ION System x4120

Command Line Interface (CLI)

Reference

33552 Rev. B

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ION System x4120 Command Line Interface (CLI) Reference 33552 Rev. B

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Revision History

Rev	Date	Description
A	07/09/13	Initial release for v 1.2.3.
B	6/8/18	Update for FW v 1.2.6 with support for management and FW upgrade of a C4120 when installed in an unmanaged ION chassis and contact info. Update for FW v 2.0.1 and Boot-loader v 0.1.5 with Slot ID and TLPT fixes.

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Tables

General

This manual describes the USB and Telnet command line interface (CLI) commands available for ION x4120 operation in an ION System chassis. This manual is for experienced network administrators who are responsible for configuring and maintaining the ION system.

CLI offers the most comprehensive set of management features. CLI is used during the initial setup, configuration, and troubleshooting, but can also be used for day-to-day management (device management, firmware upgrades, managing security features, etc.).

This manual documents the following models:

- **C4120-1040** 10GBase-T to 10GE Fiber Converter (ION Chassis Card)
- **S4120-1040** 10GBase-T to 10GE Fiber Converter (Stand-alone NID)

CLI commands are case sensitive. Enter the CLI commands as shown in this document.

In order to execute the commands described in this manual, you must press the **Enter** key after the command has been entered.

Documentation Conventions

The conventions used within this manual for commands/input entries are described in the table below.

Table 1: Documentation Conventions

Convention	Meaning
Boldface text	Indicates the entry must be made as shown. For example: **ipaddr=<**addr> In the above, only **ipaddr=** must be entered exactly as you see it, including the equal sign (=).
< >	Arrow brackets indicate a value that must be supplied by you. Do not enter the symbols < >. For example: **ipaddr=<**addr> In place of <addr> you must enter a valid IP address.
[ ]	Indicates an optional keyword or parameter. For example: **go** [**s=**<xx>] In the above, **go** must be entered, but **s=** does not have to be.
{ } |	Indicates that a choice must be made between the items shown in the braces. The choices are separated by the | symbol. For example: **state=**{**enable** | **disable**} Enter **state=enable** or state=**disable**.
" "	Indicates that the parameter must be entered in quotes. For example: **time=**<"value"> Enter **time="20100115 13:15:00"**.
>	Indicates a selection string. For example: Select **File>Save**. This means to first select/click **File** then select/click **Save**.

Related Manuals

A printed documentation card is shipped with each x61xx device. Context-sensitive Help screens, as well as cursor-over-help (COH) facilities are built into the Web interface. A substantial set of technical documents, white papers, case studies, etc. are available on the Transition Networks web site at https://www.transition.com/. Note that this manual provides links to third part web sites for which Transition Networks is not responsible. Other ION system and related device manuals are listed below.

- Product Documentation Postcard, 33504
- ION C4120 Install Guide, 33549
- ION S4120 Install Guide , 33550
- ION X4120 Web User Guide, 33551
- ION X4120 CLI Reference, 33552 (this manual)
- Local Management of Cards in a Remote Un-managed Chassis
- Focal Point™ 3.0 Management Application User Guide, 33293
- ION Management Module (IONMM) User Guide, 33457 and Install Guide, 33420
- SFP manuals (product specific)
- ION System NID User Guides (33432, 33457, 33472, 33493, 33494, 33495, 33496)
- Release Notes (firmware version specific)

Note: This manual may provide links to third part web sites for which Transition Networks is not responsible. Information in this document is subject to change without notice. All information was deemed accurate and complete at the time of publication. This manual documents the latest software/firmware version. While all screen examples may not display the latest version number, all of the descriptions and procedures reflect the latest software/firmware version, noted in the Revision History on page 2.

Reboot and Reset Command Notes

IMPORTANT

⚠️ Certain CLI commands affect important stored files. Doing a reboot, restart or upgrade of the IONMM, a power restart of the chassis, or a reset to factory removes temporary files (e.g. configuration backup files, Syslog file). A Factory Reset also removes the permanent settings (e.g. configuration files, HTTPS certification file, SSH key).

These CLI commands cause a loss of files:

- **reboot** - cold start the x4120

- **reset** - reset to factory configuration

See the specific command description for additional information.

Command Line Editing

This section describes how to enter CLI commands.

A CLI command is a series of keywords and arguments. Keywords identify a command, and arguments specify configuration parameters.

Display Similar Commands

At the command line, you can use the $\boxed{\text{Tab} \hookleftarrow}$ key or the **?** key to show available commands in a category of commands after entering a part of the command.

For example, use the $\boxed{\text{Tab} \hookleftarrow}$ key to enter part of the command (**show ether** in this example) to display all of the available commands that start with **show ether**. The commands display in a single row.

```
C1|S7|L1D>show ether <tab key>
config     loopback   security   statistics  tdr
```

Use the **?** key after a partial CLI command entry to display all of the available commands that start with **show ether**, but in a single column:

```
Agent III C1|S17|L1D>show ether ?
  config
  loopback
  security
  statistics
  tdr
Agent III C1|S17|L1D>
```

Partial Keyword Lookup

If you terminate a partial keyword with a question mark, alternatives that match the initial letters are provided. (Remember to not leave a space between the command and question mark.) For example "**s?**" shows all the keywords starting with "**s**."

Recall Commands

To recall recently-entered commands from the command history, perform one of the optional actions below:

Ctrl-P or **Up arrow** (↑) key: Recall commands in the history buffer, beginning with the most recent command. Repeat the key sequence to recall successively older commands.

Ctrl-N or **Down arrow** (↓) key: Return to more recent commands in the history buffer after recalling commands with Ctrl-P or the Up arrow key. Repeat the key sequence to recall successively more recent commands.

Keystroke Commands

The table below shows the optional keystrokes available to edit command lines (*indicates HyperTerm support, ** indicates command prompt support, *** indicates both HT and command prompt support by this keystroke).

Table 2: Editing Commands

Capability	Keystroke	Purpose
Move the command line around to make changes or corrections	Ctrl-B *** or left (←) arrow key ***	Move the cursor back one character
	Ctrl-F *** or right (→) arrow key ***	Move the cursor forward one character
	Ctrl-A ***	Move the cursor to the beginning of the command line
	Ctrl-E ***	Move the cursor to the end of the command line
Recall commands from the buffer and paste them in the command line	Ctrl-Y ***	Recall the most recent entry in the buffer
	Ctrl-T **	Transpose the character to the left of the cursor with the character located at the cursor
	Ctrl-Y **	Recall the most recent entry in the buffer
Delete entries (if you make a mistake or change your mind)	Delete key *** or Backspace key ***	Erase the character to the left of the cursor
	Ctrl-D ***	Delete the character at the cursor
	Ctrl-K ***	Delete all characters from the cursor to the end of the command line
	Ctrl-U *** or Ctrl-X ***	Delete all characters from the cursor to the beginning of the command line
	Ctrl-W ***	Delete the word to the left of the cursor
	Esc D **	Delete from the cursor to the end of the word
Capitalize or lowercase words or capitalize a set of letters	Esc C *	Change case from capital to lower-case (or lower-case to capital) at the cursor
Redisplay the current command line if the switch unexpectedly sends a message to your screen	Ctrl-L *** or Ctrl-R ***	Redisplay the current command line (reverse-i-search)

System Commands

The following are basic system level commands. These commands are used to show configuration / mode, show help, reboot the system, reset the configuration, and other basic functions.

Password for Login / Access

Syntax: Password: **private**

Description: The default device CLI password. CLI entry requires a successful password entry.

Example:
```
login: ION
Password:
Hello, this is ION command line (version 1.00).
Copyright 2009 Transition Networks.

Agent III C1|S1|L1D>
```

In order to control the NIDs via a USB interface, the command line prompt must be showing the location of the module to be managed. Use the procedure below to access the NID and login via USB connection.

1. Start the terminal emulator program (e.g., HyperTerminal).

2. When the emulator screen displays, press **Enter**. The login prompt displays. If your system uses a security protocol (e.g., RADIUS, SSH, etc.), you must enter the login and password required by that protocol.

3. Type **ION** (all upper case) and press **Enter**. The password prompt displays. If a "Login incorrect" message displays, ignore it.

4. Type your password. The default is **private** (all lower case).

5. Press **Enter**. The HyperTerminal command line prompt displays (Agent III C1|S0|L1D>).

6. Enter CLI commands to set up, configure, operate, and maintain the NID.

Log Out (Quit)

Syntax :   **q**(uit)

Description: Exit the current mode and return to the previous mode (i.e., the CLI command line prompt).

Example :
```
Agent III C1|S17|L1D>q
login:
```

Note: The NID does not automatically log out upon exit or after a timeout period, which could leave it vulnerable if left unattended. Follow your organizational policy on when to log out.

Clear the Screen

Syntax: **cls**

Description: Clears the screen and returns to the location of the IONMM card.

Go Back to IONMM

Syntax: **home**

Description: Sets the command prompt back to the location of the IONMM card.

Example: If the IONMM card is in chassis 1/slot 1 (c=1 s=1) and the command prompt was at
                 c=1 s=17 l1d and then you entered the following command:

```
Agent III C1|S17|L1D>home
```

the new command line prompt would be:

```
Agent III C1|S1|L1D>
```

Go to Another Location

Syntax: go [c=<0-16>] [s=<0-32>] [l1ap=<1-15>] [l2ap=<1-15>] (l1p=<1-5>|l2p=<1-15>|l3p=<1-15>|l1d|l2d|l3d)

Description: Defines the location (card or port) where subsequent commands are destined for. This information will appear on the command prompt line as the location where the command will be executed.

where:

c   =   Chassis number (1–16) of the chassis where the card/port is located.

s   =   Slot number (1–32) of the slot in the chassis where the card/port is located.
          Note: if the chassis parameter (c=) is specified you must specify a slot number.

l1ap =   Port number (1–16) on a level 1 device that is used to attach to a level 1 device.

[l2ap   =   Port number (1–16) on a level 2 device that is used to attach to a level 2 device.

zz   =   mandatory; specifies the port or device where subsequent commands are destined for. Valid choice are:

l1d – indicates the level 1 device to which subsequent commands are destined.

l1p=<port#> – port number (1–16) on a level 1 device.

l2d – indicates the level 2 device.

l2p=<port#> – port number (1–16) on a level 2 device.

l3d – indicates the level 3 device.

l3p=<port#> – port number (1–16) on a level 3device.

Usage: `go [c=CHASSIS] [s=SLOT] [l1ap=PORT] [l2ap=PORT] (l1p=PORT|l2p=PORT|l3p=PORT|l1d|l2d|l3d)`

Example 1:   The following command would cause all subsequent commands to be executed for the device in slot 5 of chassis 1.

```
C1|S1|L1D>go s=5 l1d
```

The new command prompt would be:

```
C1|S5|L1D>
```

Example 2:   The following would cause all subsequent commands to be executed for port 2 on
the device in slot 5.

```
C1|S5|L1D>go l1p=2
```

The new command prompt would be:

```
C1|S5|L1P2>
```

Example 3:   The following would cause all subsequent commands to be executed for a remote
device connected to port 2 of a chassis-resident module in slot 5.

```
C1|S5|L1D>go l1ap=2 l2d
```

The new command prompt would be:

```
C1|S5|L1AP2|L2D>
```

Help

Syntax: **?**

Description: Display help for CLI commands by typing a question mark (**?**). Typing a **?** at the
command line prompt displays a list of base commands (show, set, etc.).
To display a list of the options for a particular command or parameter, type the
command/parameter then a space and then **?**. See "Appendix A" on page 113 for a
complete **list** command listing.

Examples:
The following will display a list of all base commands.

```
C1|S2|L1D>?
```

While the following will display a list of all the entries for the **set** commands that start with the letter "l".

```
C1|S15|L1P1>set l ?
  l2cp
  loam
  lpt
```

The following displays a list of all the entries for the **set lpt** commands:

```
C1|S15|L1P1>set lpt ?
  monitor-port
   state
```

The following displays a list of the valid values for the **set lpt state** command:

```
C1|S15|L1P1>set lpt state ?
  disable
  enable
  notSupported
C1|S15|L1P1>
```

By typing a ? after each parameter in a command string you can see what are the options, either for
what the next parameter is or for what options must be specified following an equal sign.

List

Syntax: **list**

Description: Displays all available command line commands.

Example (partial list):

```
Agent III C1|S17|L1D>list
cat [OPTION] [FILE]
cd [DIR]
clear ether all counters
cls
go [c=CHASSIS] [s=SLOT] [l1ap=PORT] [l2ap=PORT] (l1p=PORT|l2p=PORT|l3p=PORT|l1d|l2d|l3d)
home
list
ls [OPTION] [FILES]
:               :           :           :           :           :
show usb-port state
show vlan-db config
start ether tdr test
start https certificate
stat
tftp get iptype=(ipv4|ipv6|dns) ipaddr=ADDR remotefile=RFILE [localfile=LFILE]
tftp put iptype=(ipv4|ipv6|dns) ipaddr=ADDR localfile=LFILE [remotefile=RFILE]
tftp upgrade iptype=(ipv4|ipv6|dns) ipaddr=ADDR remotefile=RFILE
update firmware-db file=FILENAME
upgrade module
Agent III C1|S17|L1D>
```

Note: See "Appendix A" on page 113 for a complete **list** command listing.

Process Snapshot

Syntax: ps

Description: Displays a snapshot of the current memory processes. For example:

```
Agent III C1|S17|L1D>ps
  PID  Uid      VmSize Stat Command
    1 root         312 S   init
    2 root             SWN [ksoftirqd/0]
    3 root             SW  [watchdog/0]
    4 root             SW< [events/0]
    5 root             SW< [khelper]
    6 root             SW< [kthread]
   37 root             SW< [kblockd/0]
   40 root             SW< [khubd]
   56 root             SW< [aio/0]
  651 root             SW  [mtdblockd]
  681 root             SW< [spi_gpio.0]
  695 root             SWN [jffs2_gcd_mtd4]
  700 root             SWN [jffs2_gcd_mtd7]
  723 root         300 S   upgradeManager -d -l 1
  733 root         244 S < bpd_linux
  734 root        1716 S   snmpd -Lsd -c /etc/snmpd.conf
  739 root         240 S   pure-ftpd (SERVER)
  742 root        1336 S   entityManager -Lsd
  744 root        2676 S   subagent
  745 root         244 S   xxdp
  746 root         240 S   agent_pm
  748 root        2676 S   subagent
  788 root         356 S   radiuscd 0
  803 root         284 S   sntpcd
  821 root         968 S   lighttpd -f /etc/lighttpd.conf
  830 root         176 S   telnetd -p 17800
  834 root         232 S   telnetd -l /usr/local/bin/a3cli
  837 root        2676 S   subagent
  851 root         268 S N monitor /usr/local/bin/taskmonitor.conf /agent3/conf/
  857 root         224 S   init
  859 root         280 S   syslogd -m 0 -L -O /var/log/sys.log -l 6 -s 200 -b 1
  861 root        2676 S   subagent
  868 root         460 S   tacplus
13054 root        2572 S   /usr/local/bin/a3cli --
14430 root         304 S   sh -c ps
14431 root         284 R   ps
Agent III C1|S17|L1D>
```

Show Current Directory

Syntax: **pwd**

Description: Displays the current directory.

Example:
```
Agent III C1|S17|L1D>pwd
/
Agent III C1|S17|L1D>
```

Change Modes (Quit)

Syntax :   **quit**

Description: Exit the current mode and return to the previous mode (i.e., the CLI command line prompt). Note that the X4120 does not automatically log out upon exit or after a timeout   period, which could leave it vulnerable if left unattended. Follow your organizational   policy on when to log out.

Example:
```
Agent III C1|S17|L1D>quit
login:
```

Reboot

Syntax: **reboot**

Description: Performs a reboot ("Cold start the system") of the device in the command line prompt. After a X4120 reboot via CLI while connected via USB port, you must disconnect and then reconnect USB cable for the console to become accessible again.

Example:
```
Agent III C1|S17|L1D>reboot
Warning: this command will restart system, connection will be lost and
please login again!
Agent III C1|S17|L1D>
```

⚠ **Warning:** doing a reboot or restart of the X4120 may cause some configuration backup files to be lost and the USB or Telnet session to drop. Doing a reboot, restart or upgrade of the IONMM, a power restart of the chassis, or a reset to factory removes temporary files (e.g. configuration backup files, Syslog file). A Factory Reset also removes the permanent settings (e.g. configuration files, HTTPS certification file, SSH key).

