CTP System

CTP Software Configuration Guide

CTP Release 5.2
CTPView Release 3.2

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Part 1

CTP Software Configuration

Chapter 1

CTP Overview

The CTP products are designed to create an IP packet flow from a serial data stream or analog voice connection, providing the necessary processing to re-create the serial bit stream or analog signal from an IP packet flow.

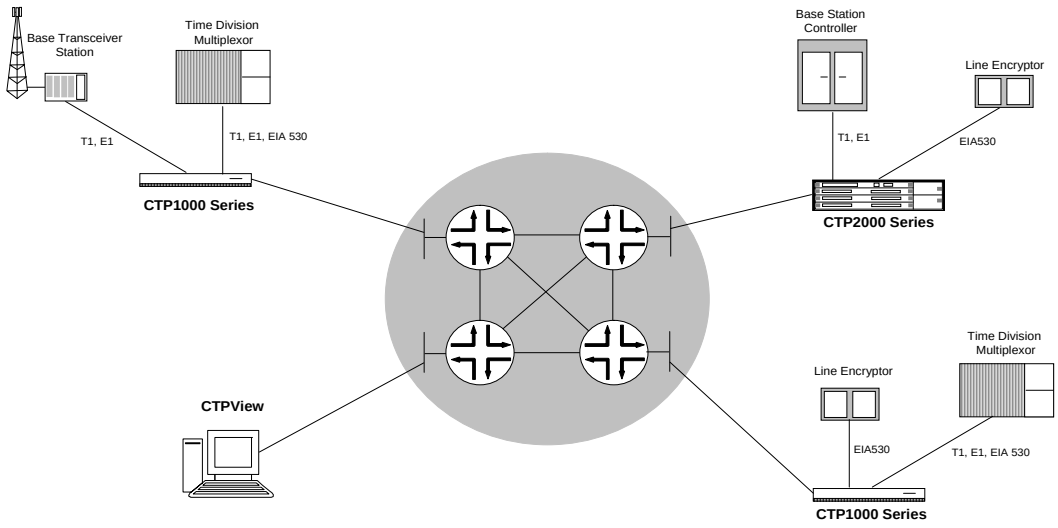
This chapter contains the following sections:

- Overview on page 3
- Packet Processing on page 5
- Clock Options on page 6

Overview

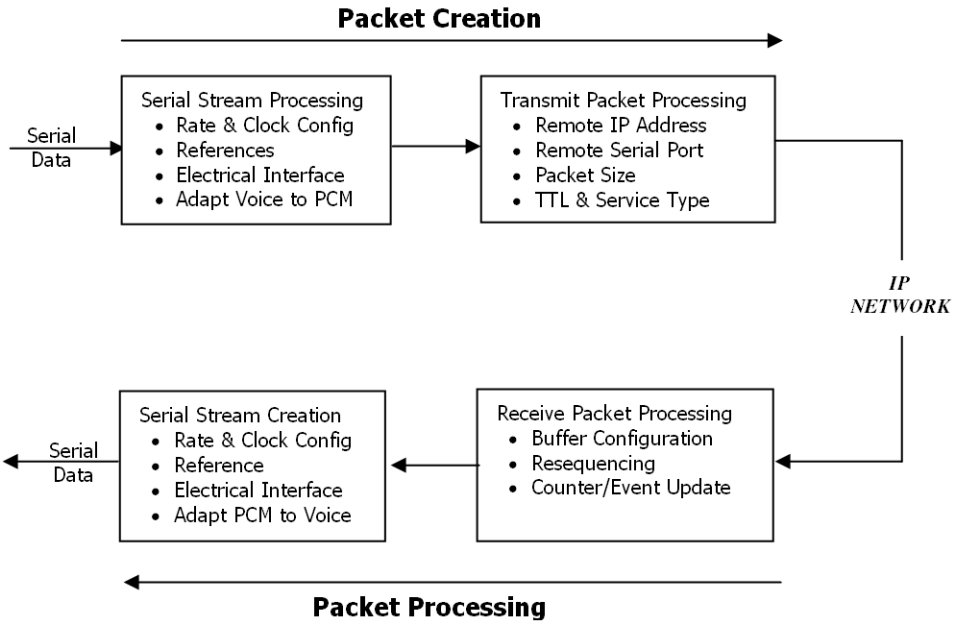
CTP products are designed to accommodate the delay, delay jitter, and packet reordering characteristics of an IP network. Figure 1 shows examples of applications that use CTP products.

Figure 1: Sample Applications Using CTP Products



Numerous processes must occur to adapt serial data to and from IP packets. These processes are summarized in Figure 2. You configure the characteristics of the processes by using the CTP menu interface or the CTPView graphical user interface.

Figure 2: Processes



Using the menu interface, you can configure the CTP products to accept a serial data stream and create an IP flow that will be transferred across an IP network. The connection provided by the CTP system is a physical layer circuit between the end user equipment.

Serial Stream Processing

For a summary of this process, see Figure 2.

Rate selection and clock configuration allow the serial interface rate to be configured through the software. Rates supported range from less than 300 bps to 12.288 Mbps (in subhertz increments).

You can configure the CTP systems by using the menu interface to provide multiple prioritized node clock references. An external reference input and any of the serial interfaces may be used for the node reference clock. Reference frequencies must be 32 KHz, *n* x 64 KHz, or 1544 KHz up to a maximum of 4096 KHz (2048 KHz maximum on the CTP1002).

The electrical characteristics and encoding of the CTP ports are software configurable. The available options are EIA530, EIA530A, RS-232, V.35, analog 4W-TO, conditioned diphase, isochronous, T1, and E1.

An analog voice signal terminated on the 4W-TO interface is converted into a 64-kbps PCM digital bit stream before adaptation to and from an IP flow. The analog interface allows transmit and receive levels to be adjusted.

Transmit Packet Processing

For a summary of this process, see Figure 2 on page 4.

The CTP system is configured with the remote IP address of the system where the packets created from the local serial port are to be routed.

The CTP remote port is specified by the IP address and physical port number of the remote unit and port.

The packet size created by the CTP system may be set from 32 to 1456 bytes. As discussed in *Chapter 2, Software Configuration*, larger packet sizes are more bandwidth-efficient but introduce more serialization delay when the packet is created. The menu interface checks to verify that the combination of packet size and data rate does not result in a packet rate exceeding 1200 packets per second.

Time to live (TTL) may be set from 0 to 255 (see Time to Live in *Chapter 2, Software Configuration*). The TTL is the maximum number of hops in the IP network that the packet may travel before it is discarded by the network. You can configure the service type byte (see Service Type in *Chapter 2, Software Configuration*), which some IP networks use to determine the quality of service provided to the IP flow.

Packet Processing

Using the CTP menu interface, you can configure the unit to accept the IP flow and create a serial data stream that meets your application requirements. For a summary of this process, see Figure 2 on page 4.

Receive Packet Processing

A receive buffer is required to “smooth” the timing jitter of received packets because of the delay variance that is inevitably encountered in the IP network. The configuration allows you to configure both the size of the buffer (in 1-msec increments) and the maximum amount of buffering delay allowed before the buffer will recenter. The size of the buffer configured should be dependent on the performance and characteristics of the IP network.

The CTP system automatically re-sequences packets when they arrive out of order. If a packet is not received, the CTP system inserts all data in lieu of the packet information so that bit count integrity is maintained.

You can prompt the menu interface to display detailed information about the port status, such as packet counts, late packets, missing packets, and buffer fill.

Serial Stream Creation

The packet receive process allows the serial data rate to be configured through the software. Rates supported range from less than 300 bps to 12.288 Mbps in subhertz increments as described in *Chapter 2, Software Configuration*. Conditioned diphase and isochronous interfaces operate at rates up to 1.024 Mbps.

Clock Options

The CTP system provides numerous options for physical layer clocking:

- Interface clocking options—As detailed in Clock Configuration on page 48 in *Chapter 2, Software Configuration*, the CTP system allows complete configuration flexibility of interface clocking. This flexibility includes your ability to specify how clocks are generated (that is, from the node clock, which can be phase locked to an external clock input) and what clocks are used to process the data from the attached device. The CTP system can synthesize over 1.5 billion rates between 1 bps and 12.288 Mbps.

- Asymmetric clocking—As detailed in Custom Clock Options—CLI on page 52 in *Chapter 2, Software Configuration*, you can configure CTP circuits to synthesize asymmetric rates.

- Reference clock input—The CTP system can phase lock its node clock to an interface clock or external reference input. Up to five prioritized references can be configured. The node provides a reference holdover if all references are lost.

- Plesiochronous operation—Calibrated Clock is a patented CTP feature that allows the one-time calibration of the CTP oscillator to a known reference. Depending on environmental factors, two units calibrated to the same clock will have a clock difference as small as 100 parts per billion. This allows CTP circuits to operate for long periods of time before a buffer recenter occurs.

- Adaptive clocking—Although IP router networks do not transfer physical layer clocking, the CTP adaptive clocking feature, using patented Advanced Time Domain Processing (ATDP), allows the CTP system to recover clocking information from the remote CTP port and adjust the local clock accordingly. ATDP provides rapid convergence to the correct clock, and does not vary due to changes in the average jitter buffer fill. As a result, a CTP circuit will continuously operate without a buffer recenter, even when clock references are not used.

Chapter 2

Software Configuration

This chapter provides information about CTP configuration parameters and about configuring the systems with both the command-line interface (CLI) and CTPView. The chapter contains the following sections:

- Overview on page 7
- First Boot Configuration on page 10
- Bundle Operations on page 11
- Bundle Operations—CTPOS CLI Menu Commands on page 13
- Configuring Voice Compression (Vcomp) on page 22
- Configuring Port Mirroring on page 24
- Bundle Operations—CTPView Interface Commands on page 27
- Configuring Bundle Parameters on page 30
- Port Configuration—Packet-Bearing Serial Interface on page 63
- Node Synchronization on page 65
- Node Summary on page 68
- Node Operations and Maintenance on page 69

Overview

See Figure 3 on page 9 for a hierarchy of the CLI menus used to configure the CTP system. Corresponding CTPView configuration windows are included throughout this section. For up-to-date CTPView information, see the *Release Notes*.

Menu options include:

- Bundle and port configuration commands—Use these commands to configure bundle interface and port interface parameters, such as bundle type, port clock, serial interface rates, interface type, buffering, and distant port IP address.

Bundles are the packetization and transport mechanisms of the physical port data, including signaling. Three bundle types are supported: circuit-to-packet (CTP), structure-agnostic TDM over packet (SAToP), and circuit emulation services of packet structure network (CESoPSN). Ports are the physical interface that can be configured and managed.

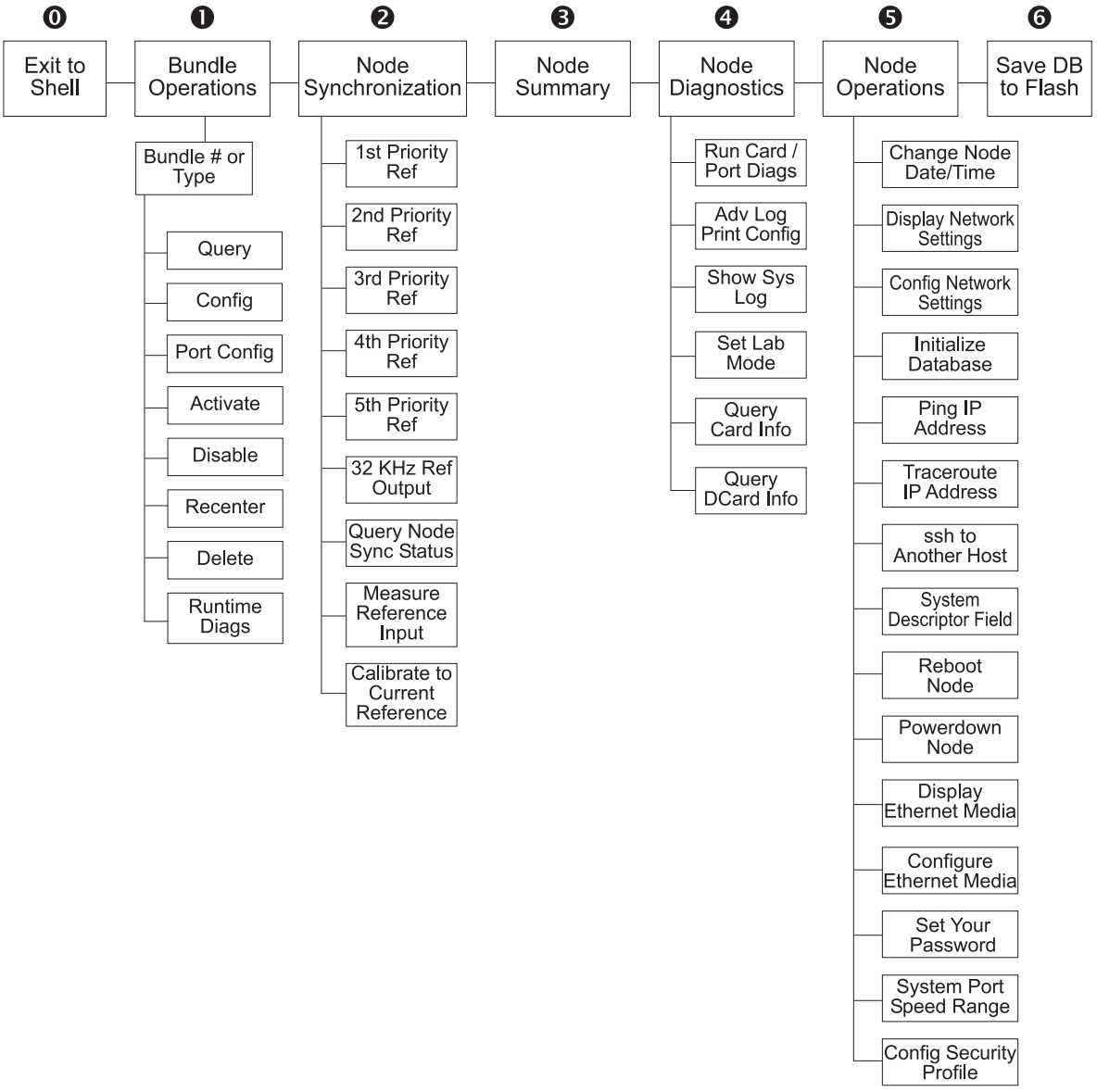
Both bundles and ports are configured through the Bundle Operations menu.

- Node synchronization commands—Use these commands to configure the clock reference to be used by the CTP system. (See Port Configuration—Packet-Bearing Serial Interface on page 63.)

- Node operation commands—Use these commands to perform infrequent operations such as setting the CTP IP address when the unit is first installed, upgrading the CTP software, and initializing the database. (See Node Operations and Maintenance on page 69.)

Commands to monitor the CTP system, circuits, and the IP network (such as **activate**, **disable**, and **query**) are described in *Chapter 4, Software Queries and Operations*.

Figure 3: CTP Menu Tree



In the CLI, the default setting for each configuration parameter appears in brackets whenever you are prompted for input. The default setting is implemented when the only input is a return. Whenever you enter an acceptable nondefault setting, that setting becomes the new default for the configuration parameter. When you are configuring the CTP system, any configuration changes take effect immediately and are implemented when you exit the configuration or activate the port.

Figure 4: CTP Main Menu

```
==============================================
CTP Main Menu
==============================================
Please select a number from the following list:
----------------------------------------------
 0) Exit to Shell
 1) Bundle Operations
 2) Node Synchronization
 3) Node Summary
 4) Node Diagnostics
 5) Node Operations
 6) Save Database to Flash
------------ Your choice [1]: 1

Enter port (0-3)[0]:
```

First Boot Configuration

The first boot processes allow you to configure the CTP system parameters the first time the system is powered on. The system configuration information entered during the first boot process is saved, and first boot prompts will not occur during subsequent power-on cycles. An asynchronous terminal connection is required during the first power-on. COM2, located on the RTM, is used when you configure the CTP2000 system during the first boot process.

You can modify the system configuration after the first boot by using the menu interface, as described in Node Operations and Maintenance on page 69. However, it is helpful to have as much complete information as possible during the first boot. The information needed includes the following:

- Password for the root user—The system will check to verify that the password meets the security profile requirements. However, you can use a noncompliant password by reentering it during the password confirmation prompt.
- Supported protocols — You can specify which versions of IP will be used by the CTP device, including: IPv4 only, IPv6 only, and IPv4 and IPv6.
- Hostname.
- Default Ethernet interface—The first boot process detects the available Ethernet interfaces, and you must select the default. CTP circuits can be routed to the default or other active Ethernet interfaces. Required information for the default Ethernet interface includes:
  - IPv4 and/or IPv6 address
  - Subnet mask
  - Gateway
  - Maximum transmission unit (MTU) size
  - Additional routes for the default interface (optional)
- Current date and time.

Additional management and/or data interfaces can be configured through the CLI. This includes the ability to configure virtual IPs as well as VLAN interfaces. Details on configuring these interfaces can be found in Node Operations and Maintenance on page 69.

Figure 5 shows an example of the first boot process and user input.

Figure 5: First Boot Process and User Input Example

```
Configure Supported Protocols:
0) IPv4 Only
1) IPv6 Only
2) IPv4&IPv6
Please select your option (rtn for 0):

There are 2 Ethernet devices available for use. The default device is the device
through which the default gateway can be accessed. CTP circuits can run over any
Ethernet device, default or not. A default device must be configured; other
devices may be configured and enabled, or disabled. Here is a list of the
available devices and their descriptions:

    eth0: 10/100/1000 Copper (front)
    eth1: 10/100/1000 Copper (back)

What device would you like to make the default device? (rtn for eth0) eth0
OK, eth0 (10/100/1000 Copper (front)) will be configured as the IPv4 default
device.

Please input the hostname (return for ctp):ctp26

Configuration for eth0 (default device):
Please input the ip (return for 127.0.0.1):172.25.62.26
Please input the netmask (return for 255.255.255.0):255.255.255.128
Please input the gateway (return for 127.0.0.1):172.25.62.1
Please input the mtu in bytes (return for 1500):

Add route to interface eth0 [n] y

How many routes would you like to add to eth1? (0-3)[0] 1

----- Route #1 for eth0
Please input the network (return for 127.0.0.1):10.0.1.0
Please input the number of bits in the netmask (return for 24):
Please input the gateway (return for 127.0.0.1):10.0.1.1
```

Bundle Operations

Bundles are the packetization and transport mechanisms of the physical port data, including signaling. Three bundle types are supported: CTP, SAToP, and CESoPSN. Ports are the physical interface that can be configured and managed. Both bundles and ports are configured through the Bundle Operations menu.

For information about working with bundles in the CLI interface, see “Bundle Operations—CTPOS CLI Menu Commands” on page 13. For information about working with bundles in the CTPView interface, see “Bundle Operations—CTPView Interface Commands” on page 27.

Bundles Overview

Bundles are a new addition to the CTP paradigm. Previously, there was a one-to-one mapping of the physical port and the IP flow that carries data for that port. With the addition of the PWE3 CESoPSN traffic type, it is possible to have more than one circuit emulation IP flow created from a single physical port. For example, some DS0 channels from a T1 interface go in an IP flow to destination A, and other DS0 channels from that same T1 interface go to destination B.

Therefore, a bundle represents an IP circuit emulation flow. All parameters related to an IP flow are considered bundle parameters, and a physical port is chosen to be attached to this bundle. This is also possible with a selection of channels if it is a fractional T1 or CESoPSN bundle.

Physical port configuration is done separately from within the Bundle Configuration menu through a submenu. Where previously the IP flow would be defined and referenced by the port number, now it is referenced by a chosen bundle ID, which is logical rather than physical. Currently, up to 64 bundles may be defined on a CTP device, with bundle IDs ranging from 0 to 63.

Workflow Changes

CTP and SAToP bundle types are compatible with ports from previous versions of the CTP operating system (CTPOS). For example, before you may have configured port 4 to be nonreturn to zero (NRZ) at a speed of 128 Kbps with a remote port of 172.25.62.45:P4. Now, you add a bundle, choose the bundle ID (10, for example), and type CTP. In the bundle configuration, you then set the remote IP to 172.25.62.45 and the remote cid (circuit ID) to 4, representing the physical port to connect to on the remote CTP.

Local port parameters are set in a separate port submenu under the bundle configuration. In this example, you would set the speed to 128 Kbps and the encoding to NRZ.

Establishing a Virtual Circuit Across the Packet Network

To establish a virtual circuit across the packet network:

1. Create a new bundle or manage an existing bundle by:
   - Selecting a bundle type (CTP, SAToP, CESoPSN, VCOMP).
   - Selecting an existing bundle.
2. Attach the bundle to a physical port.

   See Table 1 for what port type can be attached to each bundle type. Except for CESoPSN bundles, the port must be unused by other bundles to be attached to the new bundle.
3. Configure the port parameters, including port speed and interface clocking.
4. Configure the bundle parameters, including the address of the remote CTP and the packet size. For CESoPSN bundles, also configure the DS0s used by the bundle.

5. Activate the bundle.

Table 1: Bundle Types and Allowed Port Types

Bundle Type	Allowed Port Types
CTP	■ CTP-1000 ■ Serial interface ■ Serial interface with T1/E1 daughter card ■ Serial interface with 4WTO daughter card ■ CTP-2000 ■ Serial interface ■ Serial interface with T1/E1 daughter card ■ Serial interface with 4W-E&M daughter card ■ T1/E1 interface
SAToP	■ CTP-1000 ■ Serial interface with T1/E1 daughter card ■ CTP-2000 ■ Serial interface with T1/E1 daughter card ■ T1/E1 interface
CESoPSN	■ CTP-2000 ■ T1/E1 interface with unused DS0s An unused DS0 is a DS0 not assigned to another bundle. When a CESoPSN bundle is attached to a port, by default all unused DS0s are assigned to the bundle.
Voice Compression (VCOMP)	■ CTP-2000 ■ T1/E1 interface ■ 4W-E&M interface ■ Voice compression module

Bundle Operations—CTPOS CLI Menu Commands

The Bundle Operations menu enables you to configure bundles on a CTP device. To display the Bundle Operation menu, select **1) Bundle Operations** from the CTP Main Menu.

```
================================================================================
= (nova49 01/24/08 15:30:13 GMT) | CTP Main Menu
================================================================================

Please select a number from the following list:
------------------------------------
 0) Exit to Shell
 1) Bundle Operations
 2) Node Synchronization
 3) Node Summary
 4) Node Diagnostics
 5) Node Operations
 6) Save Database to Flash
------------ Your choice [1]:
```

The main Bundle menu banner displays the bundle number, bundle type, and the port attached to the bundle. In the example below, the bundle number is 3, the bundle type is CTP, and the port that is attached to the bundle is port 4.

```
================================================================================
= (nova49 01/21/08 19:51:37 GMT) | Operations Menu for bundle 3
= Bundle type: CTP | Bundle source is port 4
================================================================================

Please select a number from the following list:
-------------------------------------
 0) Back to Previous Menu
 1) Query
 2) Config
 3) Port Config
 4) Activate
 5) Disable
 6) Recenter
 7) Delete
 8) Runtime Diags
------------ Your choice [0]:
```

Query

The information displayed by choosing **1) Query** depends on the bundle and port types. Generally, the bundle type and port type are displayed at the top, followed by the port and bundle configurations, and the bundle state and counters.

```
########## Bundle 0 type      CTP ##########
##### Bundle 0 is transporting Port  0 #####

---------- Port 0 Config ----------
Interface type:      T1-B8ZS
Buf Max/Set/Min(ms): 16.000/12.000/8.000
Clock Config:        CTP is Clock Source
Port Config Flags:   NotDirDrv

--------- Bundle 0 Config ---------
DBase State:         ACTIVE
Remote Addr:         10.0.0.0
Remote Port:         0
Using Virtual IP:    No
Tx Packet Size:      1024
Buf Max/Set/Min(ms): 16.000/12.000/8.000
IP Hdr TOS:          0 (decimal)
IP Proto/OAM Port:   47/16

Hit Carriage Return to Continue...

--------- Bundle 0 State ----------
Run State:           NoSYNC
Port Runtime Flags:  ---
T1 flags:            LOS
Autobaud Frequency:  N/A (Disabled)
Adaptive State:      N/A (Disabled)

--------- Bundle 0 Counters -------
I/F bound packets:   0
NET bound packets:   0
Late pkts:           0
```

```
Missing pkts:        0
Buffer restarts:     0
Buffer underflows:   0
Buffer overflows:    0
Buffer starves:      0
BERT running sec:    0
BERT sync sec:       0
BERT error sec:      0
BERT in sync:        No
Buffer max samples:  0
Buff Max/Avg/Min:    0.00/0.00/0.00
Buff Last Minute:    0.00/0.00/0.00
Last counter clear:  0wk, 0d, 0h, 4m, 41s

Clear Port 0 Stats?  y[n]: n
```

Config

The configuration options displayed by choosing **2) Config** depend on the bundle type. Generally, the remote address, a circuit identifier, the packet size, and buffer settings are configurable.

For CTP bundles, the circuit identifier is the port to connect to on the remote CTP system. For SAToP and CESoPSN bundles, the circuit identifier is the source UPD port.

The bundle must be disabled before you configure the bundle options.

```
================================================================================
= (nova_55 05/19/08 21:43:41 GMT) | Config Menu for Bundle 1
= Bundle type: CTP | Bundle source is Port se-0/1
================================================================================

Please select a number from the following list:
-------------------------------------
 0) Back to Previous Menu
 1) Remote Address:        10.0.0.1
 2) Remote Cid:            1         (0-249)
 3) Local  Cid:            1         (0-249)
 4) Packet Size:           1024      (32-1456)
 5) Min Buffer (ms):       8.000     (0.001 - 9999.000)
 6) Pkt Buffer Set (ms):   12.000    (0.001 - 9999.000)
 7) Max Buffer (ms):       16.000    (0.001 - 9999.000)
 8) Service Type:          0         (0-255)
 9) Time to Live:          255       (0-249)
10) Advanced Options...
11) Bundle descriptor text:          (32 characters max, alphanumeric or -:)
------------ Your choice [1]:
```

Configuration Notes for CESoPSN

The following configuration menu appears when you choose **2) Config** in a CESoPSN bundle:

```
 0) Back to Previous Menu
 1) Time Slots:                1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19
20 21 22 23 24
```

```
 2) Destination IP:             10.0.0.1
 3) Source UDP port:            1064
 4) Max Buffer (ms):            192.000
 5) Pkt Buffer Set (ms):        60.000
 7) Packet Size:                1152
------------ Your choice [9]:
```

Refer to the following notes on specific menu commands.

- **3) Source UDP port**—CESoPSN uses the source UDP port plus the destination IP address as the routing index. Be sure that the source UDP port does not overlap across the whole system.

  ```
  ------------ Your choice [2]: 3
  Enter Source UDP Port (0-65535)[1064]: 6021
  ```

- **4) Max Buffer (ms)**—Unlike CTP configuration, contiguous buffer size configuration up to byte level is not allowed with CESoPSN. Instead, the number of packets are used as basic units to configure the buffer. The number has to be a power of 2. You can choose from ten common choices that apply to most scenarios.

  ```
  ------------ Your choice [3]: 4
  Enter Max buffer size
  Choices are:
  1:              8.000ms 2 packets
  2:              16.000ms        4 packets
  3:              32.000ms        8 packets
  4:              64.000ms        16 packets
  5:              128.000ms       32 packets
  6:              256.000ms       64 packets
  7:              512.000ms       128 packets
  8:              1024.000ms      256 packets
  9:              2048.000ms      512 packets
  10:             4096.000ms      1024 packets
   (1-10)[5]
  ```

- **5) Pkt Buffer Set (ms)**—Similar to max buffer size configuration. Packet numbers are used. The buffer is measured in milliseconds and the value entered is converted to the closest packet number if the buffer is not divisible by the packet size.

  ```
  ------------ Your choice [5]:5
   (1-128)[40]: 20
  ```

- **7) Packet Size**—The following configuration rules must be followed:

  - For SAToP mode, the packet size must be divisible by 32.
  - For non-CAS mode, the packet size must be divisible by the total number of time slots.
  - For CAS mode, the packet size must be non-CAS mode packet size plus CAS size.
  - After the packet size has changed, the maximum buffer size and packet buffer size change in terms of milliseconds, but not in terms of packet number.

```
------------ Your choice [5]: 7
Do you really want to change the packet size? y[n]: y
The rules of packet size configuration are:
Satop mode, packet size must be dividable by 32.
Non-CAS mode, packet size must be dividable by total number of time slots.
CAS mode, packet size must be non-CAS mode packetsize plus CAS size .
Enter packet size (18-1456)[128]: 1152
NOTE: Max Buffer Size and Threshold may need to be modified!!
```

Port Config

The configuration options displayed by choosing 3**) Port Config** depend on the port type. Generally, port speed, clocking options, and signaling options are available.

All bundles using the port must be disabled before you can configure port options. You are notified as to which bundles need to be disabled when you select **3) Port Config**. Note that depending on the port, not all attributes appear.

```
=============================================================================
= (nova_55 05/19/08 21:35:42 GMT) | Config Menu for Port se-0/1
=============================================================================

Please select a number from the following list:
-------------------------------------
 0) Back to Previous Menu
 1) Port descriptor text:      (32 characters max, alphanumeric or -:)
 2) Interface:                 (EIA-530A/DCE/NRZ)
 3) Clock Config:              (1024.000000 / Custom Setup)
 4) Advanced Options...
------------ Your choice [4]:
```

Valid port numbers are:

- CTP1002: P0 and P1
- CTP1004: P0, P1, P2, P3
- CTP1012: P0 though P11
- CTP2008: PO through P7
- CTP2024: P0 through P23
- CTP2056: P0 through P55

See “Configuring Bundle Parameters” on page 30 for information on configuring port interface type.

To delete the current description, select **1) Port descriptor text** and enter **no description**.

Activate

Choose **4) Activate** to activate a bundle.

```
***
*** You asked to bring the bundle up
```

```
***
        Are you sure? y[n]: y
```

A warning appears if you try to activate a bundle that is already active.

```
*****************************************************
*** Bundle is already ACTIVE
*****************************************************

Hit Carriage Return to Continue...
```

Disable

Choose **5) Disable** to disable a bundle.

```
***
*** You asked to bring the bundle down
***
        Are you sure? y[n]: y
```

A warning appears if you try to disable a bundle that is already active.

```
*****************************************************
*** Bundle is already DISABLED
*****************************************************

Hit Carriage Return to Continue...
```

Recenter

Choose **6) Recenter** to recenter CTP and SAToP bundle types.

```
***
*** This will cause a bundle data interruption
***
        Are you sure? y[n]: y
```

Delete

Choose **7) Delete** to delete a bundle. Deleting a bundle detaches the bundle from the port, initializes the bundle database, and, if no other bundles are using the port, initializes the port database.

```
***
*** You asked to delete the bundle config.
*** This will return you to the main menu.
***
        Are you sure? y[n]: y
```

Runtime Diags

The diagnostic options displayed by choosing **8) Runtime Diags** depend on the bundle and port type. Generally, loops, bit error rate tests (BERTs), and runtime configuration options are available. The bundle must be active for you to access this menu.

```
========================================================================
= (nova49 01/21/08 21:50:37 GMT) | Advanced Diagnostics Menu for bundle 0
= Bundle type: CTP | Bundle source is port 0
========================================================================

Please select a number from the following list:
---------------------------------------
 0) Back to Previous Menu
 1) Serial Loop:          None
 2) BERT Injection:       Disabled
 3) BERT Reception:       Disabled
 4) BERT Pattern:         2^15-1
 5) BERT Error Inject
 6) BERT   Counts
 7) SCC    Counts
 8) Buffer Counts
 9) Clear All Counts
11) Modify Runtime Configuration
12) Diagnostics...
------------ Your choice [8]: 0
```

Creating a New Bundle with the CTPOS CLI Interface

To create a new bundle:

1. From the Main CTP menu, select **1) Bundle Operations**.

```
========================================================================
= (nova49 01/21/08 18:29:19 GMT) | CTP Main Menu
========================================================================

Please select a number from the following list:
---------------------------------------
 0) Exit to Shell
 1) Bundle Operations
 2) Node Synchronization
 3) Node Summary
 4) Node Diagnostics
 5) Node Operations
 6) Save Database to Flash
------------ Your choice [1]:
```

2. Select the bundle type you want to create (1, 2, 3, or 4). For more on VCOMP, see “Configuring Voice Compression (Vcomp)” on page 22.

```
Please select from the following:
---------------------------------------
 0) To choose bundle by number.
        -or- To choose by bundle type-
 1) CTP
 2) SAToP
 3) CESoPSN
 4) VCOMP
------------ Your choice (0-4)[0]:
```

3. Add a new bundle by typing **add**.

   You are not allowed to choose the bundle number when creating a new bundle type.

```
Please select from the following CTP bundles:

Bdl | Loc Crd Port |    Rem Address Port |   State PktSz.  Port Rate
=============================================================================
  0         0    1         10.0.0.0    1   DISABLD  1024 1544.000000
  5         1   15         10.0.0.0    0   DISABLD  1024 1024.000000
  7         1    8         10.0.0.0    0   DISABLD  1024 1024.000000

Please enter a bundle number from the list above, 'add'
for new bundle, or 'back' to return to main menu)[add]: add
```

4. Select the port you want to attach the bundle to.

```
What port should bundle 3 be attached to?

Port Card CardType
   1    0     T1E1
   4    0     T1E1
   8    1     SERL
   9    1     SERL
  10    1     SERL
  11    1     SERL
  12    1     SERL
  13    1     SERL
  14    1     SERL
  15    1     SERL
------------ Your choice[1]: 9
```

5. The Operations Menu for the new bundle is displayed. You can now configure it.

```
================================================================================
= (nova49 01/24/08 15:39:44 GMT) | Operations Menu for bundle 3
= Bundle type: CTP | Bundle source is port 9
================================================================================

Please select a number from the following list:
-------------------------------------
 0) Back to Previous Menu
 1) Query
 2) Config
 3) Port Config
 4) Activate
 5) Disable
 6) Recenter
 7) Delete
 8) Runtime Diags
------------ Your choice [7]:
```

Modifying an Existing Bundle with the CTPOS CLI Interface

To manage an existing bundle:

1. From the Main CTP menu, select **1) Bundle Operations**.

```
================================================================================
= (nova49 01/21/08 18:29:19 GMT) | CTP Main Menu
================================================================================

Please select a number from the following list:
```

```
-------------------------------------
 0) Exit to Shell
 1) Bundle Operations
 2) Node Synchronization
 3) Node Summary
 4) Node Diagnostics
 5) Node Operations
 6) Save Database to Flash
------------ Your choice [1]:
```

2. Select **0) To choose bundle by number** to modify an existing bundle. For more on VCOMP, see "Configuring Voice Compression (Vcomp)" on page 22.

```
Please select from the following:
-------------------------------------
 0) To choose bundle by number.
        -or- To choose by bundle type-
 1) CTP
 2) SAToP
 3) CESoPSN
 4) VCOMP
------------ Your choice (0-4)[0]:
```

3. Select the bundle number you want to modify, and skip to Step 6. To create a new bundle, continue to Step 4.

   Note that the bundle number does not need to be the same as the port number. Any port meeting the requirements of Table 1 on page 13 can be attached to any bundle.

```
Existing bundles:
Bndl BndlTyp Card/Type Port      TS         RemAddr RP/CID RunState NtSz ReCntr
=============================================================================
   0     CTP    0/T1E1    1     n/a        10.0.0.0      1  DISABLD 1024      0
   1   SAToP    0/T1E1    2     n/a        10.0.0.0   6002  DISABLD  192      0
   2 CESoPSN    0/T1E1    3    1-10        10.0.0.1   1096  RUNNING   80      0
   4 CESoPSN    0/T1E1    3   11-24        10.0.0.1   1096  DISABLD 1152      0
   5     CTP    1/SERL   15     n/a        10.0.0.0      0  DISABLD 1024      0
   6   SAToP    0/T1E1    5     n/a        10.0.0.0   6005  DISABLD  192      0
   7     CTP    1/SERL    8     n/a        10.0.0.0      0  DISABLD 1024      0


Please enter the bundle number or 'back' to return to main menu),
if the bundle does not exist you will prompted to set it up (0-63)[3]: 8
```

4. If you entered a number for a bundle that does not exist, select the bundle type.

```
Bundle 8 is not configured, let's set it up now.

Please select from the following bundle types:
-------------------------------------
 1) CTP
 2) SAToP
 3) CESoPSN
 4) VCOMP
------------ Your choice (1-4)[1]: 3
```

5. Select the port you want to attach the bundle to.

```
What port should bundle 8 be attached to?
```

```
Port Card CardType
   1    0     T1E1
   4    0     T1E1
   6    0     T1E1
------------ Your choice[1]: 6
```

6. The Operations Menu for the bundle is displayed. You can now configure it.

```
================================================================================
= (nova49 01/24/08 15:38:22 GMT) | Operations Menu for bundle 8
= Bundle type: CESoPSN | Bundle source is port 6
================================================================================

Please select a number from the following list:
-------------------------------------
 0) Back to Previous Menu
 1) Query
 2) Config
 3) Port Config
 4) Activate
 5) Disable
 6) Recenter
 7) Delete
 8) Runtime Diags
------------ Your choice [7]:
```

Configuring Voice Compression (Vcomp)

Voice compression (Vcomp) enables serial data and voice bundles to be compressed and passed through a CTP2000 system.

- Vcomp bundles can be configured with up to 30 voice channels. These channels may be one type only. For example, if the first channel of a Vcomp bundle is a 4WE&M type; any additional channels added to that bundle must be of the same type.
- If Vcomp bundles are built from T1/E1 channels, all channels for that bundle must come from the same T1/E1 port.
- All channels in a Vcomp bundle must have the same compression options.
- For a T1/E1 module, if a port is selected for use in a Vcomp bundle, the entire module is configured for use only in Vcomp bundles. Other ports may not be used for other bundle types (CTP, CESoPSN, SAToP).
- Conversely, if a T1/E1 port is configured for a non-Vcomp bundle, other ports on that card may not be used for Vcomp bundles.
- When a port is selected on a T1/E1 card for use in a Vcomp bundle, the first port of a group of four must be used first. For example, if ports 0-3 are available, port 0 must be used first.

To configure a Vcomp bundle:

1. From the Main CTP menu, select **1) Bundle Operations**.

```
=========================================================================
= (nova49 01/21/08 18:29:19 GMT) | CTP Main Menu
=========================================================================

Please select a number from the following list:
-------------------------------------
 0) Exit to Shell
 1) Bundle Operations
 2) Node Synchronization
 3) Node Summary
 4) Node Diagnostics
 5) Node Operations
 6) Save Database to Flash
------------ Your choice [1]: 1
```

2. Select **4) VCOMP**.

```
Please select from the following:
-------------------------------------
 0) To choose bundle by number.
        -or- To choose by bundle type-
 1) CTP
 2) SAToP
 3) CESoPSN
 4) VCOMP
------------ Your choice (0-4)[0]: 4

Please select from the following VCOMP bundles:

Bdl |  Port |    Rem Address    CID | State PktSz     Compand          Codec
=========================================================================
  0   4w-3/4   172.25.60.119     1   ACTIVE   107      Mu-Law     G.729AB (8k)
 10   te-0/0   172.25.60.119    10   ACTIVE   191      Mu-Law     G.729AB (8k)
 17   te-5/0   172.25.60.119    77   ACTIVE   158      Mu-Law     G.729AB (8k)
 60   te-0/0   172.25.60.119   100   ACTIVE   125      Mu-Law     G.729AB (8k)

Please enter a bundle number from the list above, 'add'
for new bundle, or 'back' to return to main menu[0]: add
```

3. Add a new bundle by typing **add**.

   When you select a new Vcomp bundle for addition, only ports that are available for Vcomp bundles are shown. In this example, because card 0, ports 1-3 are available, you can see that card 0, port 0 is already completely used on one or more other Vcomp bundles (since it cannot be selected). Card 5, port 0 is partially used for other Vcomp bundles because it is still selected to use for the new Vcomp bundle and appears in the list.

4. Select the port you want to attach the bundle to.

```
What port should bundle 1 be attached to?

Port    CardType        Dcard
te-0/1    T1E1          T1/E1
te-0/2    T1E1          T1/E1
te-0/3    T1E1          T1/E1
te-0/4    T1E1          T1/E1
4w-3/0    4WEM  Not Installed
4w-3/1    4WEM  Not Installed
4w-3/2    4WEM  Not Installed
4w-3/3    4WEM  Not Installed
```

```
4w-3/5    4WEM  Not Installed
4w-3/6    4WEM  Not Installed
4w-3/7    4WEM  Not Installed
te-5/0    T1E1          T1/E1
te-5/1    T1E1          T1/E1
te-5/2    T1E1          T1/E1
te-5/3    T1E1          T1/E1
te-5/4    T1E1          T1/E1
------------ Your choice [te-0/1]: te-0/1
```

5. The Operations menu for the Vcomp bundle is displayed. You can now configure it.

```
================================================================================
= (ctp2056_voice_top 08/26/08 16:33:19 GMT) | Operations Menu for bundle 1
= Bundle type: VCOMP
= Bundle description:
================================================================================

Please select a number from the following list:
-------------------------------------
 0) Back to Previous Menu
 1) Query
 2) Config
 3) Port Config
 4) Activate
 5) Disable
 6) Recenter
 7) Delete
 8) Runtime Diags
------------ Your choice [0]: 3
```

See “Voice Compression” on page 32 for more configuration details.

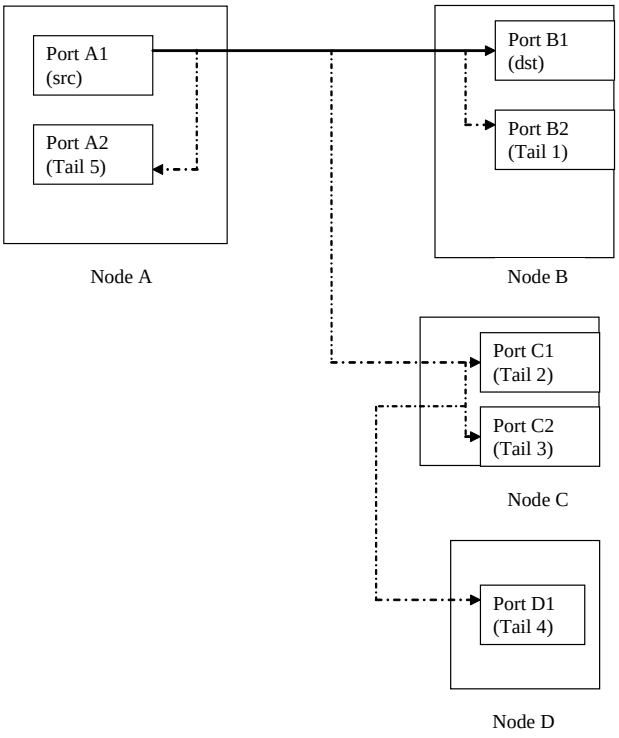
Configuring Port Mirroring

Port mirroring enables you to mirror traffic to a third port. The packet generated from the source is sent to an assigned destination and to another port whether it is on the local node or remote node.

Figure 6 illustrates all the possibilities of port-mirroring destinations on a unidirectional circuit. Bidirectional circuits copy the same configuration in the other direction. Possible port mirrorings on a unidirectional circuit from Port A1 to Port B1 include:

- Circuit can be mirrored to another port on the source node (Port A2).
- Circuit can be mirrored to another port on the destination node (Port B2).
- Circuit can be mirrored to another port on another node (Port C1).
- The tail port can also mirror the circuit to another destination (Port D1).

Figure 6: Port-Mirroring Example



To configure port mirroring:

1. From the Main CTP menu, select **1) Bundle Operations**.

```
================================================================================
= (nova49 01/21/08 18:29:19 GMT) | CTP Main Menu
================================================================================

Please select a number from the following list:
-------------------------------------
 0) Exit to Shell
 1) Bundle Operations
 2) Node Synchronization
 3) Node Summary
 4) Node Diagnostics
 5) Node Operations
 6) Save Database to Flash
------------ Your choice [1]:
```

2. Select **0) To choose bundle by number** to modify an existing bundle.

```
Please select from the following:
-------------------------------------
 0) To choose bundle by number.
       -or- To choose by bundle type-
 1) CTP
 2) SAToP
 3) CESoPSN
 4) VCOMP
```

```
------------ Your choice (0-4)[0]:
```

3. Select the bundle number you want to mirror. The Operations menu for the bundle is displayed.

4. Select **2) Config**.

```
================================================================================
= (nova49 01/24/08 15:38:22 GMT) | Operations Menu for bundle 8
= Bundle type: CESoPSN | Bundle source is port 6
================================================================================

Please select a number from the following list:
-------------------------------------
 0) Back to Previous Menu
 1) Query
 2) Config
 3) Port Config
 4) Activate
 5) Disable
 6) Recenter
 7) Delete
 8) Runtime Diags
------------ Your choice [2]: 2
```

5. From the Config menu, select **10) Advanced Options**.

```
Please select a number from the following list:
-------------------------------------
 0) Back to Previous Menu
 1) Remote Address:        10.0.0.1
 2) Remote Cid:            1
 3) Local  Cid:            1
 4) Packet Size:           1024
 5) Min Buffer (ms):       8.000
 6) Pkt Buffer Set (ms):   12.000
 7) Max Buffer (ms):       16.000
 8) Service Type:          0
 9) Time to Live:          255
10) Advanced Options...
11) Bundle descriptor text:
------------ Your choice [10]: 10
```

6. From the Advanced Option menu, select **12) Port mirror Config**.

```
Please select a number from the following list:
-------------------------------------
 0) Back to Previous Menu
 1) Use virtual ip for port          NO
 2) Virtual ip for port:             10.0.0.1
 3) Missing pkt fill pattern:        0xff
 4) Consecutive pkts loss to starve: 5
 5) In sequence pkts after starve:   15
 6) OAM Chan Rate (sec/pkt):         1
 7) OAM pkts for Sync:               2
 8) OAM pkts for Sync Loss:          5
 9) Packet Protector(tm)             Disabled
10) Unidirectional circuit:          NO
11) Signaling Config
12) Port mirror Config
13) Disable direct drive:            YES
------------ Your choice [1]:
```

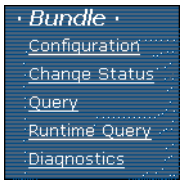
7. Add, delete, or show the current mirroring configuration by selecting **0-quit**, **1-add**, or **3-show**. All current mirroring configurations are displayed.

```
Current port mirror configuration:
Source mirroring:
#0:          0.0.0.0     0
#1:     172.25.62.42     1

Destination mirroring:
#0:     172.25.62.22     1
Options(0-quit, 1-add, 2-delete, 3-show): (0-3)[3]:
```

Bundle Operations—CTPView Interface Commands

The bundle operations commands enable you to configure bundles on a CTP device.

