Release Notes for Cisco ASR 900 Series Routers, Cisco IOS XE Gibraltar 16.11.x

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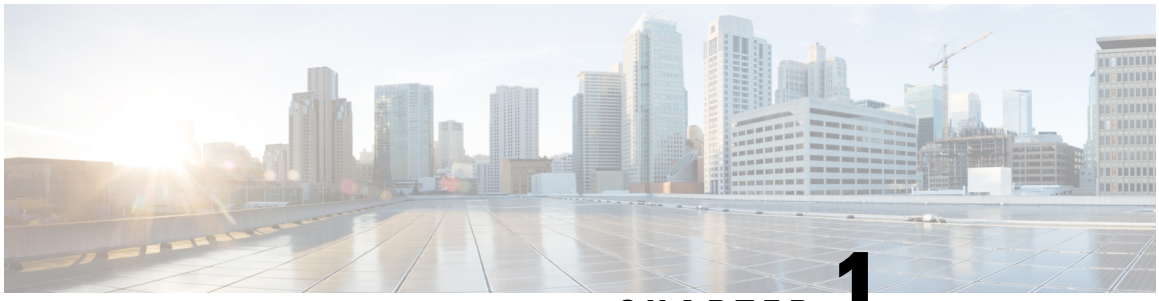

CHAPTER 1

Introduction

The Cisco ASR 900 Series Routers are full-featured, modular aggregation platforms designed for the cost-effective delivery of converged mobile, residential, and business services. This document provides information about the IOS XE software release for the Cisco ASR 900 Series Routers.

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Overview of Cisco ASR 900 Series Routers

Cisco ASR 900 Series Router

The Cisco ASR 900 Series Router is a fully-featured routing platform designed for the cost-effective delivery of converged mobile and business services. With full redundancy, shallow depth, low power consumption and high service scale, this 3-rack-unit (3RU) router is optimized for small aggregation and remote point-of-presence (POP) applications. The Cisco ASR 900 Series Router provides a rich and scalable feature

set of Legacy, Timing, Carrier Ethernet, Layer 2 VPN (L2VPN) and Layer 3 VPN (L3VPN) services in a compact package.

The Cisco ASR 900 Series Router is a fully modular platform with support for upto 6-Interface Modules (IMs), two Route Switch Processor (RSP) slots, two power supplies and redundant fans, based on the router model. Cisco offers a wide choice of LAN and WAN interfaces available in speeds ranging from nxDS0 to 10 Gigabit Ethernet. The design of the Cisco ASR 900 Series Router delivers in-box hardware redundancy for all hardware components and supports software redundancy with In Service Software Upgrade (ISSU) and Non-Stop Forwarding (NSF) support.

Cisco ASR 902 Router

The Cisco ASR 902 Router is a full-featured aggregation platform designed for cost-effective delivery of converged mobile and business services. With shallow depth, low power consumption, and an extended temperature range, this compact 2-rack unit (2RU) router provides high service scale and flexible hardware configuration.

Cisco ASR 903 Router

The Cisco ASR 903 Series Aggregation Services Router is a Cisco aggregation router product. This router uses an innovative and powerful forwarding technology known as the Cisco Carrier Ethernet ASIC.

The Cisco ASR 903 Series Router is a 6-Interface Module (IM), 3-RU, hardware-redundant chassis with two Route Switch Processor (RSP) slots, and six IM slots. It supports fully redundant RSPs that allow for full RSP hardware redundancy, NSF, ISSU, and future RSP service upgrades.

Cisco ASR 907 Router

The Cisco ASR 907 Router seven-rack (7RU) unit router that belongs to the Cisco ASR90x family of routers. This router complements Cisco’s offerings for IP RAN solutions for the GSM, UMTS, LTE and CDMA. Given its form-factor, interface types and Gigabit Ethernet density the Cisco ASR 907 Router can also be positioned as a Carrier Ethernet aggregation platform.

The Cisco ASR 907 Router is a cost optimized, fully redundant, centralized forwarding, extended temperature, and flexible pre-aggregation router.

Cisco ASR 914 Router

The Cisco ASR 914 Router is a 14-rack unit router that belongs to the Cisco ASR 900 family of routers. This router complements Cisco’s offerings for IP RAN solutions for the GSM, UMTS, LTE, and CDMA. Given its form-factor, interface types and GigabitEthernet density the Cisco ASR 914 Router can also be positioned as a Carrier Ethernet aggregation platform.

The Cisco ASR 914 Router is a cost optimized, fully redundant, centralized forwarding, extended temperature, and flexible pre-aggregation router.

Feature Navigator

You can use Cisco Feature Navigator to find information about feature, platform, and software image support. To access Cisco Feature Navigator, go to http://www.cisco.com/go/cfn. An account on cisco.com is not required.

Hardware Support

Cisco ASR 902 Supported Interface Modules

A900-RSP1-Supported Interface Modules (ASR 902 Router)

Table 1: A900-RSP1-Supported Interface Modules and Part Numbers

RSP	Interface Module	Part Number	Slot
A900-RSP1A-55 A900-RSP1B-55	8-port Gigabit Ethernet SFP Interface Module (8x1GE)	A900-IMA8S	All
	8-port Gigabit Ethernet RJ45 (Copper) Interface Module (8x1GE)	A900-IMA8T	
	1-port 10-Gigabit Ethernet XFP Interface Module (1x10GE)	A900-IMA1X	
	16-port T1/E1 Interface Module	A900-IMA16D	
	4-port OC3/STM-1 (OC-3) or 1-port OC12/STM-4 (OC-12) Interface Module	A900-IMA4OS	
	14-port Serial Interface Module	A900-IMASER14A/S	

A900-RSP2-Supported Interface Modules (ASR 902 Router)

Table 2: A900-RSP2-Supported Interface Modules and Part Numbers

RSP	Interface Modules	Part Numbers	Slots
A900-RSP2A-128 A900U-RSP2A-128	8-port Gigabit Ethernet SFP Interface Module (8x1GE)	A900-IMA8S	All
	8-port Gigabit Ethernet RJ45 (Copper) Interface Module (8x1GE)	A900-IMA8T	
	1-port 10-Gigabit Ethernet XFP Interface Module (1x10GE)	A900-IMA1X	
	16-port T1/E1 Interface Module	A900-IMA16D	
	4-port OC3/STM-1 (OC-3) or 1-port OC12/STM-4 (OC-12) Interface Module	A900-IMA4OS	
	SFP Combo IM—8-port Gigabit Ethernet (8x1GE) + 1-port 10-Gigabit Ethernet (1x10GE)	A900-IMA8S1Z	
	Copper Combo IM—8-port Gigabit Ethernet (8x1GE) + 1-port 10-Gigabit Ethernet Interface Module (1x10GE)	A900-IMA8T1Z	
	2-port 10 Gigabit Ethernet Interface Module (2x10GE)	A900-IMA2Z	
	14-port Serial Interface Module	A900-IMASER14A/S	
	4-port C37.94 Interface Module	A900-IMA4C3794	

RSP	Interface Modules	Part Numbers	Slots
A900-RSP2A-64 A900U-RSP2A-64	1-port 10 Gigabit Ethernet XFP Interface Module (1x10GE)	A900-IMA1X	0-2
	2-port 10 Gigabit Ethernet Interface Module (2x10GE)	A900-IMA2Z	
	4-port OC3/STM-1 (OC-3) or 1-port OC12/STM-4 (OC-12) Interface Module	A900-IMA4OS	
	8-port Gigabit Ethernet SFP Interface Module (8x1GE)	A900-IMA8S	0, 2 and 3
	8-port Gigabit Ethernet RJ45 (Copper) Interface Module (8x1GE)	A900-IMA8T	
	16-port T1/E1 Interface Module	A900-IMA16D	
	32-port T1/E1 Interface Module	A900-IMA32D	
	8-port T1/E1 Interface Module	A900-IMA8D	
	6-port E & M Interface Module	A900-IMA6EM	
	14-port Serial Interface Module	A900-IMASER14A/S	
	4-port C37.94 Interface Module	A900-IMA4C3794	

A900-RSP3C-200-S Supported Interface Modules (ASR 902 Router)