Reset Factory Configuration

Syntax: **reset factory**

Description: Resets a card to its factory default configuration.

Example: Agent III C1|S17|L1D>**reset factory**
               Warning: this command will restart the specified card, connection will
               be lost!
               Agent III C1|S17|L1D>

⚠️ **Warning:** doing a x4120 reset to factory restarts the device and drops the Telnet or HyperTerminal connection. Doing a reset to factory removes temporary files (e.g. configuration backup files, Syslog file) and also removes the permanent settings (e.g. configuration files, HTTPS certification file, SSH key).

Reset Device Uptime

Syntax: **reset uptime**

Description: Resets the x4120 Up Time counter to zero, and immediately begins to increment.

Example: Agent III C1|S17|L1D>**reset uptime**
               Agent III C1|S17|L1D>

Use the **show card info** command to display the current system uptime.

Note: the reset uptime command is not available for the Power Supply modules.

Show Card Information

Syntax: **show card info**

Description: Displays the system information for the IONMM or slide-in module.

Example: (C4120 in slot 17):

```
Agent III C1|S17|L1D>show card info
System name:        C4120
Uptime:             05:47:09
MAC:                00-c0-f2-00-d1-14
Port number:        2
Serial number:      12001
Config mode:        hardware
Software:           1.2.3
Bootloader:         0.1.2
Hardware:           1.0.0
Agent III C1|S17|L1D>
```

Note: This command does not function for the Power Supply.

Show Card Type

Syntax: **show cardtype**

Description: Displays the device's card type (model number).

Example: (C4120 in slot 17):

```
Agent III C1|S17|L1D>show cardtype
Card type:                    S4120-1040
Agent III C1|S17|L1D>
```

Show Chassis Information

Syntax: **stat**

Description: Displays information about all slide-in modules installed in the chassis and all standalone
                 modules connected to the slide-in modules (remotes), and their ports.

```
Example:       Agent III C1|S1|L1D>stat
ION statck
       Chassis -- BPC
              [  1]  IONMM
                       Port 1
                       Port 2
              [ 17]  S4120-1040
                       Port 1
                       Port 2
              [ 22]  IONPS-A
                       Temperature Sensor
                       Voltage Sensor
                       Power Sensor
                       Fan-1
                       Fan-2
              [ 23]  IONPS-D
                       Temperature Sensor
                       Voltage Sensor
                       Power Sensor
                       Fan-1
                       Fan-2
Agent III C1|S1|L1D>
```

Set Circuit ID

Syntax: **set circuit-ID**=<xx>

Description: Lets you define an ASCII text string up to 63 bytes and override the default Circuit ID, which is *vlan-module-port* in binary format, for a device and/or device ports. Use the **show circuit-ID** command to display the Circuit ID information for a device or port.

Example:
```
Agent III C1|S17|L1P1>set circuit XX/YYYY/000000/111/CC/SEG
Agent III C1|S17|L1P1>show circuit-ID
Circuit-ID:         XX/YYYY/000000/111/CC/SEG
Agent III C1|S17|L1P1>
```

Note: the dash ("**-**") is required, and the letters "ID" must be upper-case. The x4120 supports the Circuit ID, a company-specific identifier assigned by the user to identify the converter and individual ports in any manner the user chooses. In the ION system, the Circuit ID port identifier is based on the agent-local identifier of the circuit (defined in RFC 3046), detected by the agent and associated with a particular port.

Show Circuit ID

Syntax: **show circuit-ID**

Description: Displays the current Circuit ID for the device or port. Use the **show circuit-ID** command to display the current Circuit ID information defined for a device or port.

Example:
```
Agent III C1|S17|L1P1>set circuit XX/YYYY/000000/111/CC/SEG
Agent III C1|S17|L1P1>show circuit-ID
Circuit-ID:         XX/YYYY/000000/111/CC/SEG
Agent III C1|S17|L1P1>
```

Note: the dash ("**-**") is required, and the letters "ID" must be upper-case (in capital letters).

Set Device Description

Syntax: **set device description**=<xx>

Description: Lets you configure an ASCII text string up to 63 bytes and override the default
                     information, which is *vlan-module-port* in binary format.

Example:

```
Agent III C1|S17|L1D>set device description
  CIRCUIT
Agent III C1|S17|L1D>set device description D-CIRCUIT
Agent III C1|S17|L1D>show device description
Device description: D-CIRCUIT
Agent III C1|S17|L1D>
```

Show Device Description

Syntax: **show device description**

Description: Displays the currently-configure ASCII text string up to 63 bytes and override the default
                     information, which is *vlan-module-port* in binary format.

Example:

```
Agent III C1|S17|L1D>set device description
  CIRCUIT
Agent III C1|S17|L1D>set device description D-CIRCUIT
Agent III C1|S17|L1D>show device description
Device description: D-CIRCUIT
Agent III C1|S17|L1D>
```

Set Debug Level

Syntax: **set dbg level=<0-2>**

where:

0 = debug Severity level 0 (Emergency: system is unusable – e.g., serious hardware failure or imminent power failure).
1 = debug Severity level 1 (Alert: action must be taken immediately).
2 = debug Severity level 2 (Critical condition).

Description: Defines the system debug level.

Example:
```
Agent III C1|S17|L1D>set dbg level 1
Agent III C1|S17|L1D>set dbg level 2
Agent III C1|S17|L1D>set dbg level 3
% Parameter value is out of range.
Agent III C1|S17|L1D>set dbg level 0
Agent III C1|S17|L1D>
```

Backup

Syntax: **set backup module-index** <module-index> < config-file>

Description: Back up the specified provision module(s), where:
        module-index = the module number to be backed up (1-255).
        config-file   = the filename of the backup file (*xxxxx.config* format).

Example:

```
Agent III C1|S17|L1D>set backup module-index 1 config-file 1-3-S4120-1040.config
Error: this command should be executed on IONMM or a standalone SIC!
Agent III C1|S17|L1D>
```

Messages:
Error: cannot get backplane stack name!
Error: Cannot set device description on this device!
Error: Failed to set device description on this device.

Note that you can change the ION stack name and display in the FP3.0.
The default ION backup filename is 'Stack name + current BU file name.config' (on IONMM screen).

Restore

Syntax: **set restore** <module-index> < config-file>

Description: Restore the specified provision module(s), where:
        module-index = the module number to be restored (1-255).
        config-file   = the filename of the restore file (*xxxxx.config* format).

Example:

```
Agent III C1|S17|L1D>set restore module-index 1 config-file 1-3-C4120-1040.config
Error: this command should be executed on IONMM or a standalone SIC!
Agent III C1|S17|L1D>
```

Refresh

Syntax: **refresh provision configure** <filename>

Description: Refresh the backup and restore config file name, where

Example:

```
Agent III C1|S17|L1D>refresh provision configure filename ?
  <cr>
Agent III C1|S17|L1D>refresh provision configure filename 1.config
% Unknown command.
Agent III C1|S17|L1D>
Agent III C1|S17|L1D>set restore module-index 1 config-file 1.txt
Error: this command should be executed on IONMM or a standalone SIC!
Agent III C1|S17|L1D>
```

DMI Commands

The following commands are used for Diagnostic Monitoring Interface (DMI) operations.

Note: These commands can only be entered for a fiber port that supports DMI. Not all x4120 models or SFP models support DMI. The SFP models that support DMI have a "D" at the end of the model number. If you enter a DMI command on a x4120 model that does not support DMI, the message "*The DMI feature is not supported on current port.*" displays.

Show DMI Configuration

Syntax: **show dmi info**

Description: Displays the configuration of the Diagnostic Monitoring Interface (DMI).

Example:

```
Agent III C1|S17|L1P1>show dmi info
Error: DMI is only supported on FIBER port!
Agent III C1|S17|L1P1>go c=1 s=17 l1p=2
Agent III C1|S17|L1P2>show dmi info
Diagnostic monitoring interface information:
----------------------------------------------------------------------
DMI connector type:                             LC
DMI indentifier:                                SFP
DMI Nominal bit rate:                           10500*Mbps
DMI 9/125u Singlemode Fiber (m):                N/A
DMI 50/125u Multimode Fiber (m):                80*m
DMI 62.5/125u Multimode Fiber (m):              3*10m
Copper(m):                                      N/A
DMI fiber interface wavelength:                 850*nm
DMI temperature:                                42.5*C
DMI temperature:                                108.5*F
DMI temperature alarm:                          normal
DMI transmit bias current:                      6256*uA
DMI transmit bais alarm:                        normal
DMI Transmit power:                             592*uW
DMI Transmit power:                             -2.277*dBM
DMI Transmit power alarm:                        normal
DMI Receive power:                              573*uW
DMI Receive power:                              -2.418*dBM
DMI Receive power alarm:                         normal
DMI Receive power intrusion threshold:          0*uW
Agent III C1|S17|L1P2>
```

Set DMI Receive Power Preset Level

Syntax: **set dmi rx–power–preset–level=**<xx>

Description: Defines the lowAlarm threshold for RxPowerAlarm. If a non-zero value (in microwatts) is specified, the module will stop passing traffic when the receive power drops below the new threshold. This feature is sometimes referred to as Intrusion Detection, since tapping into a fiber to intercept traffic leads to a reduction in receive power.

Sets the Diagnostic Monitoring Interface (DMI) receive preset power level.

where:

xx = Pwr-val: A preset level for Rx Power on the Fiber port (1-100).

Example:

```
Agent III C1|S17|L1P2>set dmi rx-power-preset-level=110
Agent III C1|S17|L1P2>show dmi info
Diagnostic monitoring interface information:
----------------------------------------------------------------------
DMI connector type:                               LC
DMI indentifier:                                  SFP
DMI Nominal bit rate:                             10500*Mbps
DMI 9/125u Singlemode Fiber (m):                  N/A
DMI 50/125u Multimode Fiber (m):                  80*m
DMI 62.5/125u Multimode Fiber (m):                3*10m
Copper(m):                                        N/A
DMI fiber interface wavelength:                   850*nm
DMI temperature:                                  42.2*C
DMI temperature:                                  108.0*F
DMI temperature alarm:                            normal
DMI transmit bias current:                        6320*uA
DMI transmit bais alarm:                          normal
DMI Transmit power:                               588*uW
DMI Transmit power:                               -2.306*dBM
DMI Transmit power alarm:                         normal
DMI Receive power:                                572*uW
DMI Receive power:                                -2.426*dBM
DMI Receive power alarm:                          normal
DMI Receive power intrusion threshold:            110*uW
Agent III C1|S17|L1P2>

Agent III C1|S17|L1P2>set dmi rx-power-preset-level=110
Error: This card is in hardware mode and no setting allowed!
Agent III C1|S17|L1P2>
```

Ethernet Port Commands

The following commands are used for Ethernet port operations. The functions of some of the Ethernet port commands below depend on the type of port, as shown in the "Port Type" column in the table below.

Note: These commands can only be entered at the port level - when the last part of the command line prompt indicates the location is a port (e.g., L1P1>). In the table below, an asterisk * indicates Read only (ON) capability.

Set Ethernet Port Admin Status

Syntax: **set ether admin state={up | down}**

Description: Specifies whether or not the Ethernet port is available for use.

```
Example:     Agent III C1|S17|L1D>set ether admin state up
Error: this command should be executed on a port!
Agent III C1|S17|L1D>go l1p=1
Agent III C1|S17|L1P1>set ether admin state up
Agent III C1|S17|L1P1>go l1p=2
Agent III C1|S17|L1P2>set ether admin state up
Agent III C1|S17|L1P2>
```

Note: Use the **show ether config** command to show the current Link operation status.

Show Ethernet Port *AutoCross*

Syntax: **set ether autocross=<xx>**

Description: Defines whether the cabling for this Ethernet port is cross-over or straight through, or
                 whether the system will automatically adjust as needed. Transition Networks
                 recommends leaving AutoCross in default mode (auto).

                 where:

                 xx = **auto** – automatically correct errors in cable selection (default – recommended)

```
Example:
Agent III C1|S17|L1P2>set ether autocross auto
Error: Cannot set autocross on Fiber port!
Agent III C1|S17|L1P2>go l1p=1
Agent III C1|S17|L1P1>set ether autocross auto
Agent III C1|S17|L1P1>show ether config
Port-11040
TP port:
------------------------------------------------------------------------------
Link operation status:      down
Admin status:               up
Port mode:                  RJ-45
PHY operation mode:         phy10GBaseT
Speed:                      10G
Duplex:                     full
Autocross:                  auto

AutoNeg admin state:        enable
Agent III C1|S17|L1P1>
```

Note: This command is only applicable on a copper port (port 1).

Use the **show ether config** command to display the current auto-negotiation state.

Show Ethernet Port Configuration

Syntax: **show ether config**

Description: Displays the Ethernet port configurations on a slide-in module. Different ports capabilities vary, so the display content will vary according to the model and port type.

Example 1:   A <u>TP Port</u> (copper port) example is shown below.

```
Agent III C1|S17|L1P1>show ether config
Port-11040
TP port:
--------------------------------------------------------------------------------
Link operation status:        down
Admin status:                 up
Port mode:                    RJ-45
PHY operation mode:           phy10GBaseT
Speed:                        10G
Duplex:                       full
Autocross:                    auto

AutoNeg admin state:          enable
Agent III C1|S17|L1P1>
```

Example 2:   A <u>Fiber port</u> example is shown below.

```
Agent III C1|S17|L1P1>go l1p=2
Agent III C1|S17|L1P2>show ether config
Port-21040
FIBER port:
--------------------------------------------------------------------------------
Link operation status:        down
Admin status:                 up
Port mode:                    SFP Slot
PHY operation mode:           phy10GBaseAuto
Speed:                        10G
Duplex:                       full
```

Note: Auto Cross and Auto negotiation are only shown for the copper port.

Set Ethernet Loopback Operation

Syntax: **set ether loopback oper**=(init|stop)

Description: Starts or stops the x4120 PHY Layer loopback test.

Example:

```
Agent III C1|S17|L1D>set ether loop oper init
Error: this command should be executed on a port!
Agent III C1|S17|L1D>go l1p=1
Agent III C1|S17|L1P1>set ether loop oper init
Agent III C1|S17|L1P1>set ether loop oper stop
```

Set Ethernet Loopback Type

Syntax: **set ether loopback type**=(noloopback|phylayer)

Description: Set the type of x4120 Ethernet loopback test to noloopback, phylayer, or remote.

Example:

```
Agent III C1|S17|L1P1>set ether loop type no
Agent III C1|S17|L1P1>set ether loop type phy
Agent III C1|S17|L1P1>set ether loop type remote
Error: Set Ethernet port loopback type failed.
Agent III C1|S17|L1P1>
```

ShowEthernet Loopback State

Syntax: **show ether loopback state**

Description: Show the current x4120 Ethernet loopback test state and type.

Example:

```
Agent III C1|S17|L1P2>show ether loopback state
Loopback type: phylayer
Loopback state: localInLoopback
Agent III C1|S17|L1P2>
```

TLPT Commands

Transparent Link Pass Through (TLPT) is a troubleshooting feature that allows the media converter to monitor both the fiber and copper RX ports for loss of signal. In the event of a loss of RX signal on one media port, the NID will automatically disable the TX signal of the other media port, thus passing through the link loss.

Note: These commands can only be entered at the device level - when the last part of the command line prompt indicates the location is a device (e.g., L1D>).

Note that ION x4120 v 2.0.1 corrected issues with TLTP and Slot # ID.

The following commands are used for Transparent Link Pass Through (TLPT) operations.

Show Link Pass Through Configuration

Syntax: **show lpt config**

Description: Displays the Link Pass Though (LPT) configuration for the slide-in module.

Example:

```
Agent III C1|S0|L1D>show lpt config
Link pass through configuration:
-------------------------------------------------------------
Error: Get link pass through state no such object.
Agent III C1|S0|L1D>


Agent III C1|S17|L1D>show lpt config
Link pass through configuration:
----------------------------------------------------------------------
Link pass through state:             notSupported
Transparent link pass through state:    enable
Selective link pass through state:      notSupported
Link pass through monitor port:         0
Remote fault detect state:           notSupported
Agent III C1|S17|L1D>
```

Set Transparent Link Pass Through State

Syntax: **set transparent lpt state**={enable | disable}

Description: Enables or disables the transparent link pass through function on a slide-in module.