Figure 7: CTPView Bundle Operations Commands



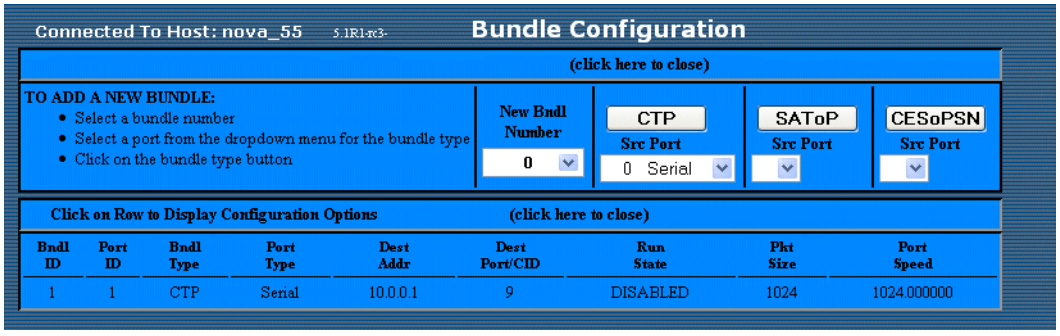
Configuration

Click **Configuration** to add a new bundle or to configure an existing bundle.

To add a bundle:

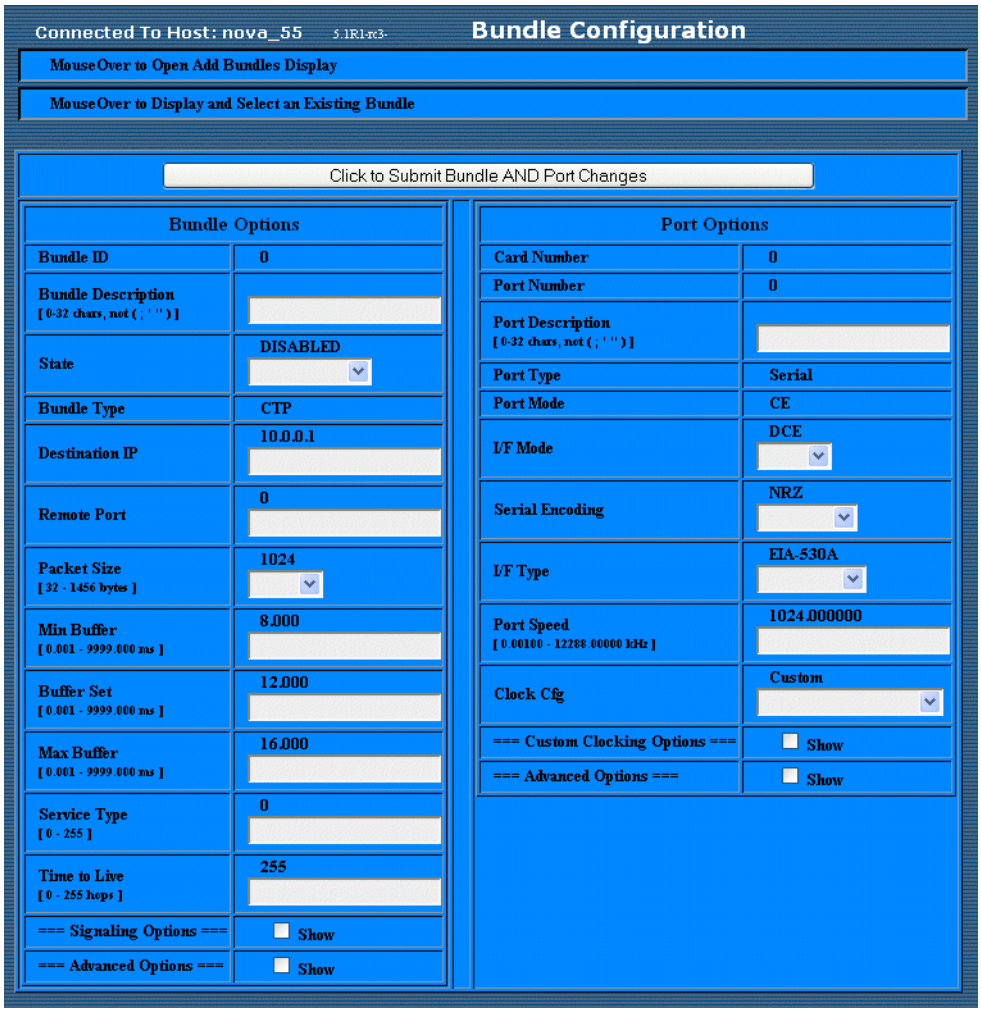
1. From the Bundle menu in the left pane, click **Configuration**.

   The Bundle Configuration pane appears.



2. Select a bundle number from the New Bndl Number drop-down list.
3. Select a port from the Src Port drop-down list.
4. Click the bundle type button for that port (CTP, SAToP, CESoPSN).

The bundle parameters pane appears.



5. Enter each parameter and click **Submit Bundle and Port Changes** to add the bundle.

   The bundle is added to the list.

To configure a bundle:

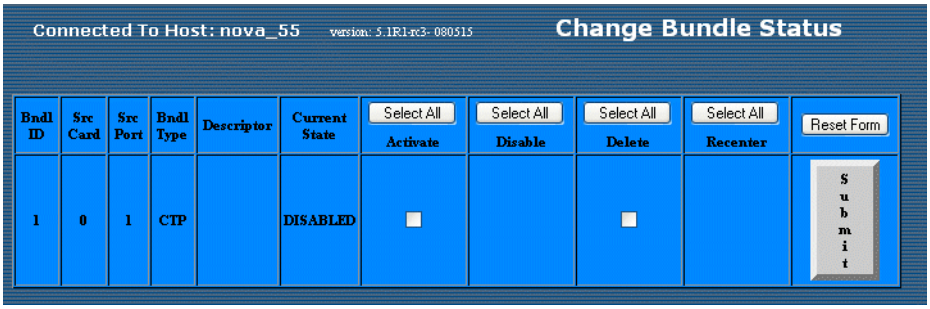
1. From the Bundle menu in the left pane, click **Configuration**. The Bundle Configuration pane appears.

2. Click the bundle you want to configure.

3. Enter each parameter and click **Submit Bundle and Port Changes** to update the bundle.

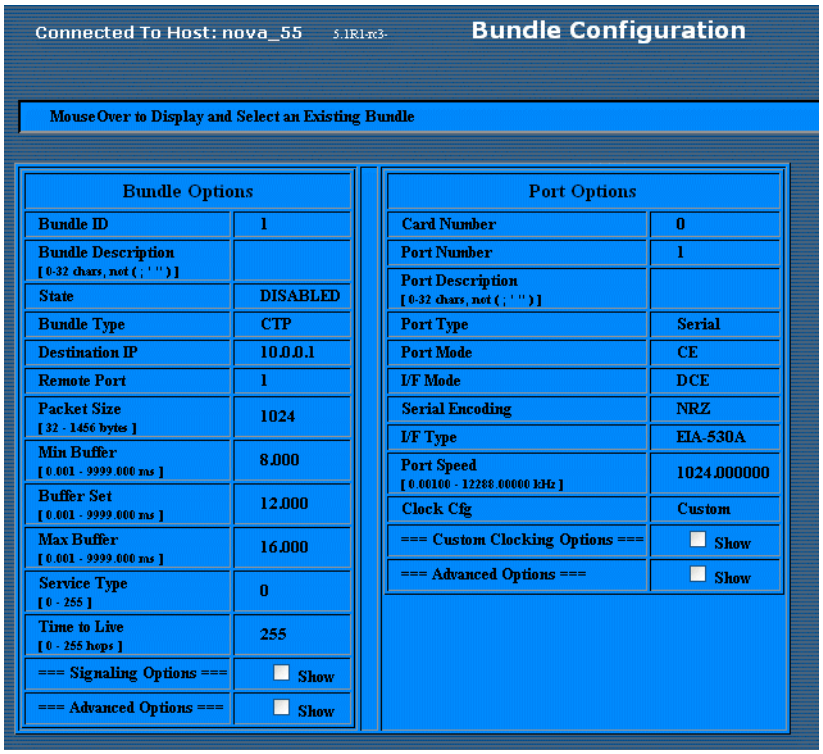
Change Status

Click **Change Status** to activate, disable, delete, or recenter a bundle. The Change Bundle Status pane appears. Make any updates and then click **Submit**.



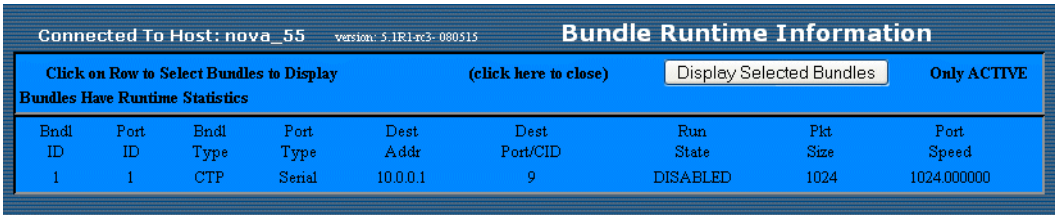
Query

Click **Query** and then select a bundle on which to perform a query. The Bundle Configuration pane appears.



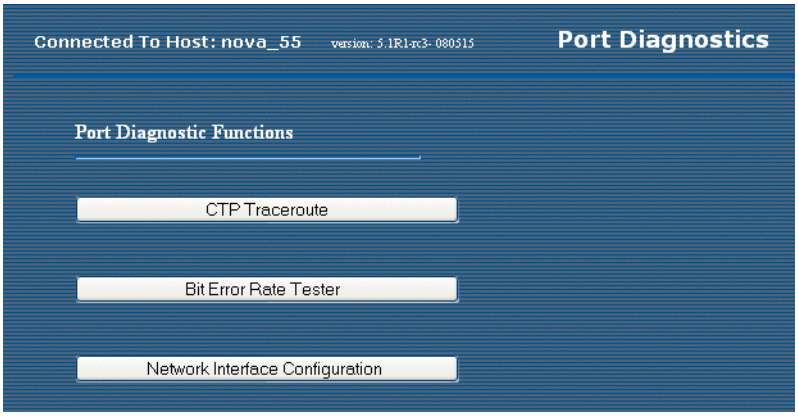
Runtime Query

Click **Runtime Query** to display runtime statistics for a selected bundle. The Bundle Runtime Information pane appears.



Diagnostics

Click **Diagnostics** to perform port diagnostics. The Port Diagnostics pane appears.



Configuring Bundle Parameters

You can use the CLI and CTPView interface to configure bundle parameters.

Interface Type

You can configure the interface attributes, including the interface type and the serial encoding. The standard interface types are RS-232, V.35, EIA530, and EIA530A. 4WTO analog voice, T1/E1, and fractional T1/E1 interface types are available when you order the optional hardware and install it on the CTP interface module. The optional interfaces are software configurable, and the system automatically detects when the necessary hardware is installed.

4WTO Voice Interface

Additional parameters associated with the 4WTO voice interface include the following:

- Dual Channel—Each CTP port with the optional voice daughter card is capable of supporting either one or two voice channels. For one channel, disable the parameter. For two channels, enable the parameter.

- Enabled Channel—If Dual Channel is disabled, then use this parameter to select which channel is enabled. The parameter is not available (N/A) if the Dual Channel parameter is enabled.

- Input level—The input level can be adjusted to a value between 0 and 255. The value of 25 is the default and is the unity value (no attenuation or gain). Setting the value to 0 attenuates the signal 33% (1.8 dB). Setting the value to 255 amplifies the signal 400% (6 dB). Intermediate values are derived with linear interpolation. The actual gain depends on the impedance of the attached device.

- Output level—The output level can be adjusted to a value between 0 and 255. The value of 25 is the default and is the unity value (no attenuation or gain). Setting the value to 0 attenuates the signal 33% (1.8 dB). Setting the value to 255 amplifies the signal 400% (6 dB). Intermediate values are derived with linear interpolation. The actual gain depends on the impedance of the attached devise.

- Talk Squelch—This parameter allows the active squelch circuit to be enabled or disabled.

T1/E1 Interface

Additional parameters are associated with the optional T1/E1 interface. When the T1 interface is configured, then you can configure the encoding for either B8ZS or AMI. When the E1 interface is configured, then you can configure the termination to work with either Coax or RJ-48.

Fractional T1/E1 Interface

Fractional T1/E1 transports the first *n* DS0 channels across the IP network, where *n* is configurable. There are slight differences depending on whether the fractional support is for T1 or E1. Fractional T1 supports only extended superframe (ESF) framing. CRC generation/checking is not supported in either.

For fractional T1, this implementation can also transport the framing bits across the IP network in addition to the DS0s. Transport of the framing bits is configurable, and the default configuration transports the framing.

For ESF framing, the frame synchronization, data link, and CRC framing bits are passed across the IP network untouched. When the framing bits are not transported across the IP network, the regenerated T1 stream at the far end most likely will not have the same data alignment within the nonidle DS0s. In addition, the CRC and data link framing bits are set to 0 in the regenerated T1 stream.

For fractional E1, the framing is contained in the first DS0. This DS0 is always transported unaltered in this implementation. In addition, CAS support is optional. When CAS support is enabled, the sixteenth DS0 is transported. DS0s that are not transported across the IP network must be idle if CRC checking is enabled by the customer equipment.

There is no internal BERT support for fractional T1/E1 circuits. Fractional T1 circuit emulation supports only T1 circuits with ESF framing. CTPOS 4.4 does not support CRC generation. Fractional T1/E1 circuit transport can be run only on ports 0 and 1 on CTP-1000 series products.

NOTE: Both endpoints must be configured with the same fractional T1/E1 options. If not, the port runtime state will go to MisCFG as a result of the endpoint clocking check.

Voice Compression

Many of the Port Configuration menu options are similar to CESoPSN bundles. One notable exception is the signal option, which if set to *on* will transport signaling lead input on each channel from end-to-end on a per-channel basis.

See the following port configuration example where signaling is turned on and channel allocation is configured.

```
==============================================================================
= (ctp2056_voice_top 08/26/08 16:33:40 GMT) | T1E1 Config Menu for Port Port
te-0/1
==============================================================================

Please select a number from the following list:
-----------------------------------
 0) Back to Previous Menu
 1) Type:                        T1
 2) LineCoding:                  B8ZS
 3) BuildOut:                    ~133 ft
 4) Frame Mode:                  ESF
 5) Signal:                      Off
 6) Port descriptor text:
------------ Your choice [1]: 5

Please select a number from the following list:
-----------------------------------------------
 0) Off
 1) On
------------ Your choice [0]: 1
```

Signaling is turned on.

```
==============================================================================
= (ctp2056_voice_top 08/26/08 16:33:43 GMT) | T1E1 Config Menu for Port Port
te-0/1
==============================================================================

Please select a number from the following list:
-----------------------------------
 0) Back to Previous Menu
 1) Type:                        T1
 2) LineCoding:                  B8ZS
 3) BuildOut:                    ~133 ft
 4) Frame Mode:                  ESF
 5) Signal:                      On
 6) Port descriptor text:
------------ Your choice [5]: 0
```

```
================================================================================
= (ctp2056_voice_top 08/26/08 16:33:45 GMT) | Operations Menu for bundle 1
= Bundle type: VCOMP
= Bundle description:
================================================================================

Please select a number from the following list:
-----------------------------------
 0) Back to Previous Menu
 1) Query
 2) Config
 3) Port Config
 4) Activate
 5) Disable
 6) Recenter
 7) Delete
 8) Runtime Diags
------------ Your choice [3]: 2


================================================================================
= (ctp2056_voice_top 08/26/08 16:33:50 GMT) | Config Menu for Bundle 1
= Bundle type: VCOMP
= Bundle description:
================================================================================

Please select a number from the following list:
-----------------------------------
 0) Back to Previous Menu
 1) Destination IP:          10.0.0.1
 2) Circuit ID:              1
 3) Channel Allocation:      00: te-0/1/1   01: te-0/1/2   02: te-0/1/3
                             03: te-0/1/4   04: te-0/1/5   05: te-0/1/6
                             06: te-0/1/7   07: te-0/1/8   08: te-0/1/9
                             09: te-0/1/10  10: te-0/1/11  11: te-0/1/12
                             12: te-0/1/13  13: te-0/1/14  14: te-0/1/15
                             15: te-0/1/16  16: te-0/1/17  17: te-0/1/18
                             18: te-0/1/19  19: te-0/1/20  20: te-0/1/21
                             21: te-0/1/22  22: te-0/1/23  23: te-0/1/24

 4) Compression Options...
 5) Buffer Min (ms):         10
 6) Buffer Set (ms):         20
 7) Buffer Max (ms):         30
 8) Service Type:            0
 9) Time to Live:            255
10) Bundle descriptor text:
------------ Your choice [1]: 3
```

Note that, initially, when a T1/E1 port is attached to a bundle, all available channels on that port are configured. By selecting **3) Channel Allocation**, you can specify a subset of channels to use in the bundle. This process is very similar to CESoPSN bundle channel allocation.

It is important to note that the order of the channels (indicated by the XX: prefix on the channel allocation display) corresponds to the relative channel positions of the channels in the bundle. They connect on a one-to-one basis with the channels in the Vcomp bundle on the remote end of the network. When channels are removed from a Vcomp bundle, they are "shifted left."

For bundles built from analog voice ports, a list of additional compatible analog voice ports to add to the bundle is displayed.

```
Configured time slots for bundle 1:
 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24

Available time slots on card 0 port 1:
 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24

Enter the timeslots(slots separated by "," or by "-" for range of slots):1-8


================================================================================
= (ctp2056_voice_top 08/26/08 16:34:00 GMT) | Config Menu for Bundle 1
= Bundle type: VCOMP
= Bundle description:
================================================================================

Please select a number from the following list:
---------------------------------------
 0) Back to Previous Menu
 1) Destination IP:          10.0.0.1
 2) Circuit ID:              1
 3) Channel Allocation:      00: te-0/1/1   01: te-0/1/2   02: te-0/1/3
                             03: te-0/1/4   04: te-0/1/5   05: te-0/1/6
                             06: te-0/1/7   07: te-0/1/8
 4) Compression Options...
 5) Buffer Min (ms):         10
 6) Buffer Set (ms):         20
 7) Buffer Max (ms):         30
 8) Service Type:            0
 9) Time to Live:            255
10) Bundle descriptor text:
------------ Your choice [3]: 4


================================================================================
= (ctp2056_voice_top 08/26/08 16:34:18 GMT) | VC bundle option Config Menu
for Bundle 1
= Bundle type: VCOMP
= Bundle description:
================================================================================
```

Additional Parameters

Compression options are selected on a per-bundle basis. Additional parameters associated with the voice compression interface module include:

- Companding—Companding is the PCM encoding standard used on the port PCM input to the Vcomp bundle. In the case of a Vcomp bundle built with analog voice cards, you perform this configuration on both the analog voice port and the Vcomp bundle DSP engine, so there is no possible compatibility issue. However, when the Vcomp bundle is built with T1/E1 channels, it is important to know what type of companding is used for the external connecting equipment so that you can set the encoding the same way. Generally, Mu-Law encoding is used in the United States and A-Law is used in Europe and elsewhere. Transparent should be chosen if the user wants to transport lossless data in a Vcomp bundle (for example, for carrying a CCS signaling D channel).

- Compression—Compression determines what level and type of voice compression are performed on voice channels. See Table 2 for information about the DSP utilization and compression level for each compression type. The tradeoff is between bundle network bandwidth and voice compression quality, with DSP resource utilization being an additional factor.

Table 2: Compression Options and DSP Usage

	Rate/Channel	Codec	ECAN	VAD	FM_REL	TONE
PCM	64 kbps	3	6	1	5	4
MELP	2.4 kbps	55	6	1	5	4
G.729.AB	8 kbps	30	10	1	8	7
G.728	16 kbps	61	13	1	9	11
G.726_16K	16 kbps	13	7	1	5	5
G.726_24K	24 kbps	13	7	1	5	5
G.726_32K	32 kbps	13	7	1	5	5
G.726_40K	40 kbps	13	7	1	5	6

- Echo Cancellation—32 ms of local tail echo cancellation is performed on every bundle channel when this is enabled.

- Silence Detection—When silence is detected on the channel, the network bandwidth used for that channel is reduced drastically when this attribute is enabled. Enabling silence detection can create significant network bandwidth savings.

- Fax/Modem Detection—When enabled, and fax or modem tones are detected on the line, compression is disabled and the channel reverts to PCM. Although enabling this attribute increases the amount of network bandwidth needed for that channel in the bundle for the duration of the fax/modem session, it succeeds in negotiation and transfer of fax/modem data at high speeds.

- Tone Relay—When enabled, and tones are detected at the local end port, they are transported and regenerated at the remote end. Enabling this attribute is an important option particularly for high compression levels, where tones may be distorted if they are compressed. The tone relay types supported are DTMF and MFR1.

Compression Type and Fax/Modem Constraints

Configuring Vcomp bundles has some constraints. If you set PCM as a compression type or enable fax/modem relay, it is possible that only a certain number of channels can be supported within the packet size constraints. With an MTU of 1500, only 18 channels can be carried with PCM compression. Also, if the cumulative DSP resource required for the bundle is greater than 1000, then no DSP will be able to handle it (see Table 2).

```
Please select a number from the following list:
-------------------------------------
 0) Back to Previous Menu
 1) Companding:           Mu-Law
 2) Compression type:     G.729AB (8k)
 3) Echo Cancellation:    YES
```

```
 4) Silence Detection:    YES
 5) Fax/Modem Support     NO
 6) Tone Relay:           YES
------------ Your choice [2]: 1

Enter Companding Type
Please select a number from the following list:
-----------------------------------------------
 0) Transparent
 1) Mu-Law
 2) A-Law
------------ Your choice [1]:


================================================================================
= (ctp2056_voice_top 08/26/08 16:34:30 GMT) | VC bundle option Config Menu
for
Bundle 1
= Bundle type: VCOMP
= Bundle description:
================================================================================

Please select a number from the following list:
-----------------------------------
 0) Back to Previous Menu
 1) Companding:           Mu-Law
 2) Compression type:     G.729AB (8k)
 3) Echo Cancellation:    YES
 4) Silence Detection:    YES
 5) Fax/Modem Support     NO
 6) Tone Relay:           YES
------------ Your choice [1]: 2

Enter Voice Codec Type
Please select a number from the following list:
-----------------------------------------------
 0) MELP (2.4k)
 1) G.729AB (8k)
 2) G.728 (16k)
 3) G.726 (16k)
 4) G.726 (32k)
 5) PCM (64k)
------------ Your choice [2]: 2


================================================================================
= (ctp2056_voice_top 08/26/08 16:34:44 GMT) | VC bundle option Config Menu
for
Bundle 1
= Bundle type: VCOMP
= Bundle description:
================================================================================

Please select a number from the following list:
-----------------------------------
 0) Back to Previous Menu
 1) Companding:           Mu-Law
 2) Compression type:     G.729AB (8k)
 3) Echo Cancellation:    YES
 4) Silence Detection:    YES
 5) Fax/Modem Support     NO
 6) Tone Relay:           YES
------------ Your choice [2]: 0
```

Buffering

Buffering is similar to other bundle types, but the flexibility is limited (menu options 5, 6, and 7). The range for all the min/set/max buffer settings is 10–100 in increments of 10. In addition, none of the buffer setting may be the same. This means that the minimum buffer set value is 20 ms.

```
================================================================================
= (ctp2056_voice_top 08/26/08 16:34:55 GMT) | Config Menu for Bundle 1
= Bundle type: VCOMP
= Bundle description:
================================================================================

Please select a number from the following list:
-----------------------------------
 0) Back to Previous Menu
 1) Destination IP:          10.0.0.1
 2) Circuit ID:              1
 3) Channel Allocation:      00: te-0/1/1   01: te-0/1/2   02: te-0/1/3
                             03: te-0/1/4   04: te-0/1/5   05: te-0/1/6
                             06: te-0/1/7   07: te-0/1/8
 4) Compression Options...
 5) Buffer Min (ms):         10
 6) Buffer Set (ms):         20
 7) Buffer Max (ms):         30
 8) Service Type:            0
 9) Time to Live:            255
10) Bundle descriptor text:
------------ Your choice [4]: 5
Buffer levels may be multiples of 10 from 10-100

Enter Buffer Minimum Threshold (in ms) (10-100)[10]:
```

Configuring the Interface Type with the CLI

The interface type is a configuration option available from the Interface submenu. The configurable interfaces, including the Optional T1/E1 or 4WTO, are provided when you select **1) Type** from the submenu.

To configure a port interface type:

1. From the Main CTP menu, select **1) Bundle Operations**.

```
================================================================================
= (nova49 01/21/08 18:29:19 GMT) | CTP Main Menu
================================================================================

Please select a number from the following list:
-----------------------------------
 0) Exit to Shell
 1) Bundle Operations
 2) Node Synchronization
 3) Node Summary
 4) Node Diagnostics
 5) Node Operations
 6) Save Database to Flash
------------ Your choice [1]:
```

2. Select **0) To choose bundle by number** to modify an existing bundle.

3. Select the bundle number you want to modify. The Operations Menu for the bundle is displayed.

4. Select **3) Port Config**.

```
Please select a number from the following list:
---------------------------------------
 0) Back to Previous Menu
 1) Query
 2) Config
 3) Port Config
 4) Activate
 5) Disable
 6) Recenter
 7) Delete
 8) Runtime Diags
------------ Your choice [3]: 3
```

5. Select **2) Interface**.

```
Please select a number from the following list:
---------------------------------------
 0) Back to Previous Menu
 1) Port descriptor text:
 2) Interface:            OFF/DCE/NRZ
 3) Clock Config:         1024.000000 / Custom Setup
 4) Advanced Options...
------------ Your choice [2]:
```

6. Choose **1) Type** and then choose a type from the list.

```
Please select a number from the following list:
---------------------------------------
 0) Back to Previous Menu
 1) Type:     OFF    (EIA-530,EIA-530A,RS-232,V.35, Optional: Voice 4W/TO or
T1/E1, IRIG-B, OFF)
 2) Mode:     DCE    (DCE,DTE, N/A)
 3) Encoding: NRZ    (NRZ, ISOCH, CDI, TRANS, N/A)
------------ Your choice [1]:
```

You can now configure additional channel option for some types. See Figure 8, Figure 9, Figure 10, Figure 11, and Figure 12.

NOTE: Selecting the optional voice interface results in the clock rate and clocking configuration being set automatically.

Figure 8: 4WTO Analog Voice Submenu

```
Please select a number from the following list:
-----------------------------------------------
 0) Back to Previous Menu
 1) Dual Channel:        (Enable,Disabled)
 2) Enabled Channel:     (Chan 0, Chan 1, N/A)
 3) Input  level:        (0 - 255)
 4) Output level:        (0 - 255)
 5) Talk Squelch:        (Enable,Disable Active Squelch)
------------ Your choice [0]:
```

Selecting the optional T1/E1 interface displays additional channel options that you can configure. When you configure the type for T1, you then have an option to set the encoding for B8ZS or AMI (Figure 9).

CTP Release 4.3 introduced support for structure-agnostic time division multiplexing (TDM) over packet (SAToP) circuit emulation. This is an implementation of the IETF's PWE3 working group Structure Agnostic TDM over Packet RFC 4553. By default, standard CTP circuit emulation techniques are used. Setting Option 3 to Yes enables standards-compliant circuit emulation.

The default packet size for SAToP encapsulation is 192. The remote port (for example, P1) is not used to identify the circuit endpoints. The source UDP port is used as the circuit identifier; you must configure both circuit endpoints to use the same UDP port. The UDP port must be unique on the CTP system. You will not be able to activate a port if another port is using the same source UPD port number.

Figure 9: Configuring a T1 Interface and Options—CLI

```
================================================================================
(intel_52 10/09/06 21:28:43 GMT) | Voice T1E1 Config Menu for Port 0
================================================================================
Please select a number from the following list:
-------------------------------------
 0) Back to Previous Menu
 1) Type:   T1
 2) Option: B8ZS
 3) SAToP:  No
 8) BuildOut: ~133ft
```

Encoding Example Example of configuring the encoding (2):

```
------------ Your choice [2]: 2
Please select a number from the following list:
-----------------------------------------------
 0) B8ZS
 1) AMI
------------ Your choice [0]:
```

SAToP Example Example of configuring the SAToP (3):

```
------------ Your choice [1]: 3
Enable SAToP for T1 using UDP for transport? y[n]: y

Enter source UDP port: (1-65535)[6000]: 2142
```

Build Out Example Example of configuring the Build Out (8):

```
------------ Your choice [1]: 8

Please select a number from the following list:
-----------------------------------------------
 0) ~133 ft
 1) ~266 ft
```

```
 2) ~399 ft
 3) ~533 ft
 4) ~655 ft
 5) -7.5dB CSU
 6) -15dB CSU
 7) -22.5dBCSU
------------ Your choice [0]:
```

E1 Interface Example

When you configure the type for E1, then you have the option to select the impedance for a Coax or an RJ-48 termination (Figure 10).

Figure 10: Configuring an E1 Interface and Options—CLI

```
================================================================================
(intel_52 10/09/06 21:34:49 GMT) | Voice T1E1 Config Menu for Port 0
================================================================================

Please select a number from the following list:
-------------------------------------
 0) Back to Previous Menu
 1) Type:   E1
 2) Option: RJ48
 3) SAToP:  No

------------ Your choice [1]: 2

Please select a number from the following list:
-----------------------------------------------
 0) RJ48
 1) COAX
------------ Your choice [0]:
```

Fractional T1 Interface Example

Figure 11 is an example of configuring a fractional T1 interface.

Figure 11: Configuring a Fractional T1/E1 Interface and Options—CLI

```
================================================================================
(ctp23 6/13/07 21:34:49 GMT) | Voice T1E1 Config Menu for Port 1
================================================================================

Please select a number from the following list:
-------------------------------------
 0) Back to Previous Menu
 1) Type:   T1
 2) Option: B8ZS
 3) SAToP:  No

------------ Your choice [1]: 2
```

Then enable fractional T1 or fractional E1 support:

```
Please select a number from the following list:
-----------------------------------------------
 0) T1
 1) E1
 2) Fractional T1
```

```
 3) Fractional E1
------------ Your choice [0]: 2
```

Fractional T1 interface:

```
========================================================================
(ctp23 6/13/07 21:34:49 GMT) | Voice T1E1 Config Menu for Port 1
========================================================================

Please select a number from the following list:
-------------------------------------
 0) Back to Previous Menu
 1) Type:   Fractional T1
 2) Option: B8ZS
 3) SAToP:  No
 4) Fractional Channels: 12
 5) Fractionl Frame Transport: Frame Transport

------------ Your choice [1]:
```

Fractional E1 Interface Example

Fractional E1 interface:

```
========================================================================
(ctp23 6/13/07 21:34:49 GMT) | Voice T1E1 Config Menu for Port 1
========================================================================

Please select a number from the following list:
-------------------------------------
 0) Back to Previous Menu
 1) Type:   Fractional E1
 2) Option: RJ48
 3) SAToP:  No
 4) Fractional channels: 12
 6) CAS support: No CAS Support

------------ Your choice [1]:
```

IRIG-B Interface Example

You can configure direction, output high and low levels, and data range for this module, which is available only on CTP2000-series models. **5) Optional Interface: IRIG-B** appears only when the module is installed on that port. See Figure 12 for a sample configuration.

You can configure these IRIG-B parameters:

- Direction—(Tx or Rx) Although the IP circuit connection through the network is full duplex, an IRIG-B circuit is actually a simplex application, and the daughter card can operate only in Rx or Tx mode and not both at the same time. Rx mode is for the end of the circuit that is recovering IRIG-B from the attached cable and generating IP packets toward the network. Tx mode is for the opposite end, which accepts IP packets, extracts the IRIG-B data codes, and transmits IRIG-B signaling output onto the cable.

- Output High Level—IRIG-B signaling embeds digital data onto an AM-modulated 1-KHz sine wave. A logic 1 is represented by a particular sine wave amplitude, as is a logic 0. The difference between these amplitudes should be at least a ratio of 10:3, but you can still select another difference. The output level is represented by a peak-to-peak voltage, but the output voltage is dependent on the impedance the output is driving into. Therefore, you can enter an impedance and a voltage to calculate the proper output level settings. Accurate output levels depend on entering proper impedance values. Maximum output level is 15.32 V pk/pk into 2000 ohms.

- Output Low Level—Maximum output level is 15.32 V peak-to-peak into 2000 ohms.

- Data Rate—To increase the packet rate on the IP connection so that adaptive clocking, which is required for proper IRIG-B transport to work well, you can add empty bits to the IP data to increase the data rate. Unless network bandwidth is at a premium, we do not recommend that you change this value from the default 16 Kbps. Valid values range from 1000–25,500 bps.

NOTE: The 4WTO clocking option is automatically configured for an IRIG-B port, and adaptive clocking is enabled on the IRIG-B Tx end. Also, the packet size is automatically set to 64 bytes for the bundle. Combined with the default 16 Kbps data rate, the packet rate is 32 pps, which is a good packet rate for adaptive clocking. If you need to change any of the clocking or adaptive clock parameters, be sure you avoid configurations that will not work well.

Figure 12: Configuring an IRIG-B Interface and Options—CLI

```
    ================================================================================
    = (nova_45 06/23/08 21:05:46 GMT) | Interface Type Config Menu for Port
    se-0/1
    ================================================================================

    Please select a number from the following list:
    -----------------------------------
     0) OFF
     1) EIA-530
     2) EIA-530A
     3) RS-232
     4) V.35
     5) Optional Interface: IRIG-B
    ------------ Your choice [5]: 5

*******************************************************
*** Dbase has different option I/F. Initializing...
*******************************************************

Hit Carriage Return to Continue...

*******************************************************
*** Use of the IRIG-B card option requires a special port
*** clock config. These changes will be made automatically.
*** Please do not change these settings back in the port
```

```
*** configuration menu, or the IRIG channels may not operate.
*******************************************************

Hit Carriage Return to Continue...

================================================================================
= (nova_45 06/23/08 21:05:53 GMT) | IRIG-B Config Menu for Port se-0/1
================================================================================

Please select a number from the following list:
-----------------------------------
 0) Back to Previous Menu
 1) Direction:         (Rx)
 2) Output High Level: 4.00 Vpp (into 50 ohm load)
 3) Output Low Level:  0.99 Vpp (into 50 ohm load)
 4) Data Rate:         16.000 kbps
------------ Your choice [4]: 0
```

Configuring the Interface Type with CTPView

To configure interface type with the CTPView interface, see “Configuration” on page 27. Interface types are listed in the I/F Type drop-down list.

The current interface type is shown above the drop-down menu. The value displayed above the field is the value currently configured.

The T1/E1 or 4WTO interface supported by optional hardware is displayed when the necessary hardware is installed.

Interface Mode

You can configure the interface to be configured for connection to a data communication equipment (DCE) device or to a data terminal equipment (DTE) device.

Figure 13: Configuring the Interface Mode—CLI

```
================================================================
(nova_54 01/19/07 19:36:14 GMT) | Interface Config Menu for Port 1
================================================================
Please select a number from the following list:
-----------------------------------------------
 0) Back to Previous Menu
 1) Type:     EIA-530
 2) Mode:     DCE
 3) Encoding: NRZ
------------ Your choice [1]: 2

Please select a number from the following list:
-----------------------------------------------
 0) DCE
 1) DTE
------------ Your choice [0]: 1
```

Configuring Interface Mode with CTPView

CTPView automatically displays the available modes based on the interface selected. To configure interface mode with the CTPView interface, see "Configuration" on page 27.

Interface mode types are listed in the I/F Mode drop-down list. The value displayed above the field is the value currently configured.

Interface Encoding

NRZ is the standard encoding used with the EIA530, V.35, and RS-232 interface types. Note that the encoding options for the T1 interface are B8ZS and AMI; however, these options are configured when the interface type selected is T1. The Interface Encoding is displayed as N/A when the 4WTO, T1, or E1 is configured.

Conditioned diphase, isochronous, and transparent are special encoding schemes. Conditioned diphase encoding recovers and embeds the clock in the data signal. Isochronous encoding does not provide or embed the clock in the data. Asynchronous applications are supported when you configure the encoding to isochronous. The maximum data rate for isochronous and conditioned diphase encoding is 1.024 Mbps.

NOTE: Transparent encoding, described below, is for unique and nonstandard applications. The encoding scheme can be supported only when you have worked with the Juniper Networks Technical Assistance Center (JTAC) to verify that the application requires this encoding scheme. Special adapters may be required on the cable to properly map the data and clock signals to the connector pins used by the application.

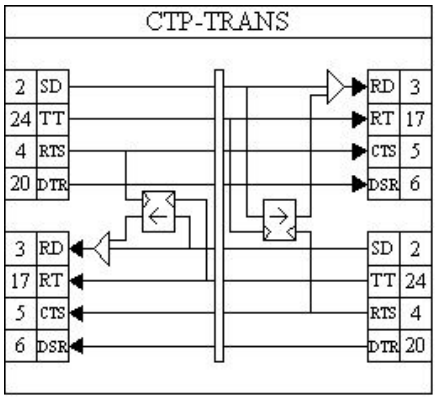
Transparent mode is for unique applications, requiring that the data and clock signals be sampled at one end and replicated at the far end. These applications often have clocks that disappear periodically during the circuit operation. The circuit rate should be 32 Kbps or less.

Transparent encoding samples incoming data on four port input leads, transports these signals across the IP network to the remote port, and sends out the signals on four output leads.The signal sampling rate is based on the configured rate of the port. For example, if the port is configured for 128 Kbps, then the four signals are sampled at 128KHz, which will generate a packet flow through the IP network of 512 Kbps (4 x 128 KHz.). The smallest sampling rate available is 5.3 µsec (approximately 192 KHz). To prevent errors, both ends of the transparent circuit must be synchronized with each other. You can achieve synchronization either by locking each CTP node to a common reference or by enabling adaptive clocking on one end of the circuit. The following is the mapping between the input and output signals:

```
Pin 2 --------> Pin 3
Pin 24 -------> Pin 17
Pin 4 --------> Pin 5
Pin 20 -------> Pin 6
Pin 3 --------> Pin 2
Pin 17 -------> Pin 24
Pin 5 --------> Pin 4
Pin 20 -------> Pin 6
```

Transparent encoding provides the option by means of a phase correction FIFO buffer. This FIFO buffer will correct the clock/data phase relationship in which the clock travels in one direction through the network and the data returns in the other direction. The correction is made on the RD output (pin 3) based on the clock input provided on Pin 4. Figure 14 show the data flows and FIFO when transparent encoding is used.

Figure 14: Transparent (TRANS) Encoding Signal Flow



Configuring Encoding with the CLI

The Encoding options are provided in the Encoding submenu (Figure 15). The menu displays the currently configured encoding. The encoding options available depend on the interface type selected. The encoding option is N/A (not available) when the 4WTO interface type is selected.

Figure 15: Encoding Submenu

```
Please select a number from the following list:
 ------------------------------------------------
 0) Back to Previous Menu
 1) Type:         {EIA530,EIA530A,RS-232,V.35,T1,E1,Optional,OFF}
 2) Mode:         {DCE,DTE, N/A}
 3) Encoding:     {NRZ, ISOCH, CDI, TRANS, N/A}
------------ Your choice [1]: 3

Please select a number from the following list:
------------------------------------------------
 0) NRZ
 1) ISOCH
 2) CDI
 3) MSTAR
 4) TRANS
------------ Your choice [2]: 1
```

Configuring Encoding with CTPView

CTPView automatically displays the available encoding based on the interface selected. To configure interface encoding with the CTPView interface, see “Configuration” on page 27.

Encoding types are listed in the Serial Encoding drop-down list. The value displayed above the field is the value currently configured.

Packet Size

The Packet Size parameter specifies the IP packet size that will be created from data received at the serial port. Packet size ranges from 32 to 1456 bytes and must be a multiple of 16 bytes. The local and remote port packet size can be set to different values, except when adaptive clocking is configured.

The packet rate is calculated based on the packet size and serial interface rate, and the rate is limited to less than 1200 packets per second. You are prompted to change the rate or packet size if the packet rate exceeds this limit.

Determining Optimal Packet Size

Determining the optimal packet size for a particular application involves several important considerations, including:

- Performance limitations (if any) of the IP network
- Bandwidth for transporting serial data
- Packet creation delay

The most significant considerations are the serialization (packet creation) delay and the bandwidth required to transport the serial data.

IP Network Performance

The number of packets created (packet rate) is inversely related to the packet size configured. For example, smaller packets result in a greater packet rate. When you configure the Packet Size parameter, consider the packet-forwarding performance of the attached router and network. Table 3 provides examples of packet rates for various packet sizes and serial interface rates. The CTP system limits the packet rate per interface to 1200 pps and will prompt you if the configuration exceeds this limit.

Table 3: Packet Rate for Various Packet Size and Serial Interface Rate Settings

	Packet Rate (Packets per Second)					
	Packet Size (Bytes)					
Interface Rate (Kbps)	**128**	**256**	**512**	**768**	**1024**	**1400**
64	62.5	31.3	15.6	10.4	7.8	5.7
128	125.0	62.5	31.3	20.8	15.6	11.4
256	250.0	125.0	62.5	41.7	31.3	22.9
1024	1000.0	500.0	250.0	166.7	125.0	91.4
1544	1507.8	753.9	377.0	251.3	188.5	137.9
2048	2000.0	1000.0	500.0	333.3	250.0	182.9

Bandwidth for Transporting Serial Data

You must add overhead for both the layer 2 encapsulation and the IP header so that packets of data can be ransported across the IP network. The IP header comprises 20 bytes; and the encapsulation overhead varies based on the method used, but is typically either 6 or 8 bytes on serial links. As a result of this overhead, smaller packets are less efficient and result in the serial data requiring more IP bandwidth. The amount of bandwidth required on the IP network for a serial bit stream may be calculated as follows:

IP Bandwidth = [Packet Size (bytes) + 20 (bytes) + 2 (bytes) +
Encapsulation Overhead (bytes) x [Packet Rate (pps)] x 8

Packet Serialization Delay

Serial data received at the CTP interface must be buffered long enough to allow a packet to be created for transmission across the IP network. The delay to create the packet will increase as either the size of the packet increases *or* as the rate of the serial interface decreases. Generally, this delay is minimal except when the rate of the serial interface is low and the packet size is large. We recommend that the Packet Size parameter be set to a smaller value when the serial interface operates at lower speeds. Table 4 provides examples of serial interface packet creation delay in milliseconds.

Table 4: Serial Interface Packet Creation Delay

	Serial Interface Delay (msec)					
	Packet Size bytes)					
Interface Rate (Kbps)	**128**	**256**	**512**	**768**	**1024**	**1400**
64	16.0	32.0	64.0	96.0	128.0	175.0
128	8.0	16.0	32.0	48.0	64.0	87/5
256	4.0	8.0	16.0	24.0	32.0	43.8
1024	1.0	2.0	4.0	6.0	8.0	10.9
1544	0.7	1.3	2.7	4.0	5.3	7.3
2048	0.5	1.0	2.0	3.0	4.0	5.5

Configuring Packet Size with the CLI

You configure packet size by selecting Option 4 from the Port Configuration menu (Figure 16). The currently configured packet size is the default value.

Figure 16: Specifying the Packet Size—CLI

```
================================================
Local CTP Configuration Menu for port 0
================================================
Please select a number from the following list:
------------------------------------------------
 0) Back to Previous Menu
 1) Port descriptor text: {user text}
 2) Remote Port:          {vvv.www.xxx.yyy:Pz}
 3) Interface:            {Submenu - Type, Mode, Encoding}
```

```
 4) Packet Size:         {32 - 1456 1Bytes}
 5) Clock Config:        Submenu - Rate and Config}
 6) Min Buffer (ms):     {0.001 - 9999.000}
 7) Pkt Buffer Set (ms): {0.001 - 9999.000}
 8) Max Buffer (ms):     {0.001 - 9999.000}
 9) Service Type:        {0 - 255}
10) Time to Live:        {0 - 255}
11) Signaling In Config:  | RL = ---  | RTS= ---  | DTR=--- | LL = ---|
12) Signaling Out Config: | DSR= ---  | CTS= --- | DCD= --- | TM =--- |
13) Advanced Options...
------------ Your choice [3]: 4

Enter packet size in bytes (32-1456)[1024]: {Input Value}
```

Configuring Packet Size with CTPView

CTPView automatically displays the available encoding based on the interface selected. To configure interface encoding with the CTPView interface, see "Configuration" on page 27.

Select a packet size from the Packet Size drop-down list. The value displayed above the field is the value currently configured.

Clock Configuration

The following list summarizes clocking options with a data interface and NRZ encoding:

- Configured Rate w/o External Tx Clock (TT)—The CTP system expects that the transmit data from the attached DTE will be at the rate specified in the configuration and that the transmit data from the DTE will be sampled at the CTP based on the transmit timing (TT) provided by the CTP system.

- Configured Rate w/ External Tx Clock (TT)—The CTP system expects that the transmit data from the attached DTE will be at the rate specified in the configuration and that the data will be sampled based on the external timing provided by the attached DTE. This option is a common configuration for long cables or high data rates because clock and data signals will travel the same cable length from the DTE and the CTP will sample the data based on the TT input.

- All Clocked w/ External TX Clock (TT)—The clock received from the attached device is received on the external TT clock input and is used for all interface clocks. This option includes transmit and receiving timing and the clock used to clock data out of the receive FIFO buffer toward the IP network.

