



CTP Series Circuit to Packet Platform

Redundancy in the CTP Network

Release

7.3



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Juniper Networks, Inc.
1133 Innovation Way
Sunnyvale, California 94089
USA
408-745-2000
www.juniper.net

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CHAPTER 1

CTP Redundancy Overview

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- [Loss of Signal Detection Capability on CTP Bundles and SAToP Bundles on page 13](#)
- [Guidelines for Configuring LOS Detection on page 16](#)

Redundancy Features Overview

A CTP series device provides the following redundancy features:

- **Ethernet interface failover**—If the default Ethernet interface fails, the CTP device fails over to the next unconfigured Ethernet interface.
- **Route management redundancy**—If the next-hop gateway (the router) becomes unreachable, the CTP device uses configured static routes to a next-hop gateway on a different network.
- **Bundle failover between CTP devices at alternate sites**—If a bundle circuit fails and the CTP device becomes unreachable, the CTP device fails over to a CTP device at an alternate site.
- **Bundle failover between CTP devices at the same site or single-ended Y-cable redundancy**—If a bundle circuit fails and the CTP device becomes unreachable, the CTP device fails over to a redundant CTP device that is connected to the failed device by a Y cable. Starting from CTPOS release 6.6, this feature is referred to as Exclusive OR (XOR). The term Exclusive OR is used because a port configured for XOR drives the cable only if its bundle is in **RUNNING** state and the other port on the same Y cable, which is also referred to as its link neighbor, is not in **RUNNING** state.
- **Bundle failover between CTP devices at both the local and remote sites or double-ended Y-cable redundancy**—If a bundle circuit fails and a CTP device at either the local or remote site becomes unreachable, the CTP devices fail over to bundles

configured on the redundant CTP devices. At each site, two CTP devices are connected to the customer equipment with a Y cable.

Double ended redundancy has two modes, revert and non-revert. When the revert mode is enabled, the circuit automatically switches back to the primary path when it recovers after a failure. When non-revert mode is enabled, the circuit continues on the secondary path even after the primary path is back online. The circuit switches back to the primary path only if the secondary path fails and the primary path is in **RUNNING** and offline state.

Double-ended Y-cable redundancy has two features, Cold Standby and Hot Standby.

- **Cold Standby**—Cold Standby feature is enabled by configuring the secondary path for RL demand signaling. When enabled, the secondary path remains in **InSYNC** state and does not consume network bandwidth until the primary path fails. This feature helps save bandwidth, especially in networks where bandwidth is expensive. When the primary circuit recovers, the secondary circuit goes back to the **InSYNC** state.

In cold standby, only the primary circuit remains in **RUNNING** state and drives the Y cable.

- **Hot Standby**—In hot standby, both the primary and the secondary circuits remain in **RUNNING** state and the primary circuit drives the cable.

Y-cable redundancy can be based on either a hardware link that uses a special Y cable or a software link that uses OAM packets, which Y-cable port pairs use to communicate with each other.

A hardware link is supported only on serial ports. The functioning of a hardware link is similar to the default operation of the redundancy feature in CTPOS Release 6.5 and earlier.

A software link does not require a special signaling hardware such as the Y cable. Y-cable port pairs maintain contact with each other by using the OAM packets instead of depending on a hardware signaling path. Because of this, Y-cable redundancy is supported on T1/E1 ports as well as serial ports.

When double-ended redundancy is configured by enabling the software link with **ReVeRT** or **NOOnReVert** mode and TRANS 8 encoding, you can connect two users devices by means of a virtual cable that transports every signal on the EIA-530A interface.

- **Packet redundancy**—If packets are lost because of transmission errors, the packet protector feature can enable a possible recovery scenario.

[Table 1 on page 6](#) lists the supported Y-cable configuration settings.

Table 1: Supported Configuration Settings for Y- Cable Redundancy

Solution		Local Configuration	Remote Configuration	Options	Features
Single-ended	Alternate site	Redundancy disabled Autoswitch	Redundancy disabled		

Table 1: Supported Configuration Settings for Y- Cable Redundancy (*continued*)

Solution		Local Configuration		Remote Configuration	Options	Features
Single-ended	Same site	Redundancy disabled Autoswitch		Exclusive OR (XOR)		
Both-ended	Not applicable	Revert (RVRT)	Revert (RVRT)	Fast ¹	Hot standby/Cold standby	
Both-ended	Not applicable	Non-Revert (NORV)	Non-Revert (NORV)	Hot standby		
Multi Master	Not applicable	Redundancy disabled	Signal (SIG)	Inv		

¹Fast switch is supported only in Hot standby in Revert redundancy mode and is valid only for a hardware link.

Table 2: Supported Platforms, Link Types, and Interface Types

Platform	CTP150				CTP2000				
Interface Type	Serial		T1/E1		Serial		T1/E1		
Link Type	Software Link	Hardware Link	Software Link	Hardware Link	Software Link	Hardware Link	Software Link	Hardware Link	
Feature	Redundancy Mode								
Single Ended	XOR	Yes	Yes	Yes	No ¹	Yes	Yes	Yes	No ¹
Hot Standby (Both ended)	RVRT	Yes	Yes	Yes	No ¹	Yes	Yes	Yes	No ¹
	NORV	Yes	Yes	Yes	No ¹	Yes	Yes	Yes	No ¹
Cold standby (Both ended)	RVRT	No ³	Yes	No ³	No ¹	No ³	Yes	No ³	No ¹
	NORV	No ³	No ²	No ³	No ¹	No ³	No ²	No ³	No ¹
Multi master	SIG	No ⁴	Yes	No ⁴	No ¹	No ⁴	Yes	No ⁴	No ¹

¹T1/E1 ports do not support a hardware link due to the lack of signaling leads on the interface.

²Non-revert (NORV) mode is supported only in a Hot standby configuration.

³Cold standby is supported only on a serial interface running a hardware redundancy link.

⁴Signal (SIG) mode is supported only on a serial interface running a hardware redundancy link.

- Related Documentation**
- [Ethernet Interface Failover Overview on page 8](#)
 - [Route Management Redundancy Overview on page 8](#)
 - [Bundle Failover Between CTP Devices at Alternate Sites Overview on page 8](#)
 - [Bundle Failover Between CTP Devices at the Same Site Overview on page 9](#)
 - [Bundle Failover Between CTP Devices at Both the Local and Remote Site Overview on page 11](#)
 - [Packet Redundancy Overview on page 13](#)

Ethernet Interface Failover Overview

When the CTP device sends traffic over the IP network, it aggregates the traffic over its Ethernet interfaces. When you configure your Ethernet interfaces, you specify which Ethernet interface is the default Ethernet interface. In the AutoSwitch configuration, you can enable failover on the default Ethernet interface. If the default Ethernet interface goes down, the CTP device switches to the next unconfigured Ethernet interface.

- Related Documentation**
- [Enabling Ethernet Interface Failover \(CTPView\) on page 19](#)

Route Management Redundancy Overview

Route management redundancy provides redundancy in case the next-hop gateway (the router) becomes unreachable.

When you configure your Ethernet interfaces, you specify a default next-hop gateway (router) in your default Ethernet interface configuration. You can then configure additional Ethernet interfaces with static routes to different next-hop gateways. The CTP device monitors the reachability of the next-hop gateway. If the gateway becomes unreachable, the CTP software removes the configured static route to the gateway from its routing table. You can also specify priority for static routes by assigning a metric. If the default route is unreachable, then the route with the lowest metric is used.

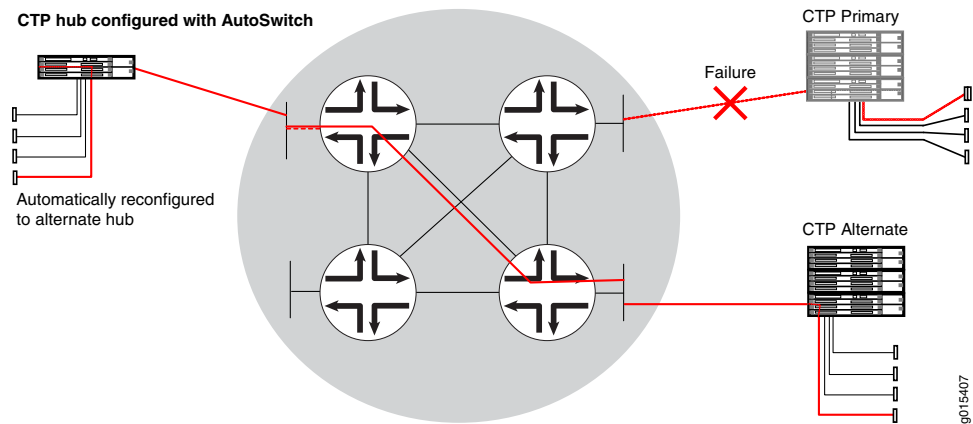
- Related Documentation**
- [Configuring Route Management Redundancy on page 20](#)
 - [Configuring an Ethernet Interface with Static Routes \(CTP Menu\) on page 21](#)

Bundle Failover Between CTP Devices at Alternate Sites Overview

If a bundle circuit fails and the CTP device becomes unreachable, the CTP device can use the AutoSwitch feature to switch between primary and secondary devices.

As shown in [Figure 1 on page 9](#), you can use this feature to automatically switch circuits from a primary site to an alternate site if a failure occurs. Automatic switching between alternate sites allows communications to be quickly restored in the event of a major site outage, as might occur with a power failure.

Figure 1: Using AutoSwitch to Back Up Bundles



For each bundle, you can have a primary and a secondary remote circuit. When you enable AutoSwitch for a bundle, it monitors the status of circuits created by the bundle. If a circuit fails to operate, the CTP software switches over to the secondary circuit on an alternate CTP device.

As shown in [Figure 1 on page 9](#), you configure AutoSwitch at the CTP hub.