Example:

```
Agent III C1|S17|L1D>set transparent lpt state ?
  disable
  enable
Agent III C1|S17|L1D>set transparent lpt state enable
Agent III C1|S17|L1D>set transparent lpt state disable
Agent III C1|S17|L1D>set transparent lpt state enable
Agent III C1|S17|L1D>
```

Use the **show lpt config** command to display the current link pass through configuration.

TFTP Transfer / Upgrade Commands

TFTP is a simple protocol used to transfer files. A TFTP client needs the IP address entered in one action. The TFTP server can be an IPv4 address, an IPv6 address or a DNS name, but only the latest TFTP IP address or DNS name can be saved. If IPv6 is disabled and the TFTP server address is an IPv6 address, the server can not be used. In this case you must change the TFTP server either to an IPv4 address or a DNS name. The Trivial File Transfer Protocol (TFTP) can be used to transfer files between the IONMM or a standalone local x4120 and a TFTP server. **Note**: A TFTP server must be online and operational. These commands can only be entered when the last part of the command line prompt indicates the location is a device (e.g., L1D>). These commands are only available to Admin level login users.

ION x4120 v 1.2.6 was released August 12, 2016. This release added:

• Support for the management of a C4120 when installed in an unmanaged ION chassis. Management is supported by another C4120 installed in a managed chassis when the two are linked together via a fiber cable. On initial power up, additional time, approximately 1min & 10sec, is now required for the cards to be displayed in the management interface. This time is needed for the cards to determine if they are installed in a managed or an unmanaged chassis.

• Support for remote firmware upgrades of a C4120 in an unmanaged chassis. Remote firmware upgrades in an unmanaged chassis is supported only after a factory bootloader upgrade is performed. Remote firmware upgrades in an unmanaged chassis can take up to 3 minutes to transfer the file, reboot, search for management module, and display card in management interface.

For more information see "*Local Management of Cards in a Remote Un-managed Chassis*".

The following commands are used for TFTP operations.

TFTP Get

Command: **TFTP Get**

Syntax: **tftp get iptype**=(ipv4|ipv6|dns) **ipaddr**=ADDR **remotefile**=**RFILE** [localfile=LFILE]

Description: This command gets (downloads) a file from a TFTP server, <u>where</u>:

iptype = the type of IP addressing to be used (IPv4, IPv6, or DNS).

ipaddr = the TFTP server's IPv4 or IPv6 address. This TFTP server must be configured and running.

remotefile = the name of the remote file to be transferred with a *.bin* suffix.

localfile = the name of the local file when transferred (optional) with a *.bin* suffix.

Example:
```
Agent III C1|S1|L1D>tftp get iptype ?
  ipv4
  ipv6
  dns
Agent III C1|S1|L1D>tftp get iptype ipv4 ipaddr 192.168.1.30 remotefile
x323x_0.8.5_AP.bin
TFTP transferring...
Agent III C1|S1|L1D>
```

```
Usage: tftp get iptype=(ipv4|dns) ipaddr=ADDR remotefile=RFILE [lo-
calfile=LFILE]
```

Example:

```
C1|S3|L1D>tftp get iptype=ipv4 ipaddr=192.168.1.30 remotefile=cert localfile=cert
TFTP transferring...

File transfer successful!

Agent III C1|S0|L1D>tftp get iptype=ipv4 ipaddr=192.168.1.30 remotefile=cert localfile=cert

Error: tftp get: set address type failed.

Agent III C1|S0|L1D>
```

TFTP Put

Command: **TFTP Put**

Syntax: **tftp put iptype**=(ipv4|ipv6|dns) **ipaddr**=ADDR **localfile**=LFILE [**remotefile**=RFILE]

Description: This command puts (uploads) a file to a TFTP server. This server must be configured and running, <u>where</u>:

        iptype = the type of IP addressing to be used (IPv4,IPv6, or DNS).

        ipaddr = the TFTP server's IPv4 or IPv6 address. This TFTP server must be configured and running.

        remotefile = the name of the remote file to be transferred with a *.bin* suffix.

        localfile = the name of the local file when transferred (optional).

Example:
```
Agent III C1|S0|L1D>tftp put iptype ipv4 ipaddr 192.168.1.30 localfile
x323x_0.8.5_AP.bin
Error: tftp put failed.
Agent III C1|S0|L1D>
```

TFTP Upgrade

Command: **TFTP Update**

Syntax: **tftp upgrade iptype**=(ipv4|ipv6|dns) **ipaddr**=ADDR **remotefile**=RFILE

Description: This command gets (downloads) a file from a TFTP server. The TFTP server must be configured and running, <u>where</u>:

        iptype = the type of IP addressing to be used (IPv4,IPv6, or DNS).

        ipaddr = the TFTP server's IP address. This server must be configured and running.

        remotefile = the name of the remote file to be transferred with a *.bin* suffix.

Example:

```
Agent III C1|S0|L1D>tftp upgrade iptype ipv4 ipaddr 192.168.1.30 remotefile IONM
M_0.8.5_AP.bin
Error: tftp get: set address type failed.
Agent III C1|S0|L1D>
```

Prov Get TFTP Server Address

Command: **Set TFTP Server**

Syntax: **prov set tftp svr type**=(ipv4|ipv6|dns) **addr**=ADDR

Description: This command sets the current TFTP server type and address, <u>where</u>:

type = the type of IP addressing (IPv4, IPv6 or DNS).

addr = the TFTP server's IP address (IPv4, IPv6 or DNS server address).

Mode: Global mode

Example:

```
Agent III C1|S0|L1D>prov set tftp svr type ipv4 addr 192.168.1.30
Agent III C1|S0|L1D>
```

Prov Set TFTP Server Type

Syntax: **prov set tftp svr type**=(ipv4|ipv6}dns) **addr**=ADDR

Description:Provision the TFTP Server type and address. Available to an Admin level login user only.

where:

x = type = (ipv4|ipv6|dns)
y = addr = ADDR

Example:

```
Agent III C1|S1|L1P1>prov set tftp svr type ?
  ipv4
  ipv6
  dns
Agent III C1|S1|L1P1>prov set tftp svr type ipv4 addr 192.168.1.10
Agent III C1|S1|L1P1>prov set tftp svr type ipv6 addr e80::2c0:f2ff:fe20:de9e
Agent III C1|S1|L1P1>
```

Recording Model Information and System Information

After performing the troubleshooting procedures, and before calling or emailing Technical Support, please record as much information as possible in order to help the Transition Networks Technical Support Specialist.

1. Select the x4120 **MAIN** tab. (From the CLI, use the commands needed to gather the information requested below. This could include commands such as **stat**, **show card info**, **show slot info**, **show ether config**, or others as request by the TN Support Specialist.

2. Record the **Model Information** for your system.

   Serial Number: _____   Model: _____

   Software Revision: _____   Hardware Revision: _____

   Bootloader Revision: _____

3. Record the **System Configuration** information for your system.

   System Uptime: _____ Configuration Mode: _____

   Number of Ports: _____ MAC Address: _____

   Device Description: _____

4.   Provide additional Model and System information to your Technical Support Specialist. See "Basic ION System Troubleshooting" on page 103.

Your Transition Networks service contract number: _____

A description of the failure: _____

_____

_____

A description of any action(s) already taken to resolve the problem (e.g., changing switch mode, rebooting, etc.): _____

_____

_____

The serial and revision numbers of all involved Transition Networks products in the network:

_____

_____

A description of your network environment (layout, cable type, etc.): _____

_____

_____

Network load and frame size at the time of trouble (if known): _____

The device history (i.e., have you returned the device before, is this a recurring problem, etc.):

_____

_____

Any previous Return Material Authorization (RMA) numbers: _____

Technical Support

Contact Us

Technical Support: Technical support is available 24-hours a day
US and Canada: 1-800-260-1312
International: 00-1-952-941-7600
Main Office
tel: +1.952.941.7600 | toll free: 1.800.526.9267 | fax: 952.941.2322
sales@transition.com | techsupport@transition.com | customerservice@transition.com
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Transition Networks
10900 Red Circle Drive
Minnetonka, MN 55343, U.S.A.
Web: https://www.transition.com

Appendix A: CLI Command Summary

This appendix provides the list of available CLI commands via the help (?) command and the list command. Commands are arranged in alphabetical order. **Note:** CLI commands are case sensitive. Enter the CLI commands in lower case. **Note:** To execute these commands, you must press the Enter key after the command has been entered.

x4120 CLI Commands - *help* Command (*Agent III C1|S17|L1D>?*)

```
Agent III C1|S17|L1D>?
add       Add a ACL condition
cat       Show the content of the FILES
cd        Change to another directory
cls       Clear the screen.
go        set location to device/port of the SIC to be operated.
home      go back to IONMM card
list      Print command list
ls        List the information about the FILES
more      A filter for paging through text one screenful at a time.
prov      Get current TFTP server address.
ps        Report a snapshot of the current processes
pwd       Show current directory
quit      Exit current mode and down to previous mode
refresh   Refresh backup and restore configure file name.
restore   Restore specified provision modules.
send      Initiates the delay measurement for a given MEP (only one DM request sup-
ported at a time per MEP).
serial    transfer file through a serial line.
set       Series of set commands for various purposes.
show      Series of show commands for various purposes.
stat      Show topology information of a chassis.
tftp      Get a file from a TFTP server.
Agent III C1|S17|L1D>
```

Note that other CLI commands display on screen; however, only the CLI commands that apply to the x4120 are listed above.

x4120 CLI Commands - *list* Command (*Agent III C1|S17|L1D>list*)

CLI commands are case sensitive. Enter the CLI commands as shown.

To execute these commands, you must press the **Enter** key after the command has been entered.

Device Level Commands
show card info
set system name=(string)
show circuit-ID
set circuit-ID=(string)
show lpt config
set transparent lpt state=(enable|disable)
reset uptime
reset factory
reboot

Port Level Commands
show ether config
set ether admin state=(up|down)
set ether loopback=(no loopback | phy layer)
show circuit-ID
set circuit-ID=(string)
show dmi info
set dmi rx-power-present-level=(integer)

Note that other CLI commands display on screen; however, only the CLI commands that apply to the x4120 are listed above.

Appendix B: Web Interface vs. CLI Commands

This appendix provides a cross-reference of the functions configurable via the Web interface versus CLI commands.

Web Field	CLI Command
System Level MAIN tab	**System Level Commands**
System Name	set system name
Device Description	set device description show device description
Uptime Reset button	reset uptime
System Reboot button	reboot
Reset to Factory Config	reset factory
Transparent Link Pass Through (TLPT)	set transparent lpt state
Port Level MAIN tab	**Port Level Commands**
Circuit ID	set circuit id show circuit id
Admin Status	set port mgmt access
Loopback Type	set ether loopback type
Start / Stop buttons (in Loopback Management section)	set ether loopback oper
Port Level DMI tab	**Port Level DMI Commands**
The DMI feature is not supported on port 1.	set dmi rx-power-preset-level show dmi info

Appendix C: CLI Messages and Recovery

The following messages may display during CLI operations.

Ambiguous command

A. This message indicates either a) the input for one of the parameters is incorrect, or b) a hyphen is missing between two parts of the command.

1. Verify the CLI command syntax.

2. Retry the operation.

B. You typed part of a valid CLI command and pressed **Enter** before completing the command syntax. For example, if you type

```
C1|S7|L1D>add v
```

and then press the **Enter** key, the message "*% Ambiguous command.*" displays.

1. Type the part of the command that failed (**add v** in the example above), type a question mark (**?**), and the press **Enter**. The valid commands that start with the part of the command you initially entered are displayed.

2. Verify the CLI command syntax.

3. Retry the operation.

C. The system was unable to resolve the desired command based on the portion of the command entered. For example, you entered the following: C1|S7|L1D>set dot1

1. Verify the command syntax.

2. Retry the CLI command syntax. See Appendix A.

3. If the problem persists, contact Technical Support. See Contact Us on page 38.

Cannot get link pass through information on this card

This message indicates that a link pass through (LPT) CLI command was entered for an IONMM. CLI commands for LPT operations are only valid for slide-in modules other than the IONMM.

1. Use the **go** command to change from the IONMM to the specific slide-in module. The **go** command format is:
   go [c=CHASSIS] [s=SLOT] [l1ap=PORT] [l2ap=PORT] (l1p=PORT|l2p=PORT|l3p=PORT|l1d|l2d|l3d)

2. Retry the operation. For a complete list of the available commands, see the ION System CLI Reference Manual, 33473.

3. If the problem persists, contact Technical Support. See Contact Us on page 38.

This message indicates that a port level command was entered for the IONMM but the command is only valid for the other types of slide-in modules.

1. Use the **go** command to change location of where the command operates. The **go** command format is:
   go [c=CHASSIS] [s=SLOT] [l1ap=PORT] [l2ap=PORT] (l1p=PORT|l2p=PORT|l3p=PORT|l1d|l2d|l3d)

2. Retry the operation.

3. If the problem persists, contact Technical Support. See Contact Us on page 38.

Cannot get port security on this port!

This message indicates that a port level command was entered for the IONMM but the command is only valid for the other types of slide-in modules.

1. Use the **go** command to change location of where the command operates. The **go** command format is:
   go [c=CHASSIS] [s=SLOT] [l1ap=PORT] [l2ap=PORT] (l1p=PORT|l2p=PORT|l3p=PORT|l1d|l2d|l3d)

2. Retry the operation. For a complete list of the available commands, see the ION System CLI Reference Manual, 33473.

3. If the problem persists, contact Technical Support. See Contact Us on page 38.

Command incomplete

This message indicates that not all of the required fields were entered for the CLI command.

1. Verify the command syntax.

2. Retry the operation. For a complete list of the available commands, see the ION System CLI Reference Manual, 33473.

3. If the problem persists, contact Technical Support. See Contact Us on page 38.

Could not open connection to the host on port 23. Connection failed.

This message indicates that the Telnet server and client are configured for different ports. For Telnet operations the default port is 23.

1. Ensure that the Telnet port is set to 23 for both the server and the client. This will require someone with administrative rights in order to make a change.

2. Add the port number to the Telnet command. For example:

```
Telnet <ipaddr> <port#>
```

3. If the problem persists, contact Technical Support. See Contact Us on page 38.

Error: this command should be executed on a device

This message indicates that the CLI command was entered for a port and it is only applicable for a device.

1. Use the **go** command to change location of where the command operates. The **go** command format is:
```
go [c=CHASSIS] [s=SLOT] [l1ap=PORT] [l2ap=PORT] (l1p=PORT|l2p=PORT|l3p=PORT|l1d|l2d|l3d)
```

2. Retry the operation.

3. If the problem persists, contact Technical Support. See Contact Us on page 38.

Error: this command should be executed on a port

This message indicates that the CLI command was entered for a card and it is only applicable for a port.

1. Use the **go** command to change location of where the command operates. The **go** command format is:
   ```
   go [c=CHASSIS] [s=SLOT] [l1ap=PORT] [l2ap=PORT] (l1p=PORT|l2p=PORT|l3p=PORT|l1d|l2d|l3d)
   ```

2. Retry the operation.

3. For a complete list of the available commands, see Appendix A.

4. If the problem persists, contact Technical Support. See Contact Us on page 38.

Fail to get MAC address!

This message indicates that communications to the module can not be established.

1. Verify that the correct hierarchy has been specified in the command (see "Managing Slide-In and Remote Modules Using CLI Commands" on page 49).

2. For all modules (slide-in and remote) check the following:

   • module is properly seated/connected
   • module is powered up

3. Wait 60 seconds, then retry the operation.

4. Cycle power for the module in question. **Note:** for slide-in modules pull the module out so it is no longer connected to the backplane, then slide the module back in, ensuring that it is firmly seated.

5. Retry the operation.

6. If the problem persists, contact Technical Support. See Contact Us on page 38.

Fail to get port type!

This message indicates that a port level command was entered for the IONMM but the command is only valid for the other types of slide-in modules.

1. Use the **go** command to change location of where the command operates.

2. Retry the operation.

3. If the problem persists, contact Technical Support. See Contact Us on page 38.

Incomplete location command!

This message indicates that one or more parameters for the **go** command are missing. The go command was entered to set location parameters, but the module, slot and/or port value(s) were no included in the command string.

The go command can operate on a local or remote card/port, and you must give the last parameter to specify the target is a port or device. For example, the input go c=1 s=14 does not include the port parameter, so the CLI module displays "Incomplete location parameters".

