

# Cisco 40GBASE QSFP Modules

## Product Overview

The Cisco® 40GBASE QSFP (Quad Small Form-Factor Pluggable) portfolio offers customers a wide variety of high-density and low-power 40 Gigabit Ethernet connectivity options for data center, high-performance computing networks, enterprise core and distribution layers, and service provider applications.



## Features and Benefits of Cisco QSFP Modules

- Hot-swappable input/output device that plugs into a 40 Gigabit Ethernet Cisco QSFP port
- Flexibility of interface choice (for different reach requirements and fiber types)
- Interoperable with other IEEE-compliant 40GBASE interfaces where applicable
- Certified and tested on Cisco QSFP 40G ports for superior performance, quality, and reliability
- High-speed electrical interface compliant to IEEE 802.3ba
- QSFP Form factor, 2-wire I2C communication interface and other low-speed electrical interface compliant to SFF 8436 and QSFP Multisource Agreement (MSA)

**Table 1.** Cisco QSFP40G Portfolio

Product	Type	Connector Type
Cisco QSFP-40G-SR-BD	40GBASE-SR-BiDi, duplex MMF	LC
Cisco QSFP-40G-SR4	40GBASE-SR4, 4 lanes, 850 nm MMF	MPO-12
Cisco FET-40G	Fabric Extender, 4 lanes, 850 nm MMF	MPO-12
Cisco QSFP-40G-CSR4	40GBASE-CSR4, 4 lanes, 850 nm MMF	MPO-12
Cisco WSP-Q40GLR4L	40GBASE-LR4-Lite, 1310 nm, SMF	LC
Cisco QSFP-40GE-LR4	40GBASE-LR4, 1310 nm, SMF	LC
Cisco QSFP-40G-LR4	40GBASE-LR4, 1310 nm, SMF with OTU3 data-rate support	LC
Cisco QSFP-4SFP10G-CU (1M, 3M, 5M)	QSFP to 4 SFP+ copper break-out cables	-
Cisco QSFP-4X10G-AC (7M, 10M)		
Cisco QSFP-H40G-CU (1M, 3M, 5M)		
Cisco QSFP-H10G-ACU (7M, 10M)		
QSFP-4X10G-AOC (1M, 2M, 3M, 5M, 7M, 10M)	QSFP to four SFP+ active optical breakout cables	
QSFP-H40G-AOC (1M, 2M, 3M, 5M, 7M, 10M, 15M)	QSFP to QSFP active optical cables	

## Cisco QSFP 40G BiDi

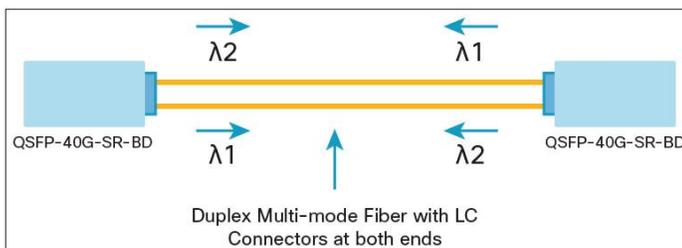
The Cisco QSFP 40-Gbps Bidirectional (BiDi) Transceiver (Figure 1) is a pluggable optical transceiver with a duplex LC connector interface for short-reach data communication and interconnect applications using multimode fiber (MMF). The Cisco QSFP 40-Gbps BiDi transceiver offers customers a compelling solution that enables reuse of their existing 10 Gigabit duplex MMF infrastructure for migration to 40 Gigabit Ethernet connectivity.

The Cisco QSFP 40-Gbps BiDi transceiver supports link lengths of 100m and 150m on laser-optimized OM3 and OM4 multimode fibers, respectively.

The Cisco BiDi transceiver complies with the QSFP MSA specification, enabling customers to use it on all QSFP 40-Gbps platforms to achieve high-density 40 Gigabit Ethernet networks.

Each Cisco QSFP 40-Gbps BiDi transceiver consists of two 20-Gbps transmit and receive channels in the 832nm-918nm wavelength range, enabling an aggregated 40-Gbps link over a 2-strand multimode fiber connection.

