Release Notes for Cisco IOS Release 15.5(1)SY

March 20, 2024

For general product information about the Catalyst 6500 Series Switches, see: https://www.cisco.com/c/en/us/support/switches/catalyst-6500-series-switches/series.html#~tab-documents

The most current version of this document is available on Cisco.com at:

http://www.cisco.com/c/en/us/td/docs/switches/lan/catalyst6500/ios/15-4SY/release_notes/release_notes.html New Features in Release 15.5(1)SY4, page 53

Caution Cisco IOS supports redundant configurations with identical Supervisor engines. If they are not identical, one Supervisor engine will boot first and become active and hold the other in a reset condition.

Contents

This publication consists of these sections:

Americas Headquarters:
Cisco Systems, Inc., 170 West Tasman Drive, San Jose, CA 95134-1706 USA

Chronological List of Releases

See the "Images and Feature Sets" section on page 48 for information about which releases are deferred.

The following is a chronological list of the 15.5SY releases:

- Release 15.5(1)SY13—20 March 2024
- Release 15.5(1)SY12—15 September 2023
- Release 15.5(1)SY11—21 March 2023
- Release 15.5(1)SY10—17 September 2022
- Release 15.5(1)SY9—17 March 2022
- Release 15.5(1)SY8—16 September 2021
- Release 15.5(1)SY7—18 March 2021
- Release 15.5(1)SY6—18 September 2020
- Release 15.5(1)SY5—18 March 2020
- Release 15.5(1)SY4—12 September 2019
- Release 15.5(1)SY3—27 March 2019
- Release 15.5(1)SY2—17 September 2018
- Release 15.5(1)SY1—8 March 2018
- Release 15.5(1)SY—22 May 2017

Supported Hardware

This section describes the hardware supported in Release 15.5(1)SY and later releases:

Note Run the **show power** command to display current system power usage.

Supervisor Engines, PFCs, DFCs, and CFC

Supervisor Engine 6T

Product ID (append "=" for spares)	**Product Description**	**Minimum Software Version**
C6800-SUP6T	Supervisor Engine 6T with PFC4	15.3(1)SY
C6800-SUP6T-XL	Supervisor Engine 6T with PFC4XL	

Features

- One of these policy feature cards:
  - Policy Feature Card 4XL (PFC4XL)
  - Policy Feature Card 4 (PFC4)
    See the Appendix , "Supported Policy Feature Cards."
- Supports up to 6-Tbps switch fabric connectivity.
- 4-GB DDR3 for both XL and non-XL Supervisors.
- Internal 4-GB eUSB (bootdisk:).
- 1 external USB Type-A slot (disk0:)
- Management Port. Supports both the following:
  - RJ45
  - SFP, which supports following transceivers:
    GLC-SX-MM
    GLC-LH-SM
    GLC-ZX-SM
    GLC-SX-MMD
    GLC-LH-SMD
    GLC-EX-SMD
    GLC-ZX-SMD
    GLC-BX-U
    GLC-BX-D
- Console port supports the following variants:
  - RJ45 Serial
  - USB port Type-B

- Front-panel Supervisor uplink ports:
  8 x 1-Gb / 10-Gb Small Form Factor Pluggable Plus (SFP+) ports (Ports numbering from TenG 1 to 8)
  2 x 40-Gb QSFP ports (Ports numbering FortyG 9 to 10)
- Supervisor Slot occupies the Supervisor slots as follows:
  - 7-Slot 6807-XL chassis–slots 3 and 4 [15.3(1)SY onwards]
- NVRAM–4 MB
- Power consumptions
  - Standard–341 W maximum
  - XL–354 W maximum
- Receive and transmit queues
  - Default–1p7q4t
  - Configurable–2p6q4t
- For further details, see this publication:
  http://www.cisco.com/c/en/us/products/collateral/interfaces-modules/catalyst-6800-series-Supervisor-engine-6t/datasheet-c78-736408.html

Supervisor Engine 2T-10GE

Product ID (append "=" for spares)	**Product Description**	**Minimum Software Version**
VS-S2T-10G-XL	Supervisor Engine 2T-10GE with PFC4XL	15.0(1)SY
VS-S2T-10G	Supervisor Engine 2T-10GE with PFC4	

Features

- One of these policy feature cards:
  - Policy Feature Card 4XL (PFC4XL)
  - Policy Feature Card 4 (PFC4)

  See the "Supported Policy Feature Cards" section on page 6.
- Supports 2-Tbps switch fabric connectivity.
- 2-GB DRAM.
- Internal 1-GB bootflash (**bootdisk:**).
- One external slot:
  - **disk0:**
  - For CompactFlash Type II flash PC cards sold by Cisco Systems, Inc., for use in Supervisor Engine 2T-10GE.
- Console ports:
  - EIA/TIA-232 (RS-232) port
  - USB port

- Ports 1, 2, and 3:
  - QoS architecture–**2q4t**/**1p3q4t**
  - Ports 1, 2, and 3–Gigabit Ethernet SFP (fiber SFP or 1000 Mbps RJ-45 SFP)
- Ports 4 and 5:
  - Support for 10-Gigabit Ethernet X2 transceivers
  - QoS architecture:
    - With ports 1, 2, and 3 enabled–**2q4t**/**1p3q4t**
    - With ports 1, 2, and 3 disabled–**8q4t**/**1p7q4t**
- 1-port group–Ports 1 through 5

Note See the *Supervisor Engine 2T-10GE Connectivity Management Processor Configuration Guide* for information about the 10/100/1000 Mbps RJ-45 port.

- Connectivity Management Processor (CMP)—See this publication:

  http://www.cisco.com/c/en/us/td/docs/switches/lan/catalyst6500/cmp_configuration/guide/sup2T_10GEcmp.html

Supervisor Engine 2T-10GE Restrictions

- The 1-Gigabit Ethernet ports and the 10-Gigabit Ethernet ports have the same QoS port architecture (**2q4t**/**1p3q4t**) unless you disable the 1-Gigabit Ethernet ports with the **platform qos 10g-only** global configuration command. With the 1-Gigabit Ethernet ports disabled, the QoS port architecture of the 10-Gigabit Ethernet ports is **8q4t**/**1p7q4t**.
- In RPR redundancy mode, the ports on a Supervisor Engine 2T-10GE in standby mode are disabled.

Supported Policy Feature Cards

Policy Feature Card 4 Guidelines and Restrictions

- The PFC4 supports a theoretical maximum of 131,072 (128K) MAC addresses with 118,000 (115.2K) MAC addresses as the recommended maximum.
- The PFC4 partitions the hardware FIB table to route IPv4 unicast, IPv4 multicast, MPLS, and IPv6 unicast and multicast traffic in hardware. Traffic for routes that do not have entries in the hardware FIB table are processed by the Route Processor in software.

  The defaults for XL mode are:
  - IPv4 unicast and MPLS–512,000 routes
  - IPv4 multicast and IPv6 unicast and multicast–256,000 routes

  The defaults for Non-XL mode are:
  - IPv4 unicast and MPLS–192,000 routes
  - IPv4 multicast and IPv6 unicast and multicast–32,000 routes

Note The size of the global internet routing table plus local routes, if any, can exceed the non-XL mode default partition sizes.

These are the theoretical maximum numbers of routes for the supported protocols (the maximums are not supported simultaneously):

- XL mode:
  - IPv4 and MPLS–Up to 1,007,000 routes
  - IPv4 multicast and IPv6 unicast and multicast–Up to 503,000 routes
- Non-XL mode:
  - IPv4 and MPLS–Up to 239,000 routes
  - IPv4 multicast, IPv6 unicast, and multicast–Up to 119,000 routes

Run the **platform cef maximum-routes** command to repartition the hardware FIB table. IPv4 unicast and MPLS require 1 hardware FIB table entry per route. IPv4 multicast, IPv6 unicast, and multicast require 2 hardware FIB table entries per route. Changing the partition for one protocol makes corresponding changes in the partitions of the other protocols. Run the **reload** command to bring the configuration changes made with the **platform cef maximum-routes** command into effect.

Note In a non-XL-mode system, if your requirements cannot be met by repartitioning the hardware FIB table, upgrade components, as necessary, to make it operate in XL mode.

- You cannot use one type of PFC on one Supervisor engine and a different type on the other Supervisor engine for redundancy. You must use identical policy feature cards.
- PFC4—These restrictions apply to a configuration with a PFC4 and these DFCs:
  - PFC4 and DFC4—No restrictions (PFC4 mode).
  - PFC4 and DFC4XL—The PFC4 restricts the DFC4XL functionality. The DFC4XL functions as a DFC4 (PFC4 mode).
- PFC4XL—These restrictions apply to a configuration with a PFC4XL and these DFCs:
  - PFC4XL and DFC4—The PFC4XL functionality is restricted by the DFC4. After a reload, with a DFC4-equipped module installed, the PFC4XL functions as a PFC4 (PFC4 mode).
  - PFC4XL and DFC4XL—No restrictions (PFC4XL mode).
- Switching modules that you install after bootup, and are equipped with a DFC that imposes a more restricted PFC mode than the current PFC mode, remain powered down.
- You must reboot to use a switching module equipped with a DFC that imposes a more restricted PFC mode than the current PFC mode.
- Run the **show platform hardware pfc mode** command to display the PFC mode.
- FIB TCAM exception may be thrown in case of a route churn where TCAM utilization is more than 80% of the total utilization. This limitation is applicable to DFC TCAM on XL line cards. If FIB TCAM exception is thrown for a transit route for IPv4 or IPv6 or MPLS traffic, the route does not get installed in FIB and connectivity gets affected. This can result in elevated CPU usage due to software switching.

Policy Feature Card 4XL

Product ID (append "=" for spares)	Product Description	Minimum Software Version
VS-F6K-PFC4XL	Policy Feature Card 4XL (PFC4XL) **Note** Use VS-F6K-PFC4XL= to upgrade to a PFC4XL.	
	With Supervisor Engine 2T-10GE	15.0(1)SY
	With Supervisor Engine 6T	15.3(1)SY

Policy Feature Card 4

Product ID (append "=" for spares)	Product Description	Minimum Software Version
VS-F6K-PFC4	Policy Feature Card 4 (PFC4)	
	With Supervisor Engine 2T-10GE	15.0(1)SY
	With Supervisor Engine 6T	15.3(1)SY

Supported Distributed Forwarding Cards

- Distributed Forwarding Card 4XL, page 9
- Distributed Forwarding Card 4, page 9

Note

- See the "Supported Policy Feature Cards" section on page 6 for Policy Feature Cards (PFC) and Distributed Forwarding Card (DFC) restrictions.
- The DFC4 uses memory that is installed on the switching module.
- For more information about DFCs, see these documents:

  http://www.cisco.com/c/en/us/td/docs/switches/lan/catalyst6500/hardware/Config_Notes/OL_24918.html

  http://www.cisco.com/c/en/us/products/collateral/interfaces-modules/catalyst-6500-series-Supervisor-engine-2t/data_sheet_c78-648214.html

Distributed Forwarding Card 4XL

Product ID (append "=" for spares)	Product Description	Minimum Software Version
WS-F6K-DFC4-EXL **WS-F6K-DFC4-AXL**	Distributed Forwarding Card 4XL (DFC4XL)	
	With Supervisor Engine 2T-10GE	15.0(1)SY
	With Supervisor Engine 6T	15.3(1)SY

Distributed Forwarding Card 4

Product ID (append "=" for spares)	Product Description	Minimum Software Version
WS-F6K-DFC4-E **WS-F6K-DFC4-A**	Distributed Forwarding Card 4 (DFC4)	
	With Supervisor Engine 2T-10GE	15.0(1)SY
	With Supervisor Engine 6T	15.3(1)SY

Centralized Forwarding Card (WS-F6700-CFC)

Product ID (append "=" for spares)	Product Description	Minimum Software Version
WS-F6700-CFC	Centralized Forwarding Card (CFC) for use on CEF720 modules	
	With Supervisor Engine 2T-10GE	15.0(1)SY

40-Gigabit Ethernet Switching Modules

Catalyst C6800-8P40G and Catalyst C6800-8P40G-XL

Product ID (append "=" for spares)	Product Description	Minimum Software Version
C6800-8P40G C6800-8P40G-XL	8-port 40-Gigabit Ethernet QSFP module	
	With Supervisor Engine 2T-10GE	15.5(1)SY
	With Supervisor Engine 6T	15.5(1)SY

- C6800-8P40G and C6800-8P40G-XL are the orderable product IDs
- Cisco IOS software commands display C6800-8P40G or C6800-8P40G-XL
- QoS architecture
  - Receive:
    1p7q4t (default)
    2p6q4t (configurable)
  - Transmit:
    1p7q4t (default)
    2p6q4t (configurable)
- Number of ports–8
- Port Groups–4
  - 2 ports per port group
  - Port-group 1–1, 3
  - Port-group 2–2, 4
  - Port-group 3–5, 7
  - Port-group 4–6, 8
- Performance Mode–Yes, per-port group
- Upgrade to Release15.5(1)SY or later before installing either C6800-8P40G or C6800-8P40G-XL
- Supported modes
  - In C6807-XL:
    8 ports–Oversubscription mode 2:1
    4 ports–Performance mode 1:1
- Number of forwarding engines–2
- Port buffers
  - Oversubscription mode:
    1000 MB per port (Egress)
    3.9 MB per port (Ingress)
  - Performance mode:
    2000 MB per port (Egress)
    7.8 MB per port (Ingress)
  - List of transceivers supported:
    QSFP-40G-SR4
    QSFP-40G-ER4
    QSFP-40G-LR4
    QSFP-40G-CSR4
    QSFP-40G-SR-BD
    QSFP-H40G-ACU7M
    QSFP-H40G-ACU10M
    QSFP-H40G-AOC1M
    QSFP-H40G-AOC2M
    QSFP-H40G-AOC3M
    QSFP-H40G-AOC5M
    QSFP-H40G-AOC7M
    QSFP-H40G-AOC10M
    QSFP-H40G-AOC15M

QSFP-40G-SR4-S
QSFP-40G-LR4-S
WSP-Q40GLR4L

WS-X6904-40G-2T 4-Port 40-Gigabit Ethernet Switching Module

Product ID (append "=" for spares)	**Product Description**	**Minimum Software Version**
WS-X6904-40G-2TXL (Has **WS-F6K-DFC4-EXL**)	4-port 40-Gigabit Ethernet module	
	With Supervisor Engine 2T-10GE	15.0(1)SY1
WS-X6904-40G-2T (Has **WS-F6K-DFC4-E**)	With Supervisor Engine 6T	15.3(1)SY

- WS-X6904-40G-2T and WS-X6904-40G-2TXL are the orderable product IDs.
- The front panel is labeled WS-X6904-40G.
- Cisco IOS software commands display WS-X6904-40G with either WS-F6K-DFC4-E or WS-F6K-DFC4-EXL.
- Has hardware abstraction layer (HAL) support.
- QoS port architecture (Rx/Tx): **1p7q4t** or **2p6q4t/1p7q4t** or **2p6q4t**
- Dual switch-fabric connections:
  - Fabric Channel #1: Ports 1 and 2, or 5 through 12
  - Fabric Channel #2: Ports 3 and 4 or 13 through 20
- Number of ports: 4 or 16
  Number of port groups: 2
  Port per port group:
  –Ports 1 and 2 or 5 through 12
  –Ports 3 and 4 or 13 through 20
- dCEF2T.
- In a 3-slot chassis, supported only with WS-C6503-E hardware revision 1.3 or higher.
- Upgrade to Release15.0(1)SY1 or later before installing WS-X6904-40G (see the "EFSU Compatibility" section on page 49).
- Each bay can support a CFP transceiver (supports one 40 Gigabit Ethernet port) or a FourX adapter (supports four 10 Gigabit Ethernet SFP+ transceivers).
- WS-X6904-40G supported modes (default mode is oversubscribed):
  - 40 Gigabit Ethernet oversubscribed mode:
    —Four 40 Gigabit Ethernet ports
    —Ports 1 through 4
  - 10 Gigabit Ethernet oversubscribed mode:
    —Sixteen 10 Gigabit Ethernet ports
    —Ports 5 through 20
  - Mixed 10/40 Gigabit Ethernet oversubscribed mode:
    —Left bays:
    –Either two 40 Gigabit Ethernet ports (1 and 2)

–Or eight 10 Gigabit Ethernet ports (5 through 12)

—Right bays:

–Either two 40 Gigabit Ethernet ports (3 and 4)

–Or eight 10 Gigabit Ethernet ports (13 through 20)

– Performance mode:

—Configurable per module or per bay:

no hw-module slot *slot_number* **oversubscription** [**port-group** *port_group_number*]

—Supported in the top left bay and top right bay.

