
Asynchronous Status		No		CLLM Enabled/Tx Timer	No/ 0 msec
T392 Polling Verif Timer		15		IDE to DE Mapping	Yes
N392 Error Threshold		3		Interface Control Template	
N393 Monitored Events Count		4		Lead	CTS DSR DCD
Communicate Priority		No		State	ON ON ON
				Advertise Intf Info	Disable
Last Command: <b>dspport 13.3</b>					

Complete the following steps for IGX-B port configuration:

1. Use the **uport 6.3** command.
2. Use the **cnfport** command to configure the port with the following parameters:

- ◆ 1536 Kbps
- ◆ Port signaling type = Annex D NNI
- ◆ Interface type = DTE

Using the dspport Command	
IGX-B	TN Cisco IGX 8420 9.3.45 July 20 2003 16:49 EST
Port:	6.3 [ACTIVE ]
<b>Interface:</b>	<b>V35 DTE</b> Configured Clock: 1536 Kbps
Clocking:	Normal Measured Rx Clock: 1536 Kbps
Neighbor IP Add:	0.0.0.0 Neighbor IfIndex: 0
Port ID	0 Min Flags / Frames 1
Port Queue Depth	65535 OAM Pkt Threshold 3 pkts
ECN Queue Threshold	65535 T391 Link Intg Timer 10 sec
DE Threshold	100 % N391 Full Status Poll 6 cyl
<b>Signalling Protocol</b>	<b>Annex D NNI</b> EFCI Mapping Enabled No
Asynchronous Status	No CLLM Enabled/Tx Timer No/ 0 msec
T392 Polling Verif Timer	15 IDE to DE Mapping Yes
N392 Error Threshold	3 Interface Control Template
N393 Monitored Events Count	4 Lead RTS DTR
Communicate Priority	No State ON ON
	Advertise Intf Info Disable
Last Command: <b>dspport 6.3</b>	

**Note:** Ports 13.3 and 6.3 are configured for Annex D NNI, with a port speed of 1536Kbps. Port 6.3 is configured as DTE because the DCE–DTE cable connects the two ports together.

Complete the following steps to perform the connection setup:

1. Use the **addcon 13.1.300 IGX–A 13.3.300 5** command on the IGX–A side (13.1.300 > 13.3.300, NNI side).
2. Use the **dsppcon** command to display your configuration:

Using the dsppcon Command	
IGX-A	TN Cisco IGX 8420 9.3.45 July 20 2003 16:51 EST
Conn:	13.3.300 IGX-A 13.1.300 fr Status:OK
MIR	CIR VC Q Depth PIR Cmax ECN QThresh QIR
64/64	64/64 65535/65535 1536/1536 10/10 65535/65535 64/64
Pri: L	Test-RTD: 255 msec FST: n % Util: 100/100
Path:	Route information not applicable for local connections
IGX-A UFMU:	OK IGX-A UFMU: OK
UFI:	OK UFI: OK
NNI:	OK
Last Command: <b>dsppcon 13.3.300</b>	

**Note:** No path is used this connection rides a trunk.

3. Use the **addcon 6.1.300 IGX–B 6.3.300** command on the IGX–B side (6.1.300 > 6.3.300, NNI side).
4. Use the **dsppcon** command to display your configuration:

## Using the dspcon Command

```
IGX-B      TN      Cisco      IGX 8420  9.3.45   July 20 2003 16:52 EST

Conn:  6.3.300      IGX-B  6.1.300      fr      Status:OK
      MIR      CIR      VC Q Depth      PIR      Cmax  ECN QThresh      QIR
      64/64      64/64      65535/65535      1536/1536      10/10  65535/65535      64/64

Pri: L  Test-RTD: 255 msec      FST: n  % Util: 100/100

Path:  Route information not applicable for local connections

IGX-B  UFMU:  OK      IGX-B  UFMU:  OK
      UFI:  OK      UFI:  OK
      NNI:  OK

Last Command:  dspcon 6.3.300
```

5. Perform the following router configurations.

Router configuration for 3810-7b:

```
interface Serial0.300 point-to-point
 ip address 3.3.3.1 255.255.255.0
  frame-relay interface-dlci 300
!
```

Router configuration for 3810-7d:

```
interface Serial0.300 point-to-point
 ip address 3.3.3.2 255.255.255.0
  frame-relay interface-dlci 300
!
```

6. Perform the following **ping** command tests:

Ping test for 3.3.3.:

```
wsw-3810-7b# ping 3.3.3.2

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 3.3.3.2, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 32/46/57 ms
wsw-3810-7b# ping 3.3.3.2

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 3.3.3.2, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 56/56/57 ms
```

Ping test for 3.3.3.1:

```
wsw-3810-7d# ping 3.3.3.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 3.3.3.1, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 32/46/56 ms
wsw-3810-7d# ping 3.3.3.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 3.3.3.1, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 52/55/61 ms
```

7. Use the **dspportstats** command to verify the NNI operations:

Using the dspportstats Command						
IGX-A	TN	Cisco	IGX 8420	9.3.45	July 20 2003	17:03 EST
Port Statistics for 13.3			Cleared: July 20 2003 17:02			
Port Speed: 1536 kbps			Collection Time: 0 day(s) 18:05:28		Corrupted: NO	
Sig Protocol: Annex D NNI						
		Bytes	Average (kbps)	Util (%)		Frames
From Port:		69	0	0		4
To Port:		64	0	0		4
Frame Errors		LMI Receive Protocol Stats		Misc Statistics		
Invalid CRC	0	Status Enq Rcvd	2	Avg Tx Port Q		0
Invalid Alignment	0	Status Xmit	2	FECN Frames		0
Invalid Frm Length	0	Asynch Xmit	0	Ratio (%)		0
Invalid Frm Format	0	Seq # Mismatches	0	BECN Frames		0
Unknown DLCIs	0	Timeouts	0	Ratio (%)		0
Last Unknown DLCI	0	Invalid Req	0	Rsrc Overflow		0
				DE Frms Dropt		0
This Command: <b>dspportstats 13.3 1</b>						

Using the dspportstats Command						
IGX-B	TN	Cisco	IGX 8420	9.3.45	July 20 2003	17:03 EST
Port Statistics for 6.3			Cleared: July 20 2003 17:02			
Port Speed: 1536 kbps			Collection Time: 0 day(s) 00:04:44		Corrupted: NO	
Sig Protocol: Annex D NNI						
		Bytes	Average (kbps)	Util (%)		Frames
From Port:		5151	0	0		86
To Port:		4839	0	0		85
Frame Errors		LMI Receive Protocol Stats		Misc Statistics		
Invalid CRC	0	Status Enq Rcvd	28	Avg Tx Port Q		0
Invalid Alignment	0	Status Xmit	28	FECN Frames		0
Invalid Frm Length	0	Asynch Xmit	0	Ratio (%)		0
Invalid Frm Format	0	Seq # Mismatches	0	BECN Frames		0
Unknown DLCIs	0	Timeouts	0	Ratio (%)		0
Last Unknown DLCI	0	Invalid Req	0	Rsrc Overflow		0
				DE Frms Dropt		0
This Command: <b>dspportstats 6.3 1</b>						

8. Use the **dspchstats** command to verify traffic passing:

Using the dspchstats Command						
IGX-A	TN	Cisco	IGX 8420	9.3.45	July 20 2003	17:06 EST
Channel Statistics: 13.3.300			Cleared: July 20 2003 17:02		(\)	
MIR: 64/64 kbps			Collection Time: 0 day(s) 00:05:31		Corrupted: NO	
		Frames	Avg Size (bytes)	Avg (fps)	Util (%)	Packets Avg (pps)
From Port:		56	128	0	0	
To Network:		56	128	0	0	402 1
Discarded:		0	0	0	0	
From Network:		56	128	0	0	402 1
To Port:		56	128	0	0	
Discarded:		0	0	0	0	0 0
ECN Stats: Avg Rx VC Q:				0	ForeSight RTD	--
Min-Pk bytes rcvd: --		FECN Frames: 0		FECN Ratio (%)		0
Minutes Congested: --		BECN Frames: 0		BECN Ratio (%)		0
Frames rcvd in excess of CIR:			0	Bytes rcvd in excess of CIR:		0
Frames xmtd in excess of CIR:			0	Bytes xmtd in excess of CIR:		0

This Command: **dspchstats 13.3.300 1**

### Using the dspchstats Command

```
IGX-B      TN      Cisco      IGX 8420  9.3.45   July 20 2003 17:06 EST

Channel Statistics: 6.3.300      Cleared: July 20 2003 17:02  (\)
MIR: 64/64 kbps      Collection Time: 0 day(s) 00:04:42      Corrupted: NO
      Frames  Avg Size Avg      Util      Packets      Avg
      (bytes) (fps) (%)
From Port:           30      141      0      0
To Network:          30      141      0      0      235      0
Discarded:           0        0      0      0
From Network:        30      141      0      0      235      0
To Port:             30      141      0      0
Discarded:           0        0      0      0      0      0
      ECN Stats:  Avg Rx VC Q:           0      ForeSight RTD      --
Min-Pk bytes rcvd:  --      FECN Frames:      0      FECN Ratio (%)      0
Minutes Congested:  --      BECN Frames:      0      BECN Ratio (%)      0
Frames rcvd in excess of CIR:      0      Bytes rcvd in excess of CIR:      0
Frames xmtd in excess of CIR:      0      Bytes xmtd in excess of CIR:      0

This Command: dspchstats 6.3.300 1
```

### Lab 3: Frame Relay to ATM using AFTX Mode

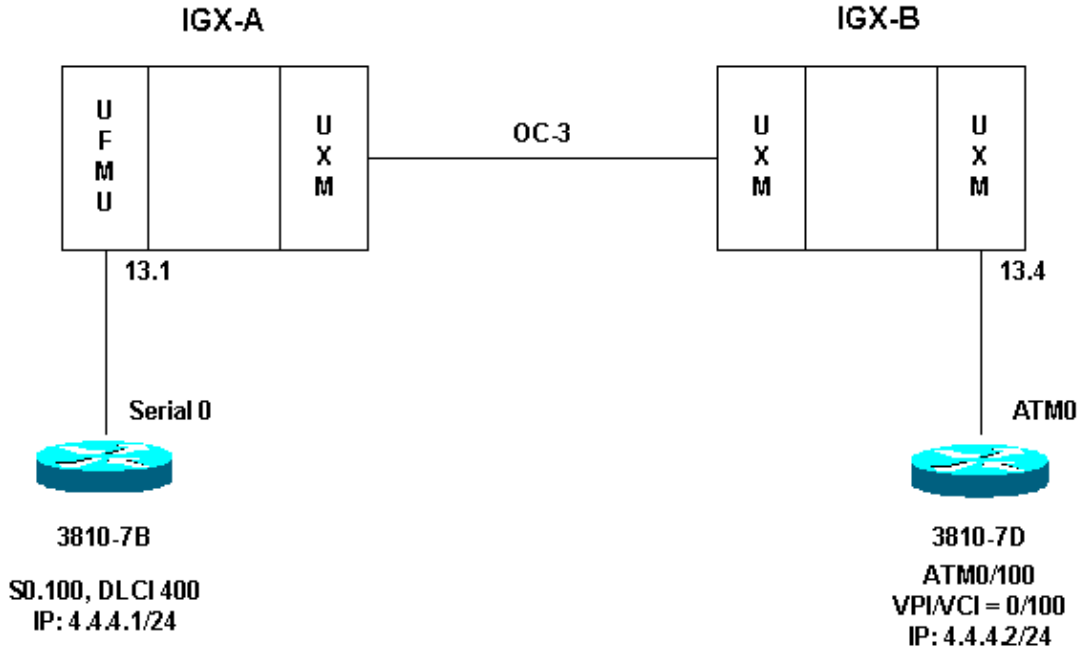
This lab builds a service interworking connection of Frame Relay to ATM using translational mode (ATFX).

This lab uses the following parameters:

- DLCI 400
- VPI/VCI = 0/100
- ATM port on 3810 (MFT configured for ATM mode)
- ATM encapsulation type aal5snap (RFC 1483)
- Peak cell rate (PCR) = 166cps/64Kbps

The following illustration shows the topology for this lab:

## UFMU Frame Relay -> ATM using ATRX mode



Complete the following steps for the Frame Relay side, IGX-A, 13.1 port configuration:

1. Use the **uport 13.1** command.
2. Use the **cnfport** command to configure the port with the following parameters:
  - ◆ 1536 Kbps
  - ◆ Port signaling type = LMI
  - ◆ Interface type = DCE

```
cnfport 13.1 DCE 1536 NORMAL 0 65535 65535 100 s N 15 3 4 N 75 25 3 N N Y 1 N
```
3. Use the **dspport** command to verify your configuration:

Using the dspport Command									
IGX-A	TN	Cisco	IGX 8420	9.3.45	July 20 2003	17:10	EST		
Port:	13.1			[ACTIVE	]				
Interface:	V35	DCE			Configured Clock:	1536	Kbps		
Clocking:	Normal				Measured Rx Clock:	1536	Kbps		
Neighbor IP Add:	0.0.0.0				Neighbor IfIndex:	0			
Port ID			0		Min Flags / Frames		1		
Port Queue Depth			65535		OAM Pkt Threshold		3	pkts	
ECN Queue Threshold			65535		T391 Link Intg Timer		10	sec	
DE Threshold			100 %		N391 Full Status Poll		6	cyl	
<b>Signalling Protocol</b>		<b>Cisco</b>	<b>LMI</b>		EFCI Mapping Enabled		No		
Asynchronous Status			No		CLLM Enabled/Tx Timer	No/	0	msec	
T392 Polling Verif Timer			15		IDE to DE Mapping		Yes		
N392 Error Threshold			3		Interface Control Template				
N393 Monitored Events Count			4		Lead	CTS	DSR	DCD	
Communicate Priority			No		State	ON	ON	ON	
Upper/Lower RNR Thresh	75%/	25%			Advertise Intf Info		Disable		
Last Command: <b>dspport 13.1</b>									



Complete the following steps for the ATM side, IGX-B, 13.4 port configuration:

1. Use the **upln 13.4** command to bring up line 13.4.
2. Use the **upport 13.4** command.
3. Use the **dspport** command to verify your configuration:

Using the dspport Command					
IGX-B	TN	Cisco	IGX 8420	9.3.45	July 20 2003 17:10 EST
Port:	13.4	[ACTIVE ]			
Interface:		T1-IMA	CAC Override:		Enabled
Type:		UNI	%Util Use:		Disabled
Speed:		3622 (cps)	GW LCNs:		200
SIG Queue Depth:		640	Reserved BW:		0 (cps)
Alloc Bandwidth:		3622 (cps)	VC Shaping:		Disabled
Protocol:		NONE			
Last Command: <b>dspport 13.4</b>					

Complete the following steps to add a connection on the ATM side:

**Tip:** When adding Frame Relay to ATM based connections, it is easier to add from the ATM side rather than from the Frame Relay side this allows the switches to automatically calculate the correct MIR/CIR settings for the Frame Relay side.