**Figure 1.** Cisco QSFP BiDi 40Gbps Transceiver: Duplex MMF with LC Connectors at Both Ends



## Cisco QSFP-40G-SR4

The Cisco 40GBASE-SR4 QSFP Module supports link lengths of 100m and 150m, respectively, on laser-optimized OM3 and OM4 multimode fibers. It primarily enables high-bandwidth 40G optical links over 12-fiber parallel fiber terminated with MPO/MTP multifiber connectors. It can also be used in a 4x10G mode for interoperability with 10GBASE-SR interfaces up to 100m and 150m on OM3 and OM4 fibers, respectively. The worry-free 4x10G mode operation is enabled by the optimization of the transmit and receive optical characteristics of the Cisco QSFP-40G-SR4 to prevent receiver overload or unnecessary triggering of alarm thresholds on the 10GBASE-SR receiver, at the same time being fully interoperable with all standard 40GBASE-SR4 interfaces. The 4x10G connectivity is achieved using an external 12-fiber parallel to 2-fiber duplex breakout cable, which connects the 40GBASE-SR4 module to four 10GBASE-SR optical interfaces. Cisco QSFP-40G-SR4 is optimized to guarantee interoperability with any IEEE 40GBase-SR4 and 10GBase-SR (in 4x10G mode).

## Cisco FET-40G

The Cisco FET-40G QSFP Module is a fabric extender transceiver module used to connect to fabric links (links between the fabric extender switch and the parent switch). The interconnect will work over parallel multimode fiber across distances of up to 100m and 150m, respectively, on laser-optimized OM3 and OM4 multimode fiber cables. This module can be used for native 40G optical links over 12-fiber ribbon cables with MPO/MTP connectors or in 4x10G mode with parallel to duplex fiber breakout cables for connectivity to four FET-10G interfaces.

### **Cisco QSFP-40G-CSR4**

The Cisco 40GBASE-CSR4 QSFP Module extends the reach of the IEEE 40GBASE-SR4 interface to 300m and 400m on laser-optimized OM3 and OM4 multimode parallel fiber, respectively. Each 10-gigabit lane of this module is compliant to IEEE 10GBASE-SR specifications. This module can be used for native 40G optical links over 12-fiber parallel cables with MPO/MTP connectors or in a 4x10G mode with parallel to duplex fiber breakout cables for connectivity to four 10GBASE-SR interfaces. Cisco QSFP-40G-CSR4 is optimized to guarantee interoperability over the full specification range of 10GBASE-SR.

### **Cisco QSFP-40GE-LR4 and Cisco QSFP-40G-LR4**

The Cisco 40GBASE-LR4 QSFP Module supports link lengths of up to 10km over a standard pair of G.652 single-mode fiber with duplex LC connectors. The 40 Gigabit Ethernet signal is carried over four wavelengths. Multiplexing and demultiplexing of the four wavelengths are managed within the device.

QSFP-40GE-LR4 supports 40GBase Ethernet rate only, whereas the QSFP-40G-LR4 supports OTU3 data rate in addition to 40GBase Ethernet rate.

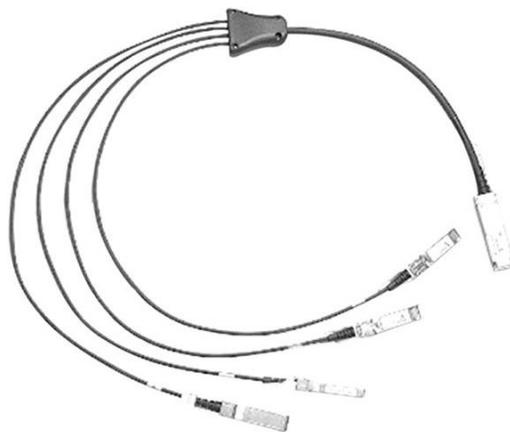
### **Cisco WSP-Q40GLR4L (QSFP-LR4-Lite)**

The Cisco WSP-Q40GLR4L QSFP Module supports link lengths of up to 2 km over a standard pair of G.652 single-mode fiber (SMF) with duplex LC connectors. The 40 Gigabit Ethernet signal is carried over four wavelengths. Multiplexing and demultiplexing of the four wavelengths are managed within the device. It is interoperable with 40GBase-LR4 for distances up to 2km. The operating temperature range is from +10 to +60°C with an optical link budget of 4dB. This 4dB link budget offers the ability to support the loss from patch panels in the link in a data center environment.

