Cisco Nexus 7000 M3-Series 48-Port 1 and 10 Gigabit Ethernet Module

The Cisco Nexus® 7000 M3-Series 48-Port 1 and 10 Gigabit Ethernet Module is a versatile I/O module with a comprehensive feature set that offers wire-rate performance on each port. The module provides deep buffers and high-capacity ternary content-addressable memory (TCAM), making this module an excellent choice for building high-density, low-latency, scalable data centers.

Product Overview

Cisco Nexus 7000 Series Switches are the foundation of Cisco® Unified Fabric solutions. Designed to meet the requirements of mission-critical data centers, these switches deliver exceptional availability, outstanding scalability, and the proven and comprehensive Cisco NX-OS Software data center switching feature set.

The first in the next generation of data center switching platforms, the Cisco Nexus 7000 Series provides integrated resilience combined with features optimized specifically for availability, reliability, scalability, and ease of management. The Cisco Nexus 7000 Series fabric architecture scales beyond 17 terabits per second (Tbps) and is designed to support high-density 10, 40, and 100 Gigabit Ethernet deployments. Table 1 summarizes the 1 and 10 Gigabit Ethernet port density of switches in this platform.

Table 1.   Cisco Nexus 7000 Series Switches 1 and 10 Gigabit Ethernet Port Density

Cisco Nexus 7000 Series Chassis	Maximum Number of Wire-Rate 1 and 10 Gigabit Ethernet Ports
Cisco Nexus 7000 18-Slot Switch	768
Cisco Nexus 7000 10-Slot Switch	384
Cisco Nexus 7000 9-Slot Switch	336
Cisco Nexus 7000 4-Slot Switch Support for Cisco Nexus 7000 4-Slot Switch chassis will be available in a later Software Release	96

The Cisco Nexus 7000 M3-Series 48-Port 1 and 10 Gigabit Ethernet Module (Figure 1) is a high-performance, high-density 1 and 10 Gigabit Ethernet module designed for the Cisco Nexus 7000 Series. It delivers up to 768 wire-rate 1 and 10 Gigabit Ethernet ports in a single Cisco Nexus 7000 18-Slot Switch chassis. The module delivers 720 million packets per second (mpps) of distributed Layer 2 and 3 forwarding and up to 480 Gbps of data throughput. A Cisco Nexus 7000 18-Slot Switch fully populated with sixteen 48-port 1 and 10 Gigabit Ethernet M3-Series modules can deliver up to 11.5 bpps and 15.4 Tbps of switching performance.

Figure 1.   Nexus 7000 M3 48-Port 1/10G Card

Features and Benefits

The Cisco Nexus 7000 M3-Series modules are powered by the proven and widely deployed NX-OS operating system. The modules integrate a broad set of data center switching technologies, including both industry standards and Cisco's own innovations such as these:

- General Packet Radio Service (GPRS) Tunneling Protocol (GTP) hashing: This feature uses the advanced packet parsing capabilities of the M3-Series modules to provide enhanced port-channel and equal-cost multipath (ECMP) load balancing for GTP packets.

- Virtual Extensible LAN (VXLAN): VXLAN enables organizations to build highly scalable virtual overlay networks for virtualized environments. It also provides the architectural flexibility and agility required to scale cloud deployments with repeatable pods in different Layer 2 domains and to migrate virtual machines between servers across Layer 3 networks.

- Advanced data center interconnect (DCI) protocols: Advanced protocols such as Cisco Overlay Transport Virtualization (OTV), Locator/ID Separation Protocol (LISP), Multiprotocol Label Switching (MPLS), and Virtual Private LAN Service (VPLS) offer customers a broad choice of technologies to transparently interconnect their data centers and to extend applications across geographically dispersed data center sites.

- Virtual device context (VDC): This feature enables the virtualization of a single physical device as multiple logical devices. Each provisioned logical device is configured and managed as if it were a separate physical device.

- Exceptional integrated hardware security capabilities:
  - MAC Security (MACsec) at wire rate with 128- and 256-bit encryption on all ports, supporting both key agreement protocols (Security Association Protocol [SAP] and MACsec Key Agreement [MKA]) in hardware
  - Cisco TrustSec® technology and access control list (ACL) processing for security-group tags (SGTs) on all ports
  - Control-Plane Policing (CoPP), which protects the supervisor CPU from excessive traffic
  - ACL counters and logging capability to provide deeper packet visibility
  - Layer 2–to–Layer 4 ACL for both IPv4 and IPv6 traffic

- Onboard fabric services accelerator (FSA): The accelerator provides higher performance and greater scalability for distributed fabric services such as Bidirectional Forwarding Detection (BFD) and Cisco NetFlow.
- Cisco FabricPath: This technology enables organizations to build resilient, flexible, and massively scalable Layer 2 networks. FabricPath provides investment protection by allowing existing spanning-tree-based deployments to be connected to a FabricPath network.
- Cisco Nexus 2000 Series Fabric Extenders: The Cisco Nexus 7000 M3-Series modules can be used with the Cisco Nexus 2000 Series Fabric Extenders. These fabric extenders are designed to simplify data center architecture and operations by dramatically reducing the number of points of management.

