Cisco 6400 Node Line Card Frequently Asked Questions

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Questions

Q. What is a Node Line Card?

A. Node Line Card (NLC) is an interface card for the Cisco 6400. Logically, the NLC forms the physical interfaces of the NSP.

Q. How can NLC interfaces be configured?

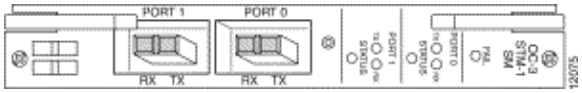
A. NLC interfaces are configured from the NSP Command line prompt.

Q. What NLC modules does the Cisco 6400 support?

A. The Cisco 6400 supports three half−height and one full−height NLC modules:

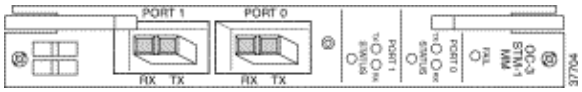
- OC−3/STM−1 SM half−height NLC has two 155−Mbps fiber−optic ports for single−mode intermediate reach connection of uplink and downlink interfaces.

  Figure 1: OC−3/STM−1 SM NLC Faceplate



- OC−3/STM−1 MM half−height NLC has two 155−Mbps fiber−optic ports for multimode connection on the front of each NLC.

  Figure 2: OC−3/STM−1 MM NLC Faceplate

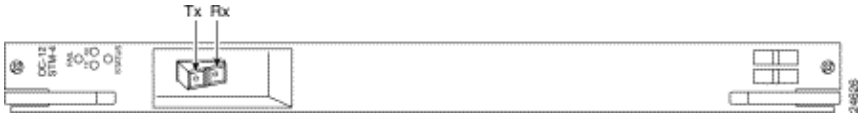


- DS3 half−height NLC has two 45−Mbps bi−directional ports for connection to network services using coaxial cable.

  Figure 3: DS3 NLC Faceplate

- OC−12/STM−4 full−height NLC has one 622−Mbps fiber−optic port for the connection of uplink and downlink interfaces; single mode, intermediate reach.

  Figure 4: OC−12/STM−4 NLC Faceplate



Q. What slots can the NLC occupy?

A. NLC can be inserted into slots 1 through 8 (subslots 0 and 1 for the half−height cards) in the Cisco 6400 chassis. The Cisco 6400 can contain several NLC modules configured to operate independently or as redundant pairs. Redundant pairs must be in side−by−side slots. For example, 7/0/1 and 8/0/1.

Q. How does the Cisco 6400 system identify NLC interfaces?

A. In the Cisco 6400, NLC interface addresses specify the physical location of each port on the system. The address is composed of a three−part number in the format slot/subslot/port:

- **Slot** − Identifies the chassis slot in which the card is installed. Card slots are numbered 1 to 8 from left to right when facing the front of the chassis.

- **Subslot** − Identifies the top or bottom half of a card slot. Sublots are numbered 0 to1 from top to bottom. Full−height NLCs are always identified with subslot 0.
- **Port** − Identifies the physical port number on the card. Port numbers always begin at 0 and are numbered from top to bottom.

Interfaces maintain the same address, even while other cards are installed in or removed from the chassis. If, however, you move an NLC to a different slot or subslot, the address changes to reflect the new slot and subslot.

Q. What are the LEDs seen on Cisco 6400 NLCs?

A. The following table shows the types of LED Indicators of OC−3 MM or SM, and DS3 NLCs:

OC−3 and DS3 NLC LED Indicators		
LED	**Status**	**Condition**
Fail	Steady yellow	NLC has failed.
	Off	NLC is operational.
Port 0 (top connector)		
TX (transmit)	Green	Transmit activity
	Off	No traffic
	Steady yellow	Far−end alarm
	Flashing yellow	Local loopback
RX (receive)	Green	Receive activity
	Off	No traffic
	Steady yellow	Loss of signal
STATUS	Green	Active (primary)
	Blinking green	Standby mode (secondary)
	Off	No power
PORT 1 (bottom connector)		
TX (transmit)	Green	Transmit activity
	Off	No traffic
	Steady yellow	Far−end alarm
	Flashing yellow	Local loopback
RX (receive)	Green	Receive activity
	Off	No traffic
		Loss of signal