—Any of these combinations:

–40 Gigabit Ethernet port 1 (top left bay) and port 3 (top right bay)

–10 Gigabit Ethernet ports 5 through 9 (top left bay) and ports 13 through 16 (top right bay)

–Top left bay: 40 Gigabit Ethernet port 1 or 10 Gigabit Ethernet ports 5 through 9
Top right bay: 40 Gigabit Ethernet port 3 or 10 Gigabit Ethernet ports 13 through 16

– 40 Gigabit Ethernet performance mode, 10 Gigabit Ethernet oversubscribed mode:

—Either of these combinations:

–Top left bay: 40 Gigabit Ethernet port 1
Right bays: eight 10 Gigabit Ethernet ports (13 through 20)

–Left bays: eight 10 Gigabit Ethernet ports (5 through 13)
Top right bay: 40 Gigabit Ethernet port 3

– 40 Gigabit Ethernet oversubscribed mode, 10 Gigabit Ethernet performance mode:

—Either of these combinations:

–Top left bay: four 10 Gigabit Ethernet ports (5 through 9)
Right bays: two 40 Gigabit Ethernet ports (3 and 4)

–Left bays: two 40 Gigabit Ethernet ports (1 and 2)
Top right bay: four 10 Gigabit Ethernet ports (13 through 16)

- For more information about WS-X6904-40G, see these publications:

  40 Gigabit Ethernet on Cisco Catalyst 6500 Series Switches: How It Works

  40 Gigabit Ethernet Interface Module for Cisco Catalyst 6500 Series Switches Data Sheet

10-Gigabit Ethernet Switching Modules

Catalyst C6800-8P10G, Catalyst C6800-8P10G-XL

Product ID (append "=" for spares)	Product Description	Minimum Software Version
C6800-8P10G-XL	8-port 10-Gigabit Ethernet SFP+ module	
C6800-8P10G	With Supervisor Engine 2T-10GE	15.2(1)SY
	With Supervisor Engine 6T	15.3(1)SY

- C6800-8P10G and C6800-8P10G-XL are the orderable product IDs
- Cisco IOS software commands display C6800-8P10G or C6800-8P10G-XL
- QoS Architecture
  - Receive:
    1p7q4t (default)
    2p6q4t (configurable)
  - Transmit:
    1p7q4t (default)
    2p6q4t (configurable)
- Number of ports: 8
- Port Groups: 2
  - 2 port-sets per port group
  - Port-group 1: 1, 2, 3, 4
  - Port-group 2: 5, 6, 7, 8
- Oversubscription: Not Applicable
- Upgrade to Release15.2(1)SY or later before installing either C6800-8P10G or C6800-8P10G-XL
- Supported modes
  - In C6807-XL: 8 ports: line rate 1:1
  - In Catalyst 6500-E: 8 ports: line rate 1:1
- Number of forwarding engines: 1
- Port Buffers
  - 500 MB per port (Egress)
  - 2.5 MB per port (Ingress)

Catalyst C6800-16P10G, Catalyst C6800-16P10G-XL

Product ID (append "=" for spares)	Product Description	Minimum Software Version
C6800-16P10G-XL	16-port 10-Gigabit Ethernet SFP+ module	
C6800-16P10G	With Supervisor Engine 2T-10GE	15.2(1)SY
	With Supervisor Engine 6T	15.3(1)SY

- C6800-16P10G and C6800-16P10G-XL are the orderable product IDs
- Cisco IOS software commands display C6800-16P10G or C6800-16P10G-XL
- QoS Architecture
  - Receive:
    1p7q4t (default)
    2p6q4t (configurable)
  - Transmit:
    1p7q4t (default)
    2p6q4t (configurable)
- Number of ports: 16
- Port Groups: 2
  - 2 port-sets per port group
  - Port-group 1:
    1, 2, 3, 4
    5, 6, 7, 8
  - Port-group 2:
    9, 10, 11, 12
    13, 14, 15, 16
- Performance Mode: Yes, per-port group
- Upgrade to Release15.2(1)SY or later before installing either C6800-16P10G or C6800-16P10G-XL
- Supported modes
  - In C6807-XL:
    16 ports: oversubscription mode 2:1
    8 ports: performance mode 1:1
  - In Catalyst 6500-E:
    16 ports: oversubscription mode 2:1
    8 ports: performance mode 1:1
- Number of forwarding engines: 1
- Port Buffers
  - Oversubscription mode:
    250 MB per port (Egress)
    1.25 MB per port (Ingress)

  - Performance mode:
    500 MB per port (Egress)
    2.5 MB per port (Ingress)

Catalyst C6800-32P10G, Catalyst C6800-32P10G-XL

Product ID (append "=" for spares)	**Product Description**	**Minimum Software Version**
C6800-32P10G-XL	32-port 10-Gigabit Ethernet SFP+ module	
C6800-32P10G	With Supervisor Engine 2T-10GE	15.2(1)SY
	With Supervisor Engine 6T	15.3(1)SY

- C6800-32P10G and C6800-32P10G-XL are the orderable product IDs
- Cisco IOS software commands display C6800-32P10G or C6800-32P10G-XL
- QoS Architecture
  - Receive:
    1p7q4t (default)
    2p6q4t (configurable)
  - Transmit:
    1p7q4t (default)
    2p6q4t (configurable)
- Number of ports: 32
- Port Groups: 4
  - 2 port-sets per port group
  - Port-group 1:
    1, 3, 5, 7
    9,11, 13, 15
  - Port-group 2:
    2,4,6,8
    10, 12, 14, 16
  - Port-group 3:
    17,19,21,23
    25, 27, 29, 31
  - Port-group 4:
    18,20,22,24
    26, 28, 30, 32

- Performance Mode: Yes, per-port group
- Upgrade to Release15.2(1)SY or later before installing either C6800-32P10G or C6800-32P10G-XL
- Supported modes
  - In C6807-XL:
    32 ports: oversubscription mode 2:1
    16 ports: performance mode 1:1
  - In Catalyst 6500-E:
    32 ports: oversubscription mode 4:1
    16 ports: performance mode 2:1
- Number of forwarding engines: 2
- Port Buffers
  - Oversubscription mode:
    250 MB per port (Egress)
    1.2 MB per port (Ingress)
  - Performance mode:
    500 MB per port (Egress)
    2.5 MB per port (Ingress)

WS-X6908-10GE 8-Port 10-Gigabit Ethernet X2 Switching Module

Product ID (append "=" for spares)	**Product Description**	**Minimum Software Version**
WS-X6908-10G-XL (Has WS-F6K-DFC4-EXL) **WS-X6908-10G** (Has WS-F6K-DFC4-E)	8-port 10-Gigabit Ethernet X2 module	
	With Supervisor Engine 2T-10GE	15.0(1)SY
	With Supervisor Engine 6T	15.3(1)SY

- WS-X6908-10G and WS-X6908-10G-XL are the orderable product IDs.
- The front panel is labeled WS-X6908-10GE.
- Cisco IOS software commands display WS-X6908-10GE with either WS-F6K-DFC4-E or WS-F6K-DFC4-EXL.
- dCEF2T
- QoS port architecture (Rx/Tx): **8q4t/1p7q4t**
- Dual switch-fabric connections
  Fabric Channel #1: Ports 2, 3, 6, 8
  Fabric Channel #2: Ports 1, 4, 5, 7
- Number of ports: 8
  Number of port groups: 8
  Port ranges per port group: 1 port in each group
- In a 3-slot chassis, supported only with WS-C6503-E hardware revision 1.3 or higher.

WS-X6816-10T-2T, WS-X6716-10T 16-Port 10-Gigabit Ethernet Copper Switching Module

Product ID (append "=" for spares)	Product Description	Minimum Software Version
WS-X6816-10T-2TXL (Has WS-F6K-DFC4-EXL) **WS-X6716-10T-3CXL** (Must be upgraded with WS-F6K-DFC4-EXL=) **WS-X6816-10T-2T** (Has WS-F6K-DFC4-E) **WS-X6716-10T-3C** (Must be upgraded with WS-F6K-DFC4-E=)	16-port 10-Gigabit Ethernet copper (RJ-45) module	
	With Supervisor Engine 2T-10GE	15.0(1)SY
	With Supervisor Engine 6T	15.3(1)SY

- The orderable product IDs are:
  - WS-X6816-10T-2TXL
  - WS-X6816-10T-2T
  - WS-X6716-10T-3CXL
  - WS-X6716-10T-3C
- The front panel is labeled WS-X6716-10T.
- Cisco IOS software commands display WS-X6716-10T with any DFC.
- QoS port architecture (Rx/Tx):
  - Oversubscription mode: **1p7q2t/1p7q4t**
  - Performance mode: **8q4t/1p7q4t**
- Dual switch-fabric connections
  Fabric Channel #1: ports 1–8
  Fabric Channel #2: ports 9–16
- Number of ports: 16
  Number of port groups: 4
  Port ranges per port group: 1–4, 5–8, 9–12, 13–16
- When not configured in oversubscription mode, supported in virtual switch links.
- To configure port oversubscription, use the **hw-module slot** command.

WS-X6816-10G-2T, WS-X6716-10G 16-Port 10-Gigabit Ethernet X2 Switching Module

Product ID (append "=" for spares)	Product Description	Minimum Software Version
WS-X6816-10G-2TXL (Has WS-F6K-DFC4-EXL) **WS-X6716-10G-3CXL** (Must be upgraded with WS-F6K-DFC4-EXL=) **WS-X6816-10G-2T** **(Has** WS-F6K-DFC4-E**)** **WS-X6716-10G-3C** (Must be upgraded with WS-F6K-DFC4-E=)	16-port 10-Gigabit Ethernet X2 module	
	With Supervisor Engine 2T-10GE	15.0(1)SY
	With Supervisor Engine 6T	15.3(1)SY

- The orderable product IDs are:
  - WS-X6816-10G-2TXL
  - WS-X6816-10G-2T
  - WS-X6716-10G-3CXL
  - WS-X6716-10G-3C
- The front panel is labeled WS-X6716-10GE.
- Cisco IOS software commands display WS-X6716-10GE with any DFC.
- QoS port architecture (Rx/Tx):
  - Oversubscription mode: **1p7q2t/1p7q4t**
  - Performance mode: **8q4t/1p7q4t**
- Dual switch-fabric connections
  Fabric Channel #1: ports 1–8
  Fabric Channel #2: ports 9–16
- Number of ports: 16
  Number of port groups: 4
  Port ranges per port group: 1–4, 5–8, 9–12, 13–16
- When not configured in oversubscription mode, supported in virtual switch links.

- To configure port oversubscription, use the **hw-module slot** command.

WS-X6704-10GE 4-Port 10-Gigabit Ethernet XENPAK Switching Module

Product ID (append "=" for spares)	**Product Description**	**Minimum Software Version**
WS-X6704-10G	4-port 10-Gigabit Ethernet XENPAK With Supervisor Engine 2T-10GE	15.0(1)SY
	With Supervisor Engine 6T **Note** Supervisor Engine 6T is supported with DFC4/4XL, it requires minimum1GB RAM.	15.3(1)SY

- WS-X6704-10GE requires one of the following:
  - With Supervisor Engine 2T-10GE:
    - WS-F6K-DFC4-AXL
    - WS-F6K-DFC4-A
    - WS-F6700-CFC
  - With Supervisor Engine 6T:
    - WS-F6K-DFC4-AXL
    - WS-F6K-DFC4-A

    Requires 1 GB DRAM with SUP6T. See this publication: http://www.cisco.com/c/en/us/td/docs/switches/lan/catalyst6500/hardware/Config_Notes/78_12409.html
- Requires 512-MB DRAM with a WS-F6700-CFC (CSCtk82279). See this publication:

  http://www.cisco.com/c/en/us/td/docs/switches/lan/catalyst6500/hardware/Config_Notes/78_12409.html
- QoS port architecture (Rx/Tx): **8q8t/1p7q8t**
- Dual switch-fabric connections:
  Fabric Channel #1: Ports 3 and 4
  Fabric Channel #2: Ports 1 and 2
- Number of ports: 4
  Number of port groups: 4
  Port ranges per port group: 1 port in each group

- WS-X6704-10G is the orderable product ID.
- The front panel is labeled WS-X6704-10GE.
- Cisco IOS software commands display WS-X6704-10GE with any DFC.
- On WS-X6704-10GE ports, STP BPDUs are not exempt from Traffic Storm Control multicast suppression. Do not configure multicast suppression on STP-protected WS-X6704-10GE ports that interconnect network devices. (CSCsg86315)

Cisco Catalyst 6880-X Series Extensible Fixed Aggregation Switches

Product ID (append "=" for spares)	**Product Description**	**Minimum Software Version**
C6880-X-LE	16 10-Gigabit (SFP+)/1-Gigabit ports (SFP), four port card slots, two power supply slots. It supports standard FIB/ACL/NetFlow tables.	15.1(2)SY1
C6880-X	16 10-Gigabit (SFP+)/1-Gigabit ports (SFP), four port card slots, two power supply slots. It supports large FIB/ACL/NetFlow tables.	
C6880-X-LE-16P10G[1]	Multi rate port card with standard tables. This module has 16 10-Gigabit or 1-Gigabit module slots which support 1-Gigabit SFPs or 10-Gigabit SFP+ modules. Supported only on the Catalyst 6880-X-LE switch model.	15.1(2)SY2
C6880-X-16P10G[1]	Multi rate port card with XL tables. This module has 16 10-Gigabit or 1-Gigabit module slots which support 1-Gigabit SFPs or 10-Gigabit SFP+s modules. Supported only on the Catalyst 6880-X switch model.	

Note See these publications for more information:

http://www.cisco.com/c/en/us/products/collateral/switches/catalyst-6880-x-switch/data_sheet_c78-728228.html

http://www.cisco.com/c/en/us/products/collateral/switches/catalyst-6880-x-switch/white_paper_c11-728540.html

http://www.cisco.com/c/en/us/products/collateral/switches/catalyst-6880-x-switch/white_paper_c11-728541.html

1. These port cards are supported only on the specified switch models and are not interoperable.

Cisco Catalyst 6840-X Series Fixed Aggregation Switches

Product ID (append "=" for spares)	**Product Description**	**Minimum Software Version**
C6816-X-LE	16 10-Gigabit (SFP+)/1-Gigabit ports (SFP), two power supply slots. It supports standard FIB/ACL/NetFlow tables.	15.2(2)SY
C6832-X-LE	32 10-Gigabit (SFP+)/1-Gigabit ports (SFP), two power supply slots. It supports standard FIB/ACL/NetFlow tables.	

Product ID (append "=" for spares)	Product Description	Minimum Software Version
C6824-X-LE-40G	24 10-Gigabit (SFP+)/1-Gigabit ports (SFP), 2 40-Gigabit(QSFP), two power supply slots. It supports standard FIB/ACL/NetFlow tables.	15.2(2)SY
C6840-X-LE-40G	40 10-Gigabit (SFP+)/1-Gigabit ports (SFP), 2 40-Gigabit(QSFP), two power supply slots. It supports standard FIB/ACL/NetFlow tables.	

Note See these publications for more information:

http://www.cisco.com/c/en/us/products/collateral/switches/catalyst-6800-series-switches/datasheet-c78-734470.html

These port cards are supported only on the specified switch models and are not interoperable.

