

Support for OCx CEM Interface Modules

This chapter provides a high-level description and restricions for the following OCx CEM interface modules:

- 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 (A900-IMA3G-IMSG)
- 1-Port OC-192 or 8-Port Low Rate CEM Interface Module (A900-IMA8S1Z-CX)
- ASR 900 1-Port OC-192 or 8-Port Low Rate CEM 20G Bandwidth Interface Module (A900-IMA1Z8S-CXMS)

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Configuring Support of 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

The 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 has 12XDS1, 4XDS3, electrical interfaces, and 4XSFP ports that can provide multiple functions such as 1XOC-48/12/3 and 3XOC-12/3. The maximum speed supported on OCx ports is OC-48. The interface module supports a maximum of 3G CEM traffic.

Note In addition to support on RSP2 module, the IM is supported on RSP3 from the Cisco IOS XE 16.9.x release.

Configuring Support of 1-Port OC-192 or 8-Port Low Rate CEM Interface Module

The OC-192 interface module with 8-port low rate CEM interface module delivers one active port of OC192 or STM-64 connectivity, or up to eight ports of OC3/12 or STM-1/-4 or up to 4 ports of OC48 or STM-16 connectivity on the router with RSP3. The module can be clocked from a line or from an internal clock source. This module delivers true high density, multiservice and multi-rate capabilities in a small form factor. The interface module can be software configured as either Synchronous Optical Networking (SONET) mode or Synchronous Digital Hierarchy (SDH) mode per module in the ASR 900 Series configuration.

Configuring Support for ASR 900 1-Port OC-192 or 8-Port Low Rate CEM 20G Bandwidth Interface Module (A900-IMA1Z8S-CXMS)

The ASR 900 1-Port OC-192 or 8-Port Low Rate CEM 20G Bandwidth Interface Module (A900-IMA1Z8S-CXMS) is supported on the RSP3 module and has the capability for SONET or SDH termination with SAToP, CESoP, and CEP traffic types.

Note The Ethernet and Multiservice Gateway features are not supported on this IM for the Cisco IOS XE 16.12.1 Release.

The IM is capable of processing a maximum of 20G with different types of traffic such as 10G CEM, 2.5G iMSG, 2.5G Ethernet, and 6.9Mbps DCC. However for the Cisco IOS XE Release 16.12.1, only the 10G CEM traffic is supported. In the 10G mode, 7.5G CEM traffic is supported.

In this IM, all the eight 1G ports can be configured as OC-48 and you can utilize a maximum of 192 STS-1.

The ASR 9001-port OC-192 or 8-port Low Rate CEM 20G Bandwidth interface module functions similar to the 1-port OC-192/STM-64 or 8-port OC-3/12/48/STM-1/-4/-16 interface module. The configurations remain the same.

The following TDM features are supported:

- SNMP
- Local, network, or remote loopback
- BERT (both system and line). The system side BERT is not supported in the framed SAToP mode.
- OH config
- Network synchronization
- SSM
- Shut at port and CEM-group level
- CAS Signaling. For more information, see Channel Associated Signaling.

- DCC is supported starting from Cisco IOS XE Amsterdam 17.3.1 release
- Interworking Multiservice Gateway Access Circuit Redundancy (iMSG ACR) support starting with the Cisco IOS XE 17.3.1 release.

The following TDM features are supported starting from Cisco IOS XE Bengaluru 17.4.1 release:

- APS and non-APS for SDH and SONET for iMSG IPv6 interworking.
- NxDS0 iMSG IPv4 and NxDS0 APS iMSG IPv4.
- UPSR IPv6.
- IPv4 with VLAN handoff for cross connect and local connect.

The CEM features such as SAToP, CESoP, and CEP are supported in the following modes:

- Unprotected CEM with ACR or DCR are supported in the following modes:
  - T1, T3, E1, E3, DS0, DS1, and DS3
  - CEM Payload size configurable.

  APS CEM with ACR or DCR are supported in the following modes
  - DS0, DS1, DS3, T1, T3, E1, E3, AU-3, and AU-4
  - CEM payload size configurable.
- UPSR at VT or STS mode.
- DS1 (with VT Protection) or DS3 (STS Protection) with ACR or DCR
- CEM Class with configurable payload size or jitter buffer

Modes of Operation

The interface module operates in following two modes:

- Single XFI or 10 G mode
- Dual XFI or 20 G mode

Single XFI or 10 G mode

Consider the following requirement while working on the 10 G mode:

- OC-192 or SFP+ port is supported on the 10G GE port. In the 10G mode, 7.5G for CEM traffic is supported.
- If bandwidth is available to accommodate a particular circuit or Ethernet port, then configuration is allowed, and it can be performed. Otherwise, the configuration is rejected due to bandwidth limitation.
- When there is a change in the payload size, the required bandwidth gets modified accordingly. This in turn checks for the bandwidth and if the sufficient bandwidth is not available, the configuration is rejected.
- You can remove or delete the existing configuration from the port and perform new configuration on the port.