1. Use the **addcon** command:

```
addcon 13.4.0.100 IGX-A 13.1.400 atfx 166 100 250000 166 1000 5 1280 35 5
```

2. Use the **dspon** command to verify your configurations:

Using the dspon Command							
IGX-B	TN	Cisco	IGX 8420	9.3.45	July 20 2003 17:12 EST		
Conn:	13.4.0.100	IGX-A	13.1.400	atfx	Status:OK		
	PCR(0+1)	% Util	CDVT(0+1)	FBTC	SCR	MBS	PLC
	166/166	100/100	250000/250000	y	166/166	1000/1000	5
Ownr:	LOCAL	Restr:	NONE	COS:	0	FST:	n % Util: 100/100
Pri:	L	Test-RTD:	0 msec				
Path:	<b>IGX-B16.3.1--15.3.1IGX-A</b>						
Pref:	Not Configured						
IGX-B	UXM:	OK	IGX-A	UFMU:	OK		
	Line 13.4 :	OK		UFI:	OK		
	OAM Cell RX:	Clear					
	NNI:	OK					
Conn:	13.4.0.100	IGX-A	13.1.400	atfx	Status:OK		
	PCR(0+1)	% Util	CDVT(0+1)	SCR		MBS	
	166/166	100/100	250000/250000	166/166		1000/1000	
Policing	VC Qdepth	EFCI	IBS				
	5	1280/1280	35/35	5/5			
This Command: <b>dspon 13.4.0.100</b>							

Using the dspon Command

```

IGX-A      TN      Cisco      IGX 8420  9.3.45   July 20 2003 17:13 EST
Conn: 13.1.400      IGX-B 13.4.0.100      atfx      Status:OK
      MIR      CIR      VC Q Depth      PIR      Cmax      ECN QThresh      QIR
      63.7/63.7  63.7/63.7  61440/61440  63.7/63.7  10/10  21504/21504  63.7/63.7

Ownr:REMOTE Restr:NONE COS:0      FST: n % Util: 100/100
Pri: L Test-RTD: 0 msec
Path: IGX-A15.3.1--16.3.1IGX-B
Pref: Not Configured

IGX-A UFMU: OK      IGX-B UXM: OK
      UFI: OK      Line 13.4 : OK
      NNI: OK

Last Command: dspcon 13.1.400

```

Complete the following router configurations:

Router configuration for 3810-7b (Frame Relay side):

```

!
interface Serial0.400 point-to-point
 ip address 4.4.4.1 255.255.255.0
 frame-relay interface-dlci 400
!

```

Router configuration for 3810-7d (ATM side):

```

!
controller T1 0
 framing esf
 linecode b8zs
 mode atm
!
!
interface ATM0
 no ip address
 ip mroute-cache
 no atm ilmi-keepalive
!
interface ATM0.100 point-to-point
 ip address 4.4.4.2 255.255.255.0
 pvc 0/100
  cbr 64
  encapsulation aal5snap
!

```

Perform the following **ping** command tests:

Ping test for 4.4.4.2:

```

wsw-3810-7b# ping 4.4.4.2

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 4.4.4.2, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 24/32/40 ms
wsw-3810-7b# ping 4.4.4.2

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 4.4.4.2, timeout is 2 seconds:
!!!!

```

Success rate is 100 percent (5/5), round-trip min/avg/max = 40/40/40 ms

#### Ping test for 4.4.4.1:

```
wsw-3810-7d# ping 4.4.4.1
```

```
Type escape sequence to abort.
```

```
Sending 5, 100-byte ICMP Echos to 4.4.4.1, timeout is 2 seconds:
```

```
!!!!!
```

```
Success rate is 100 percent (5/5), round-trip min/avg/max = 36/40/44 ms
```

```
wsw-3810-7d# ping 4.4.4.1
```

```
Type escape sequence to abort.
```

```
Sending 5, 100-byte ICMP Echos to 4.4.4.1, timeout is 2 seconds:
```

```
!!!!!
```

```
Success rate is 100 percent (5/5), round-trip min/avg/max = 40/45/60 ms
```

Complete the following steps to verify traffic passing on the PVC.

1. Use the **dspchstats** command to verify traffic passing on the ATM PVC:

Using the dspchstats Command						
IGX-B	TN	Cisco	IGX 8420	9.3.45	July 20 2003	17:15 EST
Channel Statistics: 13.4.0.100						
Collection Time: 0 day(s) 00:00:35				Clrd: 07/20/02 17:15:09		
Type			Count	Traffic	Rate (cps)	
Cells Received from Port			60	From port	1	
Cells Tx to Network			60	To network	1	
Cells Rcvd from Network			67	From network	1	
Cells Transmitted to Port			67	To port	1	
EOF Cells Rcvd from Port			20			
Cells Received with CLP=1			0			
Cells Received with CLP=0			60			
Non-Compliant Cells Rcvd			0			
Avg Rx VCq Depth in Cells			0			
Average Tx Vcq Depth in Cells			0			
Ingress Vsvd Allowed Cell Rate			0			
Egress Vsvd Allowed Cell Rate			0			
This Command: <b>dspchstats 13.4.0.100 1</b>						

2. Use the **dspchstats** command to verify traffic passing on the Frame Relay PVC:

Using the dspchstats Command						
IGX-A	TN	Cisco	IGX 8420	9.3.45	July 20 2003	17:15 EST
Channel Statistics: 13.1.400						
Cleared: July 20 2003 17:15 (//)						
MIR: 63.7/63.7 kbps	Collection Time: 0 day(s) 00:00:36				Corrupted: NO	
	Frames	Avg Size	Avg Util	Packets	Avg	
		(bytes)	(fps)		(pps)	
From Port:	21	116	0 0			
To Network:	21	116	0 0	137	3	
Discarded:	0	0	0 0			
From Network:	20	106	0 0	120	3	
To Port:	20	106	0 0			
Discarded:	0	0	0 0	0	0	
	ECN Stats:		Avg Rx VC Q:	0	ForeSight	RTD --
Min-Pk bytes rcvd: --			FECN Frames:	0	FECN Ratio (%)	0
Minutes Congested: --			BEcn Frames:	0	BEcn Ratio (%)	0
Frames rcvd in excess of CIR:			0	Bytes rcvd in excess of CIR:	0	
Frames xmtd in excess of CIR:			0	Bytes xmtd in excess of CIR:	0	

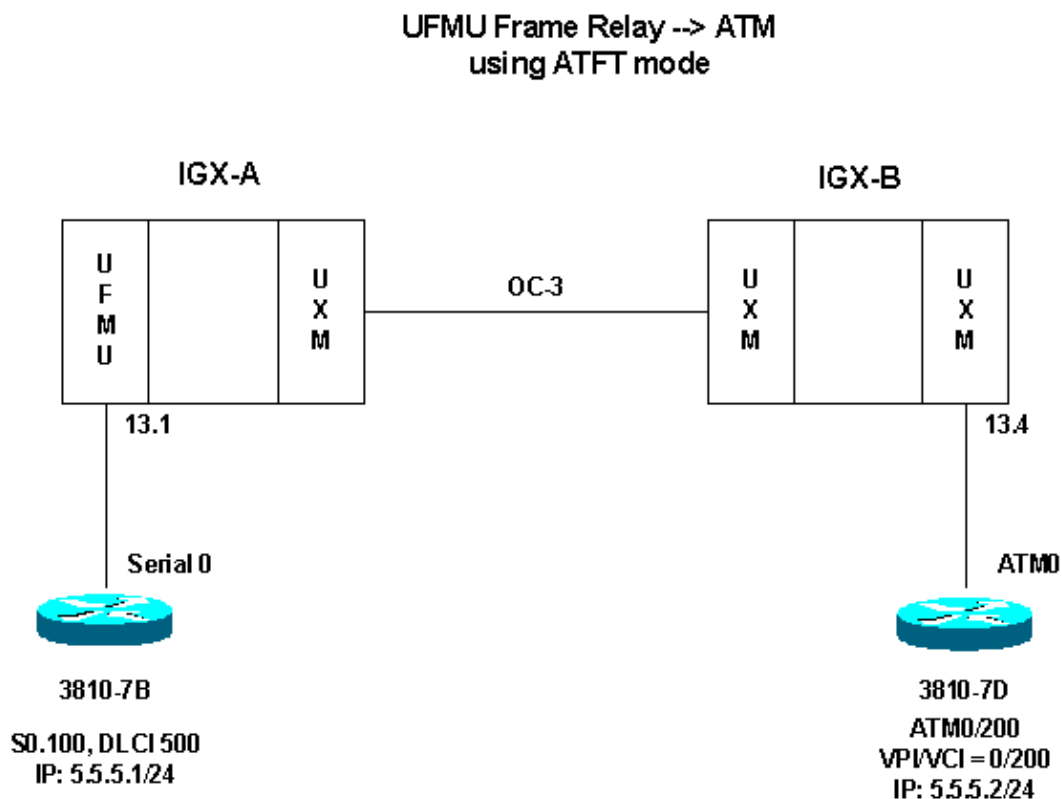
This Command: `dspchstats 13.1.400`

## Lab 4: Frame Relay to ATM using ATFT Mode

This lab builds a Service Interworking Connection of Frame Relay to ATM using transparent mode (ATFT).

- DLCI = 400
- VPI/VCI = 0/100
- An ATM port on a 3810 router (MFT configured for ATM mode)
- ATM encapsulation of ATM adaptation layer (AAL) Network Layer Protocol Identifier (NLPID) AAL5NLPID
- Peak cell rate = 166cps/64Kbps

The following illustration shows the topology for this lab:



Complete the following steps for the Frame Relay side, IGX-A, 13.1 port configuration:

1. Use the **upport 13.1** command.
2. Use the **cnfport** command to configure the port with the following parameters:
  - ◆ 1536 Kbps
  - ◆ Port signaling type = LMI
  - ◆ Interface type = DCE

```
cnfport 13.1 DCE 1536 NORMAL 0 65535 65535 100 s N 15 3 4 N 75 25 3 N N Y 1 N
```
3. Use the **dsport** command to verify your configuration:

### Using the dsport Command

IGX-A	TN	Cisco	IGX 8420	9.3.45	July 20 2003 17:10 EST
-------	----	-------	----------	--------	------------------------

```

Port:          13.1          [ACTIVE ]
Interface:     V35          DCE          Configured Clock:    1536 Kbps
Clocking:      Normal          Measured Rx Clock:  1536 Kbps
Neighbor IP Add: 0.0.0.0      Neighbor IfIndex:    0
Port ID                0          Min Flags / Frames   1
Port Queue Depth      65535       OAM Pkt Threshold    3 pkts
ECN Queue Threshold   65535       T391 Link Intg Timer 10 sec
DE Threshold          100 %        N391 Full Status Poll 6 cyl
Signalling Protocol   Cisco LMI      EFCI Mapping Enabled  No
Asynchronous Status   No          CLLM Enabled/Tx Timer No/ 0 msec
T392 Polling Verif Timer 15       IDE to DE Mapping     Yes
N392 Error Threshold   3          Interface Control Template
N393 Monitored Events Count 4          Lead   CTS   DSR   DCD
Communicate Priority   No          State  ON   ON   ON
Upper/Lower RNR Thresh 75%/ 25%    Advertise Intf Info   Disable

Last Command: dspport 13.1

```

Complete the following steps for the ATM side, IGX-B, 13.4, port configuration:

1. Use the **upln 13.4** command to bring up line 13.4.
2. Use the **upport 13.4** command to bring up port 13.4.
3. Use the **dspport** command to verify your configuration:

Using the dspport Command						
IGX-B	TN	Cisco	IGX 8420	9.3.45	July 20	2003 17:10 EST
Port:	13.4	[ACTIVE ]				
Interface:		T1-IMA	CAC Override:		Enabled	
Type:		UNI	%Util Use:		Disabled	
Speed:		3622 (cps)	GW LCNs:		200	
SIG Queue Depth:		640	Reserved BW:		0 (cps)	
Alloc Bandwidth:		3622 (cps)	VC Shaping:		Disabled	
Protocol:		NONE				
Last Command: <b>dspport 13.4</b>						

Complete the following steps to add a connection on the ATM side:

**Tip:** When adding Frame Relay to ATM based connections, it is easier to add from the ATM side rather than the Frame Relay side this allows the switches to automatically calculate the correct MIR/CIR settings for the Frame Relay side.

1. Use the **addcon** command to add a connection on the ATM side:

```
addcon 13.4.0.200 IGX-A 13.1.400 atft 166 100 250000 166 1000 5 1280 35 5
```

2. Use the **dspscon** command to verify your configurations:

Using the dspscon Command						
IGX-B	TN	Cisco	IGX 8420	9.3.45	July 20	2003 17:17 EST
Conn:	13.4.0.200	IGX-A	13.1.500	atft	Status:OK	
	PCR(0+1)	% Util	CDVT(0+1)	FBTC	SCR	MBS PLC
	166/166	100/100	250000/250000	y	166/166	1000/1000 5
Ownr:	LOCAL	Restr:	NONE	COS:	0	FST: n % Util: 100/100
Pri:	L	Test-RTD:	0 msec			
Path:	IGX-B16.3.1--15.3.1IGX-A					

```

Pref:    Not Configured

IGX-B  UXM:    OK                IGX-A  UFMU:   OK
        Line 13.4 : OK                UFI:    OK
        OAM Cell RX: Clear
        NNI:    OK

    PCR(0+1)      % Util      CDVT(0+1)      SCR      MBS
    166/166      100/100      250000/250000  166/166  1000/1000

Policing  VC Qdepth  EFCI      IBS
    5      1280/1280  35/35     5/5

This Command: dspscon 13.4.0.200

```

Using the dspscon Command									
IGX-A	TN	Cisco	IGX 8420	9.3.45	July 20	2003 17:18	EST		
Conn:	13.1.500		IGX-B	13.4.0.200	atft	Status:OK			
MIR		CIR	VC Q Depth	PIR	Cmax	ECN QThresh	QIR		
63.7/63.7		63.7/63.7	61440/61440	63.7/63.7	10/10	21504/21504	63.7/63.7		
Ownr:	REMOTE	Restr:	NONE	COS:	0	FST:	n	% Util:	100/100
Pri:	L	Test-RTD:	0	msec					
Path:	IGX-A15.3.1--16.3.1IGX-B								
Pref:	Not Configured								
IGX-A	UFMU:	OK	IGX-B	UXM:	OK	Line 13.4 :	OK		
	UFI:	OK				NNI:	OK		
Last Command: <b>dspscon 13.1.500</b>									

Complete the following router configurations:

Router configuration for 3810-7b (Frame Relay side):

```

!
interface Serial0.500 point-to-point
 ip address 5.5.5.1 255.255.255.0
 frame-relay interface-dlci 500
!