Cisco Catalyst 6807-XL Modular Switch

Product ID (append "=" for spares)	Product Description	Minimum Software Version
C6807-XL	7-slot modular chassis. The switch supports redundant power supply modules (AC-input), redundant Supervisor engines, fan-tray, power supply convertor modules, clock modules, and voltage termination enhanced (VTT-E) modules	15.1(2)SY3

Note See these publications for more information:

http://www.cisco.com/c/en/us/products/collateral/switches/catalyst-6807-xl-switch/data_sheet_c78-728229.html

http://www.cisco.com/c/en/us/products/collateral/switches/catalyst-6807-xl-switch/white_paper_c11-728264.html

IA client maximum values for a Catalyst 6500 and Catalyst 6807-XL switch with Supervisor 6T:

Value Description:	Maximum Value	Software Version
Maximum IA client ports	2016 ports across 42 Catalyst 6800ia access switches	15.3(1)SY1
Maximum IA client switches	42 (defined by IA client FEX number 1–42 range.)	
Maximum Catalyst 6800ia access switches per IA client stack	5 • An IA client stack acts as single switch unit. • Instant access only supports connection with stacking cables to form a stack. • With an IA client that has multiple Catalyst 6800ia access switches, the switches in the stack assign incrementing switch numbers to themselves (automatic stacking capability). • If you add Catalyst 6800ia access switches to a configured IA client, the additional switches assign incrementing switch numbers to themselves. • The IA client configuration does not persist if the access switch number changes.	

IA client maximum values for a Catalyst 6500 and Catalyst 6807-XL switch with Supervisor 2T:

Value Description:	Maximum Value	Software Version
Maximum IA client ports	1500 ports	15.2(1)SY1[1]
Maximum IA client switches	32	
Maximum Catalyst 6800ia access switches per IA client stack	5 • An IA client stack acts as single switch unit. • Instant access only supports connection with stacking cables to form a stack. • With an IA client that has multiple Catalyst 6800ia access switches, the switches in the stack assign incrementing switch numbers to themselves (automatic stacking capability). • If you add Catalyst 6800ia access switches to a configured IA client, the additional switches assign incrementing switch numbers to themselves. • The IA client configuration does not persist if the access switch number changes.	

1. The scale for Cisco IOS Releases 15.2(1)SY and 15.2(1)SY0a is 1200 ports with 25 Client Switches and 5 per IA Client stack.

IA client maximum values for Catalyst 6840-X switch

Value Description:	Maximum Value	Software Version
Maximum IA client ports	1500 ports across 32 Catalyst 6800ia access switches	15.2(2)SY
Maximum IA client switches	32	
Maximum Catalyst 6800ia access switches per IA client stack	5 • An IA client stack acts as single switch unit. • Instant access only supports connection with stacking cables to form a stack. • With an IA client that has multiple Catalyst 6800ia access switches, the switches in the stack assign incrementing switch numbers to themselves (automatic stacking capability). • If you add Catalyst 6800ia access switches to a configured IA client, the additional switches assign incrementing switch numbers to themselves. • The IA client configuration does not persist if the access switch number changes.	

A client maximum values for Catalyst 6880-X switch

Value Description:	Maximum Value	Software Version
Maximum IA client ports	2016 ports across 42 Catalyst 6800ia access switches	15.2(1)SY
Maximum IA client switches	42 (defined by IA client FEX number 1–42 range.)	
Maximum Catalyst 6800ia access switches per IA client stack	5 • An IA client stack acts as single switch unit. • Instant access only supports connection with stacking cables to form a stack. • With an IA client that has multiple Catalyst 6800ia access switches, the switches in the stack assign incrementing switch numbers to themselves (automatic stacking capability). • If you add Catalyst 6800ia access switches to a configured IA client, the additional switches assign incrementing switch numbers to themselves. • The IA client configuration does not persist if the access switch number changes.	

Gigabit Ethernet Switching Modules

WS-X6848-SFP-2T, WS-X6748-SFP 48-Port Gigabit Ethernet SFP Switching Module

Product ID (append "=" for spares)	Product Description	Minimum Software Version
WS-X6848-SFP-2TXL (has WS-F6K-DFC4-AXL) **WS-X6848-SFP-2T** (has WS-F6K-DFC4-A) **WS-X6748-SFP** (with WS-F6700-CFC, or upgraded with WS-F6K-DFC4-AXL or WS-F6K-DFC4-A)	48-port Gigabit Ethernet SFP	
	With Supervisor Engine 2T-10GE	15.0(1)SY
	With Supervisor Engine 6T	15.3(1)SY

- WS-X6748-SFP requires one of the following:
  - With Supervisor Engine 2T-10GE:
    - WS-F6K-DFC4-AXL
    - WS-F6K-DFC4-A
    - WS-F6700-CFC
  - With Supervisor Engine 6T:
    - WS-F6K-DFC4-AXL
    - WS-F6K-DFC4-A
- QoS architecture: **2q8t/1p3q8t**
- Dual switch-fabric connections
  Fabric Channel #1: Ports 2, 4, 6, 8, 10, 12,
  14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34,
  36, 38, 40, 42, 44, 46, 48
  Fabric Channel #2: Ports 1, 3, 5, 7, 9, 11,
  13, 15, 17, 19, 21, 23, 25, 27, 29, 31, 33,
  35, 37, 39, 41, 43, 45, 47
- Number of ports: 48
  Number of port groups: 4
  Port ranges per port group:
  1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23
  2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24
  25, 27, 29, 31, 33, 35, 37, 39, 41, 43, 45, 47
  26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48
- On WS-X6848-SFP-2T and WS-X6748-SFP ports, STP BPDUs are not exempt from Traffic Storm Control multicast suppression. Do not configure multicast suppression on STP-protected WS-X6848-SFP-2T or WS-X6748-SFP ports that interconnect network devices.

WS-X6824-SFP-2T, WS-X6724-SFP 24-Port Gigabit Ethernet SFP Switching Module

Product ID (append "=" for spares)	**Product Description**	**Minimum Software Version**
WS-X6824-SFP-2TXL (Has WS-F6K-DFC4-AXL) **WS-X6824-SFP-2T** (Has WS-F6K-DFC4-A) **WS-X6724-SFP** (with WS-F6700-CFC, or upgraded with WS-F6K-DFC4-AXL or WS-F6K-DFC4-A)	24-port Gigabit Mbps Ethernet SFP	
	With Supervisor Engine 2T-10GE	15.0(1)SY
	With Supervisor Engine 6T	15.3(1)SY

- WS-X6724-SFP requires one of the following:
  - With Supervisor Engine 2T-10GE:
    - WS-F6K-DFC4-AXL
    - WS-F6K-DFC4-A

- WS-F6700-CFC
- With Supervisor Engine 6T:
- WS-F6K-DFC4-AXL
- WS-F6K-DFC4-A

- QoS architecture: **2q8t/1p3q8t**
- Number of ports: 24
  Number of port groups: 2
  Port ranges per port group: 1–12, 13–24
- On WS-X6824-SFP-2T and WS-X6724-SFP ports, STP BPDUs are not exempt from Traffic Storm Control multicast suppression. Do not configure multicast suppression on STP-protected WS-X6824-SFP-2T or WS-X6724-SFP ports that interconnect network devices.

10/100/1000 Ethernet Switching Modules

These sections describe the supported 10/100/1000 Ethernet switching modules:

Catalyst C6800-48P-TX, Catalyst C6800-48P-TX-XL, Catalyst C6800-48P-SFP, Catalyst C6800-48P-SFP-XL

Product ID (append "=" for spares)	**Product Description**	**Minimum Software Version**
C6800-48P-TX-XL	48-port 10/100/1000 RJ-45	
C6800-48P-TX	With Supervisor Engine 2T-10GE	15.2(1)SY
	With Supervisor Engine 6T	15.3(1)SY

Product ID (append "=" for spares)	**Product Description**	**Minimum Software Version**
C6800-48P-SFP-XL	48-port 10/100/1000 SFP	
C6800-48P-SFP	With Supervisor Engine 2T-10GE	15.2(1)SY
	With Supervisor Engine 6T	15.3(1)SY

- C6800-48P-SFP and C6800-48P-SFP-XL OR C6800-48P-TX and C6800-48P-TX-XL are the orderable product IDs
- Cisco IOS software commands display C6800-48P-SFP or C6800-48P-SFP-XL for the SFP cards, and C6800-48P-TX or C6800-48P-TX-XL for the TX based cards.
- QoS Architecture
  - Receive:
    2q8t (for TX and SFP based cards)
  - Transmit:
    1p3q8t (for TX and SFP based cards)
- Number of ports: 48
- Forwarding and Performance: DFC4-A or DFC4-AXL daughter cards delivering performance up to a sustained 60 Mpps for L2, IPv4 and MPLS forwarding and 30 Mpps for IPv6 forwarding
- Upgrade to Release15.2(1)SY or later before installing these modules
- Backplane Connection: Connect to the switch fabric using dual full-duplex 20-Gbps switch fabric channels
- The TX models support copper RJ45 connectors 100 meters over Category 5, 5E, and 6. The SFP models support SX, LX/LH, -ZX, -T; 1000BASE-CWDM with the help of LC connecter
- Number of forwarding engines: 1
- Port Buffers (for both TX and SFP based cards)
  - Receive -173KB
  - Transmit -1.22MB

See this publication for more information:

http://www.cisco.com/c/en/us/products/collateral/switches/catalyst-6800-series-switches/datasheet-c78-733663.html

WS-X6848-TX-2T, WS-X6748-GE-TX

Product ID (append "=" for spares)	**Product Description**	**Minimum Software Version**
WS-X6848-TX-2TXL (has WS-F6K-DFC4-AXL) **WS-X6848-TX-2T** (has WS-F6K-DFC4-A) **WS-X6748-GE-TX**	48-port 10/100/1000 RJ-45	
	With Supervisor Engine 2T-10GE	15.0(1)SY
	With Supervisor Engine 6T	15.3(1)SY

- WS-X6748-GE-TX requires one of the following:
  - With Supervisor Engine 2T-10GE:
    - WS-F6K-DFC4-AXL
    - WS-F6K-DFC4-A
    - WS-F6700-CFC

  - With Supervisor Engine 6T:
    - WS-F6K-DFC4-AXL
    - WS-F6K-DFC4-A
- QoS architecture: **2q8t/1p3q8t**
- Dual switch-fabric connections
  Fabric Channel #1: Ports 25–48
  Fabric Channel #2: Ports 1–24
- Number of ports: 48
  Number of port groups: 4
  Port ranges per port group: 1–12, 13–24, 25–36, 37–48
- On WS-X6848-TX-2T and WS-X6748-GE-TX ports, STP BPDUs are not exempt from Traffic Storm Control multicast suppression. Do not configure multicast suppression on STP-protected WS-X6848-TX-2T or WS-X6748-GE-TX ports that interconnect network devices.

WS-X6148E-GE-45AT

Product ID (append "=" for spares)	**Product Description**	**Minimum Software Version**
WS-X6148E-GE-45AT	48-port 10/100/1000 Mbps	
	With Supervisor Engine 2T-10GE	15.0(1)SY
	With Supervisor Engine 2T-10GE in VSS mode	15.1(1)SY

- RJ-45
- WS-X6148E-GE-45AT with WS-F6K-48-AT supports up to 48 ports of Class 4 PoE+ (30.0W).
- QoS port architecture (Rx/Tx): **1q2t/1p3q8t**
- Number of ports: 48
  Number of port groups: 6
  Port ranges per port group: 1–8, 9–16, 17–24, 25–32, 33–40, 41–48
- The aggregate bandwidth of each set of 8 ports (1–8, 9–16, 17–24, 25–32, 33–40, and 41–48) is 1 Gbps.
- Does not support traffic storm control

WS-X6148A-GE-TX

Product ID (append "=" for spares)	**Product Description**	**Minimum Software Version**
WS-X6148A-GE-TX	48-port 10/100/1000 Mbps	
	With Supervisor Engine 2T-10GE (not supported in VSS mode)	15.0(1)SY

- RJ-45
- WS-X6148A-GE-TX supports WS-F6K-GE48-AF or WS-F6K-48-AF
- With WS-F6K-GE48-AF, supports up to 45 ports of ePoE (16.8W).
- QoS port architecture (Rx/Tx): **1q2t/1p3q8t**
- Number of ports: 48
  Number of port groups: 6
  Port ranges per port group: 1–8, 9–16, 17–24, 25–32, 33–40, 41–48
- The aggregate bandwidth of each port group is 1 Gbps.
- Does not support traffic storm control.

Power over Ethernet Daughter Cards

- WS-F6K-GE48-AF, WS-F6K-48-AF, page 30

WS-F6K-GE48-AF, WS-F6K-48-AF

Product ID (append "=" for spares)	**Product Description**	**Minimum Software Versions**
WS-F6K-GE48-AF **WS-F6K-48-AF**	IEEE 802.3af PoE daughtercard for: • WS-X6148A-GE-TX With Supervisor Engine 2T-10GE	15.0(1)SY

- WS-F6K-GE48-AF and WS-F6K-48-AF are not FRUs for these switching modules:
- WS-X6148A-GE-TX, supports up to 45 ports of ePoE (16.8W).

Transceivers

- CFP Modules, page 31
- X2 Modules, page 31
- 10 GE SFP+ Modules, page 33
- 40 GE QSFP Modules, page 35
- XENPAKs, page 36
- Small Form-Factor Pluggable (SFP) Modules, page 37
- Gigabit Interface Converters (GBICs), page 40

CFP Modules

Product ID (append "=" for spares)	Product Description	Minimum Software Version
CFP-40G-LR4	40GBASE-LR4	15.0(1)SY1
CFP-40G-SR4	40GBASE-SR4	15.0(1)SY1
CVR-CFP-4SFP10G	FourX converter to convert each 40GE port into 4 10GE SFP+ ports	15.0(1)SY1

X2 Modules

Note

- WS-X6716-10G and WS-X6708-10GE do not support X2 modules that are labeled with a number that ends with -01. (This restriction does not apply to X2-10GB-LRM.)
- All X2 modules shipped since WS-X6716-10G became available provide EMI compliance with WS-X6816-10G and WS-X6716-10G.
- Some X2 modules shipped before WS-X6716-10G became available might not provide EMI compliance with WS-X6816-10G and WS-X6716-10G. See the information listed for each type of X2 module in the following table.
- For information about X2 modules, see the *Cisco 10GBASE X2 Modules* data sheet:

  http://www.cisco.com/c/en/us/products/collateral/interfaces-modules/10-gigabit-modules/product_data_sheet0900aecd801f92aa.html

Product ID (append "=" for spares)	Product Description		Minimum Software Version
CVR-X2-SFP10G	10G X2 to SFP+ Converter		15.0(1)SY
DWDM-X2-60.61=	10GBASE-DWDM 1560.61 nm X2 (100-GHz ITU grid)	ITU 21	15.0(1)SY
DWDM-X2-59.79=	10GBASE-DWDM 1559.79 nm X2 (100-GHz ITU grid)	ITU 22	15.0(1)SY
DWDM-X2-58.98=	10GBASE-DWDM 1558.98 nm X2 (100-GHz ITU grid)	ITU 23	15.0(1)SY
DWDM-X2-58.17=	10GBASE-DWDM 1558.17 nm X2 (100-GHz ITU grid)	ITU 24	15.0(1)SY
DWDM-X2-56.55=	10GBASE-DWDM 1556.55 nm X2 (100-GHz ITU grid)	ITU 26	15.0(1)SY
DWDM-X2-55.75=	10GBASE-DWDM 1555.75 nm X2 (100-GHz ITU grid)	ITU 27	15.0(1)SY
DWDM-X2-54.94=	10GBASE-DWDM 1554.94 nm X2 (100-GHz ITU grid)	ITU 28	15.0(1)SY
DWDM-X2-54.13=	10GBASE-DWDM 1554.13 nm X2 (100-GHz ITU grid)	ITU 29	15.0(1)SY
DWDM-X2-52.52=	10GBASE-DWDM 1552.52 nm X2 (100-GHz ITU grid)	ITU 31	15.0(1)SY
DWDM-X2-51.72=	10GBASE-DWDM 1551.72 nm X2 (100-GHz ITU grid)	ITU 32	15.0(1)SY
DWDM-X2-50.92=	10GBASE-DWDM 1550.92 nm X2 (100-GHz ITU grid)	ITU 33	15.0(1)SY
DWDM-X2-50.12=	10GBASE-DWDM 1550.12 nm X2 (100-GHz ITU grid)	ITU 34	15.0(1)SY