- Adaptive Rate w/o External Tx Clock (TT)—The CTP system generates the transmit and receive timing based on the clock of the distant CTP system using Advanced Time Domain Processing (ATDP) adaptive clocking. This option allows the clock to rapidly adjust, or adapt, to the remote clock. The circuit will run continuously without buffer overruns or underruns, even when no reference clock is provided to the CTP1004.

- Autobaud Rate w/ External TX Clock (TT)—The CTP system calculates the transmit data rate of the attached DTE by processing the external timing (TT) from the DTE. Autobaud will be supported in a future release.

- The custom clocking options are described in Custom Clock Options—CLI on page 52.

The following are the clocking options when the configured Interface Type is T1 or E1:

- The CTP system is clock source. In this configuration, the PBX is returning the clock received from the CTP, or it is returning a clock that is traceable to the same source as the CTP node clock reference. You typically use this configuration when you configure the CTP system with a clock reference input.

- The CTP system is loop timed. In this configuration, the PBX is providing the clock and the CTP is returning the same clock to the PBX. You typically use this configuration when the PBX has the more accurate clock source. You can configure the far end of the circuit with adaptive clocking to recover this clock if necessary.

- The CTP system is clock source (adaptive). In this configuration, the PBX returns the clock received from the CTP, and the CTP uses the adaptive recovered clock. You typically use this configuration when the CTP does not have a reference input and the PBX typically requires clock from the distant PBX.

- The custom clocking options are described in Custom Clock Options—CLI on page 52.

NOTE: The clock configuration is automatically configured when isochronous, conditioned diphase, or transparent encoding is configured. The user should not change the clock configuration when these encoding options have been selected.

Adaptive Clocking Options

There are configurable attributes that affect the Adaptive Clocking algorithm. The attributes are configured only when the clocking configuration specifies adaptive. The default settings are acceptable for the majority of applications. Consider using the assistance of JTAC before changing these parameters since they affect how the clocking and circuit functions. The parameters are as follows:

- AGGR Seconds/Calc—The default is 20. The valid range is 2–60. Sets the time period during initial start of adaptive clocking for identifying packet samples experiencing the least delay through the network. Samples are used in aggressive state calculations.

- MNTN Seconds/Calc—The default is 45. The valid range is 1–60. Sets the time period during normal adaptive clocking for identifying packets experiencing the least delay through the network. Samples are used in maintenance state calculations.

- Slope for MNTN in ppm—The default is 5. The valid range is 1–10. Sets the value for changing that adaptive clocking algorithm from aggressive to maintenance state. Lower values result in longer switchover times with a clock value closer to the distant clock.

- Maintenance Decay in calcs—The default is 3. The valid range is 2–10. Sets how quickly the clocking corrects to buffer set point in maintenance state.
- Max Clock Adjust in ppb—The default is 200. The valid range is 1–1000. Constrains the frequency adjustments to the adaptive clock. This parameter has the effect of capping the frequency acceleration.
- Max Clock Offset in ppm—The default is 200. The valid range is 1–400. Constrains the frequency of the adaptive clock. This parameter has the effect of capping the frequency velocity.
- Max Buffer Error in µsec—The default is 2000. The valid range is 100–5000. Sets the buffer error required to change the adaptive clocking algorithm state from maintenance to aggressive.

Custom Clocking Options

Custom clocking gives you flexibility in the configuration to provide services such as asymmetric rates. This section provides an overview of the port clocking subsystem and how the custom clocking options can be used.

NOTE: With the flexibility of custom clocking comes the opportunity to misconfigure the port so that it will not operate according to expectations. Use caution when configuring custom clocking.

The major sections are:

- OSC: node clock oscillator—There is one central clock oscillator for every node, and it runs at a nominal rate of 32.768 MHz. This oscillator is part of a phase-locked loop (PLL), which can be locked to the incoming clock on a CTP port or the external reference input.
- DDS: direct digital synthesizer —This is a type of clock generator that is capable of synthesizing a clock at nearly any desired rate. The range of clock output is 1 Hz–12.288 MHz in increments of 1/128 Hz. Because the node OSC provides the reference clock to the DDS, the DDS output will be as accurate at the OSC. The DDS rate is configured in the port clock menu.
- DIV—This is a programmable divider that can divide a clock by an even number between 2 and 16384, inclusive. It may accept as its input clock either the OSC (32.768 MHz) or DDS output clock.
- Packet engine—This block is responsible for conversion of a constant stream of serial data to IP packets and vice versa. In the network-bound direction, incoming serial data is partitioned into packets of data (according to the packet size configured in the Port Configuration menu) and sent into the IP network toward a remote port. In the reverse (interface-bound) direction, IP packets are received from the IP network, stripped of their IP headers, reordered to accommodate packet delay, buffered to accommodate packet delay jitter, and transmitted to the serial interface as a constant stream of data.

- Rx FIFO memory—First-in first-out (FIFO) memory is used to accommodate small amounts of jitter and/or phase shift in the data because of the use of different clocks in the network-bound path (that is, TT [user] clock) or to accommodate the transmit data and transmit clock phase shift experienced on longer cables at higher data rates.

The standard port timing options described in the previous section are used in most network applications. Based on the option that you select, the settings for the multiplexers and clocking elements on the clock diagram are configured automatically. When you select Custom from the Clock Options menu, the Advanced Clock menu (Figure 18 on page 52) is presented, allowing you to configure the clocking elements.

Configuring Port Clocking with the CLI

The Clock Config submenu is available when you select Option 5 from the Port Configuration menu. The menu shown in Figure 17 allows you to set the serial interface rate and select port clocking options. You do not need to configure port speed and clocking when you select the optional analog 4WTO interface. Selecting this interface causes the port speed and clocking to be automatically configured.

Figure 17: Port Clock Configuration Menu—CLI

```
================================================
Port Clock Configuration Menu 0
================================================
Please select a number from the following list:
------------------------------------------------
0) Back to Previous Menu
1) Port Clock Config:             Configured Rate, NO Ext Tx Clk (TT)
2) Port Speed (KHz):             1024.000000
3) Send User Clock thru Network:  NO
------------ Your choice [2]:1

================================================
Clock Options Menu for Port 0 (DCE Mode)
================================================
Please select a number from the following list:
------------------------------------------------
0) Back to Previous Menu
1) Configured Rate w/o External Tx Clock (TT)
2) Configured Rate w/  External Tx Clock (TT)
3) All Clocked     w/  External Tx Clock (TT)
4) Adaptive Rate w/o External Tx Clock (TT)
5) Autobaud   Rate w/  External Tx Clock (TT)
6) Custom...
7) Set Adaptive Parameters...
     ------------ Your choice [0]:

================================================
Clock Options Menu for Port 1 (DTE Mode)
================================================
Please select a number from the following list:
------------------------------------------------
0) Back to Previous Menu
1) .....
2) ....
3) ....
4) .....
5) ....
6) DTE, All Clocked by   Ext Clk (ST/RT)
```

```
8) Custom...
9) Set Adaptive Parameters...
------------ Your choice [0]:
```

The custom clocking and adaptive parameters are available by when you select select Options 6 and 7, respectively, from the Clock Options menu. Figure 18 shows the Custom Clocking menu (Advanced Clock Options).

Figure 18: Custom Clock Options—CLI

```
=============================================
Advanced Clock Options for Port 0
=============================================
Please select a number from the following list:
---------------------------------------------
 0) Back to Previous Menu
 1) DDS Synthesizer Source:      User (OI)
 2) DIV (clk divider) Source:    Oscillator
 3) DIV (clk divider) Value:     16384
 4) ST (net bound i/f)  clk sel: DDS (synth)
 5) RF (net bound fifo) clk sel: DDS (synth)
 6) RX (net bound scc)  clk sel: DDS (synth)
 7) RT (i/f bound i/f)  clk sel: DDS (synth)
 8) TX (i/f bound scc)  clk sel: DDS (synth)
------------ Your choice [0]:
```

The clocking options menu shown in Figure 19 is provided when the interface type is T1 or E1.

Figure 19: Port Clock Configuration (T1/E1)—CLI

```
=============================================
Port Clock Configuration Menu 0
=============================================
Please select a number from the following list:
---------------------------------------------
 0) Back to Previous Menu
 1) Port Clock Config: .....
 2) Port Speed (KHz): 1544.000000
------------ Your choice [2]: 1
=============================================
Clock Options Menu for Port 0
=============================================
Please select a number from the following list:
---------------------------------------------
 0) Back to Previous Menu
 1) .....
 2) CTP is Clock Source
 3) CTP is Loop Timed
 4) .....
 5) PBX is Clock Source (Adaptive End)
 6) .....
 7) Custom...
 8) Set Adaptive Parameters...

     ------------ Your choice [0]:
```

Example of an Asymmetric Configuration with the CLI

The following is a description of an asymmetric circuit configuration with custom clocking. Assume that you want the network-bound direction (toward the remote DTE) to operate at 2.048 MHz and the interface-bound data (toward the local DTE) to operate at 64 KHz. You first configure the DDS for 2048.0 KHz; set the DIV source to DDS; and set the DIV value to 32 (because 2048/32 = 64). Set the network-bound multiplexers (Options 4, 5, and 6) for DDS, which sets the network-bound data rate to 2.048 Mbps. Set the interface-bound multiplexers (Options 7 and 8) for DIV, which sets the interface-bound data rate to 64 Kbps.

If the cable length of this port is long, it might be desirable to switch multiplexer 4 from DDS to TT, and have the DTE equipment loop the ST clock back to TT so that it travels in phase with the network-bound user data. Figure 20 shows an example of the above configuration.

At the remote CTP asymmetric port, the DDS and DIV settings would be identical, but the clock multiplexer selections would be configured appropriately for the speed of that data direction.

Figure 20: Example of Asymmetric Configuration

```
============================================
Advanced Clock Options for Port 0
============================================
Please select a number from the following list:
--------------------------------------------
 0) Back to Previous Menu
 1) DDS Synthesizer Source:      User (OI)
 2) DIV (clk divider) Source:    DDS Output
 3) DIV (clk divider) Value:     32
 4) ST (net bound i/f)  clk sel: DDS (synth)
 5) RF (net bound fifo) clk sel: DDS (synth)
 6) RX (net bound scc)  clk sel: DDS (synth)
 7) RT (i/f bound i/f)  clk sel: DIV (synth)
 8) TX (i/f bound scc)  clk sel: DIV (synth)
------------ Your choice [6]:
```

Configuring Port Clocking with CTPView

CTPView automatically displays the available clocking based on the interface selected. To configure interface encoding with the CTPView interface, see “Configuration” on page 27.

Clocking types are listed in the Clock Cfg drop-down list. Select **Show Custom Clocking Options** to display more clocking parameters. The value displayed above the field is the value currently configured.

Port Speed

The port speed is specified in Kbps ranging from 0.001000 to 12288.000000; however, the CTP1002 is limited to a port speed of 2048.000000. The aggregate port rate (sum of the rates of all ports) of the CTP1012 cannot exceed 49.152 Mbps, and the aggregate port rate of the CTP2008, CTP2024, and CTP2056 cannot exceed 114.688 Mbps. The clock rate of ports using either conditioned diphase and isochronous encoding is limited to 1024 Kbps.

The CTP system is capable of accurately synthesizing frequencies with a granularity of 0.0078125 Hz or less. If the selected frequency cannot be synthesized, the CTP system calculates the closest available rate within 0.0078125 Hz and allows you the option of using the calculated frequency.

Configuring the Port Speed with the CLI

You configure the port speed by selecting Option 2 from the Port Clock Configuration submenu (Figure 21).

Figure 21: Specifying Port Speed—CLI

```
=============================================
Port Clock Configuration Menu 0
=============================================
Please select a number from the following list:
---------------------------------------------
 0) Back to Previous Menu
 1) Port Clock Config: Configured Rate, NO Ext Tx Clock (TT)
 2) Port Speed (KHz): 1024.000000
 3) Send User Clock thru Network:  NO
------------ Your choice [1]: 2

Enter Synthesized port rate (kHz)
 (0.001000 - 12288.000000)[1024.000000]:
```

Configuring the Port Speed with CTPView

To configure port speed with the CTPView interface, see “Configuration” on page 27. Enter port speed in the Port Speed field. The value displayed above the field is the value currently configured.

Buffer Settings

Packets received from the IP network must be buffered to accommodate variances in the packet arrival rates (referred to as delay variance or delay jitter) and the resequencing of out-of-order IP packets. Making the buffer larger ensures that greater amounts of delay variance may be accommodated; however, it also increases the overall delay encountered by the serial data. We recommend that you set the buffer as small as possible without introducing unacceptable error rates and port starvation restarts due to missed packets caused by delay jitter. You can use the query commands and CTPView Runtime Query and Jitter graphs, as detailed in *Chapter 4, Software Queries and Operations*, to determine how well the serial circuit is performing, and you can make adjustments to the buffering based on actual performance.

The default settings are acceptable for local IP-switched connections, but are normally increased for routed IP connections.

NOTE: Set the buffer parameters based on the expected packet delay variance (jitter). Do not set them based on the overall packet delay through the network. For example, if a CTP circuit transits a satellite circuit with 260 msec of delay and the packets experience 20 msec of jitter, then you would configure the Packet Buffer Set parameter to a value slightly greater than 20 msec (such as 30 msec).

Minimum Buffer

The Min Buffer parameter ensures that the buffer does not become too small because of timing variances between the local and remote serial interfaces. The minimum buffer size is specified in milliseconds and defines the minimum average buffer size before the buffer is recentered.

Periodic buffer recenters are not expected. If you notice recenters, we recommend that you verify the reference to the CTP (if used) or that you configure one port with adaptive clocking. It should also be noted that the entire buffer is available for accommodating and smoothing packet delay jitter, regardless of the Minimum buffer setting. The minimum buffer setting is set to a value greater than the expected jitter and less than the packet buffer setting.

Packet Buffer

You set the buffer size by using the Pkt Buffer Set parameter. The buffer size is set to this value when the circuit enters a Running State. The Pkt Buffer Set value must be large enough to accommodate the anticipated packet delay jitter. Pkt Buffer Set must be set to a value greater than the Min Buffer parameter and less than the Max Buffer parameter.

Maximum Buffer

You configure the Max Buffer parameter to ensure that the buffer does not become too large due to timing variances between the local and remote serial interfaces. The buffer is recentered to the Pkt Buffer Set value if the buffer size exceeds the Max Buffer value.

Periodic buffer recenters are not expected. If you notice recenters, we recommend that you verify the reference to the CTP (if used) or that you configure one port with adaptive clocking.

Configuring the Buffer Settings with the CLI

You configure the Min Buffer, Pkt Buffer Set, and Max Buffer parameters by selecting Options 6, 7, or 8 from the Port Config menu (Figure 22). The current settings for the buffer are displayed and are the defaults.

Figure 22: Setting Minimum Buffering—CLI

```
================================================
Config Menu for port 0
================================================
Please select a number from the following list:
------------------------------------------------
 0) Back to Previous Menu
 1) Port descriptor text: (user text)
 2) Remote Port:           (vvv.www.xxx.yyy:Pz)
 3) Interface:          (Submenu - Type, Mode, Encoding)
 4) Packet Size:        (32 - 1456 1Bytes)
 5) Clock Config:       (Submenu - Rate and Config)
 6) Min Buffer (ms):    (0.001 - 9999.000)
 7) Pkt Buffer Set (ms): (0.001 - 9999.000)
 8) Max Buffer (ms):    (0.001 - 9999.000)
 9) Service Type:       (0 - 255)
10) Time to Live:       (0 - 255)
```

```
11) Signaling In Config:  | RL = ---  | RTS= ---  | DTR=--- | LL = ---|
12) Signaling Out Config: | DSR= ---  | CTS= --- | DCD= --- | TM =--- |
13) Advanced Options...
------------ Your choice [3]: 6

Enter minimum buffer fill (in ms) (0.001 - 9999.000)[8.000]:
```

Configuring the Buffer Settings with CTPView

To configure buffer settings with the CTPView interface, see “Configuration” on page 27. Enter buffer settings in the Min Buffer, Buffer Set, and Max Buffer fields. The value displayed above the field is the value currently configured.

Service Type

You can configure the ToS byte in the IP header. The ToS setting is specific to the port being configured, and the value is set in the IP packets transmitted from the CTP system into the IP network. The ToS setting does not need to be the same value on the local and remote ports.

Because you can configure the entire byte, the options are 0–255. Packet classification in IP networks is frequently based on the Differentiated Services code point (DSCP) as specified in the ToS byte. Table 5 shows the service type settings for all DSCP classes.

Table 5: DSCP Classes and Service Type

Class	DSCP Setting	TOS Setting
CS7	56	224
CS6	48	192
EF	46	184
CS5	40	160
AF43	38	152
AF42	36	144
AF41	34	136
CS4	32	128
AF33	30	120
AF32	28	112
AF31	26	104
CS3	24	96
AF23	22	88
AF22	20	80
AF21	18	72
CS2	16	64
AF13	13	52
AF12	12	48
AF11	10	40
CS1	8	32

Configuring the Service Type with the CLI

You configure the Service Type parameters by selecting Option 9 from the Port Config menu (Figure 23).

Figure 23: Service Type Settings—CLI

```
==============================================
Config Menu for port 0
==============================================
Please select a number from the following list:
----------------------------------------------
 0) Back to Previous Menu
 1) Port descriptor text: {user text}
 2) Remote Port:          {vvv.www.xxx.yyy:Pz}
 3) Interface:            {Submenu - Type, Mode, Encoding}
 4) Packet Size:          {32 - 1456 1Bytes}
 5) Clock Config:         {Submenu - Rate and Config}
 6) Min Buffer (ms):      {0.001 - 9999.000}
 7) Pkt Buffer Set (ms): {0.001 - 9999.000}
 8) Max Buffer (ms):      {0.001 - 9999.000}
 9) Service Type:          {0 - 255}
10) Time to Live:          {0 - 255}
11) Signaling In Config:  | RL = ---  | RTS= ---  | DTR=--- | LL = ---|
12) Signaling Out Config: | DSR= ---  | CTS= --- | DCD= --- | TM =--- |
13) Advanced Options...
------------ Your choice [8]: 9

Enter Time to Live (0-255)[255]:
```

Configuring the Service Type with CTPView

To configure service type with the CTPView interface, see “Configuration” on page 27. Enter the service type in the Service Type field. The value displayed above the field is the value currently configured.

Time to Live

You can configure the IP packet time to live (TTL). The acceptable values range from 0 to 255; the default is 255. The TTL value specifies the maximum number of router hops that a packet can traverse, and the value is set in the IP packets transmitted from the CTP system into the IP network. Note that the IP network does not alter or optimize the packet routing based on the TTL setting, and the setting does not need to be the same value on the local and remote ports.

Configuring Time to Live with the CLI

You configure the TTL setting by selecting Option 10 from the Port Config menu (Figure 24). The current settings for TTL are displayed and are the defaults.

Figure 24: Configuring Time to Live—CLI

```
==============================================
Config Menu for port 0
==============================================
Please select a number from the following list:
----------------------------------------------
 0) Back to Previous Menu
 1) Port descriptor text: {user text}
 2) Remote Port:          {vvv.www.xxx.yyy:Pz}
 3) Interface:            {Submenu - Type, Mode, Encoding}
 4) Packet Size:          {32 - 1456 1Bytes}
```

```
 5) Clock Config:        {Submenu - Rate and Config}
 6) Min Buffer (ms):     {0.001 - 9999.000}
 7) Pkt Buffer Set (ms):{0.001 - 9999.000}
 8) Max Buffer (ms):     {0.001 - 9999.000}
 9) Service Type:        {0 - 255}
10) Time to Live:        {0 - 255}
11) Signaling In Config:  | RL = ---  | RTS= ---  | DTR=--- | LL = ---|
12) Signaling Out Config: | DSR= ---  | CTS= --- | DCD= --- | TM =--- |
13) Advanced Options...
------------ Your choice [8]: 10

Enter Time to Live (0-255)[255]:
```

Configuring the Time to Live with CTPView

To configure time to live (TTL) with the CTPView interface, see “Configuration” on page 27. Enter TTL in the Time to Live field. The value displayed above the field is the value currently configured.

Signaling Configurations

The input signals (RL, RTS, DTR, LL) can be either unused (ignored) or used to create a demand circuit. When configured for demand, the packets created from the circuit are transferred across the IP network only when the signal lead is in the specified state for the circuit to be a Demand Call – Active. When two or more leads are configured for demand, all the configured leads must be in the state Demand Call – Active for the circuit to transfer packets across the IP network.

The port output signals (DSR, CTS, DCD, TM) can be set to a fixed value (high or low), or they can be set to inband so that the output signal state is based on the state of an input signal at the remote CTP port. The remote input signals that can be mapped to the output signals include RL, RTS, DTR, and LL.

The input state of each signal lead is encoding once in every transmitted IP packet. Thus the granularity of the transitions (frequency of changes) that can be transferred across the network is equal to the packet rate of the circuit.

Configuring Signals with the CLI

The menus shown in Figure 25 and Figure 26 are provided when you select either Option 11 (Signaling In Config) or Option 12 (Signaling Out Config). Both menus allow you to configure the input signals used for establishing a demand circuit and the output signals based on the remote port input.

Figure 25: Input Signaling Configuration for Demand Circuits—CLI

```
==============================================
Signaling Menu for Port 0
==============================================
Please select a number from the following list:
----------------------------------------------
 0) Back to Previous Menu
 1) DSR (output): Fixed - Low
 2) CTS (output): Fixed - Low
 3) DCD (output): Fixed - Low
 4) TM  (output): Fixed - High
 5) RL   (input): Unused
 6) RTS  (input): Unused
```

```
 7) DTR  (input): Demand Call - Active High
 8) LL   (input): Unused
 ------------ Your choice [2]: 7

Enter input signal function:
Please select a number from the following list:
-----------------------------------------------
 0) Unused
 1) Demand Call
------------ Your choice [1]:
(NOTE: 0=Space=On, 1=Mark=Off )
Enter input signal value to initiate call (0-1)[1]:
```

Figure 26: Output Signaling Configuration—CLI

```
===============================================
Signaling Menu for Port 0
===============================================
Please select a number from the following list:
-----------------------------------------------
 0) Back to Previous Menu
 1) DSR (output): Fixed - Low
 2) CTS (output): Fixed - Low
 3) DCD (output): Fixed - Low
 4) TM  (output): Fixed - High
 5) RL   (input): Unused
 6) RTS  (input): Unused
 7) DTR  (input): Demand Call - Active High
 8) LL   (input): Unused
------------ Your choice [1]: 2

Enter output signal function:
Please select a number from the following list:
-----------------------------------------------
 0) Fixed
 1) In-Band
------------ Your choice [0]: 1

Choose remote port signal source:
Please select a number from the following list:
-----------------------------------------------
 0) RL
 1) RTS
 2) DTR
 3) LL
------------ Your choice [0]: 0
```

Configuring the Signals with CTPView

To configure signal options with the CTPView interface, see “Configuration” on page 27. Select Show Signaling Options and enter signal parameters. The value displayed above the field is the value currently configured.

Advanced Options

The default Advanced Option settings are acceptable for the majority of circuits and applications. The advanced options allow the user to configure nonstandard attributes that may be required by some applications. The following list summarizes Advanced Option parameters:

- OAM Configuration—The CTP system uses periodic UDP OAM packets to determine the connectivity between the two CTP systems that are providing the circuit's ports. These parameters allow you to configure the OAM packet rate: the number of consecutive OAM packets that must be received before the circuit will change to IN-SYNC, and the number of consecutive OAM packets that must be missed before the circuit state is changed to NO-SYNC.

- Virtual IP address—This parameter allows you to use and configure an IP address for the circuit's data and OAM flow that is *different* from the IP address of the CTP system. This virtual IP address is used in the IP packet's Origination Address field, and the distant CTP system must be configured with the virtual IP address of the port.

- Packet Protector—In a network where significant IP packet loss is expected, you can configure this option to send and/or receive cloned (duplicated) packets. When configured to receive cloned packets, the CTP system automatically uses the cloned packet when the original packet is dropped by the IP network. The system ignores the cloned packet when both the original and cloned packets are received.

  The following are the configuration options for the Packet Protector feature:

  - 0—Disable packet protector
  - 1—Send cloned packets to NET
  - 2—Expect cloned packets from NET
  - 3—Send and expect cloned packets

- Missing pkt fill pattern—When an IP packet is dropped, the CTP system automatically inserts data into the circuit bit stream in lieu of the actual data. The number of bits inserted is equal to the number of bits in the missed packet. This data insertion method prevents a loss of bit count integrity to attached circuit devices and encryptors. This parameter allows you to configure the fill-pattern byte to a value other than ff. You enter the number as two hexadecimal digits. Note that the input does not require the 0x characters.

- Consecutive pkts loss to starve—Specifies how many consecutive circuit packets must be dropped by the IP network for the CTP circuit state to process the loss as a starvation and to recenter the buffer. The circuit state will also change from RUNNING to IN-SYNC, depending on the duration of the loss. This parameter allows you to change the number of consecutive lost packets required for a starvation from the default value of 5 to a value between 1 and 64.

We recommend that you set the parameter to a larger value when the IP network uses packet-encrypting devices. These devices will cause momentary interruption in packet flows when encryption keys are periodically updated.

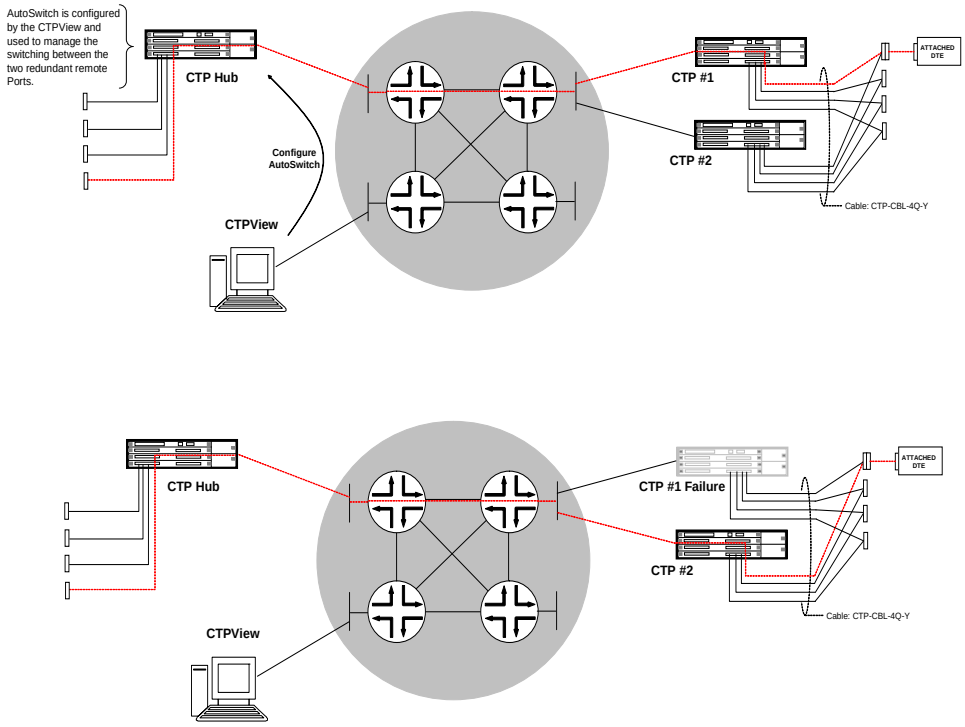
- In sequence pkts after starve—After a starvation, the CTP circuit must begin receiving circuit packets before the port recovers from the packet starvation and resets the jitter buffer. The circuit state may also change from IN-SYNC to RUNNING. This parameter allows you to change the number of required in-sequence packets received by the CTP system from the default of 15 to a value between 1 and 64.

- Y cable redundancy—Set to YES when the CTP system is configured with a redundant Y cable.

Implementing Y Cable Redundancy

Customers use Y cable redundancy to increase circuit availability to a site (typically a remote site), as shown in Figure 27 on page 61. Configuring Y cable redundancy switches the circuit to a co-located alternate CTP and port during an unlikely network or equipment failure. The objective of this redundancy scheme is to maximize network availability by providing complete hardware redundancy that protects from failures that include chassis, processor, power supplies, and the interface module. The process of switching the circuit to the redundant system is controlled by the AutoSwitch feature running at the hub CTP system.

Figure 27: Y Cable Redundancy



Using this feature requires a special Y cable (Juniper Networks part number CTP-CBL-4Q-Y). The Y cable provides control leads between the two CTP systems in addition to the standard signal, clock and data leads connected to the attached device.

The following are technical considerations to keep in mind when you use Y cable redundancy.

- The Y cable is short to maintain signal quality. The two CTP systems connected to the Y cable must be in close proximity to each other.
- The redundant port numbers may be different provided that they are using the same port on the CPT 100 pin connector. For example, a Y cable100-pin connector could be attached to ports 0-3 on the first CTP system, with the second connector attached to ports 8-11 on the second system. The redundant ports would be P0/P8, P1/P9, P2/P10 and P3/P11 on the first and second CTP systems, respectively.
- Use CTPView to configure the Autoswitch at the hub CTP system. CTPView is not required, however, to initiate or control the switchover.
- The rate of the switchover is determined by the AutoSwitch Check Period and Switch Count values configured at the hub CTP. The default values are 60 seconds, with a Switch Count of 3. The default configuration minimizes unnecessary switchovers due to transient failures, such as might occur with a brief network problem.

Configuring Advanced Options with the CLI

Figure 28 shows the Advanced Options menu provided when you select it from the Port Config menu. The CTP system automatically configures parameters 11 through 14. Do not change these values without consulting JTAC.

Figure 28: Advanced Options Menu

```
Please select a number from the following list:
-----------------------------------------------
 0) Back to Previous Menu
 1) OAM Chan Rate (sec/pkt):         1
 2) OAM pkts for Sync:               2
 3) OAM pkts for Sync Loss:          5
 4) Use virtual ip for port          NO
 5) Virtual ip for port:             0.0.0.0
 6) Packet Protector(tm)             Disabled
 7) Missing pkt fill pattern:        0xff
 8) Consecutive pkts loss to starve: 5
 9) In sequence pkts after starve:   15
10) Y cable redundancy:              NO
11) Single ended data/clock outputs: NO
12) Reclock RD to align RD/RT:       YES
13) Send pkts to stack:              NO
14) Unidirectional circuit:No
------------ Your choice [1]:
Parameters 1 through 3
```

Configuring Advanced Options with CTPView

To configure advanced options with the CTPView interface, see “Configuration” on page 27. Select Show Advanced Options and complete each field. The value displayed above the field is the value currently configured.

Port Configuration—Packet-Bearing Serial Interface

You are required to have administrative privileges to modify a port configuration. You are not permitted to configure the port if you have only user privileges. The port is disabled and will not pass data when you configure it with the CLI. The port is not disabled when you configure it with CTPView, and the configured changes will not take effect until you click the **Submit Changes** button, at which time there will be a momentary interruption in the data flow.

Configuring a packet-bearing serial (PBS) interface allows you to connect a CTP1000 to an IP network through a serial interface. The feature is currently available on the CTP1000 products and will be supported on the CTP2000 with a future software release. A port configured as a PBS interface uses static routes and does not participate in any routed protocol sessions, such as OSPF and RIP.

A port must be configured as either a circuit emulation (CE) port or PBS interface. The default is the CE port. You can change the port between CE and PBS modes in the Node Operations menu. Changing the type of port, which is typically done only during the initial installation, requires the system to automatically reboot. The following are the ports that can be configured for PBS port operation:

- CTP1002—P0 and P1
- CTP1004—P0 and P1
- CTP1012—P0, P1, P4, P5, P8, and P9

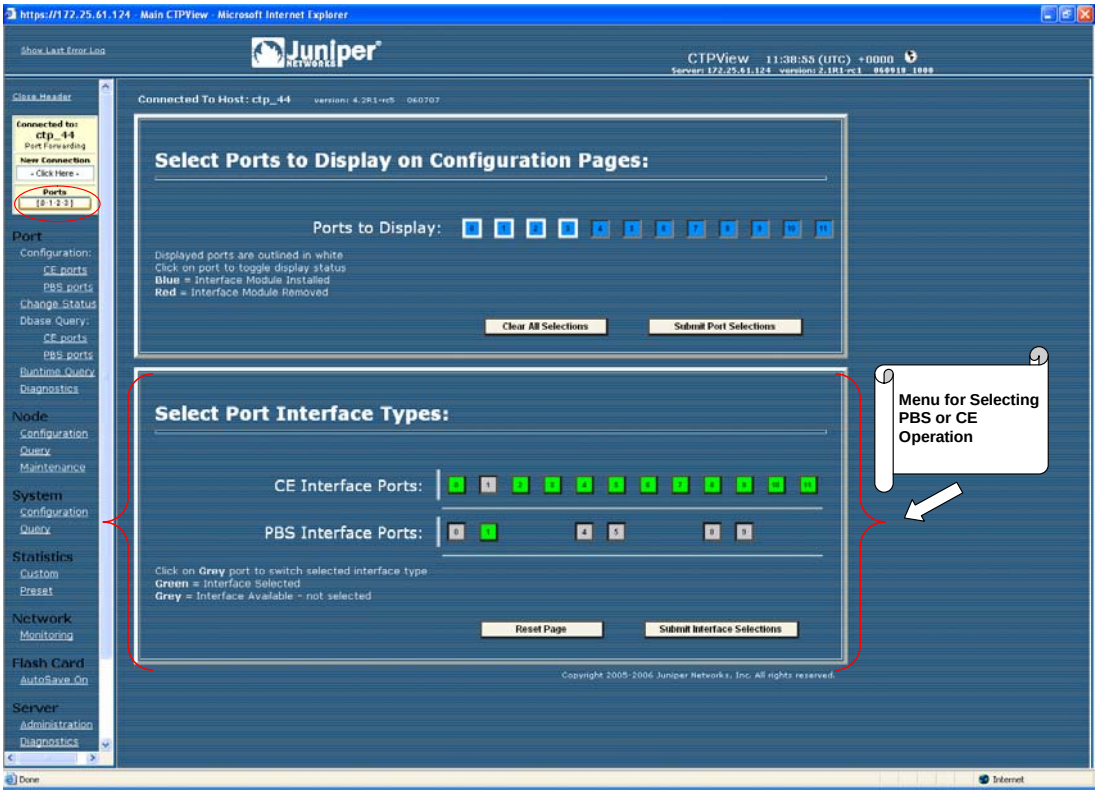
Figure 29 shows the menu that you use to change the port to PBS operation with the CLI. This submenu is available from the Node Operations menu.

Figure 29: Configuring a Port for PBS Operation—CLI

```
================================================================
(ctp_44 09/26/06 11:16:45 GMT) | Configure Ports for PBS Operation
================================================================

PBS operation is limited to the following ports:

Port 0 configured for PBS operation: no
Port 1 configured for PBS operation: yes
Port 4 configured for PBS operation: no
Port 5 configured for PBS operation: no
Port 8 configured for PBS operation: no
Port 9 configured for PBS operation: no

Please input a port to configure, <rtn> to exit: 0
Configure port 1 for PBS operation? n[y]:
```

You can change the ports between PBS and CE modes with CTPView. The window shown in Figure 30 is provided when you select **Ports** from the Connect window or when you select the **Convert to CE/Convert to PBS** check box in the configuration window. You select the CE and PBS mode by using the buttons provided.

Figure 30: Specifying PBS and CE Port Types with CTPView



Packet-Bearing Serial Interface Parameters

The following list summarizes the parameters used to configure a packet-bearing serial interface.

- **Encapsulation**—PPP and HDLC encapsulation are supported by PBS interfaces. Select the encapsulation from the CLI or from the CTPView drop-down menu.
- **Local and remote IP address—**The PBS interface requires that the IP address of the local and remote IP interfaces be specified. Both addresses must be on the same network.
- **Clock configuration**—The clock configuration submenu lets you configure port speed and clock configuration. The clocking options include configured rate with and without external TT, all clocked by external TT, and custom clocking. The custom configuration is as detailed in Bundle Operations on page 11.

  CTPView allows you to configure the rate using a input field and specify the clocking from a pull down menu of valid options.
- **MTU—**The MTU can be configured to a value up to 1500 bytes. MTU fragmentation is not supported.

- **Interface**—The Interface is configurable to be either EIA530, EIA530A, RS232, V.35 or T1/E1 (optional when hardware is installed). The encoding is limited to NRZ.

- **Static routes**—Up to three static routes that use the PBS interface can be configured and active. The static routes cannot conflict with the static routes configured on any other PBS Interfaces.

Configuring the Packet-Bearing Serial Interface with the CLI

Figure 31 shows the CLI menu for configuring the PBS interface. The parameters are as described in Packet-Bearing Serial Interface Parameters on page 64. Figure 32 shows the submenu that you use to configure the static route.

Figure 31: Configuring the PBS Interface—CLI

```
============================================================
(ctp_44 09/26/06 13:54:27 GMT) | Config Menu for PBS Port  1
============================================================
Please select a number from the following list:
------------------------------------------------------------
 0) Back to Previous Menu
 1) Port descriptor text:   {Text}
 2) Encapsulation:         {PPP,HDLC)
 3) Local ip of p2p link:  {www.xxx.yyy.zzz IP address)
 4) Remote ip of p2p link: {www.xxx.yyy.zzz IP address)
 5) Clock Config:          {Rate/ Clock Configuration}
 6) MTU:                   {0 - 1500}
 7) Interface:             {Interface / Encoding}
 8) First static route:    {Disabled or IP Address / Subnet Mask}
 9) Second static route:   {Disabled or IP Address / Subnet Mask}
10) Third static route:    {Disabled or IP Address / Subnet Mask}
11) Advanced Options...
------------ Your choice [6]: 8
```

Figure 32: Submenu for Configuring a Static Route

```
====================================================================
(ctp_44 09/26/06 13:56:26 GMT) | Route Configuration Menu for Port 1
====================================================================
Please select a number from the following list:
--------------------------------------------------------------------
 0) Back to Previous Menu
 1) Enable this route: NO
 2) Network:           172.25.61.0
 3) Netmask:           255.255.255.0
------------ Your choice [0]:
```

Node Synchronization

The CTP products can use an external clock as a reference input to the system. The reference can be input on a port or on the external reference input. You can configure and prioritize up to five references depending on the CTP model. The system will automatically use the highest priority reference available, and will switch to a holdover mode if all the references are lost. The following ports can be used for reference inputs:

- CTP1002: P0–P1

- CPT1004: P0–P3
- CTP1012: P0–P3
- CTP2008, CTP20024, CTP2056: P0–P3

The CTP2000 external reference input is provide by the CLK-RTM module through a DB-25 connector.

NOTE: An interface module must be present in slot one of the CTP2000 chassis to provide reference synchronization throughout the system.

The CTP1000 external input is provided on either a rear BNC or D-B9 connector depending on the chassis revision. The input is differential with one of the two differential leads input on the BNC outer ring. This outer ring is isolated from the chassis ground. More information about the external clock inputs is available in Clock Configuration on page 48.

Configuring References

You can define multiple clocks as references, each with a priority, to ensure that a reference with lower priority is available if the primary clock reference fails. The reference inputs to the CTP system must be 32 Kbps, an *n* x 64 Kbps (up to 4096), or 1.544 Mbps. The CTP system provides a reference holdover with an accuracy of approximately 100 parts per billion if the reference is lost and no backup is defined or available.

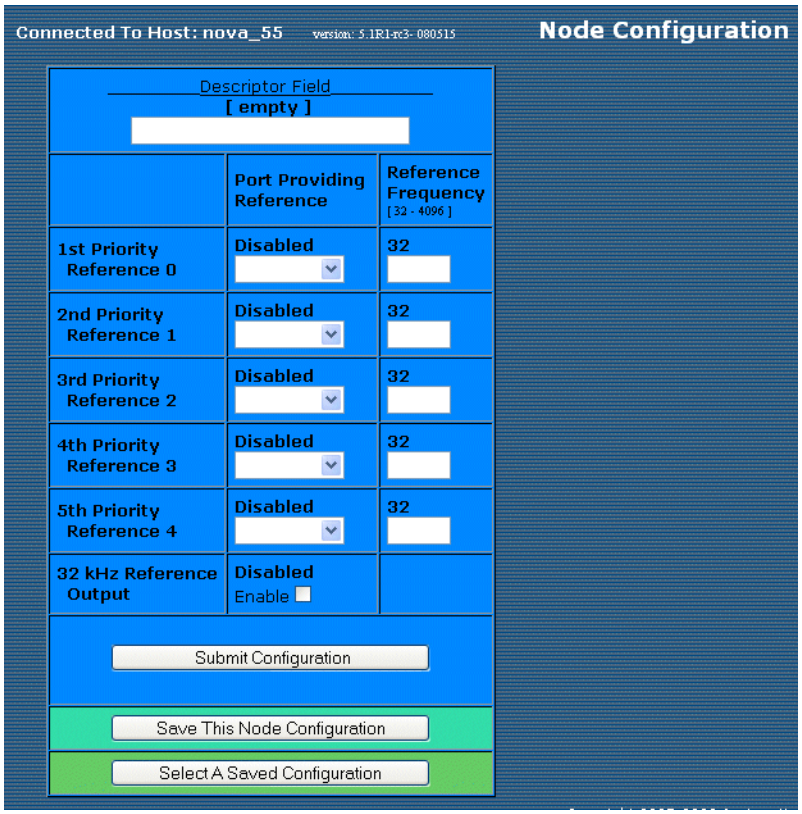
Figure 33 shows the Node Synchronization menu. When you select the reference, you may either disable it or specify both the reference input (port number or external) and frequency. Figure 34 shows the CTPView Node Configuration window.

Figure 33: Node Synchronization Options Menu—CLI

```
================================================
CTP Main Menu
================================================
Please select a number from the following list:
------------------------------------------------
 0) Exit to Shell
 1) Bundle Operations
 2) Node Synchronization
 3) Node Summary
 4) Node Diagnostics
 5) Node Operations
 6) Save Database to Flash
------------ Your choice [1]: 2


================================================
Node Synchronization Options Menu
================================================

Please select a number from the following list:
------------------------------------------------
 0) Back to Previous Menu
 1) 1st Priority, Reference 0: Disabled
 2) 2nd Priority, Reference 1: Disabled
 3) 3rd Priority, Reference 2: Disabled
```

```
 4) 4th Priority, Reference 3: Disabled
 5) 5th Priority, Reference 4: Disabled
 6) 32 kHz Ref Output:         {Yes or No}
 7) Query Node Sync Status
 8) Measure Ref Inputs
 9) Calibrate Node to Current Reference
------------ Your choice [7]: 1

Enter port providing reference (4=External,5=Disabled) (0-5)[0]: 2

Enter Reference Frequency (in Khz) (128-8192)[128]: {Input Value}
```

Figure 34: Node Configuration Window with CTPView



32-KHz Reference Output

You can use the external reference interface to send out a 32-KHz differential signal by setting the 32 KHz Ref Output value to Yes. Note that the BNC connector on the CTP1000 is isolated from the chassis, and the differential signal is sent out on both the center pin and outer BNC ring.

Calibrate Node to Current Reference

When the CTP system is configured to accept a reference and the reference is present, you can calibrate the system to the reference input by selecting Option 9. The calibrated value is stored in EEPROM, and the system uses this value to calibrate the internal oscillator when no reference is present. The calibrated clock accuracy is approximately 100 ppb.

Node Summary

The Node Summary menu enables you to display summary bundle and ports information for the CTP chassis.

The first block of information lists the ports and generic port information, as well as if the port is being used by a bundle and, if so, which bundle, the bundle type, and some generic bundle information. Ports that are not attached to an existing bundle are shown with a bundle type of NotCfgd. They are displayed with a run state of DISABLD.