Table 3: A900-RSP3C-200 Supported Interface Modules and Part Numbers

RSP Module	Supported Interface Modules	Part Numbers	Slot
A900-RSP3C-200-S	8-port Gigabit Ethernet SFP Interface Module (8x1GE)	A900-IMA8S	All[1]
	8-port Gigabit Ethernet RJ45 (Copper) Interface Module (8x1GE)	A900-IMA8T	

RSP Module	Supported Interface Modules	Part Numbers	Slot
	1-port 10 Gigabit Ethernet XFP Interface Module (1x10GE)	A900-IMA1X	0 and 1
	SFP Combo IM—8-port Gigabit Ethernet (8x1GE) + 1-port 10 Gigabit Ethernet (1x10GE)	A900-IMA8S1Z	All
	Copper Combo IM—8-port Gigabit Ethernet (8x1GE) + 1-port 10 Gigabit Ethernet Interface Module (1x10GE)	A900-IMA8T1Z	
	2-port 10 Gigabit Ethernet Interface Module (2x10GE)	A900-IMA2Z	
	8-port 10 Gigabit Ethernet Interface Module (8x10GE)	A900-IMA8Z	0
	2-port 40 Gigabit Ethernet QSFP Interface Module (2x40GE)	A900-IMA2F	

[1] There are restrictions using the interface modules in different slots with RSP3 module. Contact Cisco Sales/Support for the valid combinations..

Cisco ASR 903 Supported Interface Modules

A900-RSP1 Supported Interface Modules

The table below is applicable for A900-RSP1A-55 and A900-RSP1B-55 RSP modules.

Table 4: A900-RSP1 Supported Interface Modules and Part Numbers

Interface Modules	Part Number	Slot
8-port Gigabit Ethernet SFP Interface Module (8x1GE)	A900-IMA8S	0-4
8-port Gigabit Ethernet RJ45 (Copper) Interface Module (8x1GE)	A900-IMA8T	All
1-port 10 Gigabit Ethernet XFP Interface Module (1x10GE)	A900-IMA1X	0-3
16-port T1/E1 Interface Module	A900-IMA16D	All
14-port Serial Interface Module	A900-IMASER14A/S	

A900-RSP2 Supported Interface Modules

A900-IMA2Z IM supports SFP+ and XFP on ports 0 and 1. Either SFP+ or XFP can be connected on each port. If both are connected on the same port, the port will go down.

The combination IMs (A900-IMA8S1Z, A900-IMA8T1Z) are not supported on the A900-RSP2-64 RSP module on the Cisco ASR 903 Router.

The table below is applicable for A900-RSP2A-128 and A900U-RSP2A-128 RSP modules.

Table 5: A900-RSP2A-128 Supported Interface Modules and Part Numbers

Supported Interface Modules	Part Numbers	Slot
1-port OC48/ 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	2,3,4,5
8-port Gigabit Ethernet SFP Interface Module (8x1GE)	A900-IMA8S	All
8-port Gigabit Ethernet RJ45 (Copper) Interface Module (8x1GE)	A900-IMA8T	
1-port 10 Gigabit Ethernet XFP Interface Module (1x10GE)	A900-IMA1X	
16-port T1/E1 Interface Module	A900-IMA16D	
32-port T1/E1 Interface Module	A900-IMA32D	
8-portT1/E1 Interface Module	A900-IMA8D	
4-port OC3/STM-1 (OC-3) or 1-port OC12/STM-4 (OC-12) Interface Module	A900-IMA4OS	
SFP Combo IM—8-port SFP Gigabit Ethernet (8x1GE) + 1-port 10 Gigabit Ethernet (1x10GE)	A900-IMA8S1Z	
Copper Combo IM—8-port 10/100/1000 Gigabit Ethernet (8x1GE) + 1-port 10 Gigabit Ethernet Interface Module (1x10GE)	A900-IMA8T1Z	
2-port 10 Gigabit Ethernet Interface Module (2x10GE)	A900-IMA2Z	
6-port E & M Interface Module	A900-IMA6EM	
14-port Serial Interface Module	A900-IMASER14A/S	
4-port C37.94 Interface Module	A900-IMA4C3794	

The table below is applicable for A900-RSP2A-64 and A900U-RSP2A-64 RSP modules.

Table 6: A900-RSP2A-64 Supported Interface Modules and Part Numbers

Supported Interface Modules	Part Numbers	Slot
1-port 10 Gigabit Ethernet XFP Interface Module (1x10GE)	A900-IMA1X	0-2
2-port 10 Gigabit Ethernet Interface Module (2x10GE)	A900-IMA2Z	
4-port OC3/STM-1 (OC-3) or 1-port OC12/STM-4 (OC-12) Interface Module	A900-IMA4OS	

Supported Interface Modules	Part Numbers	Slot
8-port Gigabit Ethernet SFP Interface Module (8x1GE)	A900-IMA8S	3-5
8-port Gigabit Ethernet RJ45 (Copper) Interface Module (8x1GE)	A900-IMA8T	
16-port T1/E1 Interface Module	A900-IMA16D	
32-port T1/E1 Interface Module	A900-IMA32D	
8-port T1/E1 Interface Module	A900-IMA8D	
6-port E & M Interface Module	A900-IMA6EM	
14-port Serial Interface Module	A900-IMASER14A/S	
4-port C37.94 Interface Module	A900-IMA4C3794	

A900-RSP3C-400-S Supported Interface Modules

The table below is applicable for A900-RSP3C-400-S RSP module.

Note There are certain restrictions in using the interface modules on different slots with RSP3 module. Contact Cisco Sales/Support for the valid combinations.

Table 7: A900-RSP3C-400 Supported Interface Modules and Part Numbers

Supported Interface Modules	Part Numbers	Slot
8-port Gigabit Ethernet SFP Interface Module (8x1GE)	A900-IMA8S	All
8-port Gigabit Ethernet RJ45 (Copper) Interface Module (8x1GE)	A900-IMA8T	All
1-port 10 Gigabit Ethernet XFP Interface Module (1x10GE)	A900-IMA1X	All
SFP Combo IM—8-port SFP Gigabit Ethernet (8x1GE) + 1-port 10 Gigabit Ethernet (1x10GE)	A900-IMA8S1Z	All
Copper Combo IM—8-port 10/100/1000 Gigabit Ethernet (8x1GE) + 1-port 10 Gigabit Ethernet Interface Module (1x10GE)	A900-IMA8T1Z	All
2-port 10 Gigabit Ethernet Interface Module (2x10GE)	A900-IMA2Z	All
8-port 10 Gigabit Ethernet Interface Module (8x10GE)	A900-IMA8Z	All
1-port 100 Gigabit Ethernet Interface Module (1x100GE)	A900-IMA1C	4 or 5
2-port 100 Gigabit Ethernet (QSFP) Interface Module (2x100GE)	N560-IMA2C/A900-IMA2C	4 and 5[2]

Supported Interface Modules	Part Numbers	Slot
2-port 40 Gigabit Ethernet QSFP Interface Module (2x40GE)	A900-IMA2F	4 or 5
8/16-port 1 Gigabit Ethernet (SFP/SFP) + 1-port 10 Gigabit Ethernet (SFP+) / 2-port 1 Gigabit Ethernet (CSFP) Interface Module	A900-IMA8CS1Z-M	0,3,4 or 5
48-port T1/E1 Interface module	A900-IMA48D-C	All
48-port T3/E3 Interface module	A900-IMA48T-C	All
1-port OC-192 or 8-Port Low Rate CEM Interface Module	A900-IMA8S1Z-CX	2,3,4,5
4-port OC-48/OC-12/OC-3 + 12-Port A900-IMA3G-IMSG T1/E1 + 4-Port T3/E3 CEM Interface Module	A900-IMA3G-IMSG	All
6-port E & M Interface Module	A900-IMA6EM	All
4-port C37.94 Interface Module	A900-IMA4C3794	All
14-port Serial Interface Module	A900-IMASER14A/S	All

Combo 8-Port SFP GE and 1-Port 10GE With CEM/iMSG 20G Interface Module	A900-IMA1Z8S-CXMS	2, 3, 4, 5[3]
		Note To enable this IM on slot 0 or slot 1, do the following and reload the router:
		`Router# configure t`
		`Router(config)# license feature service-offload enable`

[2] IM supports only one port of 100G with RSP3 as QSFP28 on Port 0 in both slots 4 and 5.
[3] These slots are supported on 10G or 20G mode.