Product ID (append "=" for spares)	Product Description		Minimum Software Version
DWDM-X2-48.51=	10GBASE-DWDM 1548.51 nm X2 (100-GHz ITU grid)	ITU 36	15.0(1)SY
DWDM-X2-47.72=	10GBASE-DWDM 1547.72 nm X2 (100-GHz ITU grid)	ITU 37	15.0(1)SY
DWDM-X2-46.92=	10GBASE-DWDM 1546.92 nm X2 (100-GHz ITU grid)	ITU 38	15.0(1)SY
DWDM-X2-46.12=	10GBASE-DWDM 1546.12 nm X2 (100-GHz ITU grid)	ITU 39	15.0(1)SY
DWDM-X2-44.53=	10GBASE-DWDM 1544.53 nm X2 (100-GHz ITU grid)	ITU 41	15.0(1)SY
DWDM-X2-43.73=	10GBASE-DWDM 1543.73 nm X2 (100-GHz ITU grid)	ITU 42	15.0(1)SY
DWDM-X2-42.94=	10GBASE-DWDM 1542.94 nm X2 (100-GHz ITU grid)	ITU 43	15.0(1)SY
DWDM-X2-42.14=	10GBASE-DWDM 1542.14 nm X2 (100-GHz ITU grid)	ITU 44	15.0(1)SY
DWDM-X2-40.56=	10GBASE-DWDM 1540.56 nm X2 (100-GHz ITU grid)	ITU 46	15.0(1)SY
DWDM-X2-39.77=	10GBASE-DWDM 1539.77 nm X2 (100-GHz ITU grid)	ITU 47	15.0(1)SY
DWDM-X2-38.98=	10GBASE-DWDM 1538.98 nm X2 (100-GHz ITU grid)	ITU 48	15.0(1)SY
DWDM-X2-38.19=	10GBASE-DWDM 1538.19 nm X2 (100-GHz ITU grid)	ITU 49	15.0(1)SY
DWDM-X2-36.61=	10GBASE-DWDM 1536.61 nm X2 (100-GHz ITU grid)	ITU 51	15.0(1)SY
DWDM-X2-35.82=	10GBASE-DWDM 1535.82 nm X2 (100-GHz ITU grid)	ITU 52	15.0(1)SY
DWDM-X2-35.04=	10GBASE-DWDM 1535.04 nm X2 (100-GHz ITU grid)	ITU 53	15.0(1)SY
DWDM-X2-34.25=	10GBASE-DWDM 1534.25 nm X2 (100-GHz ITU grid)	ITU 54	15.0(1)SY
DWDM-X2-32.68=	10GBASE-DWDM 1532.68 nm X2 (100-GHz ITU grid)	ITU 56	15.0(1)SY
DWDM-X2-31.90=	10GBASE-DWDM 1531.90 nm X2 (100-GHz ITU grid)	ITU 57	15.0(1)SY
DWDM-X2-31.12=	10GBASE-DWDM 1531.12 nm X2 (100-GHz ITU grid)	ITU 58	15.0(1)SY
DWDM-X2-30.33=	10GBASE-DWDM 1530.33 nm X2 (100-GHz ITU grid)	ITU 59	15.0(1)SY
X2-10GB-T	10GBASE-T X2 Module for CAT6A/CAT7 copper cable		15.1(1)SY
X2-10GB-ZR	10GBASE-ZR X2 Module for SMF		15.0(1)SY
X2-10GB-CX4	10GBASE for CX4 (copper) cable		15.0(1)SY
X2-10GB-ER	10GBASE-ER Serial 1550-nm extended-reach, single-mode fiber (SMF), dispersion-shifted fiber (DSF) **Note** X2-10GB-ER modules labeled with a number that ends with -02 do not provide EMI compliance with WS-X6716-10G.		15.0(1)SY
X2-10GB-LR	10GBASE-LR Serial 1310-nm long-reach, single-mode fiber (SMF), dispersion-shifted fiber (DSF) **Note** X2-10GB-LR modules labeled with a number that ends with -02 or -03 do not provide EMI compliance with WS-X6716-10G.		15.0(1)SY
X2-10GB-LRM	10GBASE-LRM for FDDI-grade multimode fiber (MMF) **Note** Not supported by the **show idprom** command. (CSCsj35671)		15.0(1)SY

Product ID (append "=" for spares)	Product Description	Minimum Software Version
X2-10GB-LX4	10GBASE-LX4 Serial 1310-nm multimode (MMF) **Note** • See field notice 62840 for information about unsupported 10GBASE-LX4 modules: http://www.cisco.com/c/en/us/support/docs/field-notices/misc/FN62840.html • X2-10GB-LX4 modules labeled with a number that ends with -01 to -03 do not provide EMI compliance with WS-X6716-10G.	15.0(1)SY
X2-10GB-SR	10GBASE-SR Serial 850-nm short-reach multimode (MMF)	15.0(1)SY

10 GE SFP+ Modules

Product ID (append "" for spares)	Product Description	Minimum Software Version
DWDM-SFP10G-61.41	10GBASE-DWDM 1561.41 nm SFP+ (100-GHz ITU grid)	15.1(2)SY
DWDM-SFP10G-60.61	10GBASE-DWDM 1560.61 nm SFP+ (100-GHz ITU grid)	15.1(2)SY
DWDM-SFP10G-59.79	10GBASE-DWDM 1559.79 nm SFP+ (100-GHz ITU grid)	15.1(2)SY
DWDM-SFP10G-58.98	10GBASE-DWDM 1558.98 nm SFP+ (100-GHz ITU grid)	15.1(2)SY
DWDM-SFP10G-58.17	10GBASE-DWDM 1558.17 nm SFP+ (100-GHz ITU grid)	15.1(2)SY
DWDM-SFP10G-57.36	10GBASE-DWDM 1557.36 nm SFP+ (100-GHz ITU grid)	15.1(2)SY
DWDM-SFP10G-56.55	10GBASE-DWDM 1556.55 nm SFP+ (100-GHz ITU grid)	15.1(2)SY
DWDM-SFP10G-55.75	10GBASE-DWDM 1555.75 nm SFP+ (100-GHz ITU grid)	15.1(2)SY
DWDM-SFP10G-54.94	10GBASE-DWDM 1554.94 nm SFP+ (100-GHz ITU grid)	15.1(2)SY
DWDM-SFP10G-54.13	10GBASE-DWDM 1554.13 nm SFP+ (100-GHz ITU grid)	15.1(2)SY
DWDM-SFP10G-53.33	10GBASE-DWDM 1553.33 nm SFP+ (100-GHz ITU grid)	15.1(2)SY
DWDM-SFP10G-52.52	10GBASE-DWDM 1552.52 nm SFP+ (100-GHz ITU grid)	15.1(2)SY
DWDM-SFP10G-51.72	10GBASE-DWDM 1551.72 nm SFP+ (100-GHz ITU grid)	15.1(2)SY
DWDM-SFP10G-50.92	10GBASE-DWDM 1550.92 nm SFP+ (100-GHz ITU grid)	15.1(2)SY
DWDM-SFP10G-50.12	10GBASE-DWDM 1550.12 nm SFP+ (100-GHz ITU grid)	15.1(2)SY
DWDM-SFP10G-49.32	10GBASE-DWDM 1549.32 nm SFP+ (100-GHz ITU grid)	15.1(2)SY
DWDM-SFP10G-48.51	10GBASE-DWDM 1548.51 nm SFP+ (100-GHz ITU grid)	15.1(2)SY
DWDM-SFP10G-47.72	10GBASE-DWDM 1547.72 nm SFP+ (100-GHz ITU grid)	15.1(2)SY
DWDM-SFP10G-46.92	10GBASE-DWDM 1546.92 nm SFP+ (100-GHz ITU grid)	15.1(2)SY
DWDM-SFP10G-46.12	10GBASE-DWDM 1546.12 nm SFP+ (100-GHz ITU grid)	15.1(2)SY
DWDM-SFP10G-45.32	10GBASE-DWDM 1545.32 nm SFP+ (100-GHz ITU grid)	15.1(2)SY
DWDM-SFP10G-44.53	10GBASE-DWDM 1544.53 nm SFP+ (100-GHz ITU grid)	15.1(2)SY

Product ID (append "" for spares)	Product Description	Minimum Software Version
DWDM-SFP10G-43.73	10GBASE-DWDM 1543.73 nm SFP+ (100-GHz ITU grid)	15.1(2)SY
DWDM-SFP10G-42.94	10GBASE-DWDM 1542.94 nm SFP+ (100-GHz ITU grid)	15.1(2)SY
DWDM-SFP10G-42.14	10GBASE-DWDM 1542.14 nm SFP+ (100-GHz ITU grid)	15.1(2)SY
DWDM-SFP10G-41.35	10GBASE-DWDM 1541.35 nm SFP+ (100-GHz ITU grid)	15.1(2)SY
DWDM-SFP10G-40.56	10GBASE-DWDM 1540.56 nm SFP+ (100-GHz ITU grid)	15.1(2)SY
DWDM-SFP10G-39.77	10GBASE-DWDM 1539.77 nm SFP+ (100-GHz ITU grid)	15.1(2)SY
DWDM-SFP10G-38.98	10GBASE-DWDM 1538.98 nm SFP+ (100-GHz ITU grid)	15.1(2)SY
DWDM-SFP10G-38.19	10GBASE-DWDM 1538.19 nm SFP+ (100-GHz ITU grid)	15.1(2)SY
DWDM-SFP10G-37.40	10GBASE-DWDM 1537.40 nm SFP+ (100-GHz ITU grid)	15.1(2)SY
DWDM-SFP10G-36.61	10GBASE-DWDM 1536.61 nm SFP+ (100-GHz ITU grid)	15.1(2)SY
DWDM-SFP10G-35.82	10GBASE-DWDM 1535.82 nm SFP+ (100-GHz ITU grid)	15.1(2)SY
DWDM-SFP10G-35.04	10GBASE-DWDM 1535.04 nm SFP+ (100-GHz ITU grid)	15.1(2)SY
DWDM-SFP10G-34.25	10GBASE-DWDM 1534.25 nm SFP+ (100-GHz ITU grid)	15.1(2)SY
DWDM-SFP10G-33.47	10GBASE-DWDM 1533.47 nm SFP+ (100-GHz ITU grid)	15.1(2)SY
DWDM-SFP10G-32.68	10GBASE-DWDM 1532.68 nm SFP+ (100-GHz ITU grid)	15.1(2)SY
DWDM-SFP10G-31.90	10GBASE-DWDM 1531.90 nm SFP+ (100-GHz ITU grid)	15.1(2)SY
DWDM-SFP10G-31.12	10GBASE-DWDM 1531.12 nm SFP+ (100-GHz ITU grid)	15.1(2)SY
DWDM-SFP10G-30.33	10GBASE-DWDM 1530.33 nm SFP+ (100-GHz ITU grid)	15.1(2)SY
CWDM-SFP10G-1530	**CWDM 1530-nm SFP+; 10 Gigabit Ethernet**	**15.3(1)SY**
SFP-10G-LR	**10GBASE-LR for 1310 nm SMF**	**15.0(1)SY1**
SFP-10G-ER	**10GBASE-ER for 1550 nm SMF**	**15.0(1)SY1**
SFP-10G-LRM	**10GBASE-LRM 1310 nm MMF and SMF**	**15.0(1)SY**
SFP-10G-SR	**10GBASE-SR 850 nm MMF**	**15.0(1)SY**
SFP-10G-ZR	**10GBASE-ZR SFP+ for 1550 nm SMF**	**15.1(2)SY3**
SFP-10G-LR-S	**10GBASE-LR for 1310 nm SMF, S-Class**	**15.2(1)SY**
SFP-10G-ER-S	**10GBASE-ER for 1550 nm SMF, S-Class**	**15.2(1)SY**
SFP-10G-SR-S	**10GBASE-SR 850 nm MMF, S-Class**	**15.2(1)SY**
SFP-10G-ZR-S	**10GBASE-ZR SFP+ for 1550 nm SMF, S-Class**	**15.2(1)SY**
SFP-10G-BX40D-I	**10GE for 1330 nm SMF**	**15.3(1)SY**
SFP-10G-BX40U-I	**10GE for 1270 nm SMF**	**15.3(1)SY**
SFP-H10GB-CU1M	**1m Twinax cable, passive, 30AWG cable assembly**	**15.2(1)SY**
SFP-H10GB-CU1-5M	**1.5m Twinax cable, passive, 30AWG cable assembly**	**15.2(1)SY**
SFP-H10GB-CU2M	**2m Twinax cable, passive, 30AWG cable assembly**	**15.2(1)SY**
SFP-H10GB-CU2-5M	**2.5m Twinax cable, passive, 30AWG cable assembly**	**15.2(1)SY**
SFP-H10GB-CU3M	**3m Twinax cable, passive, 30AWG cable assembly**	**15.2(1)SY**
SFP-H10GB-CU5M	**5m Twinax cable, passive, 24AWG cable assembly**	**15.2(1)SY**
SFP-H10GB-ACU7M	**7m Twinax cable, active, 30 AWG cable assembly**	**15.2(1)SY**

Product ID (append “” for spares)	Product Description	Minimum Software Version
SFP-H10GB-ACU10M	10m Twinax cable, active, 28 AWG cable assembly	15.2(1)SY
SFP-10G-AOC1M	1m Active Optical Cable assembly	15.2(1)SY
SFP-10G-AOC2M	2m Active Optical Cable assembly	15.2(1)SY
SFP-10G-AOC3M	3m Active Optical Cable assembly	15.2(1)SY
SFP-10G-AOC5M	5m Active Optical Cable assembly	15.2(1)SY
SFP-10G-AOC7M	7m Active Optical Cable assembly	15.2(1)SY
SFP-10G-AOC10M	10m Active Optical Cable assembly	15.2(1)SY

40 GE QSFP Modules

Product ID (append “” for spares)	Product Description	Minimum Software Version
QSFP-40G-SR4	40GBASE-SR4, 4 lanes, 850 nm MMF	15.2(2)SY
QSFP-40G-CSR4	40GBASE-CSR4, 4 lanes, 850 nm MMF	15.2(2)SY
QSFP-40G-LR4	40GBASE-LR4, 1310 nm, SMF with OTU3 data-rate support	15.2(2)SY
QSFP-40G-ER4	40GBASE-ER4, 1310 nm, SMF with OTU3 data-rate support	15.2(2)SY
QSFP-40G-SR-BD	40GBASE-SR-BiDi, duplex MMF	15.2(2)SY
QSFP-40G-SR4-S	40GBASE-SR4, 4 lanes, 850 nm MMF, S-Class	15.3(1)SY1
QSFP-40G-LR4-S	40GBASE-LR4, 1310 nm, SMF, S-Class	15.3(1)SY1
WSP-Q40GLR4L	40GBASE-LR4-Lite, 1310 nm, SMF	15.3(1)SY1
QSFP-H40G-CU1M	1m QSFP to QSFP passive copper direct-attach cables	15.2(2)SY
QSFP-H40G-CU3M	3m QSFP to QSFP passive copper direct-attach cables	15.2(2)SY
QSFP-H40G-CU5M	5m QSFP to QSFP passive copper direct-attach cables	15.2(2)SY
QSFP-H40G-ACU7M	7m QSFP to QSFP active copper direct-attach cables	15.2(2)SY
QSFP-H40G-ACU10M	10m QSFP to QSFP active copper direct-attach cables	15.2(2)SY
QSFP-H40G-AOC1M	1m QSFP to QSFP active optical cables	15.3(1)SY
QSFP-H40G-AOC2M	2m QSFP to QSFP active optical cables	15.3(1)SY
QSFP-H40G-AOC3M	3m QSFP to QSFP active optical cables	15.3(1)SY
QSFP-H40G-AOC5M	5m QSFP to QSFP active optical cables	15.3(1)SY
QSFP-H40G-AOC7M	7m QSFP to QSFP active optical cables	15.3(1)SY
QSFP-H40G-AOC10M	10m QSFP to QSFP active optical cables	15.3(1)SY
QSFP-H40G-AOC15M	15m QSFP to QSFP active optical cables	15.3(1)SY
QSFP-4SFP10G-CU1M	1m QSFP to 4 SFP+ passive copper break-out cables	15.3(1)SY
QSFP-4SFP10G-CU3M	3m QSFP to 4 SFP+ passive copper break-out cables	15.3(1)SY
QSFP-4SFP10G-CU5M	5m QSFP to 4 SFP+ passive copper break-out cables	15.3(1)SY
QSFP-4X10G-AC7M	7m QSFP to 4 SFP+ passive copper break-out cables	15.3(1)SY
QSFP-4X10G-AC10M	10m QSFP to 4 SFP+ passive copper break-out cables	15.3(1)SY