The second block of information concerns only bundles. A list of the existing bundles, their types, and generic port and bundle information is displayed.

```
=============================================================================
= (nova49 01/21/08 22:13:30 GMT) | CTP Main Menu
=============================================================================

Please select a number from the following list:
-------------------------------------
 0) Exit to Shell
 1) Bundle Operations
 2) Node Synchronization
 3) Node Summary
 4) Node Diagnostics
 5) Node Operations
 6) Save Database to Flash
------------ Your choice [1]: 3

CTP Code version     : 5.0R1- 080121 (Compile Time 03:39:50 PM)
CTP CPU eth addr     : 00:40:9e:00:93:e6

Port Summary:
Port Bndl BndlTyp         RemAddr RP/CID RunState NtSz IfSz     PortRate ReCntr
=============================================================================
   0   -- NotCfgd        10.0.0.0    n/a  DISABLD 1024  N/A  1544.000000      0
   1    1   SAToP        10.0.0.0   6001  DISABLD  192  N/A  1544.000000      0
   2    2 CESoPSN        10.0.0.1   1064  RUNNING 1152   --  1544.000000      0
   3    5 CESoPSN        10.0.0.1   1096  DISABLD 1152   --  1544.000000      0
   4    3     CTP        10.0.0.0      0   NoSYNC 1024  N/A  1544.000000      0
   5   -- NotCfgd        10.0.0.0    n/a  DISABLD 1024  N/A  1544.000000      0
   6   -- NotCfgd        10.0.0.0    n/a  DISABLD 1024  N/A  1544.000000      0
   7   -- NotCfgd        10.0.0.0    n/a  DISABLD 1024  N/A  1544.000000      0
   8   -- NotCfgd        10.0.0.0    n/a  DISABLD 1024  N/A  1024.000000      0
   9   -- NotCfgd        10.0.0.0    n/a  DISABLD 1024  N/A  1024.000000      0
  10   -- NotCfgd        10.0.0.0    n/a  DISABLD 1024  N/A  1024.000000      0
  11   -- NotCfgd        10.0.0.0    n/a  DISABLD 1024  N/A  1024.000000      0
  12   -- NotCfgd        10.0.0.0    n/a  DISABLD 1024  N/A  1024.000000      0
  13   -- NotCfgd        10.0.0.0    n/a  DISABLD 1024  N/A  1024.000000      0
  14   -- NotCfgd        10.0.0.0    n/a  DISABLD 1024  N/A  1024.000000      0
  15   -- NotCfgd        10.0.0.0    n/a  DISABLD 1024  N/A  1024.000000      0
=============================================================================
Legend:
-------
Bndl     - Bundle number port is assigned to
BndlTyp  - Bundle type
RemAddr  - Remote port to which local port is connected
RP/CID   - Bundle Type: Port/Circuit ID
         -         CTP:     Remote Port
         -       SAToP: Source UDP Port
         -     CESoPSN: Source UDP Port
```

```
RemState - Sync state of local node with remote port's node
RunState - Local port's run state (i.e. DISABLD, NoSync, RUNNING, etc...)
NtSz     - Configured packet size for NET bound packets
IfSz     - Recovered packet size for I/F bound packets
PortRate - Configured data rate towards network
ReCtr    - Local port's buffer recenter event counter

Hit Carriage Return to Continue...

Bundle Summary:
Bndl BndlTyp Card/Type Port      TS         RemAddr RP/CID RunState NtSz ReCntr
================================================================================
   1   SAToP    0/T1E1    1     n/a        10.0.0.0   6001  DISABLD  192      0
   2 CESoPSN    0/T1E1    2    1-24        10.0.0.1   1064  RUNNING 1152      0
   3     CTP    0/T1E1    4     n/a        10.0.0.0      0   NoSYNC 1024      0
   5 CESoPSN    0/T1E1    3    1-24        10.0.0.1   1096  DISABLD 1152      0
================================================================================
Legend:
-------
Bndl     - Bundle number port is assigned to
BndlTyp  - Bundle type
Card     - Local card with port.
Port     - Local port.
TS       - Time slot(s) in bundle.
RemAddr  - Remote port to which local port is connected
RP/CID   - Bundle Type: Port/Circuit ID
         -         CTP:     Remote Port
         -       SAToP: Source UDP Port
         -     CESoPSN: Source UDP Port
RunState - Local port's run state (i.e. DISABLD, NoSync, RUNNING, etc...)
NtSz     - Configured packet size for NET bound packets
ReCntr   - Local port's buffer recenter event counter

Hit Carriage Return to Continue...
```

Node Operations and Maintenance

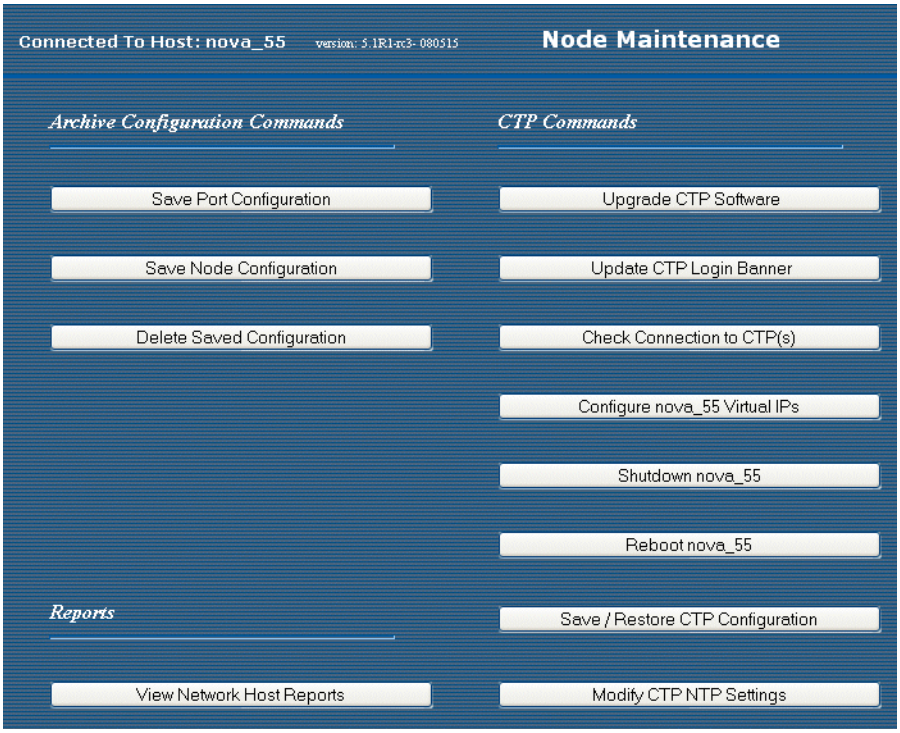
When you use the Node Operations menu to change the name, IP address, network mask gateway, or Ethernet configuration of the unit, the system reboots. Before you are allowed to change these node settings, you are asked to confirm that you want to reboot the system. If not confirmed, you are returned to the main menu without the system's rebooting.

Figure 35: Node Operations Menu—CLI

```
================================================================================
= (nova_55 05/30/08 20:13:34 GMT) | Node Operations Menu
================================================================================

Please select a number from the following list:
-----------------------------------
 0) Back to Previous Menu
 1) Change Node Date/Time
 2) Display network settings
 3) Configure network settings
 4) Initialize Database
 5) Ping IP address
 6) Traceroute IP address
 7) ssh to another host
 8) System descriptor field:
 9) Reboot Node
10) Powerdown Node
11) Display ethernet media
12) Config ethernet media
13) Set your password
14) System port speed range:       0 kHz - 12288 kHz
15) Config security profile
------------ Your choice [0]:
```

You can also perform some functions that are available in the Node Operations menu from the CTPView Node Maintenance window (Figure 36).

Figure 36: CTPView Node Maintenance Window



Node Operations Menu

The following sections describe the Node Operations menu.

```
========================================================================
= (nova_55 05/30/08 20:20:11 GMT) | Node Operations Menu
========================================================================

Please select a number from the following list:
-------------------------------------
 0) Back to Previous Menu
 1) Change Node Date/Time
 2) Display network settings
 3) Configure network settings
 4) Initialize Database
 5) Ping IP address
 6) Traceroute IP address
 7) ssh to another host
 8) System descriptor field:
 9) Reboot Node
10) Powerdown Node
11) Display ethernet media
12) Config ethernet media
13) Set your password
14) System port speed range:       0 kHz - 12288 kHz
15) Config security profile
------------ Your choice [3]:
```

Change Node Date/Time

With this selection you can change the date and times on the node.

Display Network Settings

This parameter displays the status of the Ethernet interface that is connected to the CTP system. The information includes interface IP address, default gateway, receive and transmit packet counts, errors, dropped packets, overruns, and frame errors.

```
Hostname: nova_55

Protocols supported:   IPV4 ONLY

Default network device (eth0) IPV4 parameters:
        ipaddress:  172.25.61.55
        netmask:    255.255.255.128
        default gw: 172.25.61.1
        mtu:        1500 bytes
```

Configure Network Settings

This command enables you to configure the IP interface(s).

```
========================================================================
= (nova_55 05/30/08 20:18:23 GMT) | Network Configuration Menu
========================================================================

Please select a number from the following list:
-------------------------------------
 0) Back to Previous Menu
 1) Supported Protocols:      IPv4 only
 2) IPv4 Configuration
 3) IPv6 Configuration
```

```
 4) Virtual IP addresses
 5) OAM port (IPv4):          16
 6) Data packet protocol:     47
 7) OAM port (IPv6):          32
 8) VLAN Configuration
 9) Current Configuration (active on reboot)
10) Port operations (PBS/bridge)
11) Config port operational mode (CE/PBS/bridge)
------------ Your choice [1]:
```

The configurable options include:

- IP—The options available are IPv4, IPv6, or both IPv4 and IPv6.
- IP configuration—When there are more than two interfaces available, the default device (interface) is specified through which the default gateway can be reached. The default interface can also be a VLAN. CTP circuits can use any interface regardless of whether or not it is the default. Up to three routes can be added to an interface.
- Virtual IP addresses—Virtual IP addresses are attached to the loopback interface and can be configured through this submenu. Use care to ensure proper routing of traffic associated with the virtual IPs.
- OAM port and Data Packet protocol—These parameters can be reconfigured from their default values. The default port for OAM packets is 16 (IPv4) and 32 (IPv6). The default data packet protocol is 47.
- VLAN configuration—VLANs can be added or deleted from the network settings. You add VLANs by specifying which Ethernet interface the VLAN will be added to, and the VLAN ID in the range 0–4095. After the VLAN interfaces have been defined, IP addressing can be applied by means of the above IP configuration options.
- Port operations (PBS/bridge)—Enables you to configure ports configured for PBS or bridging. Aggregation is supported on a port-by-port basis, and other ports on the same node can be used for circuit emulation. With earlier CTP releases, every port had to be configured for Layer 2 aggregation. See *Chapter 3, CTP Layer 2 Bridging* for more information.
- Config port operational mode—Enables you to change the port mode to either circuit emulation, PBS, or bridging. Requires a reboot of the CTP system. See *Chapter 3, CTP Layer 2 Bridging* for more information.

Initialize Database

This parameter clears nonvolatile configuration of the local CTP system. It returns all node settings to their factory defaults and leaves all ports in the disabled state.

Ping IP address

This parameter allows you to ping an IP address and reports the whether the ping is successful.

Traceroute IP Address

This parameter allows you to enter an IP address and get a traceroute to that address.

SSH to Another Host

This parameter allows you to enter an IP address of a host; the system establishes an SSH session with that host. You must know the login and password to the remote host. You can also use the CTPView Node Maintenance window (Figure 36 on page 70) to establish an SSH session to a host.

System Descriptor Field

This parameter allows you to enter a system descriptor that will be displayed in the top banner of each menu.

Reboot Node

This parameter allows you to reboot the CTP system. You can also use the CTPView Node Maintenance window (Figure 36 on page 70) to reboot the CTP system.

Powerdown Node

This parameter allows you to gracefully power down the system. You can also use the CTPView Node Maintenance window (Figure 36 on page 70) to shut down the system.

CAUTION: Always use the powerdown option provided in the Node Operations menu when maintenance or other activity requires a system powerdown.

Display Ethernet Media

This parameter displays the supported link modes (speed and duplex) and the configuration of the Ethernet media.

Configure Ethernet Media

You can configure the CTP Ethernet media to autonegotiate the duplex mode and speed, to set the duplex to either half or full, and to set the speed to either 100 or 10 Mbps. If you answer No to Enable Autonegotiate, you will receive prompts for the Ethernet speed and duplex settings. If you answer No to Setup Ethernet for 100 Mbps, the speed will be set to 10 Mbps. If you answer No to Setup Ethernet full duplex, the configuration will be half duplex.

The Ethernet configurations of the CTP must match the configuration of the connected router or switch. Mismatched configurations, such as setting the CTP system to autonegotiate and the router to full duplex, will result in a misconfiguration and dropped packets. You must disable Cisco Discovery Protocol on the Fast Ethernet port connected to the CTP system.

Set Your Password

You can log in to the system to change your password. The password must meet the criteria established in the Configuration Security Profile menu, and you must have the current password to make any changes.

System Port Speed Range

The parameter sets one of two valid port speed ranges for the CTP1000 series. The first range allows ports to run at rates from 1 bps through 8 Mbps. The second range allows ports to run at rates from 4 Kbps to 12.288 Mbps. There is only one port speed range for the CTP2000 series, which is 0 KHz to 12288 kHz.

Config Security Profile

The Config Security Profile menu is covered in *Chapter 5, Security Profile Menu*. The administrator must have the root password to gain access to the menu.

Chapter 3

CTP Layer 2 Bridging

This chapter provides information about CTP layer 2 bridging configuration. The chapter contains the following sections:

- Overview on page 75
- Enabling Ports for Layer 2 Bridging on page 76
- Configuring Layer 2 Bridging Port Parameters on page 79
- Options for Layer 2 Bridging Ports on page 81
- Port Query and Node Summary Examples on page 89

Overview

CTP layer 2 bridging mode is used to aggregate many serial interfaces into one or several Ethernet interfaces. Each physical serial interface on the CTP chassis maps to a separate Ethernet VLAN interface on the destination router. Aggregation is supported on a port-by-port basis, and other ports on the same node can be used for circuit emulation.

In layer 2 bridging mode, packets are extracted from the line on the serial interface. This is in contrast to circuit emulation mode where every bit on the serial interface is received (regardless of content) and formed into packets

You can use the CTP CLI menu to configure these interfaces. Layer 2 bridging is supported on CTPView release 3.1 and later.

Packet Performance and Throttling

Because there is no way to prevent large numbers of small packets from arriving at the packet-bearing serial (PBS) interfaces, policing is performed on the CTP system. Bridged packets are identifed and throttled before they exit the CTP system onto the Ethernet line, and offending packets are dropped.

This action is done with a throttling mechanism implemented in the serial driver. At the beginning of every second, the driver is deposited with a fixed number of tokens. For each token, a packet may be received by the driver and sent to the system for forwarding. After the tokens have been used up, no more packets may be received, and any subsequent packets that arrive are discarded (and the dropped counter incremented). At the beginning of the next second, that driver receives another allotment of tokens, and packet reception resumes. If there are any unused tokens at the end of the second, they are discarded.

The overall bridged packet forwarding budget of a CTP2000 system is 25,000 packets/sec.

Other Requirements

For packet bridging to work properly, it is important to have an attached router on the Ethernet side that provides advanced functions. Specifically, the router should support:

- VLAN tagging for particular IP addresses/subnets—To support the routing function in the CTP system.
- Per-VLAN bandwidth shaping—To avoid overloading the CTP bridged Ethernet-to-serial link with too much bandwidth. Otherwise, packets will eventually be dropped because the serial packet driver to the line will not be able to accept the packet.
- Per-VLAN pps shaping—To avoid overloading the CTP system with too high of a packet rate.

Enabling Ports for Layer 2 Bridging

You must enable layer 2 bridging for a port (select its operational mode) before you can configure its layer 2 bridging parameters. To configure serial aggreagation parameters, see “Configuring Layer 2 Bridging Port Parameters” on page 79.

To enable ports for layer 2 bridging:

1. From the CTP Main menu, select **5) Node Operations** menu.

```
========================================================================
= (nova_45 06/06/08 21:43:33 GMT) | CTP Main Menu
========================================================================

Please select a number from the following list:
-------------------------------------
 0) Exit to Shell
 1) Bundle Operations
 2) Node Synchronization
 3) Node Summary
 4) Node Diagnostics
 5) Node Operations
 6) Save Database to Flash
------------ Your choice [5]:
```

2. On the Node Operations menu, select **3) Configure network settings**.

```
=============================================================================
= (nova_45 06/06/08 21:47:24 GMT) | Node Operations Menu
=============================================================================

Please select a number from the following list:
-------------------------------------
 0) Back to Previous Menu
 1) Change Node Date/Time
 2) Display network settings
 3) Configure network settings
 4) Initialize Database
 5) Ping IP address
 6) Traceroute IP address
 7) ssh to another host
 8) System descriptor field:
 9) Reboot Node
10) Powerdown Node
11) Display ethernet media
12) Config ethernet media
13) Set your password
14) System port speed range:       0 kHz - 12288 kHz
15) Config security profile
------------ Your choice [0]: 3
```

3. In the Network Configuration menu, select **11) Config port operational mode (CE/PBS/bridge)**.

```
=============================================================================
= (nova_45 06/06/08 21:49:05 GMT) | Network Configuration Menu
=============================================================================

Please select a number from the following list:
-----------------------------------
 0) Back to Previous Menu
 1) Supported Protocols:      IPv4 only
 2) IPv4 Configuration
 3) IPv6 Configuration
 4) Virtual IP addresses
 5) OAM port (IPv4):          16
 6) Data packet protocol:     47
 7) OAM port (IPv6):          32
 8) VLAN Configuration
 9) Current Configuration (active on reboot)
10) Port operations (PBS/bridge)
11) Config port operational mode (CE/PBS/bridge)
------------ Your choice [0]: 11


***
*** You are about to modify a system parameter that will require
*** a system reboot when complete.
***
*** If you decide to continue, the system will automatically
*** reboot upon leaving these menus.
***
*** Note: If these parameters are changed incorrectly,
***       system may not be reachable via the network
***       after the system reboots.
***
        Are you sure? y[n]:
```

4. Type **Y** and press Enter twice.

   A list of available ports is displayed in the Configure Port Operational Mode menu.

NOTE: After you have configured port types, you must exit to the top-level CTP Main menu so that the CTP system can reboot and your changes can be applied.

```
*** Please note, changing the operation of a port will clear the database
*** for that port. All parameters for the port will be set to defaults.
*** Existing settings will be lost.

Hit Carriage Return to Continue...


=============================================================================
= (nova_45 06/06/08 21:57:10 GMT) | Configure Port Operational Mode
=============================================================================

PBS or bridging operation is limited to the following ports:

Port 0 operational mode: Bridged
Port 1 operational mode: Circuit-emulation
```

```
Port 2 operational mode: Circuit-emulation
Port 3 operational mode: Circuit-emulation
Port 4 operational mode: Circuit-emulation
Port 5 operational mode: Circuit-emulation
Port 6 operational mode: Routed (PBS)
Port 7 operational mode: Routed (PBS)

Please input a port to configure, <rtn> to exit: 2
```

5. Enter the number of the port you want to change and press Enter.

```
=============================================================================
= (nova_45 06/06/08 22:02:56 GMT) | Operational Mode for Port se-0/2
=============================================================================

Please select a number from the following list:
-------------------------------------
 0) Circuit-emulation
 1) Routed (PBS)
 2) Bridged
------------ Your choice [0]:
```

6. Choose the port type.

NOTE: Although you can set up Routed (PBS), it is not yet supported.

7. To change more ports, repeat Steps 4-5, or press Enter to finish.

8. Select **0) Back to Previous Menu** until the Reboot warning message appears.

Configuring Layer 2 Bridging Port Parameters

Before you configure layer 2 bridging port parameters, you must configure the port's operational mode for serial aggreagation. See "Enabling Ports for Layer 2 Bridging" on page 76.

To configure layer 2 bridging port parameters:

1. From the CTP Main menu, select **5) Node Operations** menu.

```
=============================================================================
= (nova_45 06/06/08 21:43:33 GMT) | CTP Main Menu
=============================================================================

Please select a number from the following list:
-------------------------------------
 0) Exit to Shell
 1) Bundle Operations
 2) Node Synchronization
 3) Node Summary
 4) Node Diagnostics
 5) Node Operations
 6) Save Database to Flash
------------ Your choice [5]:
```

2. Select **3) Configure network settings**.

```
================================================================================
= (nova_45 06/06/08 21:47:24 GMT) | Node Operations Menu
================================================================================

Please select a number from the following list:
-----------------------------------
 0) Back to Previous Menu
 1) Change Node Date/Time
 2) Display network settings
 3) Configure network settings
 4) Initialize Database
 5) Ping IP address
 6) Traceroute IP address
 7) ssh to another host
 8) System descriptor field:
 9) Reboot Node
10) Powerdown Node
11) Display ethernet media
12) Config ethernet media
13) Set your password
14) System port speed range:       0 kHz - 12288 kHz
15) Config security profile
------------ Your choice [0]: 3
```

3. In the Network Configuration menu, select **10) Port operations (PBS/bridge)**.

```
================================================================================
= (nova_45 06/06/08 21:49:05 GMT) | Network Configuration Menu
================================================================================

Please select a number from the following list:
-----------------------------------
 0) Back to Previous Menu
 1) Supported Protocols:      IPv4 only
 2) IPv4 Configuration
 3) IPv6 Configuration
 4) Virtual IP addresses
 5) OAM port (IPv4):          16
 6) Data packet protocol:     47
 7) OAM port (IPv6):          32
 8) VLAN Configuration
 9) Current Configuration (active on reboot)
10) Port operations (PBS/bridge)
11) Config port operational mode (CE/PBS/bridge)
------------ Your choice [0]: 10
```

4. Type the port you want to configure and press Enter.

```
Please choose from the following PBS/bridge ports:
0
6
7
[0]: 0
```

The Operations menu is displayed. See “Bundle Operations—CTPOS CLI Menu Commands” on page 13 for more information on the commands in this menu.

5. Select **2) Config** to configure the port.

```
=============================================================================
= (nova_45 06/06/08 22:44:59 GMT) | Operations Menu for Port se-0/0
=============================================================================

Please select a number from the following list:
-----------------------------------
 0) Back to Previous Menu
 1) Query
 2) Config
 3) Activate
 4) Disable
 5) Delete
 6) Advanced...
------------ Your choice [2]:
```

6. Set encapsulation type, interface/VLAN, static destination MAC address, AutoMAC, AutoArp, and Cryto Resync parameters. See the following topics for more information:

   - “Encapsulation” on page 81
   - “Interface/VLAN” on page 84
   - “Static Destination MAC Address” on page 84
   - “AutoMAC” on page 85
   - “AutoARP” on page 86
   - “Advanced Options (Crypto Resync)” on page 87
   - “Port Config” on page 17 for Interface and Clock Config parameters

Options for Layer 2 Bridging Ports

You can configure the following parameters.

Encapsulation

CTP layer 2 bridging works with the following protocols: CISCO HDLC, PPP, and Frame Relay. To configure a port, see “Configuring Layer 2 Bridging Port Parameters” on page 79.

Cisco HDLC

After selecting Cisco HDLC, you can specify HDLC keepalive interval (range 1–100 seconds, default 10) and keepalive timeout values (range 1–30 seconds, default 30).

```
Select the encapsulation for this port.
Please select a number from the following list:
-----------------------------------
 0) Cisco HDLC
 1) PPP
 2) Frame Relay
------------ Your choice [0]: 0
```

```
Enter the HDLC keepalive interval.

 (1-100)[10]: 10

Enter the HDLC keepalive timeout.

 (1-100)[30]: 30
```

PPP

There are no values to specify for PPP.

Frame Relay

After selecting Frame Relay, you can configure individual permanent virtual circuits (PVCs). Ethernet interface, AutoMAC, AutoARP, and static MAC options do not appear on the menu when Frame Relay encapsulation is selected because these options are configured per PVC.

```
Select the encapsulation for this port.
Please select a number from the following list:
-------------------------------------
 0) Cisco HDLC
 1) PPP
 2) Frame Relay
------------ Your choice [2]: 2
```

Configuring LMI Settings and Timers

You can configure standard link management interface (LMI) settings by selecting **1) Configure LMI settings** from the Frame Relay Config menu. Configure LMI settings and timers by selecting the corresponding options.

```
Please select a number from the following list:
---------------------------------------
 0) Back to Previous Menu
 1) Configure LMI settings
 2) Edit DLCI 301 - eth0.301
 3) Edit DLCI 302 - eth0.302
 4) Add a new DLCI configuration
------------ Your choice [0]: 1

Please select a number from the following list:
---------------------------------------
 0) Back to Previous Menu
 1) Frame-relay LMI type:                  ITU
 2) Frame-relay interface mode:            DTE
 3) t391 DTE polling timer:                10
 4) t392 DCE polling verification timer:   15
 5) n391 DTE full status polling interval: 6
 6) n392 DTE/DCE error threshold:          3
 7) n393 DTE/DCE monitored event count:    4
------------ Your choice [0]:
```

Creating and Editing PVCs and DLCIs

From the Frame Relay Config menu, you can create and configure up to eight PVCs per Frame Relay interface. Normal bridge options can be configured on a per-DLCI basis. Each data-link cinnection identifier (DLCI) is bridged to a unique Ethernet VLAN.

To add a new PVC, choose **4) Add a new DLCI configuration**. After a DLCI is created, it is added to the option list, and the menu option numbers increment by one. To edit a DLCI, select the corresponding edit option for that interface. For example, to edit DLCI 301, select **2) Edit DLCI 301 - eth0.301**.

```
Please select a number from the following list:
---------------------------------------
 0) Back to Previous Menu
 1) Configure LMI settings
 2) Edit DLCI 301 - eth0.301
 3) Edit DLCI 302 - eth0.302
 4) Add a new DLCI configuration
------------ Your choice [0]:  2
```

Deleting a PVC

To delete a PVC, you must first edit it and then select **1) Delete this PVC**.

```
Please select a number from the following list:
-------------------------------------
 0) Back to Previous Menu
 1) Delete this PVC
 2) Frame-relay DLCI:      301
 3) Interface/VLAN:        eth0.301
 4) AutoMAC:               enabled
 5) AutoARP:               enabled
 6) Static dst-MAC for TX: ffff.ffff.ffff
------------ Your choice [0]:
```

Interface/VLAN

Make the mapping, or bridge, between the serial and Ethernet interfaces by selecting **5) Interface/VLAN** from the Config menu. After selecting the bridge, you can enter the VLAN IDs on the Ethernet interface that will be mapped to the serial port.

```
Please select a number from the following list:
-------------------------------------
 0) Back to Previous Menu
 1) Port descriptor text:
 2) Interface:             RS-232/DCE/NRZ
 3) Clock config:          128.000000 / Configured Rate, w/o Ext Tx Clk (TT)
 4) Encapsulation:         cisco-hdlc / interval=10 timeout=30
 5) Interface/VLAN:        eth0.200
 6) AutoMAC:               enabled
 7) AutoARP:               enabled
 8) Static dst-MAC for TX: ffff.ffff.ffff
 9) Advanced options...

------------ Your choice [0]: 5
Select the Ethernet interface to bridge this port to.
Please select a number from the following list:
-------------------------------------
 0) Interface eth0
------------ Your choice [0]: 0

Enter the VLAN ID on interface eth0 to bridge this port to.
(1-4095)[200]: 200
```

Static Destination MAC Address

Any packets bridged from the serial interface to the Ethernet interface need to have an Ethernet header added. Because the destination MAC address is usually unknown, by default `ffff.ffff.ffff` is used. This default guarantees that the attached router will see the packet. You can define the destination MAC address for packets sent out the Ethernet interface by using the static dst-MAC option.

To set the static destination MAC address, select **8) Static dst-MAC for TX** from the Config menu. Note that AutoMAC must be disabled before you set a static dst-MAC.

```
Please select a number from the following list:
-------------------------------------
 0) Back to Previous Menu
 1) Port descriptor text:
 2) Interface:             RS-232/DCE/NRZ
 3) Clock config:          128.000000 / Configured Rate, w/o Ext Tx Clk (TT)
 4) Encapsulation:         cisco-hdlc / interval=10 timeout=30
 5) Interface/VLAN:        eth0.200
 6) AutoMAC:               disabled
 7) AutoARP:               enabled
 8) Static dst-MAC for TX: ffff.ffff.ffff
 9) Advanced options...
------------ Your choice [0]: 8
```

AutoMAC

If the Ethernet interface is directly connected to a router, the CTP chassis can dynamically learn the MAC address of the router if AutoMAC is enabled. AutoMAC works by listening for Address Resolution Protocol (ARP) packets from the router. When an ARP packet is received, the source MAC address is assumed to be the MAC address of the directly connected router, and thus the MAC address that the CTP should use as a destination in any frames bridged from the serial port.

WARNING: AutoMAC should be used only if the Ethernet router is directly connected to the CTP chassis. See other limitations below.

AutoMAC has the following limitations:

- Should be used only if the Ethernet router is directly connected to the CTP chassis.
- Works by assuming that every ARP packet seen belongs to the next-hop router.
- If there is a switch or other device on the same broadcast domain, AutoMAC should not be used. If enabled, AutoMAC constantly switches the destination MAC used by the CTP system between each of the various devices in the broadcast domain each time it sees an ARP from a different address than the MAC it is currently using.

To configure AutoMAC, select **6) AutoMAC** from the Config menu.

```
Please select a number from the following list:
-------------------------------------
 0) Back to Previous Menu
 1) Port descriptor text:
 2) Interface:             RS-232/DCE/NRZ
 3) Clock config:          128.000000 / Configured Rate, w/o Ext Tx Clk (TT)
 4) Encapsulation:         cisco-hdlc / interval=10 timeout=30
 5) Interface/VLAN:        eth0.200
 6) AutoMAC:               enabled
 7) AutoARP:               enabled
 8) Static dst-MAC for TX: ffff.ffff.ffff
 9) Advanced options...
------------ Your choice [0]: 6
```

```
-------------------------------------
                                * * * NOTE * * *

The AutoMAC feature configures the CTP to automatically learn the MAC address
of the connected Ethernet router. All traffic bridged from the serial interface
will be sent to this MAC address. AutoMAC should only be used when a router is
directly connected to the Ethernet interface. If AutoMAC is enabled on an
Ethernet interface connected to a switch or other shared segment, the CTP will
learn multiple MAC addresses and may not use the correct address.
Please select a number from the following list:
-------------------------------------
 0) Disable AutoMAC
 1) Enable AutoMAC
------------ Your choice [1]:
```

AutoARP

Normally, the Ethernet-attached router sends ARP packets to find the MAC address for the IP address configured on the serial-attached router. However, the serial-attached router will not respond to ARP packets. You can configure a static ARP entry on the Ethernet-attached router with the MAC address of the CTP system, or you can use AutoARP.

AutoARP causes the CTP system to respond to any ARP packet with its own MAC address and configures the CTP system to automatically respond to all ARP requests received on the Ethernet VLAN interface for the bridge. AutoARP also sends IPv6 neighbor advertisements in response to any IPv6 neighbor solicitation.

WARNING: AutoARP should be used only when a router is directly connected to the Ethernet interface. If AutoARP is enabled on an Ethernet interface that connects to a switch or other shared segment, serious network disruption can occur.

AutoARP has the following limitations:

- AutoARP should be used only if the Ethernet router is directly connected to the CTP chassis.
- AutoARP works by assuming that every ARP packet seen belongs to the next-hop router.
- If there is a switch or other device on the same broadcast domain, AutoARP should not be used. If enabled, AutoARP responds to every ARP on the broadcast domain and disrupts communication between other devices on the network.

To configure AutoARP, select **7) AutoARP** from the Config menu.

```
Please select a number from the following list:
-------------------------------------
 0) Back to Previous Menu
 1) Port descriptor text:
 2) Interface:             RS-232/DCE/NRZ
 3) Clock config:          128.000000 / Configured Rate, w/o Ext Tx Clk (TT)
 4) Encapsulation:         cisco-hdlc / interval=10 timeout=30
 5) Interface/VLAN:        eth0.200
```

```
 6) AutoMAC:               enabled
 7) AutoARP:               enabled
 8) Static dst-MAC for TX: ffff.ffff.ffff
 9) Advanced options...
------------ Your choice [0]: 7

-------------------------------------
                              * * * WARNING * * *

The AutoARP feature configures the CTP to automatically respond to *ALL* ARP
requests received on the Ethernet VLAN interface for this bridge.

AutoARP should only be used when a router is directly connected to the Ethernet
interface. If AutoARP is enabled on an Ethernet interface that connects to a
switch or other shared segment, SERIOUS NETWORK DISRUPTION can occur.
Please select a number from the following list:
-------------------------------------
 0) Disable AutoARP
 1) Enable AutoARP
------------ Your choice [1]:
```

Advanced Options (Crypto Resync)

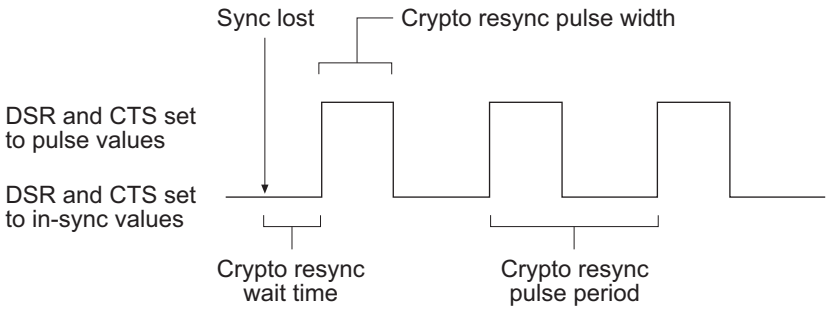
CTP chassis can be used with federally approved cryptographic (crypto) devices. You can configure synchronized (in-sync) and pulse crypto resynchronized (resync) options for use with these devices.

If an error occurs on a secure link, the crypto devices may get out of sync. When the CTP software detects that a crypto device is out of sync or that keepalives or LMI has been lost, it signals to the crypto device to resync by pulsing DSR and/or CTS.

You can configure how long the CTP software waits before requesting a resynchronization, set the pulse width, and set the pulse period of the resync request. You can also configure the direction of the pulse (0 to 1 or 1 to 0). (Other common terms for 0 are space, low, and on; and other commons terms for 1 are mark, high, and off). To disable the pulse, set the in-sync and pulse value to the same value.

- Crypto resync wait time—Time between loss of sync and the first pulse (range 1-60 seconds).
- Crypto resync pulse width—Time that the pulse is asserted (range 1–15 seconds).
- Crypto resync pulse period—Time between the beginnings of each pulse (range 1–1000 seconds). Should be greater than the pulse width; otherwise, the pulse will always be asserted.

Figure 37: Crypto Sync Timeline



To set crypto resync parameters, select **9) Advanced options** from the Config menu.

```
Please select a number from the following list:
-------------------------------------
 0) Back to Previous Menu
 1) Port descriptor text:
 2) Interface:              V.35/DCE/NRZ
 3) Clock config:           128.000000 / Configured Rate, w/o Ext Tx Clk (TT)
 4) Encapsulation:          ppp
 5) Interface/VLAN:         eth0.201
 6) AutoMAC:                enabled
 7) AutoARP:                enabled
 8) Static dst-MAC for TX: ffff.ffff.ffff
 9) Advanced options...
------------ Your choice [4]: 9

=========================================================================
= (ctp 05/26/07 10:55:17 GMT) | Advanced Option Menu for PBS port 1
=========================================================================

Please select a number from the following list:
-------------------------------------
 0) Back to Previous Menu
 3) Crypto resync wait time:         4 sec
 4) Crypto resync pulse width:       1 sec
 5) Crypto resync pulse period:      8 sec
 6) Crypto resync DSR in-sync value: 1 (mark/high/off)
 7) Crypto resync DSR pulse value:   0 (space/low/on)
 8) Crypto resync CTS in-sync value: 1 (mark/high/off)
 9) Crypto resync CTS pulse value:   0 (space/low/on)
------------ Your choice [5]:
```

When you use a DTE cable, the DSR settings apply to DTR, and the CTS settings apply to RTS. Both signals are provided to allow for different requirements of the crypto device:

- DSR (DTR) provides an unbalanced signal
- CTS (RTS) provides a balanced signal

Port Query and Node Summary Examples

You can view port configuration settings by selecting Query Port from the Port Operations menu. Figure 38 shows a Cisco HDLC configuration, and Figure 39 shows a Frame Relay configuration. Note that separate statistics are provided for each DLCI in the Frame Relay example.

Figure 38: Port Query—Cisco HDLC Configuration

```
Detail query display for bridge port 2
================================================================================
General status:
  Device name:            scc2
  Port admin state:       ACTIVE
  Port link state:        UP

Serial interface:
  Interface:              EIA-530A/DCE/NRZ
  Clock Config:           1024.000000 / Configured Rate, w/o Ext Tx Clk (TT)
  Measured TT(Ext Clock): 1023.999600
  Encapsulation:          CISCO HDLC
  HDLC keepalive status:  up

Bridge configuration:
  Interface/VLAN:         eth0.202
  AutoARP:                enabled (1 ARP reply sent)
  AutoMAC:                enabled
  Dst-MAC for TX pkts:    0012.1e71.85a1 (auto)

Statistics:
  Serial RX packets:      301          (53 pps)
  Serial TX packets:      302          (53 pps)
  Serial RX bytes:        16888        (23744 bps)
  Serial TX bytes:        16912        (23744 bps)
================================================================================

Time since last port counter clear: 0 wks, 0 days, 0 hrs, 0 mins 19 secs

Clear Port 2 Stats?  y[n]:
```

Figure 39: Port Query—Frame Relay Configuration

```
Detail query display for bridge port 2
================================================================================
General status:
  Device name:            scc2
  Port admin state:       ACTIVE
  Port link state:        UP

Serial interface:
  Interface:              EIA-530A/DCE/NRZ
  Clock Config:           1024.000000 / Configured Rate, w/o Ext Tx Clk (TT)
  Measured TT(Ext Clock): 1023.999600
  Encapsulation:          FRAME RELAY
  Frame-relay LMI status: up
```

```
Bridge configuration:
  Frame-relay DLCI:       301 (active)
  Interface/VLAN:         eth0.301
  AutoARP:                enabled (1 ARP reply sent)
  AutoMAC:                enabled
  Dst-MAC for TX pkts:    0012.1e71.85a1 (auto)

  Frame-relay DLCI:       302 (active)
  Interface/VLAN:         eth0.302
  AutoARP:                enabled (0 ARP replies sent)
  AutoMAC:                enabled
  Dst-MAC for TX pkts:    ffff.ffff.ffff

Statistics:
  DLCI 301:
    Serial RX packets:    4           (0 pps)
    Serial TX packets:    13          (0 pps)
    Serial RX bytes:      284         (0 bps)
    Serial TX bytes:      571         (0 bps)
  DLCI 302:
    Serial RX packets:    0           (0 pps)
    Serial TX packets:    0           (0 pps)
    Serial RX bytes:      0           (0 bps)
    Serial TX bytes:      0           (0 bps)
================================================================================
```

To see all configured bridge ports at once, select Option 3, Node Summary, from the main Config menu.

```
================================================================================
= (nova_45 06/06/08 23:22:51 GMT) | CTP Main Menu
================================================================================

Please select a number from the following list:
-------------------------------------
 0) Exit to Shell
 1) Bundle Operations
 2) Node Synchronization
 3) Node Summary
 4) Node Diagnostics
 5) Node Operations
 6) Save Database to Flash
------------ Your choice [3]: 3

CTP Code version     : 5.1R1-rc4-mike 080605 (Compile Time 10:07:20 AM)
CTP CPU eth addr     : 00:40:9e:00:e3:70

>>>>> Circuit Emulation Ports <<<<<
Port   Bndl BndlTyp         RemAddr   CID LCID RunState NtSz     PortRate RCtr
================================================================================
se-0/1   -- NotCfgd             N/A   N/A  N/A  DISABLD  N/A  1024.000000    0
se-0/2    1     CTP        10.0.0.1     2    2   NoSYNC 1024  1024.000000    0
se-0/3   -- NotCfgd             N/A   N/A  N/A  CfgFAIL  N/A 12288.000000    0
se-0/4   -- NotCfgd             N/A   N/A  N/A  DISABLD  N/A  1024.000000    0
se-0/5   -- NotCfgd             N/A   N/A  N/A  DISABLD  N/A  1024.000000    0
================================================================================
Legend:
-------
C        - Card on which port resides
p        - Physical port on card
Bndl     - Bundle number port is assigned to
BndlTyp  - Bundle type
```

```
RemAddr  - Remote address
CIDs     - Bundle Type: CID              : LCID
         -         CTP: Remote Circuit ID : Local Circuit ID
         -       SAToP: Source UDP Port   : N/A
         -     CESoPSN: Source UDP Port   : N/A
RunState - Bundle's local run state (i.e. DISABLD, NoSync, RUNNING, etc...)
NtSz     - Configured packet size for NET bound packets
PortRate - Configured data rate towards network
RCtr     - Bundle's local buffer recenter event counter

Hit Carriage Return to Continue...


>>>> PBS Interfaces <<<<<
Port          Encap       Inet Addr      p-t-p Addr    Status     PortRate  MTU
================================================================================
 se-0/6  Cisco HDLC         0.0.0.0         0.0.0.0  DISABLED  1024.000000 1500
 se-0/7  Cisco HDLC         0.0.0.0         0.0.0.0  DISABLED  1024.000000 1500
================================================================================

>>>>> Bridged Ports <<<<<
( pps/port allocation: 552375 pps )
Port/PVC  Ethernet   Encap  Admin  Link   Proto  Dest MAC
================================================================================
se-0/0    eth0.0     chdlc  down   down   down   ffff.ffff.ffff
================================================================================

Hit Carriage Return to Continue...

Bndl BndlTyp    Port      TS         RemAddr   CID LCID RunState NtSz IfSz RCtr
================================================================================
   0     CTP  se-0/3     N/A        10.0.0.1     3    3  CfgFAIL 1024   --    0
   1     CTP  se-0/2     N/A        10.0.0.1     2    2   NoSYNC 1024   --    0
================================================================================
Legend:
-------
Bndl     - Bundle number port is assigned to
BndlTyp  - Bundle type
Card     - Local card with port.
Port     - Local port on card.
TS       - Time slot(s) in bundle.
RemAddr  - Remote address.
CIDs     - Bundle Type: CID              : LCID
         -         CTP: Remote Circuit ID : Local Circuit ID
         -       SAToP: Source UDP Port   : N/A
         -     CESoPSN: Source UDP Port   : N/A
RunState - Bundle's local run state (i.e. DISABLD, NoSYNC, RUNNING, etc...)
NtSz     - Configured packet size for NET bound packets
IfSz     - Packet size for Interface bound packets
RCtr     - Bundle's local buffer recenter event counter
```

Chapter 4

Software Queries and Operations

The CTP command-line interface (CLI) and CTPView provide extensive capabilities that allow you to diagnose problems and assess the performance of both circuits and the IP network. The CLI and CTPView also provide tools to assist with the diagnosis of problems. These diagnostic tools include integral bit error rate tests (BERTs), circuit loops, IP pings, IP traceroutes, packet delay jitter, and dropped packet plots.

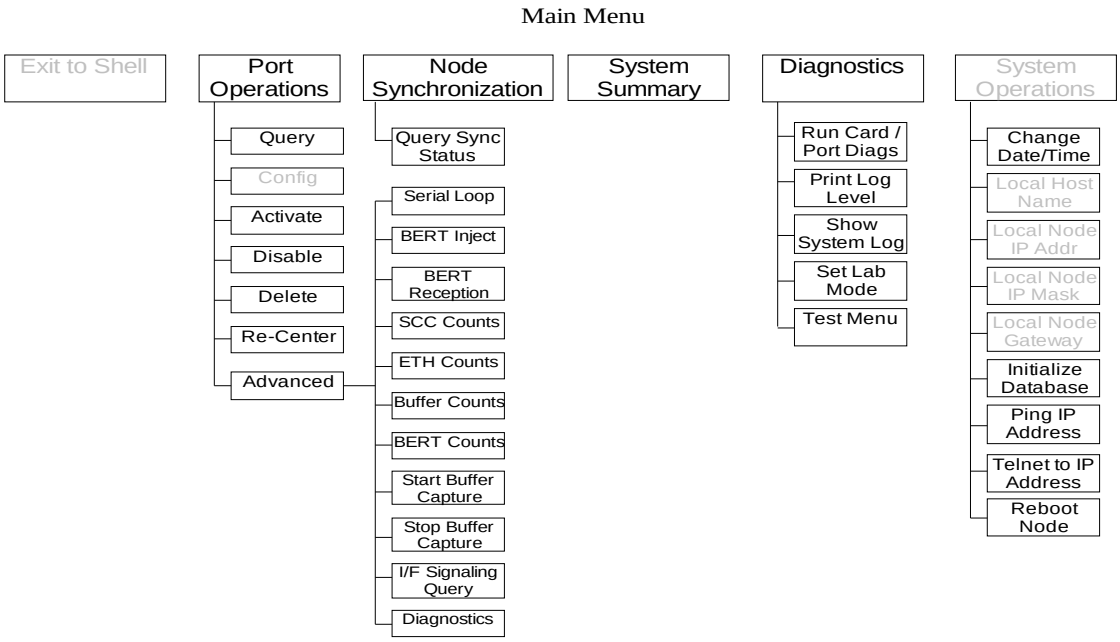
The chapter contains the following sections:

- Overview on page 93
- Port Queries and Operations on page 94
- Node Summary on page 113
- Node Diagnostics on page 114
- Node Synchronization on page 116

Overview

The CTP menu interface provides a set of menu-driven operational commands. You can use these commands to determine the status of the node or ports and to perform operations such as looping ports or saving the database. Figure 40 shows the Main menu interface with Software Queries and Operations highlighted.

Figure 40: Software Queries and Operations Menu Tree



You can find software queries and operations under the Port Operations, Node Summary, and Node Diagnostics menus. The Port Operations CLI menu is shown in Figure 41 on page 96.

Port Queries and Operations

Port queries and advanced operations are available from the CLI or from CTPView. Both provide information on the port configuration, database state, runtime state, and performance when running. The following summarizes the type of information provided by the CLI and CTPView displays:

- Remote Port—Remote port to which the queried port is connected. The variable *vvv.www.xxx.yyy* specifies the IP address of the remote CTP, and *z* specifies the port number (0-4).
- Port Database State—Specifies whether the port is active or disabled in the database. Ports disabled in the database will not connect to the remote port or pass serial data.
- Port Runtime State —Indicates whether the active local CTP port is communicating with the remote node, as follows:
  - N/A—Not applicable; is displayed when the port database state is disabled.
  - No Sync—Indicates that the local CTP system is not able to communicate with the remote CTP system.
  - In Sync—Indicates that the local CTP system is communicating properly with the remote system, but data is not flowing to the interface.

- Running—Indicates that the local CTP system is communicating and is synchronized with the remote CTP system. The circuit is established between the ports.
- Cfg Fail—Indicates that the database configuration for the port cannot be supported. You will not typically encounter this state. If you do, delete and reinstall the port.
- MisCfg —Indicates that a misconfiguration between the local and remote ports prevents bringing up the circuit. Examples of misconfigurations are incorrectly configured IP addresses or ports, and mismatched speeds.
- Too Slow—Encountered on a port when the port clock configured is TT ALL and either no clock is provided by the external device or the rate is different from the configured rate.

- Net Bound Data Info—Indicates the packet size created for transfer, the short-term average number of packets per second being sent out to the remote port, and the approximate data rate of information being received at the serial interface and sent into the IP network to the remote port.
  - Pkt Size—Size of packets created for transfer across the network. You can modify the packet size by using the **Packet Size Configuration** command (Port Operations > Config > Parameter 4).
  - Pkt/sec—Short-term average number of packets per second being sent to the remote port.
  - Data Rate—*Approximate* data rate in bits per second of information being received at the serial interface and sent into the IP network to the remote port. The data rate is calculated based on packets per second and packet size, and should be approximately the same as the configured port speed or the expected rate from the data terminal equipment (DTE) when autobaud is configured.
- I/F Bound Data Info—Indicates the following information:
  - Pkt Size—Size of packets received from the IP network destined for the queried port. You can modify the packet size.
  - Pkt/sec—Short-term average number of packets per second being received from the IP network.
  - Data Rate—Displays in bits per second the approximate data rate of information being received from the IP network and sent to the queried serial port. The data rate is calculated based on packets per second and packet size, and should be approximately the same as the configured remote port speed or the expected rate from the remote DTE when autobaud is configured.
  - Late Pkts —Counter of packets that arrives too late to be sent to the serial interface. You may need to increase the buffer size if the late packet count continually increments.