	Steady yellow	
STATUS	Green	Active (primary)
	Blinking green	Standby mode
	Off	(secondary) No power

The next table shows the types of LED Indicators of OC−12 NLC NLC:

OC−12 NLC LED Indicators		
LED	**Status**	**Condition**
FAIL	Steady yellow	OC−12/STM−4 NLC has failed
	Off	OC−12/STM−4 NLC is operational
TX (transmit)	Green	Transmit activity
	Off	No traffic
	Steady yellow	Far−end alarm
	Flashing yellow	Local loopback
RX (receive)	Green	Receive activity
	Off	No traffic
	Steady yellow	Loss of signal
STATUS	Green	Active (primary)
	Blinking green	Standby mode
	Off	(secondary) No power

Q. What clocking options does the NLC support?

A. The clock source of any NLC port is configured using the **clock source** interface configuration mode in the NSP configuration. Here is the command syntax along with keyword options:

```
Switch(config)# interface atm slot/subslot/port
Switch(config−if)# clock source  {free−running | loop−timed | network−derived}
```

All four types of NLCs can be configured to support the following clocking options:

- **free−running** (called also self−timing) − provides a Stratum 4 level clock. In this mode, the transmit clock is derived from the local oscillator on the NLC port, with Stratum level 4 accuracy. If the port adapter does not have a local oscillator, the oscillator from the NSP is used. In this mode, the transmit clock is not synchronized

with any clocks of the received datastream to any NLC port.

Note: This mode should be used only if synchronization is not required, as in some private isolated LAN environments

- **loop−timed** − which Transmit clock is derived from the received (RX) clock on the same interface. This is ideal for public network connections if the device you are connected to is with a very accurate clock source.
- **network−derived** (IOS default) − Transmit clock is derived from the port system clock specified at highest priority by the **network−clock−select global configuration** command in the NSP configuration. With network−derived clocking option, the **network−clock−select** command provides two clocking sources you can configure within network−derived clocking option:

```
Switch(config)# network-clock-select priority {system | atm slot/subslot/port
```

Note: Priority values range from 1 (highest) to 4 (lowest). Priorities 1 to 4 initially default to "no clock". Priority 5 is a pseudo−priority that defaults to "system clock" and is not configurable. If priorities 1 to 4 are not configured, the priority 5 system (NSP) clock is used as the derived clock.

A − system: this is the system clock, which will be one of the following sources:

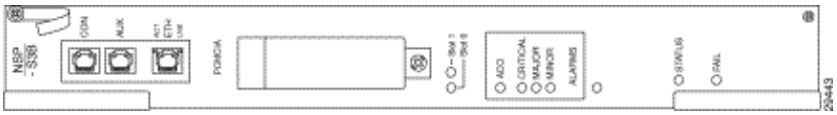
- The local oscillator on the NSP which is Stratum 3 level clock accuracy.

Or

- The Building Integrated Timing Supply (BITS), when you are using NSP−S3B module instead of the standard NSP module. NSP−S3B module is similar to the standard NSP module. But in addition to support intrenal oscillator clock source of Strantum 3 level clocking, or from any NLC interface; it supports network timing clocking source derived from Central Office (CO) BITS clock source.

B − an NLC port, means the clock is derived from the received clock of the received datastream from the public network on the specified NLC atm *slot/subslot/port*. In the **network−derived** option all the NLC ports clocking are synchronized to a single clocking source, and are distributed across the network devices in your topology.

Figure 5: NSP−S3B Faceplate



Q. What are the Synchronous Optical Network (SONET) and Synchronous Digital Hierarchy (SDH) Framing and Scrambling options that OC−3/STM−1 SM, OC−3/STM−1 MM, and OC−12/STM−4 support?

