Overview of the T3 or E3 Interface Module

The T3 or E3 interface module delivers T3 or E3 connectivity on the router with the RSP3 module. The module can be software configured as either T3 mode or E3 mode per interface module The module provides physical connectivity using a single high-density connector and requires a breakout cable and patch panel for individual port connections.

The T3 or E3 interface module supports the following modes:

- T3
- E3
- STS-1

Each mode supports clear channel and channelized mode.

Note Mixing T3 and E3 ports on the same interface module is not supported.

CEM configurations are supported on different modes on the interface module. The troubleshooting, monitoring and redundancy features are supported on the module. The module can be clocked from a line or from an internal clock source. The table describes the configurations and features for the modes supported on the T3 or E3 interface module.

Table 1: Configurations on T3 or E3 Interface Module

	T3		**E3**		**STS-1**	
	Clear Channel	**Channelized**	**Clear Channel**	**Channelized**	**Clear Channel - STS1c, T3**	**Channelized (Vt1.5, CT3)**
Required Configurations						
Mode	Yes	Yes	Yes	Yes	Yes	Yes
Internal/Line Clock Source	Yes	Yes	Yes	Yes	Yes	Yes
ACR/DCR Clock	Yes	Yes	Yes	Yes	NA	Yes

	T3		E3		STS-1	
	Clear Channel	Channelized	Clear Channel	Channelized	Clear Channel - STS1c, T3	Channelized (Vt1.5, CT3)
Line and Section Overhead	NA	NA	NA	NA	Yes	Yes
CEM Configurations						
Structure- Agnostic TDM over Packet (SATOP) (Framed/Unframed)	Yes	Yes	Yes	Yes	NA	Yes
Circuit Emulation over Packet-Switched Network (CESoPSN)	NA	Yes	NA	Yes	NA	Yes
Circuit Emulation over Packet (CEP)	Yes	NA	Yes	NA	Yes	NA
Troubleshooting Features						
Bit Error Rate Testing (BERT)	Yes	Yes	Yes	Yes	Yes	Yes
Loopback	Yes	Yes	Yes	Yes	Yes	Yes
Monitoring Features						
Maintenance Data Link (MDL)	Yes	NA	Yes	NA	Yes (only on T3 mode)	Yes
Performance Monitoring	Yes	Yes	Yes	NA	Yes	Yes
Redundancy Support						
Card Protection Switchover	Yes	Yes	Yes	Yes	Yes	Yes
Alarm Based Switchover	Yes	Yes	Yes	Yes	Yes	Yes

• STS-1 Electricals, on page 5

Benefits of T3 or E3 Interfaces

The following are the benefits of T3/E3 interfaces:

- Higher bandwidth
- Flexibility by channelization

Restrictions for Configuring T3 or E3 Interfaces

- You can configure CEM to support serial interface configuration.
- DS0 level Channelization is *not* supported.
- The G.832 framing mode is *not* supported.
- Synchronization Status Message (SSM) is not supported on T3 ports.
- The interoperability of Maintenance Data Link (MDL) is not supported with earlier version interface modules.
- The T3 or E3 port does not support sending Alarm Indication Signal (AIS) when local loopback is configured.

Circuit Emulation

Circuit Emulation (CEM) is a technology that provides a protocol-independent transport over IP/MPLS networks. It enables proprietary or legacy applications to be carried transparently to the destination, similar to a leased line.

CEM provides a bridge between a Time-Division Multiplexing (TDM) network and a Multiprotocol Label Switching (MPLS) network. The router encapsulates the TDM data in the MPLS packets and sends the data over a CEM pseudowire to the remote Provider Edge (PE) router. As a result, CEM functions as a physical communication link across the packet network.

The router supports the pseudowire type that utilizes CEM transport: Structure-Agnostic TDM over Packet (SAToP) and Circuit Emulation Service over Packet-Switched Network (CESoPSN).

L2VPN over IP/MPLS is supported on the interface modules.

Note We recommend that you configure the controller in the administratively up mode. Configuration under the administratively down mode is not recommended and it might cause configuration errors.

Note The default behaviour of the CEM pseudowire is always UP irrespective of the controller alarms.

Overview of CEM Pseudowire

Pseudowires manage encapsulation, timing, order, and other operations in order to make it transparent to users. The pseudowire tunnel acts as an unshared link or circuit of the emulated service. CEM is a way to carry TDM circuits over packet switched network. CEM embeds the TDM circuits into packets, encapsulates them into an appropriate header, and then sends that through Packet Switched Network. The receiver side of CEM restores the TDM circuits from packets.

Configuring Pseudowire

Cisco Pseudowire Emulation Edge-to-Edge (PWE3) allows you to transport traffic by using traditional services such as T1/E1 over a packet-based backhaul technology such as MPLS or IP. A pseudowire (PW) consists of a connection between two provider edge (PE) chassis that connects two attachment circuits (ACs), such as T1/E1 or T3 /E3 links.

Structure-Agnostic TDM over Packet

Structure-Agnostic TDM over Packet (SAToP) encapsulates Time Division Multiplexing (TDM) bit-streams as pseudowires over public switched networks. It disregards any structure that may be imposed on streams, in particular the structure imposed by the standard TDM framing.