Product ID (append “” for spares)	Product Description	Minimum Software Version
QSFP-4X10G-AOC1M	**1m QSFP to four SFP+ active optical breakout cables**	**15.3(1)SY**
QSFP-4X10G-AOC2M	**2m QSFP to four SFP+ active optical breakout cables**	**15.3(1)SY**
QSFP-4X10G-AOC3M	**3m QSFP to four SFP+ active optical breakout cables**	**15.3(1)SY**
QSFP-4X10G-AOC5M	**5m QSFP to four SFP+ active optical breakout cables**	**15.3(1)SY**
QSFP-4X10G-AOC7M	**7m QSFP to four SFP+ active optical breakout cables**	**15.3(1)SY**
QSFP-4X10G-AOC10M	**10m QSFP to four SFP+ active optical breakout cables**	**15.3(1)SY**
CVR-4SFP10G-QSFP	**4 x SFP10G to QSFP Reverse Adapter**	**15.3(1)SY**

XENPAKs

Note

- For information about DWDM XENPAKs, see the *Cisco 10GBase DWDM XENPAK Modules* data sheet:

  http://www.cisco.com/c/en/us/products/collateral/interfaces-modules/dwdm-transceiver-modules/product_data_sheet0900aecd801f9333.html

Product ID (append “=” for spares)	Product Description	Minimum Software Version
XENPAK-10GB-LRM	10GBASE-LRM XENPAK Module for MMF **Note** Not supported by the **show idprom** command. (CSCsl21260)	15.0(1)SY
DWDM-XENPAK	10GBASE dense wavelength-division multiplexing (DWDM) 100-GHz ITU grid	15.0(1)SY
WDM-XENPAK-REC	10GBASE receive-only wavelength division multiplexing (WDM)	15.0(1)SY
XENPAK-10GB-CX4	10GBASE for CX4 (copper) cable; uses Infiniband connectors	15.0(1)SY
XENPAK-10GB-ER	10GBASE-ER Serial 1550-nm extended-reach, single-mode fiber (SMF), dispersion-shifted fiber (DSF) **Note** XENPAK-10GB-ER units with Part No. 800-24557-01 are not supported, as described in this external field notice (CSCee47030): http://www.cisco.com/c/en/us/support/docs/field-notices/200/fn29736.html	15.0(1)SY
XENPAK-10GB-ER+	10GBASE-ER Serial 1550-nm extended-reach, single-mode fiber (SMF), dispersion-shifted fiber (DSF)	15.0(1)SY
XENPAK-10GB-LR	10GBASE-LR Serial 1310-nm long-reach, single-mode fiber (SMF), dispersion-shifted fiber (DSF)	15.0(1)SY
XENPAK-10GB-LR+	10GBASE-LR Serial 1310-nm long-reach, single-mode fiber (SMF), dispersion-shifted fiber (DSF)	15.0(1)SY

Product ID (append "=" for spares)	Product Description	Minimum Software Version
XENPAK-10GB-LW	10GBASE-LW XENPAK Module with WAN PHY for SMF **Note** XENPAK-10GB-LW operates at an interface speed compatible with SONET/SDH OC-192/STM-64. XENPAK-10GB-LW links might go up and down if the data rate exceeds 9Gbs. (CSCsi58211)	15.0(1)SY
XENPAK-10GB-LX4	10GBASE-LX4 Serial 1310-nm multimode (MMF)	15.0(1)SY
XENPAK-10GB-SR	10GBASE-SR Serial 850-nm short-reach multimode (MMF)	15.0(1)SY
XENPAK-10GB-ZR	10GBASE for any SMF type	15.0(1)SY

Small Form-Factor Pluggable (SFP) Modules

Gigabit Ethernet SFPs

Note

- For information about coarse wavelength-division multiplexing (CWDM) SFPs, see the *Cisco CWDM GBIC and SFP Solutions* data sheet:

  http://www.cisco.com/c/en/us/products/collateral/interfaces-modules/cwdm-transceiver-modules/product_data_sheet09186a00801a557c.html
- For information about DWDM SFPs, see the *Cisco CWDM GBIC and SFP Solutions* data sheet:

  http://www.cisco.com/c/en/us/products/collateral/interfaces-modules/dwdm-transceiver-modules/product_data_sheet0900aecd80582763.html
- See the "Unsupported Hardware" section on page 46 for information about unsupported DWDM-SFPs.
- For information about other SFPs, see the *Cisco SFP Optics For Gigabit Ethernet Applications* data sheet:

  http://www.cisco.com/c/en/us/products/collateral/interfaces-modules/gigabit-ethernet-gbic-sfp-modules/product_data_sheet0900aecd8033f885.html

Product ID (append "=" for spares)	Product Description	Minimum Software Version
GLC-EX-SMD &	1000BASE-EX SFP transceiver module for SMF, 1310-nm wavelength, extended operating temperature range and DOM support, dual LC/PC connector	15.2(1)SY
GLC-BX-D	1000BASE-BX10 SFP module for single-strand SMF, 1490-nm TX/1310-nm RX wavelength	15.0(1)SY
GLC-BX-U	1000BASE-BX10 SFP module for single-strand SMF, 1310-nm TX/1490-nm RX wavelength	15.0(1)SY

Product ID (append "=" for spares)	Product Description	Minimum Software Version
GLC-LH-SMD **GLC-LH-SM**	1000BASE-LX/LH SFP **Note** Supported with WS-X6904-40G-2T in Release 15.1(1)SY1 and later releases.	15.0(1)SY
GLC-SX-MMD **GLC-SX-MM**	1000BASE-SX SFP **Note** Supported with WS-X6904-40G-2T in Release 15.1(1)SY1 and later releases.	15.0(1)SY
GLC-T	1000BASE-T 10/100/1000 SFP module **Note** • For WS-X6904-40G-2T LC, supported only at 1000 Mbps. • Supported with WS-X6904-40G-2T in Release 15.1(1)SY1 and later releases.	15.0(1)SY
GLC-ZX-SM **GLC-ZX-SMD**	1000BASE-ZX SFP module 1000BASE-ZX SFP transceiver module for SMF, 1550-nm wavelength, dual LC/PC connector	15.0(1)SY
CWDM-SFP-1470	CWDM 1470-nm (Gray) Gigabit Ethernet, 1 and 2 Gb Fibre Channel SFP module	15.0(1)SY
CWDM-SFP-1490	CWDM 1490-nm (Violet) Gigabit Ethernet, 1 and 2 Gb Fibre Channel SFP module	15.0(1)SY
CWDM-SFP-1510	CWDM 1510-nm (Blue) Gigabit Ethernet, 1 and 2 Gb Fibre Channel SFP module	15.0(1)SY
CWDM-SFP-1530	CWDM 1530-nm (Green) Gigabit Ethernet, 1 and 2 Gb Fibre Channel SFP module	15.0(1)SY
CWDM-SFP-1550	CWDM 1550-nm (Yellow) Gigabit Ethernet, 1 and 2 Gb Fibre Channel SFP module	15.0(1)SY
CWDM-SFP-1570	CWDM 1570-nm (Orange) Gigabit Ethernet, 1 and 2 Gb Fibre Channel SFP module	15.0(1)SY
CWDM-SFP-1590	CWDM 1590-nm (Red) Gigabit Ethernet, 1 and 2 Gb Fibre Channel SFP module	15.0(1)SY
CWDM-SFP-1610	CWDM 1610-nm (Brown) Gigabit Ethernet, 1 and 2 Gb Fibre Channel SFP module	15.0(1)SY
DWDM-SFP-5817	1000BASE-DWDM 1558.17 nm SFP (100-GHz ITU grid) SFP module	15.0(1)SY
DWDM-SFP-5252	1000BASE-DWDM 1552.52 nm SFP (100-GHz ITU grid) SFP module	15.0(1)SY
DWDM-SFP-5172	1000BASE-DWDM 1551.72 nm SFP (100-GHz ITU grid) SFP module	15.0(1)SY
DWDM-SFP-5012	1000BASE-DWDM 1550.12 nm SFP (100-GHz ITU grid) SFP module	15.0(1)SY
DWDM-SFP-4692	1000BASE-DWDM 1546.92 nm SFP (100-GHz ITU grid) SFP module	15.0(1)SY
DWDM-SFP-4373	1000BASE-DWDM 1543.73 nm SFP (100-GHz ITU grid) SFP module	15.0(1)SY
DWDM-SFP-4214	1000BASE-DWDM 1542.14 nm SFP (100-GHz ITU grid) SFP module	15.0(1)SY
DWDM-SFP-3977	1000BASE-DWDM 1539.77 nm SFP (100-GHz ITU grid) SFP module	15.0(1)SY
DWDM-SFP-3898	1000BASE-DWDM 1538.98 nm SFP (100-GHz ITU grid) SFP module	15.0(1)SY
DWDM-SFP-3582	1000BASE-DWDM 1535.82 nm SFP (100-GHz ITU grid) SFP module	15.0(1)SY
DWDM-SFP-3504	1000BASE-DWDM 1535.04 nm SFP (100-GHz ITU grid) SFP module	15.0(1)SY
DWDM-SFP-6061	1000BASE-DWDM 1560.61 nm SFP (100-GHz ITU grid) SFP module	15.0(1)SY
DWDM-SFP-5979	1000BASE-DWDM 1559.79 nm SFP (100-GHz ITU grid) SFP module	15.0(1)SY
DWDM-SFP-5898	1000BASE-DWDM 1558.98 nm SFP (100-GHz ITU grid) SFP module	15.0(1)SY
DWDM-SFP-5655	1000BASE-DWDM 1556.55 nm SFP (100-GHz ITU grid) SFP module	15.0(1)SY
DWDM-SFP-5575	1000BASE-DWDM 1555.75 nm SFP (100-GHz ITU grid) SFP module	15.0(1)SY
DWDM-SFP-5494	1000BASE-DWDM 1554.94 nm SFP (100-GHz ITU grid) SFP module	15.0(1)SY

Product ID (append "=" for spares)	Product Description	Minimum Software Version
DWDM-SFP-5413	1000BASE-DWDM 1554.13 nm SFP (100-GHz ITU grid) SFP module	15.0(1)SY
DWDM-SFP-5092	1000BASE-DWDM 1550.92 nm SFP (100-GHz ITU grid) SFP module	15.0(1)SY
DWDM-SFP-4851	1000BASE-DWDM 1548.51 nm SFP (100-GHz ITU grid) SFP module	15.0(1)SY
DWDM-SFP-4772	1000BASE-DWDM 1547.72 nm SFP (100-GHz ITU grid) SFP module	15.0(1)SY
DWDM-SFP-4612	1000BASE-DWDM 1546.12 nm SFP (100-GHz ITU grid) SFP module	15.0(1)SY
DWDM-SFP-4453	1000BASE-DWDM 1544.53 nm SFP (100-GHz ITU grid) SFP module	15.0(1)SY
DWDM-SFP-4294	1000BASE-DWDM 1542.94 nm SFP (100-GHz ITU grid) SFP module	15.0(1)SY
DWDM-SFP-4056	1000BASE-DWDM 1540.56 nm SFP (100-GHz ITU grid) SFP module	15.0(1)SY
DWDM-SFP-3819	1000BASE-DWDM 1538.19 nm SFP (100-GHz ITU grid) SFP module	15.0(1)SY
DWDM-SFP-3661	1000BASE-DWDM 1536.61 nm SFP (100-GHz ITU grid) SFP module	15.0(1)SY
DWDM-SFP-3425	1000BASE-DWDM 1534.25 nm SFP (100-GHz ITU grid) SFP module	15.0(1)SY
DWDM-SFP-3268	1000BASE-DWDM 1532.68 nm SFP (100-GHz ITU grid) SFP module	15.0(1)SY
DWDM-SFP-3190	1000BASE-DWDM 1531.90 nm SFP (100-GHz ITU grid) SFP module	15.0(1)SY
DWDM-SFP-3112	1000BASE-DWDM 1531.12 nm SFP (100-GHz ITU grid) SFP module	15.0(1)SY
DWDM-SFP-3033	1000BASE-DWDM 1530.33 nm SFP (100-GHz ITU grid) SFP module	15.0(1)SY

Fast Ethernet SFPs

Note

- For information about Fast Ethernet SFPs, see the *Cisco 100BASE-X SFP For Fast Ethernet SFP Ports* data sheet: http://www.cisco.com/c/en/us/products/collateral/interfaces-modules/fast-ethernet-sfp-modules/product_data_sheet0900aecd801f931c.html

Product ID (append "=" for spares)	Product Description	Minimum Software Version
GLC-FE-100BX-U	100BASE-BX10-U SFP	15.0(1)SY
GLC-FE-100BX-D	100BASE-BX10-D SFP	
GLC-FE-100EX	100BASEEX SFP	
GLC-FE-100ZX	100BASEZX SFP	
GLC-FE-100FX	100BASEFX SFP	
GLC-FE-100LX	100BASELX SFP	
GLC-GE-100FX	100BASEEX SFP	

Gigabit Interface Converters (GBICs)

Note The support listed in this section applies to all modules that use GBICs.

Product ID (append "=" for spares)	Product Description	Minimum Software Versions
WDM-GBIC-REC	Receive-only wavelength division multiplexing (WDM) GBIC	15.0(1)SY
DWDM-GBIC	Dense wavelength division multiplexing (DWDM) GBIC	15.0(1)SY
CWDM-GBIC-1470	Cisco 1000BASE-CWDM GBIC, 1470 nm (Gray)	15.0(1)SY
CWDM-GBIC-1490	Cisco 1000BASE-CWDM GBIC, 1490 nm (Violet)	15.0(1)SY
CWDM-GBIC-1510	Cisco 1000BASE-CWDM GBIC, 1510 nm (Blue)	15.0(1)SY
CWDM-GBIC-1530	Cisco 1000BASE-CWDM GBIC, 1530 nm (Green)	15.0(1)SY
CWDM-GBIC-1550	Cisco 1000BASE-CWDM GBIC, 1550 nm (Yellow)	15.0(1)SY
CWDM-GBIC-1570	Cisco 1000BASE-CWDM GBIC, 1570 nm (Orange)	15.0(1)SY
CWDM-GBIC-1590	Cisco 1000BASE-CWDM GBIC, 1590 nm (Red)	15.0(1)SY
CWDM-GBIC-1610	Cisco 1000BASE-CWDM GBIC, 1610 nm (Brown)	15.0(1)SY
WS-G5483	1000BASET GBIC	15.0(1)SY
WS-G5484	Short wavelength, 1000BASE-SX	15.0(1)SY
WS-G5486	Long wavelength/long haul, 1000BASE-LX/LH	15.0(1)SY
WS-G5487	Extended distance, 1000BASE-ZX	15.0(1)SY

Service Modules

Note

- For service modules that run their own software, see the service module software release notes for information about the minimum required service module software version.
- With SPAN configured to include a port-channel interface to support a service module, be aware of CSCth03423 and CSCsx46323.
- EtherChannel configuration can impact some service modules. In particular, distributed EtherChannels (DECs) can interfere with service module traffic. See this field notice for more information:

  http://www.cisco.com/c/en/us/support/docs/field-notices/610/fn61935.html

- Application Control Engine (ACE) Module, page 41
- ASA Services Module, page 41
- Network Analysis Modules (NAMs), page 42
- Network Analysis Modules (NAMs), page 42

Application Control Engine (ACE) Module

Product ID (append "=" for spares)	Product Description	Minimum Software Versions
ACE30-MOD-K9	Application Control Engine (ACE) module	
	With Supervisor Engine 2T-10GE	15.0(1)SY

- ACE modules run their own software—See these publications:
  https://www.cisco.com/c/en/us/obsolete/interfaces-modules/cisco-ace-application-control-engine module.html
  See the ACE module software release notes for information about the minimum required service module software version.