Related Documentation

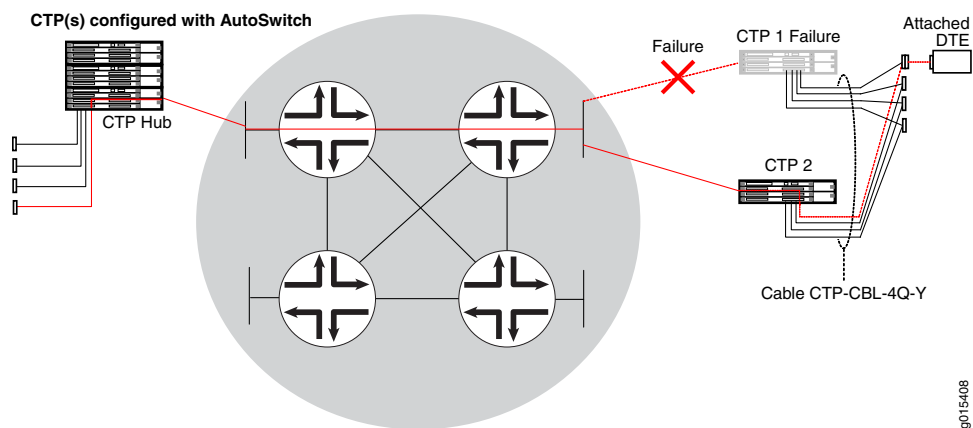
- [Configuring Bundle Failover Between CTP Devices at Alternate Sites \(CTPView\) on page 23](#)
- [Verifying Primary and Secondary AutoSwitch Connections for Bundles \(CTPView\) on page 47](#)

Bundle Failover Between CTP Devices at the Same Site Overview

Y-cable redundancy provides bundle failover using CTP devices at the same site. It provides a way to back up a CTP device with a redundant device at the same site, which increases circuit availability to a site (typically a remote site). The purpose of this redundancy scheme is to maximize network availability by providing complete hardware redundancy that protects from failures that include the network, chassis, processor, power supplies, and the interface module. It quickly restores communication when a system is not reachable or has failed, and is especially valuable at locations that do not have maintenance personnel or spare parts.

As shown in [Figure 2 on page 10](#), during a network or equipment failure, the affected circuit is switched to a co-located alternate CTP device and port. The process of switching the circuit to the redundant system is controlled by the AutoSwitch feature running at the hub CTP system. You need to configure AutoSwitch at the CTP hub location.

Figure 2: Autoswitch with Y-Cable Redundancy



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To use this feature, you use a Y cable to connect the active and standby CTP devices. With this feature enabled, the active CTP device passes data and generates keepalive messages with the standby CTP device over the Y cable. If a failure occurs, the standby CTP device becomes active and transmits data on the circuit.

Requirements for Y-Cable Redundancy

Keep the following in mind when you use Y-cable redundancy:

- Starting from CTPOS Release 7.0, CTP2000 devices support Y-cable redundancy on both serial and T1/E1 interfaces. CTPOS Releases 6.6 and earlier support Y-cable redundancy only on serial interfaces.
- Starting from CTPOS Release 6.6, CTP150 devices support Y-cable redundancy on both serial and T1/E1 interfaces. CTPOS Releases 6.5 and earlier support Y-cable redundancy only on serial interfaces.
- Y-cable redundancy can be based on either a hardware link that uses a special Y cable or a software link that uses OAM packets, which port pairs use to communicate with each other. A hardware link is supported only on serial ports. When the hardware link is enabled, the Y cable provides control leads between the two CTP devices in addition to the standard signal, clock, and data leads connected to the attached device. There is one Y cable for CTP2000 devices and another Y cable for CTP150 devices. Therefore, you must use the same platform type at each site.

A software link does not require a special signaling hardware. Y-cable port pairs can maintain contact with each other by using the OAM packets instead of depending on a hardware signaling path. Because of this, Y-cable redundancy is supported on T1/E1 ports as well as serial ports.

- The Y cable is short to maintain signal quality. The two CTP devices connected to the Y cable must be in close proximity to each other.
- To run diagnostics on a nonactive bundle attached to a Y cable without introducing data errors on the active bundle, Y-cable redundancy must be configured, and you cannot have a daughter card installed.

Clocking Supported with Y-Cable Redundancy

Y-cable redundancy is supported with the following clock configurations:

- Configured rate without external TX clock (TT).
- Configured rate with external TX clock (TT).
- All clocked with external TX clock (TT).
- Adaptive clocking with internal clock.
- Adaptive clocking with external TX clock (TT).

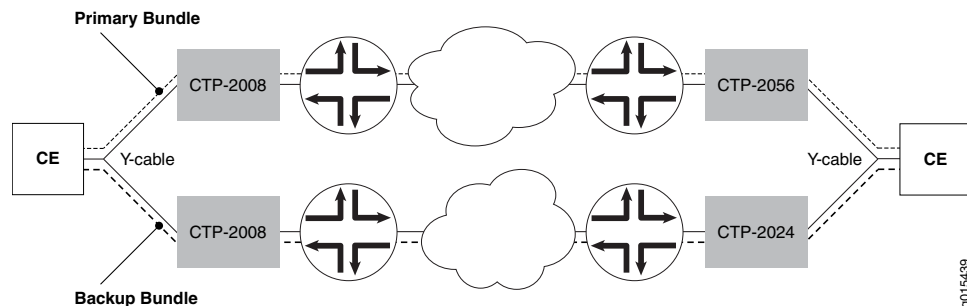
Related Documentation

- [Configuring Bundle Failover Between CTP Devices at the Same Site on page 26](#)

Bundle Failover Between CTP Devices at Both the Local and Remote Site Overview

You can use Y cables at both the local and remote sites to provide a redundant path for bundles. This feature is also known as double-ended Y-cable redundancy. As shown in [Figure 3 on page 11](#), you use a Y cable to connect two CTP devices to the customer equipment (CE) at both sites. You then create a primary bundle between one pair of CTP devices, and you create a backup bundle between a second pair of CTP devices.

Figure 3: Y-Cable Redundancy at Both the Local and Remote Sites



How Bundle Failover Between CTP Devices at Both the Local and Remote Sites Works

Under normal conditions, both the primary and backup bundles are in the running state and are consuming bandwidth. Under these conditions, the primary bundle is carrying the data between the CEs.

If the primary bundle goes down or is no longer in the running state, the CTP devices switch over to the backup bundle, and the backup bundle carries the data. The time that it takes for the switchover to occur depends on the bundle configuration. The switchover happens faster if you enable the Fast Switch option. The actual switchover time depends on the circuit packet rate and the configured **packets to starvation** parameter, but it is on the order of milliseconds instead of seconds. This option may not be used in conjunction with Cold Standby. Fast switch is supported only in Hot standby in Revert redundancy mode and is valid only for a hardware link.

When the primary bundle returns to the running state, the CTP devices switch back to the primary bundle, and the primary bundle begins carrying data.

Requirements for Y-Cable Redundancy

Keep the following in mind when you use Y-cable redundancy:

- Starting from CTPOS Release 7.0, CTP2000 devices support Y-cable redundancy on both serial and T1/E1 interfaces. CTPOS Releases 6.6 and earlier support Y-cable redundancy only on serial interfaces.
- Starting from CTPOS Release 6.6, CTP150 devices support Y-cable redundancy on both serial and T1/E1 interfaces. CTPOS Releases 6.5 and earlier support Y-cable redundancy only on serial interfaces.
- Y-cable redundancy can be based on either a hardware link that uses a special Y cable or a software link that uses OAM packets, which port pairs use to communicate with each other. A hardware link is supported only on serial ports. When the hardware link is enabled, the Y cable provides control leads between the two CTP devices in addition to the standard signal, clock, and data leads connected to the attached device. There is one Y cable for CTP2000 devices and another Y cable for CTP150 devices. Therefore, you must use the same platform type at each site.

A software link does not require a special signaling hardware. Y-cable port pairs can maintain contact with each other by using the OAM packets instead of a hardware signaling path. Because of this, Y-cable redundancy is supported on T1/E1 ports as well as serial ports.

- The Y cable is short to maintain signal quality. The two CTP devices connected to the Y cable must be in close proximity to each other.
- To run diagnostics on a nonactive bundle attached to a Y cable without introducing data errors on the active bundle, Y-cable redundancy must be configured, and you cannot have a daughter card installed.

Clocking Supported with Y-Cable Redundancy

Y-cable redundancy is supported with the following clock configurations:

- Configured rate without external TX clock (TT).
- Configured rate with external TX clock (TT).
- All clocked with external TX clock (TT).
- Adaptive clocking with internal clock.
- Adaptive clocking with external TX clock (TT).

Related Documentation

- [Configuring Bundle Failover Between CTP Devices at Both the Local and Remote Sites \(CTP Menu\) on page 38](#)
- [Configuring Bundle Failover Between CTP Devices at Both the Local and Remote Sites \(CTPView\) on page 35](#)

Packet Redundancy Overview

The packet protection feature increases circuit quality and reliability in IP networks that have significant packet loss.

With this feature, each circuit has IP packet redundancy to enable error-free transmission of packets. The packet protector creates and transmits duplicate packets to the IP network. The receiving CTP device processes the redundant packets.

You can set up the packet protector to create and transmit one-for-one duplicate packets to the IP network or to create and transmit duplicate XOR packets. Creating and transmitting one-for-one duplicate packets uses 100% additional bandwidth. Creating and transmitting duplicate XOR packets uses only 50% additional bandwidth.

To use this feature, you configure packet protection on CTP, SAToP, VComp, or CESoPSN bundles. You can specify whether each end of the connection sends and receives duplicate packets, and you can specify the type of duplicate packet.