A900-RSP3C-200-S Supported Interface Modules

The table below is applicable for A900-RSP3C-200-S RSP module.

Note There are certain restrictions in using the interface modules on different slots with RSP3 module. Contact Cisco Sales/Support for the valid combinations.

Note FAN OIR is applicable every time the IM based fan speed profile is switched to the IMA1C and IMA2F interface modules. Even though the IMs remain in the Out-of-Service state, they are still considered as present in the chassis.

Table 8: A900-RSP3C-200 Supported Interface Modules and Part Numbers

Supported Interface Modules	Part Numbers	Slot
8-port Gigabit Ethernet SFP Interface Module (8x1GE)	A900-IMA8S	All
8-port Gigabit Ethernet RJ45 (Copper) Interface Module (8x1GE)	A900-IMA8T	
1-port 10 Gigabit Ethernet XFP Interface Module (1x10GE)	A900-IMA1X	0, 2 or 4
SFP Combo IM—8-port SFP Gigabit Ethernet (8x1GE) + 1-port 10 Gigabit Ethernet (1x10GE)	A900-IMA8S1Z	1-5[4]
Copper Combo IM—8-port 10/100/1000 Gigabit Ethernet (8x1GE) + 1-port 10 Gigabit Ethernet Interface Module (1x10GE)	A900-IMA8T1Z	0-4
2-port 10 Gigabit Ethernet Interface Module (2x10GE)	A900-IMA2Z	
8-port 10 Gigabit Ethernet Interface Module (8x10GE)	A900-IMA8Z	4
2-port 40 Gigabit Ethernet QSFP Interface Module (2x40GE)	A900-IMA2F	4
4-port OC-48/OC-12/OC-3 + 12-Port A900-IMA3G-IMSG T1/E1 + 4-Port T3/E3 CEM Interface Module	A900-IMA3G-IMSG	2-5[5]
4-port C37.94 Interface Module	A900-IMA4C3794	4
6-port E & M Interface Module	A900-IMA6EM	4
14-port Serial Interface Module	A900-IMASER14AS	4

[4] If you have a 1-port 10G IM in slot 0, then SFP combo may not be supported in slot 5.
[5] If slot 0 has 8X10G IM and you want to insert IMA-3G-IMSG to slot 5, then insert 8X10G IM on slot 6, by using the **hw-module subslot 0/0 A900-IMA8Z mode 6-Port** command.

Cisco ASR 907 Supported Interface Modules

Supported Interface Modules

Note There are certain restrictions in using the interface modules on different slots in the chassis. Contact Cisco Sales and Support for the valid combinations.

Table 9: A900-RSP3 Supported Interface Modules and Part Numbers

RSP Module	Interface Modules	Part Number	Slot
A900-RSP3C-400-W	8-port Gigabit Ethernet SFP Interface Module (8X1GE)	A900-IMA8S	0,1,2,5,6,9,10,13,14,15
	8-port Gigabit Ethernet RJ45 (Copper) Interface Module (8X1GE)	A900-IMA8T	0,1,2,5,6,9,10,13,14,15
	1-port 10 Gigabit Ethernet XFP Interface Module (1X10GE)	A900-IMA1X	Not Supported
	SFP Combo IM—8-port Gigabit Ethernet (8X1GE) + 1-port 10 Gigabit Ethernet (1X10GE)	ASR900-IMA8S1Z	2,5,6,9,10,13,14,15
	Copper Combo IM—8-port Gigabit Ethernet (8X1GE) + 1-port 10 Gigabit Ethernet Interface Module (1X10GE)	ASR900-IMA8T1Z	2,5,6,9,10,13,14,15
	2-port 10 Gigabit Ethernet Interface Module (2X10GE)	ASR900-IMA2Z	3,4,7,8,11,12
	16-port T1/E1 Interface Module	A900-IMA16D	Not Supported
	14-port Serial Interface Module	A900-IMASER14A/S	3,4,7,8,11,12[6]
	8-port T1/E1 Interface Module	A900-IMA8D	Not Supported
	32-port T1/E1 Interface Module	A900-IMA32D	Not Supported
	1x100G Interface module	A900-IMA1C	7 and 8
	2-port 100 Gigabit Ethernet (QSFP) Interface Module (2X100GE)	A900-IMA2C	7 and 8[7]
	2x40G Interface module	A900-IMA2F	3,4,7,8,11,12
	8x10G Interface module	A900-IMA8Z[8]	3,4,7,8,11,12
	8/16-port 1 Gigabit Ethernet (SFP/SFP) + 1-port 10 Gigabit Ethernet (SFP+) / 2-port 1 Gigabit Ethernet (CSFP) Interface Module	A900-IMA8CS1Z-M	0,1,2,3,4,5,6,7,8,9,10,11,12,13,14,15
	1-port OC-192 or 8-Port Low Rate CEM Interface Module	A900-IMA8S1Z-CX	3,4,7,8,11,12 (10 G Mode) 0,1,2,5,6,9,10,13,14,15 (5 G Mode)
	48-port T1/E1 Interface module	A900-IMA48D-C	2,3,4,5,6,7,8,9,10,11,12,13,14,15
	48-port T3/E3 Interface module	A900-IMA48T-C	2,3,4,5,6,7,8,9,10,11,12,13,14,15
		A900-IMA3G-IMSG	3,5,7,9,11,13,15

RSP Module	Interface Modules	Part Number	Slot
	1-port OC48/ STM-16 or 4-port OC-12/OC-3 / STM-1/STM-4 + 12-Port T1/E1 + 4-Port T3/E3 CEM Interface Module		

	Combo 8-Port SFP GE and 1-Port 10GE With CEM/iMSG 20G Interface Module	A900-IMA1Z8S-CXMS	3, 7, 11[9]
			4, 8, 12[10]
			5, 9, 13, 15[11]
			Note To enable this IM on slot 0 or slot 1, do the following and reload the router:
			`Router# configure t`
			`Router(config)# license feature service-offload enable`

	6-port E&M Module	A900-IMA6EM	All slots
	4-port C37.94 Interface Module	A900-IMA4C3794	All slots

6 The serial IM will not work on slots 11 and 12, if the IMs A900-IMA8T or A900-IMA8S is inserted on any slot in the router.
7 The IMs A900-IMA6EM, A900-IMASER14A/S, and A900-IMA4C3794 can be installed in slots 3, 4, 7, 8, 11, 12. Slots 3, 4 and 11, 12 have dependency with 1 Gigabit Ethernet IMs. These IMs can be placed in slots 3 only if Gigabit Ethernet IM is not present in slot 5. These IMs can be placed in slots 4 only if Gigabit Ethernet IM is not present in slot 6. These IMs can be placed in slots 11 only if Gigabit Ethernet IM is not present in slots 1, 5, 9, 13, and 15. These IMs can be placed in slots 12 only if Gigabit Ethernet IM is not present in slots 0,2,6,10 and 14.
8 Six IM slots are supported with various combinations but only five IM slots are functional at a time.
9 These slots are supported on 10G or 20G mode.
10 These slots are supported on 10G or 20G mode, only if the adjacent odd slots are empty.
11 These slots are supported on 10G mode.

Cisco ASR 914 Supported Interface Modules

Swapping of Interface Modules

The following Ethernet interface modules support swapping on the Cisco A900-RSP3C-400-W module:

- SFP Combo IM—8-port Gigabit Ethernet (8X1GE) + 1-port 10 Gigabit Ethernet (1X10GE)
- 2-port 40 Gigabit Ethernet Interface Module (2X40GE)
- 8-port 10 Gigabit Ethernet Interface Module (8X10GE)
- 1-port 100 Gigabit Ethernet Interface Module (1X100GE)
- OC-192 Interface Module with 8-port Low Rate CEM Interface Module (10G HO / 10G LO)
- 48 T1/E1 TDM Interface Module (48XT1/E1)
- 48 T3/E3 TDM Interface Module (48XT3/E3)

Use the **hw-module subslot default** command before performing a swap of the modules to default the interfaces on the interface module.