### **Cisco QSFP to Four SFP+ Copper Breakout Cables**

Cisco QSFP to four SFP+ copper direct-attach breakout cables (Figure 2) are suitable for very short distances and offer a highly cost-effective way to connect within racks and across adjacent racks. These breakout cables connect to a 40G QSFP port of a Cisco switch on one end and to four 10G SFP+ ports of a Cisco switch on the other end. Cisco currently offers passive cables in lengths of 1, 3, and 5 meters and active cables in lengths of 7 and 10 meters.

**Figure 2.** Cisco QSFP to Four SFP+ Copper Breakout Cables



### Cisco QSFP to QSFP Copper Direct-Attach Cables

Cisco QSFP to QSFP copper direct-attach 40GBASE-CR4 cables (Figure 3) are suitable for very short distances and offer a highly cost-effective way to establish a 40-Gigabit link between QSFP ports of Cisco switches within racks and across adjacent racks. Cisco currently offers passive cables in lengths of 1, 3, and 5 meters and active cables in lengths of 7 and 10 meters.

**Figure 3.** Cisco 40GBASE-CR4 QSFP Direct-Attach Copper Cables



### Cisco QSFP to Four SFP+ Active Optical Breakout Cables

Cisco QSFP to four SFP+ Active Optical breakout cables (Figure 4) are suitable for very short distances and offer a flexible way to connect within racks and across adjacent racks. Active optical cables are much thinner and lighter than copper cables, which makes cabling easier. AOCs enable efficient system airflow and have no EMI issues, which is critical in high-density racks. These breakout cables connect to a 40G QSFP port of a Cisco switch on one end and to four 10G SFP+ ports of a Cisco switch on the other end. Cisco currently offers active optical breakout cables in lengths of 1, 2, 3, 5, 7, and 10 meters.

**Figure 4.** Cisco 40G QSFP to Four SFP+ Breakout Active Optics Cables



### Cisco QSFP to QSFP Active Optical Cables

Cisco QSFP to QSFP copper direct-attach 40GBASE-CR4 cables (Figure 5) are suitable for very short distances and offer a flexible way to connect within racks and across adjacent racks. Active optical cables are much thinner and lighter than copper cables, which makes cabling easier. AOCs enable efficient system airflow and have no EMI issues, which is critical in high-density racks. Cisco currently offers active optical cables in lengths of 1, 2, 3, 5, 7, 10, and 15 meters.

**Figure 5.** Cisco 40G QSFP Active Optics Cables



## Technical Specifications

### Platform Support

Cisco QSFP modules are supported on Cisco switches and routers. For more details, refer to the document [“Cisco 40 Gigabit Ethernet Transceiver Modules Compatibility Matrix.”](#)

### Connectors and Cabling

Refer to Table 2 for connector type information and cabling specifications for each QSFP product.

**Note:** Only connections with patch cords with PC or UPC connectors are supported. Patch cords with APC connectors are not supported. All cables and cable assemblies used must be compliant with the standards specified in the standards section of this data sheet.

**Table 2.** QSFP Port Cabling Specifications

Cisco QSFP	Wavelength (nm)	Cable Type	Core Size (Microns)	Modal Bandwidth (MHz km) <sup>3</sup>	Cable Distance <sup>*1</sup>	Power Consumption (W)	Pull Tab Color
Cisco QSFP-40G-SR-BD	832 - 918	MMF	50.0 50.0 50.0	500 (OM2) 2000 (OM3) 4700 (OM4)	30m 100m 150m <sup>2</sup>	3.5	Gray
Cisco QSFP-40G-SR4	850	MMF	50.0 50.0 50.0	500 (OM2) 2000 (OM3) 4700 (OM4)	30m 100m 150m <sup>2</sup>	1.5	Beige
Cisco FET-40G	850	MMF	50.0 50.0 50.0	500 (OM2) 2000 (OM3) 4700 (OM4)	30m 100m 150m <sup>2</sup>	1.5	Brown
Cisco QSFP-40G-CSR4	850	MMF	50.0 50.0 50.0	500 (OM2) 2000 (OM3) 4700 (OM4)	82m 300m 400m	1.5	Orange
Cisco QSFP-40GE-LR4	1310	SMF	G.652	-	10km	3.5	Blue
Cisco QSFP-40G-LR4	1310	SMF	G.652	-	10km	3.5	Blue
Cisco WSP-Q40GLR4L	1310	SMF	G.652	-	2km	3.5	Yellow
Cisco QSFP-4SFP10G-CU1M	-	Direct-attach copper cable assembly	-	-	1m	1.5	Beige
Cisco QSFP-4SFP10G-CU3M	-		-	-	3m		Orange
Cisco QSFP-4SFP10G-CU5M	-		-	-	5m		Gray
Cisco QSFP-4X10G-AC7M	-		-	-	7m		Blue
Cisco QSFP-4X10G-AC10M	-		-	-	10m		Red