Setting Buffer Sizes When You Use Cloned XOR Packets

When you use cloned XOR packets, you must set your buffer sizes so that they are large enough to accommodate three packets. You can use the following formula to determine the correct buffer size:

$$3/[\text{circuit speed}/(8 * \text{packet size})]$$

OR

$$((\text{circuit speed} / \text{packet size})/8)=\text{packets per second}$$

For example, a circuit with a speed of 9.6 kbps and 32-byte packets needs a minimum buffer set point that is greater than 80 ms:

$$(9600/32)/8=37.5 \text{ packets per second}$$

$$1/37.5 = 26.67 \text{ ms} * 3 = 80 \text{ ms}$$

Related Documentation

- [Configuring Packet Redundancy for Circuits \(CTPView\) on page 41](#)
- [Configuring Packet Redundancy for Circuits \(CTP Menu\) on page 43](#)

Loss of Signal Detection Capability on CTP Bundles and SAToP Bundles

A loss of signal (LOS) alarm indicates that there is a physical link problem with the connection to the router receive port from the neighboring SONET equipment transmit port. An LOS alarm occurs when the port on the card is in service but no signal is being received. The cabling is not correctly connected to the ports, or no signal exists on the line. Possible causes for a loss of signal include upstream equipment failure or a fiber cut.

The CTP devices support a both-ended redundancy mechanism, in which two identical CTP circuit bundles are combined using Y cables at each end, enabling one bundle to act as a backup for the other. One of the bundles is in use (online), while the other is in the standby state (offline). Only the online bundle is allowed to drive the Y cable towards

the user equipment, while the offline bundle is tristate. A communications channel (such as redundancy by using a hardware link that uses a special Y cable or redundancy based on a software link that does not depend on a signaling hardware like the Y cable) between ports at each end determines which of the two ports on the Y cable is currently online. When one bundle fails, the failed bundle transitions to the offline and places the other bundle in the online state.

Consider a sample configuration scenario in which two CTP bundles (four CTP ports) are used in a Y-cable redundancy format. Software-based redundancy is enabled. In this type of configuration, 172.25.62.51:te-0/0(B0) is the left primary link and 172.25.62.51:te-0/1(B1) is the left secondary link. 172.25.62.52:te-0/0(B0) is the right primary link and 172.25.62.52:te-0/1(B1) is the right secondary link. In this redundant configuration, the circuit is very robust, protecting against many types of failures, such network failures, power failures, and equipment failures. However, one type of failure is not detected, which is when a cable is pulled out.

Starting with CTPOS Release 7.2R1, CTP devices support the detection of a loss of signal, which denotes a physical link problem. The following conditions are supported:

- In a serial both-ended Y-cable redundancy configuration (software-based Y cable link protocol), removal of Y cable leg from the CTP port of the online bundle must be able to force a switch to the standby bundle.
- In a T1/E1 both-ended Y cable configuration (software-based Y cable link protocol), removal of Y cable leg from the CTP port of the online bundle must be able to force a switch to the standby bundle.

The T1/E1, CTP, and SAToP bundles support LOS detection and based on this signal, the run state of the bundles switches to TfFail, which initiates a software-based Y cable switchover to a redundant port. Also, for T1/E1 both-ended Y-cable redundancy configuration, only software-based Y cable link protocol is supported and hardware-based redundancy is not supported.

The way in which CTP redundancy works is by using the bundle state to make decisions. When a bundle is in the RUNNING state, the following processes occur:

1. The remote CTP is operational and is able to generate and send packets into the IP network (towards us).
2. The network is able to transport bundle OAM and payload packets from the remote CTP to the local CTP.
3. A sufficient percentage of the bundle payload packets fills packet delay variation (PDV buffers) and maintain circuit data transport towards the locally connected user equipment.

Therefore, when a bundle is in the RUNNING state, it is “usable” and can be online in a redundant configuration.

Consider a network topology in which a failure occurs in the circuit path that does not cause the circuit to exit the RUNNING state. This phenomenon can be the case when the cable is pulled from the CTP port of a redundant online bundle. Although this condition might not typically be considered an actual failure, and instead more of a configuration

error, this symptom can nevertheless be classified in the failure category. Therefore, a mechanism to be able to detect this condition in redundant setups and provide an online circuit switch to offline when the cable is removed is beneficial. CTP devices support the evaluation of LOS conditions on serial interfaces and T1/E1 interfaces in CTP bundles and SAToP bundles.

- [Detection of LOS on Serial Interfaces on page 15](#)
- [Detection of LOS on T1/E1 Interfaces on page 15](#)

Detection of LOS on Serial Interfaces

For serial interfaces, the determination of LOS condition is already performed in CTPOS releases earlier than Release 7.2R1. When a serial circuit is configured to use the TT input (on a data communication equipment [DCE] interface) for at least one of its five configured port clocks (for example, "Cfg Rate - Ext Clk), the external clock frequency is examined by the CTP device before the local bundle can go to the running state. If there is no external clock present or it is not the correct frequency, then the bundle transitions to the TtFAIL state and never go to RUNNING. Also, if the bundle is already in the RUNNING state, the external clock is verified every second to ensure that its frequency is still present and within range. If not, the bundle transitions from RUNNING to TtFAIL.

In the TtFAIL state, the bundle periodically transitions back to the EVAL state, where the external clock is checked again. If the clock fails or a bad frequency occurs, the bundle returns to the TtFAIL state. If the clock is properly functional, then the bundle transitions to the various states that eventually end in the RUNNING state. Such a method of change of states enable a graceful (if not instantaneous) recovery of a circuit where a cable is disconnected, but subsequently reconnected. Because removal of the cable on a serial port that is using an external clock can cause the bundle to exit the RUNNING state, that bundle switches offline, if currently online in a Y-cable redundancy setup.

Detection of LOS on T1/E1 Interfaces

The clock and data signals are embedded together on a T1/E1 interface in a single AMI (alternate mark inversion) electrical signal. The hardware line interface unit (LIU) that recovers the composite AMI signal into its component clock and data signals recovers a clock from the incoming AMI signal, even when none is present because it is based on a free running phase-locked loop (PLL) that generates a clock, even when it is not locked to an incoming signal. As a result, the CTP port interface receives an incoming external clock from the LIU, whether a valid T1/E1 signal is connected to the CTP or not. The LIU, however, cannot determine when it has a valid incoming T1/E1 signal, and in such a condition, the LIU indicates as a LOS status bit. This indication serves as the basis for detecting a cable disconnect in a Y-cable redundant configuration.

To use LOS as a way to take down a RUNNING bundle, the effective method implemented is to treat a T1/E1 LOS condition exactly the same as a serial port with a bad or missing external clock. When the CTP device performs its "check external clock" function, instead of returning an automatic success on T1/E1 ports, the LOS status bit is analyzed to determine whether it is a T1/E1 port. If the LIU LOS status indicates that there is no incoming signal, then the function returns a failure, which causes the bundle to move to the TtFAIL state. This state is the same as a missing external clock processing for a serial port. In this manner, the T1/E1 ports behave exactly the same way as serial ports.

Guidelines for Configuring LOS Detection

Keep the following points in mind when you configure the capability to detect LOS conditions on T1/E1 interfaces:

- A cable disconnection of a serial port cannot be detected when no external clock is being used by the port. The following clock configurations use an external clock:
 - DCE/DTE: Cfg Rate – Ext Clk
 - DCE/DTE: All Clock – Ext Clk
 - DCE/DTE: Adap Rate – Ext Clk
 - DCE/DTE: Auto Rate – Ext Clk
 - DTE: All clocked by Ext Clk (ST/RT)
 - DTE: All clocked by User Clk (RT)
 - Any custom clock config that uses “TT”
- For any other serial clock configuration, a cable removal on the online port does not cause it to exit the running state.
- For T1/E1 ports, the recovered clock (which is equivalent to the external clock of a serial port) from the incoming T1/E1 AMI signal is used in all available T1/E1 preconfigured or canned clock configurations.
- The T1 LOS checking technique was primarily intended for CTP bundles. Because the T1/E1 SAToP bundle state machine also supports the bundle EVAL state as part of its bundle state machine, it can also benefit from the LOS checking functionality provided by this feature. However, the LOS detection feature on SAToP bundles is not useful for both ended redundancy, since both-ended Y-cable redundancy configurations only supports CTP bundles.
- CESoPSN and VCOMP bundles are not supported for detecting LOS conditions because their bundle state machines do not support an EVAL state.
- You can configure the LOS detection mechanism for T1/E1 ports in the same function that checks the external input clock. In addition, this T1/E1 LOS detection capability is processed under the control of a separate port configuration flag so that this LOS checking occurs only when this flag is active. Although this menu option to enable or disable the LOS detection functionality is shown regardless of the port type, such as serial interfaces or T1/E1 interfaces, this setting becomes effective on a T1/E1 port only when it is connected to a CTP or SAToP bundle. If the LOS detection functionality is enabled on a serial port or other bundle types, the setting is not processed.
- Also, when you run the bundle query for CTP bundles and SAToP bundles, the T1/E1 port type displays port configuration flags that are relevant to a T1/E1 port. In the PortConfigFlags field displayed in the output of the bundle query, T1LoSCheck denotes that LOS detection is specified on a T1 port connected to a CTP bundle or a SAToP bundle, E1LoSCheck denotes that LOS detection is specified on a E1 port connected to a CTP bundle or a SAToP bundle, and the NoRdReclk flag signifies that the redundancy receiving (RX) clock is disabled. The NoRdReclk flag is also displayed

because this flag is default enabled for a T1/E1 port, whereas it is usually not enabled for a serial port.