ASA Services Module

Product ID (append "=" for spares)	Product Description	Minimum Software Versions
WS-SVC-ASA-SM1-K7	ASA Services Module	
	With Supervisor Engine 2T-10GE	15.1(1)SY3
WS-SVC-ASA-SM1-K9	ASA Services Module	
	With Supervisor Engine 2T-10GE	15.0(1)SY1

- Upgrade to the minimum software version or later before installing an ASA services module (see the "EFSU Compatibility" section on page 49).
- ASA modules run their own software—See these publications:

  http://www.cisco.com/c/en/us/support/interfaces-modules/catalyst-6500-series-7600-series-asa-services-module/tsd-products-support-model-home.html

  See the module software release notes for information about the minimum required service module software version.

Network Analysis Modules (NAMs)

Product ID (append "=" for spares)	Product Description	Minimum Software Version
WS-SVC-NAM3-6G-K9	Network Analysis Module 3	
	With Supervisor Engine 2T-10GE	15.0(1)SY1

- Upgrade to Release 15.0(1)SY1 or later before installing WS-SVC-NAM3-6G-K9 (see the "EFSU Compatibility" section on page 49).
- NAM modules run their own software—See these publications for more information:
  - http://www.cisco.com/c/en/us/support/cloud-systems-management/prime-network-analysis-module-software/products-release-notes-list.html
  - http://www.cisco.com/c/en/us/support/cloud-systems-management/prime-network-analysis-module-software/tsd-products-support-series-home.html

  See the software release notes for information about the minimum required NAM software version.

Wireless Services Modules (WiSMs)

Product ID (append "=" for spares)	Product Description	Minimum Software Versions
WS-SVC-WISM2-1-K9 **WS-SVC-WISM2-3-K9** **WS-SVC-WISM2-5-K9**	Wireless Services Module 2 (WiSM2)	
	With Supervisor Engine 2T-10GE	15.0(1)SY

Wireless services modules run their own software—See these publications:

http://www.cisco.com/c/en/us/support/interfaces-modules/services-modules/products-release-notes-list.html

See the wireless services modules software release notes for information about the minimum required wireless services module software version.

Chassis

Note Chassis with 64 MAC addresses automatically enable the Extended System ID feature, which is enabled with the spanning-tree extend system-id command. You cannot disable the extended-system ID in chassis that support 64 MAC addresses. The Extended System ID feature might already be enabled in your network, because it is required to support both extended-range VLANs and any chassis with 64 MAC addresses. **Enabling the extended system ID feature for the first time updates the bridge IDs of all active STP instances, which might change the spanning tree topology.**

Note The new 40-Gigabit Ethernet Switching Modules C6800-8P40G and C6800-8P40G-XL are supported only on Catalyst 6807-XL

13-Slot Chassis

Note With Supervisor Engine 2T-10GE, the slot reserved for a redundant supervisor engine can be populated with one of these modules:

- WS-X6148E-GE-45AT
- WS-X6148A-GE-TX

Product ID (append "=" for spare)	**Product Description**	**Minimum Software Version**
CISCO7613-S	• 13 slots • Slot 7 and slot 8 are reserved for supervisor engines • 64 chassis MAC addresses	
	With Supervisor Engine 2T-10GE	15.1(1)SY
C-6513-E	• 13 slots • 64 chassis MAC addresses	
	With Supervisor Engine 2T-10GE	15.1(1)SY

9-Slot Chassis

Product ID (append "=" for spare)	Product Description	Minimum Software Version
WS-C6509-V-E	• 9 vertical slots • 64 chassis MAC addresses • Required power supply: – 2,500 W DC or higher – 3,000 W AC or higher	
	With Supervisor Engine 2T-10GE	15.0(1)SY
WS-C6509-E	• 9 horizontal slots • Chassis MAC addresses: – Before April 2009—1024 chassis MAC addresses – Starting in April 2009—64 chassis MAC addresses **Note** Chassis with 64 MAC addresses automatically enable the Extended System ID feature, which is enabled with the spanning-tree extend system-id command. You cannot disable the extended-system ID in chassis that support 64 MAC addresses. The Extended System ID feature might already be enabled in your network, because it is required to support both extended-range VLANs and any chassis with 64 MAC addresses. **Enabling the extended system ID feature for the first time updates the bridge IDs of all active STP instances, which might change the spanning tree topology.** • Requires 2,500 W or higher power supply	
	With Supervisor Engine 2T-10GE	15.0(1)SY
CISCO7609-S	• 9 vertical slots • 64 chassis MAC addresses • Required power supply: – 2,500 W DC or higher – 3,000 W AC or higher	
	With Supervisor Engine 2T-10GE	15.0(1)SY1

7-Slot Chassis

Product ID (append "=" for spare)	Product Description	Minimum Software Version
Catalyst 6807-XL	• 7 slots • Required power supply: – 3,000 W AC (C6800-XL-3KW-AC)	
	With Supervisor Engine 2T-10GE	15.2(1)SY
	With Supervisor Engine 6T	15.3(1)SY

6-Slot Chassis

Product ID (append "=" for spare)	Product Description	Minimum Software Version
WS-C6506-E	• 6 slots • Chassis MAC addresses: – Before April 2009—1024 chassis MAC addresses – Starting in April 2009—64 chassis MAC addresses **Note** Chassis with 64 MAC addresses automatically enable the Extended System ID feature, which is enabled with the spanning-tree extend system-id command. You cannot disable the extended-system ID in chassis that support 64 MAC addresses. The Extended System ID feature might already be enabled in your network, because it is required to support both extended-range VLANs and any chassis with 64 MAC addresses. **Enabling the extended system ID feature for the first time updates the bridge IDs of all active STP instances, which might change the spanning tree topology.** • Requires 2,500 W or higher power supply	
	With Supervisor Engine 2T-10GE	15.0(1)SY
CISCO7606-S	• 6 slots • 64 chassis MAC addresses	
	With Supervisor Engine 2T-10GE	15.1(1)SY1

4-Slot Chassis

Product ID (append "=" for spare)	Product Description	Minimum Software Version
WS-C6504-E	• 4 slots • 64 chassis MAC addresses	
	With Supervisor Engine 2T-10GE	15.0(1)SY
CISCO7604	• 4 slots • 64 chassis MAC addresses	
	With Supervisor Engine 2T-10GE	15.1(1)SY

3-Slot Chassis

Product ID (append "=" for spare)	Product Description	Minimum Software Version
WS-C6503-E	• 3 slots • 64 chassis MAC addresses • WS-X6904-40G-2T and WS-X6908-10GE are supported only with WS-C6503-E hardware revision 1.3 or higher.	
	With Supervisor Engine 2T-10GE	15.0(1)SY

Unsupported Hardware

Release 15.5(1)SY supports only the hardware listed in the "Supported Hardware" section on page 3. Unsupported modules remain powered down if detected and do not affect system behavior.

Release 15.5(1)SY does not support these modules:

- Supervisor Engine 720-10GE and Supervisor Engine 720
- 6880-X Series Extensible Fixed Aggregation Switches (Only for Release 15.5(1)SY)
- 6840-X Series Fixed Aggregation Switches (Only for Release 15.5(1)SY)
- WS-SVC-FWM-1-K9
- WS-SVC-IDS2-BUN-K9
- WS-SVC-NAM-1
- WS-SVC-NAM-2
- WS-SVC-NAM-1-250S
- WS-SVC-NAM-2-250S
- WS-X6548-RJ-45
- WS-X6548-RJ-21

- WS-X6348-RJ45V
- WS-X6348-RJ-45
- WS-X6348-RJ21V
- WS-X6196-RJ-21
- WS-X6196-21AF
- WS-X6148X2-RJ-45
- WS-X6148X2-45AF
- WS-X6148-RJ45V
- WS-X6148-RJ-45
- WS-X6148-RJ21V
- WS-X6148-RJ-21
- WS-X6148A-RJ-45

- WS-X6148A-45AF
- WS-X6148-45AF
- WS-X6148-21AF
- WS-X6524-100FX-MM
- WS-X6324-100FX-MM
- WS-X6148-FE-SFP
- WS-X6548V-GE-TX
- WS-X6548-GE-TX
- WS-X6548-GE-45AF
- WS-X6516-GE-TX
- WS-X6148V-GE-TX
- WS-X6148A-GE-45AF
- WS-X6148-GE-TX
- WS-X6148-GE-45AF
- WS-X6816-GBIC
- WS-X6516-GBIC
- WS-X6516A-GBIC
- WS-X6416-GBIC
- WS-X6408-GBIC
- WS-X6408A-GBIC
- WS-X6502-10GE
- WS-F6K-DFC3A
- WS-F6K-DFC3B
- WS-F6K-DFC3BXL
- WS-CAC-2500W
- PWR-950-AC
- WS-C6513

Images and Feature Sets

Use Cisco Feature Navigator to display information about the images and feature sets in Release 15.4SY.

The releases includes strong encryption images. Strong encryption images are subject to U.S. and local country export, import, and use laws. The country and class of end users eligible to receive and use Cisco encryption solutions are limited. See this publication for more information:

http://www.cisco.com/web/about/doing_business/legal/global_export_trade/general_export/contract_compliance.html

EFSU Compatibility

SX SY EFSU Compatibility Matrix (XLSX - Opens with Microsoft Excel)

Cisco IOS Behavior Changes

Behavior changes describe the minor modifications that are sometimes introduced in a software release. When behavior changes are introduced, existing documentation is updated.

Cisco IOS Behavior Changes in Release 15.5(1)SY6

- CSCvc84848–IBGP paths getting marked as RPKI Valid
- CSCve92382–MustFix Hidden-CLI: " database-mapping " " map-cache " cli's are not supported

Cisco IOS Behavior Changes in Release 15.5(1)SY5

None.

Cisco IOS Behavior Changes in Release 15.5(1)SY4

None.

Cisco IOS Behavior Changes in Release 15.5(1)SY3

- CSCvk61214 – mtrose: Change WARNING msg to display on PIM dense mode as not recommended
- CSCvm94652 – Observing STP/BPDU inconsistency issue with small packet padding enabled

Cisco IOS Behavior Changes in releases prior to Release 15.5(1)SY3

- CSCve84812 – Switch crash on configuring platform multicast forwarding fast-redirect
- CSCvd09494 – LACK_CHANNEL error detected continuously when remove any of SFP10G 2,3,4.
- CSCvc97657 – There is change in CLI of “show issu state detail”, add new sub-state to CLI.

New Features in Release 15.5(1)SY13

The sections below describe the new features in Release 15.5(1)SY13, 20 March 2024:

- New Hardware Features in Release 15.5(1)SY12, page 50
- New Software Features in Release 15.5(1)SY12, page 50

New Hardware Features in Release 15.5(1)SY13

None.

New Software Features in Release 15.5(1)SY13

None.

New Features in Release 15.5(1)SY12

The sections below describe the new features in Release 15.5(1)SY12, 15 September 2023:

- New Hardware Features in Release 15.5(1)SY12, page 50
- New Software Features in Release 15.5(1)SY12, page 50

New Hardware Features in Release 15.5(1)SY12

None.

New Software Features in Release 15.5(1)SY12

None.

New Features in Release 15.5(1)SY11

The sections below describe the new features in Release 15.5(1)SY11, 21 March 2023:

- New Hardware Features in Release 15.5(1)SY11, page 50
- New Software Features in Release 15.5(1)SY11, page 50

New Hardware Features in Release 15.5(1)SY11

None.

New Software Features in Release 15.5(1)SY11

Data Sanitization: Supports the use of the National Institute of Standards and Technology (NIST) purge method that renders data unrecoverable through simple, non-invasive data recovery techniques or through state-of-the-art laboratory techniques.

New Features in Release 15.5(1)SY10

The sections below describe the new features in Release 15.5(1)SY10, 15 September 2022:

- New Hardware Features in Release 15.5(1)SY10, page 50
- New Software Features in Release 15.5(1)SY10, page 50

New Hardware Features in Release 15.5(1)SY10

None.

New Software Features in Release 15.5(1)SY10

None.

New Features in Release 15.5(1)SY9

The sections below describe the new features in Release 15.5(1)SY9, 17 March 2022:

New Hardware Features in Release 15.5(1)SY9

None.

New Software Features in Release 15.5(1)SY9

None.

New Features in Release 15.5(1)SY8

The sections below describe the new features in Release 15.5(1)SY8, 18 September 2021:

New Hardware Features in Release 15.5(1)SY8

None.

New Software Features in Release 15.5(1)SY8

None.

New Features in Release 15.5(1)SY7

The sections below describe the new features in Release 15.5(1)SY7, 18 March 2021:

New Hardware Features in Release 15.5(1)SY7

None.

New Software Features in Release 15.5(1)SY7

None.

New Features in Release 15.5(1)SY6

The sections below describe the new features in Release 15.5(1)SY6, 18 September 2020:

- New Hardware Features in Release 15.5(1)SY6, page 52
- New Software Features in Release 15.5(1)SY6, page 52

New Hardware Features in Release 15.5(1)SY6

None.

New Software Features in Release 15.5(1)SY6

- Password Hardening:
  - Auto conversion of Type 5 passwords into convoluted Type 9 (irreversible) passwords.
  - Auto conversion of Type 0 and Type 7 passwords into Type 6 (reversible) passwords.

Note If you downgrade to a release that does not support the current password type, you will be locked out of the device once the downgrade is completed. To avoid this lock-out, ensure that you configure the password type that is supported for the required release, before you downgrade to that release. For more information, see here.

New Features in Release 15.5(1)SY5

The sections below describe the new features in Release 15.5(1)SY5, 18 March 2020:

- New Hardware Features in Release 15.5(1)SY5, page 52
- New Software Features in Release 15.5(1)SY5, page 52

New Hardware Features in Release 15.5(1)SY5

None.

New Software Features in Release 15.5(1)SY5

- Password Hardening:
  - Support for Type 6, and convoluted Type 9 passwords.

- VRF-Aware DHCP Option 82 with IANA Settings

New Features in Release 15.5(1)SY4

The sections below describe the new features in Release 15.5(1)SY4, 12 September 2019:

- New Hardware Features in Release 15.5(1)SY4, page 53
- New Software Features in Release 15.5(1)SY4, page 53

New Hardware Features in Release 15.5(1)SY4

None.

New Software Features in Release 15.5(1)SY4

- Password Hardening:
  - Deprecation of Type 4 passwords.
  - Warnings for Type 0, Type 5, and Type 7 passwords.
- Secure Field Programmable Gate Array (FPGA) Support
- **show plat nat translation statistics** command to display NAT Netflow utilization.
- Support for CISCO-NAT-STAT-MIB

Secure FPGA Support

Secure FPGA is a feature to protect Gold region of FPGA Serial Peripheral Interface (SPI) flash. FPGA prevents any modifications to Gold region of FPGA flash. Cisco IOS achieves this by bundling the latest secure FPGA image and auto-upgrading the Gold and Upgrade regions of FPGA flash to this image. Release 15.5(1)SY4 introduces a change to Cisco IOS FPGA auto-upgrade procedure.

Note Before proceeding with the upgrade to Cisco IOS Release 15.5(1)SY4, see Secure Field Programmable Gate Array and Performing FPGA Upgrade for complete information about the change in FPGA auto-upgrade procedure and how to perform FPGA upgrade.

New Features in Release 15.5(1)SY3

The sections below describe the new features in Release 15.5(1)SY3, 27 March 2019:

- New Hardware Features in Release 15.5(1)SY3, page 53
- New Software Features in Release 15.5(1)SY3, page 54

New Hardware Features in Release 15.5(1)SY3

None.