1. Verify the command syntax.

2. Re-enter the **go** command and be sure to include all of the location parameters:

    ```
    go [c=CHASSIS] [s=SLOT] [l1ap=PORT] [l2ap=PORT] (l1p=PORT|l2p=PORT|l3p=PORT|l1d|l2d|l3d)
    ```

3. If the problem persists, contact Technical Support. See Contact Us on page 38.

Invalid location parameters, cannot find the physical entity!

This message indicates that the system can not detect the presence of the device or port specified in the **go** command.

1. Verify that the correct hierarchy has been specified in the command (see "Managing Slide-In and Remote Modules Using CLI Commands" on page 49).

2. For all modules (slide-in and remote) check the following:

    • module is properly seated/connected

    • module is powered up

3. Wait 60 seconds then retry the operation.

4. Cycle power for the module in question. **Note:** for slide-in modules pull the module out so it is no longer connected to the backplane, then slide the module back in, ensuring that it is firmly seated.

5. Retry the operation.

6. If the problem persists, contact Technical Support. See Contact Us on page 38.

Invalid user!

This message indicates that the specified user is not valid.

1. Verify the user.

2. Retry the operation.

3. If the problem persists, contact Technical Support. See Contact Us on page 38.

Login incorrect

This message indicates that either the login or password entered while trying to establish a USB or Telnet connection is incorrect.

1. Verify the login/password.

   Note: the login and password are case sensitive. The default login is **ION** and the default password is **private**.

2. Retry the operation.

3. If the problem persists, contact Technical Support. See Contact Us on page 38.

No DMI support on this port!

This message indicates that you entered a DMI command for a port that does not support DMI.

1. Verify that the port supports DMI. For Transition Networks x4120s and SFPs, the model number has a "-D" at the end.

2. Retry the operation.

3. If the problem persists, contact Technical Support. See Contact Us on page 38.

There is no matched command

This message indicates that there is no such command available on this system.

1. Verify the command syntax.

2. Retry the operation.

3. If the problem persists, contact Technical Support. See Contact Us on page 38.

Unable to open xx. Please check your port settings.

This message indicates that HyperTerminal no longer recognizes which COM port to use for its connection.

1. Check that the USB cable is connected to the management station and the IONMM.

2. Check that the COM port is listed for the device manager on the management station (PC).

   a) On the desktop, right-click on **My Computer**.

   b) Select **Manage**.

   c) Click **Device Manager**.

   d) In the right panel, expand the list for **COM & LPT**.

3. Is the COM port in the list?

Yes	No
Continue with step 4.	Restart the management station.

4. In the HyperTerminal window, select **File>Properties**.

5. Check that the correct port is listed in the **Connect using** field.

6. Restart the management station.

7. Reboot the IONMM.

8. If the problem persists, contact Technical Support. See Contact Us on page 38.

Error, you should first give full location parameters

The location value is incomplete; it is missing the module, slot and/or port value(s). This message can display when a device-level command is entered (e.g., **show lpt config**).

When you change a bigger container, the value of smaller object is cleared. For example, originally the operated object is Chassis=1, slot=4, L1AP=1 L2AP=2 L3D, and then when the command chassis 3 is entered. This automatically sets the value of module, slot and port to 0.

If the value of module, slot and port are not set in later commands, and then you run a device-level command (e.g., **show lpt config**), this error message displays.

Enter the **go** command and be sure to include all of the location parameters.

`go [c=CHASSIS] [s=SLOT] [l1ap=L0APORT] [l2ap=L1APORT] (l1p=PORT|l2p=PORT|l3p=PORT|l1d|l2d|l3d)`

System is initializing...

CLI is receiving continuous error message "*system is initializing...*"
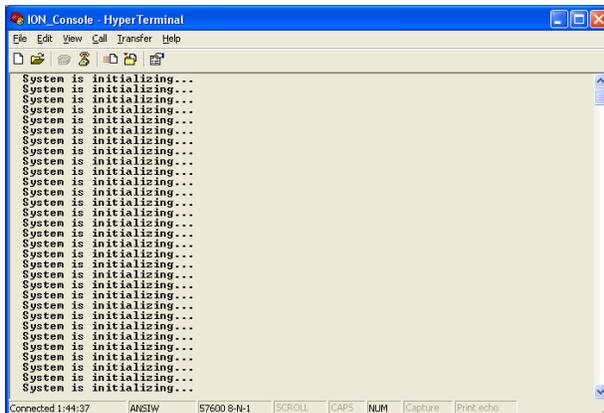
1. Wait for a few minutes for the message to clear.

2. Cycle power to the IONMM.

3. Retry the operation.

4. If the problem persists, contact Technical Support. See Contact Us on page 38.

Start HTTPS certificate failed.

1. Verify the HTTPS parameters (HTTPS is enabled, the certificate type is defined, certificate file defined, private key file defined, password defined).

2. Verify that the HTTPS server is operational.

3. Retry the operation (i.e., type **start https certificate** and press **Enter**).

4. If the problem persists, contact Technical Support. See Contact Us on page 38.

This command is only available on <x323x> card!

The command you entered is not supported on the card from which it was entered (e.g., you entered **set soam ma**, **set soam meg**, or **set soam mep** from a x4120 card, which does not support SOAM).

1. Verify the command entered is the one you want.

2. Verify that the device for the command entered can support the function of the command.

3. Retry the operation.

4. If the problem persists, contact Technical Support. See Contact Us on page 38.

Error: this command should be executed on a port!

1. Verify the command entered is the one you want.

2. Change to the desired port; enter the **go** command with all of the location parameters (chassis / slot / port).

3. Retry the operation from the port (i.e., type **show fwd portlist** and press **Enter**).

Unknown command!

The command you entered is not supported, or you entered the wrong command format / syntax.

1. Verify the CLI command syntax.

2. Retry the operation.

3. For a complete list of the available commands, see Appendix A.

4. If the problem persists, contact Technical Support. See Contact Us on page 38.

There is no matched command.

The command you entered is not supported, or you entered the wrong command format / syntax.

1. Verify the CLI command syntax.

2. Retry the operation.

3. For a complete list of the available commands, see Appendix A.

4. If the problem persists, contact Technical Support. See Contact Us on page 38.

Error location parameter number!

The go command you entered had an invalid or missing parameter.

1. Enter the **go** command with all of the location parameters (chassis / slot / port) in the format:

   ```
   go [c=CHASSIS] [s=SLOT] [l1ap=PORT] [l2ap=PORT](l1p=PORT|l2p=PORT|l3p=PORT|l1d|l2d|l3d)
   ```

Fail to set link pass through state!

You tried to set the LPT state to an unacceptable state. For example, you typed:

   ```
   C1|S3|L1D>set lpt state=enable
   ```

1. Verify the CLI command syntax.

2. Check the **set lpt monitor-port** and **set selective lpt state** command settings.

3. Enter the **show lpt config** command and in the Link Pass Through configuration, check if the Link pass through state is set to **notSupported** or if the **Remote fault detect state** is set to **notSupported**.

   If either is set to **notSupported**, change the setting to enable (e.g., type **set rfd state enable** and press **Enter**).

4. Retry the operation.

5. If the problem persists, contact Technical Support. See Contact Us on page 38.

TFTP transfer failed!

The attempted firmware upgrade via the **tftp upgrade** command was unsuccessful.

1. Verify the CLI command syntax.

2. Verify the firmware version.

3. Be sure the TFTP server is configured and running.

4. Check that the remotefile is in the proper location (e.g., the file *x323x.bin.0.5.4* is at *C:\TFTP-Root*).

5. Retry the operation. See the **tftp upgrade** command.

6. If the problem persists, contact Technical Support. See Contact Us on page 38.

Fail to transfer the file!
tftp get: set address type failed.
tftp put failed.

The file transfer attempt failed. The command you entered to do a tftp file transfer was unsuccessful (e.g., tftp get or tftp put or tftp transfer). For example:

```
C1|S4|L1D>tftp get iptype ipv4 ipaddr 192.168.1.30 remotefile xxxx
tftp get: set address type failed.
C1|S4|L1D>tftp put iptype ipv4 ipaddr 192.168.1.30 localfile xxxx
tftp put failed.
C1|S4|L1D>tftp upgrade iptype ipv4 ipaddr 192.168.1.30 remotefile xxxx
tftp get: set address type failed.
```

1. Check the command syntax. See "TFTP Commands" page on page 157.
2. Make sure the TFTP server is configured and running.
3. Verify the filename to be transferred, its location, and the IP address of the TFTP server.
4. If the problem persists, contact Technical Support. US/Canada: 1-800-260-1312, International: 00-1-952-941-7600.

The attempted show dot1bridge aging-time command failed to complete.

1. Verify the **dot1bridge aging-time** command syntax. See "Configure Forwarding Learning Aging Time" on page 191.

2. Retry the operation. See the **dot1bridge aging-time** command

3. If the problem persists, contact Technical Support. See Contact Us on page 38.

Redundancy is not supported on this card!

The attempt to set or show fiber redundancy failed. For example, you entered the command:
show redundancy info, but the device does not support fiber redundancy.

1. Verify that the card you entered the command on supports this function (must have at least 2 fiber ports) .
2. Retry the operation on a card that supports this function.
3. If the problem persists, contact Technical Support. See Contact Us on page 38.

Invalid user!
Fail to set SSH server state!

You entered the command **show ssh public-key user admin**, but the x4120 does not support SSH.

1. Use the go command to switch to a device that supports SSH.
2. If the problem persists, contact Technical Support. See Contact Us on page 38.
    Upgrade is only supported on IONMM card!
You entered a firmware *upgrade* or firmware *update* command from a device other than the IONMM. For example:

```
C1|S3|L1D>show firmware upgrade result
C1|S3|L1D>show firmware-db update result
C1|S3|L1D>show upgrade firmware file
C1|S3|L1D>update firmware-db file cert
C1|S3|L1D>upgrade module
```

1. Make sure of the command you want to enter. See "Firmware Upgrade Commands" on page 137.
2. Use the **home** command to go to the IONMM device.
3. Re-enter the firmware upgrade command from the IONMM.
4. If the problem persists, contact Technical Support. See Contact Us on page 38.

DMI is only supported on FIBER port!

You entered the command **show dmi info** on a card that does not support it. For example:

```
C1|S7|L1P1>show dmi info
DMI is only supported on FIBER port!
```

1. Verify if the card supports DMI.
2. Use the **go** command to switch to a different card port supporting Fiber.
3. Verify the command entry. See "DMI Commands" on page 55.
4. If the problem persists, contact Technical Support. See Contact Us on page 38.

Cannot clear loopback counters on this card!
Cannot set administrate state on this port!
Cannot set advertisement capability on this port!
Cannot set autocross on this card!
Cannot set auto negotiation state on this port!
Cannot set Ethernet port speed for this card!
Cannot set Ether port duplex mode on this card!
Cannot set far end fault on this card!
Cannot set filter unknown dest unicast frames on this port!
Cannot set pause on this port!
Cannot set source address lock action on this port!
Cannot set USB port state on this card!
Cannot get port security configuration on this port!
Cannot show forwarding port list on this card!
Cannot show slot info on this card!
Cannot show USB port state on this card!
Cannot show port QoS configuration in this card!
Cannot set tag type for priority in this card!
Cannot set default priority in this card!
Cannot set IEEE tag for priority in this card!
Cannot get VLAN database configuration on this card!
Cannot get LOAM configuration on this port!
Cannot set remote fault detect state on this card!
Cannot set service vid for tag on this card!
Fail to set management VLAN id!
Fail to set management VLAN state!
Cannot set bandwidth alloc type on this card!
Cannot set ingress and egress rate on this card!
Cannot show system information on this card!
Cannot set ingress and egress rate on this card!
IP management is not supported on this card!
Link OAM is not supported on this card!
No tdm loopback supported on this card!
No Time-domain reflectometer support on this card!
Syslog is not supported on this card!
TAOS status setting is not supported on this card!
TNDP is not supported on this card!

You entered a command for a function not supported on the card. For example:

```
C1|S7|L1P1>clear ether all counters
Cannot clear loopback counters on this card!
C1|S7|L1P1>show qos config
Cannot show port QoS configuration in this card!

C1|S7|L1P1>show qos priority remapping
Cannot show port QoS priority remapping in this card!
```

1. Verify if the card supports the desired function.
2. Use the **go** command to switch to a different card port supporting loopback.
3. Verify the command entry.

Cannot set slot power on this card!

You entered a s**et slot power**= command on a device that does not support it. For example:

```
C1|S16|L1P1>set slot 16 power on
Cannot set slot power on this card!
```

1. Verify this is the command you want.
2. Verify the command parameter; make sure you are not trying to power up a slot that already has power.
3. Use the **go** command to switch to the slot you want.
4. If the problem persists, contact Technical Support. See Contact Us on page 38.

Error: this command should be executed on a power sensor or fan!

You entered a s**et sensor** command on a device that does not support it. For example:

```
C1|S16|L1P1>set sensor stid 1 notif true
Error: this command should be executed on a power sensor or fan!
```

1. Verify this is the command you want.
2. Use the **stat** command to show the chassis configuration. For example:
   ```
        [ 22]  IONPS-A
         Temperature Sensor
         Volatage Sensor
         Power Sensor
         Fan-1
         Fan-2
   ```
3. Use the **go** command to switch to the power sensor or fan.
4. If the problem persists, contact Technical Support. See Contact Us on page 38.

Invalid forward port list!

You entered an invalid parameter in response to a prompt (e.g., for a module number for firmware upgrade). For example:

```
C1|S7|L1D>upgrade module
Available modules:
index     module                                    loc
----------------------------------------------------------------------
1         ION219                                    c=1 s=0 l1d
2         C3230-1040                                c=1 s=3 l1d
3         C3230-1040                                c=1 s=5 l1d
4         S3230-1040                                c=1 s=5 l1ap=2 l2d
5         IONMM                                     c=1 s=7 l1d
6         C3231-1040                                c=1 s=10 l1d
7         C2220-1014                                c=1 s=16 l1d
8         C3220-1040                                c=1 s=18 l1d
9         IONPS-A                                   c=1 s=22 l1d

Choose the module you want to upgrade: (eg. 1,3,16; at most 8 modules
to upgrade, press 'q' to exit upgrade)
show card info

Invalid forward port list!
```

1. Re-enter the command, wait for the prompt, and then enter a response in the correct syntax.

2. See the related command / function section of this manual.

3. If the problem persists, contact Technical Support. US/Canada: 1-800-260-1312, International: 00-1-952-941-7600.

L2CP is not supported on this card!

You tried to perform an L2CP function but the device does not support L2CP.
1. Make sure this is the command / function that you wanted.
2. Use the **go** command to switch to a device that supports L2CP.
3. Try entering the command again. See "Configuring L2CP" on page 268.
4. If the problem persists, contact Technical Support. See Contact Us on page 38.

Cannot show circuit-ID on this card!

You tried to display the Circuit ID information, but the function is not supported.
1. Make sure this is the command / function that you wanted.
2. Use the **go** command to switch to a device that supports Circuit ID display.
3. Try entering the command again. See "Circuit ID" on page 268.
4. If the problem persists, contact Technical Support. See Contact Us on page 38.

Cannot set circuit-ID on this card!

You tried to enter Circuit ID information, but the function is not supported.
1. Verify the Circuit ID parameters. See "Circuit ID" on page 268 and try entering the command again.
2. Use the **go** command to switch to a device that supports Circuit ID entry.
3. If the problem persists, contact Technical Support. See Contact Us on page 38.

Can not set speed on this port!

You entered the CLI command to define the x4120 port's operating speed, but the command failed. For example:

```
C1|S5|L1P2>set ether speed 100M
Can not set speed on this port!
C1|S5|L1P2>
```

1. Verify the x4120 supports this speed.
2. Verify the command syntax.
3. Re-enter the **set ether speed=** command with a speed supported by the card.

4. If the problem persists, contact Technical Support. See Contact Us on page 38.

Cannot remove vlan on this card!

You entered a command to delete one or all VLANs from the x4120, but the action cannot be performed. For example:

```
C1|S7|L1D>remove vlan all
Cannot remove vlan on this card!
C1|S7|L1D>remove vlan vid=3
Cannot remove vlan on this card!
C1|S7|L1D>
```

1. Make sure this is the function that you want.
2. Use the **go** command to switch to a x4120 that supports the VLAN database.
3. Use the **add vlan-db** command to add a VLAN VID if needed.
4. If the problem persists, contact Technical Support. See Contact Us on page 38.