CHAPTER 2

Configuring CTP Redundancy

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- Configuring Route Management Redundancy on page 20
- Configuring Bundle Failover Between CTP Devices at Alternate Sites (CTPView) on page 23
- Configuring Bundle Failover Between CTP Devices at the Same Site on page 26
- Configuring Bundle Failover Between CTP Devices at Both the Local and Remote Sites (CTPView) on page 35
- Configuring Bundle Failover Between CTP Devices at Both the Local and Remote Sites (CTP Menu) on page 38
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- Configuring Packet Redundancy for Circuits (CTP Menu) on page 43
- Configuring LOS Detection on CTP and SAToP Bundles (CTP Menu) on page 45

Enabling Ethernet Interface Failover (CTPView)

This topic describes how to enable the use of Ethernet failover. You can configure this feature only in CTPView.

Before you begin:

- Log in to the CTPView software at least at the Net_Admin level.
- Connect the CTPView server to the CTP device for which you want to configure this feature.

To enable Ethernet failover using CTPView:

1. In the side pane, select **System > Configuration**.
2. Set the **AutoSwitch Daemon** parameter to Enabled.
3. Click **AutoSwitch**.
4. Under **AutoSwitch Ethernet Failover Settings**, configure the parameters described in [Table 3 on page 20](#), and click **Submit Settings**.

Table 3: AutoSwitch Ethernet Failover Settings in CTPView

Field	Function	Your Action
Use	Specifies whether or not Ethernet failover is enabled for an Ethernet interface. If this feature is enabled and the active Ethernet interface goes down, the CTP device switches to an alternate Ethernet interface.	Select one: <ul style="list-style-type: none"> • Yes—Ethernet failover is enabled. • No—Ethernet failover is not enabled.

Related Documentation

- [Ethernet Interface Failover Overview on page 8](#)

Configuring Route Management Redundancy

Route management redundancy requires the following:

- Two Ethernet interfaces that are configured for different networks. One is the default interface that contains the default gateway configuration. The second interface provides static routes that use a different next-hop gateway.
- A virtual IP address for the CTP device. To create a list of the virtual IP addresses that will be associated with the CTP device, select **Node > Maintenance > Configure Virtual IPs**, and follow the instructions on the pane. You can create up to 56 virtual IP addresses.
- CTP bundle circuits that use route redundancy should have direct drive disabled to allow for asymmetric routing. See *Configuring IP Forwarding for CTP Bundles (CTPView)* or *Configuring IP Forwarding for CTP Bundles (CTP Menu)*.

To set up route management redundancy, perform the following tasks:

1. [Configuring a Default Ethernet Interface \(CTP Menu\) on page 20](#)
2. [Configuring an Ethernet Interface with Static Routes \(CTP Menu\) on page 21](#)
3. [Enabling Route Management Redundancy \(CTPView\) on page 22](#)

Configuring a Default Ethernet Interface (CTP Menu)

You are required to reboot the CTP device when you finish this configuration procedure.

To configure the default Ethernet interface by using the CTP Menu:

1. From the Main menu, select **5) Node Operations**.
2. Select **3) Configure network settings**.
3. Select **2) IPv4 Configuration** or **3) IPv6 Configuration**.
4. Follow the onscreen instructions to select and specify a default Ethernet interface.
5. Configure the options as described in [Table 4 on page 21](#).



NOTE: Do not add a route to the default Ethernet interface.

Table 4: Ethernet Interface Parameter Settings in the CTP Menu

Field	Function	Your Action
Please input the hostname	Specifies the hostname for the CTP device.	Enter a name.
Please input the ip/ipv6	Specifies the IP address of the Ethernet interface.	Enter an IP address.
Please input the netmask	For IPv4 interfaces, specifies the network mask.	Enter the network mask.
Please input the gateway	On the default Ethernet interface, specifies the IP address of the default next-hop gateway, which is the Ethernet interface on the router.	Enter an IP address.
Please input the mtu in bytes	Specifies the maximum transmission unit (MTU) for the Ethernet interface.	For IPv4 networks, enter a number from 64 through 1500. For IPv6 networks, enter a number of at least 1280.

- See Also**
- *Ethernet Media Configuration Overview*
 - *Configuring Ethernet Media (CTP Menu)*
 - *Displaying Ethernet Media Information (CTP Menu)*

Configuring an Ethernet Interface with Static Routes (CTP Menu)

Configure an Ethernet interface on a network that is different from the default Ethernet interface, and add static routes to the interface configuration. You can configure metric for static routes to specify priority of the routes on the subnet.

You must reboot the CTP device when you finish this configuration procedure.

To configure static routes for Ethernet interfaces using the CTP Menu:

1. From the Main menu, select **5) Node Operations**.
2. Select **3) Configure network settings**.
3. Select **2) IPv4 Configuration** or **3) IPv6 Configuration**.
4. Follow the onscreen instructions to select a second Ethernet interface to activate on boot, and configure the options as described in [Table 5 on page 22](#).

Table 5: Ethernet Parameter Settings in the CTP Menu

Field	Function	Your Action
Please input the ip/ipv6	Specifies the IP address of the Ethernet interface.	Enter an IP address.
Please input the netmask	For IPv4 interfaces, specifies the network mask.	Enter the network mask.
Please input the mtu in bytes	Specifies the maximum transmission unit (MTU) for the Ethernet interface.	For IPv4 networks, enter a number from 64 through 1500. For IPv6 networks, enter a number of at least 1280.
Add route to interface eth	Specifies whether or not to add static routes to the Ethernet configuration.	Specify yes .
How many routes would you like to add to eth0?	Specifies the number of static routes to add to your Ethernet interface configuration.	Enter a number between 0 and 3.
Please input the network	Specifies the IP address of the static route to the next-hop gateway.	Enter an IP address.
Please input the number of bits in the netmask	For IPv4 networks, specifies the IP mask of the Ethernet interface.	Enter an IP mask.
Please input the gateway	Specifies the IP address of the next-hop gateway (the router).	Enter an IP address.
Please input the metric for this route, -1 for no metric	Specifies the value for metric for the route.	Enter -1 for no metric. If another route with a metric value between 1 and 256 is configured on the same subnet, then the route with no metric takes precedence. Enter a value between 1 and 256 to enable metric.

- See Also**
- [Route Management Redundancy Overview on page 8](#)
 - [Enabling Ethernet Interface Failover \(CTPView\) on page 19](#)

Enabling Route Management Redundancy (CTPView)

This topic describes how to enable the route redundancy management feature.

To enable route management redundancy using CTPView:

1. In the side pane, select **System > Configuration**.
2. Set the **AutoSwitch Daemon** parameter to Enabled.

3. Click **AutoSwitch**.
4. Under **AutoSwitch Ethernet Failover Settings**, configure the parameters described in [Table 6 on page 23](#), and click **Submit Settings**.

Table 6: Route Management Redundancy Settings in CTPView

Field	Function	Your Action
Status	Enables or disables route management redundancy	Select one: <ul style="list-style-type: none"> • Enabled • Disabled
Secondary Revert	<p>Specifies whether or not the CTP device periodically checks the connectivity to the AutoSwitch primary device after a switchover to the secondary device.</p> <p>Whenever the primary route is unavailable, the traffic is routed through the secondary route configured in the CTP system. Secondary Revert feature applies only when traffic is flowing through the secondary route. When Secondary Revert is enabled, the traffic is routed back to the primary route after a configurable delay, whenever the primary route is back online. If the secondary route is disabled, the route is not switched back to the primary route even if the primary route is available again.</p>	Select one: <ul style="list-style-type: none"> • Disabled—CTP device does not check the connectivity to the primary device. • Enabled—CTP device checks the connectivity to the primary CTP device after a switchover. If the primary device becomes available, the CTP device reconnects to the primary CTP device.
Forceful Revert	<p>The Forceful Revert button is enabled only if the Route Management Redundancy status is set to enabled and Secondary Revert is disabled.</p> <p>If secondary revert is disabled after the switchover from primary device to secondary device, click Forceful Revert to perform switchover from the secondary device to the primary device, provided the primary device becomes available.</p>	Click Forceful Revert to manually switch from the secondary device to the primary device.
Check Period [all functions]	Specifies the frequency with which the CTP software runs a reachability check. For example, if the check period is set for 30, the CTP software verifies whether the next hop is reachable once every 30 seconds.	Select the number of seconds.

Related Documentation • [Route Management Redundancy Overview on page 8](#)

Configuring Bundle Failover Between CTP Devices at Alternate Sites (CTPView)

This topic describes how to configure AutoSwitch for bundle failover. You can configure the AutoSwitch feature only with CTPView.

Before you begin:

- Log in to the CTPView software at least at the Net_Admin level.
- Connect the CTPView server to the CTP device for which you want to configure this feature.

To configure AutoSwitch using CTPView:

1. In the side pane, select **System > Configuration**.
2. Set the **AutoSwitch Daemon** parameter to Enabled.
3. Click **Autoswitch**.
4. (Optional) You can update the network interface device (NID) information for all CTP devices that are reachable in the network. To do so, click **Update NID info** in the **Remote Host Settings** row.
5. Configure the **Check Period [all functions]** parameter under **AutoSwitch Ethernet Failover Settings** as well as the parameters under **AutoSwitch Bundle Failover Settings** as described in [Table 7 on page 24](#), and click **Submit Settings**.