- Missing Packets—Counter of packets destined for the serial interface that were not available at the time when that data was needed. This unavailability may be due to a dropped packet in the IP network or to a packet that arrived too late at the CTP unit to be processed out the serial interface. Both dropped and late packets cause the missing packet counter to increment.
- Buffer Recenter Count—Count of buffer recenters since the last time statistics were cleared. Recenters are due to either buffer underflow (buffer depleted) or the buffer exceeding the maximum delay configured for the port.
- Buffer Underflow Count—Number of times the buffer reached the minimum set threshold.
- Buffer Overflow Count—Number of times the buffer reached the maximum set threshold.
- Buffer Fill—Amount of data (in milliseconds) currently held in the buffer.
- Buffer Starvation Count—Indicates an exceeded threshold. The CTP system is designed to tolerate strings of consecutive missing packets without the loss of bit count integrity. The number of packets is configurable; the default is five (5). Exceeding this threshold is called a "starvation," and a counter is incremented each time this event occurs.

Port Query with the CLI

The Query operation provides both the database configuration and current state of the port (Figure 41). When you perform the query, the menu interface provides the option to clear the statistics (counters).

Figure 41: Port Query and Results

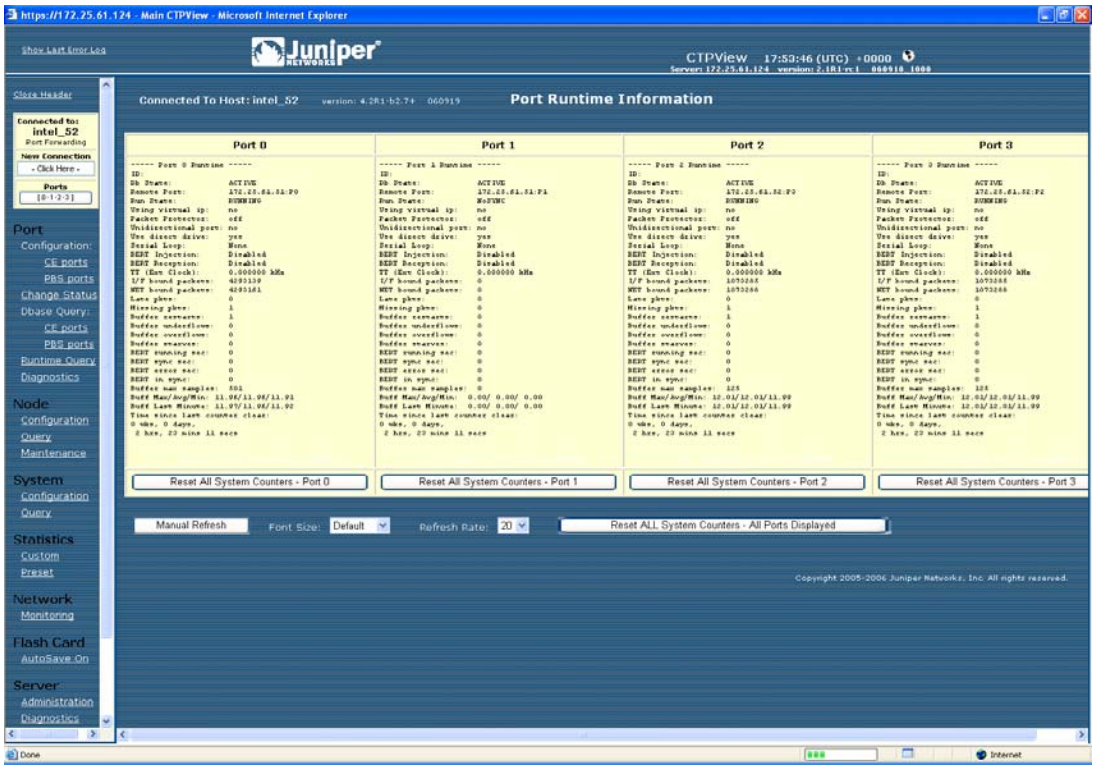
```
=============================================
Operations Menu for port 0
=============================================
Please select a number from the following list:
---------------------------------------------
 0) Back to Previous Menu
 1) Query
 2) Config
 3) Activate
 4) Disable
 5) Delete
 6) Recenter
 7) Advanced...
------------ Your choice [2]: 1

Detail query display for port  0
================================
Remote Port:                    vvv.www.xxx.yyy:Pz
Port Database State:            DISABLED, ACTIVE
Port Runtime State:             N/A,No Sync,In Sync,Running,Cfg
Fail,MisCfg,Too Slow
Permanent/Demand:               Permanent or Demand
---------- Net Bound Data Info ----------
Pkt Size:                       Configured Packet Size
Pkt/sec:                        Approximate Packet Rate
```

```
Data Rate (Approx bps):           Calculated Rate
---------- I/F Bound Data Info ----------
Pkt Size:                         Packet Size from Remote
Pkt/sec:                          Approximate Packet Rate From Remote
Data Rate (Approx bps):           Approximate Date Rate
Late/Missing Pkts:                Late Packets/Missing Packets Since Last Clear
Buffer Recntr/Underflow/Overflow: Recenter/Underflow/Overflow Since Last Clear
Buffer Fill (in Msec):            0.000
Buffer Starvation Count:          0

Clear Port 0 Stats?  y[n]:
```

Port Query with CTPView

A superset of Port Query attributes is described at the beginning of the Port Queries and Operations section on page 94. The CTPView Port Runtime option provides the status of the port (Figure 42). Additional information provided by the Runtime query includes the status of internal BERTs and port loops. The display will periodically be updated at the rate specified in the drop-down menu. The Reset ALL System Counters button at the bottom of the display resets the counters.

Figure 42: CTPView Port Runtime Information Window



Technical Notes—Port Operations

Missing Packets and Late Packets

Each time a packet is missed, the data fill pattern specified in the advanced port options is substituted for data in the missed packet. The substitution maintains the bit count integrity of the data sent to the DTE or encryptor, but results in what appears to be a burst of errors with a duration equal to the size of the packet. Both the missing packet count and late packet count are incremented if the packet is received too late to be processed out the serial interface.

Packets may infrequently arrive late because of momentary congestion and delay in the IP network. If the rate of late packets is too great, consider increasing the port buffer size to accommodate the delay jitter being experienced. You can modify the port buffer size in the Port Configuration menu of the CLI or the Configuration window of CTPView.

Buffer Recenter Count

Under normal operations, the buffer recenter count should not be incrementing. If the count is incrementing, examine both the clocking configuration and references being used by the CTP system. For example, if the distant port and local port are configured with slightly different rates, buffer recenters will result. If the accuracy or stability of the references is inaccurate, recenters may also occur.

Port Database States

A port's database state can be set to Active or Disabled, or the port can be deleted. Deleting the port disables it and returns the port configuration to default values the next time it is configured. As shown in Figure 43, the commands to activate, disable or delete the port are provided in the Port Operations menu. You will be prompted to confirm your command before it will take effect.

Ports must be disabled when configured from the CLI. When you select Config from the menu, you will be prompted to confirm that the port can be disabled.

Figure 43: Activating Port Command

```
==============================================
Operations Menu for port 0
==============================================
Please select a number from the following list:
----------------------------------------------
 0) Back to Previous Menu
 1) Query
 2) Config
 3) Activate
 4) Disable
 5) Delete
 6) Recenter
 7) Advanced...
------------ Your choice [7]: 3

*** You asked to bring the port up. Are you sure? y[n]:
```

You can activate or disable the port by using either of two CTPView windows. The Port Configuration window allows you to change the state by checking the appropriate box near the top of the display (Figure 44). You can also open the Change Port Status window (Figure 45). This window allows you to change the state of the port from active to disabled or disabled to active, to delete the port, and to recenter the buffer.

Figure 44: CTPView Port Configuration Window to Activate and Disable the Port

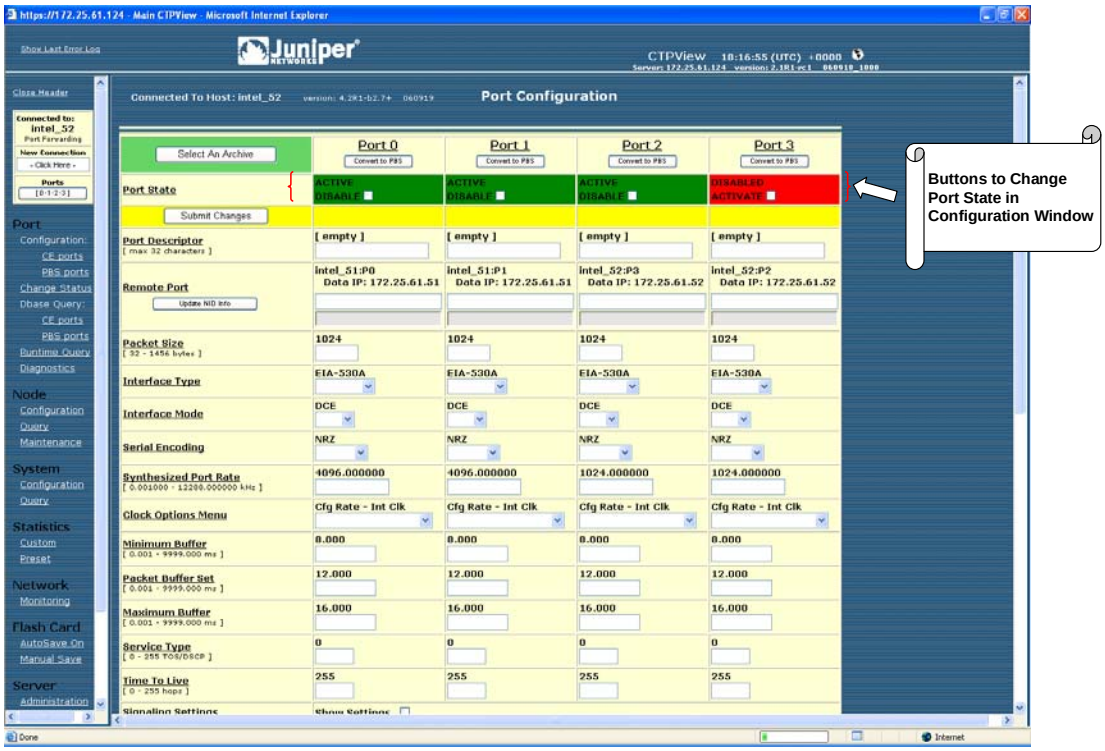
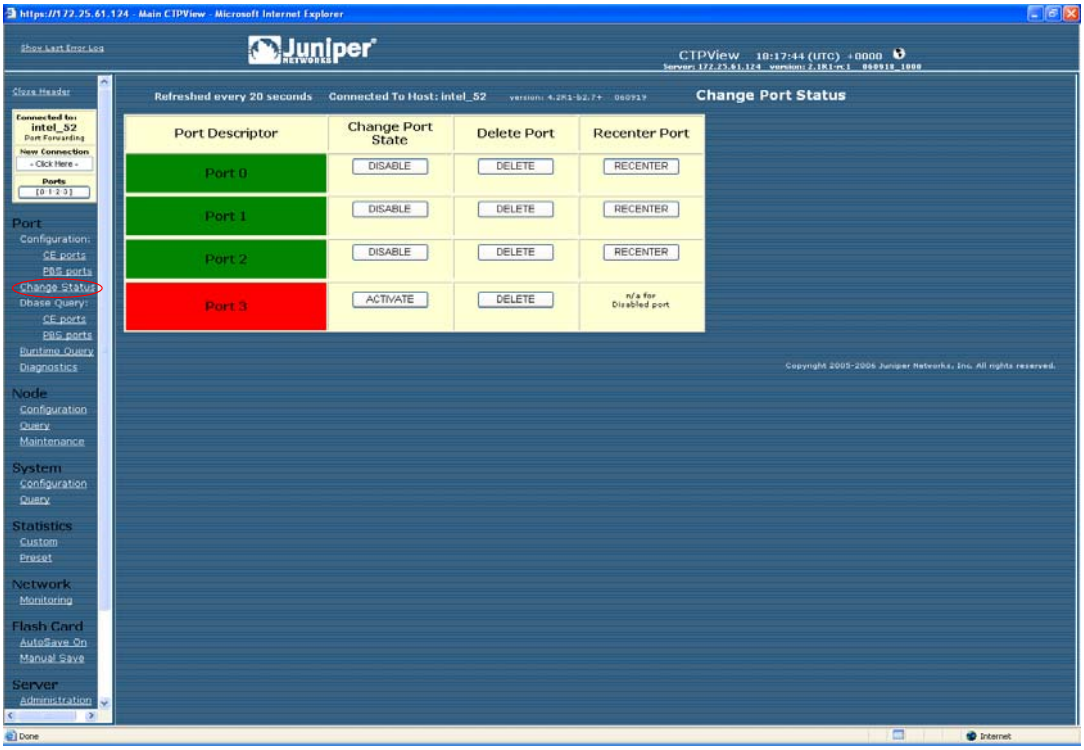


Figure 45: CTPView Change Port Status Window



Port Recenter

Use the Recenter operation to reset the buffer to the Pkt Buffer Set size specified in the port configuration. Recentering the buffer results in a one-time loss of bit count integrity and synchronization for the attached DTE. Figure 46 shows the Port Recenter option from the CLI. You can also recenter the port from the Change Port Status window on CTPView (Figure 45).

Figure 46: Port Recentering

```
================================================
Operations Menu for port 0
================================================
Please select a number from the following list:
------------------------------------------------
 0) Back to Previous Menu
 1) Query
 2) Config
 3) Activate
 4) Disable
 5) Delete
 6) Recenter
 7) Advanced...
------------ Your choice [5]: 6

*** This will cause a port data interruption. Are you sure? y[n]:
```

Advanced Query Menu

You access the Advanced Query menu from the CLI Port Operations menu by selecting Advanced (Figure 47).

Figure 47: Advanced Query Menu

```
================================================
Operations Menu for Port 0
================================================
Please select a number from the following list:
------------------------------------------------
 0) Back to Previous Menu
 1) Query
 2) Config
 3) Activate
 4) Disable
 5) Delete
 6) Recenter
 7) Advanced...

------------ Your choice [7]: 7
```

```
============================================
Advanced Query Menu for Port 0
============================================
Please select a number from the following list:
------------------------------------
 0) Back to Previous Menu
 1) Serial Loop:    None
 2) BERT Injection: Disabled
 3) BERT Reception: Disabled
 4) BERT Pattern:   2^15-1
 5) BERT Error Inject
 6) BERT   Counts
 7) SCC    Counts
 8) Buffer Counts
 9) Clear All Counts
10) I/F Signaling Query
11) Modify Runtime Configuration
12) Diagnostics...
------------ Your choice [8]:
```

Serial Loops

The Serial Loop parameter provides the option for enabling loops toward the interface (DTE device) or toward the “NET” (IP network) in the direction of the remote port (Figure 48). The following loop options are available:

- Disabled—If a loop is currently active on the port, the Disabled setting will remove the loop.
- To NET—Data arriving from the IP network destined for the serial interface is looped back to the IP network and remote port. The data is still transmitted from the IP network to the serial interface, but the data from the serial interface to the IP network and remote port is blocked.
- To I/F—Data arriving from the serial interface that is destined for the IP network is looped back to the serial interface. The data is still transmitted from the serial interface to the IP network, but the data from the IP network to the serial interface is blocked.

Figure 48: CTP Serial Loops

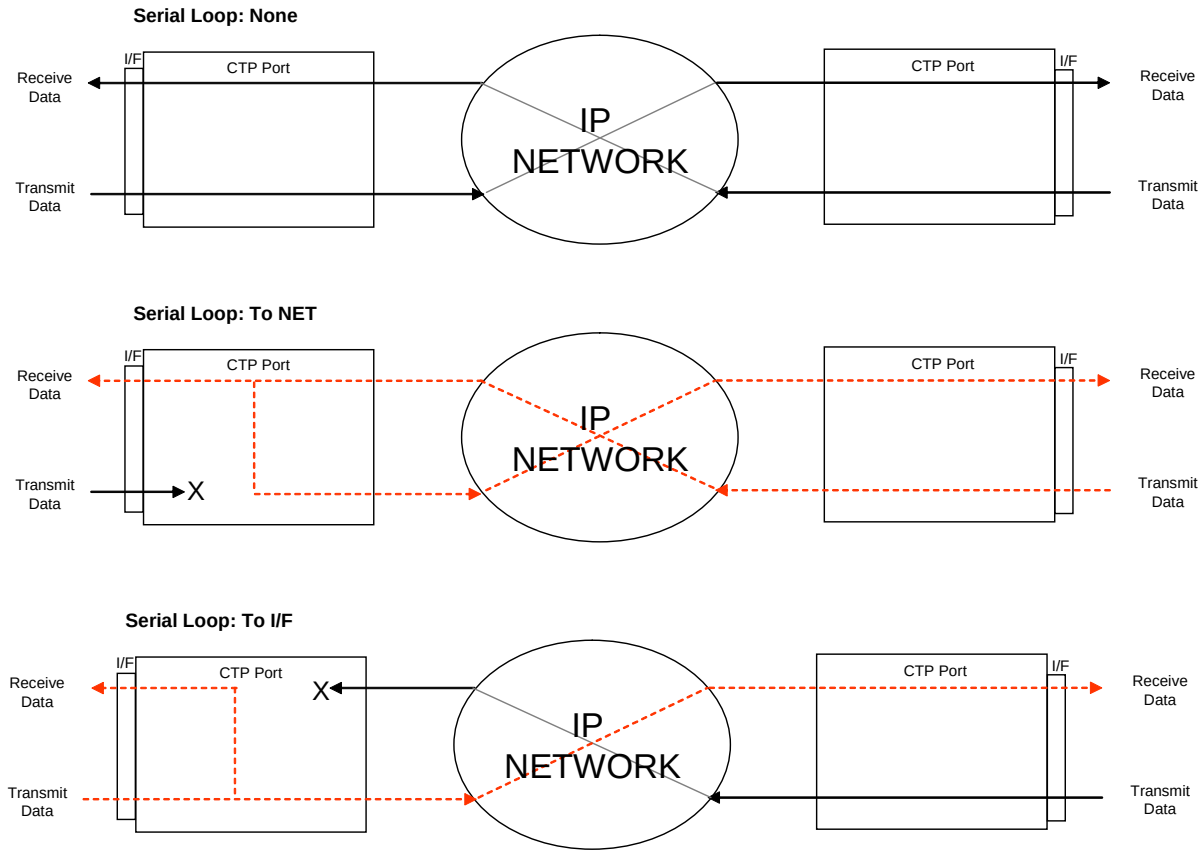


Figure 49 shows the CLI Advanced Query menu that you use for setting the loops.

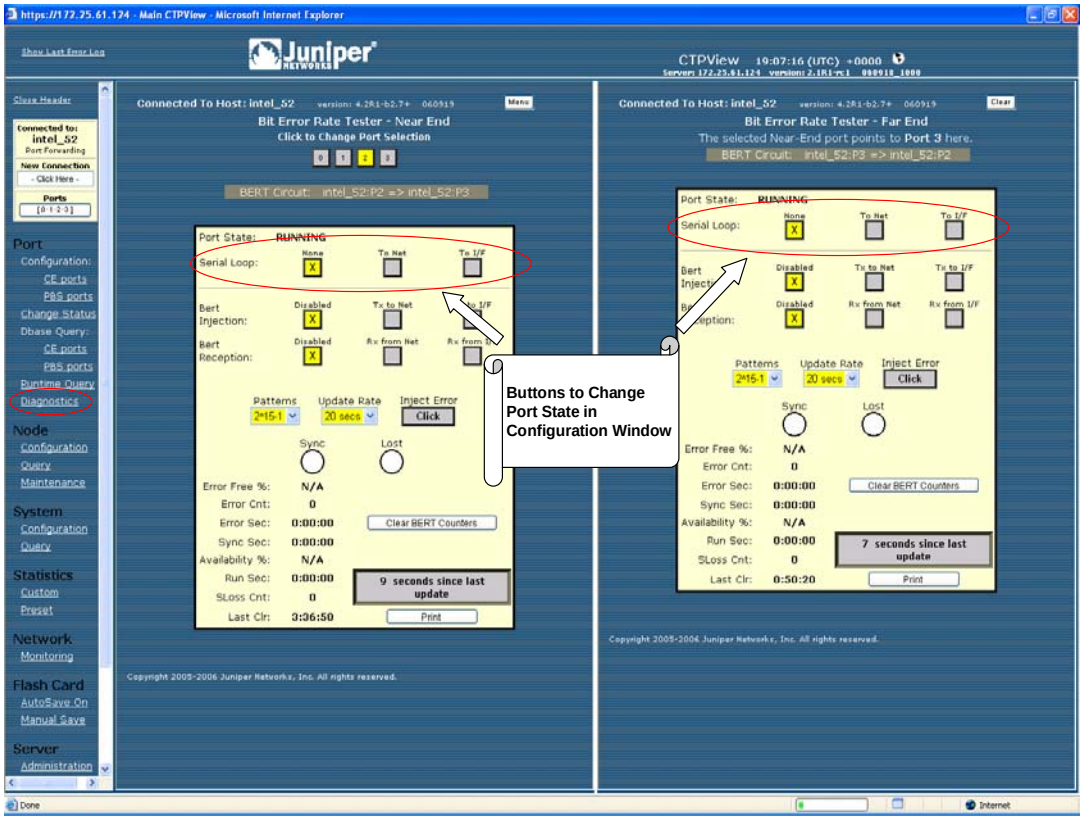
Figure 49: Serial Loop Menu

```
================================================
Advanced Query Menu for Port 0
================================================
Please select a number from the following list:
------------------------------------------------
 0) Back to Previous Menu
 1) Serial Loop:     None
 2) BERT Injection: Disabled
 3) BERT Reception: Disabled
 4) BERT Pattern:   2^15-1
 5) BERT Error Inject
 6) BERT   Counts
 7) SCC    Counts
 8) Buffer Counts
 9) Clear All Counts
10) I/F Signaling Query
11) Modify Runtime Configuration
12) Diagnostics...
------------ Your choice [8]:1

Enter Loop Function
```

```
Please select a number from the following list:
-----------------------------------------------
 0) None
 1) To NET
 2) To I/F
------------ Your choice [0]:
```

You can also configure serial loops by using the Bit Error Rate Tester menu, which is located in the Port Diagnostics window. The remote port is automatically displayed when you select the local port (Figure 50).

Figure 50: CTPView Bit Error Rate Tester Window—Serial Loop Buttons



BERT Testing

Each port provides a dedicated BERT transmitter and receiver, which are capable of transmitting and receiving a pseudorandom sequence of data by means of a user-specified pattern. The data sequence may be injected toward the serial interface or the IP network, and replaces the user data with the BERT pattern in the selected direction (Figure 51 on page 105). The BERT receiver does not disrupt the existing data flow in either direction (Figure 52 on page 106).

You can select the type of BERT pattern. The BERT patterns are compatible with the Firebird 6000, with the exception of pattern 2^31-1, which is not a Firebird option. You must configure the same pattern on both ports when performing a bidirectional end-to-end BERT. The available patterns include MARK, ALT, 511m 2047, 2^15-1, 2^20-1, 2^23-1, 2^29-1, and 2^31-1.

Figure 51: BERT Injection

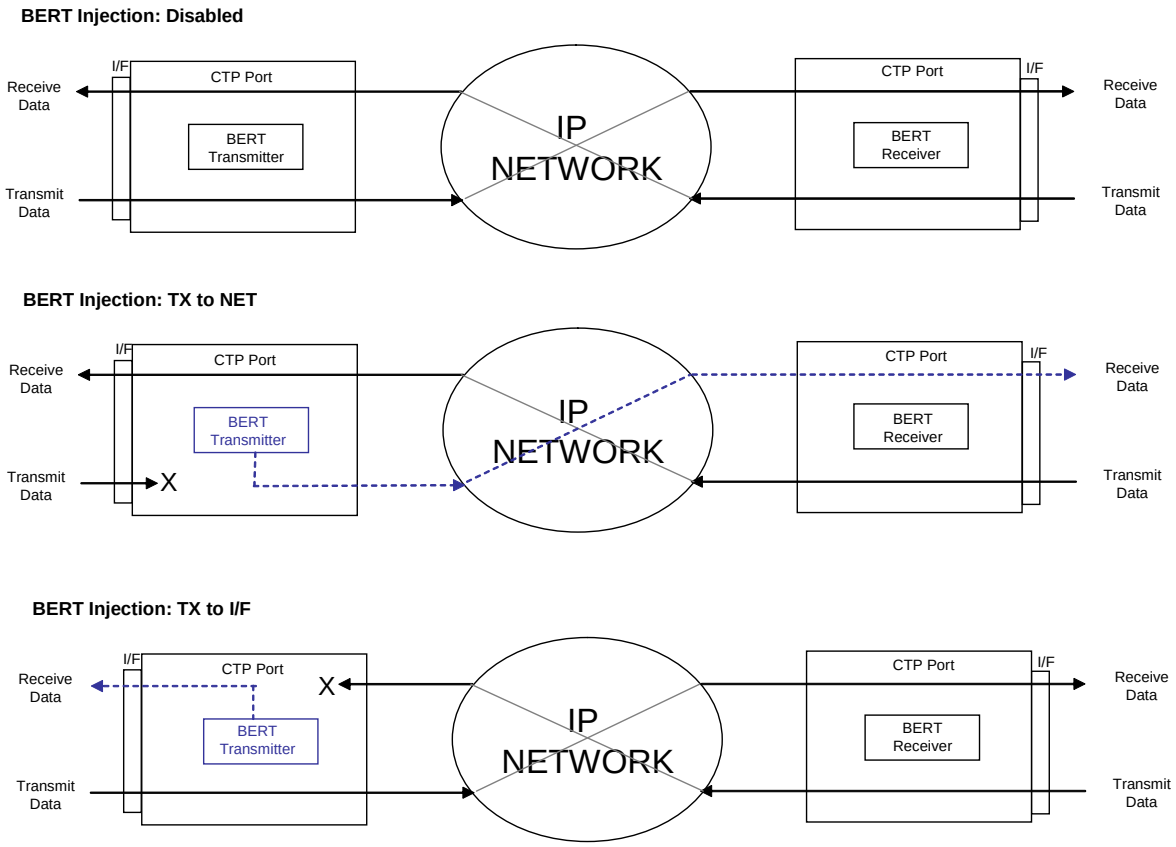
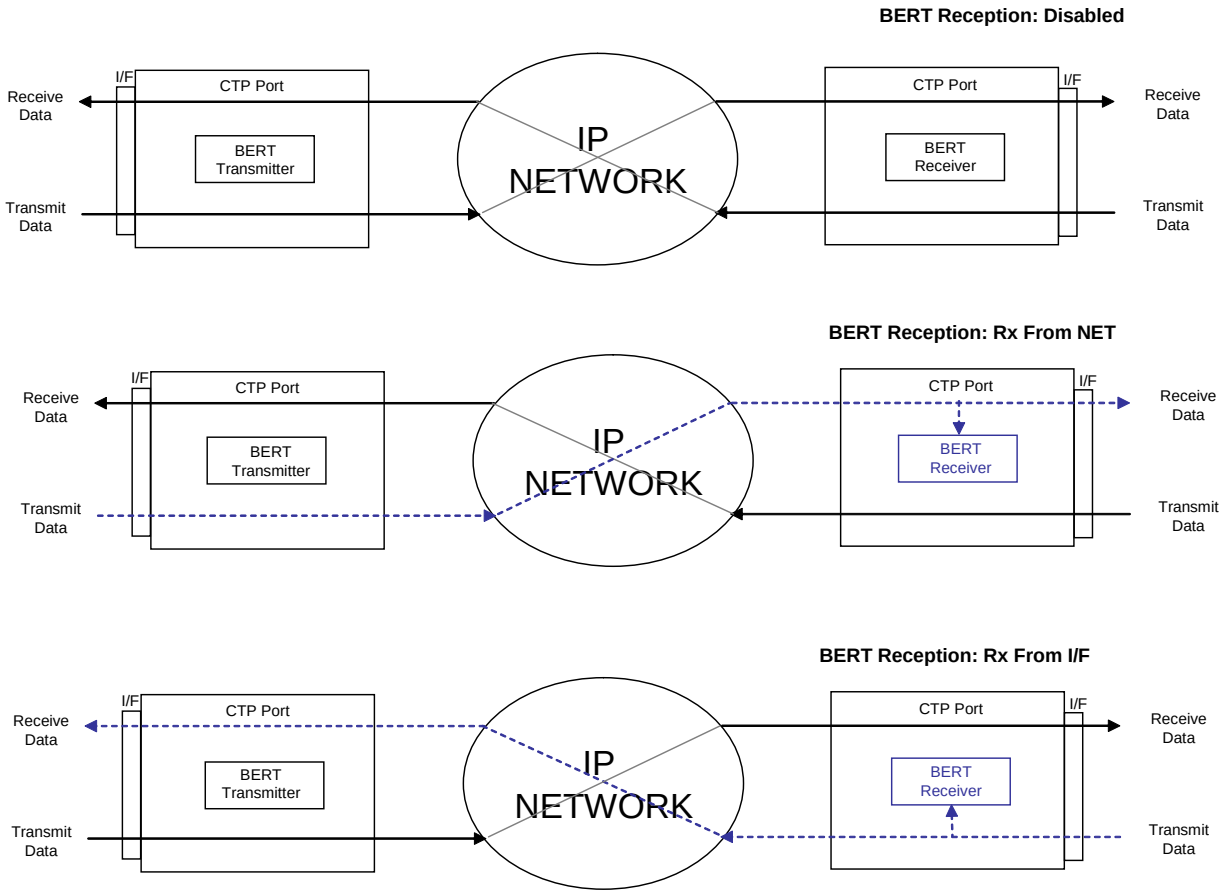


Figure 52: BERT Reception



In the CLI menu, use Options 2, 3, and 4 to configure the BERT transmitter, receiver, and pattern (Figure 53). Option 5 injects an error in the pattern to verify that an end-to-end BERT has been established. Option 6 provides the BERT counts (Figure 54).

Figure 53: Example of Configuring the BERT Transmitter

```
Please select a number from the following list:
-----------------------------------------------
0) Back to Previous Menu
 1) Serial Loop:        None
 2) BERT Injection:     Disabled
 3) BERT Reception:     Disabled
 4) BERT Pattern:       2^15-1
 5) BERT Error Inject
 6) BERT   Counts
 7) SCC    Counts
 8) Buffer Counts
 9) Clear All Counts
10) I/F Signaling Query
11) Modify Runtime Configuration
12) Diagnostics...
------------ Your choice [8]: 2

Enter Tx BERT Function
```

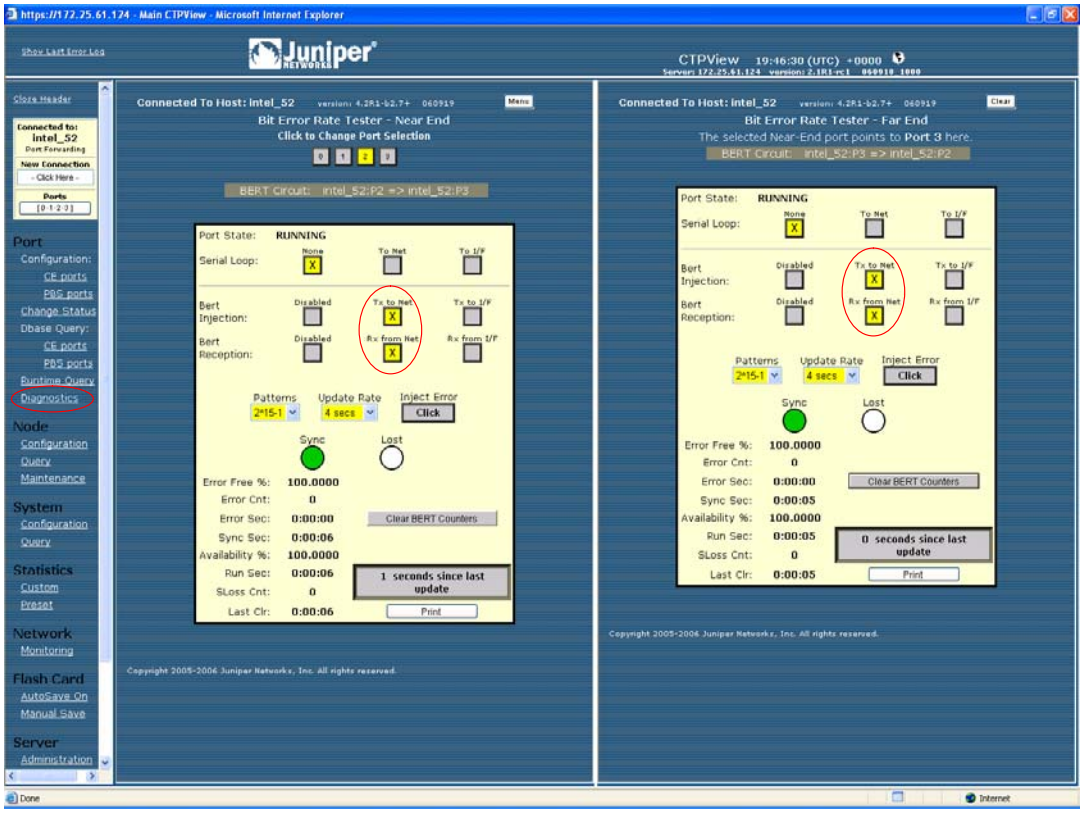
```
Please select a number from the following list:
-----------------------------------------------
 0) Disabled
 1) Tx to NET
 2) Tx to I/F
------------ Your choice [0]: 1
```

Figure 54: BERT Counts

```
===============================================
Advanced Query Menu for Port 0
===============================================
Please select a number from the following list:
-----------------------------------------------
0) Back to Previous Menu
 1) Serial Loop:          None
 2) BERT Injection:       Disabled
 3) BERT Reception:       Disabled
 4) BERT Pattern:         2^15-1
 5) BERT Error Inject
 6) BERT   Counts
 7) SCC    Counts
 8) Buffer Counts
 9) Clear All Counts
10) I/F Signaling Query
11) Modify Runtime Configuration
12) Diagnostics...

------------ Your choice [2]: 6

BERT query display for port  0
=======================================
BERT Running time: Sync Seconds:      0
Errored Seconds:   0
Error Count:       0
Sync Loss Count:   0
Currently in SYNC: NO

Time since last counter clear: 0 wks, 0 days, 1 hrs, 34 mins 20 secs

Clear Port 0 BERT Stats?  y[n]:
```

Figure 55 on page 108 shows the BERT pane, which is displayed when you select Port > Diagnostics in the left pane of the CTPView window. The remote port is automatically displayed when you select the local port. You can use this window to specify whether the BERT transmitter and receiver will be directed toward the network (NET) or serial interface (I/F). You choose the pattern by using the drop-down menu. CTPView checks the status of the BERT at the rate specified in the Update Rate drop-down menu and updates the synchronization status and counter accordingly.

Figure 55: CTPView BERT Tester Window



SCC Counts

The Serial Communications Controller (SCC) counts are counters related to packet creation and reception (Figure 56 on page 109). Many of these counters also appear in the Port Query menu. All the SCC counts increment until you clear them.

The SCC counts are:

- Pkts to NET—Number of packets that have been sent to the IP network.
- Pkts to NET ints—Packets-to-NET interrupts; corresponds to the number of packets destined for the IP network that have been processed by the software driver.
- Pkts to I/F—Number of packets that have been sent to the serial interface.
- Pkts to I/F ints—Packets-to-interface interrupts; corresponds to the number of packets destined for the serial interface that have been processed by the software driver.

- Pkts to I/F missing—Packets to interface missing; packets destined for the serial interface that were not available at the time when that data was needed. Unavailability may be caused by a dropped packet in the IP network or a delayed packet considered late by the CTP system, according to the current buffer settings and state.

- Pkts to I/F late—Packets to interface late; number of packets destined for the serial interface that were not available at the time when that data was needed. Unavailability may be caused by a dropped packet in the IP network or a by a packet delayed too long, according to the current buffer settings and state.

- Pkts to I/F recenter cnt—Packets to interface recenter count; number of buffer recenters since the last time statistics were cleared. Recenters are due to either buffer underflow (buffer depleted) or the buffer exceeding the maximum delay configured for the port.

- Pkts to I/F underflow cnt—Packets to underflow count; number of times the minimum threshold was reached since the counter was last reset.

- Pkts to I/F overflow cnt—Packets to overflow count; number of times the maximum threshold was reached since the counter was last reset.

- Pkts to I/F starve cnt—Packets to interface starvation count. When a fixed consecutive number of packets are missing from the IP network, the CTP receive processor detects this as a starvation condition. During this state, the buffer is recentered. Starvation can occur because of a failure in the IP network or because of a cabling or Ethernet interface problem.

- Clear Port Stats—Responding affirmatively to this option will clear all the SCC counts listed in this menu.

Figure 56: SCC Counts Output

```
================================================
Advanced Query Menu for Port 0
================================================
Please select a number from the following list:
------------------------------------------------
0) Back to Previous Menu
 1) Serial Loop:          None
 2) BERT Injection:       Disabled
 3) BERT Reception:       Disabled
 4) BERT Pattern:         2^15-1
 5) BERT Error Inject
 6) BERT   Counts
 7) SCC    Counts
 8) Buffer Counts
 9) Clear All Counts
10) I/F Signaling Query
11) Modify Runtime Configuration
12) Diagnostics...
------------ Your choice [3]: 7
```

```
Advanced Packet query display for port  0
=======================================
Pkts to NET:                      0
Pkts to NET ints:                 0
 ----------------------------------------
Pkts to I/F:                      0
Pkts to I/F ints:                 0
Pkts to I/F missing:              0
Pkts to I/F late:                 0
Pkts to I/F recenter cnt:         0
Pkts to I/F underflow cnt:        0
Pkts to I/F overflow cnt:         0
Pkts to I/F starve cnt:           0

Clear Port 0 Stats?  y[n]:
```

Buffer Counts

The CTP system monitors packet delay. The time is measured from when a packet arrives from the Ethernet interface to when it is completely transmitted out the serial interface. This interval represents an instantaneous measure of the buffer fill. Short-term changes in the value of this measured delay correspond to the packet delay jitter in the network. These values are stored in an array where the average may be calculated over a large number of samples.

Figure 57 on page 111 shows the Buffer Counts menu, which provides the following counts:

- Sample Buffer Size—Total number of samples in the array used for averaging.
- Valid Buffer Samples—Number of currently valid samples in the array.
- Total Samples—Number of packets measured since the last time the count was cleared.
- Smallest Sample—Within the total number of samples, the smallest sample measured (in milliseconds).
- Average Sample—Within the valid array samples, the average buffer fill (in milliseconds).
- Largest Sample—Within the total number of samples, the largest sample measured (in milliseconds).
- Largest Buffer Jitter—Difference between the largest sample and the smallest sample measured. This corresponds to system packet delay jitter.
- Reset Array Monitor—An affirmative response will reset the counter for all statistics in this menu.

Figure 57: Buffer Counts Command

```
============================================
Advanced Query Menu for Port 0
============================================
Please select a number from the following list:
--------------------------------------------
0) Back to Previous Menu
 1) Serial Loop:          None
 2) BERT Injection:       Disabled
 3) BERT Reception:       Disabled
 4) BERT Pattern:         2^15-1
 5) BERT Error Inject
 6) BERT   Counts
 7) SCC    Counts
 8) Buffer Counts
 9) Clear All Counts
10) I/F Signaling Query
11) Modify Runtime Configuration
12) Diagnostics...
------------ Your choice [5]: 9

Advanced Buffer query display for port  0
========================================
Sample Buffer Size:           2048
Valid Buffer Samples:            0
Total Samples:                   0
----------------------------------------
Smallest Sample:       0.000 ms
Average Sample:        0.000 ms
Largest Sample:        0.000 ms
Largest Buffer Jitter: 0.000 ms

Reset Buffer Monitor? y[n]:
```

Clear All Counts

Select this option to clear all the counts on all the ports.

I/F Signaling Query

Select this option to record the state of the signaling leads.

Modify Runtime Configuration

Selecting this option allows you to modify parameters that affect adaptive clocking, signal output, interface mode, and buffer configurations without your having to disable the port. The changes are valid only while the port is active and are not stored in the database. We recommend that you do not make port changes with this option except in a lab or test environment.

Diagnostics

You can perform diagnostic tests on a port by using the Diagnostics menu. Running the diagnostics on a port will automatically test the port with the integral BERT. The port will not transfer user data during the test.

Figure 58 shows the CLI Diagnostics menu. The system reports results as pass or fail. A failed test indicates possible faulty hardware. You can select one diagnostic test from this menu at a time. The test menu (parameter 5) allows additional functions, such as intentionally dropping an IP packet that should be used only in a test or lab environment. Tests include:

- Test Port Data Path (towards NET fast and slow)—Data path test toward the IP network.
- Test Port Data Path (towards I/F)—Data path test toward the serial interface.
- Test Port Signaling—Tests the signaling leads on the serial interface.

Figure 58: Diagnostics Command

```
================================================
Advanced Query Menu for Port 0
================================================
Please select a number from the following list:
------------------------------------------------
0) Back to Previous Menu
 1) Serial Loop:          None
 2) BERT Injection:       Disabled
 3) BERT Reception:       Disabled
 4) BERT Pattern:         2^15-1
 5) BERT Error Inject
 6) BERT   Counts
 7) SCC    Counts
 8) Buffer Counts
 9) Clear All Counts
10) I/F Signaling Query
11) Modify Runtime Configuration
12) Diagnostics...
------------ Your choice [8]: 9

================================================
Diagnostics Menu for Port 0
================================================
Please select a number from the following list:
------------------------------------------------
 0) Back to Previous Menu
 1) Test Port Data Path (towards NET fast)
 2) Test Port Data Path (towards NET Slow)
 3) Test Port Data Path (towards I/F)
 4) Test Port Signalling

------------ Your choice [2]:
```

Node Summary

Figure 59 shows a sample CLI Node Summary menu. The node summary provides CTP port system information for all ports on a single screen.

Figure 59: Node Summary Sample Menu

```
=============================================
CTP Main Menu
=============================================
Please select a number from the following list:
---------------------------------------------
 0) Exit to Shell
 1) Bundle Operations
 2) Node Synchronization
 3) Node Summary
 4) Node Diagnostics
 5) Node Operations
 6) Save Database to Flash
------------ Your choice [1]: 3

Port Config and Status Summary:

Port             RemPort  DbState  RunState NtSz IfSz     PortRate  ReCtr
=============================================================================
   0         6.6.6.2:P0    ACTIVE   RUNNING   32   32    38.400000      0
   1         6.6.6.2:P1    ACTIVE   RUNNING   64   64   136.000000      0
   2        10.0.0.0:P0    ACTIVE    NoSYNC 1024  N/A     0.103996      0
   3        10.0.0.0:P0    ACTIVE    NoSYNC 1024  N/A    64.000000      0
=============================================================================
```

The menu provides the following summary information:

- RemPort—Remote port to which the local port is connected.The variable *vvv.www.xxx.yyy* specifies the IP address of the remote CTP system, and *z* defines the port number (0-55). You can change the remote port by using the **Port Configuration** command (Port Operations > Configuration > Parameter 1).

- DbState—Database state and whether the port is active or disabled in the database. Ports disabled in the database will not connect to the remote port or pass serial data.

- Run_State—Remote node synchronization state; indicates whether the local CTP port is communicating and synchronized with the remote node. Status is defined as NoSYNC, ToSYNC, or RUNNING.

  - NoSYNC—Indicates that the local CTP system is not able to communicate with the remote CTP system.

  - InSYNC—Indicates that the local CTP system is communicating properly with the remote unit, but data is not flowing to the interface.

  - RUNNING—Indicates that the local CTP system is communicating and synchronized with the remote CTP system and that the circuit is established.

- MisCfg—Indicates that there is a misconfiguration between the local and remote ports that prevent bringing up the circuit. Examples of misconfigurations are incorrectly configured IP addresses or ports, and mismatched speeds.
- N/A—Not applicable; displayed when the port database state is disabled.
- Cfg Fail—Indicates that the database configuration for the port cannot be supported. You will not typically encounter this state. If you do, delete and reinstall the port.
- Too Slow—Encountered on a port when the port clock configured is TT ALL and either no clock is provided by the external device or the rate is different from the configured rate.

- NtSz—Network-bound data packet size. You can modify the packet size by using the **Packet Size Configuration** command.
- IfSz—Interface-bound data packet size. You can modify the packet size only at the remote CTP system.
- PortRate—User-specified port speed in kilohertz. (For further details, see Port Speed on page 53 in *Chapter 2, Software Configuration*.)
- ReCtr—Number of times the buffer has been recentered to the size specified in the port configuration.

Node Diagnostics

By using the Node Diagnostics menu, you can troubleshoot suspected problems with the CTP hardware or software configuration.

Run Diags on Card/Ports

This parameter runs data path tests on each port (Figure 60) using the built-in BERT testers. The test will loop back data at both the serial and packet interfaces on all ports. In addition, the system tests signaling loopback on the serial interface. Ports will be disabled for the duration of the tests and then reactivated after the diagnostic is complete. The system reports results as pass or fail. A failed test may indicate a hardware problem.