Cannot remove forward database rows on this card!

You entered a command to delete a VLAN forward database VID (forward database row) from the x4120, but the action cannot be performed. For example:

```
C1|S7|L1D>remove vlan-db vid 3
Cannot remove forward database rows on this card!
C1|S7|L1D>
```

1. Make sure this is the function that you want.
2. Use the **go** command to switch to a NID that supports the VLAN FDB.
3. If the problem persists, contact Technical Support. See Contact Us on page 38.

Error symbol period window low is out of range, its range is 125000000 - 268435455!
Error frame period window is out of range, its range is 174762 - 104057560!
Error frame period threshold is out of range, its range is 0 - 268435455!
Error frame window is out of range, its range is 10 - 600!
Error frame threshold is out of range, its range is 0 - 268435455!
Error frame seconds summary window is out of range, its range is 100 - 9000!
Error frame seconds summary threshold is out of range, its range is 0 - 268435455!

A parameter entered in the "Event Configuration" has exceeded the range limitation.

1. Enter a parameter within the valid range displayed.
2. If the problem persists, contact Technical Support. See Contact Us on page 38.

No data in VLAN forward database table now!
You entered the command to display FWDDB information, but the VLAN forward database table has no data to report. For example:

```
C1|S16|L1D>show fwddb config fdbid 1
No data in VLAN forward database table now!
```

1. Make sure this is the function that you want.
2. Use the Forwarding Database Commands on page 92 to create the VLAN FDB entry.
3. If the problem persists, contact Technical Support. See Contact Us on page 38.

The specified monitor-port does not exist!
You specified a monitoring port (monitor-port) number outside the valid range.

1. Make sure this is the function that you want.
2. See the related section (e.g., "Redundancy" or "Link Pass Through") for more information.
3. If the problem persists, contact Technical Support. See Contact Us on page 38.

Cannot show cable length for fiber port!
You entered the command to display the length of the copper cable for a port that does not support it.
1. Make sure the DEVICE supports the **show cable length** command (only for x2110).

2. Verify the command syntax. See the related *User Guide* manual.

3. Type **show ether config** to show the Ethernet port's configuration.

4. If the problem persists, contact Technical Support. See Contact Us on page 38.

Message: *tftp get: set address type failed.*

Meaning: You entered a tftp command, but the address entered was not accepted.

```
C1|S15|L1D>tftp get iptype ipv4 ipaddr 192.168.1.30 remotefile
C3210_1.0.4_AP
tftp get: set address type failed.
C1|S15|L1D>
```

Recovery:

1. Make sure the tftp server address is valid.

2. Verify that the TFTP Server is running and properly configured.

3. Try entering the tftp command again.

4. If the problem persists, contact Technical Support. See Contact Us on page 38.

Cannot proceed because some other TFTP operation is currently in progress!
Please input config file name!
TFTP file transferring failed! Please make sure the TFTP server is up and the file being transferred does exist.
TFTP Server Address is empty or invalid!
The firmware has been successfully upgraded and the system will be rebooted soon
The specified firmware on the TFTP server will be upgraded to the current module, operation is currently in progress!
The sys.log file will be transferred to the TFTP server, are you sure to proceed?

You tried a TFTP transfer operation, but the operation failed or is still in process.

1. Wait for the "*operation is currently in progress!*" message to clear.
2. If an entry was requested in the message, enter the required information (e.g., valid TFTP Server address, or config file name).
3. Follow any on-screen instructions (e.g., "make sure the TFTP server is up").
4. Verify that this is the operation you want (e.g., click **OK** at the "*are you sure to proceed?*" message).
5. Verify the related command syntax in the applicable section of this manual (e.g., Syslog, or TFTP Upgrade section).
6. Retry the operation.
7. If the problem persists, contact Technical Support. See Contact Us on page 38.

ERROR: Current user is not authorized to do this operation!
% There is no matched command.

You tried to enter a CLI command but the entry failed.

An Admin user has full rights to read/write all configurations through Web/CLI. An Admin user can create new users and delete any users other than itself and ION.

A Read-Write user can read/write all configurations except for Upgrade and Backup/Restore via the Web or CLI. A read-write user can also change its own login password. When a read-write user logs in via the Web, the "UPGRADE" tab and the "BACKUP/RESTORE" tab are disabled. When a read-write user logs in via the CLI, all set commands except for upgrade and backup/restore can be executed.

A Read-Only user can read all configurations except for Upgrade and Backup/Restore though the Web/CLI.

1. Try another command on the x4120.
2. Check with the Admin if the command should be supported.
3. If the problem persists, contact Technical Support. See Contact Us on page 38.

TFTP Server Messages

Messages like the ones below may display during TFTP Server operation, depending on the TFTP Server package that you use.
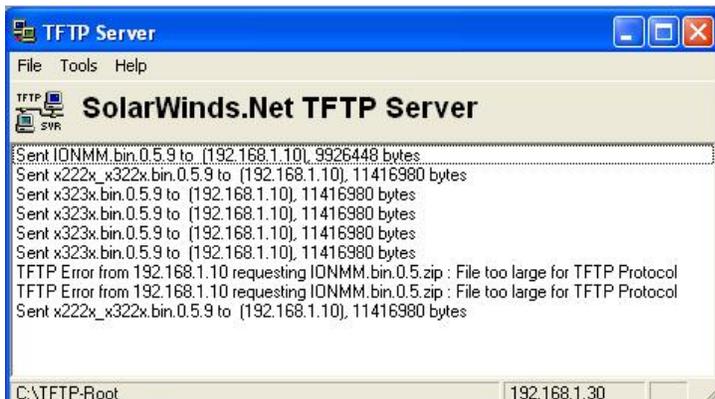
Message: *File does not exist*

Meaning: A TFTP Server error - the TFTP Server Address that you specified does not contain the Firmware File Name specified.
Recovery: 1) Verify the TFTP server's correct file location (e.g., local disk at *C:\TFTP-Root*). 2) Make sure of the filename / extension. 3) Check the TFTP Server's online helps for suggestions.

Message: *File too large for TFTP Protocol*

Meaning: A TFTP Server error - you tried to upload a file e.g., (IONMM.bin.0.5 – 50Mb) but the TFTP server failed. The file you tried to upload via the TFTP server exceeded the file size capability.
Recovery: 1) Check if some extra files ended up in the zip folder – some repeated – 6 FW files total.
2) Remove some of the files from the zip folder and try the upload again. 3) Send the remaining files in a separate file. 4) Check the TFTP Server's online helps for suggestions.

Appendix D: Linux Commands

ION supports certain standard Linux file system commands such as **cat**, **cd**, **ls**, **more**, **pwd**, and **rm**. These commands are restricted to the user directories; internal Linux file systems are not accessible.

The ION standard Linux file system commands are based on BSD 4; refer to the related documentation for more information.

cat *Command*

Command: cat

Description: Show the content of the FILES. Concatenate files and print on the standard output.

Example: `C1|S7|L1D>cat [OPTION]`

Options: Refer to the BSD 4 documentation for options and Interactive commands for the **more** command.

cd *Command*

Command: cd

Description: Change to another directory.

Example:

Options: Refer to the BSD 4 documentation for options and Interactive commands for the **more** command.

ls *Command*

Command: ls

Description: Unix and Unix-like operating systems maintain the concept of a current working directory, (i.e., where you are currently positioned in the hierarchy of directories).

When invoked without any arguments, **ls** lists the files in the current working directory. This command is restricted to the IONMM user directories; internal Linux file systems are not accessible.

The IONMM card stores all configuration backup files, HTTPS certification file, SSH key file, and Sys-log file. For example, the HTTPS certificate is stored in *'/agent3/conf/lighttpd'*. For SSH, the host keys (RSA and DSA) are stored in *'/agent3/conf/dropbear'*. For the SSH user key, there is a 'root' user and the user key for 'root' is stored in *'/root/.ssh'*.

Example:
```
C1|S7|L1D>ls
    agent3
    app
    bin
    dev
    etc
    lib
    linuxrc
    mnt
    proc
    root
    sbin
    sys
    tftpboot
    tmp
    usr
    var
    www
C1|S7|L1D>
```

Options:
Without options, **ls** displays files in a bare format. This bare format however makes it difficult to establish the type, permissions, and size of the files. The most common options to reveal this information or change the list of files are:

-l long format, displaying Unix file types, permissions, number of hard links, owner, group, size, date, and filename

-F appends a character revealing the nature of a file, for example, * for an executable, or / for a directory. Regular files have no suffix.

-a lists all files in the given directory, including those whose names start with "." (which are hidden files in Unix). By default, these files are excluded from the list.

-R recursively lists subdirectories. The command ls -R / would therefore list all files.

-d shows information about a symbolic link or directory, rather than about the link's target or listing the contents of a directory.

-t sort the list of files by modification time.

-h print sizes in human readable format. (e.g., 1K, 234M, 2G, etc.)

Example:

```
C1|S3|L1D>ls etc
    TZ
    VERSION
    dropbear
    factory
    fstab
    group
    gshadow
    host.conf
    hostname
    hosts
    init.d
    inittab
    lighttpd
    lighttpd.conf
    motd
    openssl
    passwd
    profile
    protocols
    radius
    rcS.d
    resolv.conf
    rpc
    script
    services
    shadow
    snmpd.conf
    sysconfig
    terminfo
C1|S3|L1D>
```

Refer to the BSD 4 documentation for additional options and Interactive commands for the **more** command.

more *Command*

Command: more

Description: A filter for paging through text one screenful at a time.

Example: `C1|S7|L1D>more [OPTION]`

Options: Refer to the BSD 4 documentation for options and Interactive commands for the **more** command.

pwd *Command*

Command: pwd

Description: Show current directory.

Example:

```
C1|S7|L1D>pwd
/
C1|S7|L1D>
```

Options: Refer to the BSD 4 documentation for options and Interactive commands for the **pwd** command.

rm *Command*

Command: rm

Description: Removes each specified file. By default, it does not remove directories.

Example:

Options: Refer to the BSD 4 documentation for options and Interactive commands for the **rm** command.

Glossary

This section describes many of the terms and mnemonics used in this manual. Note that the use of or description of a term does not in any way imply support of that feature or of any related function(s).

100BASE-FX

100BASE-FX is a version of Fast Ethernet over optical fiber. It uses a 1300 nm near-infrared (NIR) light wavelength transmitted via two strands of optical fiber, one for receive (RX) and the other for transmit (TX). Maximum length is 400 meters (1,310 ft) for half-duplex connections (to ensure collisions are detected), 2 kilometers (6,600 ft) for full-duplex over multimode optical fiber, or 10,000 meters (32,808 feet) for full-duplex single mode optical fiber. 100BASE-FX uses the same 4B5B encoding and NRZI line code that 100BASE-TX does. 100BASE-FX should use SC, ST, or MIC connectors with SC being the preferred option. 100BASE-FX is not compatible with 10BASE-FL, the 10 MBit/s version over optical fiber.

1000BASE-X

Refers to gigabit Ethernet transmission over fiber, where options include 1000BASE-CX, 1000BASE-LX, and 1000BASE-SX, 1000BASE-LX10, 1000BASE-BX10 or the non-standard -ZX implementations.

802.1

The IEEE standard for port-based Network Access Control. IEEE 802.1 is a working group of the IEEE 802 project of the IEEE Standards Association. It's concerns include 802 LAN/MAN architecture, internetworking among 802 LANs, MANs and other wide area networks, 802 Link Security, 802 overall network management, and those protocol layers above the MAC and LLC layers.

802.1ad

IEEE 802.1ad (Provider Bridges) is an amendment to IEEE standard IEEE 802.1Q-1998 (aka QinQ or Stacked VLANs), intended to develop an architecture and bridge protocols to provide separate instances of the MAC services to multiple independent users of a Bridged LAN in a manner that does not require cooperation among the users, and requires a minimum of cooperation between the users and the provider of the MAC service.

802.1ah

IEEE 802.1ah-2008 is a set of architecture and protocols for routing of a customer network over a provider network, allowing interconnection of multiple Provider Bridge Networks without losing each customer's individually defined VLANs. The final standard was approved by the IEEE in June 2008.

AC

(Alternating Current) Electrical power that comes from wall outlets. Contrast with DC.

ANSI

(American National Standards Institute) A private non-profit organization that oversees the development of voluntary consensus standards for products, services, processes, systems, and personnel in the United States. The organization also coordinates U.S. standards with international standards so that American products can be used worldwide.

ARP

(Address Resolution Protocol) A protocol for mapping an IP address to a physical machine address that is recognized in the local network.

Auto-Negotiation

With Auto-Negotiation in place, Ethernet can determine the common set of options supported between a pair of "link partners." Twisted-pair link partners can use Auto-Negotiation to figure out the highest speed that they each support as well as automatically setting full-duplex operation if both ends support that mode. (AKA, N-WAY Protocol. Standard: IEEE 802.3u.)

Auto MDI / MDIX

Auto MDI/MDIX automatically detects the MDI or MDIX setting on a connecting device in order to obtain a link. This means installers can use either a straight through or crossover cable and when connecting to any device, the feature is pretty self explanatory.

Auto-provisioning

A process that enables centralized management for multiple end user devices. It uses DHCP option 60, 66 and 67 to provide centralized firmware and configuration management. The feature provides mass firmware upgrade capability as well as booting-up full end device configuration without any manual intervention.

BIA

(Burned-In Address) The last six bytes of a MAC address that are assigned by the manufacturer of a network interface card (NIC).

BPC

(Back Plane Controller) the ION system component that provides communication between the SIC cards and the IONMM. The BPC is an active device with a microprocessor and management software used to interconnect IONMM and SIC cards via the Ethernet management plane. The BPC has knowledge of the cards that are present in the system, and is responsible for managing the Ethernet switch that interconnects all the chassis slots.

BPDU

(Bridge Protocol Data Unit) Data messages that are exchanged across the switches within an extended LAN that uses a spanning tree protocol topology. BPDU packets contain information on ports, addresses, priorities and costs and ensure that the data ends up where it was intended to go.

Bridge

A device that connects one local area network (LAN) to another LAN.

BT

(Bit Time) The time it takes for one bit to be ejected from a Network Interface Card (NIC) operating at some predefined standard speed, such as 10 Mbit/s. The time is measured between the time the logical link control layer 2 sublayer receives the instruction from the operating system until the bit actually leaves the NIC. The bit time has nothing to do with the time it takes for a bit to travel on the network medium, but has to do with the internals of the NIC.

CBN

(Common Bonding Network) The set of metallic components that are intentionally or incidentally interconnected to provide the principal means for effecting bonding and grounding inside a telecommunications building. These components include: structural steel or reinforcing rods, metallic plumbing, AC power conduit, cable racks, and bonding conductors. The CBN is connected to the exterior grounding electrode system.

CE

A mandatory conformity mark on many products placed on the single market in the European Economic Area (EEA). The CE marking certifies that a product has met EU consumer safety, health or environmental requirements.

Circuit ID

A company-specific identifier assigned to a data or voice network between two locations. This circuit is then leased to a customer by that ID. If a subscriber has a problem with the circuit, the subscriber contacts the telecommunications provider to provide this circuit id for action on the designated circuit.

Several Circuit ID formats exist (Telephone Number Format, Serial Number Format, Carrier Facility Format and Message Trunk Format). Telecom Circuit ID formats (LEC circuit IDs) provide service codes for DSL, HDSL, ADSL, Digital data, SST Network Trunk, Switched Access, E1, Switched Access, Basic Data and Voice, LAN, SONET, Ethernet, Video, Voice, Digital Transmission, and others.

CISPR

(Comité Internationale Spécial des Perturbations Radioelectrotechnique) An International Special Committee on Radio Interference.

CLI

(Command-Line Interface) A mechanism for interacting with a computer operating system or software by typing commands to perform specific tasks. The CLI allows users to set up switch configurations by using simple command phrases through a console / telnet session.

Community

Two levels of ION system access privileges are password protected:

- Read access (Read ONLY) - a Community Name with a particular set of privileges to monitor the network without the right to change any of its configuration.

- Read/Write (Read <u>and</u> make changes) - a Community Name with an extended set of privileges to monitor the network as well as actively change any of its configuration.

CPU

(Central Processing Unit) The portion of a computer system that carries out the instructions of a computer program, and is the primary element carrying out the computer's functions.