Cisco QSFP	Wavelength (nm)	Cable Type	Core Size (Microns)	Modal Bandwidth (MHz km) <sup>3</sup>	Cable Distance <sup>1</sup>	Power Consumption (W)	Pull Tab Color
Cisco QSFP-H40G-CU1M	-		-	-	1m		Beige
Cisco QSFP-H40G-CU3M	-		-	-	3m		Orange
Cisco QSFP-H40G-CU5M	-		-	-	5m		Gray
Cisco QSFP-H10G-ACU7M	-		-	-	7m		Blue
Cisco QSFP-H10G-ACU10M	-		-	-	10m		Red
QSFP-4X10G-AOC1M	-	Active optical cable assembly	-	-	1m	1.5	Beige
QSFP-4X10G-AOC2M	-		-	-	2m		Brown
QSFP-4X10G-AOC3M	-		-	-	3m		Orange
QSFP-4X10G-AOC5M	-		-	-	5m		Gray
QSFP-4X10G-AOC7M	-		-	-	7m		Blue
QSFP-4X10G-AOC10M	-		-	-	10m		Red
QSFP-H40G-AOC1M	-		-	-	1m		Beige
QSFP-H40G-AOC2M	-		-	-	2m		Brown
QSFP-H40G-AOC3M	-		-	-	3m		Orange
QSFP-H40G-AOC5M	-		-	-	5m		Gray
QSFP-H40G-AOC7M	-		-	-	7m		Blue
QSFP-H40G-AOC10M	-		-	-	10m		Red
QSFP-H40G-AOC15M	-		-	-	15m		Black

<sup>1</sup> Minimum cabling distance is 0.5m for -SR4 and -CSR4 modules and 2m for -LR4 according to the IEEE 802.3 standard.

<sup>2</sup> Considered an engineered link with maximum 1dB loss budget.

<sup>3</sup> Specified at transmission wavelength.

**Note:** All Cisco QSFP modules and cables exceed IEEE specifications, guaranteeing a link bit-error rate (BER) better than 1E-15 with some exceptions:

- QSFP-40G-SR-BD guarantees a link BER of 1E-12 when supporting 150m on OM4 fiber.
- QSFP-40G-CSR4 complies with IEEE specifications, guaranteeing a link BER better than 1E-12.

**Table 3.** Loss Budget Comparison of QSFP BiDi with 40GBase-SR4 Specifications

Optical Modules	MMF Type	Reach (Meters)	Total Loss Budget (dB)	BER
QSFP-40G-SR-BD	OM3	100m	1.9 <sup>4</sup>	1E-15
	OM4	150m	1.5	1E-12
QSFP-40G-SR4	OM3	100m	1.9	1E-15
	OM4	150m	1.5	1E-15

<sup>4</sup> QSFP-40G-SR-BD has 0.7dB incremental margin (in addition to 1.9dB total loss budget shown in Table 3), which can be allocated to connector losses in the link for OM3 fiber for applications when a link BER of 1E-12 is sufficient. Cisco recommends that this margin be allocated to connector losses, and care should be taken to not exceed 120m in fiber link distance with the OM3 fiber.

Table 4 shows the key optical characteristics for the Cisco QSFP modules.