- OC-192 Interface Module with 8-port Low Rate CEM Interface Module (10G HO / 10G LO)
- 48 T1/E1 TDM Interface Module (48XT1/E1)
- 48 T3/E3 TDM Interface Module (48XT3/E3)
- 1-port OC48 STM-16 or 4-port OC-12/OC-3 / STM-1/STM-4 + 12-Port T1/E1 + 4-Port T3/E3 CEM Interface Module
- NCS 4200 Combo 8-Port SFP GE and 1-Port 10 GE 20G Interface Module

Note There are certain restrictions in using the interface modules on different slots in the chassis. Contact Cisco Sales/Support for the valid combinations.

Table 10: Cisco A900-RSP3C-400-W Supported Interface Modules and Part Numbers

RSP Module	Interface Modules	Part Number	Slot
A900-RSP3C-400-W	SFP Combo IM—8-port Gigabit Ethernet (8X1GE) + 1-port 10 Gigabit Ethernet (1X10GE)	A900-IMA8S1Z	2,5,6,9,10,13,14,15
	1x100G Interface module	A900-IMA1C	7,8
	2x40G Interface module	A900-IMA2F	3,4,7,8,11,12
	8x10G Interface module	A900-IMA8Z	3,4,7,8,11,12
	8/16-port 1 Gigabit Ethernet (SFP/SFP) + 1-port 10 Gigabit Ethernet (SFP+) / 2-port 1 Gigabit Ethernet (CSFP) Interface Module	A900-IMA8CS1Z-M	0,1,2,3,4,5,6,7,8,9,10,11,12,13,14, and 15
	OC-192 Interface Module with 8-port Low Rate CEM Interface Module (10G HO / 10G LO)	A900-IMA1Z8S-CX	3,4,7,8,11,12 **Note** Other slots are supported in the 5G mode.
	48XT1/E1 Interface module	A900-IMA48D-C	2,3,4,5,6,7,8,9,10,11,12,13,14, and 15
	48XT3/E3 Interface module	A900-IMA48T-C	2,3,4,5,6,7,8,9,10,11,12,13,14, and 15
	1-port OC48/ 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	2,3,4,5,6,7,8,9,10,13,14, and 15
	2x100G Interface module	NCS560-IMA2C/A900-IMA2C	7, 8

	Combo 8-Port SFP GE and 1-Port 10GE With CEM/iMSG 20G Interface Module	A900-IMA1Z8S-CXMS	0, 1, 2, 5, 6, 9, 10, 13, 14, 15[12]
			3, 4, 7, 8, 11, 12[13]
			Note To enable this IM on slot 0 or slot 1, do the following and reload the router:
			`Router# configure t`
			`Router(config)# license feature service-offload enable`

[12] These slots are supported on 10G mode.
[13] These slots are supported on 20G mode.

Software Licensing Overview

The router offers the following base licenses:

- Metro Services
- Metro IP Services
- Metro Aggregation Services

Table 11: Cisco ASR 900 Software Licenses Feature Set

Metro Services	Metro IP Services	Metro Aggregation Services
—	Includes all features in Metro Services	Includes all features in Metro IP Services
QoS, with deep buffers and hierarchical QoS (HQOS)	IP routing (RIP, OSPF, EIGRP, BGP, IS-IS)	MPLS (LDP and VPN)
Layer 2: 802.1d, 802.1q	PIM (SM, DM, SSM), SSM mapping	MPLS TE and FRR
Ethernet Virtual Circuit (EVC)	BFD	MPLS OAM
Ethernet OAM (802.1ag, 802.3ah)	Multi-VRF CE (VRF lite) with service awareness (ARP, ping, SNMP, syslog, trace-route, FTP, TFTP)	MPLS-TP
Multiple Spanning Tree (MST) and Resilient Ethernet Protocol (REP)	IEEE 1588-2008 Ordinary Slave Clock and Transparent Clock	Pseudowire emulation (EoMPLS, CESoPSN, and SAToP)
Synchronous Ethernet	—	VPLS and HVPLS
IPv4 and IPv6 host connectivity	—	Pseudowire redundancy
—	—	MR-APS and mLACP

The router offers the following additional feature licenses:

- ATM
- IEEE 1588-2008 Boundary Clock/Master Clock
- OCx-overview- Port License

Note These features require a software license to use.

Determining the Software Version

You can use the following commands to verify your software version:

- Consolidated Package—**show version**
- Individual sub-packages—**show version installed** (lists all installed packages)

Upgrading to a New Software Release

Only the latest consolidated packages can be downloaded from Cisco.com; users who want to run the router using individual subpackages must first download the image from Cisco.com and extract the individual subpackages from the consolidated package.

For information about upgrading to a new software release, see the Cisco ASR 900 Series Router Configuration Guide.

ROMMON Version

We recommend you to upgrade the ROMMON version to 15.6(33r)S.

For more information on the ROMMON package, see Cisco Software Download.

Note Starting from Cisco IOS XE 16.10.x release, ROMMON upgrade is mandatory to boot RSP3 images.

Supported FPGA Versions

Use the **show hw-module all fpd** command to display the FPGA version on the router.

The below table lists the FPGA version for the software releases.

Note If there is an FPGA upgrade during ISSU, it will cause traffic disruption. TDM interface modules get reset irrespective of FPGA upgrade during the ISSU.

Table 12: IM FPGA Versions for all Ethernet Phase 1 and Phase 2 IMs

Cisco IOS XE Release	Gigabit Ethernet Interface Module (Phase 1) FPGA	Gigabit Ethernet Interface Module (Phase 2) FPGA	TDM Interface Module FPGA	RSP2 Module HoFPGA
16.11.1a	• A900-IMA8S/ A900-IMA8T — 0.47 • A900-IMA1X — 0.47	• A900-IMA8T1Z/ A900-IMA8S1Z — 69.24 • A900-IMA2Z — 69.22	—	0X00030009

Table 13: CEM and IM FPGA Versions for ASR 903 RSP3 and ASR 907

Category	48-port T1/E1 CEM Interface Module FPGA	48-port T3/E3 CEM Interface Module FPGA	1-port OC-192 Interface Module + 8-port Low Rate Interface Module FPGA	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
CEM FPGA	0x00000051	0x00000051	5G mode: 0x10180062 10G mode: 0x10510078	0x10820063
IM FPGA	1.22	1.22	1.15	2.00

MIB Support

The below table summarizes the supported MIBs on the Cisco ASR 900 Series Router.

Table 14: Supported MIBs

Supported MIBs		
BGP4-MIB (RFC 1657)	CISCO-IMAGE-LICENSE-MGMT-MIB	MPLS-LDP-STD-MIB (RFC 3815)
CISCO-BGP-POLICY-ACCOUNTING-MIB	CISCO-IMAGE-MIB	MPLS-LSR-STD-MIB (RFC 3813)
CISCO-BGP4-MIB	CISCO-IPMROUTE-MIB	MPLS-TP-MIB
CISCO-BULK-FILE-MIB	CISCO-LICENSE-MGMT-MIB	MSDP-MIB
CISCO-CBP-TARGET-MIB	CISCO-MVPN-MIB	NOTIFICATION-LOG-MIB (RFC 3014)
CISCO-CDP-MIB	CISCO-NETSYNC-MIB	OSPF-MIB (RFC 1850)
CISCO-CEF-MIB	CISCO-OSPF-MIB	OSPF-TRAP-MIB (RFC 1850)
CISCO-CLASS-BASED-QOS-MIB	CISCO-OSPF-TRAP-MIB	PIM-MIB (RFC 2934)
CISCO-CONFIG-COPY-MIB	CISCO-PIM-MIB	RFC1213-MIB
CISCO-CONFIG-MAN-MIB	CISCO-PROCESS-MIB	RFC2982-MIB
CISCO-DATA-COLLECTION-MIB	CISCO-PRODUCTS-MIB	RMON-MIB (RFC 1757)
CISCO-EMBEDDED-EVENT-MGRMIB	CISCO-PTP-MIB	RSVP-MIB
CISCO-ENHANCED-MEMPOOL-MIB	CISCO-RF-MIB	SNMP-COMMUNITY-MIB (RFC 2576)
CISCO-ENTITY-ALARM-MIB	CISCO-RTTMON-MIB	SNMP-FRAMEWORK-MIB (RFC 2571)
CISCO-ENTITY-EXT-MIB	CISCO-SONET-MIB	SNMP-MPD-MIB (RFC 2572)