```

Router configuration for 3810-7d (ATM side):

```

!
controller T1 0
 framing esf
 linecode b8zs
 mode atm
!
!
interface ATM0.200 point-to-point
 ip address 5.5.5.2 255.255.255.0
 pvc 0/200
  cbr 64
  encapsulation aal5nlpid
!

```

Perform the following **ping** command tests:

## Ping test for 5.5.5.2:

```
wsw-3810-7b# ping 5.5.5.2
```

```
Type escape sequence to abort.
```

```
Sending 5, 100-byte ICMP Echos to 5.5.5.2, timeout is 2 seconds:
```

```
!!!!!
```

```
Success rate is 100 percent (5/5), round-trip min/avg/max = 28/35/40 ms
```

```
wsw-3810-7b# ping 5.5.5.2
```

```
Type escape sequence to abort.
```

```
Sending 5, 100-byte ICMP Echos to 5.5.5.2, timeout is 2 seconds:
```

```
!!!!!
```

```
Success rate is 100 percent (5/5), round-trip min/avg/max = 36/37/41 ms
```

## Ping test for 5.5.5.1:

```
wsw-3810-7d# ping 5.5.5.1
```

```
Type escape sequence to abort.
```

```
Sending 5, 100-byte ICMP Echos to 5.5.5.1, timeout is 2 seconds:
```

```
!!!!!
```

```
Success rate is 100 percent (5/5), round-trip min/avg/max = 28/34/44 ms
```

```
wsw-3810-7d# ping 5.5.5.1
```

```
Type escape sequence to abort.
```

```
Sending 5, 100-byte ICMP Echos to 5.5.5.1, timeout is 2 seconds:
```

```
!!!!!
```

```
Success rate is 100 percent (5/5), round-trip min/avg/max = 36/39/40 ms
```

Complete the following steps to verify traffic passing on the PVC.

1. Use the **dspchstats** command to verify traffic passing on the ATM PVC:

Using the dspchstats Command					
IGX-B	TN	Cisco	IGX 8420	9.3.45	July 20 2003 17:20 EST
Channel Statistics: 13.4.0.200					
Collection Time: 0 day(s) 00:00:16			Clrd: 07/20/02 17:19:59		
Type			Count	Traffic	Rate (cps)
Cells Received from Port			45	From port	2
Cells Tx to Network			45	To network	2
Cells Rcvd from Network			45	From network	2
Cells Transmitted to Port			45	To port	2
EOF Cells Rcvd from Port			15		
Cells Received with CLP=1			0		
Cells Received with CLP=0			45		
Non-Compliant Cells Rcvd			0		
Avg Rx VCq Depth in Cells			0		
Average Tx Vcq Depth in Cells			0		
Ingress Vsvd Allowed Cell Rate			0		
Egress Vsvd Allowed Cell Rate			0		
This Command: <b>dspchstats 13.4.0.200 1</b>					

2. Use the **dspchstats** command to verify traffic passing on the Frame Relay PVC:

Using the dspchstats Command					
IGX-A	TN	Cisco	IGX 8420	9.3.45	July 20 2003 17:20 EST
Channel Statistics: 13.1.500					
MIR: 63.7/63.7 kbps			Cleared: July 20 2003 17:19 (\)		
Collection Time: 0 day(s) 00:00:29			Corrupted: NO		

	Frames	Avg Size (bytes)	Avg (fps)	Util (%)	Packets	Avg (pps)	
From Port:	15	106	0	0			
To Network:	15	106	0	0	90	3	
Discarded:	0	0	0	0			
From Network:	15	106	0	0	90	3	
To Port:	15	106	0	0			
Discarded:	0	0	0	0	0	0	
ECN Stats:				Avg Rx VC Q:	0	ForeSight RTD	--
Min-Pk bytes rcvd:	--	FECN Frames:	0	FECN Ratio (%)	0		
Minutes Congested:	--	BECN Frames:	0	BECN Ratio (%)	0		
Frames rcvd in excess of CIR:	0	Bytes rcvd in excess of CIR:	0		0		
Frames xmtd in excess of CIR:	0	Bytes xmtd in excess of CIR:	0		0		

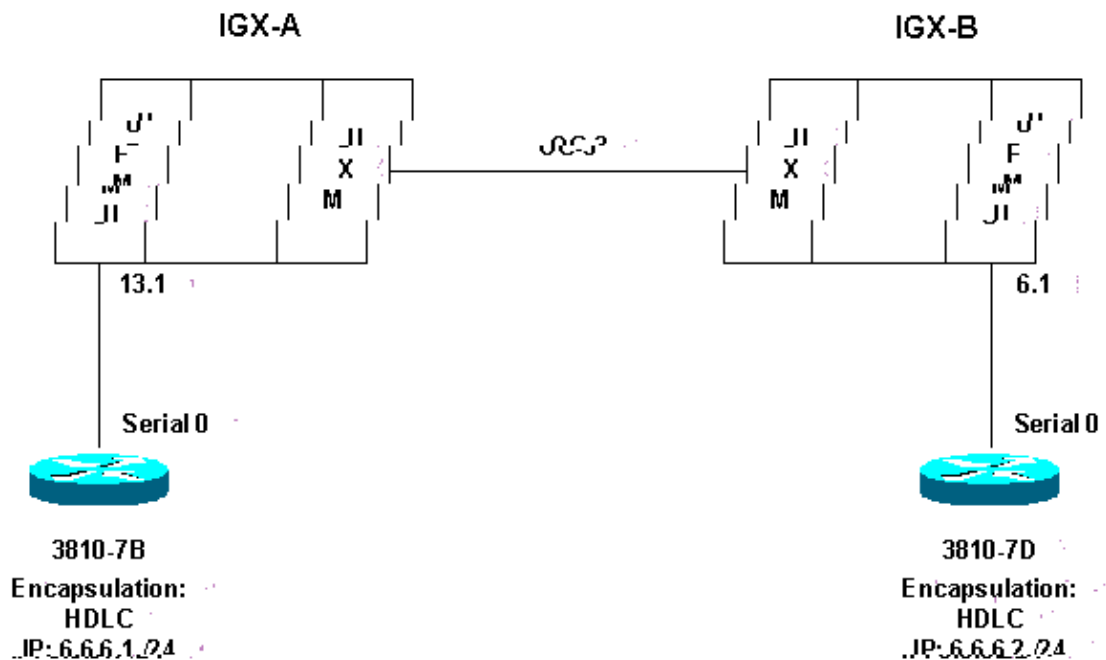
This Command: **dspchstats 13.1.500 1**

## Lab 5: Frame Forwarding

This lab demonstrates how the UFMU card can be configured to transfer HDLC frames (emulating SNA) traffic, using an IGX Frame Relay cards. In this lab UFMU ports are configured for no signaling.

The following illustration shows the topology for this lab:

### UFMU Frame Forwarding Lab



Complete the following steps for port configurations:

1. Use the **uport 13.1** command.
2. Use the **cnfport** command to configure the IGX-A port with the following parameters:
  - ◆ 1536 Kbps
  - ◆ Port signaling type = None
  - ◆ Interface type = UNI

```
cnfport 13.1 DCE 1536 NORMAL 0 65535 65535 100 n N N Y 1 N
```



3. Use the **dspport** command to verify your configuration:

Using the dspport Command							
IGX-A	TN	Cisco	IGX 8420	9.3.45	July 21 2003	18:56	EST
Port:	13.1		[ACTIVE	]			
Interface:	V35	DCE			Configured Clock:	1536	Kbps
Clocking:	Normal				Measured Rx Clock:	1536	Kbps
Neighbor IP Add:	0.0.0.0				Neighbor IfIndex:	0	
Port ID		0	Min Flags / Frames			1	
Port Queue Depth		65535	OAM Pkt Threshold			3	pkts
ECN Queue Threshold		65535	T391 Link Intg Timer			10	sec
DE Threshold		100 %	N391 Full Status Poll			6	cyl
Signalling Protocol		None	EFCI Mapping Enabled			No	
Asynchronous Status		No	CLLM Enabled/Tx Timer	No/		0	msec
T392 Polling Verif Timer		15	IDE to DE Mapping			Yes	
N392 Error Threshold		3	Interface Control Template				
N393 Monitored Events Count		4	Lead	CTS	DSR	DCD	
Communicate Priority		No	State	ON	ON	ON	
			Advertise Intf Info			Disable	
Last Command: <b>dspport 13.1</b>							

4. Use the **upport 6.1** command.

5. Use the **cnfport** command to configure the IGX-B port with the following parameters:

- ◆ 1536 Kbps
  - ◆ Port signaling type = None
  - ◆ Interface type = UNI
- cnfport 6.1 DCE 1536 NORMAL 0 65535 65535 100 n N N Y 1 N**

6. Use the **dspport** command to verify your configuration:

Using the dspport Command							
IGX-B	TN	Cisco	IGX 8420	9.3.45	July 21 2003	18:58	EST
Port:	6.1		[ACTIVE	]			
Interface:	V35	DCE			Configured Clock:	1536	Kbps
Clocking:	Normal				Measured Rx Clock:	1536	Kbps
Neighbor IP Add:	0.0.0.0				Neighbor IfIndex:	0	
Port ID		0	Min Flags / Frames			1	
Port Queue Depth		65535	OAM Pkt Threshold			3	pkts
ECN Queue Threshold		65535	T391 Link Intg Timer			10	sec
DE Threshold		100 %	N391 Full Status Poll			6	cyl
<b>Signalling Protocol</b>		<b>None</b>	EFCI Mapping Enabled			No	
Asynchronous Status		No	CLLM Enabled/Tx Timer	No/		0	msec
T392 Polling Verif Timer		15	IDE to DE Mapping			Yes	
N392 Error Threshold		3	Interface Control Template				
N393 Monitored Events Count		4	Lead	CTS	DSR	DCD	
Communicate Priority		No	State	ON	ON	ON	
			Advertise Intf Info			Disable	
Last Command: <b>dspport 6.1</b>							

7. Use the **addcon** command to build the frame forwarding connection on IGX-A:

**addcon 13.1.\* IGX-B 6.1.\* 10**

8. Use the **dspon** command to verify your configuration:

Using the dspon Command							
IGX-A	TN	Cisco	IGX 8420	9.3.45	July 21 2003	18:59	EST

```

Conn: 13.1.*          IGX-B 6.1.*          fr          Status:OK
      MIR            CIR          VC Q Depth  PIR          Cmax  ECN QThresh  QIR
      1024/1024      1024/1024  65535/65535 1536/1536   10/10 65535/65535 1024/1024

Ownr:LOCAL Restr:NONE COS:0          FST: n % Util: 100/100
Pri: L Test-RTD: 0 msec
Path: IGX-A15.3.1--16.3.1IGX-B
Pref: Not Configured

IGX-A UFMU: OK          IGX-B UFMU: OK
      UFI: OK          UFI: OK

Last Command: dspcon 13.1.*

```

9. Perform the following 3810-7b router configuration:

```

!
interface Serial1
 ip address 6.6.6.1 255.255.255.0
!

```

10. Perform the following 3810-7d router configuration:

```

!
interface Serial0
 ip address 6.6.6.2 255.255.255.0
!

```

11. Perform the following **ping** command test 6.6.6.2:

```

wsw-3810-7b# ping 6.6.6.2

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 6.6.6.2, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 4/7/8 ms
wsw-3810-7b# ping 6.6.6.2

```

```

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 6.6.6.2, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 4/7/8 ms
wsw-3810-7b#

```

12. Perform the following **ping** command test 6.6.6.1:

```

wsw-3810-7d# ping 6.6.6.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 6.6.6.1, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 4/10/24 ms
wsw-3810-7d# ping 6.6.6.1

```

```

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 6.6.6.1, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 4/8/24 ms
wsw-3810-7d#

```

13. Use the **dspportstats** command to verify traffic passing:

Using the dspportstats Command							
IGX-A	TN	Cisco	IGX 8420	9.3.45	July 21 2003	19:00	EST
Port Statistics for 13.1				Cleared: July 21 2003 19:00			
Port Speed: 1536 kbps		Collection Time: 0 day(s) 00:00:28			Corrupted: NO		

```

Sig Protocol: None
      Bytes      Average (kbps)      Util (%)      Frames
From Port:      341586           94             6             3223
To Port:        341398           94             6             3223
Frame Errors          LMI Receive Protocol Stats  Misc Statistics
Invalid CRC           0  Status Enq Rcvd           0  Avg Tx Port Q           0
Invalid Alignment    0  Status Xmit                 0  FECN Frames             0
Invalid Frm Length   0  Asynch Xmit                 0  Ratio (%)               0
Invalid Frm Format    0  Seq # Mismatches           0  BECN Frames             0
Unknown DLCIs        0  Timeouts                   0  Ratio (%)               0
Last Unknown DLCI    0  Invalid Req                 0  Rsrc Overflow           0
                                           DE Frms Dropd           0
This Command: dspportstats 13.1 1

```

```

Using the dspportstats Command
IGX-B      TN      Cisco      IGX 8420  9.3.45   July 21 2003 19:00 EST
Port Statistics for 6.1      Cleared: July 21 2003 19:00
Port Speed: 1536 kbps      Collection Time: 0 day(s) 00:04:52      Corrupted: NO
Sig Protocol: None
      Bytes      Average (kbps)      Util (%)      Frames
From Port:      3474324           95             6             32789
To Port:        3474280           95             6             32790
Frame Errors          LMI Receive Protocol Stats  Misc Statistics
Invalid CRC           0  Status Enq Rcvd           0  Avg Tx Port Q           0
Invalid Alignment    0  Status Xmit                 0  FECN Frames             0
Invalid Frm Length   0  Asynch Xmit                 0  Ratio (%)               0
Invalid Frm Format    0  Seq # Mismatches           0  BECN Frames             0
Unknown DLCIs        0  Timeouts                   0  Ratio (%)               0
Last Unknown DLCI    0  Invalid Req                 0  Rsrc Overflow           0
                                           DE Frms Dropd           0
This Command: dspportstats 6.1 1

```

```

Using the dspchstats Command
IGX-A      TN      Cisco      IGX 8420  9.3.45   July 21 2003 19:01 EST
Channel Statistics: 13.1.*      Cleared: July 21 2003 19:00  (//)
MIR: 1024/1024 kbps      Collection Time: 0 day(s) 00:00:11      Corrupted: NO
      Frames  Avg Size Avg      Util      Packets  Avg
      (bytes) (fps) (%)      (pps)
From Port:      1253      105  105  8
To Network:     1253      105  105  8      7510      633
Discarded:      0        0    0    0
From Network:   1252      106  105  8      7518      634
To Port:        1252      106  105  8
Discarded:      0        0    0    0
      ECN Stats:  Avg Rx VC Q:      0  ForeSight RTD  --
Min-Pk bytes rcvd: --      FECN Frames:      0  FECN Ratio (%)  0
Minutes Congested: --      BECN Frames:      0  BECN Ratio (%)  0
Frames rcvd in excess of CIR:      0  Bytes rcvd in excess of CIR:      0
Frames xmtd in excess of CIR:      0  Bytes xmtd in excess of CIR:      0
This Command: dspchstats 13.1.* 1