New Software Features in Release 15.5(1)SY3

- Support for PIM Join to IGMP Proxy

New Features in Release 15.5(1)SY2

The sections below describe the new features in Release 15.5(1)SY2, 17 September 2018:

- New Hardware Features in Release 15.5(1)SY2, page 54
- New Software Features in Release 15.5(1)SY2, page 54

New Hardware Features in Release 15.5(1)SY2

None.

New Software Features in Release 15.5(1)SY2

- VPLS BGP-based Autodiscovery High Availability
- Interface Template ACL Support

New Features in Release 15.5(1)SY1

These sections describe the new features in Release 15.5(1)SY1, 8 March 2018:

- New Hardware Features in Release 15.5(1)SY1, page 54
- New Software Features in Release 15.5(1)SY1, page 54

New Hardware Features in Release 15.5(1)SY1

None.

New Software Features in Release 15.5(1)SY1

- SDA – Phase 1.1
  - L2 Overlay, MAC based EID
  - Broadcast underlay support/Link Local Multicast
  - LISP IPv4 Extranet
  - Egress WCCP support with SDA fabric
- PnP over VRF
- Single Chassis VSS
- URL Redirect Priority Enhancement
- OpenFlow
- Auto Install/ZTP

- PKI OCSP

New Features in Release 15.5(1)SY

These sections describe the new features in Release 15.5(1)SY, 22 May 2017:

- New Hardware Features in Release 15.5(1)SY, page 55
- New Software Features in Release 15.5(1)SY, page 55

New Hardware Features in Release 15.5(1)SY

- C6800-8P40G
- C6800-8P40G-XL

New Software Features in Release 15.5(1)SY

None.

Software Features from Earlier Releases

Use Cisco Feature Navigator to display supported features that were introduced in earlier releases.

Unsupported Features

The following features are not supported:

- MACsec Key Agreement Protocol (MKA)
- Smart Install
- Data Link Switching (DLSw)
- Serial Tunneling (STUN)
- Bisync Serial Tunnel (BSTUN)
- Airline Product Set (ALPS)
- Source-Route Bridging (SRB)
- Source-Route Translational Bridge (SRTLB)
- Remote Source-Route Bridging (RSRB)
- SNA Switching Services (SNASw)
- DownStream Physical Unit (DSPU)
- Logical Link Control (LLC)
- Cisco Link Services (CLS)
- Qualified Logical Link Control (QLLC)
- Token Ring Switching

- Asynchronous Point of Sale (APOS)
- Bisync IP (BiP)

Restrictions for Release 15.5(1)SY13

None.

Restrictions for Release 15.5(1)SY12

None.

Restrictions for Release 15.5(1)SY11

None.

Restrictions for Release 15.5(1)SY10

None.

Restrictions for Release 15.5(1)SY9

None.

Restrictions for Release 15.5(1)SY8

None.

Restrictions for Release 15.5(1)SY7

None.

Restrictions for Release 15.5(1)SY6

None.

Restrictions for Release 15.5(1)SY5

None.

Restrictions for Release 15.5(1)SY4

Identifier	Component	Description
CSCvp49126	cat6000-acl	Static NAT entries not updated after "clear plat flow ip"
CSCvr07662	cat6000-acl	DAI feature conflict with DHCP snooping feature
CSCvq03487	cat6000-acl	Dynamic NAT entries count not cleared after flow entry timeout

Restrictions for Release 15.5(1)SY3

Identifier	Component	Description
CSCvp49120	accsw-ease-of-use	With vstack and its related CLIs enabled C6k ISSU upgrade to 15.5(1)SY3 will fail

Restrictions for Release 15.5(1)SY2

Identifier	Component	Description
CSCvi62529	cat6000-routing	L2 traffic ingress/egress in STDBY SUP going down after SSO and stdby SUP is UP

Restrictions for Release 15.5(1)SY1

Identifier	Component	Description
CSCvi28828	nat	Dynamic Nat preferred over Static Nat with Route maps, For overlapping IP addresses.
CSCvf91588		DNA-SA : Remote mac becomes invalid in l2fib on shutting down high priority rloc
CSCvf90572	lisp	L2 Map-cache entry taking 52 sec to learn for remote MAC EID on reload of remote peer
CSCvf94336	sisf	MAC shown as unreachable after 5min of traffic flow in "show device-tracking database Mac"
CSCvg87913	pnpa	Cat6K-PnP: Cisco Cloud Discovery is not supported on cat6K vrf management interface
CSCvf50885	autoinstall	Cat6K-PnP: %Error opening tftp://255.255.255.255/ciscortr.cfg

Restrictions for Release 15.5(1)SY

- C6800-8P40G card can operate only in 40G mode.

- Linecards listed below with Hardware version 2.1 or later has a new hardware component and gets shipped with a new ROMMON image version 15.2(1r)SYL3.

PID	Hardware version	IOS release	Restriction
C6800-32P10G-XL C6800-32P10G C6800-16P10G-XL C6800-16P10G C6800-8P10G-XL C6800-8P10G	2.1 or later	IOS versions 15.2(1)SY4 or later, 15.4(01)SY02 or later, 15.5(1)SY or later	None
		IOS versions earlier than 15.2(1)SY4, 15.4(01)SY02, 15.5(1)SY	Linecard will continue to work without Onboard Failure Logging (OBFL) functionality. Upgrading to supported IOS is required for OBFL to work.
	Earlier than 2.1	IOS versions 15.2(1)SY4 or later, 15.4(01)SY02 or later, 15.5(1)SY or later	None
		IOS versions earlier than 15.2(1)SY4, 15.4(01)SY02, 15.5(1)SY	None

- Linecards mentioned below with Hardware version 2.2 or later has a new hardware component and gets shipped with a new ROMMON image version 15.2(02r)SYL3.

PID	Hardware version	IOS release	Restriction
C6800-X-16P10G C6800-X-LE-16P10G	2.2 or later	IOS versions 15.2(1)SY4 or later, 15.4(01)SY02 or later, 15.5(1)SY or later	None
		IOS versions earlier than 15.2(1)SY4, 15.4(01)SY02, 15.5(1)SY	Linecard will continue to work without Onboard Failure Logging (OBFL) functionality. Upgrading to supported IOS is required for OBFL to work.
	Earlier than 2.2	IOS versions 15.2(1)SY4 or later, 15.4(01)SY02 or later, 15.5(1)SY or later	None
		IOS versions earlier than 15.2(1)SY4, 15.4(01)SY02, 15.5(1)SY	None

Caveats in Release 15.5(1)SY13

Caveats Open in Release 15.5(1)SY13

None.

Caveats Resolved in Release 15.5(1)SY13

Identifier	Component	Description
CSCwf54007	isis	Cisco IOS and IOS XE Software IS-IS Denial of Service Vulnerability
CSCwe55871	ssh	Cisco IOS and Cisco IOS XE Software Command Authorization Bypass Vulnerability

Caveats in Release 15.5(1)SY12

Caveats Open in Release 15.5(1)SY12

None.

Caveats Resolved in Release 15.5(1)SY12

Identifier	Component	Description
CSCwd48113	cat6000-l2	SDA - 6800 L2 Handoff Border not Learning MAC Addresses
CSCwe55871	ssh	Cisco IOS and Cisco IOS XE Software Command Authorization Bypass Vulnerability

Caveats in Release 15.5(1)SY11

Caveats Open in Release 15.5(1)SY11

None.

Caveats Resolved in Release 15.5(1)SY11

Identifier	Component	Description

CSCvy45135	polaris-aaa	RADIUS requests to ISE dropped due to wrong Message-Authenticator attribute

Caveats in Release 15.5(1)SY10

Caveats Open in Release 15.5(1)SY10

None.

Caveats Resolved in Release 15.5(1)SY10

Identifier	Component	Description
CSCwb12806	cat6000-ipc	Crash on Cat6800 sup 2T while processing incoming DHCP packet with ip helper-address as source
CSCwc49173	cat6000-l2	SCP messages takes time when CTS sessions are closed during LC reset

Caveats in Release 15.5(1)SY9

Caveats Open in Release 15.5(1)SY9

None.

Caveats Resolved in Release 15.5(1)SY9

Identifier	Component	Description
CSCvz39074	cat6000-hw-fwding	Cat6K OSPF FRR ELIF stuck in Adjacency table
CSCwa56283	cat6000-firmware	Sup6T/6880-X - seeing corrupted control-plane packets (udld,lacp,stp) due to VLAN number corruption

Caveats in Release 15.5(1)SY8

Caveats Open in Release 15.5(1)SY8

None.

Caveats Resolved in Release 15.5(1)SY8

Identifier	Component	Description
CSCvx46955	l2vpn	L2VPN 0.0.0.0/96 entry problem
CSCvx58135	cat6000-l2-infra	C6880 Cannot delete flowcontrol send config under port
CSCvx37374	cat6000-env	Cat6K Sup6T drops ARP packets on 40G interfaces
CSCvz20517	cat6000-netflow	pnp startup-vlan <vlan> config triggers NDE_0 interface to come up/up under show cdp interface

Caveats in Release 15.5(1)SY7

Caveats Open in Release 15.5(1)SY7

None.

Caveats Resolved in Release 15.5(1)SY7

Identifier	Component	Description
CSCvv01053	cat6000-ha	C6509-E/Sup2T VSS specific traffic down after boot up the SW1
CSCvv18136	mfib	PIM feature cannot be enabled under SVI
CSCvv65437	pnpa	Cat6k - PNP startup vlan not advertised in CDP TLV after switchport configuration
CSCvv92364	cat6000-hw-fwd-ing	"CM INTR Task" Holding Memory Increasing along with "CM INTR Task" high CPU.
CSCvv93342	mcast-fib	Linecard crash due to memory corruption due to multicast
CSCvw12603	mcast-pim	MFIB_IPC and IPC NOBLOCK Error logs print on PIM Assert generation after upgrade to 155-1.SY4
CSCvw45714	aaa	Secret sent in clear-text via TACACS+ command accounting/authorization with algorithm hashing config
CSCvw57370	cat6000-routing	Cat6K - ARP adjacencies programmed as MPLS entries in HW CEF when OSPF IP FRR is configured
CSCvw70243	cat6000-l2	Port-channel with min-links flaps after shut/no-shut.

Caveats in Release 15.5(1)SY6

Caveats Open in Release 15.5(1)SY6

Identifier	Component	Description
CSCvv65993	config-sync	Cat6500 SUP2T: format slavebootdisk failed on 5th slot

Caveats Resolved in Release 15.5(1)SY6

Identifier	Component	Description
CSCvt08994	cts	Switch ends up in a crash or high CPU while processing CTS egress policy of invalid SGT as -1 or ANY
CSCvr82708	sisf	Device crash when upgrading via ISSU
CSCvs53186	cat6000-dot1x	SISF crash in 6807-XL switch with 15.5(1)SY3
CSCvt21717	cat6000-acl-fwding	Undefined ACL under "ip multicast boundary" will punt traffic to CPU
CSCvt26023	parser	Cat6800 crashes when term shell is used
CSCvt96939	cat6000-hw-fwding	HSRP VMAC missing in one or more EARL's with VPLS usecase in SVI
CSCvu12905	cat6000-l2-mcast	Cat6k - Sup2T - DHCPv6 control packets snooped by MLD when forwarded over VPLS circuit

Caveats in Release 15.5(1)SY5

Caveats Open in Release 15.5(1)SY5

None.

Caveats Resolved in Release 15.5(1)SY5

Identifier	Component	Description
CSCvg45950	sap	packet drop seen intermittently if 40G traffic sent via cts interface
CSCvi48253	pki	Self-signed certificates expire on 00:00 1 Jan 2020 UTC, cannot be created after that time
CSCvj47973	cat6000-hw-fwding	Control Plane Interface not showing UP status.
CSCvq97772	cat6000-acl	Switch may crash when processing a DHCP offer on a tunnel interface with DHCP snooping enabled
CSCvr02688	aaa	Reload after reconfiguring 'login block-for' and 'login quiet-mode access-class'
CSCvr04928	cat6000-span	ERSPAN Destination on 6800 Sup 6T VSS does not replicate packets to destination port
CSCvr06927	flexible-netflow	CPUHOG errors occur and LC crash after executing "show flow monitor x cache format table"
CSCvr23401	cat6000-cts	C6K Switch adding Device SGT to proxy generated IGMP leave messages while keeping End host src IP
CSCvr37717	mcast-pim	Crash due to PIM process
CSCvr51938	cat6000-acl	Crash on DHCP packet validation
CSCvr83942	cat6000-acl	The active switch crashes in dhcp process while upgrading ROMMON/Software version in the standby

Caveats in Release 15.5(1)SY4

Caveats Open in Release 15.5(1)SY4

Identifier	Component	Description
CSCvq89131	cat6000-ha	ISSU - SUP2T-HA - FIB XDR Client error on LV
CSCvq90646	cat6000-acl	NAT traffic from outside to inside dropped during ISSU

Caveats Resolved in Release 15.5(1)SY4

Identifier	Component	Description
CSCuv90519	ipsec-core	IKEv2 session fails to come up after tunnel source address change
CSCvb89928	parser	Cat3850 crashed with mips64_linux_iosd_ngwc core during reload the 3 member stack
CSCvd04425	cdp	c6500 no response to CDP trigger
CSCve63165	ssh	ASR903 RSP1 crashes @ ssh_buffer_append, ssh2_packet_start
CSCvf33000	snmp	Add CLI command to block SNMP report for "unknownSnmpEngineID" when SNMP ACL is configured.
CSCvh55744	ssh	SSH password length restricted to 25.
CSCvh61330	ssh	3650 -- high CPU due to TTY Background process

CSCvj85568	xdr	XDR disabled logs should be printed with a higher severity
CSCvk56331	ipsec-core	Initial contact in IKEv1 phase 2 rekey (QM1) causes all crypto sessions to drop
CSCvm73100	cat6000-acl	cat6880x : Crash due to check heaps_process memory corruption
CSCvn98904	sap	Standby reloads continuously in VSS if the configuration contains AES encryption and macsec (CTS)
CSCvo35441	cat6000-env	Cat6832 VSS "Standby console disabled" shows in show tech
CSCvo40575	ribinfra	Distribute-list with route-map blocks all OSPF IPv6 routes
CSCvo58195	ip	HSRP VIP is not reachable locally
CSCvo90231	bgp	spurious accesses are seen in show alignment output with BGP
CSCvp26761	cat6000-snmp	pethPsePortOnOffNotification traps are there even if it is disabled
CSCvp39459	cat6000-mcast	cat6k ipv6 mld snooping explicit-tracking ageing counter error
CSCvp68962	cat6000-diag	C6807-XL VSS with Quad Supervisors showing minor error in module/slot 3
CSCvp70362	cat6000-routing	Direct connection ping fail after reloading full-chassis.
CSCvp71334	sisf	Traceback seen on XTR
CSCvq09071	cat6000-mpls	ECMP in the MPLS core is broken with "ip cef accounting non-recursive" configured
CSCvq25824	cat6000-acl	SUP2T - can't delete SVI due to Device tracking
CSCvq73364	mcast-fib	mVPN - Multicast packets dropped and "%MFIB-SW2-3-MFIB_CTXT_DEPTH_EXCEEDED" printed continuously

Caveats in Release 15.5(1)SY3

Caveats Open in Release 15.5(1)SY3

Identifier	Component	Description
CSCvo35441	cat6000-env	Cat6832 VSS "Standby console disabled" shows in show tech
CSCvo69942	cat6000-l2	sup6t // mst // delay in flushing mac table after tcn
CSCvo82251	cat6000-l2	STP action before portchannel convergence complete when C6807 with sup6t boot up