Figure 60: Run Diagnostics on Card/Ports

```
==============================================
Diagnostics Menu
==============================================
Please select a number from the following list:
----------------------------------------------
 0) Back to Previous Menu
 1) Run Diags on Card/Ports
 2) Set Log Print Level:    EVE
 3) Show Node Log
 4) Set Lab Mode:           Disable
------------ Your choice [0]: 1

***
*** This will cause a port data interruption
```

```
***
    Are you sure? y[n]: y

    PLL Lock Test...                Passed
     External Reference Test...     Passed
     Port 0 Net-Bound Data Test... Passed
    Port 0 I/F-Bound Data Test... Passed
    Port 0 I/F Signaling Test...  Passed
    Port 1 Net-Bound Data Test... Passed
    Port 1 I/F-Bound Data Test... Passed
    Port 1 I/F Signaling Test...  Passed
    Port 2 Net-Bound Data Test... Passed
    Port 2 I/F-Bound Data Test... Passed
    Port 2 I/F Signaling Test...  Passed
    Port 3 Net-Bound Data Test... Passed
    Port 3 I/F-Bound Data Test... Passed
    Port 3 I/F Signaling Test...  Passed
```

Set Log Print Level

By selecting Set Log Print Level, you can set the level of stored node event messages that the CTP system logs. Figure 61 shows the Set Log Print Level menu. The settings range from most detailed (Level 1: debug) to least detailed (Level 8: fatal alarm):

- DBG—debug
- GEN—general
- FNC—function entry
- EVE—event
- TMP—temporary; not a user setting; for system development only
- MIN—minor alarm
- MAJ—major alarm
- FAT—fatal alarm

Figure 61: Set Log Print Level Menu

```
==============================================
Diagnostics Menu
==============================================
Please select a number from the following list:
----------------------------------------------
 0) Back to Previous Menu
 1) Run Diags on Card/Ports
 2) Set Log Print Level:    EVE
 3) Show Node Log
 4) Set Lab Mode:           Disable
------------ Your choice [0]:2
```

```
Please select a number from the following list:
-----------------------------------------------
 0) OFF
 1) DBG
 2) GEN
 3) FNC
 4) EVE
 5) TMP
 6) MIN
 7) MAJ
 8) FAT
------------ Your choice [4]:
```

Show Node Log

By selecting Show Node Log, you can review stored node event messages that the CTP system logs. The node prompts you to specify the number of most recent events to be reviewed and the number of events to be presented per page.

Set Lab Mode

Set Lab Mode is not a user parameter; this parameter is for system development use only.

Node Synchronization

Query Sync Status

Figure 62 shows the Node Synchronization menu provided by the CLI, and Figure 63 shows the Node Synchronization Query window provided by CTPView. The Query Node Sync Status option (option 7 on the CLI menu) provides details of the current state of the node synchronization:

- PLL Monitor Runtime—Time (in seconds) that the phase lock loop (PLL) has been monitored since the last restart of the CTP or reconfiguration of the CTP reference.
- PLL Locked—Indicates whether the PLL is currently locked to a valid reference (YES) or whether no reference is available (NO).
- PLL Loss Seconds—Indicates the number of seconds during the PLL monitor runtime that the PLL has not been locked.
- Reference in Use:
  - Fixed/Calibrated—The CTP unit is not locked to a reference and has loaded and used the calibrated value (provides improved clock accuracy). Setting a calibrated value is discussed in *Chapter 2, Software Configuration*.
  - Center—The CTP unit is not locked to a reference, and the clock is based on the natural frequency of the internal oscillator.
  - Ref (0–4)—The CTP unit is currently using a reference defined in the configuration.

  - Holdover—The CTP unit acquired a valid reference that was subsequently lost. The clock is biased to the reference until it is restored.

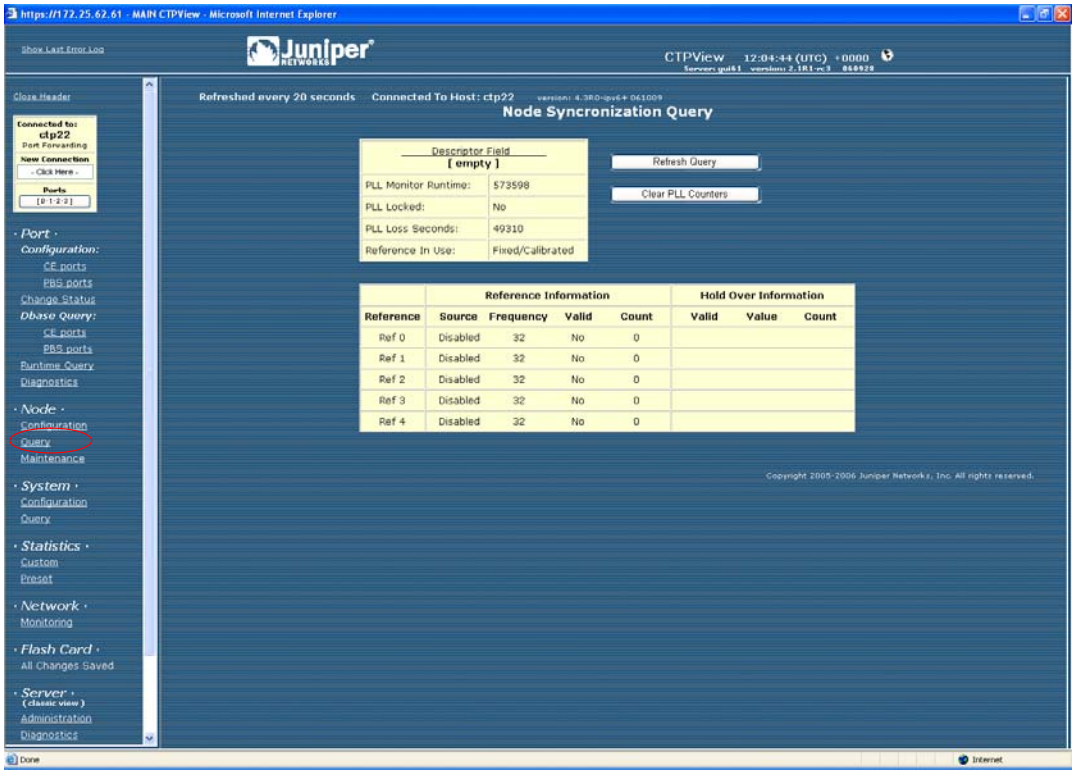
- Reference Info:
  - Valid—Indicates whether the reference is valid for the configuration (Yes) or invalid (No)
  - PPM—Measured difference in parts per million from the current state of the clock and the reference.
  - Count—Progress (1–5) of the system's assessment of the reference before its use.

- Holdover Info
  - Valid—Indicates whether the reference is valid for holdover use.
  - Value—Numerical value between 1 and 4096 used to profile the reference for holdover if the reference is lost.
  - Count—Progress (1–5) of the system's assessment of the reference before determining the holdover value.

Figure 62: Node Synchronization Status Menu

```
================================================
Node Synchronization Menu
================================================
Please select a number from the following list:
------------------------------------------------
 0) Back to Previous Menu
 1) 1st Priority, Reference 0: Disabled
 2) 2nd Priority, Reference 1: Disabled
 3) 3rd Priority, Reference 2: Disabled
 4) 4th Priority, Reference 3: Disabled
 5) 5th Priority, Reference 4: Disabled
 6) 32 kHz Ref Output:         NO
 7) Query Node Sync Status
 8) Measure Ref Inputs
 9) Calibrate Node to Current Reference
------------ Your choice [2]: 7

Node Synchronization Info
=========================
PLL Monitor Runtime: 1056
PLL Locked:          NO
PLL Loss Seconds:    1056
Reference in use:    Fixed/Calibrated
     +-------------------+-------------------+
     |  Reference Info   |   HoldOver Info   |
     +-------------------+-------------------+
 Ref | Valid    PPM Count | Valid Value Count |
====   ===== ====== =====   ===== ===== =====
  0:   ----- ------ -----   ----- ----- -----
  1:   ----- ------ -----   ----- ----- -----
  2:   ----- ------ -----   ----- ----- -----
  3:   ----- ------ -----   ----- ----- -----
  4:   ----- ------ -----   ----- ----- -----

Clear Counters?  y[n]:
```

Figure 63: CTPView Node Synchronization Query Window



Chapter 5

Security Profile Menu

This chapter describes security profile options available on CTP systems through the command-line interface (CLI). The chapter contains the following sections:

- Overview on page 119
- User Management on page 120
- Password Management on page 121
- Secure Log Management on page 122
- Login Banner on page 124

Overview

The Security Profile menu is available from the Node Operations menu to administrators who have the root password. The Security Profile menu provides the following functions:

- User management
  - Adding or deleting user and administrator profiles
  - Displaying user and administrator profiles
- Password management
  - Displaying and managing password expirations
  - Displaying and managing password requirements
- Secure log management
  - Scanning and viewing the secure log
  - Following log entries
  - Copying logs to a remote host
  - Configuring and showing remote logging options

User Management

User management functions are provided by Option 1 from the Security Profile menu (Figure 64). The submenu allows the security administrator access to the following functions:

- Users and administrators logged in to the CTP—Users are able to execute menu commands to query the status of the ports and clocking. Administrators can configure the CTP system, configure loops and BERTs, and query the status of the ports and clocking.
- User and administrator accounts currently configured.
- Option to add or delete user accounts.

Figure 64: User Administration Menu

```
************************************************************
****            Security Profile Menu V 1.0             ****
****   Host lab_top: Mon Apr 11 14:56:20 2005
****   User root logged in from 10.0.1.27 as ctp_cmd
**** **** ****     All actions are logged     **** **** ****
************************************************************

Main Configuration Menu

Please choose a menu item from the following list:
0) Exit Security Profile Menu
1) User Management
2) Password Management
3) Secure Log Management
4) Change login banner

Please input your choice [1]:

************************************************************
****              Profile Menu V 1.0                    ****
****   Host lab_top: Mon Apr 11 14:56:42 2005
****   User root logged in from 10.0.1.27 as ctp_cmd
**** **** ****     All actions are logged     **** **** ****
************************************************************

User Management Menu

Please choose a menu item from the following list:
0) Return to main menu
1) List users currently logged on
2) List user & admin accounts
3) Add user or admin accounts
4) Delete user or admin account

Please input your choice [1]:
```

NOTE: When a user password need to be changed, you must follow the procedure described in Changing a User Password on page 122. All users are required to change their password at their initial login and at subsequent intervals of between 1 to 90 days, depending on how their account is configured.

Password Management

Password management functions are provided by Option 2 from the Security Profile menu (see Figure 64). The submenu (Figure 65) provides a list of password management functions.

Figure 65: Password Management Menu

```
************************************************************
****            Security Profile Menu V 1.0             ****
****   Host lab_top: Mon Apr 11 15:08:40 2005
****   User root logged in from 10.0.1.27 as ctp_cmd
**** **** ****     All actions are logged     **** **** ****
************************************************************

Password Management Menu

Please choose a menu item from the following list:
0) Return to main menu
1) List user & admin accounts
2) Display password expiration details
3) Manage password expiration details
4) Show password requirements
5) Manage password requirements
```

When you select Option 2, you see the password expiration details for a user, including the life of the password, days before expiration before a warning is provided, maximum number of inactive days after expiration when the password can be changed, and the password expiration and inactivity dates. Figure 66 shows an example of the display of password expiration details.

Figure 66: Expiration Details

```
Displaying the password aging setting for a user.
Input the username to query, hit return to exit: jiml
Minimum:        10
Maximum:        90
Warning:        3
Inactive:       45
Last Change:            Mar 31, 2005
Password Expires:       Jun 29, 2005
Password Inactive:      Aug 13, 2005
Account Expires:        Jun 29, 2005
```

When you select Option 3 from the Password Management menu, you can configure the password expiration details of a specific user:

- Maximum number of days a password will remain valid (5 to 9999 days)
- Minimum number of days between password changes (0 to 90 days)
- Days before expiration that an expiration warning is provided (0 to 80 days)
- Number of days after expiration that the user account is locked out (0 to 100 days)

When you select Options 4 and 5 from the Password Management menu, you can view and configure password requirements. The configurable password requirements are as follows:

- Password length (0 to 20 characters)—No restriction is enforced if you enter 0.
- Minimum number of lowercase characters (0 to 6)—No restriction is enforced if you enter 0.
- Minimum number of uppercase characters (0 to 5)—No restriction is enforced if you enter 0.
- Minimum number of numerals (0 to 4)—No restriction is enforced if you enter 0.
- Minimum number of other characters (nonalphanumeric; 0 to 3)—No restriction is enforced if you enter 0.

Changing a User Password

A speical procedure is required to change a user's password because the CTP OS is installed on a flash drive that normally operates in a read-only state. The flash drive must be made writable during the user account password modification process. Only the root user is allowed to make the flash drive writable. See *Appendix B, CTPView Troubleshooting and Recovery* for details.

These steps must occur to change a user's password:

1. The root user makes the flash drive writable by entering **mfw** at the CLI.
2. The user logins to the CTP, following the prompts to select a new password.
3. When the user has successfully changed his password, the root user makes the flash drive read-only by entering **mfr** at the CLI.

NOTE: For users who employ the utility SecureCRT to ssh into the CTP, the Authentication method on SecureCRT must be changed from the default setting of Password to Keyboard Interactive. Not doing this prevents the password prompts originating at the CTP from reaching your display and the password update procedure fails.

Secure Log Management

The secure log provides an audit trail of user and administrator activity on the CTP system. Figure 67 shows the Secure Log Management submenu, which you access from the CLI Security Profile menu > Option 3. You can view the log by selecting Option 1—Scan/view log entries. Use the Page Up and Page Down keys to move through the log; press q to exit the log view. You can view the secure log in real time when you select Option 2—Follow log entries. Enter ^c to terminate the real-time view and return to the submenu.

Options 3 and 4 allow you to copy the secure logs to a remote host or to configure a host for remote logging. Option 5 shows the remote logging configuration.

Figure 67: Secure Log Management Submenu

```
Please choose a menu item from the following list:
0) Return to main menu
1) Scan/view log entries
2) Follow log entries
3) Copy logs to remote host
4) Configure remote logging options
5) Show remote logging configuration

Please input your choice [1]:
```

Login Banner

You can configure the login banner by selecting Option 4—Change login banner—which you access from the CLI Security Profile menu. The banner can have multiple lines, up to 80 characters. The input is complete when you enter a blank line. Figure 68 shows an example of changing the login banner.

Figure 68: Login Banner

```
Main Configuration Menu

Please choose a menu item from the following list:
0) Exit to shell
1) User Management
2) Password Management
3) Secure Log Management
4) Change login banner

Please input your choice [1]: 4
In order to input a banner message to be displayed to users before they
log in, you will be asked to input alphanumeric text at the keyboard.

Would you like to continue? [n] y
Input your text, 80 characters to a line. Enter a blank line when you are
finished.
CTP Security Banner
Lab Test Unit
```

Part 2

CTPView Server Installation and Configuration

Chapter 6

Installing the Software and Configuring Security Settings

The chapter describes how to install, manage, and configure CTPView and configure security features. The chapter contains the following sections:

- Overview on page 127
- Schemes 1 and 3—Installing or Upgrading the CTPView Server Operating System on page 129
- Scheme 2—Upgrade CTPView Software Only on page 132
- Scheme 4—Configuring Administrative Settings on page 134

Overview

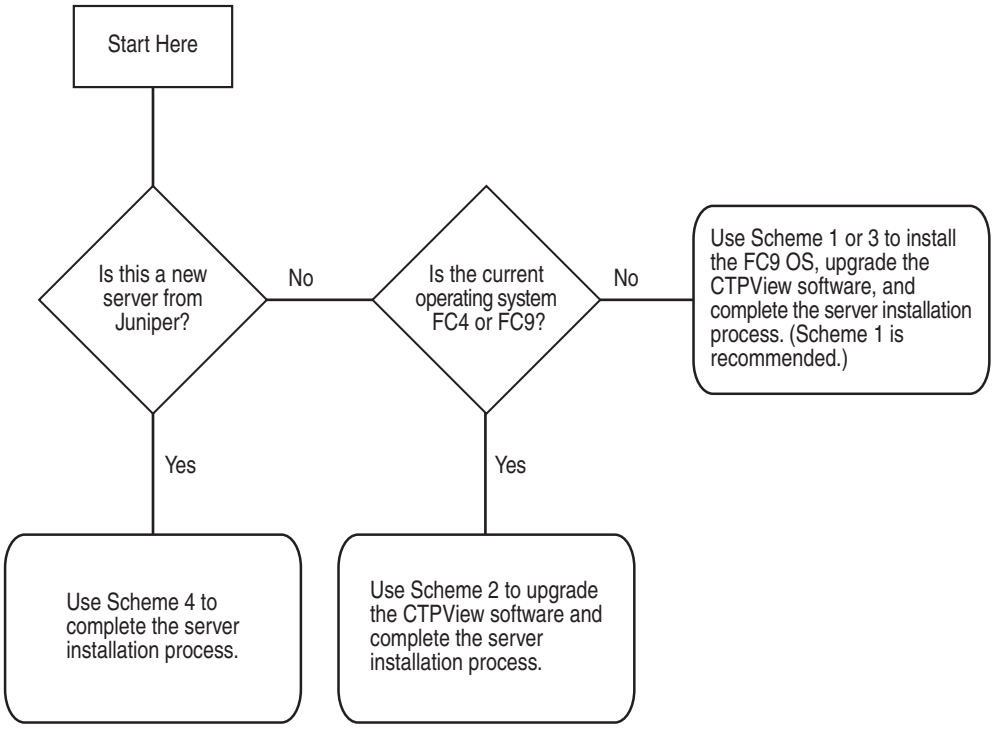
All existing CTPView servers can upgrade to this CTPView release. However, your upgrade procedure will differ depending on your existing operating system (OS). This release of CTPView is compatible with CTPOS versions 5.2 and earlier.

CTPView version 2.2R2 introduced a new security-enhanced user login interface. To upgrade to the current release, your CTPView server must be running either Fedora Core 4 (FC4) OS or Fedora 9 (FC9) OS. Additionally, enabling all of the security updates requires that certain server settings be configured by an administrator as part of the installation process.

If the CTPView server you have is a Dell PowerEdge server, it was delivered with FC4 or FC9 OS already installed. Delivery of FC4 units started in November 2006 and delivery of FC9 units started in September 2008. Servers shipped before November 2006 were built with FC1 OS installed.)

See Figure 69 on page 128 to determine which scheme you should follow to get your server ready for use.

Figure 69: CTPView Server Configuration Flowchart



Scheme 1—Install FC9 OS and CTPView Software

This procedure can be used for any system. The new installation of the operating system reformats the server hard drives and deletes all existing data and settings. The advantage to this method is that your server is left in a stable known state, with all of the security-related features enabled. The main steps are:

1. Saving existing server configuration and data.
2. Performing a new installation of FC9 OS.
3. Installing the current CTPView software.
4. Restoring the saved server configuration and data.

Scheme 2—Upgrade CTPView Software Only

This option is only for servers already running FC4 or FC9 OS.

Scheme 3—Upgrade to FC9 OS and CTPView Software

This option can be used for any system. The steps are similar to Scheme 1, but the hard drive is not reformatted. The main steps are:

1. Saving existing server configuration and data.
2. Upgrading the existing OS to FC9.
3. Installing the current CTPView software.

Only if there is a loss of data or a configuration error will you need to restore the saved configuration and data.

Scheme 4—Configure Administrative Settings Only

This option is for new Dell servers that are delivered with CTPView version 3.2R1 or later software already installed.

Schemes 1 and 3—Installing or Upgrading the CTPView Server Operating System

Use the guidelines in the following sections for Schemes 1 and 3.

Requirements

- CTPView server built according to Juniper Networks specifications
- CTPView Management System for Fedora 9 CDs for the current software version (disks 1–3)
- Monitor, keyboard, and mouse connected to server
- Ethernet connection to the network
- External storage device for saving the current CTPView data and settings

For FC1 servers, you must upgrade the CTPView software to at least version 2.1R2 if you want to back up your existing configuration and data before upgrading the server operating system. The upgrade is necessary to utilize the backup utility described in the next step.

The last released version of software that supports FC1 servers is 2.1R3. Install the required CTPView software before proceeding, and follow the separate installation instructions appropriate to the release version you will be installing.

If you are upgrading the CTPView software from a version earlier than 2.0.4R1, after upgrading you may need to update the server ethernet settings. Use the CLI menu: System Configuration > Display Current Configuration. Make any required modifications from within the CLI menu.

Saving Current Data and Settings to External Storage Device

Using the CTPView Data Backup Utility

Run the CTPView data backup utility from the CLI menu: Backup Functions > Save Current Settings and Data. The utility works for all systems.

The remote storage device can use any operating system; however, the backup utility function will automatically transfer the backup file only to a remote Unix-like system. A network path needs to exist between the upgrading server and the remote storage device being used for storing the backup file. If your remote storage computer is not running a Unix-like operating system, you will need to transfer the file with a copy utility compatible with that operating system.

Before running the backup utility, the hard drive on the upgrading server must have at least 25% free space. You can view the server's current usage from within CTPView. Go to the Server Diagnostics pane, and look in the Mounted Filesystems section.

You can create additional free space on the hard drive by deleting old data files. There is an automatic CTPView function for this. In the CTPView navigation pane, click **Server > Administration**. the Administrative Functions pane appears. Click **Automatic Functions**. There are three options to choose from: older than 6, 9, or 12 months. If the amount of free space on the hard drive is less than 25% when the backup utility is run, the utility will prompt you to delete more old data files before continuing.

Using Server Synchronization

Ensure that there has been a recent data synchronization. Use the Manual Synchronization function if an update is necessary. From the Administrative Functions window, click **Server Synchronization**. The button to start the processes is in the Server Synchronization pane of the primary server. The server synchronization works only with two or more CTPView servers.

After the synchronization is complete, be sure to isolate the server being upgraded from the synchronization function of other CTPView servers. From the Server Synchronization pane of the server to be upgraded, set the Server Type to Primary Server.

Note that some functions in the Server Synchronization pane are not available if you are accessing the pane by means of a management console. You must connect to the CTPView server using the Ethernet connection to be able to interact with the utility.

Installing or Upgrading Operating Systems

Working from the monitor and keyboard connected to the upgrading server, insert the CTPView Management System for Fedora 9 CD #1 into the CD-ROM drive. Reboot the server by using the CLI: System Configuration > Reboot System.

The boot process stops at the Juniper CTPView Management System window. You have the choice here either to install a new instance of Fedora 9 or to only upgrade the existing operating system to Fedora 9. A new installation will reformat the hard drives and give you a conforming instance of the operating system.

At the bottom of the screen type either ctpview-install or ctpview-upgrade at the prompt for boot, and then press Enter.

The operating system update begins. On some early hardware systems a RAMDISK error may be reported at the beginning of the upgrade process. If this occurs, you must reboot the system using the power switch, leaving disk #1 in the CD-ROM drive. After the hard restart, at the "boot:" prompt type mediacheck, and then press Enter. The response will be "Could not find kernel image: mediacheck"; the "boot:" prompt will be reprinted. Now retype ctpview-install or ctpview-upgrade, and press Enter. The upgrade process should proceed normally.

When the upgrade process is complete, remove the last CD from the CD-ROM drive.

NOTE: Using the CTPView Management System CDs automatically installs the CTPView software on the system.

Restoring Configuration Settings and Data

This step is required if you installed a new instance of the FC9 OS. If the existing operating system was only upgraded, this step is necessary only in the unlikely event of data loss.

Using the CTPView Restore Utility

On the upgraded server, use the CTPView restore utility from the CLI menu by choosing Backup Functions > Restore Settings and Data. The utility works for all systems.

Before starting the restore utility, place the file that contains the data backup in the /var/www/html/acorn/data directory of the upgraded server.

The filename will be in this format: ctpview_data_ < hostname > _ < date > .tgz

Using Server Synchronization

The server synchronization works only with two or more CTPView servers. On the upgraded server, go to the Server Synchronization pane, and verify that the server is not listed or its Server Type is set as Not Selected.

On the CTPView server with the intact data (the primary server), go to the Server Synchronization pane. Set the upgraded server as Server Type Secondary Server, the primary server as type Primary Server, and any other listed server as type Not Selected.

Click **Manually Synchronize Network**. A new window opens. In the new window, click **Select All Hosts**, and then click **Synchronize Servers**.

After the synchronization program finishes, restore the Server Type selections for all servers to the values normally used for your network.

Review the Installation Log for Errors

From the command prompt, open the file /var/log/ctpview_autoinstall.log. This file has the log of all CTPView installations and upgrades beginning with version 2.1R1.

Find the beginning of the latest upgrade. There should be no unresolved errors reported.

Administrative Configuration Modifications

Follow the steps detailed in the section Scheme 4—Configuring Administrative Settings on page 134 to complete the setup of the server and ensure that the new security enhancements are properly set.

After completing that section return to this point and continue with the next step.

Verifying That the Operating Stem Was Successfully Upgraded

To verify whether the upgrade has been successful:

1. In CTPview, go to the Server Diagnostics pane.
2. In the System Vital section, verify the following information:
   - Kernel Version: 2.6.25-14.fc9.i686
   - Distribution Name: Fedora release 9 (Sulphur)

The system information above can also be found in the heading on the CLI menu pages.

Validating the System Configuration

From the Server Diagnostics pane, click **Validate Server Configuration**. All items should be set to default values. For any highlighted items, follow the supplied directions to correct the problem.

NOTE: Upgrading from a pre-2.2 version of CTPView to the current software does not change the existing server passwords or accounts except to add the user account “juniper”. However, all the existing pre-2.2 CTPView user accounts are removed. Browser access to the CTPView is through a new login interface, which requires that an administrator create new usernames and passwords.

Scheme 2—Upgrade CTPView Software Only

For a successful installation, please follow the directions carefully. You can download updates from the CTP Support site at

https://www.juniper.net/customers/csc/software/ctp/

To install new software, you need the:

- Root account password
- Operating system version (FC1, FC4, or FC9)
- CTPView software version that is currently running on your system

To find this information:

1. Log in to the server CLI and type the command uname -r. If the output starts with:
   - 2.4, the operating system is FC1.
   - 2.6.11, 2.6.16, or 2.6.17, the operating system is FC4.
   - 2.6.25, the operating system is FC9.
2. To locate the current software version, open CTPView, and look in the header section of the page under the time.

For Systems with FC1

Because this release is supported only by FC4 or FC9 systems, you will need to follow the steps described in "Schemes 1 and 3—Installing or Upgrading the CTPView Server Operating System" on page 129.

For Systems with FC4 Running CTPView 2.2R1 or Earlier

Follow these steps:

1. Copy the archive file labeled "..._complete_.." to the /tmp directory on the server. The file name is in the format

   ctpview_fc4_complete_<version>_<date>.tgz

2. Extract the archive by typing tar -xzvf < filename > .
3. Run the installation script by typing the command /tmp/upgrade while logged in as root.
4. Complete the steps in the section Scheme 4—Configuring Administrative Settings on page 134 to complete the setup of the server and ensure that the new security enhancements are properly set.
5. To validate the system configuration, in CTPView click **Server > Server Diagnostics**, and then click **Validate Server Configuration**.

For Systems with FC4 Running CTPView 2.2R2 or Later

Follow these steps:

1. Copy the archive file labeled **web** to the /tmp directory on the server. The file name is in the format

   web_fc4_<version>_<date>.tgz

2. Run the installation script by typing the command upgrade while logged in as root.

3. To validate the system configuration, in CTPView click **Server > Server Diagnostics**, and then click **Validate Server Configuration**.

NOTE: Upgrading from a pre-2.2 version of CTPView to the current software does not change the existing server CLI passwords or accounts except to add the user account juniper. However, all the existing pre-2.2 CTPView browser user accounts are removed. Browser access to the CTPView is through a new login interface, which requires that an administrator create new usernames and passwords.

For Systems with FC9 Running CTPView 3.2R1

Follow these steps:

1. Copy the archive file labeled **web** to the /tmp directory on the server. The file name is in the format

   web_fc9_<version>_<date>.tgz

2. Run the installation script by typing the command upgrade while logged in as root.

3. To validate the system configuration, in CTPView click **Server > Server Diagnostics**, and then click **Validate Server Configuration**

Scheme 4—Configuring Administrative Settings

If you have received a new Dell PowerEdge CTPView server or have upgraded your existing server, you must perform some additional configuration before using the system. To initialize the server for first use, complete the following tasks:

- Rack-Mounting the CTPView Server on page 135
- Connecting a Management Console on page 135
- Connecting an Ethernet Cable on page 135
- Powering On the CTPView Server on page 135
- Changing the BIOS Menu Password on page 135
- Changing the Server's Default User Account Password on page 136
- Changing the Server's Root Account Password on page 136
- Changing the GRUB Boot Loader Password on page 136
- Changing the MySQL Apache Account Password on page 137
- Changing the MySQL Root Account Password on page 137
- Configuring the Network Access on page 137
- Creating a Self-Signed Web Certificate on page 138

- Updating the CTPView Software on page 138
- Logging In with a Browser on page 138
- Changing the CTPView Default User Account Password on page 138
- Creating a New Global_Admin Account on page 139

For information about which procedure to use to upgrade the software or operating system for a working CTPView server, see Figure 69 on page 128.

Rack-Mounting the CTPView Server

Follow the steps in the *Rack Installation Guide,* which came packed with your CTPView Server to install the server in a rack.

Connecting a Management Console

Connect a monitor and keyboard to the appropriate ports on the server. You may also connect a mouse or make a connection using a HyperTerminal utility on another device. The server's serial COM1 port connection is configured with these settings:

- Speed—9600 bps
- Data bits—8
- Parity—none
- Stop bits—1

Connecting an Ethernet Cable

Insert an Ethernet cable (RJ-45) connector into the 10/100Base-T (RJ-45) port labeled 1 until it clicks into place. Connect the other end of the cable to the appropriate Ethernet network.

Powering On the CTPView Server

Verify that the power source is operational and turned on. Inspect all grounding and power connections to the server chassis. Confirm that all connections are secure. Switch the power switch to ON, and monitor the LEDs on the front panel to verify that the system is booting properly.

Changing the BIOS Menu Password

For security purposes, change the default password for BIOS menu access. There is no username associated with this account.

During the boot process, while the Dell logo is displayed on the monitor, press F2. The boot process continues, displaying several messages on the screen. Wait until the process pauses and displays “Enter Setup Password.” Enter the default password to continue. See *Appendix C, Default CTPView Accounts and Passwords*.

When you have gained access to the BIOS menu, highlight the line **System Security**, and press Enter. Highlight the line **Setup Password**. (Make sure that you have not selected System Password.) Press Enter, and type your new BIOS password. Press Enter, and then reenter your new password. Press Enter to continue.

Press the Esc key. In the pop-up window highlight the line Save Changes and Exit, and press Enter. The system will now restart.

NOTE: Good security practice requires that the BIOS menu password be changed at least yearly or upon administrator reassignment.

Changing the Server's Default User Account Password

For security purposes, change the default password for the server's default user account.

Using the management console, log in as the default user. For the default account username and password, see *Appendix C, Default CTPView Accounts and Passwords*. Note that logging in using the root account is not allowed.

After successfully logging in as the default user, type passwd at the command line prompt. You will be prompted to select a new password. Alternatively, you may choose to delete the default user account at the conclusion of this configuration process.

CAUTION: Do not delete the default user account until after you have created another user account. Otherwise, you will not be able to log in to the server.

Changing the Server's Root Account Password

For security purposes, change the default password for the server's root user account.

After logging in as a non-root user, switch to the root user account. For the default root account password, see *Appendix C, Default CTPView Accounts and Passwords*. At the command prompt type su - and then enter the password when prompted.

After successfully logging in as the root user, type passwd at the command line prompt. You will be prompted to select a new password.

NOTE: Good security practice requires that the root account password be changed at least yearly or on administrator reassignment.

Changing the GRUB Boot Loader Password

For security purposes, change the default password for the GRUB Boot Loader menu.

Using the management console, log in as the default user, and then switch to the root user account. At the command prompt type menu. The CTPView Configuration Menu utility will open. Make a note of the CTPView version number displayed in the heading. You will need it later when checking for upgrades.

Select Option 8 (GRUB Functions). Then select Option 1 (Change GRUB password), and follow the prompts.

NOTE: Good security practice requires that the GRUB Boot Loader password be changed at least yearly or on administrator reassignment.

Changing the MySQL Apache Account Password

For security purposes, change the default password for the MySQL server Apache user account.

Using the management console, log in as the default user, and then switch to the root user account. At the command prompt type menu. The CTPView Configuration Menu utility will open.

Select Option 6 (MySQL Functions). Then select Option 2 (Change MySQL Apache password), and follow the prompts.

NOTE: Good security practice requires that the MySQL Apache password be changed at least yearly or on administrator reassignment.

Changing the MySQL Root Account Password

For security purposes, change the default password for the MySQL server Root user account.

While in the main screen of the menu utility, select Option 6 (MySQL Functions). Then select Option 1 (Change MySQL Root password), and follow the prompts.

NOTE: Good security practice requires that the MySQL root password be changed at least yearly or on administrator reassignment.

Configuring the Network Access

While in the main screen of the menu utility, select Option 2 (System Configuration). Answer y to continue. Select Option 1 (Display Current Configuration). Use Options 2 through 5 to configure the server to operate on your network. Exit the submenu to implement your changes.

Creating a Self-Signed Web Certificate

While in the main screen of the menu utility, select Option 4 (Advanced Functions). Then select Option 4 (Reset CTPView Self-Signed Certificate). Answer the list of questions that will be displayed. When asked for the Common Name, enter the IP address of the server. Otherwise, at login your users' browsers will report a domain name mismatch when users connect to the server. In any event, the browser connection will be successfully completed.

Updating the CTPView Software

From a computer with access to the Web, use a browser to connect with the Juniper CTP Support site at

https://www.juniper.net/customers/csc/software/ctp/

You need your Juniper support username and password to access this site. If an update to the CTPView software is available, download the new archive along with the release notes. Your current CTPView version is listed in the header of the CLI menu utility.

After reviewing the release notes, see Scheme 2—Upgrade CTPView Software Only on page 132 to install a newer version of the CTPView software on the server. Then return to this point, and continue with the remaining steps below.

Logging In with a Browser

In the address bar of a browser enter the address

https://<your server IP address>

Your browser then issues a warning that the security certificate presented by the website was not issued by a trusted certificate authority. Make the selection to accept the certificate, and continue.

The CTPView login page will load. Log in as the default CTPView user. For the default account username and password, see *Appendix C, Default CTPView Accounts and Passwords*.

Changing the CTPView Default User Account Password

For security purposes, change the default password for the CTPView default user account.

Click **Edit My Account**. Enter the new password. For help in determining acceptable passwords, click **Password Help**. Return to the login screen by clicking **Return to Login Page**.

Creating a New Global_Admin Account

The new security-enhanced CTPView interface introduced with version 2.2R2 allows only one active session per username. If a second user were to attempt to log in using the same username in an active session, both clients' IP addresses and the username would be locked out from access for a preset lockout period. It is therefore imperative that each user have his or her own account and that the default user account not be used for normal access.

After logging into CTPView using the Juniper Networks user account, click **Admin Center**.

Add a new user account for yourself. Make sure that the user level is set to Global_Admin in order to access the CTPView User Administration Center.

After creating a new Global_Admin user account, log out of CTPView. Then log in using your new user account.

Part 3

CTPView Server Functions

Chapter 7

CTPView Administration Center

The chapter describes the CTPView Administration Center. It contains the following sections:

- Overview on page 143
- Accessing the Admin Center on page 144
- Navigating Within the Admin Center on page 144
- Setting Global CTPView Access on page 144
- Admin Center Option Descriptions on page 144

Overview

CTPView version 2.2R2 introduced a new security-enhanced login interface. There are now three user levels:

- Net_View—Users belonging to this class are restricted to query-only access to CTP systems. This class was previously referred to as query-only.
- Net_Admin—Members of this user level are able to configure CTP systems; however, they do not have the ability to create or modify CTPView user accounts. This class was previously referred to as administrators.
- Global_Admin—This is a new user class. These users have all the privileges of the Net_Admin class. They are also able to create and modify user accounts.

Net_View and Net_Admin users will see a few new features. The significant ones are a new login dialog, a browser interface to change their own password, the ability to log out of CTPView, and more secure password requirements. These changes do not affect the appearance or functionality of the CTPView query or provisioning interface that previous users are accustomed to.

Each CTPView user has a profile that describes his or her privileges and restrictions, referred to here as user properties. For convenience, users are assigned to user groups. These groups have a set of default user properties that are transferred to new users; however, Global_Admin users can modify any of the user properties on a per-user basis.

Accessing the Admin Center

Only members of the new user class Global_Admin have access to the Admin Center, where CTPView user and password profiles are managed. After your successful login to CTPView, the window will display four buttons, one of which is labeled Admin Center. Click it.

Navigating Within the Admin Center

In the header of the Admin Center screen is a row of category names: Users, Groups, Prohibit, Delete, Passwords, Login/Logout and Display All.

Display All is a special case. Clicking it will show all option dialogs in a single window. This view is useful if you do not know under which category the option you are looking for is located.

Hovering your mouse over any of the other category names displays its subcategories or options. You can then click on the option to open its dialog box. Alternatively, you can click on the major category link, which displays all its subcategories in a single window.

Setting Global CTPView Access

Global_Admin users can block or reinstate global browser access to the CTPView server. When access is allowed, which is the default setting, a green button is prominently displayed at the top of the Admin Center that contains the text ACCESS To CTPView Is Allowed. Clicking this button toggles the option to deny access after the user confirms his or her choice. The button background changes to red, and the text reads ALL ACCESS To CTPView Is BLOCKED. Clicking the button again restores access.

Admin Center Option Descriptions

See Table 6 for a description of all Admin Center options.

Table 6: Admin Center Options

Option	Description
Active Users	This is a view-only table that lists all users who are logged into CTPView. In addition to the username, the user browser's IP address is listed, along with the time the browser session began, the time of last activity, and the current period of inactivity.
All Users	This is a view-only table that displays all users who are in the CTPView user database. Also listed is each user's group affiliation, the user level, and the time of last login.

Table 6: Admin Center Options (continued)

Option	Description
Add New User	Use this dialog box to add new CTPView users. You are required to type the new username, assign the new user to an existing user group by selecting from a list, and create a user password. The password requirements are displayed when you click the link **Password Help**. The new user is required to change this initial password the first time he or she attempts a login. The username requirements for length are a minimum of 6 characters and a maximum of 30. The allowed characters are the same as for passwords: either alphanumeric or the characters @ { } # % ~ [ ] = & , - _ ! The new user is then assigned the default user properties of the group you selected. If you wish to alter the particular user's properties, use the Modify User Properties option after creating the new user.
Modify User's Group Affiliation	We expect that user groups will be used to group users who share a common set of user properties; however, shared properties are not a requirement. User groups can be used simply to label a set of users irrespective of their individual user properties if that suits your particular situation. To change the group a user belongs to, select the username and group from the drop-down lists, and click **Update Group**. Changing group affiliation does not alter the current user properties of the user.
Modify User Properties	When you select a user from the drop-down list, the current user properties for that user are displayed. You can then change any of the user properties by using the drop-down menu for each property. The property labels are self-explanatory. The No Access Date property is a special case. When you enter a date here, the user's access will be blocked as of that date. This option overrides all other properties.
All Groups	This is a view-only table that displays all groups and the associated default user properties for its members. Note that any individual member can have user properties that are different from the default values.
Add New Group	We expect that user groups will be used to group users who share a common set of user properties. However shared properties are not a requirement. User groups can be used simply to label a set of users irrespective of their individual user properties if that suits your particular situation. Enter the new group name, and select a default user level from the drop-down menu. The new group will be assigned the following default property values: ■ Max Days Between Logins—30 ■ Min Password Age Before Change—1 ■ Max Valid Password Age—60 ■ Days Before Expire Start Warning—7 ■ Days Before No Access After Expire—14 Use the Modify Group Properties option if you wish to change these default values. The group name requirements for length are a minimum of 6 characters and a maximum of 30. The allowed characters are the same as for passwords: either alphanumeric or the characters @ { } # % ~ [ ] = & , - _ !

Table 6: Admin Center Options (continued)

Option	Description
Modify Group Properties	When you select a group name from the drop-down list, the current default user properties for that group are displayed. You can then change any of the user properties by using the drop-down menu for each property. The property labels are self-explanatory. The No Access Date property is a special case. When you enter a date here, the user's access will be blocked as of that date. This option overrides all other properties. Changes made to the group default user properties will not affect current members of the group unless you select **Update current members** before clicking **Update Group Properties**.
Current Prohibited Users	This is a view-only table that displays all users who have been manually added to this category. For each member of this list, the followng information is also displayed: the time added to this category, by whom, and the last time CTPView was accessed.
Designate Prohibited User	Individual users can be blocked from accessing CTPView for an indefinite period. Select the user from the drop-down menu, and click **Add Prohibited User**.
Reinstate Prohibited User	Select the user from the drop-down menu, and click **Reinstate Prohibited User**. The user will be removed from the prohibited list. However, if the user is excluded from access to CTPView due to some other cause, such as an expired password, those restrictions are still in effect.
Delete Prohibited User	Delete a user on the prohibited list from the CTPView user database.
Delete User	Delete a user from the CTPView user database. If the user is on the Prohibited User or the Inactive User List, the username will not appear here. To remove those users, go to the delete option for those categories.
Delete Inactive User	Delete a user on the Inactive list from the CTPView user database.
Delete Group	Delete a user group and all of its members. If the group has members, you will be asked to confirm your desire to delete all the users belonging to the group before the request is executed.
Re-Use Password Limit	When a user changes a password, he or she is prohibited from reusing a password before using a certain number of new passwords. This option sets the number of new passwords that must be used before a reused password is allowed.
Excluded Passwords	The administrator can create a list of passwords that are not allowed. Use this option to add or remove words from the excluded list.
Modify Password Requirements	The required password properties can be modified here. Parameters that can be specified are minimum length, maximum length, minimum number of lowercase letters, minimum number of uppercase letters, minimum number of digits, and minimum number of other characters. Changes do not affect existing passwords.
Logout Users	Any active user, including oneself, can be logged off the system.
Auto Logout	This option sets the allowed period of inactivity of a logged-in user after which time the user will be logged out automatically.
Lockout Period	When a user exceeds the allowed failed login attempts or tries to open multiple CTPView sessions from unique IP addresses, the user will be locked out of accessing CTPView for the lockout period. This option sets the lockout period.
Login Limit	This option sets the number of allowed failed login attempts before a user is locked out. The user lockout is effective for the lockout period.

Table 6: Admin Center Options (continued)

Option	Description
Clear Counters	Two counters are associated with each user. One counter is the number of failed login attempts. This counter is automatically reset to zero after a successful login. The other counter is the number of reminders that a user receives to change his or her password. This counter is automatically reset after the user has selected a new password. If a counter exceeds the allowed limit, the user is locked out of CTPView access. Use this option to restore access by manually resetting the counters to zero.
UnLock IP	When a user attempts to access CTPView with a currently active username from a second IP address, the username and both IP addresses are locked out for the lockout period. You can remove the IP addresses from the list.
IP Access Filter	The IP address of the user's browser can filter access to CTPView. The default setting is to allow access from any IP address. Defining a new filter is a two-step process 1. Specify an IP address or range of IP addresses. 2. Choose whether to allow or deny the specified address or range. You can define multiple filters, In case of conflict, a rule to deny will override one that allows an IP address. With this option, you can also remove filters from the set of rules.

Chapter 8

Support for CTP Features

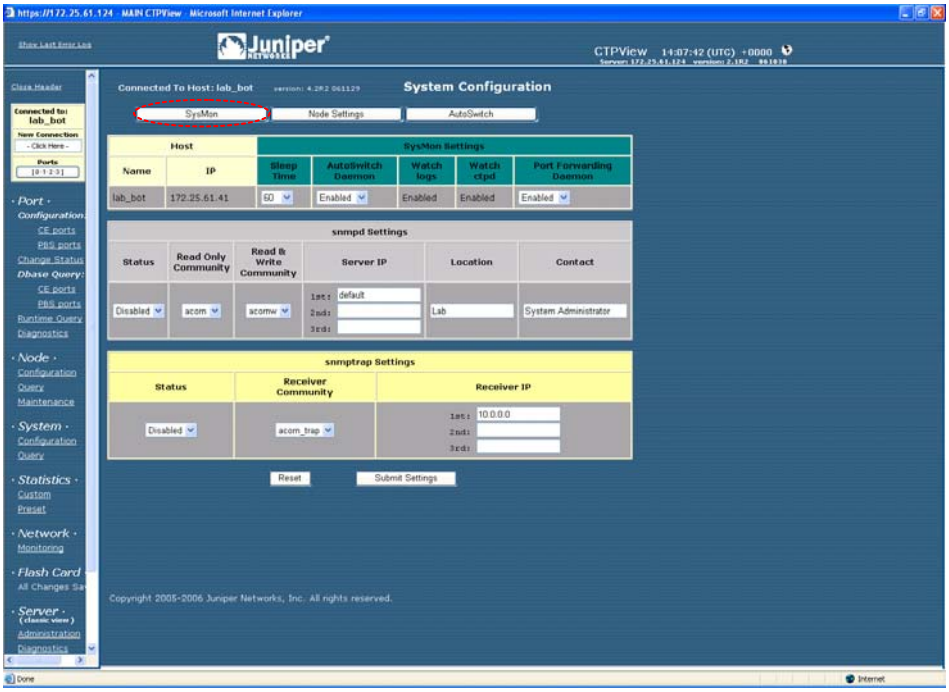
The chapter describes additional features of the CTP operating system. It contains the following sections:

- SysMon on page 150
- Node Settings on page 151
- AutoSwitch on page 152
- Virtual IP Designation for CTP Systems on page 154
- Autobaud Support on page 154
- DTE Interface Support on page 155
- Hardware Monitoring on page 155
- IPv6 Support on page 155
- PWE3 Support (SAToP) on page 155
- Transparent Mode Support on page 156
- VLAN Support on page 156
- Support for Multiple Ethernets on CTPs on page 156
- Packet-Based Serial (PBS) Port Configuration on page 157

SysMon

You can configure the CTP system to monitor critical software daemons by providing AutoSwitch and Port Forwarding capabilities. When these functions are enabled, the system will automatically regenerate these processes if they fail unexpectedly. In addition to SysMon settings, you can use the SysMon window to configure SNMP and SNMP trap settings, as shown in Figure 70.