CISCO-ENTITY-FRU-CONTROLMIB	CISCO-SYSLOG-MIB	SNMP-NOTIFICATION-MIB (RFC 2573)
CISCO-ENTITY-SENSOR-MIB	DS1-MIB (RFC 2495)	SNMP-PROXY-MIB (RFC 2573)
CISCO-ENTITY-VENDORTYPE-OID-MIB	ENTITY-MIB (RFC 4133)	SNMP-TARGET-MIB (RFC 2573)
CISCO-FLASH-MIB	ENTITY-SENSOR-MIB (RFC 3433)	SNMP-USM-MIB (RFC 2574)
CISCO-FTP-CLIENT-MIB	ENTITY-STATE-MIB	SNMPv2-MIB (RFC 1907)
CISCO-IETF-ISIS-MIB	EVENT-MIB (RFC 2981)	SNMPv2-SMI
CISCO-IETF-PW-ATM-MIB	ETHERLIKE-MIB (RFC 3635)	SNMP-VIEW-BASED-ACM-MIB (RFC 2575)
CISCO-IETF-PW-ENET-MIB	IF-MIB (RFC 2863)	SONET-MIB
CISCO-IETF-PW-MIB	IGMP-STD-MIB (RFC 2933)	TCP-MIB (RFC 4022)
CISCO-IETF-PW-MPLS-MIB	IP-FORWARD-MIB	TUNNEL-MIB (RFC 4087)
CISCO-IETF-PW-TDM-MIB	IP-MIB (RFC 4293)	UDP-MIB (RFC 4113)
CISCO-IF-EXTENSION-MIB	IPMROUTE-STD-MIB (RFC 2932)	CISCO-FRAME-RELAY-MIB
CISCO-IGMP-FILTER-MIB	MPLS-LDP-GENERIC-STD-MIB (RFC 3815)	IF-MIB
CISCO-AAA-SERVER-MIB	—	—

Table 15: Unverified MIBs

Unverified MIBs		
ATM-MIB	CISCO-IETF-DHCP-SERVER-EXT-MIB	EXPRESSION-MIB
CISCO-ATM-EXT-MIB	—	HC-ALARM-MIB
CISCO-ATM-IF-MIB	CISCO-IETF-PPVPN-MPLS-VPN-MIB	HC-RMON-MIB
CISCO-ATM-PVC-MIB	CISCO-IP-STAT-MIB	IEEE8021-CFM-MIB
CISCO-ATM-PVCTRAP-EXTN-MIB	CISCO-IPSLA-ETHERNET-MIB	IEEE8021-CFM-V2-MIB
CISCO-BCP-MIB	CISCO-L2-CONTROL-MIB	IEEE8023-LAG-MIB
CISCO-CALLHOME-MIB	CISCO-LAG-MIB	INT-SERV-GUARANTEED-MIB
CISCO-CIRCUIT-INTERFACE-MIB	CISCO-MAC-NOTIFICATION-MIB	INTEGRATED-SERVICES-MIB
CISCO-CONTEXT-MAPPING-MIB	CISCO-MEMORY-POOL-MIB	MPLS-L3VPN-STD-MIB (RFC 4382)
CISCO-EIGRP-MIB	CISCO-NHRP-EXT-MIB	MPLS-LDP-ATM-STD-MIB (RFC 3815)

CISCO-ERM-MIB	CISCO-NTP-MIB	MPLS-LDP-MIB
CISCO-ETHER-CFM-MIB	CISCO-PING-MIB	MPLS-TE-STD-MIB
CISCO-ETHERLIKE-EXT-MIB	CISCO-RESILIENT-ETHERNET-PROTOCOL-MIB	MPLS-VPN-MIB
CISCO-EVC-MIB	CISCO-RTTMON-ICMP-MIB	NHRP-MIB
CISCO-HSRP-EXT-MIB	CISCO-RTTMON-IP-EXT-MIB	RFC2006-MIB (MIP)
CISCO-HSRP-MIB	CISCO-RTTMON-RTP-MIB	RMON2-MIB (RFC 2021)
CISCO-IETF-ATM2-PVCTRAP-MIB	CISCO-SNMP-TARGET-EXT-MIB	SMON-MIB
CISCO-IETF-ATM2-PVCTRAP-MIBEXTN	CISCO-TCP-MIB	VRRP-MIB
CISCO-IETF-BFD-MIB	CISCO-VRF-MIB	—
CISCO-IETF-DHCP-SERVER-MIB	ETHER-WIS (RFC 3637)	—

MIB Documentation

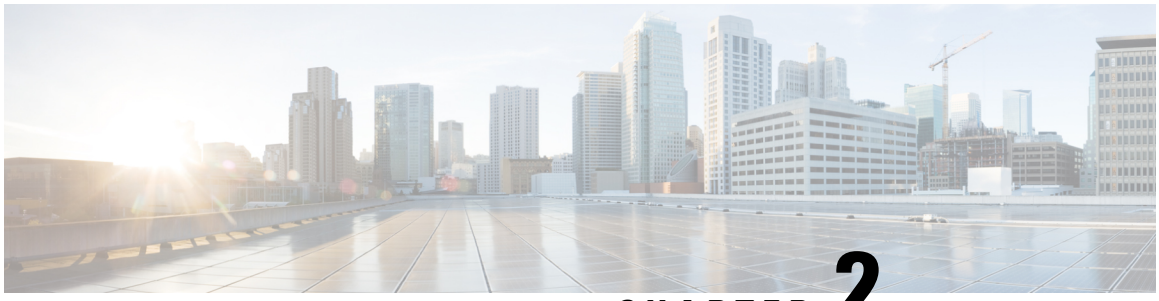
The following resources provide more detail about MIBs on the Cisco ASR 900 Series Router:

- Cisco ASR 900 Series Router MIB Guide—For information about the Cisco ASR 903 Series Router product implementation of the MIB protocol, see *Cisco ASR 903 Series Aggregation Services Router MIB Specifications Guide* at the following location:

  http://www.cisco.com/c/en/us/td/docs/wireless/asr_900/mib/guide/asr903mib.html

- MIB Locator—To locate and download MIBs for selected platforms, Cisco IOS and Cisco IOS XE releases, and feature sets, use Cisco MIB Locator found at the following location:

  http://tools.cisco.com/ITDIT/MIBS/servlet/index



CHAPTER 2

New Features

This chapter describes the new hardware and software features supported on the Cisco ASR 900 Series routers in the following releases:

For information on features supported for each release, see *Feature Matrix*.

- New Software Features in Cisco IOS XE Gibraltar 16.11.1a, on page 21
- New Hardware Features in Cisco IOS XE Gibraltar 16.11.1a, on page 26

New Software Features in Cisco IOS XE Gibraltar 16.11.1a

- **Seven Segment Routing-Traffic Engineering Label Support**

  The Cisco ASR 900 routers with RSP3 modules support seven SR-TE label stack with recirculation. This router supports up to four transport labels along with one to two service labels.

  For more information, see the Segment Routing Configuration Guide, Cisco IOS XE Gibraltar 16.11.x (Cisco ASR 900 Series Routers).

- **16 bundle members in LAG or LACP**

  For RSP3, 16 member links per port channel is supported. The restrictions for 8 member-link port channel are also applicable for 16 member-link port channel. 16 member links per port channel is supported only for 1G and 10G port-channel bundles.

  For more information, see the Ethernet Channel Configuration Guide Cisco IOS XE Gibraltar 16.11.x (Cisco ASR 900 Series).

- **64 Kbps Support on C37.94 Interface Module**

  The C37.94 interface module configuration reduces latency in all the timeslots, since these timeslots are always used, and the bandwidth utilization is high with the field-programmable gate array (FPGA) configured in an unstructured mode.

  With the 64 Kbps support on C37.94 interface module, when low bandwidth applications are required, you can configure the exact number of timeslots required with specific bandwidth. The FPGA is configured in structured mode.