Caveats Resolved in Release 15.5(1)SY3

Identifier	Component	Description
CSCvi86071	parser	Crash seen after configuring SCP path under archive
CSCvk73350	polaris-aaa	Change the default encryption type to type 9 for username <> secret
CSCvf84349	eigrp	Router crash on polling cEigrpPeerEntry
CSCvi55399	cat6000-l2-mcast	FIB Space limit reached, Some IPv6 Multicast routes may be absent from hardware tables
CSCvk29155	mcast-fib	multicast memory overlay linecard crashes
CSCvm12991	cat6k-vs-infra	Sup6T - VSDA link moves to up/down state after eFSU/ISSU and Standby Sup reload
CSCvm15692	cat6000-dot1x	Sup2T crashing at EPM when failing dot1x authentications
CSCvm37443	cat6000-diag	Cat6K- C68xx/sup6T/ TestNonDisruptiveLoopback failing on ALL ports due to Rx drops in Ginband
CSCvm61500	mcast-vpn	Mroute not switching to MDT data when the MDT default threshold is crossed
CSCvm69018	lisp	crash on polling lispMIB or during SNMP-walk
CSCvm94652	cat6000-hw-fwding	Observing STP/BPDU inconsistency issue with small packet padding enabled
CSCvm94759	cat6000-firmware	CAP1 traffic crossing 40G VSL on Sup6t from stdby-sup gets duplicated on port#10 due to no RBH FLTR
CSCvn04334	mcast-fib	Cat6k crash when try to read the mfib stats from a linecard
CSCvn05254	mcast-fib	Traffic not switched from MDT default to MDT data during a switchover
CSCvn07597	cat6000-fabric	Packet flows through Sup6t may experience constant, silent loss due to FPOE mis-programming.
CSCvn25014	bgp	Add support for mVPN overlay using C-signaling for BGP c-mroutes
CSCvn28983	cat6000-hw-fwding	C6800-32P10G-XL - Router MAC is not present on EARL2 of DFC.
CSCvn38590	polaris-cts	CTS policies download fails with Missing/Incomplete ACEs error
CSCvn38893	cat6000-hw-fwding	Cat68k CEF Adjacency table gets exhausted
CSCvn49823	cat6000-snmp	Watchdog crash due SNMP when polling OID SmonVlanIdStatsTable
CSCvn55765	cat6000-l2-mcast	%UTIL-3-TREE: Data structure error on cat6k
CSCvn72973	polaris-cts	Device is getting crashed on the "cts role-based enforcement"

CSCvo05604	cat6000-dot1x	Crash on ISE service template processing
CSCvo46820	cat6k-vs-infra	Some VSL are in 'probe_wait' state and SUP has 'minor error' after switchover

Caveats in Release 15.5(1)SY2

Caveats Open in Release 15.5(1)SY2

Identifier	Component	Description
CSCvm01965	cat6000-span	ERSPAN TX only no packets received, RX only receiving both TX and RX packets

Caveats Resolved in Release 15.5(1)SY2

Identifier	Component	Description
CSCvj04264	cat6000-l2	Storm-control configuration not propagated to physical interfaces
CSCvj33085	cat6000-fabric	Switch crashes at read sw counters
CSCuy25398	cat6000-firmware	6880x crashed after a port status change
CSCvb69966	ethernet-lldp	Memory leak under LLDP Protocol process
CSCvi10935	cat6000-firmware	Sup2T/6T- CTS enabled interface goes down intermittently with trace backs-15.3(1)SY2
CSCvi74405	cat6k-vs-infra	Ports on Sup2T based 6ks or 6880 switches may remain down after software upgrade
CSCvj22514	ip-acl	Telnet/ssh gets rejected with IPV6 Link-local address
CSCvj28680	cat6000-ltl	random duplicate DHCP Discover and DHCP Request in VSS 40gig link
CSCvk10393	cat6000-dot1x	Crash on clear mac stale-static address
CSCvk68167	cat6000-mcast	Memory corruption happen when bouncing interface
CSCvh22593	cat6000-l2-mcast	MLD snooping EHT limit not being honoured
CSCvi20960	accsw-fex	CDP packet dump on the console of 6800
CSCvi57667	cat6000-svc	Not able to session ASA module from SUP2T.
CSCvi90601	cat6000-hw-fwding	Cat6500: cfc installed module reset with remote command mod 3 show platform hardware earl statistics
CSCvj02398	cat6000-l2	Storm control configuration inconsistency for port-channels
CSCvj11676	cat6000-l2-mcast	6513/ VS-SUP2T-10G Crashes due to watchdog cause by PIM process
CSCvk28411	cat6000-firmware	10GB SFP and QSFP is showed as "no connector" in show interface status
CSCvk37681	sisf	C6807-XL-S2T-BUN crash after "no interface port-channel" command
CSCvh22583	cat6000-l2-mcast	Implementing EHT Ager for expiring aged entries.
CSCvk54610	cat6000-routing	Static mac address entry of SVI is present even if the SVI was deleted
CSCvm27795	cat6000-mpls	MPLS labels missprograming 6500 with "ip cef accounting non-recursive" enabled
CSCvj29126	aaa	RADIUS client on network fails to solicit PAC key from CTS even though the device has a valid PAC
CSCvi99432	cat6000-hw-fwding	CAT6: HSRP static RMAC/VMAC removed from from Earl during Transient state due to Duplicate VMAC
CSCvh66758	flexible-netflow	Big buffer exhaustion due to FNF

Identifier	Component	Description
CSCvj78871	cat6000-l2fib	ISSU_ERROR-SW1-3-MSG_MTU: ISSU L3 Manager Client(6022): Client failed to get mtu for message 12
CSCvk73821	cat6000-cm	CPUHOG with "CM main thrd" seen in ACL scale setup after reload,SSO and ACL modify

Caveats in Release 15.5(1)SY1

Caveats Open in Release 15.5(1)SY1

Identifier	Component	Description
CSCve22732	cat6000-diag	TestL3TcamMonitoring fails on T2 with 1G transceiver in 1/1 and traffic along with IPv4/IPv6 routes
CSCvi33424	cat6000-docs	All LISP/SDA configs to be removed before doing ISSU from 15.5(1)SY to 15.5(1)SY1 image

Caveats Resolved in Release 15.5(1)SY1

Identifier	Component	Description
CSCvc98461	cat6000-acl	IPv6 ND raguard policy breaks dhcp snooping
CSCvf56977	cat6000-acl	Duplicate ACL entries in ACL TCAM for dACLs
CSCvf39985	cat6000-firmware	6880X uplink remains down with third party switch
CSCvf61464	cat6000-firmware	6880X uplink remains down with third party switch upon continuous reload
CSCvd65374	cat6000-hw-fwding	CDP neighbors disappear when we change the sub-interface maximum-vlan vlan-id from default to any.
CSCvc49765	cat6000-l2-mcast	6500//SUP2T Multicast Streams get dropped when passing over VPLS Circuit
CSCvf34391	cat6000-l2-mcast	Traceback: MCVPLS holding memory on the Quadsup-ICS
CSCvf35279	cat6000-ltl	Ports are getting UDLD err-disabled on quadsup Sup2t while performing OIR
CSCve33442	cat6000-mpls	routed VPLS: Direct DHCP client is unable to obtain IP from DHCP server reachable via L3VPN
CSCve27925	cat6000-mcast	LTL stuck in PNDG state due to missing port deletion callback
CSCve84812	cat6000-mcast	Switch crash on configuring platform multicast forwarding fast-redirect
CSCvf53685	cat6000-mcast	Catalyst 6840-X crashes after removing vlans from virtual interface
CSCvf24298	cat6000-netflow	Crash seen @shared_label when reconfiguring tunnel with FNF
CSCvf48113	cat6000-qos	6716/6816 wrr-queue command not syncing correctly to port-group members
CSCvc59675	cat6k-vs-infra	Multicast traffic being switched on both hardware and software simultaneously
CSCvh92805	fib	Crash@show_cef_broker_command(0x4d3cf00)+0x4e
CSCvd35137	cat6000-env	Sup6T may experience a Nested crash that causes the switch to hang instead of rebooting
CSCvd83170	cat6000-hw-fwding	6500sup2t VSS - MAC addresses learnt over VPLS are timed out prematurely
CSCvd65374	cat6000-hw-fwding	CDP neighbors disappear when we change the sub-interface maximum-vlan vlan-id from default to any.
CSCuz63959	cat6000-firmware	GLC-LH-SMD unable to link up
CSCvb94345	cat6000-firmware	SUP crash due to Reason: Failed TestL3TcamMonitoring
CSCvd07970	cat6000-l2-infra	6880 "flowcontorl send off" command disappear from show run
CSCvc49765	cat6000-l2-mcast	6500//SUP2T Multicast Streams get dropped when passing over VPLS Circuit

Identifier	Component	Description
CSCvc59675	cat6k-vs-infra	Multicast traffic being switched on both hardware and software simultaneously
CSCvd46498	ip	Inconsistency between ARP and CEF leads to packet drop - Intermittent for Cat6K
CSCsq42459	os	No log message of falling the cpu threshold
CSCvd35070	tcl-bleeding	Running a script through TCLSH when all TTY's are used results in a crash

Caveats in Release 15.5(1)SY

Caveats Open in Release 15.5(1)SY

Identifier	Component	Description
CSCvd35137	cat6000-env	Sup6T may experience a Nested crash that causes the switch to hang instead of rebooting
CSCvd83170	cat6000-hw-fwding	6500sup2t VSS - MAC addresses learnt over VPLS are timed out prematurely
CSCvd65374	cat6000-hw-fwding	CDP neighbors disappear when we change the sub-interface maximum-vlan vlan-id from default to any.
CSCuz63959	cat6000-firmware	GLC-LH-SMD unable to link up
CSCvb94345	cat6000-firmware	SUP crash due to Reason: Failed TestL3TcamMonitoring
CSCvd07970	cat6000-l2-infra	6880 "flowcontorl send off" command disappear from show run
CSCvc49765	cat6000-l2-mcast	6500//SUP2T Multicast Streams get dropped when passing over VPLS Circuit
CSCvc59675	cat6k-vs-infra	Multicast traffic being switched on both hardware and software simultaneously
CSCvd46498	ip	Inconsistency between ARP and CEF leads to packet drop - Intermittent for Cat6K
CSCsq42459	os	No log message of falling the cpu threshold
CSCvd35070	tcl-bleeding	Running a script through TCLSH when all TTY's are used results in a crash

Troubleshooting

These sections describe troubleshooting guidelines for the Catalyst 6500 series switch configuration:

- System Troubleshooting, page 71
- Module Troubleshooting, page 71
- Additional Troubleshooting Information, page 71

System Troubleshooting

This section contains troubleshooting guidelines for system-level problems:

- When the system is booting and running power-on diagnostics, do not reset the switch.
- After you initiate a switchover from the active Supervisor engine to the redundant Supervisor engine, or when you insert a redundant Supervisor engine in an operating switch, always wait until the Supervisor engines have synchronized and all modules are online before you remove or insert modules or Supervisor engines or perform another switchover.
- If you have an interface whose speed is set to **auto** connected to another interface whose speed is set to a fixed value, configure the interface whose speed is set to a fixed value for half duplex. Alternately, you can configure both interfaces to a fixed-value speed and full duplex.

Module Troubleshooting

This section contains troubleshooting guidelines for module problems:

- When you hot insert a module into a chassis, be sure to use the ejector levers on the front of the module to seat the backplane pins properly. Inserting a module without using the ejector levers might cause the Supervisor engine to display incorrect messages about the module. For module installation instructions, refer to the *Catalyst 6500 Series Module Installation Guide*.
- Whenever you connect an interface that has duplex set to autonegotiate to an end station or another networking device, make sure that the other device is configured for autonegotiation as well. If the other device is not set to autonegotiate, the autonegotiating port will remain in half-duplex mode, which can cause a duplex mismatch resulting in packet loss, late collisions, and line errors on the link.

Additional Troubleshooting Information

For additional troubleshooting information, refer to the publications at this URL:

http://www.cisco.com/c/en/us/support/switches/catalyst-6500-series-switches/tsd-products-support-troubleshoot-and-alerts.html

Notices

The following notices pertain to this software license.

OpenSSL/Open SSL Project

This product includes software developed by the OpenSSL Project for use in the OpenSSL Toolkit (http://www.openssl.org/).

This product includes cryptographic software written by Eric Young (eay@cryptsoft.com).

This product includes software written by Tim Hudson (tjh@cryptsoft.com).

License Issues

The OpenSSL toolkit stays under a dual license, i.e. both the conditions of the OpenSSL License and the original SSLeay license apply to the toolkit. See below for the actual license texts. Actually both licenses are BSD-style Open Source licenses. In case of any license issues related to OpenSSL please contact openssl-core@openssl.org.

OpenSSL License:

Copyright © 1998-2007 The OpenSSL Project. All rights reserved.

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:

1. Redistributions of source code must retain the copyright notice, this list of conditions and the following disclaimer.
2. Redistributions in binary form must reproduce the above copyright notice, this list of conditions, and the following disclaimer in the documentation and/or other materials provided with the distribution.
3. All advertising materials mentioning features or use of this software must display the following acknowledgment: “This product includes software developed by the OpenSSL Project for use in the OpenSSL Toolkit (http://www.openssl.org/)”.
4. The names “OpenSSL Toolkit” and “OpenSSL Project” must not be used to endorse or promote products derived from this software without prior written permission. For written permission, please contact openssl-core@openssl.org.
5. Products derived from this software may not be called “OpenSSL” nor may “OpenSSL” appear in their names without prior written permission of the OpenSSL Project.
6. Redistributions of any form whatsoever must retain the following acknowledgment:

   “This product includes software developed by the OpenSSL Project for use in the OpenSSL Toolkit (http://www.openssl.org/)”.

THIS SOFTWARE IS PROVIDED BY THE OpenSSL PROJECT “AS IS”' AND ANY EXPRESSED OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE OpenSSL PROJECT OR ITS CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

This product includes cryptographic software written by Eric Young (eay@cryptsoft.com). This product includes software written by Tim Hudson (tjh@cryptsoft.com).

Original SSLeay License:

Copyright © 1995-1998 Eric Young (eay@cryptsoft.com). All rights reserved.

This package is an SSL implementation written by Eric Young (eay@cryptsoft.com).

The implementation was written so as to conform with Netscapes SSL.

This library is free for commercial and non-commercial use as long as the following conditions are adhered to. The following conditions apply to all code found in this distribution, be it the RC4, RSA, lhash, DES, etc., code; not just the SSL code. The SSL documentation included with this distribution is covered by the same copyright terms except that the holder is Tim Hudson (tjh@cryptsoft.com).

Copyright remains Eric Young's, and as such any Copyright notices in the code are not to be removed. If this package is used in a product, Eric Young should be given attribution as the author of the parts of the library used. This can be in the form of a textual message at program startup or in documentation (online or textual) provided with the package.

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:

1. Redistributions of source code must retain the copyright notice, this list of conditions and the following disclaimer.
2. Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.
3. All advertising materials mentioning features or use of this software must display the following acknowledgement:

   "This product includes cryptographic software written by Eric Young (eay@cryptsoft.com)".

   The word 'cryptographic' can be left out if the routines from the library being used are not cryptography-related.
4. If you include any Windows specific code (or a derivative thereof) from the apps directory (application code) you must include an acknowledgement: "This product includes software written by Tim Hudson (tjh@cryptsoft.com)".

THIS SOFTWARE IS PROVIDED BY ERIC YOUNG "AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE AUTHOR OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

The license and distribution terms for any publicly available version or derivative of this code cannot be changed. i.e. this code cannot simply be copied and put under another distribution license [including the GNU Public License].

Communications, Services, and Additional Information

- To receive timely, relevant information from Cisco, sign up at Cisco Profile Manager.
- To get the business impact you're looking for with the technologies that matter, visit Cisco Services.
- To submit a service request, visit Cisco Support.

- To discover and browse secure, validated enterprise-class apps, products, solutions and services, visit Cisco Marketplace.
- To obtain general networking, training, and certification titles, visit Cisco Press.
- To find warranty information for a specific product or product family, access Cisco Warranty Finder.

Cisco Bug Search Tool

Cisco Bug Search Tool (BST) is a web-based tool that acts as a gateway to the Cisco bug tracking system that maintains a comprehensive list of defects and vulnerabilities in Cisco products and software. BST provides you with detailed defect information about your products and software.

This document is to be used in conjunction with the *Catalyst 6500 Series Cisco IOS Software Configuration Guide* publication.