The protocol used for emulation of these services does not depend on the method in which attachment circuits are delivered to the Provider Edge (PE) chassis. For example, a T1 attachment circuit is treated the same way for all delivery methods, including copper, multiplex in a T3 circuit, a virtual tributary of a SONET circuit, or unstructured Circuit Emulation Service (CES).

In SAToP mode, the interface is considered as a continuous framed bit stream. The packetization of the stream is done according to IETF RFC 4553. All signaling is carried out transparently as a part of a bit stream.

Circuit Emulation Service over Packet-Switched Network

CESoPSN is a method for encapsulating structured (NxDS0) TDM signals as pseudowires over packet switching networks.

Restrictions for CESoPSN on T3 or E3 Controller

- The maximum number of CEM interface supported is 1344.
- M13 framing isn't supported on the T3 interface for the clear channel configuration, and it's only supported for the T3 channelized configuration.

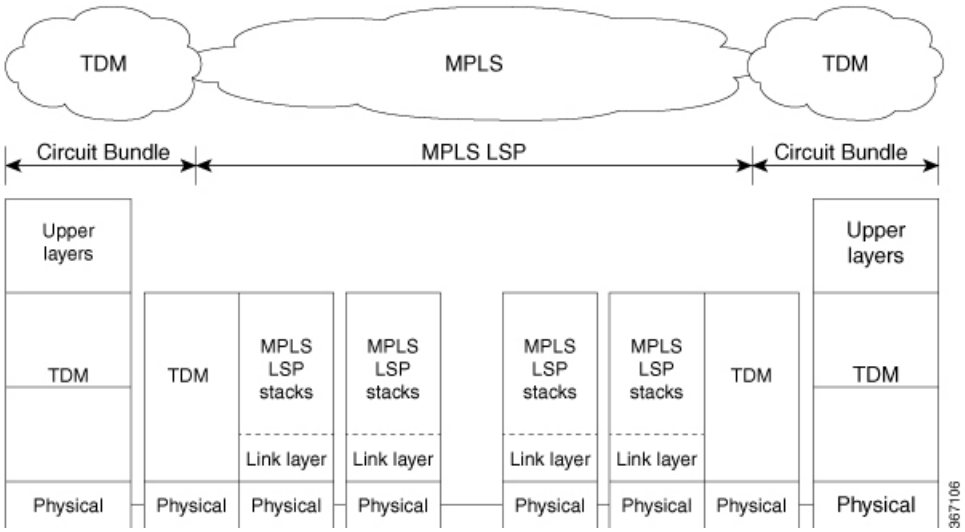
  G832 framing isn't supported on the E3 interface for the clear channel configuration, and it's only supported for the E3 channelized configuration.
- CT3-E1 and CE3-T1 are not supported and only CT3-T1 and CE3-E1 are supported.
- DS0 loopback isn't supported on the T3 interface.
- Alarm forwarding isn't supported on the T3 interface.

- Card protection isn't supported on the T3 interface.

Circuit Emulation over Packet (CEP)

Effective Cisco IOS XE Fuji 16.8.1, CEP feature is introduced to achieve STS-1 or VC4 CEP configuration on the interface module. Here, T3 or E3 is mapped to STS-1 or VC4 that is emulated on a packet network.

Figure 1: Network Reference Model and Protocol Layers for TDM-MPLS User Plane Interworking



For more information on CEP, see Asynchronous Mapping for T3 or E3 CEP and Alarms for T3 or E3 CEP.

Restrictions

- BERT for both line and system directions is *not* supported until Cisco IOS XE Fuji 16.9.5 release.
- Card Protection is *not* supported.
- E3 CEP is not supported on optical or SDH controller.

STS-1 Electricals

STS-1 structure or frame format enables STS-1 mode on the Electrical T3 or E3 ports in the 48-Port T3 or E3 CEM interface module and 1 port OC-48/STM-16 or 4 port OC-12/OC-3 / STM-1/STM-4 + 12 port T1/E1 + 4 port T3/E3 CEM interface module. STS-1E provides facility to have STS-1 and its modes transmission on the Electrical T3 or E3 ports. Thus, the STS-1 signal coded for electrical transmission is also termed as Electrical Carrier-1 (EC-1).

STS-1E supports SAToP and CEP support configurations on the T3 or E3 ports.

For information on STS-1 frame, see STS-1 Frame and STS-1 Overhead.

Prerequisites for Configuring STS-1e

You must select the MediaType controller to configure and enter the controller configuration mode.

You must configure the controller as a STS-1e port.

Restrictions for STS-1e

- Only 16 BERT patterns can be configured at a time.
- PMON fields are not supported for VT1.5 VT and T3.
- PMON far-end parameters are not supported.
- APS and card-protection are not supported for STS-1e port.
- In the unframed mode, ACR and DCR are not supported.
- CESoPSN is not supported.
- Framed SAToP is not supported for releases until Cisco IOS XE Amsterdam 17.3.1. Starting with Cisco IOS XE Bengaluru 17.4.1 framed SAToP is supported.
- For framed SAToP with SF framing, RAI is asserted and cleared continuously.

Restrictions for Clock Source Configuration

- Only 4 ports can be configured in STS-1e line for clock source configuration per chassis.
- You should configure the clock source line and network-clock sync together to receive the clock from a remote port that is connected to the STS-1e port.