  For more information, see the IOT Serial Controller Configuration Guide, Cisco IOS XE Gibraltar 16.11.x (Cisco ASR 900 Series).

- **Alarm Profile and Auto In-Service States**

The Alarm Profiling feature enables you to create a unique alarm profiles for chassis, card or interface module and port. You can also enable Auto-In Service (AINS) through the Alarm Profile by using the ains command. To configure the alarm profiles, you must create profiles either for the chassis, card or port and define the severities for each alarm and then attach the profile onto the corresponding chassis, card or port.

For more information, see the Auto-In Service States, Cisco IOS XE Gibraltar 16.11.x (ASR900 Series).

- **BDI statistics Support on RSP3 Module**

  BDI statistics is supported on the RSP3 module. The show interface command displays the BDI statistics for the interface.

  For more information, see Carrier Ethernet Configuration Guide, Cisco IOS XE Gibraltar 16.11.x (Cisco ASR 900 Series).

- **BFD over Routed Pseudowire on the RSP3 Module**

  BFD over Routed Pseudowire is supported on the RSP3 module.

  Routed VPLS is the ability to route or bridge frames to and from the pseudowire. Routed VPLS is configured by assigning the IP address under a bridge domain interface (BDI), in addition to the configuring the **vfi** command.

  Both the virtual forwarding interface (VFI), and the IP address is configured under the BDI. This configuration makes the BDI multi-functional and unique to other previously possible interfaces.

  For more information, see IP Routing: BFD Configuration Guide, Cisco IOS XE Gibraltar 16.11.x (Cisco ASR 900 Series).

- **Control Plane Policing Overview**

  The IPv4 control packets are punted into the respective CPU queues instead of host queues, if MPLS explicit NULL labels are tagged. Use the **platform qos-feature copp-mpls enable** command, to enable CoPP on the device for MPLS explicit null scenario.

  For more information, see the QoS: Policing and Shaping Configuration Guide, Cisco IOS XE Gibraltar 16.11.x (Cisco ASR 900 Series).

- **CoS Marking for Local Traffic on the RSP2 Module**

  CoS marking is supported on the following list of supported protocols for locally generated traffic.

  - SNMP
  - NTP
  - TELNET
  - SSH
  - TFTP
  - Syslog
  - FTP
  - DNS
  - TACACS
  - ICMP

Use the **platform cos-mark protocol** *protocol***cos-value** *cos-value* command to enable CoS marking on protocols.

For more information on CoS marking, see Quality of Service Configuration Guidelines, Cisco IOS XE Gibraltar 16.11.x (Cisco ASR 900 Series).

- **Global Table Map**

  A table-map helps you to define a mapping from an integer to an integer. In the RSP3 platform, by default global table-map configuration is used to map DSCP to EXP for L3VPN services.

  Note Usage of policy-map for marking the EXP is not recommended as it modifies the DSCP.

  For more information, see the Quality of Service Configuration Guidelines, Cisco IOS XE Fuji 16.11.x (Cisco ASR 900 Series).

- **Interworking Multiservice Gateway Access Circuit Redundancy**

  Interworking Multiservice Gateway Access Circuit Redundancy (iMSG ACR) is supported on Cisco ASR 900 RSP2 and RSP3 modules. The iMSG ACR enables local switching for serial interfaces by creating a virtual serial-ACR interface. All configuration changes made on the virtual serial-ACR interface are applied automatically on both the working and protect interfaces.

  For more information, see 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 Configuration Guide Cisco IOS XE Gibraltar 16.11.x (Cisco ASR 900 Series).

- **IPv4 Layer 3 Termination on HDLC or PPP Serial Interfaces**

  IPv4 Layer 3 termination on HDLC or PPP serial interfaces is supported for RSP3 module on the Cisco ASR 900 Series 4-Port OC3/STM-1 or 1-Port OC12/STM-4 Module (A900-IMA3G-IMSG).

  IPv4 routing can be performed using standard routing protocols such as OSPF, BGP, IS-IS, EIGRP, and RIP.

  For more information, see 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 Configuration Guide Cisco IOS XE Gibraltar 16.11.x (Cisco ASR 900 Series)

- **IP SLA for Pseudowire on the RSP2 Module**

  The IP SLAs VCCV operation supports Virtual Circuit Connectivity Verification (VCCV) for Pseudo-Wire Emulation Edge-to-Edge (PWE3) services across MPLS networks.

  The IP SLAs VCCV operation type is based on the **ping mpls pseudowire** command, which checks MPLS LSP connectivity across an Any Transport over MPLS (AToM) virtual circuit (VC) by sending a series of pseudo-wire ping operations to the specified destination PE router.

  For more information on IP SLA for Pseudowire, see IP SLAs Configuration Guide, Cisco IOS XE Gibraltar 16.11.x (Cisco ASR 900 Series).

- **IP SLA v2 UDP Jitter Probe on the RSP3 Module**

  The IP SLA v2 UDP jitter probe feature provides link monitoring with UDP packets carrying timestamp information, called probe. The RX or TX timestamp information provides monitoring of better UDP statistics and accuracy.

For more information see the IP SLAs Configuration Guide, Cisco IOS XE Gibraltar 16.11.x (Cisco ASR 900 Series).

- **IPv4 Unicast Generic Routing Encapsulation Tunnel**

  IPv4 Unicast Generic Routing Encapsulation Tunnel is supported on ASR 900 RSP2 module.

  For more information, see the MPLS: Layer 3 VPNs Configuration Guide, Cisco IOS XE Fuji 16.11.x, (Cisco ASR 900 Series).

- **Layer 2 Hardware Protocol Forwarding on RSP3**

  With Layer 2 Hardware Protocol Forwarding feature, the Layer 2 control protocol frames coming from cross-connect and local connect are transparently forwarded to the destination through hardware without getting punted to the CPU.

  For more information, see the Carrier Ethernet Configuration Guide, Cisco IOS XE Gibraltar 16.11.x (Cisco ASR 900 Series).

- **Policer Adjustment in QoS Policy Map**

  Policers are configured usually at a value range of 64,000–10 G where as the hardware policer is programmed only to discrete value. The policer rate received is less than that of the configured CIR and PIR values. The policer adjustment feature is added to adjust the CIR and PIR values of hardware policer either to match the configured value or to the next higher value available in hardware.

  The policer adjustment feature is supported on the RSP2 module.

  For more information, see the QoS: Policing and Shaping Configuration Guide, Cisco IOS XE Gibraltar 16.11.x (Cisco ASR 900 Series) .

- **Programmability Features for the Cisco RSP2 Module**

  - Kill Telemetry Subscription—The ability to delete a dynamic model driven telemetry dynamic subscription using either one of the following options:

    - The **clear telemetry ietf subscription** Cisco IOS command
    - The <**kill-subscription**> RPC

  - NETCONF and RESTCONF Service Level Access Control Lists—Enable you to configure an IPv4 or IPv6 access control list (ACL) for NETCONF and RESTCONF sessions.

    Clients that do not conform to the configured ACL are not allowed to access the NETCONF or RESTCONF subsystems. When service-level ACLs are configured, NETCONF and RESTCONF connection requests are filtered based on the source IP address.

  - YANG Data Models—For the list of Cisco IOS XE YANG models available with this release, navigate to https://github.com/YangModels/yang/tree/master/vendor/cisco/xe/16111.

    Revision statements embedded in the YANG files indicate if there has been a model revision. The `README.md` file in the same GitHub location highlights changes that have been made in the release.

- **PTP Asymmetry Readjustment**

  PTP asymmetry readjustment can be performed on each PTP node to compensate for the delay in the network.

  For more information, see Timing and Synchronization Configuration Guide, Cisco IOS XE Gibraltar 16.11.x (Cisco ASR 900 Series).

- **QoS Overhead Accounting**

  Overhead accounting enables the router to account for packet overhead when shaping traffic to a specific rate.

  This accounting ensures that the router executes quality of service (QoS) features on the actual bandwidth used by subscriber traffic.

  The overhead accounting feature enables the router to account for downstream Ethernet frame headers when applying shaping to packets. The traffic scheduler allows a minimum amount of value more than the configured rate at the port, in addition to the excess bytes configured on that port.