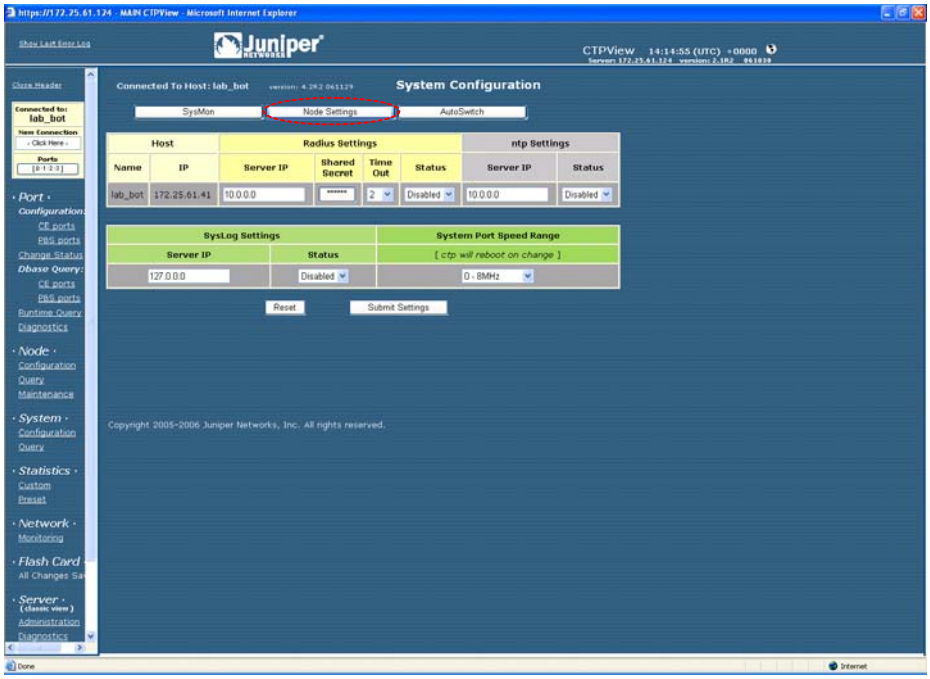
Figure 70: SysMon Configuration Window



Node Settings

The Node Settings window allows you to configure RADIUS, NTP, and system logging (syslog) settings (Figure 71). You can also configure the CTP port speed range if applicable to the CTP system.

Figure 71: Node Settings Configuration Window

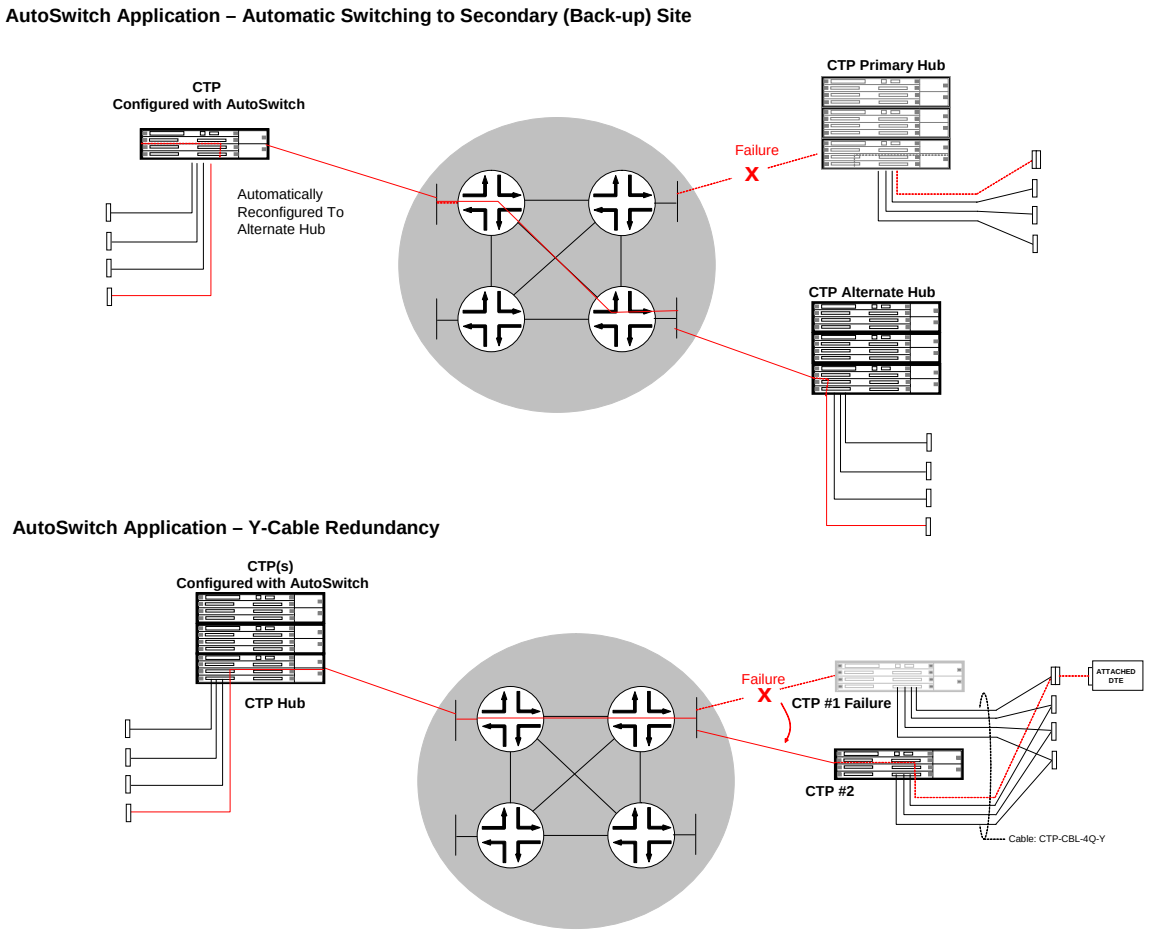


AutoSwitch

The CTP AutoSwitch feature monitors the status of a circuit connection, and will reconfigure the remote port to an alternate port if the circuit fails to operate. You configure AutoSwitch using CTPView. AutoSwitch is generally used for one of two applications, as shown in Figure 72. The first application is the automatic switching of circuits from a primary hub site to an alternate hub site in the event of a failure. Automatic switching allows communications to be quickly restored in the event of a major site outage, as might occur with a power failure.

The second application is switching a circuit between two redundant CTP systems connected by a Y cable. This redundancy feature quickly restores communications when a system is not reachable or has failed, and is especially valuable at locations that do not have maintenance personnel or spares.

Figure 72: AutoSwitch Applications



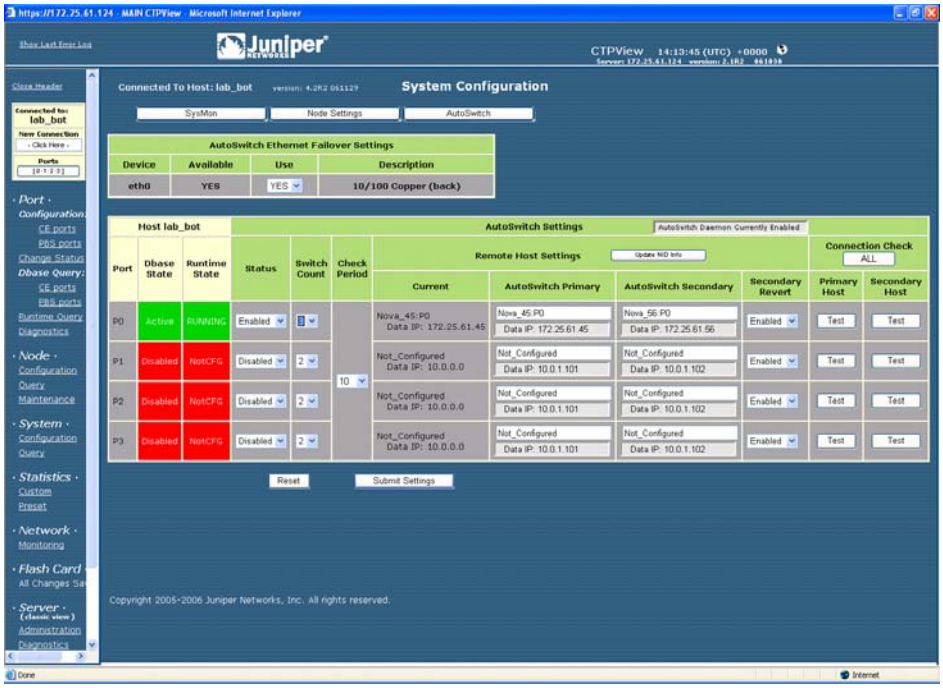
You access the Autoswitch configuration window by selecting the AutoSwitch button in the System Configuration window (Figure 73 on page 153). The configurable Check Period value is the time period between the checking of ports to determine the circuit status. You can configure this value to 3, 5, 10, 15, 20, 30, 45, 60, or 120 seconds. You configure the Switch Count value on a per-port basis. Switch Count specifies how many consecutive checks are required without a circuit being

established before the primary port is reconfigured to an alternate port. You must properly configure the alternate port to establish a circuit connection to the AutoSwitch port; AutoSwitch will not configure the alternate port. You can set the Switch Count value to 1, 2, 3, 4, or 5. We recommend that Switch Period and Switch Count be configured to values that prevent the circuit from switching in the event of a short transient outage.

You can configure the CTP system to periodically check the connectivity to the AutoSwitch primary port after a switch to the alternate. Setting the Secondary Revert value to Enabled allows the CTP system to reconfigure the port back to the primary when it is available.

You can verify the connectivity between a CTP port running AutoSwitch and its primary and secondary remote ports by using the Primary and Secondary Host Test buttons. When selected, the button will change to Testing while the system is checking connectivity. The results of the test will show Success with a green background or Failure with a red background. When you click **Connection Check All**, the system checks the connectivity to all primary and secondary hosts, and updates the display with the results.

Figure 73: CTPView AutoSwitch Configuration Window



Virtual IP Designation for CTP Systems

Creating and selecting CTP virtual IP addresses are now separated into two distinct operations.

To create the virtual IP addresses that will be associated with a CTP system, click **Node > Maintenance > Configure [CTP] Virtual IPs**. Follow the simple instructions at the top of the pane. You can create a maximum of 56 virtual IP addresses. All current virtual IP addresses are shown. The system checks new IP addresses for proper format before submission.

To designate a source virtual IP when you configure a remote port, select the virtual IP from a drop-down menu by clicking **Port > Configuration > Advanced Settings** and then selecting **Source Virtual IP**.

Autobaud Support

Autobaud configuration depends on your first configuring a circuit to work properly in an adaptive clocking configuration. You can use many methods to configure the clocking that will allow adaptive clocking to work properly. Generally, however, you must configure one end to generate packets in the net-bound direction using the TT (user) clock, and then you must configure the other end for adaptive clocking.

From Port > Configuration, you can then switch this circuit over to Autobaud:

- On the adaptive end, set DDS Synthesizer Source in the custom clocking menu from Adaptive to Autobaud. This setting enables the monitoring of OAM packets for the other end TT frequency, and processing to accommodate frequency changes that are detected.

- On the other end, it is important to enable the port advance configuration for Only High TT Checking. This setting keeps the port from going to the TtFail state when the incoming user clock fluctuates, and allows a TT clock in the range of 0 to the configured port rate. However, it does check for the TT rate going above the configured port rate, and will send the port to the TtFail state if it goes above. This process protects the system from an overspeed TT causing problems for the port, CTP system, or network.

It is also important to set the port rate on both ends for the maximum required port operating speed. Although the port will autobaud to any rate between 0 and the configured rate, it will not operate above the configured speed of the port.

DTE Interface Support

In the Port > Configuration window, you can configure a port for DTE Interface mode. In this mode:

- There will be only one “canned” [meaning default?]clock configuration option available, which is DTE, All Clocked by Ext Clk. The other option available is “custom”.
- The labels for the eight signaling parameters and the signaling menu options are labeled for both DCE and DTE encoding. Refer to the correct label when you choose the configuration options. The convention used is to list the DCE label first, followed by the DTE label.

Hardware Monitoring

CTPView does not provide a user interface for displaying sensor data from CTP platforms. You may use SNMP or the CTP CLI to obtain the hardware sensor data.

IPv6 Support

CTPView supports both IPv4 and IPv6 address protocols for CTP products, including the coexistence of both protocols on the same equipment. However, the current CTP operating system does not support some features—such as virtual IP, PWE3 and PBS. They may be supported in later releases.

The CTPView server is IPv6-capable. You configure an Ethernet port through the CLI menu. All ethernet ports are configurable and can have routes associated with them.

PWE3 Support (SAToP)

Structure-Agnostic Time Division Multiplexing (TDM) over Packet (SAToP) configuration appears as Port Configuration options after you have configured the port to use the T1/E1 interface type. You must install a T1/E1 DCARD before the configuration options are visible.

When the SAToP option is set to Enable, the packet size will be set to the default value of 192, and the Clock Option Menu will be set to CTP is Loop Timed. Both of these values may be modified if desired.

SAToP ports use the source UDP port as the circuit identifier. It must be the same on both pseudowire emulation (PE) endpoints and cannot be used by another SAToP port on either PE endpoint. The source UDP port is used instead of the remote port to define the circuit, and the configured remote port is not used during SAToP operation. All other configuration options are the same as those for standard CTP ports that are configured to use the T1/E1 DCARD, including buffer settings, remote node IP address, and clocking options.

Transparent Mode Support

Transparent circuit mode is available only on CTP2000 products and appears as a serial encoding Port Configuration option.

Transparent mode is intended to be used only for DCE NRZ serial circuits (default port configuration). Although it is possible to choose the interface electrical standard (EIA-530A, RS-232, V.35), it is not intended to work in conjunction with any other interface-related configurations (DCARD, encoding, interface mode) and is therefore not supported. Note that the menu interface and CTPView may not disallow these nonsupported configurations, so be careful if you choose these configurations.

BERTs will not work on transparent ports because of the location of the BERT tester in the data path.

Loops may not work on transparent circuits. The serial loop function connects the SD and RD leads of the interface (in the direction specified), and will work only if a transparent circuit actually uses these leads for data transport. You may use the transparent leads for any purpose you see fit.

When you select the TRANS serial encoding option, three additional advanced port configuration options are made available: 16-Bit Jitter Absorption FIFO, Invert FIFO Write Clock, and Invert FIFO Read Clock.

VLAN Support

You configure CTP VLANs through the CLI. CTPView displays all the configured CTP IP addresses (such as ethernet, virtual IP, and VLAN) in its port selection drop-down menus.

Support for Multiple Ethernets on CTPs

Also labeled as network interface devices (NIDs) in CTPView, this information is gathered from several sources. The actual configuration of the CTP interface device is done on the CTP itself. CTPView assembles, stores, and updates this information for display to the user during provisioning of the data circuits.

NID Selection

When in the port configuration process, as part of the Remote Port selection, you are presented with a list of NIDs and their respective IP addresses to choose from as the final step in designating the remote port. To help you identify the current NID/Remote Port pairings, the Remote Port display in the Port Configuration and AutoSwitch Configuration panes now show the IP address of the port along with the hostname.

Updating NID Information

The NID information on CTPView is compiled and updated through these methods:

- When you add a CTP host to the CTPView database, you enter values for the management and default data IP addresses. If the CTP operating system is 4.2R1 + , the CTP system is queried for NID information.
- During the CTPView-to-CTP connection process, if the CTP operating system is 4.2R1 + , the CTP system is queried for all of its NID information.
- You can manually update NID information by clicking **Update NID Info** in the Port Configuration pane on the Remote Port line.

Packet-Based Serial (PBS) Port Configuration

During the CTP connection process, CTPView determines whether the PBS feature is supported on the CTP system. If it is, CTPView will present a modified set of configuration panes. Currently, the CTP 1000 series running CTP operating system 4.2 + supports this feature.

When CTPview is connected to a PBS-capable CTP system, the navigation pane shows submenus for Port Configuration and Port Dbase Query. These submenus are split into two categories: CE ports (the default type) and PBS ports. Because different configuration options are available for these two port types, separate port configuration panes are necessary.

PBS Port Designation

To enable/disable PBS on a port, after making a CTP connection, click the gray **Ports** button inside the blue connection box at the top of the CTPView navigation pane. A configuration pane is displayed.

Not every port on a PBS-capable CTP system is available for designation as a PBS interface. The configuration pane displays which ports are available for PBS selection and what CE/PBS type has currently been assigned to each port.

In the main pane a set of simple instructions explains how to interpret the display and how to modify the current configuration.

Additional links to this CE/PBS configuration pane are in the Port Configuration pane at the top of each column directly under the port numbers.

Port Display Limits

The CE/PBS configuration pane shares its window with the Ports to Display selection panel. The pane contains a set of simple instructions on how to interpret the display and how to modify the current configuration.

You can select a maximum of 4 ports of each type—CE or PBS. When a change in the configuration of CE/PBS Interface Type results in the maximum number of ports to be displayed of any one type to exceed 4, only the first 4 ports of each type will remain selected, starting with port 0. You are notified when this happens. If you want to change this selection, you can use the normal process to modify the selected Ports to Display.

Chapter 9

CTPView Server Management Functions

This chapter describes the administration of the CTPView server, and about using the CTPView to monitor, manage, and maintain CTP systems.

This chapter contains the following sections:

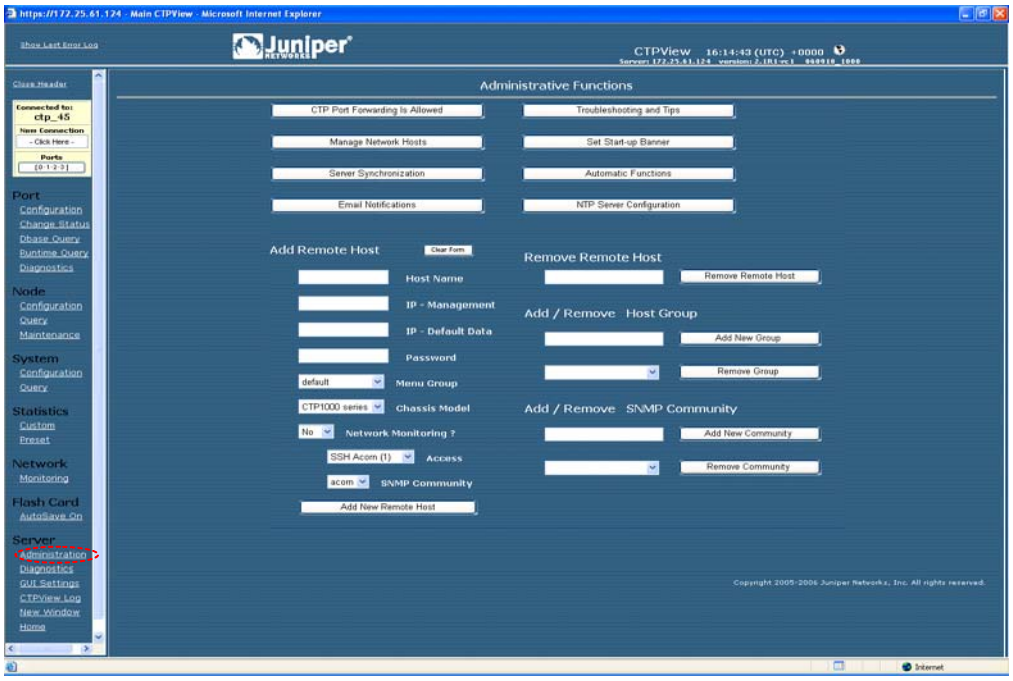
- CTPView Server Administration on page 160
- Adding and Deleting CTP Hosts and Groups on page 160
- Managing CTP Network Hosts on page 161
- Configuring E-Mail Notifications on page 162
- Configuring Automatic Functions on page 163
- Node Maintenance Functions on page 165
- Saving Port, Node, and CTP Configurations on page 166
- Saving Port, Node, and CTP Configurations on page 166
- Formatting Maintenance Reports on page 171
- Network Monitoring on page 172
- Statistics and IP Performance Reports on page 174
- Automatically Saving CTP System Configurations on page 179
- CTPView Connection Throttling on page 179
- Support for Tabbed Browsers on page 180
- Server Configuration Validation on page 180
- SSH Port Forwarding on page 181
- Updating CTP Software Directory on page 181
- Burning CTP Compact Flash Media on page 182
- Network Monitoring on page 182

- AutoSwitch Connection Check on page 183
- Network Host Reports on page 184

CTPView Server Administration

Figure 74 shows the CTPView Administrative Functions window. This window allows you to add and delete CTP hosts and groups, manage and update the configuration of existing CTP hosts, configure e-mail notifications, configure automatic functions, and synchronize CTPView servers. Information about using these functions is provided in the following sections.

Figure 74: CTPView Administrative Functions Window



Adding and Deleting CTP Hosts and Groups

CTPView allows you to create groups that multiple CTP hosts are then logically associated with. The host groups allow easier connection and monitoring of CTP systems, especially as networks become large and complex. Group names can have 3 to 20 characters that include letters, numbers, hyphens, and underscores. The groups and names are created based on your requirements, and are often based on geography or application type. If you do not define a group, then the CTP hosts are placed in the Default group.

The **Connected to** area in the upper left pane provides a good example of how host groups are used. The available groups are first displayed in the window, and then the CTP hosts within the group are displayed after the group is selected. This process makes connecting to a CTP system easier compared with a connect window that lists every CTP host in a large network.

Figure 74 on page 160 shows the area that you use to add a host group and the area that you use to delete a selected group.

NOTE: Deleting a group will delete all the CTP hosts within the group. Use the Network Hosts window to move CTP hosts to other groups before the group is deleted.

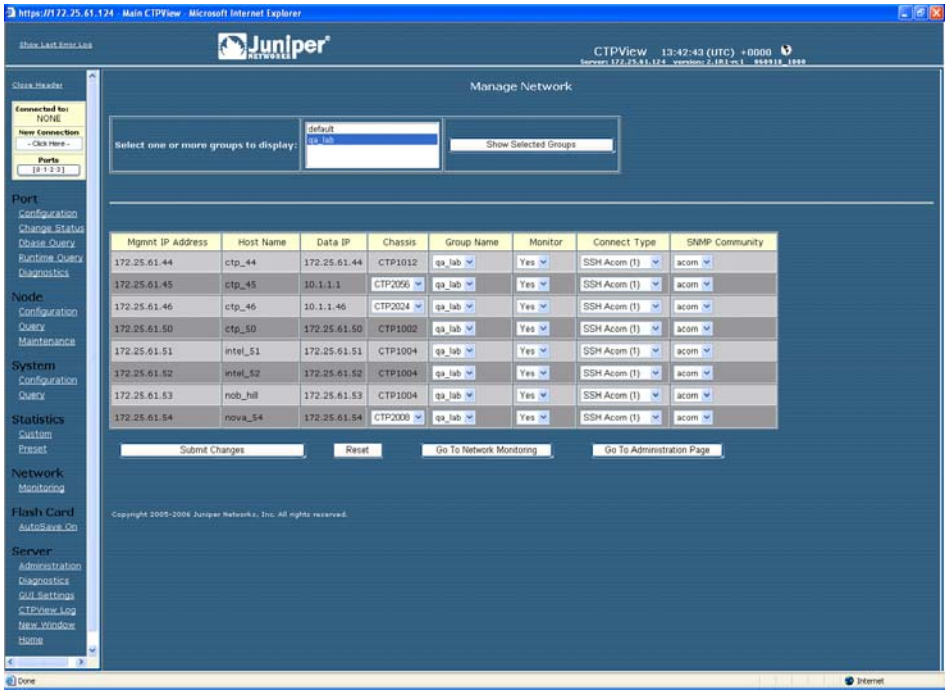
You add CTP systems to CTPView using the Add Remote Host field and drop-down menus (Figure 74 on page 160). To successfully add a CTP host, fill in the following fields, or select the appropriate parameter from the drop-down menus:

- Host Name—A unique name for the CTP host.
- IP–Management, IP–Default Data—IP addresses used for CTPView management connection and circuit data flow.
- Password—Password on the CTP host that CTPView will use when accessing the system.
- Menu Group—The group that the CTP host is be logically associated with. The available group names are displayed, and Default is used when no groups have been defined.
- Chassis Model— CTPView will determine the type of CTP1000 system. You must specify the type of CTP2000 system when applicable (CTP2008, CTP2024, and CTP2056).
- Network Monitoring—CTPView is capable of monitoring remote CTP hosts (see Network Monitoring on page 172). The drop-down list provides the option of including or excluding the CTP host for monitoring.
- Access—When selected for monitoring, CTPView must periodically access the CTP host. The type of access can be either SSH or SNMP, as specified in this drop-down menu.
- SNMP Community—Defines the SNMP community of the CTP host.

Managing CTP Network Hosts

The Manage Network window, which you access by clicking **Manage Network Hosts** in the Administration Functions window, allows you to change the configuration of an existing host (Figure 75 on page 162). After selecting the appropriate group, you are able to change the type of CTP system, group association, monitoring, monitoring connection type, and SNMP community of any CTP host within the selected group. The changes do not take effect until you click **Submit**.

Figure 75: Managing Network Hosts with CTPView

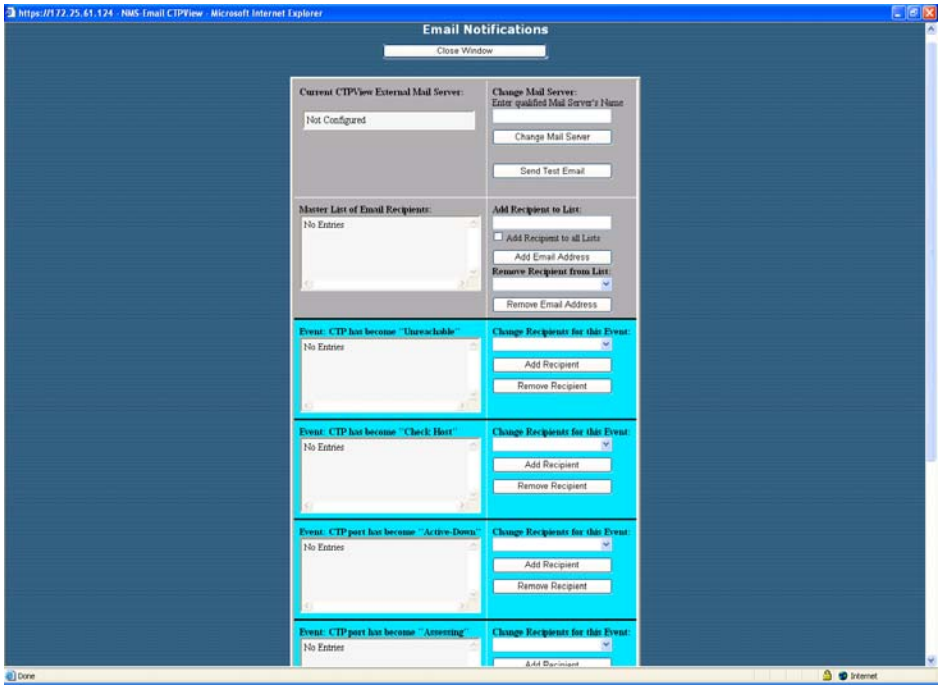


Configuring E-Mail Notifications

You may want to create e-mail notifications based on specific server and network problems identified by CTPView. As shown in Figure 76, you can create a list of specific e-mail addresses to be notified based on the type of problem. The problems that can initiate an e-mail notification are specified in the following CTPView areas (Figure 76):

- CTP host Unreachable
- CTP has become Check Host
- CTP Port has become Active–Down
- CTP Port has become Assessing
- CTP Port has become Active–Up
- CTP Port has become Disabled

Figure 76: Configuring E-Mail Notifications with CTPView



Configuring Automatic Functions

You cofigure actions that should periodically occur in the CTPView Automatic Functions window (Figure 77 on page 165). This window specifies the following actions:

- Verify Email Notification Script Is Running—A software script runs in the background to create the e-mails used for notifications. This automatic function verifies that the script is running and restarts the script if necessary.
- Gather Remote Host Statistical Data—This function retrieves the data used to create the plots of IP Buffer Usage, Delay Jitter, Round Trip Delay, and Missing Packets.
- Synchronize Secondary Servers—This function copies information from the primary server to each secondary server. The information includes SSH keys, archived port configurations, e-mail notifications, port forwarding settings, trigger point for hard drive warning usage level, and CTP identification information (IP address, host name, group name).

- Synchronize Secondary Servers and Remote Hosts—This function copies information from the primary to each secondary server and CTP host. The information transferred to the secondary servers includes SSH keys, archived port configurations, e-mail notifications, port forwarding settings, trigger point for hard drive warning usage level, CTP identification information (IP address, host name, group name) and CTP statistical data. The function copied from the primary server to CTP hosts includes each secondary server's SSH key.

- Remove Outdated Data Files (over 6, 9, or 12 months)—CTPView removes older files (typically CTP host statistical data) based on the age of the data. The age criterion can be set to 6, 9, or 12 months. We recommend that you configure the automatic function to ensure that the file system does not become filled.

- Update Network Interface Device Information—CTPView collects network interface device information. Use this automatic function if you configure virtual IP addresses using the CLI or if you use multiple CTPView servers to configure CTP hosts and virtual IP addresses.

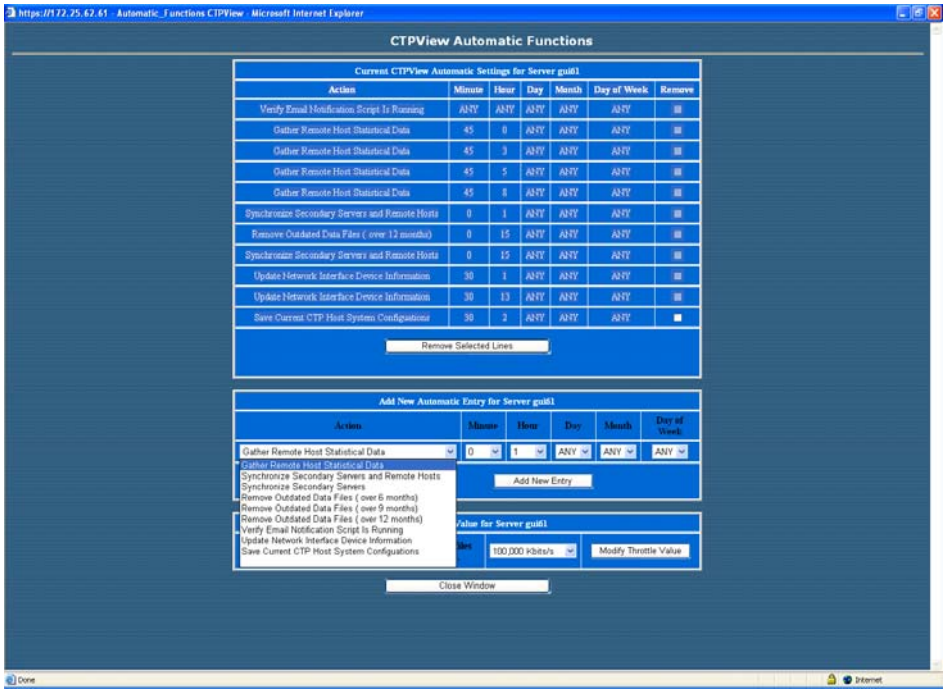
- Save Current CTP Host System Configuration—CTPView saves every CTP host configuration at the specified time interval. CTPView will save the 10 most recent configurations.

In the CTPView Automatic Functions window (Figure 77 on page 165), you select the action in the area titled Add New Automatic Entry for Server *serverName,* and you specify when the action should take place. For example, the action being added in Figure 77 would occur every day at 01:00.

It may be necessary for an action to occur multiple times in a day. To add this configuration, you can add multiple entries for the same action and specify a different time for each entry. In the example shown in Figure 77, the Gather Remote Host Statistical Data action is to occur four times every day—at 00:45, 03:45, 05:45 and 8:45.

You can limit the bandwidth used to copy and retrieve information from the CTP hosts by using the Modify Throttle Value for Server *serverName* area in the CTPView Automatic Functions window. Throttling the bandwidth is typically not necessary and may be required only when the local LAN segment experiences significant load and bandwidth limitations.

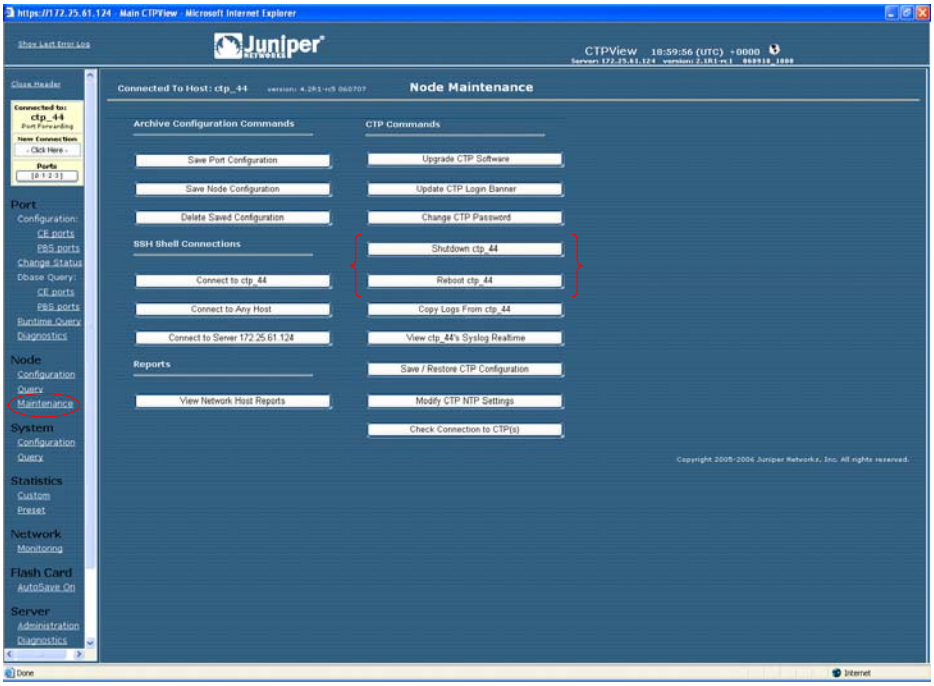
Figure 77: Configuring Automatic Functions with CTPView



Node Maintenance Functions

The Node Maintenance window (Figure 78 on page 166) allows you to perform functions such as distributing and updating CTP software, saving port and node configurations, saving and restoring CTP databases, and creating reports that detail the provisioning of ports. Other functions provided are similar to those in the Node Operations command-line interface (CLI) menu, which includes opening SSH connections, shutting down and rebooting systems, and modifying banners.

Figure 78: CTPView Node Maintenance Window

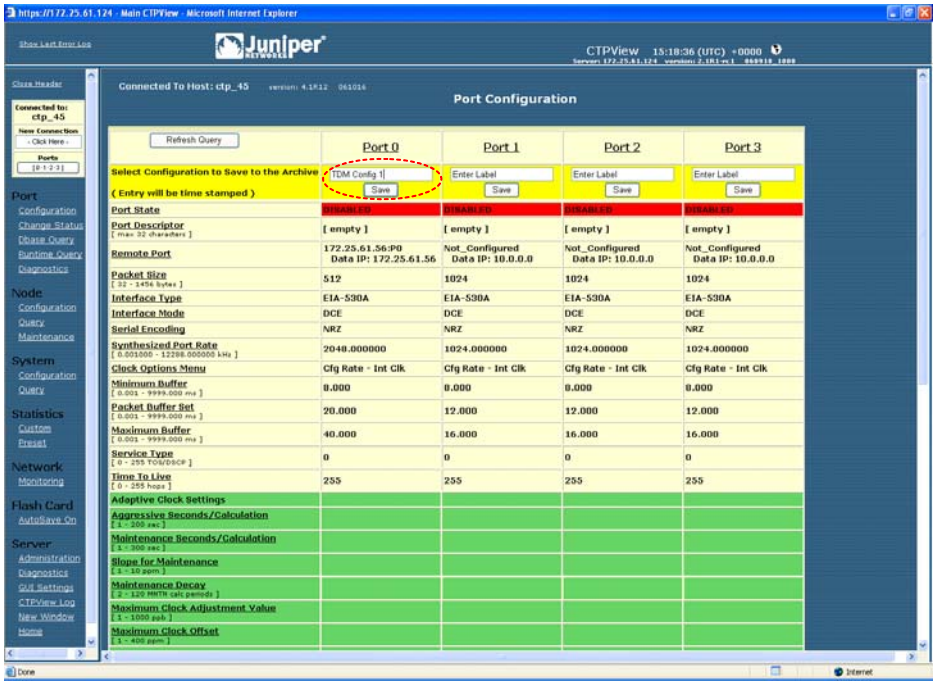


Saving Port, Node, and CTP Configurations

CTPView allows you to save a port configuration using your naming convention. You can apply the saved port configuration as a template to other ports when you are configuring them. Reusing the configuration eliminates repetitive entries for common configurations. The saved configuration includes all the port attributes except the remote host and port.

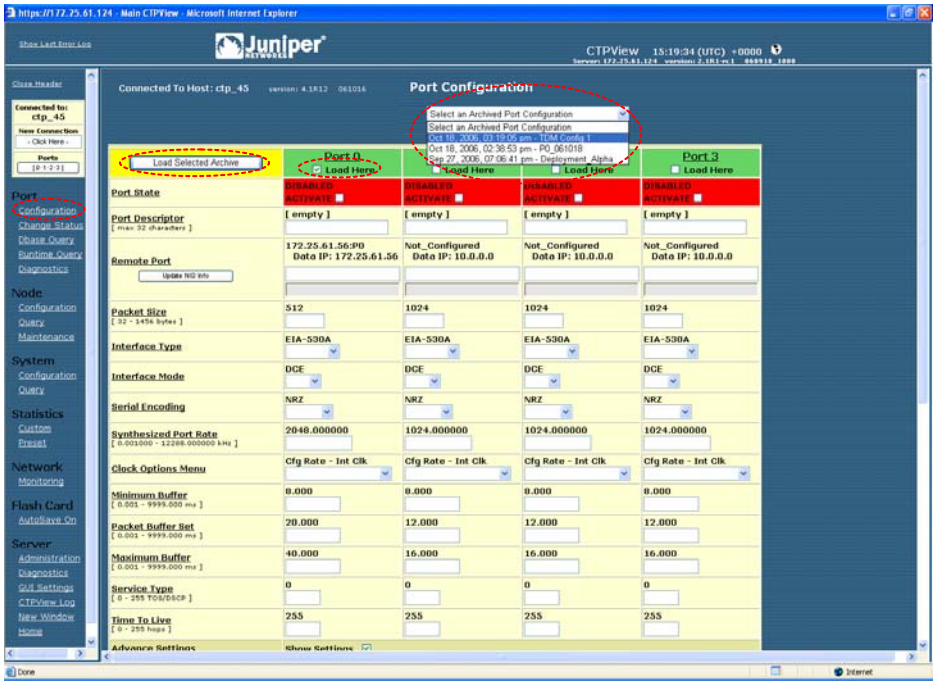
Figure 79 shows the window for saving a port configuration. You enter a name above the port whose configuration you want to save, and then you click **Save.**

Figure 79: Saving a Port Configuration with CTPView



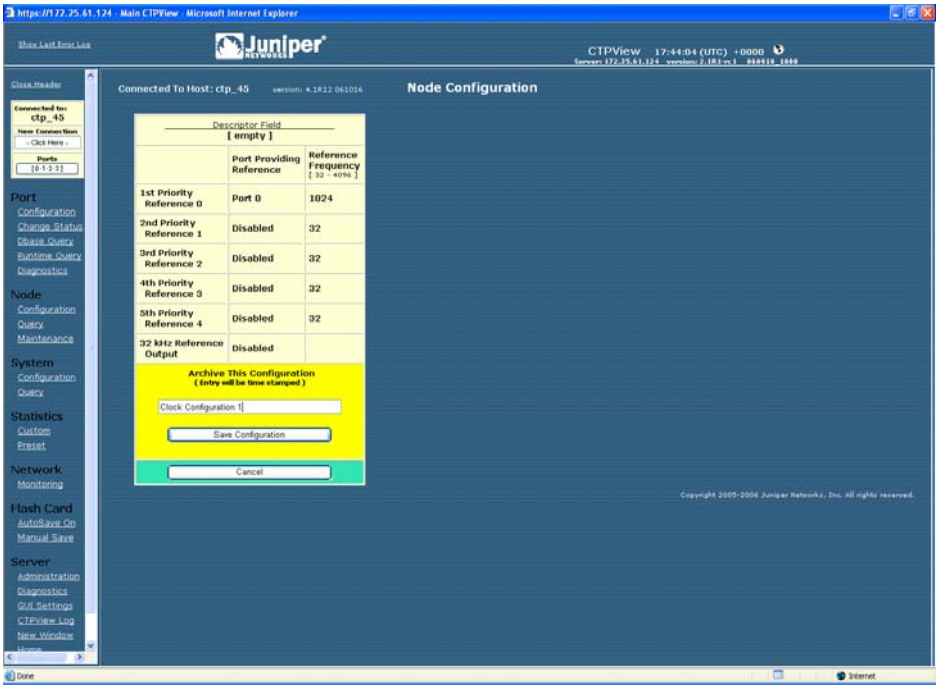
You can apply a saved port configuration to another port by using the Port Configuration window (Figure 80). First, select the saved port configuration from the Archived Port Configuration drop-down menu, and then click **Load Here** on the appropriate port(s). The configuration is loaded when you click **Load Selected Archive**. The changes do not take effect on the CTP system until you click **Submit**.

Figure 80: Applying a Save Port Configuration with CTPView



You access the Node Configuration window (Figure 81) by selecting **Save Node Configuration** in the Node Maintenance window (Figure 78 on page 166). This window allows you to save the clock configuration for the CTP system as a template, which you can then apply to other node configurations.

Figure 81: Saving a Node Configuration with CTPView



You can save the current complete CTP configuration or restore an earlier configuration by using the Save and Restore CTP System Configuration windows (Figure 82). You access these windows by selecting the **Save/Restore CTP Configuration** button in the Node Maintenance window (Figure 78 on page 166).

You can also save multiple configurations for future restoration. Configuring Automatic Functions on page 163 describes how you can configure CTPView to periodically retrieve and save the CTP configuration. You can restore these saved configurations by using the Restore CTP System Configuration window (Figure 82). Up to 10 of the latest configurations are saved. The oldest configurations are automatically deleted when 10 are exceeded.

Restoration of a configuration requires the CTP system to reboot, which occurs automatically. CTPView monitors the system during this process and provides a confirmation when the CTP system returns online with the restored configuration.

Figure 82: Saving and Restoring the CTP Configuration with CTPView

Save/Restore CTP Configuration Window

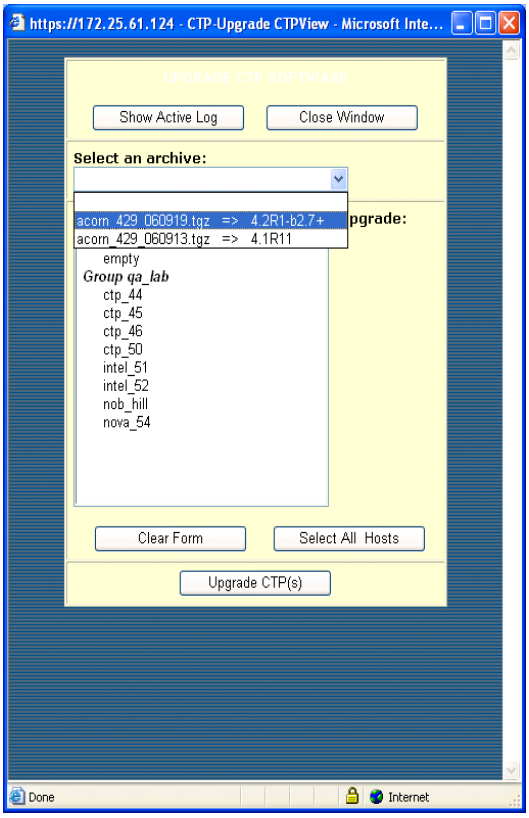
Save Configuration Window

Restore Configuration Window

Updating CTP Software

You can use CTPView to manage the distribution and installation of CTP operating system archives. The software update window (Figure 83), which you access from the Node Maintenance window (Figure 78 on page 166), allows you to select from the available archives provided and then to select the CTP system(s) to be updated. You can select all the CTP systems, or you can specify a system by pressing the Ctrl key when you select each system. CTPView updates the target CTP systems sequentially, and provides a window with the status of the upgrade process.

Figure 83: CTPView Software Update Window

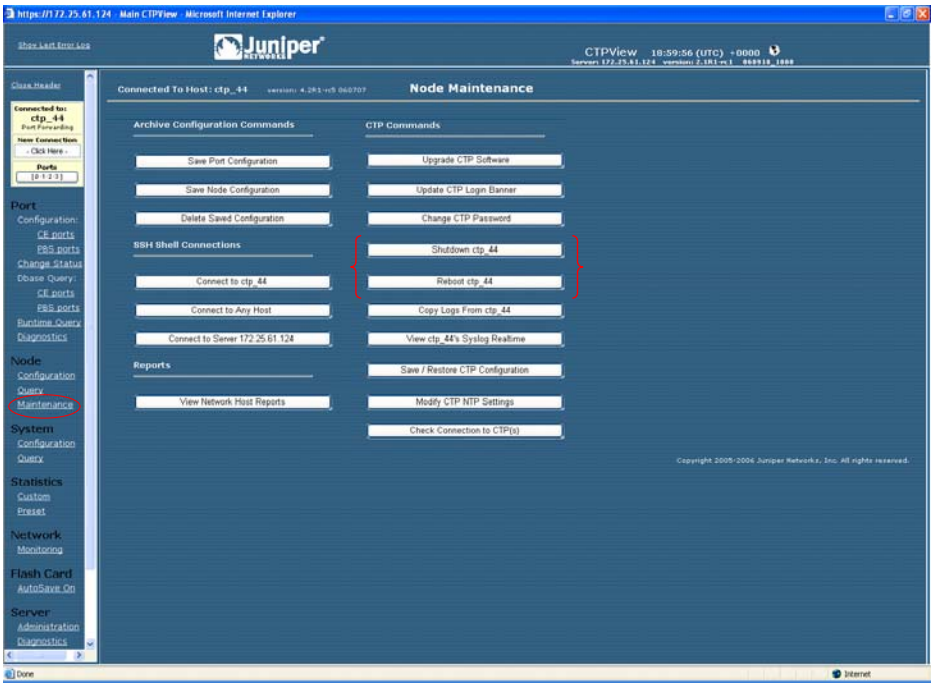


Formatting Maintenance Reports

Node maintenance reports detail how ports are provisioned on one or more CTP systems. You can format reports for printing and sort the columns.