A. The OC−3 NLC and OC−12 NLC support the following Synchronous Optical Network (SONET) and Synchronous Digital Hierarchy (SDH) framing modes:

- STM−1 − Synchronous Transport Module level 1. One of a number of SDH formats that specifies the frame structure for the 155.52−Mbps lines used to carry ATM cells.
- STS−3c − Synchronous Transport Signal level 3, concatenated. SONET format that specifies the frame structure for the 155.52−Mbps lines used to carry ATM cells. (this is the default for OC−3 MM or SM NLC).
- STM−4 − Synchronous Transport Module level 4. SDH/STM−4 operation (ITU−T

specification).

- STS−12c − Synchronous Transport Signal level 12, concatenated (12 x 51.84 Mbps). SONET format that specifies the frame structure for the 5184−Mbps lines used to carry ATM cells (this is the default for OC−12 NLC).

The OC−3 NLC and OC−12 NLC support the following scrambling modes, both turned on by default:

- STS−stream − scrambles the SONET/SDH Layer 1 stream.
- Cell−payload − scrambles only the payload of the cell (not the header).

Q. How do I configure the Synchronous Optical Network (SONET) and Synchronous Digital Hierarchy (SDH) Framing and Scrambling options for OC−3/STM−1 SM, OC−3/STM−1 MM, and OC−12/STM−4 NLCs?

A. Framing options for OC−3 MM or SM, and OC−12 NLCs can be configured in the interface configuration mode:

```
Switch(config)# interface atm slot/subslot/port
Switch(config-if)# sonet {stm-1 | sts-3c | stm-4 | sts-12c}
```

To enable or disable scrambling mode for OC−3 MM or SM, and OC−12 NLCs use the below command in the interface configuration mode:

```
Switch(config-if)# [no] scrambling {cell-payload | sts-stream}
```

In the following example, both cell−payload scrambling and STS−stream scrambling are disabled for the OC−3 interface ATM 1/0/0. Also, the SONET mode of operation is set to SDH/STM−1.

```
!
interface atm 1/0/0
no scrambling cell-payload
no scrambling sts-stream
sonet sts-3c
!
```

Q. How do I verify the OC−3 and OC−12 interface configuration?

A. To verify successful configuration of OC−3 or OC−12 interfaces, use the **show controller atm** EXEC command. Check that the output displays the correct interface options.

```
Switch# show controller atm 7/0/0

Redundancy NOT Enabled on interface
IF Name: ATM7/0/0    Chip Base Address(es): A8B08000, 0 Port type: OC3    Port rate:
Mbps    Port medium: SM Fiber
Port status:Good Signal    Loopback:None    Flags:8308
TX Led: Traffic Pattern    RX Led: Traffic Pattern  TX clock source:  network-derive
Framing mode:  sts-3c
Cell payload scrambling on
Sts-stream scrambling on
.......
.......
.......
```

Q. What are the framing and scrambling options DS3 NLC supports?

A. The DS3 NLC supports the following framing modes:

- cbitadm − C−bit with ATM direct mapping (default framing mode).
- cbitplcp − C−bit with physical layer convergence procedure (PLCP) framing.
- m23adm − M23 ATM direct mapping.
- m23plcp − M23 with PLCP framing.

The DS3 NLC supports the cell payload scrambling mode, which scrambles only the payload of the cell (not the header). Cell payload scrambling is off by default.

Q. How can I configure the framing and scrambling options for DS3 NLC interface?

A. To change the framing mode option, complete the following steps, beginning in global configuration mode:

```
Switch(config)# interface atm slot/subslot/port
Switch(config−if)# framing {cbitadm | cbitplcp | m23adm | m23plcp}
```

To change scrambling option, complete the following steps, beginning in global configuration mode:

```
Switch(config−if)# [no] scrambling cell−payload
```

Q. Does the length of the coaxial cable connected to DS3 interface affect the DS3 NLC interface operational status?

A. The DS3 NLC defaults to a short line buildout, which supports cables less than 50 feet long. If the cable attached to the DS3 interface is longer than 50 feet, you must configure the long line buildout.

Q. How can I change the coaxial cable length value (line buildout parameter) to which the DS3 NLC interface is connected to?

A. To change line buildout parameter, complete the following steps, beginning in global configuration mode:

```
Switch(config)# interface atm slot/subslot/port
Switch(config−if)# lbo {long | short}
```

- **long** − this option should be confiugred if the length of the coaxial cable connected to the DS3 interface is longer that 50 feet.
- **short** − this option should be used if the length of the coaxial cable connected to the DS3 interface is is less than 50 feet.