Table 7: AutoSwitch Parameter Settings in CTPView

Field	Function	Your Action
Check Period [all functions]	<p>This parameter is under the AutoSwitch Ethernet Failover Settings configuration in CTPView.</p> <p>Specifies the time between the checking of ports to determine the circuit status.</p> <p>The combination of the switch count value and the check period value determines the rate of the switchover.</p>	<p>Select the number of seconds.</p> <p>We recommend that you configure the Switch Count and Check Period to values that prevent the circuit from switching in the event of a short transient outage.</p>
Status	<p>Specifies whether the AutoSwitch feature is enabled or disabled on the bundle.</p>	<p>Select one:</p> <ul style="list-style-type: none"> • Disabled—AutoSwitch is disabled for this bundle. • Enabled—AutoSwitch is enabled for this bundle.
Switch Count	<p>Specifies how many consecutive checks are required without a circuit being established before the circuit is switched over to an alternate circuit.</p> <p>The combination of the switch count value and the check period value determines the rate of the switchover.</p>	<p>Select the number of checks.</p> <p>We recommend that you configure the Switch Count and Check Period to values that prevent the circuit from switching in the event of a short transient outage.</p>

Table 7: AutoSwitch Parameter Settings in CTPView (*continued*)

Field	Function	Your Action
AutoSwitch Primary	Specifies the CTP device that is used as the primary device to fail over to. Also specifies the circuit ID and interface that are used on the device.	<p>To specify the primary device:</p> <ol style="list-style-type: none"> Click the box under AutoSwitch Primary, and select a group. A list of CTP devices within the group appears. Select a CTP device. A list of the circuit IDs configured on the CTP device appears. Select a circuit ID. A list of interfaces configured with the circuit ID appears. Select an interface.
AutoSwitch Secondary	Specifies the CTP device that is used as the secondary device to fail over to. Also specifies the circuit ID and interface that are used on the device.	<p>To specify the secondary device:</p> <ol style="list-style-type: none"> Click the box under AutoSwitch Primary, and select a group. A list of CTP devices within the group appears. Select a CTP device. A list of the circuit IDs configured on the CTP device appears. Select a circuit ID. A list of interfaces configured with the circuit ID appears. Select an interface.
Secondary Revert	Specifies whether or not the CTP device periodically checks the connectivity to the AutoSwitch primary device after a switchover to the secondary device.	<p>Select one:</p> <ul style="list-style-type: none"> Disabled—The CTP device does not check the connectivity to the primary device. Enabled—The CTP device checks the connectivity to the primary CTP device after a switchover. If the primary device becomes available, the CTP device reconnects to the primary CTP device.

- Related Documentation**
- [Bundle Failover Between CTP Devices at Alternate Sites Overview on page 8](#)
 - [Verifying Primary and Secondary AutoSwitch Connections for Bundles \(CTPView\) on page 47](#)

Configuring Bundle Failover Between CTP Devices at the Same Site

To configure bundle failover between CTP devices at the same site that are connected by a Y cable, perform the tasks below. You can configure Y-cable redundancy for the bundle with either CTPView or CTP Menu. You can configure AutoSwitch only with CTPView.

1. [Configuring Y-Cable Redundancy for the Bundle \(CTPView\) on page 26](#)
2. [Configuring Y-Cable Redundancy for the Bundle \(CTP Menu\) on page 29](#)
3. [AutoSwitch for Bundle Failover \(CTPView\) on page 32](#)

Configuring Y-Cable Redundancy for the Bundle (CTPView)

A CTP series device provides two types of Y-cable redundancy.

- Redundancy by using a hardware link that uses a special Y cable—A hardware link requires a special Y cable that connects the CTP devices and is supported only on serial ports. The functioning of a hardware link is similar to the default operation of the redundancy feature in CTPOS Release 6.5 and earlier. A hardware link is supported only on serial ports.
- Redundancy by using a software link that does not depend on a signaling hardware like the Y cable—A software link does not require a special signaling hardware. Y-cable port pairs can maintain contact with each other by means of OAM packets instead of a hardware signaling path. Because of this, Y-cable redundancy is supported on T1E1 ports as well as serial ports with a special Y cable. Redundancy by means of a software link is supported on both serial and T1/E1 ports on CTP150 and CTP2000 devices.

When you configure Y-cable redundancy that uses a hardware link, you can use different redundant port numbers if the devices are using the same port on the 100-pin connector. For example, a Y-cable 100-pin connector could be attached to ports 0-3 on the first CTP device, with the second connector attached to ports 8-11 on the second device. The redundant ports would be P0/P8, P1/P9, P2/P10 and P3/P11 on the first and second CTP devices, respectively.

Before you begin:

- Log in to the CTPView software at least at the Net_Admin level.
- Connect the CTPView server to the CTP device for which you want to configure bundles.
- Disable the bundle before you modify the bundle options.

To configure Y-cable redundancy by using CTPView:

1. In the side pane, select **Bundle > Configuration**.
2. Run your mouse over the **Display and Select an Existing Bundle** bar.
3. In the table of bundles, select the bundle that you want to modify.

4. Under **Port Options**, place a check mark in the **Advanced Options Show** check box to display advanced parameters, and configure the parameters described in [Table 8 on page 27](#).
5. Click **Click to Submit Bundle AND Port Changes**.
6. Configure AutoSwitch settings for bundle failover. See [“Configuring Bundle Failover Between CTP Devices at Alternate Sites \(CTPView\)” on page 23](#).

Table 8: Y-Cable Settings in CTPView

Field	Function	Your Action
Redundancy Mode	Displays a list of supported redundancy modes. See “Redundancy Features Overview” on page 5 for a list of supported Y-cable redundancy configuration settings.	<p>Select one:</p> <ul style="list-style-type: none"> • Disable—Y-cable redundancy is not enabled on this port. • eXclusive OR (XOR)—Redundancy is enabled. In this mode the Y cable is active only if the port is in RUNNING state and the serial port on the Y-cable link is not in RUNNING state. If both bundles are RUNNING, the Y cable remains inactive on both the ports. • ReVeRT (RVeRT)—When you select this mode, a primary and a secondary path is enabled. The primary path drives the cable when its bundle is in RUNNING state, independent of the state of the secondary path. The secondary path is activated when the primary path is offline. Whenever the primary path comes back online, the path is switched back to the primary path. • NOOnReVert (NOReV)—When you select this mode, the circuit is not switched back to primary when the primary path comes back online after switching to secondary path. The circuit is switched to the primary path only when the secondary path fails. • Signal (SIG)—The primary path is activated only if the secondary CTS output is inactive. When CTS is active, secondary drives cable.
Primary/Secondary	Specifies the primary and backup bundles.	Configure a primary and a backup bundle. When the software link is enabled and link partners are specified, the software verifies that there is a matched primary and backup pair.

Table 8: Y-Cable Settings in CTPView (continued)

Field	Function	Your Action
Pri/Sec Link Type	Specifies the link types for primary and back up bundle.	<p>Select one.</p> <ul style="list-style-type: none"> • H/W link—When enabled, the Y-cable redundancy is supported only on serial ports, and the link between ports is a hardware signaling connection over a special Y cable that uses the output to cable(TM) and the input from cable(RL) to communicate redundancy state between port pairs, by using keepalive pulses. Its operation is similar to the default operation of the redundancy feature in CTPOS Release 6.5 and earlier. • S/W link—Allows Y-cable port pairs to maintain contact with each other by means of OAM packets instead of using a hardware signaling path. The software link has the following advantages: <ul style="list-style-type: none"> • The software link does not require a special signaling hardware, which means that Y-cable redundancy is supported on T1E1 ports as well as serial ports with a special Y cable. Serial ports can get TM/RL signals for user applications. • Software or OAM link packets can check link partners and identify configuration errors. They can also differentiate between dead and alive states.
IP Address	Specifies an IP address for the other port of the redundant primary and backup pair.	Specify an IP address.
Card Number	Specifies a card number for the other port of the redundant primary and backup pair.	Specify a card number in the range 0 through 6.
Port Number	Specifies a port number for the other port of the redundant primary and backup pair.	Specify a port number in the range 0 through 23.
Fast switch	<p>Allows fast switching in case of a failover. This feature is supported only on serial ports.</p> <p>Fast switch is supported only in Hot standby in Revert redundancy mode and is valid only for a hardware link.</p>	Select ENABLED or DISABLED .

Configuring Y-Cable Redundancy for the Bundle (CTP Menu)

A CTP series device provides two types of Y-cable redundancy.

- Redundancy by using a hardware link that uses a special Y cable—A hardware link requires a special Y cable that connects the CTP devices and is supported only on serial ports. The functioning of a hardware link is similar to the default operation of the redundancy feature in CTPOS Release 6.5 and earlier. A hardware link is supported only on serial ports.
- Redundancy by using a software link that does not depend on a signaling hardware like the Y cable—A software link does not require a special signaling hardware. Y-cable port pairs can maintain contact with each other by means of OAM packets instead of a hardware signaling path. Because of this, Y-cable redundancy is supported on T1/E1 ports as well as serial ports with a special Y cable. Redundancy by means of a software link is supported on both serial and T1/E1 ports on CTP150 and CTP2000 devices.

When you configure Y-cable redundancy that uses a hardware link, you can use different redundant port numbers if the devices are using the same port on the 100-pin connector. For example, a Y cable 100-pin connector could be attached to ports 0-3 on the first CTP device, with the second connector attached to ports 8-11 on the second device. The redundant ports would be P0/P8, P1/P9, P2/P10 and P3/P11 on the first and second CTP devices, respectively.

Before you begin:

- Disable the bundle before you modify the bundle options.

To configure Y-cable redundancy for CTP bundles by using the CTP Menu:

1. From the Main Menu, select **1) Bundle Operations**.
2. Select **1) CTP**.
3. Select a bundle from the list.
If you select an active bundle, you are prompted to disable the bundle before configuring it.
4. Select **3) Port Config**.
5. Select **4) Advanced Options > 19) Redundancy Options > 1) Redundancy Mode** and configure the options as described in [Table 9 on page 30](#).
6. Configure AutoSwitch settings for bundle failover. See [“Configuring Bundle Failover Between CTP Devices at Alternate Sites \(CTPView\)” on page 23](#).