**Table 4.** Optical Characteristics

Product	Type	Transmit Power (dBm) <sup>5</sup>		Receive Power (dBm) <sup>5</sup>		Transmit and Receive Wavelength (nm)
		Maximum	Minimum	Maximum	Minimum	
<b>Cisco QSFP-40G-SR-BD</b>	40GBASE-SR-BiDi, Duplex MMF	+5, per lane <sup>6</sup>	-4, per lane	+5, per lane	-6, per lane	832 to 918
<b>Cisco QSFP-40G-SR4</b>	40GBASE-SR4, 4 lanes, 850 nm MMF	-1, per lane <sup>6</sup>	-7.6, per lane	2.4, per lane	-9.5, per lane	840 to 860
<b>Cisco FET-40G</b>	Fabric Extender, 4 lanes, 850 nm MMF	-1, per lane <sup>6</sup>	-8.0, per lane	-1.0, per lane	-9.9, per lane	840 to 860
<b>Cisco QSFP-40G-CSR4</b>	40GBASE-CSR4, 4 lanes, 850 nm MMF	0, per lane	-7.3, per lane	0, per lane	-9.9, per lane	840 to 860
<b>Cisco WSP-Q40GLR4L</b>	40GBASE-LR4-Lite, 1310 nm, SMF	2.3, per lane	-10, per lane	2.3, per lane	-13.7, per lane	Four lanes: 1271, 1291, 1311, 1331
<b>Cisco QSFP-40GE-LR4</b>	40GBASE-LR4, 1310 nm, SMF	2.3, per lane	-7, per lane	2.3, per lane	-13.7, per lane	Four lanes: 1271, 1291, 1311, 1331
<b>Cisco QSFP-40G-LR4</b>	40GBASE-LR4 with OTU3 data rate support, 1310 nm, SMF	2.3, per lane	-7, per lane	2.3, per lane	-13.7, per lane	Four lanes: 1271, 1291, 1311, 1331

<sup>5</sup> Transmitter and receiver power is average, unless specified.

<sup>6</sup> Version -01 of QSFP-40G-SR4 allows for a maximum transmit power of +1dBm per lane.

## Dimensions

Maximum outer dimensions for the QSFP connector module are (H x W x D) 13.5 x 18.4 x 72.4 mm.

Cisco QSFP connector module typically weigh 100 grams or less.

## Environmental Conditions

Operating temperature range:

- Commercial temperature range: 0 to 70°C (32 to 158°F). Exceptions are
  - QSFP BiDi (QSFP-40G-SR-BD): +10 to 70°C (50 to 158°F)
  - QSFP LR4 Lite (WSP-Q40GLR4L): +10 to 60°C (50 to 158°F)
- Storage temperature range: -40 to 85°C (-40 to 185°F)

## Warranty

- Standard warranty: 90 days
- Extended warranty (optional): Cisco QSFP modules can be covered in a Cisco SMARTnet<sup>®</sup> Service support contract for the Cisco switch or router chassis.

## Ordering Information

Table 5 provides the ordering information for Cisco SFP+ modules and related cables.