Q. What are the types of automatic far−end receive failure (FERF) alarms DS3 NLC supports?

A. The DS3 NLC automatic far−end receive failure (FERF) alarms support the following values, all turned on by default:

- los − Loss of signal
- oof − Out of frame
- red − Indicates a major alarm
- ais − Alarm indication signal
- lcd − Loss of cell delineation

Q. How do I modify the automatic far−end receive failure (FERF) alarms for DS3 NLC interface?

A. To manually modify the automatic FERF configuration of DS3 NLC interface, complete the following steps, beginning in global configuration mode:

```
Switch(config)# interface atm slot/subslot/port
     Switch(config−if)# [no] auto−ferf {ais | lcd | los | oof | red}
```

Q. How can I verify the DS3 interface configurations?

A. To verify successful configuration of DS3 interfaces, use the show controllers atm EXEC command. Check that the output displays the interface options you configured.

```
Switch# show controllers atm 1/1/0

IF Name:ATM1/1/0, Chip Base Address:A8C08000
Port type:DS3    Port rate:45000 Kbps    Port medium:Coax
Port status:Good Signal    Loopback:None    Flags:8108
TX Led:Traffic Pattern    RX Led:Traffic Pattern TX clock source: network−derived
DS3 Framing Mode: cbit plcp
FERF on AIS is on
FERF on LCD is on (n/a in PLCP mode)
FERF on RED is on
FERF on OOF is on
FERF on LOS is on
LBO:<= 225'
Cell payload scrambling on
........
........
.......
```

Q. What are the commands that can be used to troubleshoot the NLC interface configuration?

A. The commands that you can use to confirm proper configuration of the hardware, software, and interfaces for the Cisco 6400 are listed in the table below. Unless otherwise specified, all of the commands can be used in EXEC mode.

Command	Purpose
show version	Displays the version and type of software installed on the NSP.
show hardware	Displays the type of hardware installed in the Cisco 6400 system.
show atm addresses	Displays the ATM addresses configured

	in the system.
`show atm interface`	Displays ATM−specific information about an ATM interface.
`show atm status`	Displays current information about ATM interfaces and the number of installed connections.
`show atm vc`	Displays the ATM layer connection information about the virtual connections.
`show controller atm`	Displays information about the physical ATM port device.
`more system:running−config`	Displays the running configuration.
`more nvram:startup−config`	Displays the startup configuration.
`ping atm interface atm`	(Privileged EXEC command) Tests connectivity between the NSP and a host.

Q. Does Cisco 6400 support redundancy configuration between two NLCs modules?

A. Yes. You can configure on Cisco 6400 redundancy between two NLCs installed in the chassis. Cisco 6400 uses SONET automatic protection switching (APS) provides a mechanism to support redundant transmission interfaces (circuits) between SONET devices. Automatic switchover from the working (primary) circuit to the protection (secondary) circuit happens when the working circuit fails or degrades. When a node line card (NLC) is configured for redundancy, all ports on that NLC module are automatically configured to operate in redundant mode using SONET automatic protection switching (APS).

Q. What are the different types of redundancy that Cisco 6400 supports for redundant NLCs?

A. There are two types of reduntant configurations that Cisco 6400 supports for redundant NLCs:

1. Redundant Full−Height NLCs:

   For two full−height NLCs to act as a redundant pair, they must be installed in one the following slot pairs:

   ◊ 1 and 2

◊ 3 and 4
◊ 5 and 6
◊ 7 and 8

Note: By default, the NLC in the lower slot number is the working device, and the NLC in the higher slot number is the protection device.

2. Redundant Half−Height NLCs:

   For two half−height NLCs to act as a redundant pair, they must be installed in one of the following slot/subslot pairs:

   ◊ 1/0 and 2/0, or 1/1 and 2/1
   ◊ 3/0 and 4/0, or 3/1 and 4/1
   ◊ 5/0 and 6/0, or 5/1 and 6/1
   ◊ 7/0 and 8/0, or 7/1 and 8/1

   Note: By default, the NLC in the lower slot number is the working device, and the NLC in the higher slot number is the protection device.