```

```

Using the dspchstats Command
IGX-B      TN      Cisco      IGX 8420  9.3.45   July 21 2003 19:01 EST
Channel Statistics: 6.1.*      Cleared: July 21 2003 19:00  (-)
MIR: 1024/1024 kbps      Collection Time: 0 day(s) 00:04:40      Corrupted: NO

```

	Frames	Avg Size (bytes)	Avg (fps)	Util (%)	Packets	Avg (pps)
From Port:	31280	105	111	9		
To Network:	31280	105	111	9	187618	669
Discarded:	0	0	0	0		
From Network:	31279	105	111	9	187596	668
To Port:	31279	105	111	9		
Discarded:	0	0	0	0	0	0
	ECN Stats:	Avg Rx VC Q:			0	ForeSight RTD --
Min-Pk bytes rcvd: --		FECN Frames:			0	FECN Ratio (%) 0
Minutes Congested: --		BECN Frames:			0	BECN Ratio (%) 0
Frames rcvd in excess of CIR:		0	Bytes rcvd in excess of CIR:			0
Frames xmtd in excess of CIR:		0	Bytes xmtd in excess of CIR:			0
This Command: <b>dspchstats 6.1.* 1</b>						

## IGX ATM Configuration

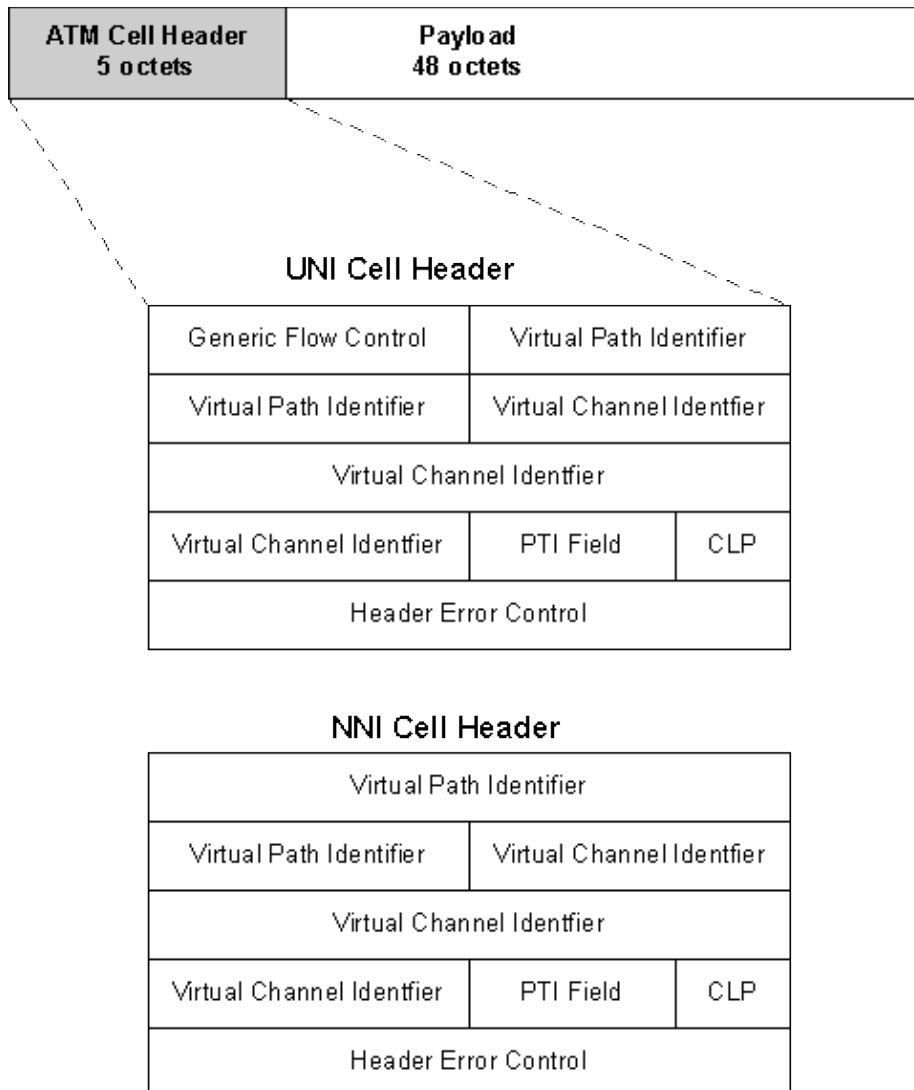
This section describes ATM capabilities of the IGX switch. The UXM card is used as a UNI line connected to a pair of routers.

The ATM cell is 53 octets long and includes a 5-octet header with a 48 octet payload. An ATM cell is composed of the following:

- Generic Flow Control (GFC):
  - ◆ In the UNI header, this is a 4-bit field that provides flow control information specific to a connection.
  - ◆ Applies to the UNI cell header and is not currently used.
- Virtual Path Identifier (VPI):
  - ◆ A logical grouping of VCIs.
  - ◆ Allows an ATM switch to perform operations on groups of VCIs.
- Virtual Circuit Identifier (VCI) A logical identification for a virtual channel between two ATM entities.
- Payload Type Identifier (PTI) A 3-bit field that characterizes the information in the payload of the cell.
- Cell Loss Priority (CLP):
  - ◆ Helps determine whether the cell is of normal or low priority.
  - ◆ Can be set by either CPE or network ATM switch.
  - ◆ Used to respond to congestion situations that can cause data loss.
- Header Error Control (HEC) An 8-bit CRC on the cell header only.

The following illustration shows the standard ATM cell format:

## Standard ATM Cell Format



## **ATM Signaling**

ATM signaling uses Integrated Local Management Interface (ILMI), which enables devices to determine the status of components at the other end of a physical link and to negotiate a common set of operational parameters to ensure interoperability. ILMI operates over a reserved VCC of VPI = X, VCI = 16.

You can enable or disable ILMI Cisco recommends that you enable it. Enabling ILMI allows the devices to determine the highest UNI interface level to operate (3.0, 3.1, 4.0), UNI vs. NNI, as well as numerous other elements. ILMI also allows devices to share information such as Network Service Access Point (NSAP) addresses, peer interface names, and IP addresses. Without ILMI many parameters must be manually configured for the ATM attached devices to operate correctly.

## **Operation, Administration, Maintenance Cells**

Operation, administration, maintenance (OAM) cells carry standard management information between ATM devices. There are two basic types of OAM cells:

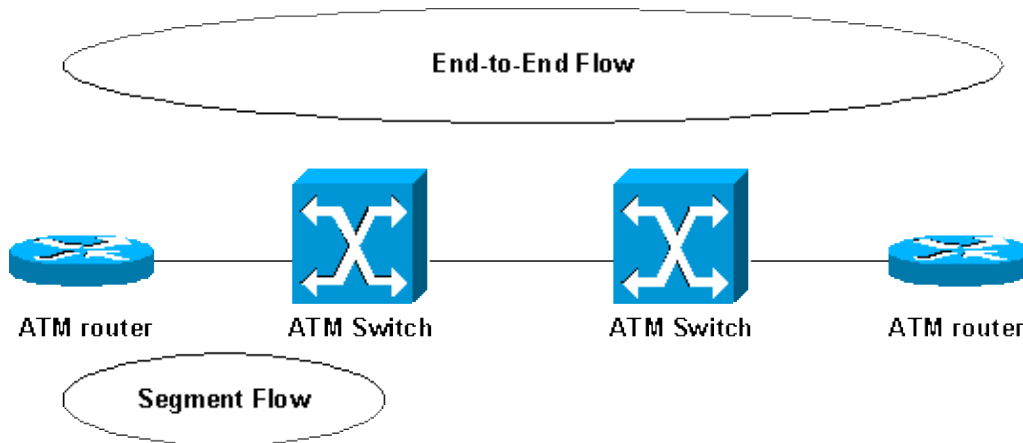
- F4 Used for Virtual Path (VP) monitoring.

- F5 Used for Virtual Circuit (VC) monitoring.

OAM traffic flows in two different ways:

- End-to-End Flow is between terminating equipment; OAM cells are not interpreted by the intermediate elements.
- Segment Flow is between two adjacent network elements (CPE and switch).

The following illustration shows OAM cells flowing in a network:



For F4 OAM cells, a VCI of 3 identifies Segment flow and a VCI of 4 identifies End-to-End flow.

F5 OAM cells use the PTI field to identify the flow control.

The PTI field is used to distinguish the various types of management cells and user cells found within the payload. The following table describes PTI field values:

PTI Field Value (Bits)	Description
000	User data, no congestion, SDU type = 0
001	User data, no congestion, SDU type = 1
010	User data, congestion, SDU type = 0
011	User data, congestion, SDU type = 1
100	Congestion management, no congestion present, OAM F5 Segment to Segment cell
101	Congestion management, no congestion present, OAM F5 End to End cell
110	Reserved
111	Reserved

## ATM Traffic Classes

The IGX supports the following standard ATM traffic classes to meet ATM-standard Class of Service (CoS) requirements:

- Constant Bit Rate (CBR) Used for time–dependant constant range traffic such as uncompressed voice, video, or synchronous data. Most often, CBR connections carry cells created using AAL1. CBR connections have allowances for burstiness.
- Real Time Variable Bit Rate (RT–VBR) and Nonreal Time Variable Bit Rate (NRT–VBR) Used for bursty traffic that may have some time dependency such as compressed voice, video, or synchronous data. Traffic is permitted within set limitations. VBR connections can support any variable rate application, but are used most often with AAL5 cells.

RT–VBR is used for connections which require a fixed timing relationship between the source and the destination.

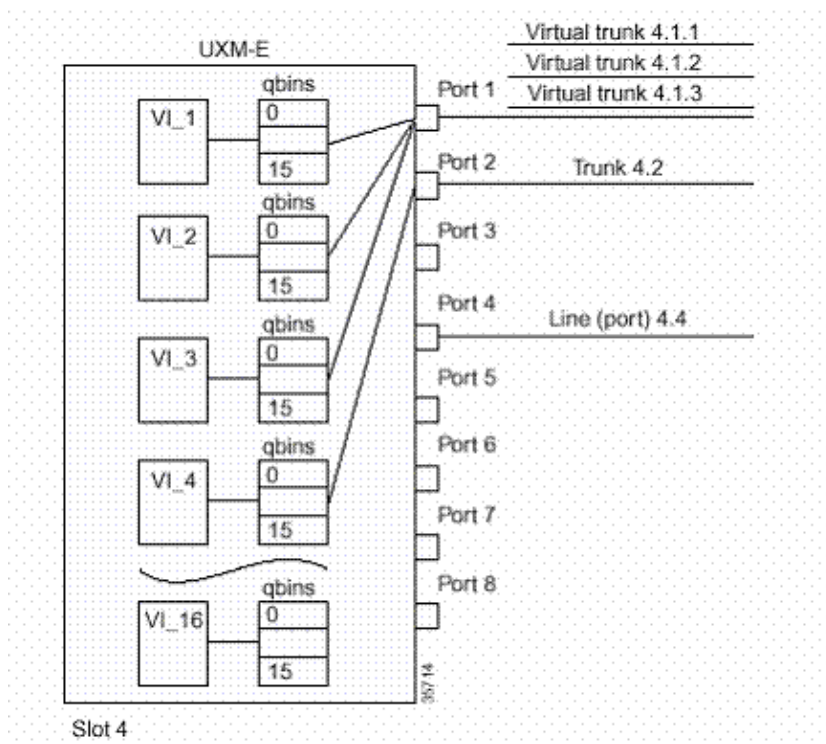
NRT–VBR is used for connections that do not require a fixed timing relationship, but still need a guaranteed Quality of Service (QoS). Traffic is permitted to burst within set limitations.

- Available Bit Rate (ABR) A variation on VBR; most commonly used for LAN–WAN services such as router traffic. ABR is used for connections that do not require a timing relationship between the source and destination.

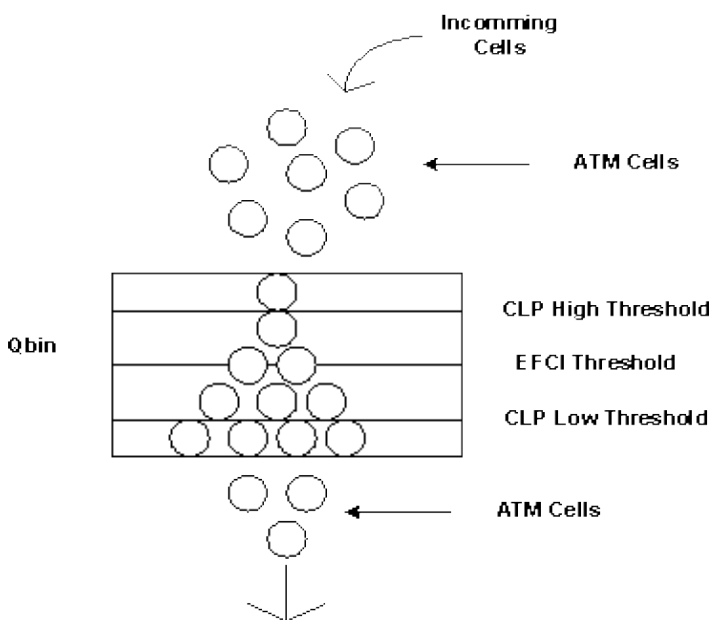
ABR traffic, like VBR, supports variable rate applications. The added function of ABR connections is the ability to adjust the data rates in order to accommodate for congestion and bandwidth availability in the network. ABR connections are typically used to support AAL5 ATM cells.

- Undefined Bit Rate (UBR) Connections are variable rate connections without a guaranteed service rate. If there is congestion or no available bandwidth, a UBR connection is not given bandwidth in the network. UBR connections are used for variable rate applications that are tolerant of zero–transmission periods such as batch processed email or LAN Emulation (LANE).
- Separately–configurable CoS buffers (Qbins) and Port Queuing Qbins store cells and serve them to an interface based on bandwidth availability and CoS priority. For example, if CBR and ABR cells must exit the switch from the same interface, but the interface is already transmitting CBR cells from another source, the newly–arrived CBR and ABR cells are held in the Qbin associated with that interface. As the interface becomes accessible, the Qbin passes CBR cells to the interface for transmission. After the CBR cells have been transmitted, the ABR cells are passed to the interface and transmitted to their destination.