CRC

(Cyclic Redundancy Check) A technique for detecting errors in digital data, but not for making corrections when errors are detected. It is used primarily in data transmission. In the CRC method, a certain number of check bits, often called a checksum, are appended to the message being transmitted. The receiver can determine whether or not the check bits agree with the data, to ascertain with a certain degree of probability whether or not an error occurred in transmission. If an error occurred, the receiver

sends a negative acknowledgement (**Error! Reference source not found.**) back to the sender, requesting that the message be retransmitted.

CSA

(Canadian Standards Association) A not-for-profit membership-based association serving business, industry, government and consumers in Canada and the global marketplace.

dBm

(DeciBels below 1 Milliwatt) A measurement of power loss in decibels using 1 milliwatt as the reference point. A signal received at 1 milliwatt yields 0 dBm. A signal at .1 milliwatt is a loss of 10 dBm.

DC

(Direct Current) Electrical power that comes from a battery. Contrast with AC.

DCE

(Data Circuit-terminating Equipment) A device that sits between the data terminal equipment (DTE) and a data transmission circuit. Also called data communications equipment and data carrier equipment.

DHCP

(Dynamic Host Configuration Protocol) A protocol for assigning dynamic IP addresses to devices on a network. With dynamic addressing, a device can have a different IP address every time it connects to the network.

DHCP lets a network administrator supervise and distribute IP addresses from a central point, and automatically sends a new address when a computer is plugged into a different place in the network. (Standard: RFC 2131.)

DiffDerv

In terms of traffic classification, DiffDerv lets a network perform differentiated service treatments.

Discovery

Discovery allows a Service OAM-capable device to learn sufficient information (e.g. MAC addresses etc.) regarding other SOAM capable NIDs so that OAM frames can be exchanged with those discovered devices. With EVCs, discovery allows SOAM capable NIDs to learn about other Service OAM capable devices that support the same EVCs. These devices are expected to be at the edges of the OAM domain in which the discovery is carried out. See "LLDP" and "TNDP" for discovery mechanisms. Discovery occurs when a SOAM-capable NID learns sufficient information (e.g. MAC addresses etc.) regarding other SOAM capable NIDs to exchange OAM frames with those discovered NIDs.

DMI

(Diagnostic Monitoring Interface) Adds parametric monitoring to SFP devices.

DMM / DMR

(Delay Measurement Message / Delay Measurement Response) DMM/DMR is used to measure single-ended (aka, two-way) Frame Delay (FD) and Frame Delay Variation (FDV, aka, Jitter).

DNS

(Domain Name System) An internet service that translates domain names into IP addresses. DNS allows you to use friendly names, such as www.transition.com, to easily locate computers and other resources on a TCP/IP-based network

Dr. Watson

Dr. Watson for Windows is a program error debugger. The information obtained and logged by Dr. Watson is used by technical support groups to diagnose a program error for a computer running Windows. A text file (Drwtsn32.log) is created whenever an error is detected, and can be delivered to support personnel by the method they prefer. There is an option to create a crash dump file, which is a binary file that a programmer can load into a debugger.

DSCP

DiffServ (Differentiated Services) Prioritization provides the ability to prioritize traffic internally based on the DSCP field in the IP header of a packet. (AKA, DiffServ Modification DSCP / DiffServ. Standard: RFC 3290.)

DST

(Daylight Savings Time) Advancing clocks so that afternoons have more daylight and mornings have less. Typically clocks are adjusted forward one hour near the start of spring (March) and are adjusted backward in autumn (November).

DTE

(Data Terminal Equipment) The RS-232C interface that a computer uses to exchange data with a modem or other serial device. An end instrument that converts user information into signals or reconverts received signals (e.g., a terminal).

Dynamic IP addressing

"Dynamic" means moving or changing. A dynamic IP address is an address that is used for the current session only; when the session is terminated, the IP address is returned to the list of available addresses.

If a network uses dynamic addressing, it means that when a network interface asks to join the network, it is randomly allocated an IP address from a pool of available addresses within that network. Thus, under dynamic addressing, a computer may possess over time (e.g. across reboots) a variety of different IP addresses. Dynamic addressing is often used in scenarios where end-user computers are intermittently connected to the network.

The DHCP protocol provides a means to dynamically allocate IP addresses to computers on a network. A system administrator assigns a range of IP addresses to a DHCP server, and each client computer on the LAN has its TCP/IP software configured to request an IP address from the DHCP server, which can grant the request. The request and grant process uses a lease concept with a controllable time period.

EEA

(European Economic Area) Established on 1 January 1994 following an agreement between member states of the European Free Trade Association, the European Community, and all member states of the European Union (EU). It allows these EFTA countries to participate in the European single market without joining the EU.

Egress Frame

A service frame sent from the Service Provider network to the CE. Contrast "Ingress Frame".

Egress rules

Egress rules determine which frames can be transmitted out of a port, based on the Egress List of the VLAN associated with it. Each VLAN has an Egress List that specifies the ports out of which frames can be forwarded, and specifies whether the frames will be transmitted as tagged or untagged frames.

ESD

(Electrostatic Discharge) A sudden and momentary electric current that flows between two objects.

EtherType

One of two types of protocol identifier parameters that can occur in Ethernet frames after the initial MAC-48 destination and source identifiers. Ethertypes are 16-bit identifiers appearing as the initial two octets after the MAC destination and source (or after a tag).

Implies use of the IEEE Assigned EtherType Field with IEEE Std 802.3, 1998 Edition Local and Metropolitan Area Networks. The EtherType Field provides a context for interpretation of the data field of the frame (protocol identification). Several well-known protocols already have an EtherType Field.

The IEEE 802.3, 1998 Length/EtherType Field, originally known as EtherType, is a two-octet field. When the value of this field is greater than or equal to 1536 decimal (0600 hexadecimal) the EtherType Field indicates the nature of the MAC client protocol (EtherType interpretation). The length and EtherType interpretations of this field are mutually exclusive.

Event log

Records events such as port link down, configuration changes, etc. in a database.

FCC

(Federal Communications Commission) An independent United States government agency established by the Communications Act of 1934 that is charged with regulating interstate and international communications by radio, television, wire, satellite and cable. The FCC's jurisdiction covers the 50 states, the District of Columbia, and U.S. possessions.

FDX

(Full Duplex) Communication in both directions simultaneously.

Firmware

Computer programs and data stored in hardware - typically in read-only memory (ROM) or programmable read-only memory (PROM) - such that the programs and data cannot be dynamically written or modified during execution of the programs.

Flow Control

Prevents congestion and overloading when a sending port is transmitting more data than a receiving port can receive. (Standard: IEEE 802.3X.)

Frame

A unit of data that is transmitted between network points on an Ethernet network. An Ethernet frame has explicit minimum and maximum lengths and a set of required data that must appear within it. Each frame on an IEEE 802 LAN MAC conveys a protocol data unit (PDU) between MAC Service users. There are three types of frame; untagged, VLAN-tagged, and priority-tagged.

Frame Format

In Ethernet, a frame is a way of arranging sections of data for transfer over a computer network. The frame is a key element of an Ethernet system. A typical Ethernet frame is made up of three elements: a pair of addresses, the data itself, and an error checking field.

Frame Formats for 802.1, 802.1Q and 802.1ad are illustrated below.

FTP
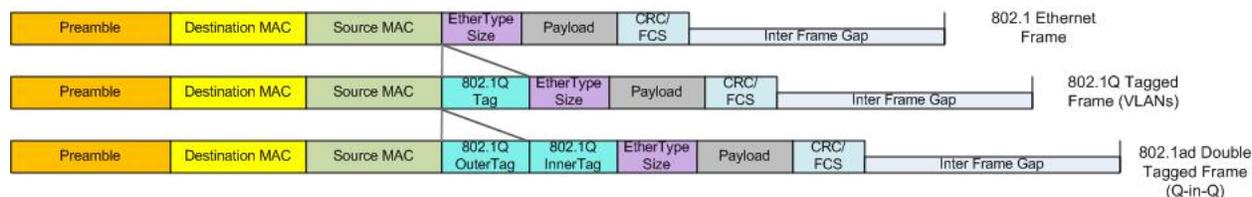
(File Transfer Protocol) A standard network protocol used to exchange and manipulate files over a TCP/IP based network, such as the Internet. See also TFTP.

GBIC

(Gigabit Interface Converter) A transceiver that converts serial electrical signals to serial optical signals and vice versa. In networking, a GBIC is used to interface a fiber optic system with an Ethernet system, such as Fibre Channel and Gigabit Ethernet.

Gbps

(Gigabits Per Second) Data transfer speeds as measured in gigabits.

GUI

(Graphical User Interface) A type of user interface item that allows people to interact with programs in more ways than typing. A GUI offers graphical icons, and visual indicators, as opposed to text-based interfaces, typed command labels or text navigation to fully represent the information and actions available to a user. The actions are usually performed through direct manipulation of the graphical elements.

HSCP

(High-Security Console Password)

HTML

(HyperText Markup Language) The predominant markup language for web pages. It provides a means to create structured documents by denoting structural semantics for text such as headings, paragraphs, lists etc as well as for links, quotes, and other items.

HTTPS

(Hypertext Transfer Protocol Secure) A combination of the Hypertext Transfer Protocol with the SSL/TLS protocol to provide encryption and secure identification of the server.

Hz

(Hertz) A unit of frequency that defines the number of complete cycles per second.

ICMP

(Internet Control Message Protocol) Part of the internet protocol suite that is used by networked computers to send error, control and informational messages indicating, for instance, that a requested service is not available or that a host or router could not be reached.

IEC

(International Electrotechnical Commission) The world's leading organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

IEEE

(Institute of Electrical and Electronics Engineers) An international non-profit, professional organization for the advancement of technology related to electricity.

IGMP

(Internet Group Management Protocol) A communications protocol used to manage the membership of Internet Protocol multicast groups. IGMP is used by IP hosts and adjacent multicast routers to establish multicast group memberships.

Ingress

The direction from the CE into the Service Provider network. Contrast Egress.

IP

(Internet Protocol) One of the core protocols of the Internet Protocol Suite. IP is one of the two original components of the suite (the other being TCP), so the entire suite is commonly referred to as TCP/IP. IP is the method or protocol by which data is sent from one computer to another on the Internet. Each computer (known as a host) on the Internet has at least one IP address that uniquely identifies it from all other computers on the Internet.

IPC

(Interprocess Communications) The exchange of data between one program and another either within the same computer or over a network. It implies a protocol that guarantees a response to a request.

IP Stacking

The capability to stack multiple switches together and manage them under one IP address.

ITU

ITU is the leading United Nations agency for information and communication technology issues, and the global focal point for governments and the private sector in developing networks and services. For nearly 145 years, ITU has coordinated the shared global use of the radio spectrum, worked to improve telecommunication infrastructure in the developing world, and established worldwide standards that foster seamless interconnection of a vast range of communications systems. See http://www.itu.int/net/about/itu-t.aspx.

Jumbo Frame

Jumbo frames are frames larger than the standard Ethernet frame size, which is 1518 bytes (1522 if VLAN-tagged). Though this is not a standard, more vendors are adding support for jumbo frames. An initiative to increase the maximum size of the MAC Client Data field from 1500-bytes to 9000-bytes. The initiative was not adopted by the IEEE 802.3 Working Group, but it was endorsed by a number of other companies. Larger frames would provide a more efficient use of the network bandwidth while reducing the number of frames that have to be processed. The Jumbo Frame proposal restricts the use of Jumbo Frames to full-duplex Ethernet links, and defines a "link negotiation" protocol that allows a station to determine if the station on the other end of the segment is capable of supporting Jumbo Frames.

Kbps

(Kilobits Per Second) Data transfer speeds as measured in kilobits.

LAN

(Local Area Network) A group of computers and associated devices that share a common communications line or wireless link. Typically, connected devices share the resources of a single processor or server within a small geographic area (for example, within an office building).

Layer 2 Switch

A network device that functions as multi-port switch.

Layer 3 Switch

A network device that functions as a router and a multi-port switch.

Layer 4 Switch

A switch that makes forwarding decisions taking Layer 4 protocol information into account.

LED

(Light Emitting Diode) An electronic light source.

LPT

(Link Pass Through) A troubleshooting feature that allows a device to monitor both the fiber and copper RX ports for loss of signal. In the event of a loss of RX signal on one media port, the device will automatically disable the TX signal of the other media port, thus "passing through" the link loss.

MAC

(Media Access Control) An address that is a unique value associated with a network adapter. MAC addresses are also known as hardware addresses or physical addresses. They uniquely identify an adapter on a LAN.

MAC-based Security

the ability to lock the learning mechanism down on a port. This means that no further MACs will be learned on those ports. (AKA, MAC Lockdown.)

MAC Table Size

the location where switches store learned addresses. The size of the MAC table determines how many unicast streams the switch can support without flooding. (AKA, FDB (Forwarding Data Base) table, CAM table, MAC.)

MAU

(Media Attachment Unit) In an Ethernet LAN, a device that interconnects the attachment unit interface port on an attached host computer to the Ethernet network medium (such as Unshielded Twisted Pair or coaxial cable). The MAU provides the services that correspond to the physical layer of the Open Systems Interconnection (OSI) reference model. A MAU can be built into the computer workstation or other device or it can be a separate device

Mbps

(Megabits per second) Data transfer speed measured in thousands of bits per second.

MDI

(Medium Dependent Interface) A type of Ethernet port connection using twisted pair cabling. The MDI is the component of the media attachment unit (MAU) that provides the physical and electrical connection to the cabling medium. MDI ports connect to MDIX ports via straight-through twisted pair cabling; both MDI-to-MDI and MDIX-to-MDIX connections use crossover twisted pair cabling. See also MDIX.

The standard wiring for end stations is known as Media Dependent Interface (MDI), and the standard wiring for hubs and switches is known as Media Dependent Interface with Crossover (MDIX). The x222x/32xx device's *AutoCross* feature makes it possible for hardware to automatically correct errors in cable selection.

MDIX

(MDI Crossover) A version of MDI that enables connection between like devices. The standard wiring for end stations is known as Media Dependent Interface (MDI), and the standard wiring for hubs and switches is known as Media Dependent Interface with Crossover (MDIX).
The x222x/32xx device's *AutoCross* feature makes it possible for hardware to automatically correct errors in cable selection. See also MDI.

Media converter

Media converters transparently connect one type of media, or cabling, to another – typically copper to fiber. By bridging the gap between legacy copper infrastructures and fiber growth, media converters provide an economical way to extend the distance of an existing network, extend the life of non-fiber based equipment, or extend the distance between two like devices.

Transition Networks' brand of media converters makes conversion between disparate media types possible; while helping companies leverage their existing network infrastructure. These media conversion technologies are offered across a broad spectrum of networking protocols including Ethernet, Fast Ethernet, Gigabit, T1/E1, DS3, ATM, RS232/485, video, Power-over-Ethernet, and many more.

MIB

(Management Information Base) The set of variables that are used to monitor and control a managed device. A formal description of a set of network objects that can be managed using the Simple Network Management Protocol (SNMP). The format of the MIB is defined as part of the SNMP.

MIBs stems from the OSI/ISO Network management model and are a type of database used to manage the devices in a communications network. A MIB comprises a collection of objects in a (virtual) database used to manage entities (such as routers and switches) in a network. Objects in the MIB are defined using a subset of Abstract Syntax Notation One (ASN.1) called "Structure of Management Information Version 2 (SMIv2)" RFC 2578. The database is hierarchical (tree-structured) and entries are addressed through object identifiers. IETF RFCs discuss MIBs, notably RFC 1155, "Structure and Identification of Management Information for TCP/IP based internets", RFC 1213, "Management Information Base for Network Management of TCP/IP-based internets", and RFC 1157, "A Simple Network Management Protocol".

MIB Module

Strictly speaking, a MIB is just a set of ideas; however, since the MIB Module is the most tangible representation of the MIB, the terms "MIB" and "MIB Module" are used interchangeably by many. To prevent naming conflicts and provide organization, all of the manageable features of all products from all vendors are arranged into one enormous tree structure referred to as the MIB Tree or "The MIB," which is managed by the Internet Assigned Numbers Authority (IANA). Each vendor of SNMP equipment has an exclusive section of The MIB Tree that they control.

MSA

(Multi-Source Agreement) Common product specifications for pluggable fiber optic transceivers.