Dual XFI or 20 G mode

You can convert the IM into dual mode. In 20G mode of operation, channelized (xfi0) and non-channelized (xfi1) bandwidth are available.

Enter the following commands to convert into dual mode and then reload the IM:

```
router (config)# platform hw-module configuration
PE1(conf-plat-hw-conf)# hw-module <slot/subslot> A900-IMA1Z8S-CXMS mode 10G_CEM
```

Consider the following requirements while working on the 20-G mode:

- For configuring CEM group, the software performs bandwidth check. If the required bandwidth is not available, you cannot configure the CEM group.
- If a maximum capacity configuration is already performed on the IM and you update the payload size, then the update is not accepted on the same channel (xfi). You need to remove some configurations on circuits and then update the payload again.

For slot compatibility, refer Supported RSP and Slots in the Cisco ASR 900 Series Routers and Cisco Interface Module Hardware Installation Guide.

Restrictions and Limitations for ASR 900 1-Port OC-192 or 8-Port Low Rate CEM 20G Bandwidth Interface Module (A900-IMA1Z8S-CXMS)

Feature Restrictions

The following features are not supported:

- Ethernet
- EOS L1 or L2
- MS features are not supported for the Cisco IOS XE 16.12.1 release. Starting with the Cisco IOS XE Amsterdam 17.3.1 release, MS features are supported.
- DCC is **not** supported until the Cisco IOS XE 16.12.1 release.
- IPv4 or IPv6 iMSG is not supported for the Cisco IOS XE 16.12.1 release.

  Starting with the Cisco IOS XE Amsterdam 17.3.1 release, IPv4 iMSG is supported.

  Starting with the Cisco IOS XE Bengaluru 17.4.1 release, IPv6 iMSG is supported.

  For iMSG IPv6 MTU, the change in configuring MTU value is not supported. Ensure that you configure the circuit with the default MTU value.
- MLPPP for serial interface is not supported for the Cisco IOS XE Amsterdam 17.3.1 release.
- STS-192c or VC-4-64c concatenation
- Low-order path concatenation (VCAT)
- Fractional CEP
- BLSR for SONET or MSSP ring for SDH
- SyncE and PTP Support on EoS (L1 or L2/L3 Terminated)

- Card level protection
- Nonstandard concatenation such as STS-6c, STS-9c, STS-15c, STS-18c, and so on
- APS or MSP 1:N, where N is greater than 1.
- TSOP support
- Auto detection support
- SONET to SDH and SDH to SONET Translation
- HSPW
- Scrambling is not supported in the POS mode.
- In A900-IMA1Z8S-CXMS, invalid FE flag gets asserted for the current interval when the controller is shut and no shut.

Management Restrictions

The following are some management restrictions to consider while configuring the module:

- The ports can be configured and used regardless of available backplane bandwidth or HO Path resources.
- Provisioning a new CEM circuit and payload size change to the new CEM circuit is allowed as long as bandwidth is available.
- Gigabit Ethernet configuration is allowed if required bandwidth is available. Bandwidth reallocation can be performed based on some following scenarios:
  - The required bandwidth is not available on channelized xfi, but sufficient bandwidth is available on nonchannelized xfi. In such cases, you should remove some configuration from circuits on the channelized xfi and then provision Gigabit Ethernet followed by CEM circuit provision.

Scale Restrictions

- The maximum number of supported VT1.5 CESoP circuits are 672 per interface module for Cisco IOS XE 16.12.x release.
- For the Cisco IOS XE Amsterdam 17.3.1 release, a maximum of 1000 serial interfaces can be configured on RSP2 module as 1000 internal VLANs are reserved for serial interfaces. The same scale limit is applicable for RSP3 module.
- For the Cisco IOS XE Amsterdam 17.3.1 release, CEM FPGA supports up to 1016 data channels per interface module.
- For the Cisco IOS XE Amsterdam 17.3.x release, a maximum of **5376** ACR and DCR session scale is supported on the Cisco 1-port OC-192 Interface module or 8-port Low Rate Interface Module (ASR 900 Combo 8-port SFP GE and 1-port 10GE IM with CEM, 10G). For releases before the Cisco IOS XE Amsterdam 17.3.1 release, only 2000 session are supported.