Table 9: Y-Cable Settings in the CTP Menu

Field	Function	Your Action
Redundancy Mode	Displays a list of supported redundancy modes. See “Redundancy Features Overview” on page 5 for a list of supported Y-cable redundancy configuration settings.	Select one: <ul style="list-style-type: none"> • Disable—Y-cable redundancy is not enabled on this port. • eXclusive OR (XOR)—Redundancy is enabled. In this mode the Y cable is active only if the port is in RUNNING state and the serial port on the Y-cable link is not in RUNNING state. If both bundles are RUNNING, the Y cable remains inactive on both the ports. • ReVeRT (RVRT)—When you select this mode, a primary and a secondary path is enabled. The primary path drives the cable when its bundle is in RUNNING state, independent of the state of the secondary path. The secondary path is activated when the primary path is offline. Whenever the primary path comes back online, the path is switched back to the primary path. • NOOnReVert (NORV)—When you select this mode, the circuit is not switched back to primary when the primary path comes back online after switching to secondary path. The circuit is switched to the primary path only when the secondary path fails. • Signal (SIG)—The primary path is activated only if the secondary CTS output is inactive. When CTS is active, secondary drives cable.

Table 9: Y-Cable Settings in the CTP Menu (*continued*)

Field	Function	Your Action
Pri/Sec Link Type	Specifies the link types for primary and back up bundle.	<p>Select one.</p> <ul style="list-style-type: none"> H/W link—When enabled, the Y-cable redundancy is supported only on serial ports, and the link between ports is a hardware signaling connection over a special Y cable that uses the output to cable (TM) and the input from cable (RL) to communicate redundancy state between port pairs, by using keepalive pulses. Its operation is similar to the default operation of the redundancy feature in CTPOS Release 6.5 and earlier. S/W link—Allows Y-cable port pairs to maintain contact with each other by means of OAM packets instead of using a hardware signaling path. The software link has the following advantages: <ul style="list-style-type: none"> The software link does not require a special signaling hardware, which means that Y-cable redundancy is supported on TIE1 ports as well in addition to serial ports with a special Y cable. Serial ports can get TM/RL signals for user applications. Software or OAM link packets can check link partners and identify configuration errors. They can also differentiate between dead and alive states.
Primary/Secondary	Specifies the primary and backup bundles.	Configure a primary and a backup bundle. When the software link is enabled and link partners are specified, the software verifies that there is a matched primary and backup pair.
Other Port on Y	Specifies information about the other port of the redundant primary and backup pair.	<p>Specify the following parameters:</p> <ul style="list-style-type: none"> Enter IP address—Specify an IP address. Enter card number—Specify a card number in the range 0 through 6. Enter port number—Specify a port number in the range 0 through 23.
Fast switch	<p>Allows fast switching in case of a failover. This feature is supported only on serial ports with hardware links.</p> <p>Fast switch is supported only in Hot standby in Revert redundancy mode and is valid only for a hardware link.</p>	Select y or n .

AutoSwitch for Bundle Failover (CTPView)

This topic describes how to configure AutoSwitch for bundle failover. You can configure the AutoSwitch feature only with CTPView.

Before you begin:

- Log in to the CTPView software at least at the Net_Admin level.
- Connect the CTPView server to the CTP device for which you want to configure this feature.

To configure AutoSwitch by using CTPView:

1. In the side pane, select **System > Configuration**.
2. Set the **AutoSwitch Daemon** parameter to Enabled.
3. Click **Autoswitch**.
4. (Optional) You can update the network interface device (NID) information for all CTP devices that are reachable in the network. To do so, click **Update NID info** in the **Remote Host Settings** row.
5. Configure the **Check Period [all functions]** parameter under **AutoSwitch Ethernet Failover Settings** as well as the parameters under **AutoSwitch Bundle Failover Settings** as described in [Table 10 on page 32](#), and click **Submit Settings**.

Table 10: AutoSwitch Parameter Settings in CTPView

Field	Function	Your Action
Check Period [all functions]	<p>This parameter is under the AutoSwitch Ethernet Failover Settings configuration in CTPView.</p> <p>Specifies the time between the checking of ports to determine the circuit status.</p> <p>The combination of the switch count value and the check period value determines the rate of the switchover.</p>	<p>Select the number of seconds.</p> <p>We recommend that you configure the Switch Count and Check Period to values that prevent the circuit from switching in the event of a short transient outage.</p>
Status	<p>Specifies whether the AutoSwitch feature is enabled or disabled on the bundle.</p>	<p>Select one:</p> <ul style="list-style-type: none"> • Disabled—AutoSwitch is disabled for this bundle. • Enabled—AutoSwitch is enabled for this bundle.

Table 10: AutoSwitch Parameter Settings in CTPView (*continued*)

Field	Function	Your Action
Switch Count	<p>Specifies how many consecutive checks are required without a circuit being established before the circuit is switched over to an alternate circuit.</p> <p>The combination of the switch count value and the check period value determines the rate of the switchover.</p>	<p>Select the number of checks.</p> <p>We recommend that you configure the Switch Count and Check Period to values that prevent the circuit from switching in the event of a short transient outage.</p>
AutoSwitch Primary	Specifies the CTP device that is used as the primary device to fail over to. Also specifies the circuit ID and interface that are used on the device.	<p>To specify the primary device:</p> <ol style="list-style-type: none"> Click the box under AutoSwitch Primary, and select a group. A list of CTP devices within the group appears. Select a CTP device. A list of the circuit IDs configured on the CTP device appears. Select a circuit ID. A list of interfaces configured with the circuit ID appears. Select an interface.
AutoSwitch Secondary	Specifies the CTP device that is used as the secondary device to fail over to. Also specifies the circuit ID and interface that are used on the device.	<p>To specify the secondary device:</p> <ol style="list-style-type: none"> Click the box under AutoSwitch Primary, and select a group. A list of CTP devices within the group appears. Select a CTP device. A list of the circuit IDs configured on the CTP device appears. Select a circuit ID. A list of interfaces configured with the circuit ID appears. Select an interface.

Table 10: AutoSwitch Parameter Settings in CTPView (*continued*)

Field	Function	Your Action
Secondary Revert	Specifies whether or not the CTP device periodically checks the connectivity to the AutoSwitch primary device after a switchover to the secondary device.	Select one: <ul style="list-style-type: none">• Disabled—The CTP device does not check the connectivity to the primary device.• Enabled—The CTP device checks the connectivity to the primary CTP device after a switchover. If the primary device becomes available, the CTP device reconnects to the primary CTP device.

- See Also**
- [Verifying Primary and Secondary AutoSwitch Connections for Bundles \(CTPView\) on page 47](#)

- Related Documentation**
- [Bundle Failover Between CTP Devices at the Same Site Overview on page 9](#)

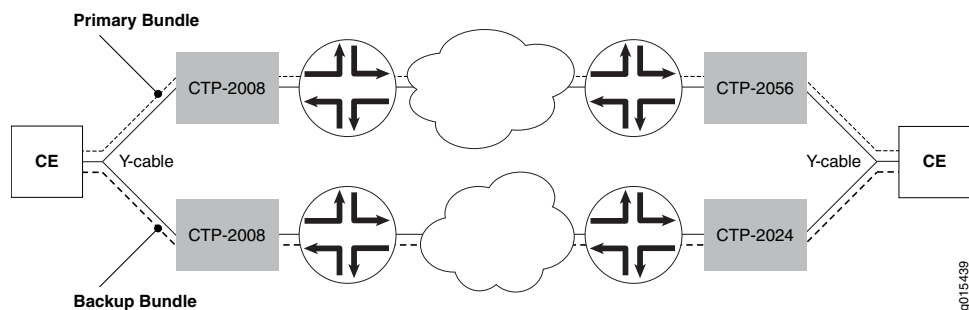
Configuring Bundle Failover Between CTP Devices at Both the Local and Remote Sites (CTPView)

A CTP series device provides two types of Y-cable redundancy.

- Redundancy by using a hardware link that uses a special Y cable—A hardware link requires a special Y cable that connects the CTP devices and is supported only on serial ports. The functioning of a hardware link is similar to the default operation of the redundancy feature in CTPOS Release 6.5 and earlier. A hardware link is supported only on serial ports.
- Redundancy by using a software link that does not depend on a signaling hardware like the Y cable—A software link does not require a special signaling hardware. Y-cable port pairs can maintain contact with each other by means of OAM packets instead of a hardware signaling path. Because of this, Y-cable redundancy is supported on T1/E1 ports as well as serial ports with a special Y cable. Redundancy by means of a software link is supported on both serial and T1/E1 ports on CTP150 and CTP2000 devices.

To set up Y-cable redundancy at both the local and remote sites, you configure two bundles—a primary bundle and a backup bundle. Each bundle follows a different path between the two sites, as shown in [Figure 4 on page 35](#).

Figure 4: Y-Cable Redundancy at Both the Local and Remote Sites



When you configure Y-cable redundancy that uses a hardware link, you can use different redundant port numbers if the devices are using the same port on the 100-pin connector. For example, a Y cable 100-pin connector could be attached to ports 0-3 on the primary CTP device, with the second connector attached to ports 8-11 on the backup CTP device. The redundant ports would be P0/P8, P1/P9, P2/P10, and P3/P11 on the primary CTP and backup CTP devices, respectively.

Redundancy is not supported on Y cable between CTPOS releases 6.2 and earlier. Whether the Y-cable configuration is both-ended or single-ended, the primary and backup bundles on the Y cable must either be 6.1 or below, or 6.2 and later. After a switchover from primary to backup, if the primary circuit comes up later, it will revert to the primary circuit automatically.

Before you begin:

- Log in to the CTPView software at least at the Net_Admin level.
- Connect the CTPView server to the CTP device for which you want to configure bundles.

- Disable the bundle before you modify the bundle options.

To configure primary and backup CTP bundles for Y-cable redundancy by using CTPView:

1. In the side pane, select **Bundle > Configuration**.
2. Run your mouse over the **Display and Select an Existing Bundle** bar.
3. In the table of bundles, select the bundle that you want to modify.
4. Under **Port Options**, place a check mark in the **Advanced Options Show** check box to display advanced parameters, and configure the parameters described in [Table 11 on page 36](#).
5. Click **Click to Submit Bundle AND Port Changes**.