Q. What is the SONET APS redundancy mode currently supported on Cisco 6400?

A. The " **linear 1+1 nonreverting unidirectional**" mode, configured by interface configuration mode command **aps mode**, is the only APS mode currently supported on the Cisco 6400.

- 1+1 − There is one working interface and one protection interface, and the same payload from the transmitting end is sent to both the receiving ends. The receiving end decides which interface to use. The line overhead (LOH) bytes (K1 and K2) in the SONET frame indicate both status and action.
- Linear − Back−to−back connection (as opposed to a ring topology), as defined in the Telcordia GR−253−CORE document.
- Unidirectional − Transmit and receive channels are switched independently.
- Nonreverting − Nonreverting channels continue to operate after a failure has been corrected, thus preventing data from flowing back to the working channel.

Note: By default, the NLC in the lower slot number is the working device, and the NLC in the higher slot number is the protection device.

Q. How do I configure redundancy for Cisco 6400 in full−height NLCs and half−height NLCs?

- Configuring Redundancy for Full−Height NLCs:

  To configure redundant full−height NLCs, complete the following steps beginning in global configuration mode:

  1. Enter the redundancy configuration submode:

     ```
     Switch(config)# redundancy
     ```

  2. Configure the two slots as a redundant pair. You need to specify only the first slot of the redundant pair. The second slot is assumed to be the adjacent slot.

     ```
     Switch(config-r)#associate slot slot [slot]
     ```

     For example: the OC−12s in slots 5 and 6 are configured for redundancy:

```
!
redundancy
associate slot 5 6
!
```

Note: By default, the NLC in the lower slot number is the working device, and the NLC in the higher slot number is the protection device.

3. Enable SONET APS on the protected NLC interface ports. In Cisco 6400, a pair of redundant ports is represented as a single interface. APS commands are accepted only for an interface that represents a pair of redundant ports. For APS operation, the APS mode must be specified for each interface associated with a redundant pair of ports. To enable SONET APS, complete the following steps beginning in global configuration mode:

   · Specifies the interface (that represents a pair of redundant NLC ports).

   ```
   Switch(config)#interface atm slot/subslot/port
   ```

   · Enables SONET APS on the interface.

   ```
   Switch(config-if)#aps mode linear 1+1 nonreverting unidirectiona
   ```

   Note: SONET APS is enabled by default when you install an NLC in a slot already configured for redundancy.

   If the redundant NLC configuration is disabled by using the **no associate slot** redundancy configuration commands, two interface configuration sections are created, one for each port, but all of the APS configuration commands are removed.

♦ Configuring Redundancy for Half−Height NLCs:

To configure redundant half−height NLCs, complete the following steps beginning in global configuration mode:

1. Enters the redundancy configuration submode.

   ```
   Switch(config)# redundancy
   ```

2. Configures the two subslots as a redundant pair. You need only specify the first subslot of the redundant pair. The second subslot is assumed to be the adjacent slot.

   ```
   Switch(config-r)#associate subslot slot/subslot [slot/subslot]
   ```

   For example, the OC−3s in subslots 3/0 and 4/0 are configured as a redundant pair

   ```
   !
   redundancy
   associate subslot 3/0 4/0
   !
   ```

   Note: By default, the NLC in the lower slot number is the working device, and the NLC in the higher slot number is the protection device.

3. Enable SONET APS on the protected NLC interface ports. In Cisco 6400, a pair of redundant ports is represented as a single interface. APS commands are accepted only for an interface that represents a pair of redundant ports. For APS operation, the APS mode must be specified for each interface

associated with a redundant pair of ports. To enable SONET APS, complete the following steps beginning in global configuration mode:

- Specifies the interface (that represents a pair of redundant NLC ports).

```
Switch(config)#interface atm slot/subslot/port
```

- Enables SONET APS on the interface.

```
Switch(config-if)#aps mode linear 1+1 nonreverting unidirectiona
```

Note: SONET APS is enabled by default when you install an NLC in a slot already configured for redundancy.