The following illustration shows UXM Virtual Interfaces and Qbins:



The following illustration shows ATM cell flow:



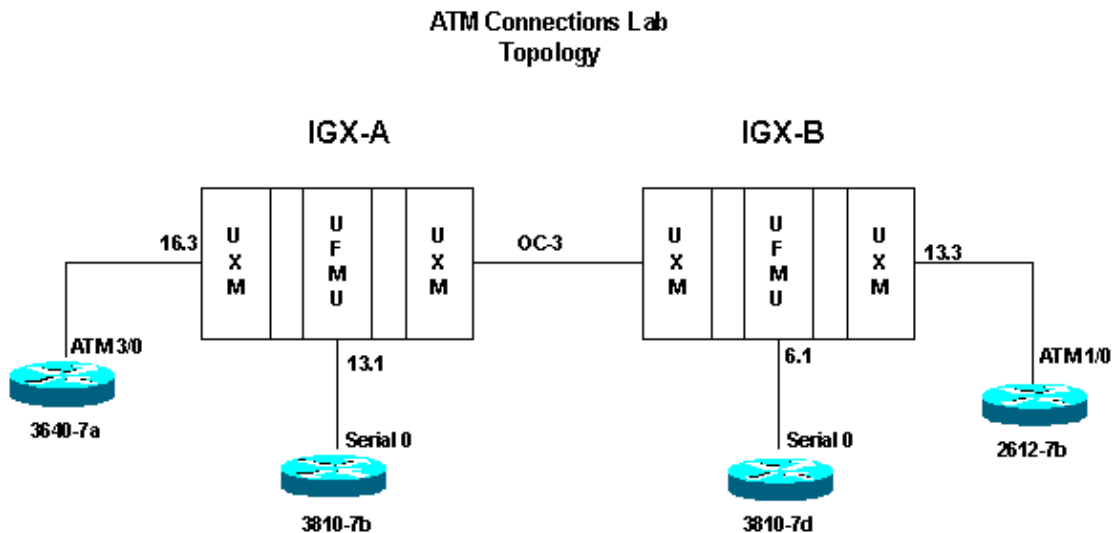
Configurable parameters:

- ◆ VC Queue Depth Determines the depth of the queue. If the Qbin exceeds the defined queue size, all arriving cells are dropped.
- ◆ Explicit Forward Congestion Indication (EFCI) Threshold Determines congestion marking. When the Qbin reaches the EFCI threshold, all arriving cells into the Qbin have the EFCI bit set to 1, which notifies the CPE of congestion in the network.
- ◆ CLP High Threshold Determines when to start dropping CLP tagged cells. When the Qbin reaches the CLP high threshold, all arriving cells with the CLP bit tagged (set to 1) are dropped. Any cells already in Qbin, regardless of CLP bit, are not dropped.



# ATM Labs

This section provides basic lab setups, which demonstrate ATM PVC provisioning. These labs are based on the UXM and UFMU cards (for SIW connection examples). The following illustration shows the topology for the ATM labs in this section, except for IMA lines:



All ATM labs in this section have the following configurations.

An IGX-A line and port configuration of:

1. **upln 16.3**
2. **upport 16.3**
3. Verifications with the **dsplncnf** and **dspport** commands:

Using the dsplncnf Command					
IGX-A	TN	Cisco	IGX 8420	9.3.45	July 22 2003 22:51 EST
LN	16.3	Config	T1/24	UXM	slot:16
IMA Group Member(s):	3				
Retained links:	1				
IMA Protocol Option:	Disabled				
IMA Max. Diff. Dly:	-- msec.				
IMA Clock Mode:	--				
Loop clock:	No				
Line framing:	ESF				
Line coding:	B8ZS				
Line cable type:	ABAM				
Line length:	0-131 ft.				
Idle code:	7F hex				
HCS Masking:	Yes				
Payload Scramble:	No				
Last Command: <b>dsplncnf 16.3</b>					

Using the dspport Command
---------------------------

```

IGX-A      TN      Cisco      IGX 8420  9.3.45   July 22 2003 22:52 EST

Port:      16.3    [ACTIVE  ]
Interface: T1-IMA
Type:      UNI
Speed:     3622 (cps)
SIG Queue Depth: 640
Alloc Bandwidth: 3622 (cps)
Protocol:  NONE

CAC Override: Enabled
%Util Use:   Disabled
GW LCNs:     200
Reserved BW: 0 (cps)
VC Shaping:  Disabled

Last Command: dspport 16.3

```

An IGX-B line and port configuration of:

1. **upln 13.3**
2. **upport 13.3**
3. Verifications with the **dspln** and **dspport** commands:

Using the dspln Command					
IGX-B	TN	Cisco	IGX 8420	9.3.45	July 22 2003 22:53 EST
LN 13.3 Config		T1/24	UXM slot:13		
IMA Group Member(s):		3			
Retained links:		1			
IMA Protocol Option:		Disabled			
IMA Max. Diff. Dly:		--	msec.		
IMA Clock Mode:		--			
Loop clock:		No			
Line framing:		ESF			
Line coding:		B8ZS			
Line cable type:		ABAM			
Line length:		0-131 ft.			
Idle code:		7F hex			
HCS Masking:		Yes			
Payload Scramble:		No			
Last Command: <b>dspln 13.3</b>					

Using the dspport Command					
IGX-B	TN	Cisco	IGX 8420	9.3.45	July 22 2003 22:53 EST
Port:	13.3	[ACTIVE ]			
Interface:	T1-IMA		CAC Override:	Enabled	
Type:	UNI		%Util Use:	Disabled	
Speed:	3622 (cps)		GW LCNs:	200	
SIG Queue Depth:	640		Reserved BW:	0 (cps)	
Alloc Bandwidth:	3622 (cps)		VC Shaping:	Disabled	
Protocol:	NONE				
Last Command: <b>dspport 13.3</b>					

The following labs are contained in this section:

- Lab 1: CBR Connection
- Lab 2: RT-VBR Connection
- Lab3: NRT-VBR Connection
- Lab 4: ABR Connection
- Lab 5: UBR Connection
- Lab 6: SIW-X AFTF Connection

- Lab 7: SIW–AFTF Transparent Connection

## Lab 1: CBR Connection

This lab builds a CBR PVC between 3640–7a and 2612–7b, using the following parameters:

- CBR Connection type
- VPI 1/100 on each side
- 1 MB PVC
- No policing

1. Configure the line and ports on both sides as described in the introduction of this section.
2. Use the **addcon** command to add a CBR connection from the IGX–A side:

```
addcon 16.3.1.100 IGX-B 13.3.1.100 cbr 2667 * * 5 * * * Y
```

3. Use the **dspcon** command to verify your configuration:

Using the dspcon Command						
IGX-A	TN	Cisco	IGX 8420	9.3.45	July 22 2003	22:55 EST
Conn:	16.3.1.100	IGX-B	13.3.1.100	cbr	Status:OK	
	PCR(0+1)	% Util	CDVT(0+1)	Policing		
	2667/2667	100/100	10000/10000	5/5		
Ownr:LOCAL Restr:NONE COS:0 Pri: L Test-RTD: 0 msec						
Path: IGX-A15.3.1--16.3.1IGX-B						
Pref: Not Configured						
IGX-A	UXM:	OK	IGX-B	UXM:	OK	
	Line 16.3	: OK		Line 13.3	: OK	
	OAM Cell RX:	Clear		NNI:	OK	
	NNI:	OK				
This Command: <b>dspcon 16.3.1.100</b>						

Using the dspcon Command						
IGX-A	TN	Cisco	IGX 8420	9.3.45	July 22 2003	22:56 EST
Conn:	16.3.1.100	IGX-B	13.3.1.100	cbr	Status:OK	
	PCR(0+1)	% Util	CDVT(0+1)	Policing	VC Qdepth	CLP Hi
	2667/2667	100/100	10000/10000	5	160/160	80/80
	CLP Lo					
	35/35					
Trunk Cell Routing Restrict: Y						
Last Command: <b>dspcon 16.3.1.100</b>						

4. Perform the following router configuration for 3640–7a:

```
!
interface ATM3/0
  no ip address
  no atm ilmi-keepalive
  no scrambling-payload
!
interface ATM3/0.100 point-to-point
  ip address 20.1.1.1 255.255.255.0
```

```

pvc 1/100
  cbr 1024
  encapsulation aal5snap
!
```

5. Perform the following router configuration for 2612-7b:

```

!
interface ATM1/0
  no ip address
  no ip directed-broadcast
  no atm ilmi-keepalive
  no scrambling-payload
  no fair-queue
!
interface ATM1/0.100 point-to-point
  ip address 20.1.1.2 255.255.255.0
  no ip directed-broadcast
  pvc 1/100
    cbr 1000
    encapsulation aal5snap
!
```

6. Perform the following **ping** command test:

```

wsw-3640-7a# ping 20.1.1.2

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 20.1.1.2, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 8/8/12 ms
wsw-3640-7a# ping 20.1.1.2

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 20.1.1.2, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 8/8/12 ms
```

7. Perform the following **ping** command test:

```

wsw-2612-7b# ping 20.1.1.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 20.1.1.1, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 8/8/8 ms
wsw-2612-7b# ping 20.1.1.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 20.1.1.1, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 8/9/12 ms
```

8. Use the **dspchstats** and **dspportstats** commands to verify traffic is passing on the PVC:

Using the dspchstats Command						
IGX-A	TN	Cisco	IGX 8420	9.3.45	July 23 2003	13:38 EST
Channel Statistics: 16.3.1.100						
Collection Time: 0 day(s) 00:03:06						
Clrd: 07/23/02 13:38:10						
Type			Count	Traffic	Rate (cps)	
Cells Received from Port			3363	From port	18	
Cells Tx to Network			3363	To network	18	
Cells Rcvd from Network			3384	From network	18	
Cells Transmitted to Port			3384	To port	18	
EOF Cells Rcvd from Port			1121			
Cells Received with CLP=1			0			

```

Cells Received with CLP=0          3363
Non-Compliant Cells Rcvd          0
Avg Rx VCq Depth in Cells         0
Average Tx Vcq Depth in Cells     0
Ingress Vsvd Allowed Cell Rate    0
Egress Vsvd Allowed Cell Rate     0

```

This Command: **dspchstats 16.3.1.100 1**

### Using the dspchstats Command

```

IGX-B      TN      Cisco      IGX 8420  9.3.45      July 23 2003 13:38 EST

Channel Statistics: 13.3.1.100
Collection Time: 0 day(s) 00:02:29      Clrd: 07/23/02 13:38:21
Type                                          Count      Traffic      Rate (cps)
Cells Received from Port                    3354      From port    22
Cells Tx to Network                        3354      To network   22
Cells Rcvd from Network                    3333      From network 22
Cells Transmitted to Port                  3333      To port      22
EOF Cells Rcvd from Port                   1118
Cells Received with CLP=1                   0
Cells Received with CLP=0                  3354
Non-Compliant Cells Rcvd                    0
Avg Rx VCq Depth in Cells                  0
Average Tx Vcq Depth in Cells              0
Ingress Vsvd Allowed Cell Rate             0
Egress Vsvd Allowed Cell Rate              0

```

This Command: **dspchstats 13.3.1.100 1**

### Using the dspportstats Command

```

IGX-A      TN      Cisco      IGX 8420  9.3.45      July 23 2003 13:39 EST

Port 16.3                                     Snapshot
Collection Time: 0 day(s) 00:05:47      Clrd: 07/23/02 13:38:14
Type                                          Count
VI: Cells received                          3363
VI: Cells transmitted                       3384
VI: Cells rcvd w/CLP=1                      0
VI: Cells tx w/CLP=1                        0
VI: Cells received w/CLP=0                  3363
VI: Cells transmitted w/CLP=0               3384
VI: Cells discarded w/CLP=1                 0
VI: Cells discarded w/CLP=0                 0
VI: OAM cells received                      0
VI: OAM cells transmitted                   0
VI: RM cells received                       0
VI: RM cells transmitted                    0

```

Last Command: **dspportstats 16.3**

### Using the dspportstats Command

```

IGX-B      TN      Cisco      IGX 8420  9.3.45      July 23 2003 13:39 EST

Port 13.3
Collection Time: 0 day(s) 00:05:16      Clrd: 07/23/02 13:38:18
Type                                          Count
VI: Cells received                          3384
VI: Cells transmitted                       3363
VI: Cells rcvd w/CLP=1                      0
VI: Cells tx w/CLP=1                        0

```

```

VI: Cells received w/CLP=0          3384
VI: Cells transmitted w/CLP=0       3363
VI: Cells discarded w/CLP=1         0
VI: Cells discarded w/CLP=0         0
VI: OAM cells received              0
VI: OAM cells transmitted           0
VI: RM cells received               0
VI: RM cells transmitted            0

This Command: dspportstats 13.3 1

```

## Lab 2: RT-VBR Connection

This lab builds an RT-VBR PVC between 3640-7a and 2612-7b, using the following parameters:

- RT-VBR Connection type
- VPI 1/150 on each side
- 1 MB PVC
- No policing

1. Configure the line and ports on both sides as described in the introduction of this section.
2. Use the **addcon** command to add a CBR connection from the IGX-A side.

```
addcon 16.3.1.150 IGX-B 13.3.1.150 rt-vbr 2667 * * * * * 5 * * *
```

3. Use the **dspon** command to verify your configuration:

Using the dspon Command									
IGX-A	TN	Cisco	IGX 8420	9.3.45	July 23 2003 13:42	EST			
Conn:	16.3.1.150		IGX-B	13.3.1.150	rt-vbr	Status:OK			
	PCR(0+1)	% Util	CDVT(0+1)	FBTC	SCR	MBS	PLC		
	2667/2667	100/100	250000/250000	n	2667/2667	1000/1000	5		
Ownr:LOCAL Restr:NONE COS:0 Pri: L Test-RTD: 0 msec									
Path: IGX-A15.3.1--16.3.1IGX-B									
Pref: Not Configured									
IGX-A	UXM:	OK	IGX-B	UXM:	OK				
	Line 16.3 :	OK		Line 13.3 :	OK				
	OAM Cell RX:	Clear		NNI:	OK				
	NNI:	OK							
This Command: <b>dspon 16.3.1.150</b>									

Using the dspon Command									
IGX-A	TN	Cisco	IGX 8420	9.3.45	July 23 2003 13:42	EST			
Conn:	16.3.1.150		IGX-B	13.3.1.150	rt-vbr	Status:OK			
	PCR(0+1)	% Util	CDVT(0+1)	AAL5 FBTC	SCR				
	2667/2667	100/100	250000/250000	n	2667/2667				
	MBS	Policing	VC Qdepth	CLP Hi	CLP Lo				
	1000/1000	5	1280/1280	80/80	35/35				
Trunk Cell Routing Restrict: Y									
Last Command: <b>dspon 16.3.1.150</b>									

```

Using the dspcon Command
IGX-B      TN      Cisco      IGX 8420  9.3.45   July 23 2003 13:42 EST
Conn:  13.3.1.150      IGX-A  16.3.1.150      rt-vbr  Status:OK
      PCR(0+1)    % Util    CDVT(0+1)    FBTC      SCR      MBS      PLC
      2667/2667    100/100  250000/250000  n        2667/2667  1000/1000  5

Ownr:REMOTE Restr:NONE COS:0 Pri: L Test-RTD: 0 msec
Path:  IGX-B16.3.1--15.3.1IGX-A
Pref:  Not Configured

IGX-B  UXM:  OK      IGX-A  UXM:  OK
      Line 13.3 : OK      Line 16.3 : OK
      OAM Cell RX: Clear      NNI:  OK
      NNI:  OK

This Command: dspcon 13.3.1.150

```

```

Using the dspcon Command
IGX-B      TN      Cisco      IGX 8420  9.3.45   July 23 2003 13:43 EST
Conn:  13.3.1.150      IGX-A  16.3.1.150      rt-vbr  Status:OK
      PCR(0+1)    % Util    CDVT(0+1)    AAL5 FBTC    SCR
      2667/2667    100/100  250000/250000  n        2667/2667

      MBS      Policing  VC Qdepth  CLP Hi    CLP Lo
      1000/1000  5        1280/1280  80/80    35/35

Trunk Cell Routing Restrict: Y

Last Command: dspcon 13.3.1.150

```

4. Perform the following router configuration for 3640-7a:

```

!
interface ATM3/0.150 point-to-point
ip address 21.1.1.1 255.255.255.0
pvc 1/150
vbr-rt 1025 512 1000
encapsulation aal5snap
!