Table 11: Y-Cable Settings in CTPView

Field	Function	Your Action
Redundancy Mode	Displays a list of supported redundancy modes. See “Redundancy Features Overview” on page 5 for a list of supported Y-cable redundancy configuration settings.	<p>Select one:</p> <ul style="list-style-type: none"> • Disable—Y-cable redundancy is not enabled on this port. • eXclusive OR (XOR)—Redundancy is enabled. In this mode the Y cable is active only if the port is in RUNNING state and the serial port on the Y-cable link is not in RUNNING state. If both bundles are RUNNING, the Y cable remains inactive on both the ports. • ReVeRT (RVRT)—When you select this mode, a primary and a secondary path is enabled. The primary path drives the cable when its bundle is in RUNNING state, independent of the state of the secondary path. The secondary path is activated when the primary path is offline. Whenever the primary path comes back online, the path is switched back to the primary path. • NOOnReVert (NORV)—When you select this mode, the circuit is not switched back to primary when the primary path comes back online after switching to secondary path. The circuit is switched to the primary path only when the secondary path fails. • Signal (SIG)—The primary path is activated only if the secondary CTS output is inactive. When CTS is active, secondary drives cable.
Primary/Secondary	Specifies the primary and backup bundles.	Configure a primary and a backup bundle. When the software link is enabled and link partners are specified, the software verifies that there is a matched primary and backup pair.

Table 11: Y-Cable Settings in CTPView (*continued*)

Field	Function	Your Action
Pri/Sec Link Type	Specifies the link types for primary and back up bundle.	<p>Select one.</p> <ul style="list-style-type: none"> H/W link—When enabled, the Y-cable redundancy is supported only on serial ports, and the link between ports is a hardware signaling connection over a special Y cable that uses the output to cable(TM) and the input from cable(RL) to communicate redundancy state between port pairs, by using keepalive pulses. Its operation is similar to the default operation of the redundancy feature in CTPOS Release 6.5 and earlier. S/W link—Allows Y-cable port pairs to maintain contact with each other by means of OAM packets instead of using a hardware signaling path. The software link has the following advantages: <ul style="list-style-type: none"> The software link does not require a special signaling hardware, which means that Y-cable redundancy is supported on T1E1 ports as well in addition to serial ports with a special Y cable. Serial ports can get TM/RL signals for user applications. Software or OAM link packets can check link partners and identify configuration errors. They can also differentiate between dead and alive states.
IP Address	Specifies an IP address for the other port of the redundant primary and backup pair.	Specify an IP address.
Card Number	Specifies a card number for the other port of the redundant primary and backup pair.	Specify a card number in the range 0 through 6.
Port Number	Specifies a port number for the other port of the redundant primary and backup pair.	Specify a port number in the range 0 through 23.
Fast switch	<p>Allows fast switching in case of a failover. This feature is supported only on serial ports with hardware links.</p> <p>Fast switch is supported only in Hot standby in Revert redundancy mode and is valid only for a hardware link.</p>	Select ENABLED or DISABLED .

Related Documentation • [Bundle Failover Between CTP Devices at Both the Local and Remote Site Overview on page 11](#)

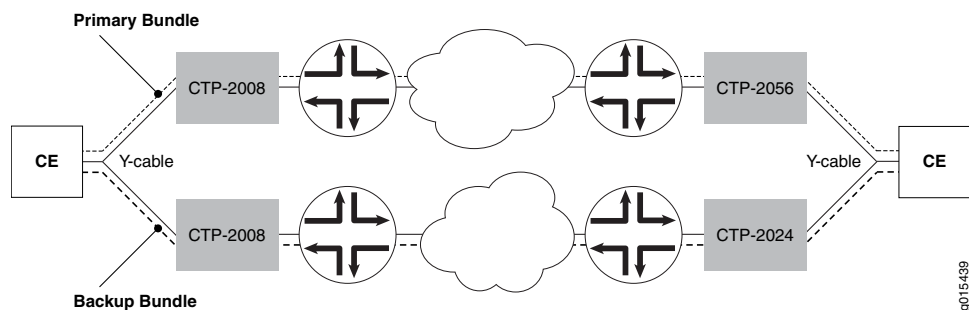
Configuring Bundle Failover Between CTP Devices at Both the Local and Remote Sites (CTP Menu)

A CTP series device provides two types of Y-cable redundancy.

- Redundancy by using a hardware link that uses a special Y cable—A hardware link requires a special Y cable that connects the CTP devices and is supported only on serial ports. The functioning of a hardware link is similar to the default operation of the redundancy feature in CTPOS Release 6.5 and earlier. A hardware link is supported only on serial ports.
- Redundancy based on a software link that does not depend on a signaling hardware like the Y cable—A software link does not require a special signaling hardware. Y-cable port pairs can maintain contact with each other by means of OAM packets instead of a hardware signaling path. Because of this, Y-cable redundancy is supported on T1/E1 ports as well as serial ports with a special Y cable. Redundancy by means of a software link is supported on both serial and T1/E1 ports on a CTP150 and CTP2000 devices.

To set up Y-cable redundancy at both the local and remote sites, you configure two bundles—a primary bundle and a backup bundle. Each bundle follows a different path between the two sites, as shown in [Figure 5 on page 38](#).

Figure 5: Y-Cable Redundancy at Both the Local and Remote Sites



When you configure Y-cable redundancy that uses a hardware link, you can use different redundant port numbers if the devices are using the same port on the 100-pin connector. For example, a Y cable 100-pin connector could be attached to ports 0-3 on the primary CTP device, with the second connector attached to ports 8-11 on the backup CTP device. The redundant ports would be P0/P8, P1/P9, P2/P10, and P3/P11 on the primary CTP and backup CTP devices, respectively.

Redundancy is not supported on Y cable between CTPOS releases 6.2 and earlier. Whether the Y-cable configuration is both-ended or single-ended, the primary and backup bundles on the Y cable must either be 6.1 or below, or 6.2 and later. After a switchover from primary to backup, if the primary circuit comes up later, it will revert to the primary circuit automatically.

Before you begin:

- Disable the bundle before you modify the bundle options.

To configure Y-cable redundancy for CTP bundles by using the CTP Menu:

1. From the Main Menu, select **1) Bundle Operations**.
2. Select **1) CTP**.
3. Select a bundle from the list.
If you select an active bundle, you are prompted to disable the bundle before configuring it.
4. Select **3) Port Config**.
5. Select **4) Advanced Options > 19) Redundancy Options > 1) Redundancy Mode** and configure the options as described in [Table 12 on page 39](#).

Table 12: Y-Cable Settings in the CTP Menu

Field	Function	Your Action
Redundancy Mode	Displays a list of supported redundancy modes. See “Redundancy Features Overview” on page 5 for a list of supported Y-cable redundancy configuration settings.	<p>Select one:</p> <ul style="list-style-type: none"> • Disable—Y-cable redundancy is not enabled on this port. • eXclusive OR (XOR)—Redundancy is enabled. In this mode the Y cable is active only if the port is in RUNNING state and the serial port on the Y-cable link is not in RUNNING state. If both bundles are RUNNING, the Y cable remains inactive on both the ports. • ReVeRT (RVeRT)—When you select this mode, a primary and a secondary path is enabled. The primary path drives the cable when its bundle is in RUNNING state, independent of the state of the secondary path. The secondary path is activated when the primary path is offline. Whenever the primary path comes back online, the path is switched back to the primary path. • NOOnReVert (NOReV)—When you select this mode, the circuit is not switched back to primary when the primary path comes back online after switching to secondary path. The circuit is switched to the primary path only when the secondary path fails. • Signal (SIG)—The primary path is activated only if the secondary CTS output is inactive. When CTS is active, secondary drives cable.

Table 12: Y-Cable Settings in the CTP Menu (*continued*)

Field	Function	Your Action
Pri/Sec Link Type	Specifies the link types for primary and back up bundle.	<p>Select one.</p> <ul style="list-style-type: none"> H/W link—When enabled, the Y-cable redundancy is supported only on serial ports, and the link between ports is a hardware signaling connection over a special Y cable that uses the output to cable(TM) and the input from cable(RL) to communicate redundancy state between port pairs, by using keepalive pulses. Its operation is similar to the default operation of the redundancy feature in CTPOS Release 6.5 and earlier. S/W link—Allows Y-cable port pairs to maintain contact with each other by means of OAM packets instead of using a hardware signaling path. The software link has the following advantages: <ul style="list-style-type: none"> The software link does not require a special signaling hardware, which means that Y-cable redundancy can be used on TIE1 ports as well and is not restricted to serial ports with a special Y cable. Serial ports can get TM/RL signals for user applications. Software or OAM link packets can check link partners and identify configuration errors. They can also differentiate between dead and alive states.
Primary/Secondary	Specifies the primary and backup bundles.	Configure a primary and a backup bundle. When the software link is enabled and link partners are specified, the software verifies that there is a matched primary and backup pair.
Other Port on Y	Specifies information about the other port of the redundant primary and backup pair.	<p>Specify the following parameters:</p> <ul style="list-style-type: none"> Enter IP address—Specify an IP address. Enter card number—Specify a card number in the range 0 through 6. Enter port number—Specify a port number in the range 0 through 23.
Fast switch	<p>Allows fast switching in case of a failover. This feature is supported only on serial ports with hardware links.</p> <p>Fast switch is supported only in Hot standby in Revert redundancy mode and is valid only for a hardware link.</p>	Select y or n .

- Related Documentation**
- [Bundle Failover Between CTP Devices at Both the Local and Remote Site Overview on page 11](#)

Configuring Packet Redundancy for Circuits (CTPView)

The packet protector feature transmits one-for-one duplicate packets into the IP network, which enables a possible recovery scenario in the event of lost IP packets caused by transmission errors.