MSDU

(MAC Service Data Unit) The service data unit that is received from the logical link control (LLC) sub-layer which lies above the medium access control (MAC) sub-layer in a protocol stack (communications stack).

MT-RJ

(Mechanical Transfer-Registered Jack) A small form-factor fiber optic connector which resembles the RJ-45 connector used in Ethernet networks.

Multicast

One of the four forms of IP addressing, each with its own unique properties, a multicast address is associated with a group of interested receivers. Per RFC 3171, addresses 224.0.0.0 through 239.255.255.255, the former Class D addresses, are designated as multicast addresses in IPv4. The sender sends a single datagram (from the sender's unicast address) to the multicast address, and the intermediary routers take care of making copies and sending them to all receivers that have registered their interest in data from that sender. See also "Unicast".

MVRP

(Multiple VLAN Registration Protocol) a standards-based Layer 2 network protocol, for automatic configuration of VLAN information on switches. It was defined in the IEEE 802.1ak amendment to 802.1Q-2005 standard. MVRP provides a method to dynamically share VLAN information and configure the needed VLANs within a layer 2 network.

NIC

(Network Interface Card or Network Interface Controller) A computer hardware component designed to allow computers to communicate over a computer network. It is both an OSI layer 1 (physical layer) and layer 2 (data link layer) device, as it provides physical access to a networking medium and provides a low-level addressing system through the use of MAC addresses. It allows users to connect to each other either by using wireless communications or cables.

NID

(Network Interface Device) A device that serves as the demarcation point between the carrier's local loop and the customer's premises wiring. In telecommunications, a NID is a device that serves as the demarcation point between the carrier's local loop and the customer's premises wiring. In fiber-to-the-premises systems, the signal is transmitted to the customer premises using fiber optic technologies.
In general terms, a NID may also be called a Network Interface Unit (NIU), Telephone Network Interface (TNI), Slide-in-card (SIC), or a slide-in-module.

NTP

(Network Time Protocol) A protocol for synchronizing the clocks of computer systems over packet-switched, variable-latency data networks.

OAM

(Operation, Administration and Maintenance) A group of network management functions that provide network fault indications, performance information, data, and diagnosis.

OID

(Object Identifier) Known as a "**MIB** object identifier" or "MIB variable" in the SNMP network management protocol, an OID is a number assigned to devices in a network for identification purposes. Each branch of the MIB Tree has a number and a name, and the complete path from the top of the tree down to the point of interest forms the name of that point. A name created in this way is known as an Object ID or OID.

OSI

(Open Systems Interconnection) A standard description or reference model for how messages should be transmitted between any two points in a telecommunication network. Its purpose is to guide product implementors so that their products will consistently work with other products. The reference model defines seven layers of functions that take place at each end of a communication.

OUI

(Organizationally Unique Identifier) the Ethernet Vendor Address component. Ethernet hardware addresses are 48 bits, expressed as 12 hexadecimal digits (0-9, plus A-F, capitalized). These 12 hex digits consist of the first/left 6 digits (which should match the vendor of the Ethernet interface within the station) and the last/right 6 digits, which specify the interface serial number for that interface vendor. These high-order 3 octets (6 hex digits) are called the Organizationally Unique Identifier or OUI.

Pause

The Pause feature (data pacing) uses Pause frames for flow control on full duplex Ethernet connections. If a sending device is transmitting data faster than the receiving device can accept it, the receiving station will send a pause frame to halt the transmission of the sender for a specified period of time.

Pause frames are only used on full duplex Ethernet link segments defined by IEEE 802.3x that use MAC control frames to carry the pause commands. Only stations configured for full duplex operation can send pause frames.

PDU

(Protocol Data Units) **1.** Information that is delivered as a unit among peer entities of a network and that may contain control information, address information or data. **2.** In a layered system, a unit of data which is specified in a protocol of a given layer and which consists of protocol control information and possibly user data of that layer.

Protocol Endpoint

A communication point from which data may be sent or received. It represents communication points at various levels on an Open Systems Interconnection (OSI) structure.

RADIUS

(Remote Authentication Dial In User Service) Is a networking protocol that provides centralized authentication, authorization, and accounting management for computers to connect and use a network service.

RJ-45

The standard connector utilized on 4-pair (8-wire) UTP (Unshielded Twisted Pair) cable. The RJ-45 connector is the standard connector for Ethernet, T1, and modern digital telephone systems.

RMON

(Remote Network Monitoring) Software that supports the monitoring and protocol analysis of LAN.
A part of SNMP, RMON is a network management protocol that gathers remote network information.
(Standard: RFC 1271.)

RS-232

(Recommended Standard 232) A standard for serial binary data signals connecting between a (Data
Terminal Equipment) and a DCE (Data Circuit-terminating Equipment). It is commonly used in computer
serial ports.

SFP

(Small Form-Factor Pluggable) A compact, hot-pluggable transceiver used in telecommunication and data
communications applications. It interfaces a network device mother board (for a switch, router, media
converter or similar device) to a fiber optic or copper networking cable. The SFP transceiver is specified
by a multi-source agreement (MSA) between competing manufacturers. The SFP was designed after the
GBIC interface, and allows greater port density (number of transceivers per inch along the edge of a
mother board) than the GBIC, thus SFP is also known as "mini-GBIC". Optical SFP transceivers support
digital diagnostics monitoring (DDM) functions according to the industry-standard SFF-8472. This
feature lets you monitor real-time parameters of the SFP, such as optical output power, optical input
power, temperature, laser bias current, and transceiver supply voltage. AKA, Digital Optical Monitoring
(DOM), DMI (Diagnostic Monitoring Interface), or DMM (Diagnostic Maintenance Monitoring).

SGMII

(Serial Gigabit Media Independent Interface) A standard Gigabit Ethernet interface used to connect an
Ethernet MAC-block to a PHY. To carry frame data and link rate information between a 10/100/1000
PHY and an Ethernet MAC, SGMII uses a different pair for data signals and for clocking signals, with
both being present in each direction (i.e., TX and RX). The x4120 uses the **set ether phymode=SGMII**
CLI command to select SGMII mode.

SLA

(Service Level Agreement) In general terms, a part of a service contract where the level of service is
formally defined in terms of a contracted delivery time or performance. In Metro Ethernet, the contract
between the Subscriber and Service Provider specifying the agreed to service level commitments and
related business agreements.

SMAC

(Static MAC) A MAC address that is manually entered in the address table and must be manually removed. It can be a unicast or multicast address. It does not age and is retained when the switch restarts. You can add and remove static addresses and define the forwarding.

SNMP

(Simple Network Management Protocol) A request-response protocol that defines network communication between a Managed Device and a Network Management Station (**Error! Reference source not found.**). A set of protocols for managing complex IP networks. (Standard: RFC 1157.)

SNTP

(Simple Network Time Protocol) A less complicated version of Network Time Protocol, which is a system for synchronizing the clocks of networked computer systems, primarily when data transfer is handled via the Internet. SNTP is used to synchronize times on IP devices over a network. (Standard: RFC 2030.)

SSH

(Secure Shell) A network protocol that allows data to be exchanged using a secure channel between two networked devices. SSH was designed as a replacement for Telnet and other insecure remote shells, which send information, notably passwords, in plain text, leaving them open for interception. The encryption used by SSH provides confidentiality and integrity of data over an insecure network, such as the Internet. SSH is used to provide a secure Telnet session to the console/command line interface of a network device through an insecure environment. (AKA, Secured Telnet; Standard: SSH RFC 1034).

SSL

(Secure Socket Layer) A protocol for transmitting private documents via the Internet. SSL uses a cryptographic system that uses two keys to encrypt data; a public key known to everyone and a private or secret key known only to the recipient of the message. SSL is used to manage a network device via its web interface. (AKA, HTTPS, Standard: RFC 2818).

Static IP addressing

"Static" comes from the word stationary, meaning not moving. A static IP address means it never changes. A static IP address is an IP address permanently assigned to a workstation. If a network uses static addressing, it means that each network interface has an assigned IP address that it always uses whenever it is online. With static addressing, the computer has a well-defined IP address which it uses always and which no other computer ever uses.

Static MAC Entry

Static MAC entry support means that users can assign MAC addresses to ports manually that never age out.

STID

(Sensor Transaction Identifier) The STID is used for power supply / sensor / IONDCR configuration via the set sensor stid command to define notification, relation, severity, and value parameters. The show power config command displays the power supply sensors information. The STID is shown in the Web interface at the Power Supply tab > Temp, Volt, Power, and Fan sub-tabs.

STP

(Shielded Twisted Pair) A special kind of copper telephone wiring used in some business installations. An outer covering or shield is added to the ordinary twisted pair telephone wires; the shield functions as a ground.

Syslog

A service run mostly on Unix and Linux systems (but also available for other OSes) to track events that occur on the system. Analysis can be performed on these logs using available software to create reports detailing various aspects of the system and/or the network.

TCP

(Transmission Control Protocol) One of the core protocols of the Internet Protocol Suite. TCP is one of the two original components of the suite (the other being Internet Protocol, or IP), so the entire suite is commonly referred to as TCP/IP. Whereas IP handles lower-level transmissions from computer to computer as a message makes its way across the Internet, TCP operates at a higher level, concerned only with the two end systems, for example a Web browser and a Web server. In particular, TCP provides reliable, ordered delivery of a stream of bytes from a program on one computer to another program on another computer.

TCP/IP

(Transmission Control Protocol/Internet Protocol) The basic communication language or protocol of the Internet and/or a private network (either an intranet or an extranet).

TCP/IP is a two-layer program. The higher layer, Transmission Control Protocol (TCP), manages the assembling of a message or file into smaller packets that are transmitted over the Internet and received by a TCP layer that reassembles the packets into the original message. The lower layer, Internet Protocol (IP), handles the address part of each packet so that it gets to the right destination.

TDM

(Time Division Multiplexing) A method of putting multiple data streams in a single signal by separating the signal into many segments, each having a very short duration. Each individual data stream is reassembled at the receiving end based on the timing.

Telnet

A user command and an underlying TCP/IP protocol for accessing remote computers. Through Telnet, an administrator or another user can access someone else's computer remotely. Telnet is a terminal emulation program for TCP/IP networks that runs on your computer and connects your PC to a switch management. (Standard: RFC 854.)

TFTP

(Trivial File Transfer Protocol) A file transfer protocol, with the functionality of a very basic form of File Transfer Protocol (FTP). Due to its simple design, TFTP can be implemented using a very small amount of memory. Because it uses UDP rather than TCP for transport, TFTP is typically used to transfer firmware upgrades to network equipment.

TFTP Download / Upload

The ability to load firmware, configuration files, etc. through a TFTP server. (AKA, TFTP. Standard: RFC 1350.)

TFTP Root Directory

The location on the console device (PC) where files are placed when received, and where files to be transmitted should be placed (e.g., *C:\TFTP-Root*).

TFTP Server

An application that uses the TFTP file transfer protocol to read and write files from/to a remote server. In TFTP, a transfer begins with a request to read or write a file, which also serves to request a connection. If the server grants the request, the connection is opened and the file is sent in fixed length blocks of 512 bytes. Each data packet contains one block of data, and must be acknowledged by an acknowledgment packet before the next packet can be sent. Examples of available packages include Open TFTP Server, Tftpd32, WinAgents TFTP Server for Windows, SolarWinds free TFTP Server, TFTP Server 1.6 for Linux, and TftpServer 3.3.1, a TFTP server enhancement to the standard Mac OSX distribution.

Throughput

The maximum rate at which no frame is dropped. This is typically measured under test conditions.

TLS

(Transport Layer Security) A protocol that ensures privacy between communicating applications and their users on the Internet. When a server and client communicate, TLS ensures that no third party may eavesdrop or tamper with any message. TLS is the successor to the Secure Sockets Layer (SSL).

TLV

Type, Length, Value format - LLDP frames are sent by each equipment on each port at a fixed frequency. A frame contains a Link Layer Discovery Protocol Data Unit (LLDPDU) which is a set of type, length, value (TLV) structures. An LLDP frame should start with mandatory TLVs (e.g., Chassis ID, Port ID, and Time to live). These mandatory TLVs are followed by any number of optional TLVs. The frame should end with a special TLV named end of LLDPDU. The IEEE 802.1ab specification contains a description of all of the TLV types.

Trap

In SNMP, a trap is a type of PDU used to report an alert or other asynchronous event about a managed subsystem.

Also, a place in a program for handling unexpected or unallowable conditions - for example, by sending an error message to a log or to a program user. If a return code from another program was being checked by a calling program, a return code value that was unexpected and unplanned for could cause a branch to a trap that recorded the situation, and take other appropriate action.

An ION system trap is a one-way notification (e.g., from the IONMM to the NMS) that alerts the administrator about instances of MIB-defined asynchronous events on the managed device. It is the only operation that is initiated by the IONMM rather than the NMS. For a management system to understand a trap sent to it by the IONMM, the NMS must know what the object identifier (OID) defines. Therefore, it must have the MIB for that trap loaded. This provides the correct OID information so that the NMS can understand the traps sent to it.

TCP/UDP Port Prioritization

The ability to prioritize traffic internally based on a TCP or UDP port number. (AKA, Layer 4 Prioritization.)

TTL

(Time to live) an Ethernet counter that records the number of times a transmission is sent/received without errors. TTL specifies how long a datagram is allowed to "live" on the network, in terms of router hops. Each router decrements (reduces by one) the value of the TTL field prior to transmitting it. If the TTL field drops to zero, the datagram is assumed to have taken too long a route and is discarded.

The default TTL for ION software is 64. This means that a test packet must be successfully sent and received 63 times before a TTL expired message is generated. You can change the TTL value (e.g., a value of 255 is a demanding test because the packet must be sent and received error free 254 times).

UAC

(User Account Control) Technology and security infrastructure of some *Microsoft* operating systems that improve OS security by limiting application software to standard user privileges until an administrator authorizes an increase.

UDP

(User Datagram Protocol) A connectionless protocol that, like TCP, runs on top of IP networks. Unlike TCP/IP, UDP/IP provides very few error recovery services, offering instead a direct way to send and receive datagrams over an IP network. It's used primarily for broadcasting messages over a network.

Unicast

One of the four forms of IP addressing, each with its own unique properties. The most common concept of an IP address is in unicast addressing, available in both IPv4 and IPv6. It normally refers to a single sender or a single receiver, and can be used for both sending and receiving. Usually, a unicast address is associated with a single device or host, but it is not a one-to-one correspondence. Some individual PCs have several distinct unicast addresses, each for its own distinct purpose. Sending the same data to multiple unicast addresses requires the sender to send all the data many times over, once for each recipient. See also Multicast.

USB

(Universal Serial Bus) A plug-and-play interface between a computer and add-on devices, such as media players, keyboards, telephones, digital cameras, scanners, flash drives, joysticks and printers.

UTC

(Coordinated Universal Time) A time standard based on International Atomic Time (TAI) with leap seconds added at irregular intervals to compensate for the Earth's slowing rotation. Leap seconds are used to allow UTC to closely track UT1, which is mean solar time at the Royal Observatory, Greenwich.

UTP

(Unshielded Twisted Pair) The most common form of twisted pair wiring, because it is less expensive and easier to work with than **Error! Reference source not found.** (Shielded Twisted Pair). UTP is used in Ethernet 10Base-T and 100Base-T networks, as well as in home and office telephone wiring. The twist in UTP helps to reduce crosstalk interference between wire pairs.

VAC

Volts AC (alternating current, as opposed to DC – direct current). See also "DC".

VCP

(Virtual Com Port) A driver that allows a USB device to appear as an additional COM port. The USB device can be accessed by an application in the same manner as a regular COM port.

VDC

Volts DC (direct current, as opposed to AC – alternating current).

Web-based Management

Allows users to manage the switch through a web browser. (AKA, Web GUI, Web interface, Web IF.)

Well Known Ethernet Multicast Addresses

Some common Ethernet multicast MAC addresses are shown below with their related Field Type and typical usage.