Table 1: Dual-Mode Restrictions for Gigabit Ethernet port

Circuit Type	Scale Supported
DS1 SAToP	2800

Circuit Type	Scale Supported
VT 1.5 CEP Pseudowire	2800
Gigabit Ethernet	1 x 10 G and 8 x 1 G
ACR or DCR	2000 per interface module
DS1 CESoP Pseudowire	672 per interface module

Features supported on OCx CEM Interface Module

Table 2: Features supported on OCx CEM Interface Module on ASR 900 Series Routers

Feature	OCx CEM Interface Module
Port Licensing	Supported only on the ASR 900 series platform. • 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 module • 1-port OC-192 or 8-port low rate module • ASR 900 1-port OC-192 or 8-port low rate CEM 20G bandwidth module
SONET	• 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 module • 1-port OC-192 or 8-port low rate module • ASR 900 1-port OC-192 or 8-port low rate CEM 20G bandwidth module
SDH	• 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 module • 1-port OC-192 or 8-port low rate module • ASR 900 1-port OC-192 or 8-port low rate CEM 20G bandwidth module
CEM Features	

Feature	OCx CEM Interface Module
Automatic Protection Switching	• 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 module • 1-port OC-192 or 8-port low rate module • ASR 900 1-port OC-192 or 8-port low rate CEM 20G bandwidth module
Multiplex Section Protection	• 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 module • 1-port OC-192 or 8-port low rate module • ASR 900 1-port OC-192 or 8-port low rate CEM 20G bandwidth module
Unidirectional Path Switching Ring Path Protection	• 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 module • 1-port OC-192 or 8-port low rate module • ASR 900 1-port OC-192 or 8-port low rate CEM 20G bandwidth module
UPSR Over HDLC	• 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 module • 1-port OC-192 or 8-port low rate module • ASR 900 1-port OC-192 or 8-port low rate CEM 20G bandwidth module
Subnetwork Connection Protection	• 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 module • 1-port OC-192 or 8-port low rate module • ASR 900 1-port OC-192 or 8-port low rate CEM 20G bandwidth module

Feature	OCx CEM Interface Module
Data Communication Channel	• 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 module • 1-port OC-192 or 8-port low rate module • ASR 900 1-port OC-192 or 8-port low rate CEM 20G bandwidth module
Transparent Overhead Tunneling Data Communication Channel	• 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 module • 1-port OC-192 or 8-port low rate module • ASR 900 1-port OC-192 or 8-port low rate CEM 20G bandwidth module
Target Identifier Address Resolution Protocol	• 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 module • 1-port OC-192 or 8-port low rate module • ASR 900 1-port OC-192 or 8-port low rate CEM 20G bandwidth module
5G Mode	• 1-port OC-192 or 8-port low rate module
iMSG Features	
Serial Interfaces	• 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 module • ASR 900 1-port OC-192 or 8-port low rate CEM 20G bandwidth module
iMSG ACR	• 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 module • ASR 900 1-port OC-192 or 8-port low rate CEM 20G bandwidth module
Multilink Interfaces	• 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 IM module

Feature	OCx CEM Interface Module
VLAN Handoff	• 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 module • ASR 900 1-port OC-192 or 8-port low rate CEM 20G bandwidth module

For more information on the features supported with release versions, see Cisco ASR 900 Series Aggregation Services Routers Feature Optics Matrix.

Restrictions for Configuring OCx CEM Interface Modules

- Mixed mode support, for example, T1 and E1 or T3 and E3 or SONET and SDH simultaneously on different ports is not available.
- E1 or E3, Unidirectional Path Switching Ring (UPSR), and Data Communication Channel (DCC) are not supported.
- Multiservice functionality: MLPPP, FR, and MLFR are not supported.

  Starting with Cisco IOS XE Amsterdam 17.1.x, MLPPP is supported.
- EoS and EoPDH are not supported.
- The **configure replace** command is *not* supported.
- On RSP3 module, the CEM OCx IM is not supported in slots 0 and 1.

  On the Cisco ASR907 router, the CEM OCx IM is not supported in the default license mode but the IM is supported in the service-offload license mode.
- Synchronization Status Message (SSM) is not supported on T3 ports for 48-port T3 and E3 CEM IM 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 IM.