  For more information, see QoS: Policing and Shaping Configuration Guide, Cisco IOS XE Gibraltar 16.11.x (Cisco ASR 900 Series)

- **RS232 Async with E2E Signaling Support**

  The RS232 async mode supports carrying signals defined between data circuit-terminating equipment (DCE) and data terminal equipment (DTE). The RS232 async mode can be enabled or disabled.

  For more information, see the Cisco ASR 900 Router Series Configuration Guide, Cisco IOS XE Gibraltar 16.11.x.

- **Segment Routed Traffic Engineering On-Demand Next Hop Color-extended Community Support and Constraints**

  Segment Routed Traffic Engineering (SR-TE) policy configuration supports the following features. The **segment-routing traffic-eng** command is introduced to configure the following features under segment routing.

  - Color-extended community—An egress router adds the color extended community to the BGP updates that require a Traffic-Engineered path and a SR-TE policy is created on the ingress router for the Color-Endpoint pair.
  - Affinity constraints—Affinity is a 32-bit constraint used by the path computation and path calculation for calculating paths that take the affinity constraint into account. Affinity constraints let you assign, or map, and color names for path affinities. After mappings are defined, the attributes can be referred to by the corresponding color name.
  - Disjointness constraints—Disjointness describes two or more services that must be completely disjoint of each other. Disjointness is useful for providing traffic flow redundancy in the network.

  For more information, see the Segment Routing Configuration Guide, Cisco IOS XE Gibraltar 16.11.x (Cisco ASR 900 Series Routers).

- **Segment Routing Label Recirculation for TI-LFA**

  The Cisco ASR 900 router with RSP3 module supports more than one SR-TE label in both, the primary and backup paths. This increase in number of labels is achieved by recirculating the FRR backup path.

  For more information, see the Segment Routing Configuration Guide, Cisco IOS XE Gibraltar 16.11.x (Cisco ASR 900 Series Routers).

- **Target Identifier Address Resolution Protocol**

  When a device needs to send a data packet to another device, it has to know the Network Service Access Point (NSAP) corresponding to the TID of the other device. This mandates the device to request this information either directly from the remote device or from another intermediate device along the network. This functionality is provided by a protocol called Target Identifier Address Resolution Protocol (TARP).

For more information, see the 1-Port OC-192 or 8-Port Low Rate CEM Interface Module Configuration Guide, Cisco IOS XE Everest 16.11.x (Cisco ASR 900 Series).

- **Unidirectional Path Switching Ring Over HDLC**

  A Unidirectional Path Switching Ring (UPSR) over HDLC is supported on Cisco ASR 900 RSP2 and RSP3 modules.

  In an access network, the UPSR serial traffic is processed with an HDLC encapsulation protocol. UPSR is supported on modes such as VT 1.5, STS 3c, and T3.

  For more information, see 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 Configuration Guide Cisco IOS XE Gibraltar 16.11.x (Cisco ASR 900 Series).

- **Video Template - IPv4 QoS classifications**

  The max-qos-video template supports increased QoS support to 4000 and decreases IPv4 ACL to 2000.

  For more information, see the Cisco ASR 900 Router Series Configuration Guide, Cisco IOS XE Gibraltar 16.11.x.

New Hardware Features in Cisco IOS XE Gibraltar 16.11.1a

- **2X100 Gigabit Interface Module**

  The 2-port 100 Gigabit Ethernet Interface Module (A900-IMA2C) supports one mode of operation with 100 Gbps of traffic and QSFP28 optics.

  In the Cisco IOS XE Gibraltar 16.11.1a release, the 2-port 100 Gigabit Ethernet Interface Module supports only one 100G QSFP28 optics on Port 0. Port 1 is disabled with RSP3.

  Note For the ASR 903 or ASR 907 series router, the N560-IMA2C interface module is supported.

  For more information, see the following guides:

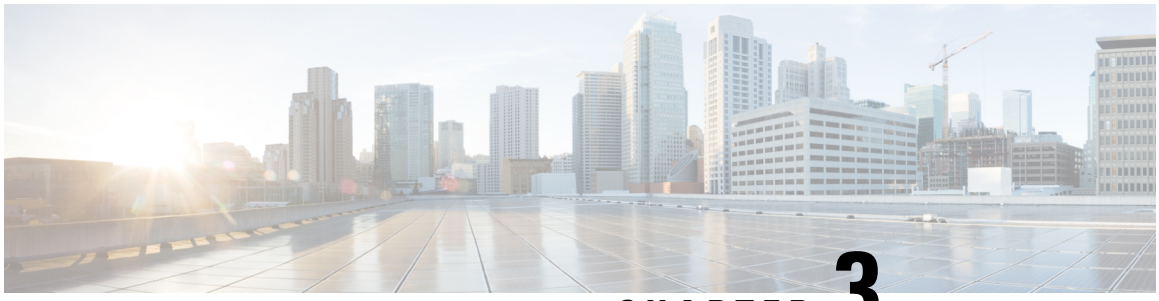
  - Cisco ASR 903 and ASR 903U Aggregation Services Router Hardware Installation Guide
  - Cisco ASR 907 and ASR 907U Aggregation Service Router Hardware Installation Guide

- **RS422 pinout details**

  Cable to be used: 4-port EIA-232 DCE, 10ft, Female D.

  Pinout of the DB25 connector to be hooked up to the RS232-to-RS422 converter.

  - TXD+ pin 4—This is the RTS pin for RS232 that functions as TXD+ for RS422.
  - TXD- pin 20—This is the DTR pin for RS232 that functions as TXD- for RS422.
  - RXD+ pin 5—This is the CTS pin for RS232 that functions as RXD+ for RS422.
  - RXD- pin 6—This is the DSR pin for RS232 that functions as RXD- for RS422.



CHAPTER 3

Caveats

This chapter describes open and resolved severity 1 and 2 caveats and select severity 3 caveats:

- The “Open Caveats” sections list open caveats that apply to the current release and may apply to previous releases. A caveat that is open for a prior release and is still unresolved applies to all future releases until it is resolved.
- The “Resolved Caveats” sections list caveats resolved in a specific release, but open in previous releases.

The bug IDs are sorted alphanumerically.

Note The Caveats section includes the bug ID and a short description of the bug. For details on the symptoms, conditions, and workaround for a specific caveat you must use the Bug Search Tool.

- Cisco Bug Search Tool, on page 27
- Open Caveats – Cisco IOS XE Gibraltar 16.11.1a, on page 27
- Resolved Caveats – Cisco IOS XE Gibraltar 16.11.1a, on page 28

Cisco Bug Search Tool

Cisco Bug Search Tool (BST), the online successor to Bug Toolkit, is designed to improve effectiveness in network risk management and device troubleshooting. You can search for bugs based on product, release, and keyword, and aggregates key data such as bug details, product, and version. For more details on the tool, see the help page located at http://www.cisco.com/web/applicat/cbsshelp/help.html

Open Caveats – Cisco IOS XE Gibraltar 16.11.1a

Caveat ID Number	Description
CSCvj02303	RSP3: More convergence seen during first SSO.
CSCvk00975	LDP is not coming up due to TCP failure with OS mode and 2:1 mode
CSCvm31596	ASR903 RSP3C-400-S going in hang state.