Ethernet Multicast Address	Usage
01-00-0C-CC-CC-CC	CDP (Cisco Discovery Protocol), VTP (VLAN Trunking Protocol)
01-00-0C-CC-CC-CD	Cisco Shared Spanning Tree Protocol Address
01-80-C2-00-00-00	Spanning Tree Protocol (for bridges) (IEEE 802.1D)
01-80-C2-00-00-01	Ethernet OAM Protocol (IEEE 802.3ah)
01-80-C2-00-00-02	IEEE Std 802.3 Slow Protocols multicast address
01-80-C2-00-00-03	IEEE Std 802.1X PAE address
01-80-C2-00-00-04	IEEE MAC-specific control protocols
01-80-C2-00-00-08	Spanning Tree Protocol (for provider bridges) (IEEE 802.1AD)
01-00-5E-xx-xx-xx	IPv4 Multicast (RFC 1112)
33-33-xx-xx-xx-xx	IPv6 Multicast (RFC 2464)

Well Known Ports

The set of all available port numbers are divided into three ranges: Well Known Ports, Registered Ports, and Dynamic and/or Private Ports. The Well Known Ports are those from 0 through 1023. The Registered Ports are those from 1024 through 49151. Registered ports require IANA registration. The Dynamic and/or Private Ports are those from 49152 through 65535. Port 443 is reserved for the HTTPS, port 179 for the BGP Border Gateway Protocol, and port 161 for SNMP.

To see all the used and listening ports on your computer, use the **netstat** (or similar) command line command. For further port assignment information, see IETF RFC 1700.

Port Number	Description
20	FTP
22	SSH Remote Login Protocol
23	Telnet
25	Simple Mail Transfer Protocol (SMTP)
53	Domain Name System (DNS)
69	Trivial File Transfer Protocol (TFTP)
80	HTTP
143	Interim Mail Access Protocol (IMAP)
161	SNMP /TCP
161	SNMP /UDP
161	SNMPTRAP /TCP
162	SNMPTRAP /UDP
179	Border Gateway Protocol (BGP)
190	Gateway Access Control Protocol (GACP)
443	HTTPS
514	Syslog UDP
546	DHCP Client

10Gigabit Ethernet Terms

10 gigabit Ethernet
(10GE or 10GbE or 10 GigE) refers to various technologies for transmitting Ethernet frames at a rate of 10 gigabits per second (10 billion bits per second), first defined by the IEEE 802.3ae-2002 standard.
Like previous versions of Ethernet, 10GbE supports both copper and fiber cabling. However, due to its higher bandwidth requirements, higher-grade copper cables are required: category 6a or Class F/Category 7 cables for links up to 100m. Unlike previous Ethernet standards, 10 gigabit Ethernet only defines full duplex point-to-point links which are generally connected by network switches. Half duplex operation does not exist in 10GbE.
The 10 gigabit Ethernet standard encompasses a number of different physical layer (PHY) standards. A networking device may support different PHY types through pluggable PHY modules, such as those based on SFP+. Over time, market forces will determine the most popular 10GE PHY types. At the time that the 10 gigabit Ethernet standard was developed, interest in 10GbE as a wide area network (WAN) transport led to the introduction of a WAN PHY for 10GbE. The WAN PHY encapsulates Ethernet packets in SONET OC-192c frames and operates at a slightly slower data-rate (9.95328 Gbps) than the local area network (LAN) PHY. Both share the same physical medium-dependent sublayers so can use the same optics. The WAN PHY can support maximum link distances up to 80 km depending on the fiber standard employed.

Backplane Ethernet
Backplane - also known by its task force name 802.3ap - is used in backplane applications such as blade servers and routers/switches with upgradable line cards. 802.3ap implementations are required to operate in an environment comprising up to 1 meter (39 in) of copper printed circuit board with two connectors. The standard defines two port types for 10 Gbit/s (10GBASE-KX4 and 10GBASE-KR) and a 1 Gbit/s port type (1000BASE-KX). It also defines an optional layer for FEC, a backplane autonegotiation protocol and link training for 10GBASE-KR where the receiver can set a three tap transmit equalizer. The autonegotiation protocol selects between 1000BASE-KX, 10GBASE-KX4, 10GBASE-KR or 40GBASE-KR4 operation. 40GBASE-KR4 is defined in 802.3ba. New backplane designs use 10GBASE-KR rather than 10GBASE-KX4.

10GBASE-KX4
Operates over four backplane lanes and uses the same physical layer coding (defined in IEEE 802.3 Clause 48) as 10GBASE-CX4.

10GBASE-KR
Operates over a single backplane lane and uses the same physical layer coding (defined in IEEE 802.3 Clause 49) as 10GBASE-LR/ER/SR.

10GBASE-T
10GBASE-T, or IEEE 802.3an-2006, is a standard released in 2006 to provide 10 Gbit/s connections over unshielded or shielded twisted pair cables, over distances up to 100 meters (330 ft). Although category 6a is required to reach the full 100 meters (330 ft), category 5e is good for up to 45 meters (148 ft) and category 6 will reach 55 meters (180 ft).[22] 10GBASE-T cable infrastructure can also be used for 1000BASE-T allowing a gradual upgrade from 1000BASE-T using autonegotiation to select which speed to use. 10GBASE-T has latency in the range 2 to 4 micro-seconds compared to 1 to 12 microseconds on 1000BASE-T. As of 2010 10GBASE-T silicon is available from several manufacturers with claimed power dissipation of 3-4 W at structure widths of 40 nm. With 28 nm in development, power will continue to decline.
10GBASE-T uses the IEC 60603-7 8P8C (commonly known as RJ45) connectors already widely used with Ethernet. Transmission characteristics are now specified to 500 MHz. To reach this frequency Category 6A or better balanced twisted pair cables specified in ISO/IEC 11801 amendment 2 or ANSI/TIA-568-C.2 are needed to carry 10GBASE-T up to distances of 100 m. Category 6 cables can carry 10GBASE-T for shorter distances when qualified according to the guidelines in ISO TR 24750 or TIA-155-A.

10GBASE-SR
10GBASE-SR ("short range") is a port type for multi-mode fiber and uses 850 nm lasers. Its Physical Coding Sublayer 64b/66b PCS is defined in IEEE 802.3 Clause 49 and its Physical Medium Dependent PMD in Clause 52. It delivers serialized data at a line rate of 10.3125 Gbit/s.
Over obsolete FDDI-grade 62.5 micrometers multimode fiber cabling it has a maximum range of 26 meters. Over 62.5 micrometers OM1 it has a range of 33 meters; over 50 micrometers OM2 a range of 82 meters; over OM3 300 meters and over OM4 400 meters. OM3 and OM4 are the preferred choices for structured optical cabling within buildings. MMF has the advantage over SMF of having lower cost connectors because of its wider core.
There is a non-standard lower cost, lower power variant sometimes referred to as 10GBASE-SRL (10GBASE-SR lite). This is inter-operable with 10GBASE-SR but only has a reach of 100 meters.

10GBASE-LR
10GBASE-LR ("long reach") is a port type for single-mode fiber and uses 1310 nm lasers. Its Physical Coding Sublayer 64b/66b PCS is defined in IEEE 802.3 Clause 49 and its Physical Medium Dependent PMD in Clause 52. It delivers serialized data at a line rate of 10.3125 Gbit/s.
10GBASE-LR has a specified reach of 10 kilometers (6.2 mi), but 10GBASE-LR optical modules can often manage distances of up to 25 kilometers (16 mi) with no data loss.

10GBASE-LRM
10GBASE-LRM, (Long Reach Multimode) originally specified in IEEE 802.3aq is a port type for multimode fiber and uses 1310 nm lasers. Its Physical Coding Sublayer 64b/66b PCS is defined in IEEE 802.3 Clause 49 and its Physical Medium Dependent PMD in Clause 68. It delivers serialized data at a line rate of 10.3125 Gbit/s.
10GBASE-LRM supports distances up to 220 meters (720 ft) on FDDI-grade multimode fiber and the same 220m maximum reach on OM1, OM2 and OM3 fiber types. 10GBASE-LRM reach is not quite as far as the older 10GBASE-LX4 standard.

To ensure that specifications are met over FDDI-grade, OM1 and OM2 fibers, the transmitter should be coupled through a mode conditioning patch cord. No mode conditioning patch cord is required for applications over OM3 or OM4.
Some 10GBASE-LRM transceivers also support distances up to 300 meters (980 ft) on standard single-mode fiber (SMF, G.652), however this is not part of the IEEE or MSA specification. 10GBASE-LRM uses electronic dispersion compensation (EDC) for receive equalization.
10GBASE-LRM has been a failure in the market.

10GBASE-ER
10GBASE-ER ("extended reach") is a port type for single-mode fiber and uses 1550 nm lasers. Its Physical Coding Sublayer 64b/66b PCS is defined in IEEE 802.3 Clause 49 and its Physical Medium Dependent PMD in Clause 52. It delivers serialized data at a line rate of 10.3125 Gbit/s.
The 10GBASE-ER transmitter is implemented with an externally modulated laser (EML).
10GBASE-ER has a reach of 40 kilometers (25 mi) over engineered links and 30 km over standard links.

10GBASE-ZR
Several manufacturers have introduced 80 km (50 mi) range ER pluggable interfaces under the name 10GBASE-ZR. This 80 km PHY is not specified within the IEEE 802.3ae standard and manufacturers have created their own specifications based upon the 80 km PHY described in the OC-192/STM-64 SDH/SONET specifications. The 802.3 standard will not be amended to cover the ZR PHY.

802.3 Standards for 10GbE
Over the years the IEEE 802.3 working group has published several standards relating to 10GbE. These included: 802.3ae-2002 (fiber -SR, -LR, -ER and -LX4 PMDs), 802.3ak-2004 (-CX4 copper twin-ax InfiniBand type cable), 802.3an-2006 (10GBASE-T copper twisted pair), 802.3ap-2007 (copper backplane -KR and -KX4 PMDs) and 802.3aq-2006 (fiber -LRM PMD with enhanced equalization). The 802.3ae-2002 and 802.3ak-2004 amendments

were consolidated into the IEEE 802.3-2005 standard. IEEE 802.3-2005 and the other amendments were consoli-
dated into IEEE Std 802.3-2008.

ALR
(Automatic Link Restoration) After a link failure condition has been corrected, the device will automatically re-
establish the link in all network conditions using the ALR feature.

Cat 6 (Category 6) Cable
Category 6 cable, commonly referred to as Cat 6, is a standardized cable for Gigabit Ethernet and other network
physical layers that is backward compatible with the Category 5/5e and Category 3 cable standards. Compared to
Cat 5 and Cat 5e, Cat 6 provides more stringent specifications for crosstalk and system noise. The Cat 6 cable
standard provides performance of up to 250 MHz and is suitable for 10BASE-T, 100BASE-TX (Fast Ethernet),
1000BASE-T/1000BASE-TX (Gigabit Ethernet) and 10GBASE-T (10-Gigabit Ethernet). Category 6 cable has a reduced
maximum length when used for 10GBASE-T.
Like most earlier twisted-pair cable, Category 6 cable contains four twisted wire pairs. Attenuation, near end cross-
talk (NEXT), and PSNEXT (power sum NEXT) in Cat 6 cable and connectors are all much lower than Cat 5 or Cat 5e,
which uses 24 AWG wire. The increase in performance with Cat 6 comes mainly from increased (22 AWG) wire size.
Because the conductor sizes are generally the same, Cat 6 jacks may also be used with Cat 5e cable.
Category 6 cable can be identified by the printing on the side of the cable sheath. Cat 6 patch cables are normally
terminated in 8P8C modular connectors. If Cat 6 rated patch cables, jacks, and connectors are not used with Cat 6
wiring, overall performance is degraded to that of the cable or connector.
Connectors use either T568A or T568B pin assignments; although performance is comparable provided both ends
of a cable are the same, T568B is a deprecated standard in the US and no longer supported by TIA.

Category 6a Cable (Augmented Category 6)
Category 6a cable, or Augmented Category 6, is characterized to 500 MHz and has improved alien crosstalk charac-
teristics, allowing 10GBASE-T to be run for the same distance as previous protocols.
The latest standard from the TIA for enhanced performance standards for twisted pair cable systems was defined
in February 2008 in ANSI/TIA/EIA-568-B.2-10. Category 6a is defined at frequencies up to 500 MHz—twice that of
Cat. 6.
Category 6a performs at improved specifications, in particular in the area of alien crosstalk, as compared to Cat 6
UTP (unshielded twisted pair), which exhibited high alien noise in high frequencies.
The global cabling standard ISO/IEC 11801 has been extended by the addition of amendment 2, which defines new
specifications for Cat 6A components and Class EA permanent links. These new global Cat 6A/Class EA specifica-
tions require a new generation of connecting hardware, which offer superior performance compared to existing
products based on the American TIA standard.
Note the performance difference between ISO/IEC and EIA/TIA component specifications for the NEXT transmis-
sion parameter. At a frequency of 500 MHz, an ISO/IEC Cat 6A connector performs 3 dB better than a Cat 6A con-
nector that conforms with the EIA/TIA specification. The 3 dB represents a 100% increase of near-end crosstalk
noise reduction when measured in absolute magnitudes.
When used for 10GBASE-T, Cat 6 cable's maximum length is 55 meters (180 ft) in a favorable alien crosstalk envi-
ronment, but only 37 meters (121 ft) in a hostile alien crosstalk environment, such as when many cables are bun-
dled together. However, because the effects of alien crosstalk environments on cables are difficult to determine
prior to installation, it is highly recommended that all Cat 6 cables being used for 10GBASE-T are electrically tested
once installed. With its improved specifications, Cat6 A does not have this limitation and can run 10GBASE-T at 100
meters (330 ft) without electronic testing.

LRM
Long Reach Multimode. See "10GBASE-LRM".

MSA
Multi-Source Agreements. enhanced Small Form-factor Pluggable transceiver. To support different 10GbE physical
layer standards, many interfaces consist of a standard socket into which different PHY modules may be plugged.

Physical layer modules are not specified in an official standards body but by multi-source agreements (MSAs) that can be negotiated more quickly. Relevant MSAs for 10GbE include XENPAK (and related X2 and XPAK), XFP and SFP+. When choosing a PHY module, a designer considers cost, reach, media type, power consumption, and size (form factor). A single point-to-point link can have different MSA pluggable formats on either end (e.g. XPAK and SFP+) as long as the 10GbE optical or copper interface (e.g. 10GBASE-SR) inside the pluggable is identical. See also "SFP+".

SFP+

enhanced Small Form-factor Pluggable transceiver. To support different 10GbE physical layer standards, many in-terfaces consist of a standard socket into which different PHY modules may be plugged. Physical layer modules are not specified in an official standards body but by multi-source agreements (MSAs) that can be negotiated more quickly. Relevant MSAs for 10GbE include XENPAK (and related X2 and XPAK), XFP and SFP+. When choosing a PHY module, a designer considers cost, reach, media type, power consumption, and size (form factor). A single point-to-point link can have different MSA pluggable formats on either end (e.g. XPAK and SFP+) as long as the 10GbE optical or copper interface (e.g. 10GBASE-SR) inside the pluggable is identical. See also "MSA".
The newest module standard is the enhanced small form-factor pluggable transceiver, generally called SFP+. Based on the small form-factor pluggable transceiver (SFP) and developed by the ANSI T11 fibre channel group, it is smaller still and lower power than XFP. SFP+ has become the most popular socket on 10GE systems. SFP+ modules do only optical to electrical conversion, no clock and data recovery, putting a higher burden on the host's channel equalization. SFP+ modules share a common physical form factor with legacy SFP modules, allowing higher port density than XFP and the re-use of existing designs for 24 or 48 ports in a 19" rack width blade.
SFP+ modules can further be grouped into two types of host interfaces: linear or limiting. Limiting modules are preferred except when using old fiber infrastructure which requires the use of the linear interface provided by 10GBASE-LRM modules.

TLPT

(Transparent Link Pass Through) will notify an end device of a link failure just like Link Pass Through; however, it uses a different method for "passing through" this information. Transparent Link Pass Through sends a link loss signal over the fiber, instructing the remote converter to shut down the copper port thus notifying the end device, while maintaining the fiber link between the two converters. With TLPT, an End device automatically notified of link loss, and the Fiber link remains up as it carries a link loss signal

XAUI

XAUI is a standard for extending the XGMII (10 Gigabit Media Independent Interface) between the MAC and PHY layer of 10 Gigabit Ethernet (10GbE). XAUI is pronounced "zowie", a concatenation of the Roman numeral X, mean-ing ten, and the initials of "Attachment Unit Interface". The XGMII Extender, which is composed of an XGXS at the MAC end, an XGXS at the PHY end and a XAUI between them, is to extend the operational distance of the XGMII and to reduce the number of interface signals. Applications include extending the physical separation possible be-tween MAC and PHY components in a 10 Gigabit Ethernet system distributed across a circuit board.

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