**Table 5.** Ordering Information

Description	Product Number
<b>QSFP Optics Modules</b>	
Cisco 40GBASE-SR-Bi Directional QSFP Module for Duplex MMF	QSFP-40G-SR-BD
Cisco 40GBASE-SR4 QSFP Module for MMF	QSFP-40G-SR4
Cisco Fabric Extender Transceiver	FET-40G
Cisco 40GBASE-CSR4 QSFP Module for MMF	QSFP-40G-CSR4
Cisco 40GBASE-LR4 QSFP Module for SMF	QSFP-40GE-LR4
Cisco 40GBASE-LR4 QSFP Module for SMF with OTU-3 data-rate support	QSFP-40G-LR4
Cisco 40GBASE-LR4L QSFP Module for SMF	WSP-Q40GLR4L
<b>QSFP Direct-Attach Copper Modules</b>	
Cisco 40GBASE-CR4 QSFP to 4 10GBASE-CU SFP+ direct-attach breakout cable, 1-meter, passive	QSFP-4SFP10G-CU1M
Cisco 40GBASE-CR4 QSFP to 4 10GBASE-CU SFP+ direct-attach breakout cable, 3-meter, passive	QSFP-4SFP10G-CU3M
Cisco 40GBASE-CR4 QSFP to 4 10GBASE-CU SFP+ direct-attach breakout cable, 5-meter, passive	QSFP-4SFP10G-CU5M
Cisco 40GBASE-CR4 QSFP to 4 10GBASE-CU SFP+ direct-attach breakout cable, 7-meter, active	QSFP-4X10G-AC7M
Cisco 40GBASE-CR4 QSFP to 4 10GBASE-CU SFP+ direct-attach breakout cable, 10-meter, active	QSFP-4X10G-AC10M
Cisco 40GBASE-CR4 QSFP direct-attach copper cable, 1-meter, passive	QSFP-H40G-CU1M
Cisco 40GBASE-CR4 QSFP direct-attach copper cable, 3-meter, passive	QSFP-H40G-CU3M
Cisco 40GBASE-CR4 QSFP direct-attach copper cable, 5-meter, passive	QSFP-H40G-CU5M
Cisco 40GBASE-CR4 QSFP direct-attach copper cable, 7-meter, active	QSFP-H40G-ACU7M
Cisco 40GBASE-CR4 QSFP direct-attach copper cable, 10-meter, active	QSFP-H40G-ACU10M
Cisco 40GBase-AOC QSFP to 4 SFP+ Active Optical breakout Cable, 1-meter	QSFP-4X10G-AOC1M
Cisco 40GBase-AOC QSFP to 4 SFP+ Active Optical breakout Cable, 2-meter	QSFP-4X10G-AOC2M
Cisco 40GBase-AOC QSFP to 4 SFP+ Active Optical breakout Cable, 3-meter	QSFP-4X10G-AOC3M
Cisco 40GBase-AOC QSFP to 4 SFP+ Active Optical breakout Cable, 5-meter	QSFP-4X10G-AOC5M
Cisco 40GBase-AOC QSFP to 4 SFP+ Active Optical breakout Cable, 7-meter	QSFP-4X10G-AOC7M
Cisco 40GBase-AOC QSFP to 4 SFP+ Active Optical breakout Cable, 10-meter	QSFP-4X10G-AOC10M
Cisco 40GBase-AOC QSFP direct-attach Active Optical Cable, 1-meter	QSFP-H40G-AOC1M
Cisco 40GBase-AOC QSFP direct-attach Active Optical Cable, 2-meter	QSFP-H40G-AOC2M
Cisco 40GBase-AOC QSFP direct-attach Active Optical Cable, 3-meter	QSFP-H40G-AOC3M
Cisco 40GBase-AOC QSFP direct-attach Active Optical Cable, 5-meter	QSFP-H40G-AOC5M
Cisco 40GBase-AOC QSFP direct-attach Active Optical Cable, 7-meter	QSFP-H40G-AOC7M
Cisco 40GBase-AOC QSFP direct-attach Active Optical Cable, 10-meter	QSFP-H40G-AOC10M
Cisco 40GBase-AOC QSFP direct-attach Active Optical Cable, 15-meter	QSFP-H40G-AOC15M

---

## Regulatory and Standards Compliance

### Standards:

- GR-20-CORE: Generic Requirements for Optical Fiber and Optical Fiber Cable
- GR-326-CORE: Generic Requirements for Single-Mode Optical Connectors and Jumper Assemblies
- GR-1435-CORE: Generic Requirements for Multifiber Optical Connectors
- IEEE 802.3ba (-SR4, -LR4)
- IEEE 802.3ae (-CSR4)
- QSFP+ MSA SFF-8436
- SFP+ MSA SFF-8431 and -8461
- RoHS 6

### Safety:

- Laser Class 1M per IEC60825-1 and CFR 21 Section 1040
- Cable jacket of QSFP copper modules is UL E116441 Compliant
- QSFP copper cables are ELV Compliant

### Additional Information

For more information about Cisco 40GBASE QSFP optics and copper modules, contact your sales representative or visit [http://www.cisco.com/en/US/products/hw/modules/ps5455/prod\\_module\\_series\\_home.html](http://www.cisco.com/en/US/products/hw/modules/ps5455/prod_module_series_home.html).



---

Americas Headquarters  
Cisco Systems, Inc.  
San Jose, CA

Asia Pacific Headquarters  
Cisco Systems (USA) Pte. Ltd.  
Singapore

Europe Headquarters  
Cisco Systems International BV Amsterdam,  
The Netherlands

Cisco has more than 200 offices worldwide. Addresses, phone numbers, and fax numbers are listed on the Cisco Website at [www.cisco.com/go/offices](http://www.cisco.com/go/offices).

Cisco and the Cisco logo are trademarks or registered trademarks of Cisco and/or its affiliates in the U.S. and other countries. To view a list of Cisco trademarks, go to this URL: [www.cisco.com/go/trademarks](http://www.cisco.com/go/trademarks). Third party trademarks mentioned are the property of their respective owners. The use of the word partner does not imply a partnership relationship between Cisco and any other company. (1110R)