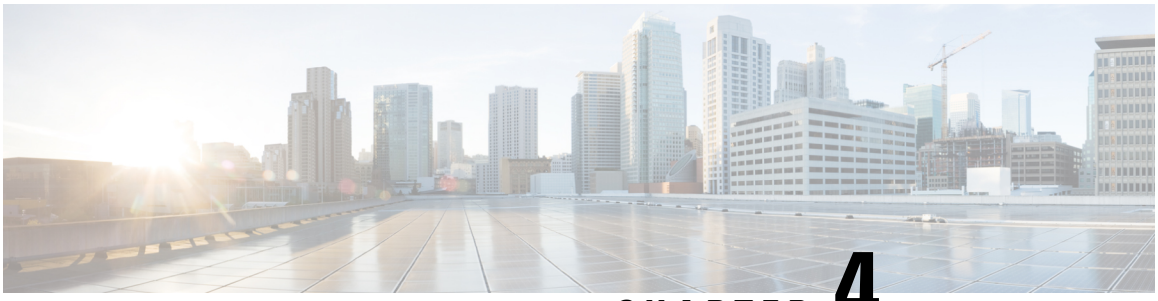
Caveat ID Number	Description
CSCvn66789	Standby RSP3 is not coming to hot standby in case of OOS IM combination.
CSCvm31554	RSP3: Traces at iomd_ha_speed_duplex_sync_message_handler on IM OIR soak script run with respect to standby.
CSCvm93301	RSP3:On IMA1X Interface flap on peer, with ISSU on UUT
CSCvo45246	RSP3: Standby-RSP struck in init state for an hour due to interface related pending-obj.
CSCvo60233	IMA8Z : OTN mode port is not coming Up after shutdown, MSR, SSO,and no shutdown in sequence.
CSCvo65796	ASR900-RSP3C-400: -For 2x100G IM in Post Reload, peer link-status is UP when one side is admin-shut.
CSCvj70341	RSP3: G8032 ports stuck in blocked state with Ring in the Idle State.
CSCvn57264	RSP3: PC member-link moved to suspended state post removing PC interface and moving member-links to new PC interface.
CSCvn63571	RSP3:HSPW switchover updates the correct MAC but not the Remote IP.
CSCvo59937	Path level traps stucked in EPNM.
CSCvm53996	RSP2: All Traffic punted to HOSTQ and Core ISIS and BFD sessions are Down and Do Not Recover.
CSCvn27921	1 pps TE absolute average time is failing for N560-IMA2C.
CSCvn55871	T1 serial interface went down with encapsulation mode as PPP with remote loopback configuration as IBOC.
CSCvo35275	MVPN: Unable to pass high MTU multicast packets-MDT-MTU
CSCvn75106	%FMFP-3-OBJ_DWNLD_TO_DP_FAILED: R0/0:adj 0xf80002f8, Flags Midchain download to DP failed.
CSCvo05478	Flex-LSP EoMPLS VC wrong tunnel label programmed in EMPLSINTD.
CSCvp33107	Interfaces are flapping and going down.

Resolved Caveats – Cisco IOS XE Gibraltar 16.11.1a

Caveat ID Number	Description
CSCvg67742	ASR903-RSP3C enhancement of log messages on FAN Tray OIR.
CSCvi91527	RSP2 8xT1 and E1 Adaptive Clock Recovery is in the UNKNOWN status.
CSCvj22030	ACR fails with -/+ 50 ppm tolerance.

Caveat ID Number	Description
CSCvj27560	The `cman-fp/cmcc` heartbeat failure crash due to pca954x channel selection errors.
CSCvj39606	AG1 CLI command **show ptp port running detail** is not showing output.
CSCvj50335	Lock issue on DS1 IM in slot15.
CSCvj50537	ISSU Failure in Vz ME lab.
CSCvk14135	With monitoring session configured slave is not locking <167>.
CSCvk14221	Crash on standby RSP on configuring APS working.
CSCvk23983	%DATACORRUPTION-1-DATAINCONSISTENCY observed with VFI and XCONNECT configuration during reload.
CSCvk59137	Fan tray temperature read as 0 degree Celsius.
CSCvm04696	MAC learnt on G8032 blocked ports due to DHCPv4 discovery packets.
CSCvm10079	Force QL Tx option is not working when netsync configured with more than 3 input sources.
CSCvm76770	Unpredictable asymmetry on T1 or E1 IM.
CSCvj70696	RSP3: Standby failed to reset on injection of uncorrectable parity error with traffic on.
CSCvk61183	Inconsistent report of controller status between SNMP and CLI.
CSCvi83876	MST instance 0 is not interoperable with STP.
CSCvm68956	Applying QoS shaper policy on xconnect interface causes total traffic failure.
CSCvo02009	RSP3: L3 Multi-act PC advertising OSPF or LDP packets with .1ad/.1q tag \"0\", causing cont OSPF flaps.
CSCvo06345	RSP2: Traceroute reply for destination with prefix /128 is failing.
CSCvk44911	LOTR OCx: 1+1 Uni Non-Revertive APS behaves as revertive when Protect leg is active in ADM and NCS42xx.
CSCvm61997	Unable to provision concatenated services on SDH MSP other than the first group of AUs.
CSCvm88334	LOS alarm is not asserted in IOS in 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 if peer is down.
CSCvn04612	T3 Framing configuration requires a CEM-group configuration or an IM reload to take effect.
CSCvn20074	Alarm profile: Crash observed while attaching profile to chassis
CSCvn97073	OCx IM operates in different modes when moved from slot 14 to slot 12.
CSCvg43968	Router reloads when peer end device reboots.

Caveat ID Number	Description
CSCvk62834	Router reloads during soak test.
CSCvk72044	Router reloads during soak test.
CSCvi96805	IGMP packet duplicated if IGMP snooping is disabled.
CSCvj43977	CEF inconsistency issue observed after continuous BFD flaps.
CSCvk45460	MLDP:Router crashed after breaking the core link with recursive enabled.
CSCvm21116	RP-reset when **sh pla har pp act** command is executed for the failed obj after EMPLSintd exhaust.
CSCvo07619	BDI IPv6 ping failure_FMFP_OBJ_Download_Failure.



CHAPTER 4

Restrictions and Limitations

- From the Cisco IOS XE 16.5.1 and 16.6.1 releases, In-Service Software Upgrade (ISSU) is not supported on the router to the latest releases.
- The port restriction on 1-port OC-192 or 8-port low rate CEM interface module is on port pair groups. If you have OC48 configured on a port, the possible port pair groups are 0-1, 2-3, 4-5, 6-7. If one of the port within this port group is configured with OC48 rate, the other port cannot be used.
- RS422 pinout works only on ports from 0 to 7.
- The **ip cef accounting** command is *not* supported on the router.
- Crash may be observed on the router when:
    - EoMPLS, CEM, ATM and IMA Pseudowire Redundancy (PW-redundancy) configurations exist while switchover and fail-back of the pseudowires are being triggered, and the **show platform hardware pp active pw eompls** command is executed.
- Configuration sync does *not* happen on the Standby RSP when the active RSP has Cisco Software Licensing configured, and the standby RSP has Smart Licensing configured on the router. If the active RSP has Smart Licensing configured, the state of the standby RSP is undetermined. The state could be pending or authorized as the sync between the RSP modules is not performed.
- Evaluation mode feature licenses may not be available to use after disabling, and enabling the smart licensing on the RSP2 module. A reload of the router is required.
- Ingress counters are not incremented for packets of the below format on the RSP3 module for the 10 Gigabit Ethernet interfaces, 100 Gigabit Ethernet interfaces, and 40 Gigabit Ethernet interfaces:

  Packet Format

  MAC header---->Vlan header---->Length/Type

  When these packets are received on the RSP3 module, the packets are not dropped, but the counters are not incremented.
- T1 SAToP, T3 SAToP, and CT3 are supported on an UPSR ring only with local connect mode. Cross-connect configuration of T1, T3, and CT3 circuits to UPSR are not supported.
- PTP is not supported when 8-port 10 Gigabit Ethernet interface module is in oversubscribed mode.
- ISSU is not supported between a Cisco IOS XE 3S Release and the Cisco IOS XE Gibraltar 16.11.x.
- This following restrictions are applicable only to Cisco RSP2 module.

- Traffic is dropped when packets of size 64 to 100 bytes are sent on 1G and 10G ports.
  - For 64-byte packets, traffic drop is seen at 70% and beyond of the line rate.
  - For 90-byte packets, traffic drop is seen at 90% and beyond of the line rate.
  - For 95-byte packets, traffic drop is seen at 95% and beyond of the line rate.

- Traffic is dropped when:
  - Traffic is sent on a VRF interface.
  - Traffic is sent across layer 2 and layer 3.

  However, traffic is not dropped when the packet size is greater than 100 bytes, even if the packets are sent bi-directionally at the line rate.

- Effective with Cisco IOS XE Everest 16.6.1, the Port-channel (PoCH) scale is reduced to 24 from 48 for Cisco ASR 900 RSP3 module.

  Note The PoCH scale for Cisco ASR 907 routers is 48.

- Important Notes, on page 32

Important Notes

Note Port channels 61-64 are not supported in the 16.11.1a release. The range of configurable port channel interfaces is limited to 60.