You can configure this feature on CTP and VComp bundles.

Before you begin:

- Log in to the CTPView software at least at the Net_Admin level.
- Connect the CTPView server to the CTP device for which you want to configure this feature.

To configure packet redundancy using CTPView:

1. In the side pane, select **Bundle > Configuration**.
2. Run your mouse over the **Display and Select an Existing Bundle** bar.
3. In the table of bundles, select the bundle that you want to modify.
4. Under **Bundle Options**, place a check mark in the Advanced Options show check box to display advanced parameters, and configure the parameters described in [Table 13 on page 42](#).
5. Click **Click to Submit Bundle AND Port Changes**.

Table 13: Packet Redundancy Parameter Settings in CTPView

Field	Function	Your Action
Packet Protector	<p>Specifies whether the CTP device sends and/or receives cloned (duplicated packets).</p> <p>This option is useful in networks where you expect significant IP packet loss.</p> <p>You need to configure the packet protector so that the setting at one end of the bundle corresponds with the setting at the other end of the bundle.</p> <p>For example, if you configure the local bundle to send cloned packets to the network, configure the remote bundle to expect cloned packets from the network.</p>	<p>Select:</p> <ul style="list-style-type: none"> • Disabled—The CTP device does not send cloned packets over the IP network, and it ignores cloned packets that it receives. • Send cloned pkts to NET—The CTP device sends duplicated packets over the IP network. • Expect cloned pkts from NET—The CTP device uses cloned packets that it receives when the IP network drops the original packet. If the device receives both the original and cloned packets, it ignores the cloned packet. • Send & expect cloned pkts—The CTP device sends duplicated packets over the IP network. The CTP device uses cloned packets that it receives when the IP network drops the original packet. • Send delayed cloned packets to NET—The CTP device sends duplicated packets after the interpacket delay of the circuit. This option is not available for VComp bundles. • Send delayed & expect cloned packets—The CTP device sends duplicated packets after the interpacket delay of the circuit. The CTP device uses cloned packets that it receives when the IP network drops the original packet. This option is not available for VComp bundles. • Expect cloned XOR packets—The CTP device uses cloned XOR packets that it receives when the IP network drops the original packet to regenerate the missing packet. If the device receives both the original and cloned XOR packets, it ignores the cloned packet. This option is not available for VComp bundles. • Send & expect cloned XOR packets—The CTP device sends duplicated XOR packets over the IP network. The CTP device uses cloned XOR packets that it receives to regenerate missing packets when the IP network drops the original packet. This option is not available for VComp bundles.

Related Documentation • [Packet Redundancy Overview on page 13](#)

Configuring Packet Redundancy for Circuits (CTP Menu)

The packet protector feature transmits one-for-one duplicate packets into the IP network, which enables a possible recovery scenario in the event of lost IP packets caused by transmission errors.

You can configure this feature on CTP and VComp bundles.

Before you begin:

- Disable the bundle before you modify the bundle options.

To configure redundancy using the CTP Menu:

1. From the Main Menu, select **1) Bundle Operations**.
2. Select the type of bundle that you want to configure.
3. Select a bundle from the list.

If you select an active bundle, you are prompted to disable the bundle before configuring it.

4. Select **2) Config**.
5. Select **10) Advanced Options**.
6. Configure option **9) Packet Protector(tm)** as described in [Table 14 on page 44](#).

Table 14: Packet Redundancy Parameter Settings in the CTP Menu

Field	Function	Your Action
Packet Protector	<p>Specifies whether the CTP device sends and/or receives cloned (duplicated) packets.</p> <p>This option is useful in networks where you expect significant IP packet loss.</p> <p>You need to configure the packet protector so that the setting at one end of the bundle corresponds with the setting at the other end of the bundle.</p> <p>For example, if you configure the local bundle to send cloned packets to the network, configure the remote bundle to expect cloned packets from the network.</p>	<p>Select:</p> <ul style="list-style-type: none"> • Disable packet protector—The CTP device does not send cloned packets over the IP network, and it ignores cloned packets that it receives. • Send cloned packets to NET—The CTP device sends duplicated packets over the IP network. • Expect cloned packets from NET—The CTP device uses cloned packets that it receives when the IP network drops the original packet. If the device receives both the original and cloned packets, it ignores the cloned packet. • Send and expect cloned packets—The CTP device sends duplicated packets over the IP network. The CTP device uses cloned packets that it receives when the IP network drops the original packet. • Send delayed cloned packets to NET—The CTP device sends duplicated packets after the interpacket delay of the circuit. This option is not available for VComp bundles. • Send delayed & expect cloned packets—The CTP device sends duplicated packets after the interpacket delay of the circuit. The CTP device uses cloned packets that it receives when the IP network drops the original packet. This option is not available for VComp bundles. • Expect cloned XOR packets—The CTP device uses cloned XOR packets that it receives when the IP network drops the original packet to regenerate the missing packet. If the device receives both the original and cloned XOR packets, it ignores the cloned packet. This option is not available for VComp bundles. • Send & expect cloned XOR packets—The CTP device sends duplicated XOR packets over the IP network. The CTP device uses cloned XOR packets that it receives to regenerate missing packets when the IP network drops the original packet. This option is not available for VComp bundles. • Send cloned XOR packets—The CTP device sends duplicated XOR packets over the IP network. This option is not available for VComp bundles.

Related Documentation • [Packet Redundancy Overview on page 13](#)

Configuring LOS Detection on CTP and SAToP Bundles (CTP Menu)

Starting with CTPOS Release 7.2R1, CTP devices support the detection of a loss of signal, which denotes a physical link problem. The following conditions are supported:

- In a serial both-ended Y-cable redundancy configuration (hardware-based redundancy or software-based Y cable link protocol), removal of Y cable leg from the CTP port of the online bundle must be able to force a switch to the standby bundle.
- In a T1/E1 both-ended Y cable configuration (hardware-based redundancy or software-based Y cable link protocol), removal of Y cable leg from the CTP port of the online bundle must be able to force a switch to the standby bundle.

A CTP series device provides two types of Y-cable redundancy.

- Redundancy by using a hardware link that uses a special Y cable
- Redundancy by using a software link that does not depend on a signaling hardware like the Y cable

The CTP devices support a both-ended redundancy mechanism, in which two identical CTP circuit bundles are combined using Y cables at each end, enabling one bundle to act as a backup for the other. One of the bundles is in use (online), while the other is in the standby state (offline). Only the online bundle is allowed to drive the Y cable towards the user equipment, while the offline bundle is tristate. A communications channel (such as redundancy by using a hardware link that uses a special Y cable or redundancy based on a software link that does not depend on a signaling hardware like the Y cable) between ports at each end determines which of the two ports on the Y cable is currently online. When one bundle fails, the failed bundle transitions to the offline and places the other bundle in the online state.

Before you begin:

- Disable the bundle before you modify the bundle options.

To configure the capability to detect LOS alarms in a Y-cable redundancy configuration for CTP and SAToP bundles by using the CTP Menu:

1. From the Main Menu, select **1) Bundle Operations**.

2. Select **1) CTP**.

3. Select a bundle from the list.

If you select an active bundle, you are prompted to disable the bundle before configuring it.

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

5. Select **4) Advanced Options** to configure advanced attributed for the CTP bundle.

6. Select **20) LOS checking (T1E1 only)** to configure the functionality to detect LOS for the T1E1 interfaces in a CTP bundle or SAToP bundle.
7. Follow the onscreen instructions and configure the options as described [Table 15 on page 46](#).

Table 15: LOS Settings in the CTP Menu

Field	Function	Your Action
Check LOS on T1/E1 ports for CTP/SAToP bundles? y[n]	<p>Specifies that the capability to identify LOS alarms on T1E1 interfaces in SAToP or CTP bundles needs to be enabled.</p> <p>A loss of signal (LOS) alarm indicates that there is a physical link problem with the connection to the router receive port from the neighboring SONET equipment transmit port. An LOS alarm occurs when the port on the card is in service but no signal is being received. The cabling is not correctly connected to the ports, or no signal exists on the line. Possible causes for a loss of signal include upstream equipment failure or a fiber cut.</p>	<p>Enter y or n to enable or disable the LOS detection capability.</p> <p>NOTE: Although this menu option to enable or disable the LOS detection functionality is shown regardless of the port type, such as serial interfaces or T1E1 interfaces, this setting becomes effective on a T1/E1 port only when it is connected to a CTP or SAToP bundle. If the LOS detection functionality is enabled on a serial port or other bundle types, the setting is not processed.</p>

CHAPTER 3

Administration

- [Verifying Primary and Secondary AutoSwitch Connections for Bundles \(CTPView\) on page 47](#)

Verifying Primary and Secondary AutoSwitch Connections for Bundles (CTPView)

You can test the connection between a CTP device running AutoSwitch and its primary and secondary circuits.

Before you begin:

- Log in to the CTPView software at least at the Net_Admin level.
- Connect the CTPView server to the CTP device on which you want to use this feature.

To test connections to primary and secondary circuits using CTPView:

1. In the side pane, select **System > Configuration**.
2. Click **AutoSwitch**.
3. Under **Connection Check**, you have the option of verifying all connections or verifying specific connections.
 - To verify all connections, under **Connection Check**, click **ALL**.
 - To verify connections for a specific primary or secondary circuit, click **Test** under the **Primary Host** and **Secondary Host** columns.

During the test, the buttons turn blue and display **Testing**. The results of the test are displayed inside the buttons, and the background color around the buttons either turns green for success or red for failure.

Related Documentation

- [Bundle Failover Between CTP Devices at Alternate Sites Overview on page 8](#)
- [Configuring Bundle Failover Between CTP Devices at Alternate Sites \(CTPView\) on page 23](#)