The Channelization Report provides a summary of all the ports and includes the source IP address, remote IP address and port, interface type, and port speed. The CCSD report includes only ports that are configured, and the Non-Configured Port Report shows ports that are in the default configuration. Figure 84 shows an example of the Channelization Report.

Figure 84: Node Maintenance Report



Network Monitoring

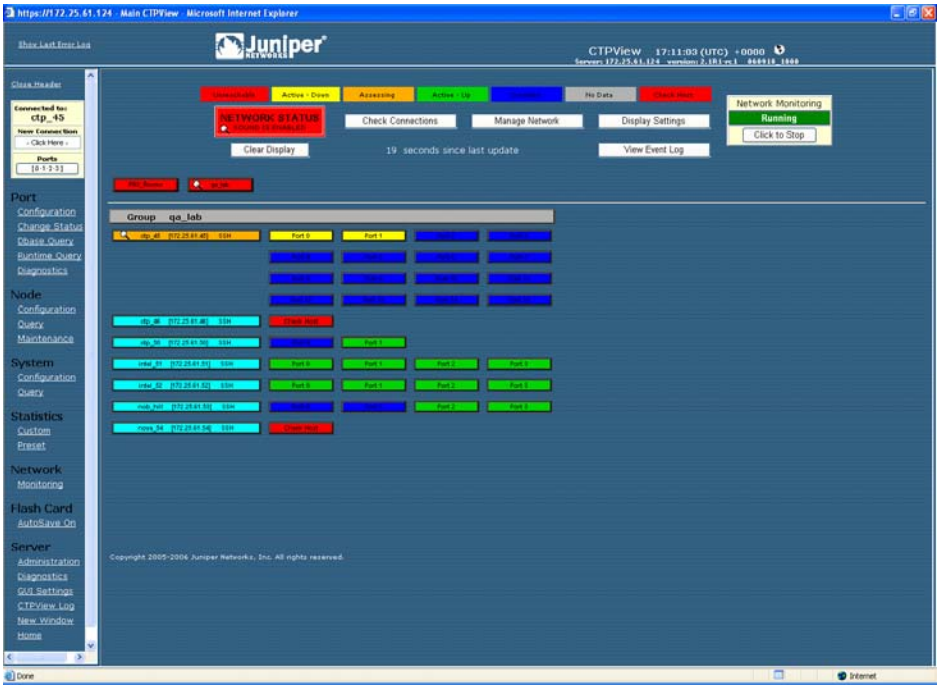
When Network Monitoring is in the Running state, CTPView periodically checks the reachability of CTP hosts if the host is configured with network monitoring enabled. If the host is reachable, CTPView obtains the status of the CTP host ports. Selecting Network Monitoring in the CTPView navigation pane opens the network monitoring window, which provides a summary of both the CTP host reachability and the port status. The highest alarm level on a CTP percolates up to the Group icon.

Figure 85 on page 173 provides an example of a network monitoring window. When you select a group, the window displays all CTP hosts within the group. The status or alarm associated with each CTP host and port is displayed:

- Unreachable (alarm)—The CTPView server cannot reach the CTP host. This alarm could be due to a IP network problem, a site problem (such as a power outage), or a CTP equipment or configuration issue.
- Active–Down (alarm)—The port on the CTP system is configured as active, but the port state is Down (that is, no circuit is established to the port).
- Assessing (alarm)—The problem is being assessed, and a user has placed the CTP host into an Assessing state, as described below.
- Active–Up (status)—The port is configured as active, and the port state is Up (that is, a circuit is established to the port).
- Disabled (status)—The circuit is configured as disabled.

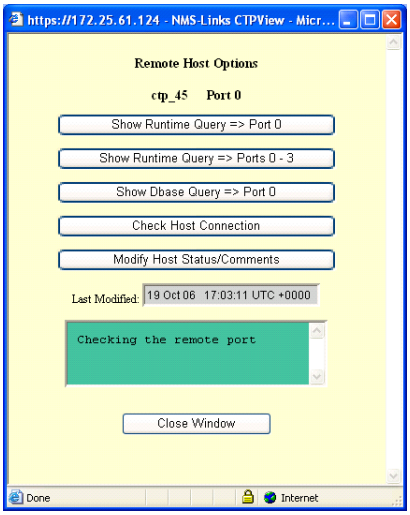
- No Data (status)—No data could be obtained from the CTP host, a status that requires further investigation
- Check Host (alarm)—The CTP host is reachable across the network, but CTPView is unable to communicate with the system and obtain the status of the ports.

Figure 85: Network Monitoring Window

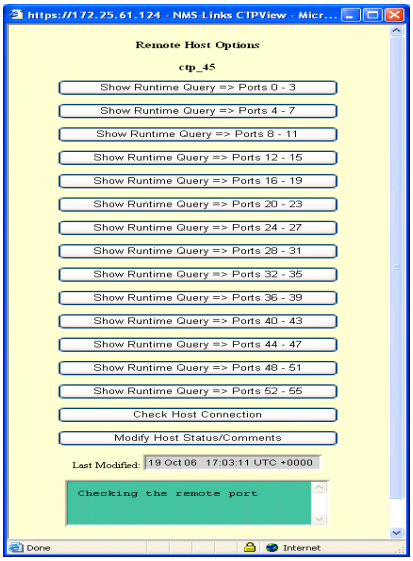


Additional information and functions are available, as shown in Figure 86. You access them by clicking a CTP host or port. The functions available include quick access to the runtime and database queries (see *Chapter 4, Software Queries and Operations*). You can also create and modify comments about the problem, and change the alarm level to Assessing by clicking **Modify Host Status/Comments**.

Figure 86: Additional Functions Accessed from the CTPView Network Monitoring Window



Remote Host Options when Port is Selected



Remote Host Options when Node is Selected

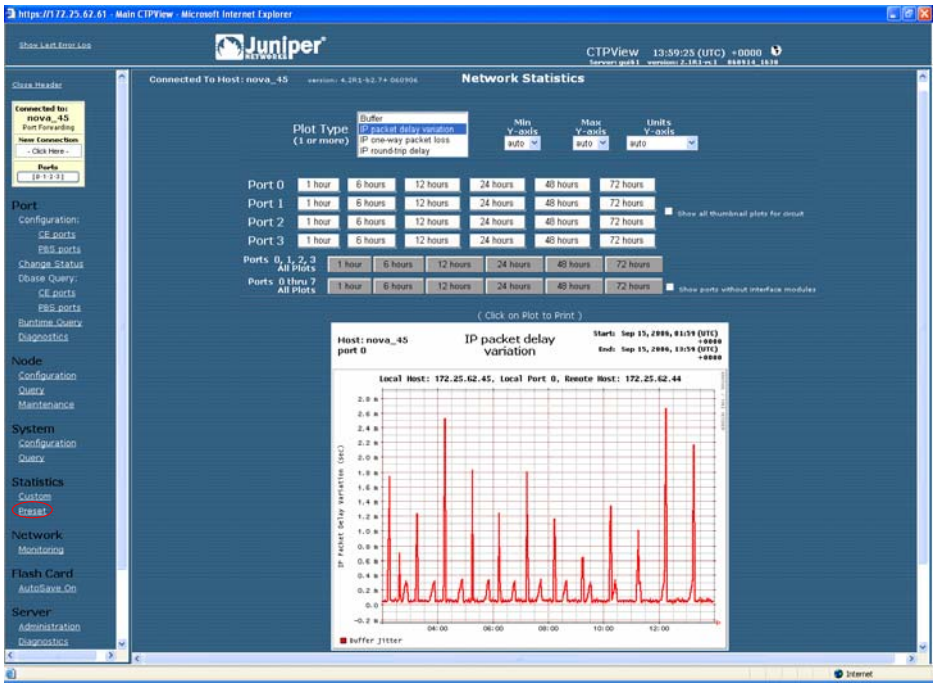
Statistics and IP Performance Reports

CTPView periodically retrieves IP performance information from each CTP system. The data retrieved includes 1-minute observations of the maximum, minimum, and average buffer state; calculated IP packet delay variance (jitter); round-trip delay; and missing packet counts. CTPView allows you to review this data using either preset or custom plots.

Preset plots are provided for the currently connected CTP system. The time periods displayed include the preceding 1, 6, 12, 24, 48, or 72 hours. The plot's **y** axis is automatically scaled unless you specify the axis units with the minimum and maximum value in the three drop-down menus provided. You can make plots for a single port, for the four ports currently selected, or for all the ports on the CTP system. You can select and expand thumbnail plots.

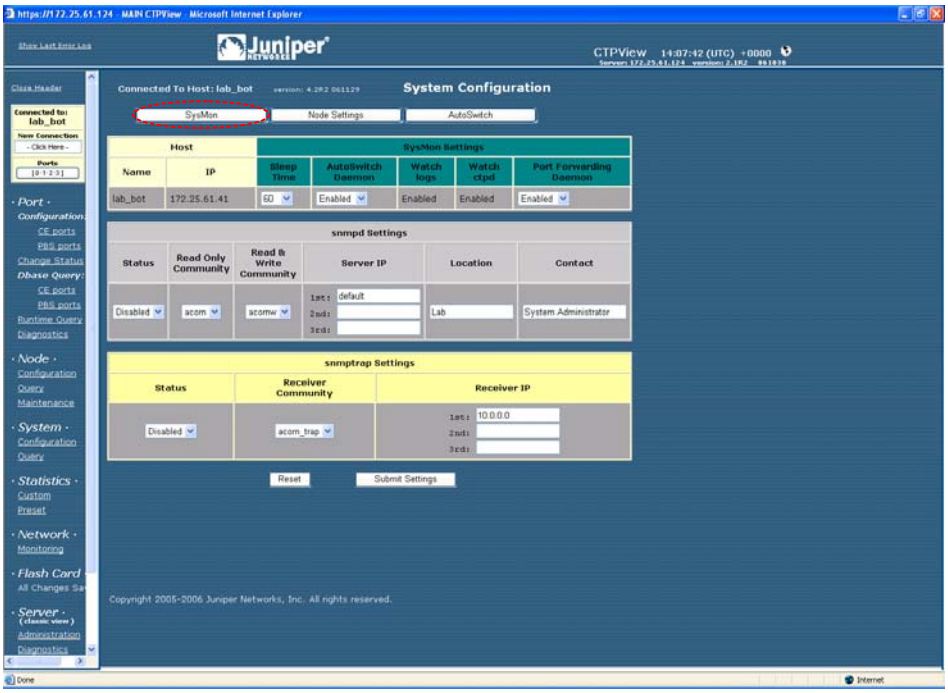
Figure 87 is an example of a preset report showing packet delay variance received at a port over a 12-hour period.

Figure 87: Viewing a Preset Statistics Report with CTPView



Custom statistics plots allow you to display graphs from one or more CTP systems during any period of time when CTPView has retrieved data from the system(s). The plot's y axis is automatically scaled unless you specify the axis units with the minimum and maximum value in the drop-down menus provided. You can create up to four plots by specifying the CTP system and port, report type, and the start and finish time of the plot. Figure 88 on page 176 shows an example of a custom plot.

Figure 88: Viewing a Custom Statistics Report with CTPView



CTPView Server Synchronization

Requirements

All servers must have CTPView version 1.4.2 or higher installed.

Setup Procedure

With a Web browser, connect to the server you have chosen to be the source of the data used in the synchronization process by clicking **Server > Administration > Server Synchronization**. This server will be the primary server.

Enter the information for the primary server in the block labeled Add Network Server. The server name is used for display purposes only and does not need to be the server's UNIX hostname. Click **Add New Server**. You will now see the server listed in the block labeled Current Server Synchronization Settings.

Repeat for all the other servers in the network that you wish to have synchronized with the primary server. These additional servers will be secondary servers. When you add a secondary server, the primary server will set up SSH authorization keys with the secondary server so it can communicate without requiring the login password again.

Now look in the Current Server Synchronization Settings area. You should see all the servers that you added listed here. The Server Type will be set to Not Selected. This is the default setting for all new entries. For each server, select the Server Type from the drop-down menu. Only the server you are logged in to can be set as the primary server. You can leave a server as Not Selected if you wish to temporarily remove it from the synchronization process. You can remove an entry entirely by checking the **Remove** box. After making your selections, click **Commit Changes**.

To set up the primary server to perform the synchronization at predetermined times, click **Set Automatic Functions** in the Synchronize Servers on Network area. This action opens a new window where you can set commands that CTPView will perform automatically, known as the Crontab function. Numerous commands are available; two relate to server synchronization. If you chose the option Synchronize Secondary Servers and Remote Hosts, the program copies the necessary SSH keys to each secondary server so that it will then be able to communicate with the remote hosts without requiring the login password to be typed. This is the default selection. The second synchronization option synchronizes only server-specific information.

After selecting your choice for Action, set the time for the command to be executed by using the drop-down menus. Remember that the numbers you select represent a specific time, not an interval of time. For example the default setting of [0,1,ANY,ANY,ANY] means that the command will be run at the 0 minute (that is, on the hour) of the first hour (1 AM) every day (that is, ANY day of ANY month, landing on ANY day of the week). A setting of [30,16,8,ANY,ANY] would result in the command being executed at 4:30 PM on the 8th of every month. You may add any number of entries as required to provide the result you desire. The optimal configuration will have the server synchronization being run shortly after the statistical data is obtained from the remote hosts. Commit your new selection by clicking **Add New Entry**.

The primary server is now set up to perform the synchronization process automatically at the times you have selected. More information about this process is detailed later in this document.

You may also manually execute the synchronization process. In the Server Synchronization window in the Synchronize Servers on Network area, click **Manually Synchronize Network**. This action opens a new window from which you can choose to synchronize only the servers or to include any number of remote hosts. From this window you can also access the logs generated from the synchronization process.

Definitions

The scope of these definitions is not global, but are locally restricted to the server that the user is logged in to. In other words, each server views the rest of the servers in the network according to its own designations. Each server maintains its own file of server designations that it refers to when performing a server synchronization. You do not need to configure a remote server for that server to be updated by the server that is performing the synchronization.

- Primary server—Any server with the correct version of CTPView software can be designated as a primary server. The primary server executes the synchronization program and distributes data to the secondary servers. Regardless of how any other server is configured, when a server is designated as a primary server its data is safeguarded from being overwritten by any other server executing the server synchronization program. You set or change a server's designation by logging in to that server and entering the required information in the Server Synchronization CTPView window.

- Secondary server—Any server with the correct version of CTPView software can be designated by a primary server as one of its secondary servers. The data files on the secondary server are updated to match those on the primary server on synchronization.

- Data Files—The data which is synchronized is the:

  - Statistical history that has been archived from the CTP systems.

  - IP addresses, hostnames, host menus, and SSH authorization keys that are necessary to communicate with the CTP systems.

Configuration

Remember that the settings described below are restricted to how this server views the world. The choices made here *do not* change any configuration or settings on remote servers.

- Current Server Settings—This section displays the current configuration file of the server you are logged in to. You *must* have the local server listed here. This is also where you modify Server Type of the listed servers or remove a server from the list. The default type for newly added servers is Not Selected.

- Synchronize Servers on Network—You can use the links here to modify the timing of the automatic synchronization schedule and to open a new window that allows you to manually start a synchronization process.

- Add Network Server—You make additions to this server's configuration file here. The Server Name is for identification only. It is not used for any other purpose or passed to any other server. Because the default type for newly added servers is Not Selected, you need to modify the type designation before running the synchronization program.

Miscellaneous

There is a 15-second timeout limit on attempts of the primary server to establish contact with a remote host. If the timeout is reached, the primary server skips to the next remote host and continues executing the program. This information is displayed in the screen output and logs.

When you add a new remote host to a primary server, the new host's SSH RSA keys are also exchanged with each secondary server. You are given the option to disable this feature in the Administration window when you add the new remote host.

Automatically Saving CTP System Configurations

You can now program an automatic function to save every CTP system configuration at a prescribed time and interval. The saved files are then available to restore the settings on a CTP system.

Configuration

You set automatic saving set in the Automatic Functions pane. Click the button in the Server Administration window to get there. In the Add New Automatic Entry dialog box, select **Current CTP Host System Configurations** from the Action drop-down menu.

CTPView will save the ten most recent configuration files for each CTP system. The Manual System Configuration Save is still available. In addition, each CTP upgrade automatically creates another system save before beginning the upgrade process.

Restoring Saved Configurations

From the Node Maintenance pane, click **Save / Restore CTP Configuration** to restore a saved configuration or to manually save one.

All available saved configurations appear in the drop-down list in the Restore CTP Configuration pane. Follow the prompts to complete the restoration.

CTPView Connection Throttling

File transfers between CTPView and CTP systems are now throttled to limit the used bandwidth during the file transfer. The selected throttle value is user configurable.

Configuration

In the Server Administration pane, click **Automatic Functions**. The Throttle dialog box is at the bottom of the pop-up screen. The default value is 100,000 Kbits/sec—that is, the full bandwidth of the server's Ethernet port.

Scope

The following functions are affected by the bandwidth throttling:

- Gathering statistical data for plots
- Synchronizing secondary servers
- Saving CTP system configurations
- Modifying CTP login banners
- Upgrading CTP operating system software

Support for Tabbed Browsers

You can configure CTPView for use with tabbed Web browsers, such as Firefox, Mozilla, or Internet Explorer 7. You can select your own preference for the type of browser to support, either classic or tab. Your selection is stored in your browser settings, but you can change your preference at any time. After being enabled, the Tabbed Browsing feature applies to all new CTPView windows opened with the New Window link located in the Directory frame. The remaining links and window behavior of the two CTPView styles remain the same. The default CTPView style is Classic, which is suitable for earlier versions of Internet Explorer.

Limitations

The current tabbed browsers do not support dynamically changing the tab's title after a page has been loaded onto the screen. CTPView uses frames to open new content in the viewing window without reloading the entire page, so the tab titles cannot describe the current content. However, to differentiate the tabs for easier browsing, we add a bracketed sequencing number in the tab's title when the tab is first opened.

Using the Tabbed Style

The current browser style is displayed in the Directory frame just under the heading Server. Click on the style type or the **GUI Settings** link to go to the style configuration page.

On the configuration page you can choose the browser style. In addition, there is a button that will manually reset the tab index counter. The tab index is also reset after you close all browser windows.

You must configure each browser that you use separately, even when you open the browsers on the same desktop.

Browser Configuration

With default Firefox or Internet Explorer 7 settings, to open a new window as a tab, right-click the **New Window** link under the Server heading in the Directory frame. Select **Open Link in New Tab** from the pop-up menu. If the new tab does not open in focus (as the visible tab) on your desktop, you can modify your browser's tab options/preferences to change the behavior.

Server Configuration Validation

This utility tests and reports on a long list of system configuration details that are either critical or desirable for the proper operation of the CTPView Management System. For every item that is identified as out of compliance, instructions for correcting the problem are supplied.

Using Configuration Validation

To run this utility, go to the Server Diagnostics window. At the bottom, click **Validate Server Configuration**. There will be a few seconds' delay while the script is processing the configuration before the results appear.

Validate the server configuration after every CTPView software upgrade or any time you are experiencing a problem with the CTPView operations.

SSH Port Forwarding

This features creates a persistent encrypted and protected connection between CTPView and a remote CTP system. The reduction of overhead compared with using separate SSH connections for each command results in a noticeable performance increase of CTPView. This feature must be enabled on both CTPView and the CTP system. It is enabled by default.

Using SSH Port Forwarding

In the Server Administration pane in CTPView, the button labeled CTP Port Forwarding is [Allowed || Prohibited] indicates the current state of this function on CTPView. When clicked, the button will toggle CTPView to the other state.

After connecting to a remote CTP system with CTPView, go to the System Configuration window. In the SysMon pane, in the SysMon Settings area, the current state of the CTP port forwarding daemon is shown. You can also reconfigure it here.

When a port forwarding connection has been successfully established, the phrase Port Forwarding appears directly underneath the CTP hostname in the blue Connection Box located at the top of the navigation pane in CTPView.

Updating CTP Software Directory

Obtaining New CTP Software

Before using CTPView to upgrade CTP software, you must copy the appropriate CTP archive files to the proper directory on the CTPView server. Released versions of CTP operating system software packages are available for download from the Juniper Networks CTP Support site at

https://www.juniper.net/customers/csc/software/ctp/

You need your Juniper Networks support username and password to access this site.

Directory Location

The location to place the CTP archives into on the CTPView server is the /var/www/html/acorn/ctp/ directory. To copy software into this directory you must be a root user or a member of the UNIX group “server,” such as the default user “juniper”. The CTPview server automatically checks and modifies the copied file's ownership and permissions as necessary.

Burning CTP Compact Flash Media

Obtaining CTP Flash Image Files

Before using CTPView to burn CTP software images onto flash drives, you must copy the appropriate CTP image files to the proper directory on the CTPView server. Released versions of CTP operating system software images are available for download from the Juniper Networks CTP Support site at

https://www.juniper.net/customers/csc/software/ctp/

You need your Juniper Network support username and password to access this site.

Directory Location

Place the CTP flash image file on the CTPView server in the /var/www/html/flash/ directory. To copy software into this directory, you must be a root user or a member of the UNIX group "server," such as the default user "juniper". You do not need to modify the file's ownership and permissions after you have copied it into the flash directory.

To burn a CTP image:

NOTE: You must have physical access to the CTPView server.

1. Place the new compact flash media into a USB compact flash adapter, and insert the adapter into one of the USB ports on the CTPView server. The adapter will be mounted automatically.

2. Using SSH from a remote computer or using a management console connected to the server, log in to the CTPView server. Switch to the root user account. Change to the /var/www/html/flash directory.

3. Type the command: **./burn_flash < version >** , where flash_ < version > .img is the image filename.

4. Typing just the command **./burn_flash** will return the usage instructions and a list of flash images that are available.

5. Answer the screen prompts to complete the process.

6. Log out of the server, and remove the USB compact flash adapter.

Network Monitoring

Audible Alarm

This option is configurable at the user level. When Audible Alarm is enabled, your Web browser plays the selected audio file each time the Network Monitoring window refreshes *and* the Network Status is red or yellow. The state of this function is displayed within the Network Status indicator.

The audible alarm function has two configuration settings, which are accessible from the Display Settings button in the Network Monitoring pane. You can turn the sound on or off, and you can choose and preview the audio file that will be played.

The site administrator can add additional audio files to the list of available selections by copying the desired file to the directory /var/www/html/acorn/sounds/. Only wav files are supported, and the filename may consist only of alphanumeric characters and the underscore (_). The root of the filename is displayed as the label of the selection. CTPView automatically corrects illegal filenames and modifies the file permissions as necessary to enable the embedded media player to read the file.

For Linux users, your default browser installation probably does not have an embedded media player. If if you need a player, there is an easy-to-install multimedia plug-in named Plugger available at

http://fredrik.hubbe.net/plugger.html

Manual Override

When you manually override the status of a host in the Network Monitoring pane, a magnifying glass icon appears within that host's button, its group button, and the network button. The overridden host's color status will not be passed on to the group and network buttons. In other words, the color of the buttons indicates the most severe status of only the hosts that are not overridden; and the icon indicates whether a host, and which one, has been manually excluded from the group and network color indicators.

AutoSwitch Connection Check

This new utility tests the connection between a CTP port running AutoSwitch and its primary and secondary remote ports. The function also verifies that the authorization keys have been correctly set. This feature is available only when the AutoSwitch host's CTP operating system is version 4.2R1 or later.

Using Connection Check

Go to the System Configuration pane, and click **AutoSwitch**. In the AutoSwitch pane, the Connection Check test buttons are on the extreme right end of each port line. There are individual buttons for each primary and secondary host plus a single button labeled All, which runs the test for every port with a single click.

When in the ready mode, the buttons will display “test”. While the script is running, the buttons will show “testing” and turn blue. The results of the test are displayed as text inside the buttons, and the background color around the buttons either turns green or red, for success or failure, respectively.

After a test has been completed, you may rerun the test by clicking the button again.

Network Host Reports

Three new database reports are available, in both onscreen and printer friendly formats. On an individual port basis for any or all CTP units in the system, the reports list selected information about the source and destination ports of the circuits. You can sort the reports and resize the font for easy viewing. The report database is updated in real time when CTPView is used for CTP provisioning. Additionally, a configurable automatic function queries for the current configuration data from all CTP units.

Accessing Reports

You access Network Host Reports from the Node Configuration window. Click **View Network Host Reports** under the heading Reports.

The three reports are:

- Channelization—Includes all ports.
- Configured Ports—Displays only configured ports.
- Non-Configured Ports—Shows just the nonconfigured ports.

Database Updates

To schedule the database updates to be done on a regular basis, from the Server Administration pane click **Automatic Functions**. Select the **Save Current CTP Host System Configurations** from the Action menu. Then set the time interval, and add the entry to the list of automatic functions. We recommend that you set this function to run on a daily basis.

You can also manually trigger a one-time database update by clicking **Update Database** in the Network Reports pane.

Exporting to Spreadsheet Program

To export data from the Reports pane:

1. From the CTPView Network Reports pane, create the report you want.
2. Click **Printer Friendly Page**.
3. Select all, copy, and then paste as HTML into your spreadsheet application.

Part 4

Appendixes

Appendix A
Previous CTPView Software Release Enhancements

This appendix summarizes enhancements made to the CTPView software and is organized by release number. If the information in this appendix differs from the information found in previous chapters, follow this information.

It contains the following sections:

- CTPView Release 3.0 on page 187
- CTPView Release 3.1.0 on page 188

CTPView Release 3.0

The following enhancements were made to the software.

- Port Selection page—This page's presentation is unchanged; port numbers are used for identification. To help you associate bundle numbers with their attached ports, a table has been inserted that maps port numbers to bundle numbers. Ports that are not attached to a bundle are also shown.

  Before you switch ports between circuit emulation (CE) and packet-bearing serial (PBS) mode, the selected port must not be attached to a bundle. You are warned with a pop-up alert if you attempt this action, and will be prevented from performing the operation.

- Directory pane—Port category has been replaced with Bundle.

- Bundle > Configuration page—You can view and reconfigure existing bundles here. You can also create and configure new bundles.

  PBS ports can also be configured here.

- Bundle > Change Status page—Only configured bundles are displayed on this page. Possible user actions are Activate, Disable, Delete, and Recenter bundles. Options that are not available for a specific bundle do not appear.

- Bundle > Runtime Query page—Only configured bundles are displayed on this page.

- Bundle > Diagnostics > CTP Traceroute page—This page requires that you make selections based on the port number that is attached to a bundle. A table showing the port-bundle association is displayed on the page.
- Bundle > Diagnostics > Bit Error Rate Tester page and Bundle > Diagnostics > Network Interface Configuration page—These two pages have been disabled. They will be reenabled in Release 3.1.
- System > Configuration > AutoSwitch page and System > Query > AutoSwitch page—These pages display only settings for bundles that are allowed to be configured for Autoswitch. This is limited to bundle types CTP and SAToP.
- System > Statistics > Custom page and System > Statistics > Custom page—These pages remain organized by port number. A table showing the port-bundle association is displayed on the page.
- Network > Monitoring page—This page remains organized by port number. For CTP nodes running CTPOS v5.0, the port state as indicated by the page is the state of the bundle that port is attached to. Ports that are not attached to a bundle are shown as disabled.

CTPView Release 3.1.0

The following enhancements and changes were made to the software.

Port Selection

The Port Selection page is accessed from the blue connection box at the top of the Directory frame on the left of the main CTPView window. Click to open this page in the main frame.

Port Selection Section

The scope for this area of control has been reduced with the introduction of the bundle-centric concept of defining circuits. For this release the page's presentation is unchanged but the process of choosing which circuits (bundles) to display has been transferred to the individual content pages.

This process is not complete in this release, but does include the Bundle Configuration and Runtime Query pages. The Statistics page (Plots) still relies on the selections made here to determine which graphs are displayed.

To assist you in associating the new bundle numbers with their attached ports, an expanding table has been added to this page that maps port numbers to bundle numbers. Mousing over the blue bar at the top of the page opens the table. Ports that are not attached to a bundle are not shown.

Type Selection Section

You must be logged into the CTPView software as an administrator to change the port mode.

Before switching ports between CE and PBS modes, you must detach the selected port from any bundle. You detach the port on the Bundle Change Status page by deleting the appropriate bundle from the CTP node. To open this page, click **Change Status** in the Directory frame.

If you try to change a port's mode while it is still attached to a bundle, a pop-up warning appears and you are prevented from performing the operation.

Previous Port Configuration Page and Related Port-Centric Pages

In previous releases, these pages were accessed from the Directory frame by links under Port. Page headings were labeled Configuration, Change Status, Query, Runtime Query, and Diagnostics.

New Functionality

Pages have been replaced with versions that comply with the new bundle-centric method of circuit designation. See the following sections for descriptions of their new functions and current limitations.

Bundle Configuration

You must be logged into the CTPView software as an administrator to see the Bundle Configuration page. Starting in the Directory frame under Bundles, click **Configuration**. Two blue bars are displayed at the top of the page. Mousing over each bar expands them, allowing you to:

- Add a new bundle to the node.
- Reconfigure an existing bundle.

Adding a New Bundle

Follow the directions displayed. Select a bundle number, select a port number from the menu for the bundle type you wish to create (CTP, SAToP, CESoPSN), and click the bundle type button. The range of allowed bundle numbers is 0 to 63.

Once created, a bundle-port pairing cannot be modified directly. The bundle must be deleted and then a new bundle created with the desired pairing. You delete a bundle from the Change Status page.

Only available bundle numbers and appropriate port numbers for the indicated bundle types are displayed in the drop-down selection menus. An empty drop-down menu indicates that there are no more available ports for the bundle type.

Reconfiguring an Existing Bundle

Display the current configuration of a bundle by clicking on the appropriate row in the table displaying existing bundles. If the table is collapsed, mouse over the second blue bar to open it.

After the page refreshes, the current configuration for the selected bundle and its attached port are displayed. Where appropriate, a drop-down menu or text field is displayed that enables you to insert new values for this bundle/port's configuration. Configuration is subject to the restrictions for the selected option as indicated under the option name and as described in the *CTP Hardware, Installation, and Software Configuration Guide*.

Changes to the configuration fields are not transmitted to the connected node or saved until you click **Submit** located at the top of the configuration table. After the new configuration is sent to the connected node, the page refreshes with the new bundle configuration. Review the settings to ensure the new configuration is accurate.

The list of options displayed may change depending on your choice for new option values. When the current value of a configuration option is made invalid by the change in a second option's configuration, a new value is inserted to update the invalid value. This new value is visible and may be changed if other valid configuration values are available.

There are four option fields that, when changed, force the browser to re-render the page. This causes a slight, but noticeable, delay before the page is updated (0.5-1.5 seconds). The fields are: Port I/F Mode, Port Serial Encoding, Port I/F Type, and Port Clock Cfg.

Bundle Change Status

Starting in the Directory frame under Bundles, click **Change Status**. You must be logged into CTPView as an administrator to see this page. You can perform these operations to existing bundles:

- Activate
- Disable
- Delete
- Reset

Previously, this page offered the same operations but the display was based on the node's physical ports. Now these functions are associated with bundles.

Bundle Query

Starting in the Directory frame under Bundles, click **Query**. All users have access to this read-only page, which displays the same information as the Bundle configuration page. However, you cannot change bundle configurations or add new bundles.

Bundle Runtime Query

In the Directory frame under Bundles, click **Runtime Query**. All users have access to this page. The page displays configuration and runtime information on a per bundle basis, not port. Only active bundles are displayed.

Select which bundles to display from the expandable menu bar located at the top of the page. You can select up to 64 bundles. After selecting the bundle rows you want to display, click **Display Selected Bundles**.

Bundle Diagnostics

In the Directory frame under Bundles, click **Diagnostics**. All users have access to this page and the linked utilities. The main Diagnostics page serves as a portal to open three utilities that assist you in evaluating CTP circuit operations and troubleshoot CTP connection problems. These utilities are:

- CTP Traceroute
- Bit Error Rate Test (BERT)
- Network Interface Configuration (NIC)

NOTE: These utilities are currently disabled in the software.

Node Maintenance

You must be logged into CTPView as an administrator to see this page. In the Directory frame under Node, click **Maintenance**. You can choose from a variety of utilities.

Archive Configuration Commands

The Save Port Configuration button is disabled when the CTPView system is connected to a CTP node running CTPOS 5.0 or greater due to the introduction of bundles. It will return in a later release.

Reports

Only information from CTP nodes running pre-5.0 CTPOS software appear in reports available from this page (View Network Host Reports). This page will include post-5.0 nodes in a later release.

AutoSwitch

In the Directory frame under System, click **Bundle Configuration** or **Bundle Query**. At the top of the new page, click the **AutoSwitch** tab.

Only users logged into CTPView as an administrator can see the Bundle Configuration link, and only they have the ability to modify the current configuration.

AutoSwitch settings are now tied to bundles. The individual settings themselves have not changed, but now each row in the AutoSwitch display represents a bundle configured on the local CTP node. You cannot preassign AutoSwitch values to a circuit before you create a bundle on the Bundle Configuration page.

Network Statistics

In the Directory frame under Statistics, click either **Custom,** which enables you to plot statistics of any CTP node in the CPTView network, or click **Preset**, which enables you to quickly select and display statistical plots for the currently connected CTP node. All users have access to these pages.

The Statistics pages are functional, but are still tied to the pre-5.0 port-centric selection method of identifying circuits. Using these pages requires you to make circuit selections based on port numbers, not bundle numbers. Only the port numbers selected on the Port Selection page are displayed on the Preset page.

To help the you map bundle IDs to port numbers, there is an expandable table at the top of both Statistics pages that displays a summary of the current bundle circuits of the connected CTP node.

Network Monitoring

In the Directory frame under Network, click **Monitoring**. All users have access to this page, but only users logged into CTPView as an administrator are allowed to reconfigure any setting on the page.

The Network Monitoring page is operational. However, like the Network Statistics pages, it is still uses a port-centric display for identifying CTP circuits. Because this page covers all CTP nodes in the network designated for monitoring, the table that maps port numbers to bundle IDs is not provided.

The status of a port that is not attached to a bundle is displayed as Disabled.

The Network Monitoring feature is functional on a mixed network of CTP systems running both pre-5.0 and post-5.0 versions of CTPOS code. To maintain this general capability, a few features on this page have been modified or disabled. These features are accessed by clicking a node or port button in the main body of the page. The features are still available in their full form when accessed from the Directory frame of the main CTPView window.

Runtime Query

When the runtime query feature is run from the network monitoring page, only the port information is displayed. No bundle information is included.

Dbase Query (Configuration Query)

This feature has been temporarily removed.

Flash Card

When a configuration change is made through the CTPView software to a CTP system, the modification is saved only in RAM on the CTP system until the CTP system receives a command to write the change to its CompactFlash drive or on a normal shutdown.

To avoid unnecessary write cycles to the CompactFlash, CTPView software uses a timer set to a 5-minute interval. When called, a CTPView script checks for unsaved changes in the CTP system's RAM and only then sends a command for the CTP system to save the changes to the CTP system's CompactFlash. When there are unsaved changes in RAM, a manual override link appears in the CTPView Directory frame under Flash Card.

The timer and the script executing the write-to-flash commands to the CTP nodes are run by the CTPView server itself, without relying on your browser. The check interval remains at 5 minutes and is not adjustable.

Commands are only sent to CTP nodes that have unsaved configuration changes in their RAM. The manual override link is still available in the CTPView Directory frame.

Appendix B
CTPView Troubleshooting and Recovery

This appendix describes how to restore system settings. It contains the following sections:

- Restoring Shell Access to a CTPView Server on page 195
- Restoring Browser Access to a CTPView Server on page 198
- Booting CTPView from a CD-ROM on page 199

Restoring Shell Access to a CTPView Server

Login Restrictions

You cannot log in to the server as user `root`. You must first log in using an existing nonroot account. Then, if you are required to perform tasks as a root user, switch to the root account with the command **su -**. You are prompted for the root password.

This section describes a method that will help you regain access to the server if you have:

- Lost the root password
- Lost the passwords to all available nonroot user accounts and cannot log in to the server

To continue, you must have the GRUB Boot Loader password and physical access to the server with a connected monitor and keyboard.

If you have forgotten the GRUB Boot Loader password, you must use the system motherboard jumpers to disable the password protection feature before proceeding. You can find details about how to perform this task on the Dell PowerEdge Documentation CD P/N GJ625, which was included with the original packing material.

Getting Access to a Shell

To get access to a shell:

1. Use the power switch on the server to turn the power off.
2. Turn the server power back on.
3. When the blue GNU GRUB screen appears, type the letter **p**. You have only a few seconds to do this.
4. The system prompts you to enter the GRUB Boot Loader password.
5. Type the letter **e**.
6. Using the keyboard arrows, highlight the line that begins with the word **kernel**.
7. Type the letter **e** again.
8. Type the following code to the end of the highlighted line, and press Enter:

   init=/bin/bash

9. Type the letter **b**. The system boots and gives a shell prompt of "bash-3.00#".
10. Type the following phrase, and press Enter:

    /bin/mount /dev/md2 -o remount,rw

11. Continue with the appropriate following section.

Setting a New Password for a Root User Account

1. Prepare the server by following the instructions for Getting Access to a Shell on page 196.
2. Type the following phrase, and press Enter:

   /usr/bin/passwd

3. Type the new root password at the prompts.
4. Type the following phrase, and press Enter:

   /bin/mount /dev/md2 -o remount,ro

5. Type the word **reboot**, and press Enter.
6. Allow the system to reboot.

Setting a New Password for a Nonroot User Account

1. Prepare the server by following the instructions for Getting Access to a Shell on page 196.
2. Type the following phrase, and press Enter:

   /usr/bin/passwd <username>
3. Type the new password for <username> at the prompts.
4. Type the following phrase, and press Enter:

   /bin/mount /dev/md2 -o remount,ro
5. Type the word **reboot**, and press Enter.
6. Allow the system to reboot.

Creating a Temporary Nonroot User Account and Password

1. Prepare the server by following the instructions for "Getting Access to a Shell" on page 196.
2. Type the following phrase, and press Enter:

   /usr/sbin/useradd <username>
3. Type the following phrase, and press Enter:

   /usr/bin/passwd <username>
4. Type the new password for <username> at the prompts.
5. Type the following phrase, and press Enter

   /bin/mount /dev/md2 -o remount,ro
6. Type the word **reboot**, and press Enter.
7. Allow the system to reboot.
8. Log in as Temporary User.
9. Switch to the root account by typing **su -**, and press Enter.
10. At the command prompt, type **menu**. The CTPView Configuration Menu utility opens. Create a new permanent nonroot user account.
11. Exit Menu, exit the root account, and then exit the temporary user account.
12. Log in again, this time as the new permanent user.

13. Switch to the root account by typing **su -** and press Enter.

14. Delete the temporary user account by typing the following phrase, and then press Enter:

    /usr/bin/userdel -r <username>

Changing a User Password

A speical procedure is required to change a user's password because the CTP OS is installed on a flash drive that normally operates in a read-only state. The flash drive must be made writable during the user account password modification process. Only the root user is allowed to make the flash drive writable. See *Appendix B, CTPView Troubleshooting and Recovery* for details.

These steps must occur to change a user's password:

1. The root user makes the flash drive writable by entering **mfw** at the CLI.

2. The user logins to the CTP, following the prompts to select a new password.

3. When the user has successfully changed his password, the root user makes the flash drive read-only by entering **mfr** at the CLI.

NOTE: For users who employ the utility SecureCRT to ssh into the CTP, the Authentication method on SecureCRT must be changed from the default setting of Password to Keyboard Interactive. Not doing this prevents the password prompts originating at the CTP from reaching your display and the password update procedure fails.

Restoring Browser Access to a CTPView Server

Lost usernames and passwords cannot be recovered. If you have lost access to CTPView as a Global_Admin user, you can use the following procedure to re-create the default user account “Juniper,” re-create the default user group “TempGroup,” and select a new password for user “Juniper.”

After you have regained access to CTPView Admin Center, use its functions to create the desired user account.

Creating or Resetting a Default Account

Using the terminal management console, log in as the default user, and then switch to the root user account. At the command prompt, type menu. The CTPView Configuration Menu utility opens.

Select Option 7 (CTPView Access Functions). Then select Option 1 (Reset password for default user Juniper), and follow the prompts.

The user “Juniper” is assigned to the default user group “TempGroup” and is given default user properties. Review these values using CTPView Admin Center, and make any appropriate modifications.

Booting CTPView from a CD-ROM

For security purposes booting from the CD-ROM drive has been disabled in the system BIOS settings. If you need to boot from a CD-ROM, you need to reconfigure the BIOS. You must also have physical access to the server and have the BIOS Menu password.

If you have forgotten the BIOS Menu password, use the system motherboard jumpers to disable the password protection feature before proceeding. Details about how to perform this task are found on the Dell PowerEdge Documentation CD P/N GJ625, which was included with the original packing material.

Modifying the Setting in the BIOS Menu

To modify the BIOS setting:

1. Connect a monitor, PS/2 keyboard, and PS/2 mouse to the system.
2. Turn on the system. While the Dell logo is displayed, press F2. The phrase “Entering Setup” appears in the top right corner of the screen, and then the BIOS setup screen loads. If you miss entering F2 at the proper time, press Ctrl + Alt + Delete together to reboot the system so you can repeat this step.
3. The bottom line on the screen contains help for navigating and modifying this menu.
4. Insert the CD-ROM disk from which you intend to boot into the system's CD-ROM drive.
5. Enter the BIOS Menu password, and press Enter to continue.
6. Highlight the line **Boot Sequence**, press Enter, and select **IDE CD-ROM device**. Press Enter to continue.
7. Press the Esc key. In the pop-up window highlight the line **Save Changes and Exit**, and press Enter.

The system will now restart and boot from the CD-ROM disk you placed into the drive earlier.

Restoring the Setting in the BIOS Menu

Repeat the procedure you used to modify the BIOS Menu, but this time remove the check mark next to the line for **IDE CD-ROM device** in the Boot Sequence menu.

For security considerations it is important that you leave the system's ability to boot from a CD-ROM in the disabled state.

Appendix C
Default CTPView Accounts and Passwords

This appendix lists the default accounts and passwords for the CTPView software. It contains the following sections:

- Default Accounts and Passwords on page 201

Default Accounts and Passwords

Table 7: Default Accounts and Passwords for CTPView 2.2 and Later

Application		Default Username	Default Password
Server (cli)	BIOS Menu	Not applicable	CTPView-2-2
Server (cli)	GRUB Boot Loader	Not applicable	CTPView-2-2
Server (cli)	User account	juniper (lowercase j)	CTPView-2-2
Server (cli)	Root account	root	CTPView-2-2
CTPView (browser)	Global_Admin account	Juniper (capital J)	CTPView-2-2
MySQL (cli)	Root account	root	CTPView-2-2
MySQL (cli)	Apache account	ctpview_mysql	CTPView-2-2

NOTE: Upgrading from a pre-2.2 version of CTPView to the current software does not change the existing server passwords or accounts except to add the user account “juniper”. However, all the existing pre-2.2 CTPView user accounts are removed. Browser access to the CTPView is through a new login interface, which requires that an administrator create new usernames and passwords.

Table 8: Default Accounts and Passwords for CTPView 2.1 and Earlier

Application		Default Username	Default Password
Server (cli)	User account	sys_user	sys_user
Server (cli)	Root account	root	passw0rd
CTPView (browser)	Admin account	admin	admin
CTPView (browser)	Query-only account	ctp	ctp

Appendix D
Tripwire v2.3 Software on CTPView

NOTE: Tripwire is third-party software that is preloaded onto the CTPView server. It is not supported by Juniper Networks. Refer to the Tripwire documentation for more information.

Complete documentation is located on the CTPView server in the following directory:

/usr/share/doc/tripwire-2.3.1

Appendix E
Antivirus Software on CTPView

McAfee VirusScan for UNIX, version 5.10.0, is the only antivirus application from a DOD-approved vendor that is compatible with CTPView server software. You can download the software and documentation from the McAfee website.

NOTE: Third-party antivirus software is not supported by Juniper Networks. Refer to the antivirus documentation for more information.

Antivirus Installation Directory

A dedicated directory is on the CTPView server for the antivirus software installation:

/var/av

You may install the antivirus software directly into the directory /var/av if you are a member of the group "server." After the software archive is in the /var/av directory, follow the installation directions in the McAfee product guide. We recommend that you select the default choices offered when installing the antivirus software.

Appendix F
CTP Declaration of Conformity

Declaration of Conformity — CTP1000 Models

Declaration of Conformity

Juniper Networks, Inc.
10 Technology Park Drive
Westford, Massachusetts 01886 USA

Declares that under our sole responsibility the product(s)

Circuit-to-Packet Network Device
Models CTP1002, CTP1004, CTP1012

are in conformity with the provisions of the following EC Directives, including all amendments, and with national legislation implementing these directives:

Low Voltage Directive 73/23/EEC
EMC Directive 89/336/EEC

and that the following harmonized standards have been applied:

EN 60950-1:2001 + A11

EN 60825-1:1994 + A1 + A2

EN 55024:1998 + A1 + A2

EN 55022:1998 + A1(2000) + A2 (2003) Class A

Place	Signature	Date
Westford, MA, USA	Susanne Delisle	7/19/2007

Declaration of Conformity — CTP 2000 series

Declaration of Conformity

Juniper Networks, Inc.
10 Technology Park Drive
Westford, Massachusetts 01886 USA

Declares that under our sole responsibility the product(s)

Circuit-to-Packet Network Device
Model CTP 2000 series

are in conformity with the provisions of the following EC Directives, including all amendments, and with national legislation implementing these directives:

Low Voltage Directive 73/23/EEC
EMC Directive 89/336/EEC

and that the following harmonized standards have been applied:

EN 60950-1:2001 + A11

EN 60825-1:1994 + A1 + A2

EN 300 386 V1.3.3:2005

EN 55024:1998 + A1 + A2

EN 55022:1998 + A1(2000) + A2 (2003) Class A

Place	Signature	Date
Westford, MA, USA	Susanne Delisle	7/19/2007

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