```

5. Perform the following router configuration for 2612-7b:

```

!
interface ATM1/0.150 point-to-point
ip address 21.1.1.2 255.255.255.0
no ip directed-broadcast
pvc 1/150
vbr-rt 1000 512 1000
encapsulation aal5snap
!

```

6. Perform the following **ping** command test:

```

wsw-3640-7a# ping 21.1.1.2

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 21.1.1.2, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 8/8/12 ms
wsw-3640-7a# ping 21.1.1.2

Type escape sequence to abort.

```

```

Sending 5, 100-byte ICMP Echos to 21.1.1.2, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 8/8/8 ms
wsw-3640-7a#

```

7. Perform the following **ping** command test:

```
wsw-2612-7b# ping 21.1.1.1
```

```

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 21.1.1.1, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 8/8/8 ms
wsw-2612-7b# ping 21.1.1.1

```

```

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 21.1.1.1, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 8/9/12 ms

```

8. Use the **dspchstats** and **dspportstats** commands to verify traffic passing on the PVC:

Using the dspchstats Command					
IGX-A	TN	Cisco	IGX 8420	9.3.45	July 23 2003 13:48 EST
Channel Statistics: 16.3.1.150					
Collection Time: 0 day(s) 00:00:03					
Clrd: 07/23/02 13:47:57					
Type			Count	Traffic	Rate (cps)
Cells Received from Port			675	From port	170
Cells Tx to Network			675	To network	170
Cells Rcvd from Network			678	From network	171
Cells Transmitted to Port			678	To port	171
EOF Cells Rcvd from Port			225		
Cells Received with CLP=1			0		
Cells Received with CLP=0			675		
Non-Compliant Cells Rcvd			0		
Avg Rx VCq Depth in Cells			0		
Average Tx Vcq Depth in Cells			0		
Ingress Vsvd Allowed Cell Rate			0		
Egress Vsvd Allowed Cell Rate			0		
This Command: <b>dspchstats 16.3.1.150 1</b>					

Using the dspchstats Command					
IGX-B	TN	Cisco	IGX 8420	9.3.45	July 23 2003 13:50 EST
Channel Statistics: 13.3.1.150					
Collection Time: 0 day(s) 00:01:16					
Clrd: 07/23/02 13:48:19					
Type			Count	Traffic	Rate (cps)
Cells Received from Port			675	From port	8
Cells Tx to Network			675	To network	8
Cells Rcvd from Network			663	From network	8
Cells Transmitted to Port			663	To port	8
EOF Cells Rcvd from Port			225		
Cells Received with CLP=1			0		
Cells Received with CLP=0			675		
Non-Compliant Cells Rcvd			0		
Avg Rx VCq Depth in Cells			0		
Average Tx Vcq Depth in Cells			0		
Ingress Vsvd Allowed Cell Rate			0		
Egress Vsvd Allowed Cell Rate			0		
This Command: <b>dspchstats 13.3.1.150 1</b>					



```

Using the dspportstats Command
IGX-A      TN      Cisco      IGX 8420  9.3.45   July 23 2003 13:50 EST
Port 16.3
Collection Time: 0 day(s) 00:07:04          Clrd: 07/23/02 13:48:03
Type                                          Count
VI: Cells received                          3320
VI: Cells transmitted                        3361
VI: Cells rcvd w/CLP=1                      0
VI: Cells tx w/CLP=1                        0
VI: Cells received w/CLP=0                  3320
VI: Cells transmitted w/CLP=0                3361
VI: Cells discarded w/CLP=1                  0
VI: Cells discarded w/CLP=0                  0
VI: OAM cells received                       0
VI: OAM cells transmitted                     0
VI: RM cells received                         0
VI: RM cells transmitted                      0
This Command: dspportstats 16.3 1

```

```

Using the dspportstats Command
IGX-B      TN      Cisco      IGX 8420  9.3.45   July 23 2003 13:50 EST
Port 13.3                                     Snapshot
Collection Time: 0 day(s) 00:06:04          Clrd: 07/23/02 13:48:15
Type                                          Count
VI: Cells received                          3361
VI: Cells transmitted                        3320
VI: Cells rcvd w/CLP=1                      0
VI: Cells tx w/CLP=1                        0
VI: Cells received w/CLP=0                  3361
VI: Cells transmitted w/CLP=0                3320
VI: Cells discarded w/CLP=1                  0
VI: Cells discarded w/CLP=0                  0
VI: OAM cells received                       0
VI: OAM cells transmitted                     0
VI: RM cells received                         0
I: RM cells transmitted                       0
Last Command: dspportstats 13.3

```

### Lab 3: NRT-VBR Connection

This lab builds an NRT-VBR PVC between 3640-7a and 2612-7b, using the following parameters:

- NRT-VBR Connection type
- VPI 1/200 on each side
- 1 MB PVC
- No policing

1. Configure the line and ports on both sides as described in the introduction of this section.
2. Use the **addcon** command to add an NRT-VBR connection from the IGX-A side:

```
addcon 16.3.1.200 IGX-B 13.3.1.200 nrt-vbr 2667 * * * * * 5 * * * Y
```

3. Use the **dspon** command to verify your configuration:

### Using the dspon Command

```

IGX-A      TN      Cisco      IGX 8420  9.3.45   July 23 2003 13:52 EST

Conn:  16.3.1.200      IGX-B  13.3.1.200      nrt-vbr  Status:OK
      PCR(0+1)    % Util    CDVT(0+1)    FBTC      SCR      MBS      PLC
      2667/2667    100/100  250000/250000  n        2667/2667    1000/1000    5

Ownr:LOCAL Restr:NONE COS:0 Pri: L Test-RTD: 0 msec
Path:  IGX-A16.1--13.1IGX-B
Pref:  Not Configured

IGX-A UXM:  OK      IGX-B UXM:  OK
      Line 16.3 : OK      Line 13.3 : OK
      OAM Cell RX: Clear      NNI:  OK
      NNI:  OK

This Command:  dspcon 16.3.1.200

```

```

Using the dspcon Command

IGX-A      TN      Cisco      IGX 8420  9.3.45   July 23 2003 13:52 EST

Conn:  16.3.1.200      IGX-B  13.3.1.200      nrt-vbr  Status:OK

      PCR(0+1)    % Util    CDVT(0+1)    AAL5 FBTC    SCR
      2667/2667    100/100  250000/250000  n        2667/2667

      MBS      Policing  VC Qdepth  CLP Hi    CLP Lo
      1000/1000    5        1280/1280  80/80    35/35

Trunk Cell Routing Restrict: Y

Last Command:  dspcon 16.3.1.200

```

```

Using the dspcon Command

IGX-A      TN      Cisco      IGX 8420  9.3.45   July 23 2003 13:52 EST

Conn:  16.3.1.200      IGX-B  13.3.1.200      nrt-vbr  Status:OK

      PCR(0+1)    % Util    CDVT(0+1)    AAL5 FBTC    SCR
      2667/2667    100/100  250000/250000  n        2667/2667

      MBS      Policing  VC Qdepth  CLP Hi    CLP Lo
      1000/1000    5        1280/1280  80/80    35/35

Trunk Cell Routing Restrict: Y

Last Command:  dspcon 16.3.1.200

```

```

Using the dspcon Command

IGX-B      TN      Cisco      IGX 8420  9.3.45   July 23 2003 13:53 EST

Conn:  13.3.1.200      IGX-A  16.3.1.200      nrt-vbr  Status:OK

      PCR(0+1)    % Util    CDVT(0+1)    AAL5 FBTC    SCR
      2667/2667    100/100  250000/250000  n        2667/2667

      MBS      Policing  VC Qdepth  CLP Hi    CLP Lo
      1000/1000    5        1280/1280  80/80    35/35

Trunk Cell Routing Restrict: Y

Last Command:  dspcon 13.3.1.200

```

4. Perform the following router configuration for 3640-7a:

```

!
interface ATM3/0.200 point-to-point
 ip address 22.1.1.1 255.255.255.0
 pvc 1/200
  vbr-nrt 1024 512 1000
  encapsulation aal5snap
!

```

5. Perform the following router configuration for 2612-7b:

```

!
interface ATM1/0.200 point-to-point
 ip address 22.1.1.2 255.255.255.0
 no ip directed-broadcast
 pvc 1/200
  vbr-nrt 1000 512 1000
  encapsulation aal5snap
!

```

6. Perform the following **ping** command test:

```

wsw-3640-7a# ping 22.1.1.2

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 22.1.1.2, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 12/12/12 ms
wsw-3640-7a# ping 22.1.1.2

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 22.1.1.2, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 12/12/12 ms

```

7. Perform the following **ping** command test:

```

wsw-2612-7b# ping 22.1.1.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 22.1.1.1, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 12/12/12 ms
wsw-2612-7b# ping 22.1.1.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 22.1.1.1, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 12/14/16 ms

```

8. Use the **dspchstats** and **dspportstats** commands to verify traffic passing:

Using the dspchstats Command					
IGX-A	TN	Cisco	IGX 8420	9.3.45	July 23 2003 13:57 EST
Channel Statistics: 16.3.1.200					
Collection Time: 0 day(s) 00:00:13					
				Clrd: 07/23/02 13:57:32	
Type		Count	Traffic	Rate (cps)	
Cells Received from Port		45	From port	3	
Cells Tx to Network		45	To network	3	
Cells Rcvd from Network		45	From network	3	
Cells Transmitted to Port		45	To port	3	
EOF Cells Rcvd from Port		15			
Cells Received with CLP=1		0			
Cells Received with CLP=0		45			
Non-Compliant Cells Rcvd		0			

```

Avg Rx VCq Depth in Cells          0
Average Tx Vcq Depth in Cells      0
Ingress Vsvd Allowed Cell Rate     0
Egress Vsvd Allowed Cell Rate      0

This Command: dspchstats 16.3.1.200 1

```

**Using the dspchstats Command**

```

IGX-B      TN      Cisco      IGX 8420  9.3.45      July 23 2003 13:57 EST

Channel Statistics: 13.3.1.200
Collection Time: 0 day(s) 00:00:24      Clrd: 07/23/02 13:56:58
Type      Count      Traffic      Rate (cps)
Cells Received from Port      45      From port      1
Cells Tx to Network           45      To network     1
Cells Rcvd from Network       42      From network   1
Cells Transmitted to Port     42      To port        1
EOF Cells Rcvd from Port     15
Cells Received with CLP=1      0
Cells Received with CLP=0     45
Non-Compliant Cells Rcvd      0
Avg Rx VCq Depth in Cells     0
Average Tx Vcq Depth in Cells  0
Ingress Vsvd Allowed Cell Rate 0
Egress Vsvd Allowed Cell Rate  0

This Command: dspchstats 13.3.1.200 1

```

**Using the dspportstats Command**

```

IGX-A      TN      Cisco      IGX 8420  9.3.45      July 23 2003 13:58 EST

Port 16.3
Collection Time: 0 day(s) 00:04:51      Clrd: 07/23/02 13:56:51
Type      Count
VI: Cells received            260
VI: Cells transmitted         230
VI: Cells rcvd w/CLP=1        0
VI: Cells tx w/CLP=1          0
VI: Cells received w/CLP=0    231
VI: Cells transmitted w/CLP=0 230
VI: Cells discarded w/CLP=1    0
VI: Cells discarded w/CLP=0   29
VI: OAM cells received        59
VI: OAM cells transmitted     31
VI: RM cells received         0
VI: RM cells transmitted      0

This Command: dspportstats 16.3 1

```

**Using the dspportstats Command**

```

IGX-B      TN      Cisco      IGX 8420  9.3.45      July 23 2003 13:58 EST

Port 13.3
Collection Time: 0 day(s) 00:03:44      Clrd: 07/23/02 13:56:54
Type      Count
VI: Cells received            289
VI: Cells transmitted         224
VI: Cells rcvd w/CLP=1        0
VI: Cells tx w/CLP=1          0
VI: Cells received w/CLP=0    231
VI: Cells transmitted w/CLP=0 224

```

```

VI: Cells discarded w/CLP=1          0
VI: Cells discarded w/CLP=0         58
VI: OAM cells received               62
VI: OAM cells transmitted            31
VI: RM cells received                0
VI: RM cells transmitted              0

This Command: dspportstats 13.3 1

```

## Lab 4: ABR Connection

This lab builds an ABR Standard (ABRSTD) PVC between 3640-7a and 2612-7b, using the following parameters:

- ABRSTD connection type
- VPI 1/250 on each side
- 1 MB PVC
- No policing
- No virtual source/virtual destination (VSVD)

1. Configure the line and ports on both sides as described in the introduction of this section.
2. Use the **addcon** command to add an ABR connection from IGX-A side:

```
addcon 16.3.1.250 IGX-B 13.3.1.250 ABRSTD 2667 * 2667 * * * 5 Y
```

3. Use the **dsppcon** command to verify your configuration:

Using the dsppcon Command									
IGX-A	TN	Cisco	IGX	8420	9.3.45	July 23 2003 14:00 EST			
Conn:	16.3.1.250		IGX-B	13.3.1.250		abrstd	Status:Ok		
	PCR(0+1)	% Util	MCR		CDVT(0+1)	FBTC	FST	VSVD	FCES
	2667/2667	100/100	2667/2667		250000/250000	y	n	n	n
Ownr:LOCAL Restr:NONE COS:0 Pri: L Test-RTD: 0 msec									
Path: IGX-A16.1--13.1IGX-B									
Pref: Not Configured									
IGX-A	UXM:	OK	IGX-B	UXM:	OK				
	Line 16.3 :	OK		Line 13.3 :	OK				
	OAM Cell RX:	Clear		NNI:	OK				
	NNI:	OK							
This Command: <b>dsppcon 16.3.1.250</b>									