If the redundant NLC configuration is disabled by using the **no associate subslot** redundancy configuration commands, two interface configuration sections are created, one for each port, but all of the APS configuration commands are removed.

Example: Disabling Redundancy and SONET APS:

Redundancy On	After Redundancy is Turned Off
! redundancy associate slot 1 2 ! interface ATM1/0/0 no ip address no ip redirects no ip proxy-arp no atm auto-configuration no atm ilmi-keepalive atm uni version 4.0 aps mode linear 1+1 nonreverting unidirectional aps signal-fail BER threshold 3 !	! interface ATM1/0/0 no ip address no ip redirects no ip proxy-arp no atm auto-configuration no atm ilmi-keepalive atm uni version 4.0 ! interface ATM2/0/0 no ip address no ip redirects no ip proxy-arp no atm auto-configuration no atm ilmi-keepalive atm uni version 4.0 !

Q. How do I verify SONET APS operation for redundant NLC configuration?

A. To verify the that SONET APS is enabled or to determine if a switchover has occurred, use the **show aps** EXEC command or the **show controller atm** *slot/subslot/port* command.

In the following example, slot 7 contains the working (primary) card, and slot 8 contains the protection (secondary) card:

```
Switch# show aps

ATM7/0/0: APS Lin NR Uni, Failure channel: Protection
          Active Channel: CHANNEL7/0/0, Channel stat: Good
          Port stat (w,p): (Good, Good)
ATM7/0/1: APS Lin NR Uni, Failure channel: Protection
          Active Channel: CHANNEL7/0/1, Channel stat: Good
          Port stat (w,p): (Good, Good)
```

In the following example, the OC−3 interface ATM 5/0/0 is not configured for redundancy:

```
Switch# show controller atm 5/0/0
 ...
Redundancy NOT Enabled on interface
IF Name: ATM5/0/0    Chip Base Address(es): A8B08000, 0 Port type: OC3    Port rate:
Mbps    Port medium: SM Fiber
Port status:Good Signal    Loopback:None    Flags:8308
TX Led: Traffic Pattern    RX Led: Traffic Pattern  TX clock source:  network-derive
Framing mode:  sts-3c
Cell payload scrambling on
Sts-stream scrambling on
...
...
```

Q. Can I force a manual switchover between two ports configured in SONET APS redundant mode?

A. Yes. On Cisco 6400, you can force a switchover between two ports configured in SONET APS redundant mode using SONET APS priority requests. APS priority requests are used to manually control the relationship between two APS ports from the EXEC mode. The APS priority levels, lockout (APS priority level 1), force (APS priority level 2), and manual (APS priority level 5) are defined in the Telcordia GR−253−CORE document. To set the APS priority requests, use the following commands in EXEC mode:

Command	Purpose
Switch# **aps lockout atm** *slot/subslot/port*	APS priority level 1 request. Prevents a working interface from switching to a protection interface.
Switch# **aps force atm** *slot/subslot/port* from [**protection** | **working**]	APS priority level 2 request. Manually forces the specified interface to the protection or working interface, unless a request of equal or higher priority is in effect. Use the **working** option to force operation from the working channel to the protection channel. Use the **protection** option to force operation from the protection channel to the working channel.
Switch# **aps manual atm** *slot/subslot/port* from [**protection** | **working**]	APS priority level 5 request. Manually switches an interface to the protection or working interface, unless a request of equal or higher priority is in effect. Use the **working** option to manually switch operation from the working channel to the protection channel. Use the **protection** option to manually switch operation from the protection channel to the working channel.

Switch# **aps clear atm** *slot/subslot/port*	Manually clears all posted APS priority requests created by any of the APS priority commands.

Related Information

- Cisco 6400 Carrier−Class Broadband Aggregator
- Cisco 6400 Feature Guide
- Error Messages on the Cisco 6400 UAC:Descriptions and Resolutions
- Cisco 6400 Universal Access Concentrator Frequently Asked Questions
- Cisco 6400 Node Route Processor Frequently Asked Questions
- Cisco 6400 Node Switch Processor Frequently Asked Questions
- Cisco 6400 Carrier−Class Broadband Aggregator Release Notes
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