Using the dsppcon Command									
IGX-A	TN	Cisco	IGX	8420	9.3.45	July 23 2003 14:00 EST			
Conn:	16.3.1.250		IGX-B	13.3.1.250		abrstd	Status:Ok		
	PCR(0+1)	% Util	MCR		CDVT(0+1)	AAL5	FBTC	VSVD	
	2667/2667	100/100	2667/2667		250000/250000	y		n	
	Policing								
	5								
Trunk Cell Routing Restrict: Y									
Last Command: <b>dsppcon 16.3.1.250</b>									

```

Using the dspcon Command
IGX-B      TN      Cisco      IGX 8420  9.3.35   July 23 2003 14:00 EST
Conn:  13.3.1.250      IGX-A  16.3.1.250      abrstd  Status:Ok
      PCR(0+1)      % Util      MCR      CDVT(0+1)  FBTC  FST  VSVD  FCES
      2667/2667    100/100    2667/2667    250000/250000  y    n    n    n

Ownr:REMOTE Restr:NONE COS:0 Pri: L Test-RTD: 0 msec
Path:  IGX-A16.1--13.1IGX-B
Pref:  Not Configured

IGX-B UXM:  OK      IGX-A UXM:  OK
      Line 13.3 : OK      Line 16.3 : OK
      OAM Cell RX: Clear      NNI:  OK
      NNI:  OK

This Command: dspcon 13.3.1.250

```

```

Using the dspcon Command
IGX-B      TN      Cisco      IGX 8420  9.3.35   July 23 2003 14:00 EST
Conn:  13.3.1.250      IGX-A  16.3.1.250      abrstd  Status:Ok
      PCR(0+1)      % Util      MCR      CDVT(0+1)  AAL5 FBTC  VSVD
      2667/2667    100/100    2667/2667    250000/250000      y      n

Policing
5

Trunk Cell Routing Restrict: Y

Last Command: dspcon 13.3.1.250

```

4. Perform the following router configuration for 3640-7a:

```

!
interface ATM3/0.250 point-to-point
ip address 23.1.1.1 255.255.255.0
pvc 1/250
abr 1024 512
encapsulation aal5snap
!

```

5. Perform the following router configuration for 2612-7b:

```

!
interface ATM1/0.250 point-to-point
ip address 23.1.1.2 255.255.255.0
no ip directed-broadcast
pvc 1/250
abr 1000 512
encapsulation aal5snap
!

```

6. Perform the following **ping** command test:

```

wsw-3640-7a# ping 23.1.1.2

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 23.1.1.2, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 32/48/60 ms
wsw-3640-7a# ping 23.1.1.2

Type escape sequence to abort.

```

Sending 5, 100-byte ICMP Echos to 23.1.1.2, timeout is 2 seconds:  
 !!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 32/47/60 ms

7. Perform the following **ping** command test:

wsw-2612-7b# **ping 23.1.1.1**

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 23.1.1.1, timeout is 2 seconds:  
 !!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 32/49/64 ms  
 wsw-2612-7b# **ping 23.1.1.1**

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 23.1.1.1, timeout is 2 seconds:  
 !!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 32/48/60 ms

8. Use the **dspchstats** and **dsportstats** commands to verify traffic passing:

Using the dspchstats Command					
IGX-A	TN	Cisco	IGX 8420	9.3.35	July 23 2003 14:05 EST
Channel Statistics: 16.3.1.250					
Collection Time: 0 day(s) 00:00:21					
Type		Count		Clrd: 07/23/02 14:04:33	
Cells Received from Port		57	From port		2
Cells Tx to Network		57	To network		2
Cells Rcvd from Network		63	From network		2
Cells Transmitted to Port		63	To port		2
EOF Cells Rcvd from Port		13			
Cells Received with CLP=1		0			
Cells Received with CLP=0		57			
Non-Compliant Cells Rcvd		0			
Avg Rx VCq Depth in Cells		0			
Average Tx Vcq Depth in Cells		0			
Ingress Vsvd Allowed Cell Rate		0			
Egress Vsvd Allowed Cell Rate		0			
This Command: <b>dspchstats 16.3.1.250 1</b>					

Using the dspchstats Command					
IGX-B	TN	Cisco	IGX 8420	9.3.35	July 23 2003 14:05 EST
Channel Statistics: 13.3.1.250					
Collection Time: 0 day(s) 00:00:20					
Type		Count		Clrd: 07/23/02 14:04:39	
Cells Received from Port		63	From port		3
Cells Tx to Network		63	To network		3
Cells Rcvd from Network		57	From network		2
Cells Transmitted to Port		57	To port		2
EOF Cells Rcvd from Port		15			
Cells Received with CLP=1		0			
Cells Received with CLP=0		63			
Non-Compliant Cells Rcvd		0			
Avg Rx VCq Depth in Cells		0			
Average Tx Vcq Depth in Cells		0			
Ingress Vsvd Allowed Cell Rate		0			
Egress Vsvd Allowed Cell Rate		0			
This Command: <b>dspchstats 13.3.1.250 1</b>					

Using the dspportstats Command					
IGX-A	TN	Cisco	IGX 8420	9.3.35	July 23 2003 14:06 EST
Port 16.3					
Collection Time: 0 day(s) 00:00:30				Clrd: 07/23/02 14:05:46	
Type			Count		
VI: Cells received			85		
VI: Cells transmitted			85		
VI: Cells rcvd w/CLP=1			0		
VI: Cells tx w/CLP=1			0		
VI: Cells received w/CLP=0			85		
VI: Cells transmitted w/CLP=0			85		
VI: Cells discarded w/CLP=1			0		
VI: Cells discarded w/CLP=0			0		
VI: OAM cells received			0		
VI: OAM cells transmitted			0		
VI: RM cells received			25		
VI: RM cells transmitted			25		
This Command: <b>dspportstats 16.3 1</b>					

Using the dspportstats Command					
IGX-B	TN	Cisco	IGX 8420	9.3.35	July 23 2003 14:06 EST
Port 13.3					
Collection Time: 0 day(s) 00:00:25				Clrd: 07/23/02 14:05:52	
Type			Count		
VI: Cells received			85		
VI: Cells transmitted			85		
VI: Cells rcvd w/CLP=1			0		
VI: Cells tx w/CLP=1			0		
VI: Cells received w/CLP=0			85		
VI: Cells transmitted w/CLP=0			85		
VI: Cells discarded w/CLP=1			0		
VI: Cells discarded w/CLP=0			0		
VI: OAM cells received			0		
VI: OAM cells transmitted			0		
VI: RM cells received			25		
VI: RM cells transmitted			25		
This Command: <b>dspportstats 13.3 1</b>					

## Lab 5: UBR Connection

This lab builds a UBR PVC between 3640-7a and 2612-7b, using the following parameters:

- UBR Connection type
- VPI 1/251 on each side
- 1 MB PVC
- No policing

1. Configure the line and ports on both sides as described in the introduction of this section.
2. Use the **addcon** command to add a UBR connection from the IGX-A side:

```
addcon 16.3.1.251 IGX-B 13.3.1.251 UBR 2667 * * * * Y
```

3. Use the **dspon** command to verify your configuration:

Using the dspon Command
-------------------------



```

IGX-A      TN      Cisco      IGX 8420  9.3.35   July 23 2003 14:07 EST

Conn:  16.3.1.251      IGX-B  13.3.1.251      ubr      Status:OK
      PCR(0+1)    % Util    CDVT(0+1)    FBTC CLP Set
      2667/2667    1/1      250000/250000  n      1

Ownr:LOCAL Restr:NONE COS:0 Pri: L Test-RTD: 0 msec
Path:  IGX-A15.3.1--16.3.1IGX-B
Pref:  Not Configured

IGX-A UXM:  OK      IGX-B UXM:  OK
      Line 16.3 : OK      Line 13.3 : OK
      OAM Cell RX: Clear      NNI:  OK
      NNI:  OK

This Command:  dsppcon 16.3.1.251

```

**Using the dsppcon Command**

```

IGX-A      TN      Cisco      IGX 8420  9.3.35   July 23 2003 14:07 EST

Conn:  16.3.1.300      IGX-B  13.3.1.300      ubr      Status:OK

      PCR(0+1)    % Util    CDVT(0+1)    AAL5 FBTC    CLP Setting
      2667/2667    1/1      250000/250000  n      y

Trunk Cell Routing Restrict: Y

Last Command:  dsppcon 16.3.1.300

```

**Using the dsppcon Command**

```

IGX-B      TN      Cisco      IGX 8420  9.3.35   July 23 2003 14:08 EST

Conn:  13.3.1.251      IGX-A  16.3.1.251      ubr      Status:OK
      PCR(0+1)    % Util    CDVT(0+1)    FBTC CLP Set
      2667/2667    1/1      250000/250000  n      1

Ownr:REMOTE Restr:NONE COS:0 Pri: L Test-RTD: 0 msec
Path:  IGX-B16.3.1--15.3.1IGX-A
Pref:  Not Configured

IGX-B UXM:  OK      IGX-A UXM:  OK
      Line 13.3 : OK      Line 16.3 : OK
      OAM Cell RX: Clear      NNI:  OK
      NNI:  OK

This Command:  dsppcon 13.3.1.251

```

**Using the dsppcon Command**

```

IGX-B      TN      Cisco      IGX 8420  9.3.35   July 23 2003 14:08 EST

Conn:  13.3.1.251      IGX-A  16.3.1.251      ubr      Status:OK

      PCR(0+1)    % Util    CDVT(0+1)    AAL5 FBTC    CLP Setting
      2667/2667    1/1      250000/250000  n      y

Trunk Cell Routing Restrict: Y

Last Command:  dsppcon 13.3.1.251

```

4. Perform the following router configuration for 3640-7b:

!

```

interface ATM3/0.251 point-to-point
 ip address 24.1.1.1 255.255.255.0
 pvc 1/251
  ubr 1000
  encapsulation aal5snap
 !

```

5. Perform the following router configuration for 2612-7b:

```

!
interface ATM1/0.251 point-to-point
 ip address 24.1.1.2 255.255.255.0
 no ip directed-broadcast
 pvc 1/251
  ubr 100
 !

```

6. Perform the following **ping** command test:

```
wsw-3640-7a# ping 24.1.1.2
```

```

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 24.1.1.2, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 12/13/16 ms
wsw-3640-7a# ping 24.1.1.2

```

```

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 24.1.1.2, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 12/15/16 ms

```

7. Perform the following **ping** command test:

```
wsw-2612-7b# ping 24.1.1.1
```

```

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 24.1.1.1, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 12/14/16 ms
wsw-2612-7b# ping 24.1.1.1

```

```

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 24.1.1.1, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 12/15/16 ms

```

8. Use the **dsphstats** and **dspportstats** commands to verify traffic passing on the PVC:

Using the dsphstats Command						
IGX-A	TN	Cisco	IGX 8420	9.3.35	July 23 2003	15:21 EST
Channel Statistics: 16.3.1.251						
Collection Time: 0 day(s) 00:00:55						
Clrd: 07/23/02 15:20:56						
Type			Count		Traffic	Rate (cps)
Cells Received from Port			24		From port	0
Cells Tx to Network			24		To network	0
Cells Rcvd from Network			30		From network	0
Cells Transmitted to Port			30		To port	0
EOF Cells Rcvd from Port			8			
Cells Received with CLP=1			0			
Cells Received with CLP=0			24			
Non-Compliant Cells Rcvd			0			
Avg Rx VCq Depth in Cells			0			
Average Tx Vcq Depth in Cells			0			
Ingress Vsvd Allowed Cell Rate			0			
Egress Vsvd Allowed Cell Rate			0			

This Command: **dspchstats 16.3.1.251 1**

### Using the dspchstats Command

```
IGX-B      TN      Cisco      IGX 8420  9.3.35   July 23 2003 15:21 EST

Channel Statistics: 13.3.1.251
Collection Time: 0 day(s) 00:05:19          Clrd: 07/23/02 15:21:00
Type                                          Count      Traffic      Rate (cps)
Cells Received from Port                    105        From port    0
Cells Tx to Network                         105        To network   0
Cells Rcvd from Network                     99         From network 0
Cells Transmitted to Port                   99         To port      0
EOF Cells Rcvd from Port                    35
Cells Received with CLP=1                   0
Cells Received with CLP=0                   105
Non-Compliant Cells Rcvd                    0
Avg Rx VCq Depth in Cells                   0
Average Tx Vcq Depth in Cells               0
Ingress Vsvd Allowed Cell Rate              0
Egress Vsvd Allowed Cell Rate               0
```

This Command: **dspchstats 13.3.1.251 1**

### Using the dspportstats Command

```
IGX-A      TN      Cisco      IGX 8420  9.3.35   July 23 2002 15:22 EST

Port 16.3                                     Snapshot
Collection Time: 0 day(s) 00:04:31          Clrd: 07/23/02 15:22:14
Type                                          Count
VI: Cells received                          161
VI: Cells transmitted                        167
VI: Cells rcvd w/CLP=1                      137
VI: Cells tx w/CLP=1                        139
VI: Cells received w/CLP=0                  24
VI: Cells transmitted w/CLP=0                28
VI: Cells discarded w/CLP=1                  0
VI: Cells discarded w/CLP=0                  0
VI: OAM cells received                       0
VI: OAM cells transmitted                    0
VI: RM cells received                        0
VI: RM cells transmitted                      0
```

Last Command: **dspportstats 16.3**

### Using the dspportstats Command

```
IGX-B      TN      Cisco      IGX 8420  9.3.35   July 23 2002 15:23 EST

Port 13.3                                     Snapshot
Collection Time: 0 day(s) 00:03:17          Clrd: 07/23/02 15:22:29
Type                                          Count
VI: Cells received                          166
VI: Cells transmitted                        160
VI: Cells rcvd w/CLP=1                      139
VI: Cells tx w/CLP=1                        137
VI: Cells received w/CLP=0                  27
VI: Cells transmitted w/CLP=0                23
VI: Cells discarded w/CLP=1                  0
VI: Cells discarded w/CLP=0                  0
VI: OAM cells received                       0
VI: OAM cells transmitted                    0
```

```

VI: RM cells received          0
VI: RM cells transmitted      0

Last Command: dspportstats 13.3 1

```

## Lab 6: SIW-X AFTF Connection

This lab builds a Service Interworking connection using translational mode between the 2612-7b ATM interface, and the 3810-7b Frame Relay interface, with the following parameters:

- ATM requirements:
  - ◆ AFTF connection type
  - ◆ VPI 1/252 on ATM side
  - ◆ 1 MB PVC
  - ◆ No policing
- Frame Relay requirements:
  - ◆ DLCI = 251
  - ◆ 1 MB PVC
  - ◆ LMI signaling of Cisco/Stratacom

1. Configure the line and ports on both sides as described in the introduction of this section.
2. Refer to the Frame Relay section for Frame Relay interface configuration steps.
3. Use the **addcon** command to add the SIW AFTF connection from IGX-B to 3810-7b Frame Relay:

```
addcon 13.3.1.252 IGX-A 13.1.251 atfx 2667 100 250000 2667 1000 5 1280 35 5
```

4. Use the **dspon** command to verify your configuration:

Using the dspon Command									
IGX-B	TN	Cisco	IGX 8420	9.3.35	July 23 2002	15:51	EST		
Conn: 13.3.1.252 IGX-A 13.1.251 atfx Status:OK									
PCR(0+1)		% Util	CDVT(0+1)	FBTC	SCR	MBS	PLC		
2667/2667		100/100	250000/250000	y	2667/2667	1000/1000	5		
Ownr:LOCAL Restr:NONE COS:0						FST: n % Util: 100/100			
Pri: L Test-RTD: 0 msec									
Path: IGX-B16.3.1--15.3.1IGX-A									
Pref: Not Configured									
IGX-B UXM: OK			IGX-A UFMU: OK						
Line 13.3 : OK			UFI: OK						
OAM Cell RX: Clear									
NNI: OK									
This Command: <b>dspon 13.3.1.252</b>									

Using the dspon Command									
IGX-B	TN	Cisco	IGX 8420	9.3.35	July 23 2002	15:52	EST		
Conn: 13.3.1.252 IGX-A 13.1.251 atfx Status:OK									
PCR(0+1)		% Util	CDVT(0+1)		SCR	MBS			
2667/2667		100/100	250000/250000		2667/2667	1000/1000			

Policing	VC Qdepth	EFCI	IBS
5	1280/1280	35/35	5/5
Last Command: <b>dspscon 13.3.1.252</b>			

Using the dspscon Command							
IGX-A	TN	Cisco	IGX 8420	9.3.35	July 23 2002	15:52	EST
Conn:	13.1.251		IGX-B	13.3.1.252	atfx	Status:OK	
MIR		CIR	VC Q Depth	PIR	Cmax	ECN QThresh	QIR
1024/1024		1024/1024	61440/61440	1024/1024	10/10	21504/21504	1024/1024
Ownr:REMOTE Restr:NONE COS:0					FST: n % Util: 100/100		
Pri: L Test-RTD: 0 msec							
Path: IGX-A15.3.1--16.3.1IGX-B							
Pref: Not Configured							
IGX-A UFMU: OK				IGX-B UXM: OK			
UFI: OK				Line 13.3 : OK			
				NNI: OK			
Last Command: <b>dspscon 13.1.251</b>							

5. Perform the following router configuration for 2623-7b:

```

!
interface ATM1/0.252 point-to-point
ip address 25.1.1.2 255.255.255.0
no ip directed-broadcast
pvc 1/252
vbr-nrt 1000 512 1000
encapsulation aal5snap
!

```

6. Perform the following router configuration for 3810-7b (Frame Relay router):

```

!
interface Serial0
no ip address
encapsulation frame-relay IETF
no ip mroute-cache
no fair-queue
clockrate line 1536000
frame-relay lmi-type cisco
!
interface Serial0.100 point-to-point
ip address 25.1.1.1 255.255.255.0
no arp frame-relay
frame-relay interface-dlci 251
!

```

7. Perform the following **ping** command test:

```

wsw-2612-7b# ping 25.1.1.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 25.1.1.1, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 8/8/12 ms
wsw-2612-7b# ping 25.1.1.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 25.1.1.1, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 8/8/12 ms

```

8. Perform the following **ping** command test:

```
wsw-3810-7b# ping 25.1.1.2
```

```
Type escape sequence to abort.
```

```
Sending 5, 100-byte ICMP Echos to 25.1.1.2, timeout is 2 seconds:
```

```
!!!!!
```

```
Success rate is 100 percent (5/5), round-trip min/avg/max = 8/8/8 ms
```

```
wsw-3810-7b# ping 25.1.1.2
```

```
Type escape sequence to abort.
```

```
Sending 5, 100-byte ICMP Echos to 25.1.1.2, timeout is 2 seconds:
```

```
!!!!!
```

```
Success rate is 100 percent (5/5), round-trip min/avg/max = 8/9/12 ms
```

```
wsw-3810-7b#
```

9. Use the **dspchstats** command to verify traffic passing on the IGX:

Using the dspchstats Command							
IGX-B	TN	Cisco	IGX 8420	9.3.35	July 23 2002	15:55	EST
Channel Statistics: 13.3.1.252							
Collection Time: 0 day(s) 00:00:10				Clrd: 07/23/02 15:54:04			
Type		Count	Traffic	Rate (cps)			
Cells Received from Port		45	From port	4			
Cells Tx to Network		45	To network	4			
Cells Rcvd from Network		52	From network	4			
Cells Transmitted to Port		52	To port	4			
EOF Cells Rcvd from Port		15					
Cells Received with CLP=1		0					
Cells Received with CLP=0		45					
Non-Compliant Cells Rcvd		0					
Avg Rx VCq Depth in Cells		0					
Average Tx Vcq Depth in Cells		0					
Ingress Vsvd Allowed Cell Rate		0					
Egress Vsvd Allowed Cell Rate		0					
This Command: <b>dspchstats 13.3.1.252 1</b>							

Using the dspchstats Command							
IGX-A	TN	Cisco	IGX 8420	9.3.35	July 23 2002	15:55	EST
Channel Statistics: 13.1.251							
Cleared: July 23 2002 15:53 (//)							
MIR: 1024.1/1024.1 kbps Collection Time: 0 day(s) 00:00:26				Corrupted: NO			
	Frames	Avg Size	Avg Util	Packets	Avg		
		(bytes)	(fps)		(pps)		
From Port:	16	118	0 0				
To Network:	16	118	0 0	106	3		
Discarded:	0	0	0 0				
From Network:	15	106	0 0	90	3		
To Port:	15	106	0 0				
Discarded:	0	0	0 0	0	0		
	ECN Stats:		Avg Rx VC Q:	0	ForeSight RTD		--
Min-Pk bytes rcvd:	--	FECN Frames:		0	FECN Ratio (%)		0
Minutes Congested:	--	BECN Frames:		0	BECN Ratio (%)		0
Frames rcvd in excess of CIR:	0	Bytes rcvd in excess of CIR:		0			
Frames xmtd in excess of CIR:	0	Bytes xmtd in excess of CIR:		0			
This Command: <b>dspchstats 13.1.251 1</b>							

## Lab 7: SIW–AFTF Transparent Connection

This lab builds a Service Interworking connection using transparent mode between the 2612–7b ATM interface, and the 3810–7b Frame Relay interface, with the following parameters:

- ATM requirements:
  - ◆ ATFX connection type
  - ◆ VPI 1/253 on ATM side
  - ◆ 1 MB PVC
  - ◆ No policing
- Frame Relay requirements:
  - ◆ DLCI = 252
  - ◆ 1 MB PVC
  - ◆ LMI signaling of Cisco/Stratacom

1. Configure the line and ports on both sides as described in the introduction of this section.
2. Refer to the Frame Relay section for Frame Relay interface configuration steps.
3. Use the **addcon** command to add the SIW ATFX connection from IGX–B to 3810–7b Frame Relay:

```
addcon 13.3.1.253 IGX-A 13.1.252 atft 2667 100 250000 2667 1000 5 1280 35 5
```

4. Use the **dspon** command to verify your configuration:

Using the dspon Command									
IGX-B	TN	Cisco	IGX	8420	9.3.35	July 23 2002 15:58 EST			
Conn:	13.3.1.253		IGX-A	13.1.252		atft	Status:OK		
	PCR(0+1)	% Util		CDVT(0+1)	FBTC	SCR	MBS	PLC	
	2667/2667	100/100		250000/250000	y	2667/2667	1000/1000	5	
Ownr:LOCAL Restr:NONE COS:0						FST: n % Util: 100/100			
Pri: L Test-RTD: 0 msec									
Path: IGX-B16.3.1--15.3.1IGX-A									
Pref: Not Configured									
IGX-B	UXM:	OK		IGX-A	UFMU:	OK			
	Line 13.3 :	OK			UFI:	OK			
	OAM Cell RX:	Clear							
	NNI:	OK							
This Command: <b>dspon 13.3.1.253</b>									

Using the dspon Command									
IGX-B	TN	Cisco	IGX	8420	9.3.35	July 23 2002 15:59 EST			
Conn:	13.3.1.253		IGX-A	13.1.252		atft	Status:OK		
	PCR(0+1)	% Util		CDVT(0+1)		SCR	MBS		
	2667/2667	100/100		250000/250000		2667/2667	1000/1000		
Policing	VC Qdepth	EFCI	IBS						
5	1280/1280	35/35	5/5						
Last Command: <b>dspon 13.3.1.253</b>									

Using the dspon Command									
-------------------------	--	--	--	--	--	--	--	--	--

```

IGX-A      TN      Cisco      IGX 8420  9.3.35   July 23 2002 15:59 EST

Conn: 13.1.252      IGX-B 13.3.1.253      atft      Status:OK
      MIR      CIR      VC Q Depth      PIR      Cmax      ECN QThresh      QIR
      1024/1024      1024/1024      61440/61440      1024/1024      10/10      21504/21504      1024/1024

Ownr:REMOTE Restr:NONE COS:0      FST: n % Util: 100/100
Pri: L Test-RTD: 0 msec
Path: IGX-A15.3.1--16.3.1IGX-B
Pref: Not Configured

IGX-A UFMU: OK      IGX-B UXM: OK
      UFI: OK      Line 13.3 : OK
      NNI: OK

Last Command: dspscon 13.1.252

```

5. Perform the following router configuration for 2612-7b:

```

!
interface ATM1/0.253 point-to-point
 ip address 26.1.1.2 255.255.255.0
 no ip directed-broadcast
 pvc 1/253
  vbr-nrt 1000 512 1000
  encapsulation aal5nlpid
 ! --- Notice that aal5nlpid encapsulation is used.

```

6. Perform the following router configuration for 3810-7b:

```

!
interface Serial0.200 point-to-point
 ip address 26.1.1.1 255.255.255.0
 no arp frame-relay
 frame-relay interface-dlci 252
!

```

7. Perform the following **ping** command test:

```

wsw-2612-7b# ping 26.1.1.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 26.1.1.1, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 8/8/12 ms
wsw-2612-7b# ping 26.1.1.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 26.1.1.1, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 8/9/12 ms

```

8. Perform the following **ping** command test:

```

wsw-3810-7b# ping 26.1.1.2

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 26.1.1.2, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 4/7/8 ms
wsw-3810-7b# ping 26.1.1.2

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 26.1.1.2, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 8/8/12 ms

```



9. Use the **dspchstats** command to verify traffic on the IGX:

Using the dspchstats Command						
IGX-B	TN	Cisco	IGX 8420	9.3.35	July 23 2002	16:02 EST
Channel Statistics: 13.3.1.253						
Collection Time: 0 day(s) 00:00:16					Clrd: 07/23/02 16:02:04	
Type			Count		Traffic	Rate (cps)
Cells Received from Port			45		From port	2
Cells Tx to Network			45		To network	2
Cells Rcvd from Network			45		From network	2
Cells Transmitted to Port			45		To port	2
EOF Cells Rcvd from Port			15			
Cells Received with CLP=1			0			
Cells Received with CLP=0			45			
Non-Compliant Cells Rcvd			0			
Avg Rx VCq Depth in Cells			0			
Average Tx Vcq Depth in Cells			0			
Ingress Vsvd Allowed Cell Rate			0			
Egress Vsvd Allowed Cell Rate			0			
This Command: <b>dspchstats 13.3.1.253 1</b>						

Using the dspchstats Command						
IGX-A	TN	Cisco	IGX 8420	9.3.35	July 23 2002	16:02 EST
Channel Statistics: 13.1.252						
Cleared: July 23 2002 16:01 ( )						
MIR: 1024.1/1024.1 kbps			Collection Time: 0 day(s) 00:00:25		Corrupted: NO	
	Frames	Avg Size	Avg	Util	Packets	Avg
		(bytes)	(fps)	(%)		(pps)
From Port:	16	118	0	0		
To Network:	16	118	0	0	106	4
Discarded:	0	0	0	0		
From Network:	15	106	0	0	90	3
To Port:	15	106	0	0		
Discarded:	0	0	0	0	0	0
ECN Stats: Avg Rx VC Q: 0 ForeSight RTD --						
Min-Pk bytes rcvd: --	FECN Frames: 0		FECN Ratio (%) 0			
Minutes Congested: --	BECN Frames: 0		BECN Ratio (%) 0			
Frames rcvd in excess of CIR:	0		Bytes rcvd in excess of CIR:		0	
Frames xmtd in excess of CIR:	0		Bytes xmtd in excess of CIR:		0	
This Command: <b>dspchstats 13.1.252 1</b>						

## Verify

There is currently no verification procedure available for this configuration.

## Troubleshoot

Refer to the following documents to troubleshoot your configuration:

- CRC Troubleshooting Guide for ATM Interfaces
- Technical Support ATM (Asynchronous Transfer Mode)
- Configuring and Troubleshooting ATM Connection Configurations and Cisco BPX 8600 Series Switches

## Related Information

- [Voice Parameters and Tuning Guide for the IGX 8400, VISM, 3810, FastPAD, and VNS](#)
- [Cisco IGX 8400 Series Installation, Release 8.5](#)
- [Cisco IGX 8400 Series Reference, Release 9.3.0](#)
- [Frame Relay Connections Command Reference, Release 9.3.00](#)
- [Frame Relay Glossary](#)
- [Frame Discards](#)
- [Why Frames and Bytes Are Discarded](#)
- [Data Sheet Universal Switching Module \(UXM-E\)](#)
- [Asynchronous Transfer Mode Switching Internetworking Technology Handbook](#)
- [ATM Connections Command Reference, Release 9.2](#)
- [Line Interface Cards Cisco IGX 8400 Series Reference, Release 9.2](#)
- [Reference Guide Cisco IGX Universal Router Module](#)
- [IGX Universal Router Module](#)
- [Configuring Voice Ports Cisco IOS Release 12.0 Voice, Video, and Home Applications Configuration Guide](#)
- [Cisco IOS Voice Features on IGX 8400 Series Universal Router Module](#)
- [Data Sheet Cisco IGX 8400 Universal Router Module](#)
- [Cisco IGX 8400 Series Cards Cisco IGX 8400 Series Provisioning Guide, Release 9.3.3 and Later](#)
- [Cisco WAN Switching Solutions – Cisco Documentation](#)
- [Guide to New Names and Colors for WAN Switching Products](#)
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