This broad set of foundational and advanced features available on the Cisco Nexus 7000 M3-Series 48-Port 1 and 10 Gigabit Ethernet Module provides flexible deployment options and investment protection for organizations that are consolidating their data centers and migrating to high-density 10 Gigabit Ethernet networks.

Wire-Rate 256-Bit AES Encryption

The Cisco Nexus 7000 M3-Series 48-Port 1 and 10 Gigabit Ethernet Module supports wire-rate 256-bit Advanced Encryption Standard (AES) MACsec encryption on all ports at all speeds. This encryption can be used to secure:

- Data center uplinks to campus or MPLS cores
- DCI links when using OTV, virtual port channel (vPC), direct links, etc.
- vPC and FabricPath links within a data center

High-Performance Fabric Services Accelerator

The Cisco Nexus 7000 M3-Series 48-Port 1 and 10 Gigabit Ethernet Module has an onboard high-performance coprocessor: a fabric services accelerator. The FSA is directly connected to the M3-Series switch on a chip (SoC) with high-speed links. This approach enables the module to provide higher performance and greater scalability for distributed fabric services such as BFD and NetFlow.

Product Specifications

Table 2 summarizes the specifications for the Cisco Nexus 7000 M-Series 48-Port 1 and 10 Gigabit Ethernet Module.

Table 2.   Product Specifications

Item	Specification
System	
Product compatibility	• Supported on Cisco Nexus 7000 4-, 9-, 10-, and 18-Slot Switch chassis • Supported with Cisco Fabric-2 modules • Supported with Cisco Nexus 7000 Series Supervisor 2 and Supervisor 2E Modules
Software compatibility	Cisco NX-OS Software Release 8.0 or later
Memory	8 GB of dynamic RAM (DRAM)

Front-panel LEDs	• Status
	  ◦ Green (operational)
	  ◦ Orange (module booting)
	  ◦ Red (fault)
	• Link
	  ◦ Green (port enabled and connected)
	  ◦ Orange (port disabled)
	  ◦ Off (port enabled and not connected)
	  ◦ Blinking green and orange in conjunction with blue ID LED (port flagged for identification; beacon)

Item	Specification

	• ID
	  ◦ Blue (operator has flagged this card for identification; beacon)
	  ◦ Off (module not flagged)

Programming interfaces	• Cisco NX-API • XML • Scriptable command-line interface (CLI) • Cisco Data Center Network Manager (DCNM) web services • Python and Tcl • Puppet and Chef • Cisco Embedded Event Manager (EEM)
Physical Interfaces	
Connectivity	48 ports of 1 and 10 Gigabit Ethernet (Small Form-Factor Pluggable [SFP] and Enhanced SFP [SFP+])
Port density	• 768 x 10 Gigabit Ethernet ports in Cisco Nexus 7000 18-Slot chassis • 384 x 10 Gigabit Ethernet ports in Cisco Nexus 7000 10-Slot chassis • 336 x 10 Gigabit Ethernet ports in Cisco Nexus 7000 9-Slot chassis • 96 x 10 Gigabit Ethernet ports in Cisco Nexus 7000 4-Slot chassis[1]
MACsec	All 48 ports have built-in IEEE 802.1AE MACsec and an AES cipher with a 256-bit key
Queues per port	4 ingress and 8 egress
Virtual output queuing (VOQ) buffer	1.5 GB
Jumbo frames	Up to 9216 bytes for bridged and routed packets
Forwarding Engine	
Forwarding performance	720 mpps of Layer 2 and 3 forwarding capacity for both IPv4 and IPv6 packets
MAC address entries	384,000
VLANs	4096 per VDC
IPv4 entries	2 million
IPv6 entries	1 million
ACLs	128,000
Policers	8000
Environmental	
Physical dimensions	• Occupies one I/O module slot in a Cisco Nexus 7000 Series chassis • Dimensions: 1.733 x 15.3 x 21.9 in. (4.4 x 38.9 x 55.6 cm) • Weight: 12 lbs
Environmental conditions	• Operating temperature: 32 to 104°F (0 to 40°C) • Operational relative humidity: 5 to 90%, noncondensing • Storage temperature: -40 to 158°F (-40 to 70°C) • Storage relative humidity: 5 to 95%, noncondensing
Regulatory compliance	• EMC compliance • FCC Part 15 (CFR 47) (USA) Class A • ICES-003 (Canada) Class A • EN55022 (Europe) Class A • CISPR22 (International) Class A • AS/NZS CISPR22 (Australia and New Zealand) Class A • VCCI (Japan) Class A • KN32 (Korea) Class A • KN35 (Korea) Class A • CNS13438 (Taiwan) Class A • TCVN 7189 (Vietnam) • CISPR24 • EN55024 • EN50082-1

Item	Specification
	• EN61000-3-2 • EN61000-3-3 • EN61000-6-1 • EN300 386
Environmental standards	Designed to meet: • GR-1089-CORE[*] • GR-63-CORE[*] • ETSI[*] ◦ ETSI 300 019-2-1, Class 1.2 Storage ◦ ETSI 300 019-2-2, Class 2.3 Transportation[**] ◦ ETSI 300 019-2-3, Class 3.2 Stationary Use [*] Validation in progress [**] Some exceptions apply
Safety	• UL/CSA/IEC/EN 60950-1 • AS/NZS 60950
Warranty	Cisco Nexus 7000 Series Switches come with the standard Cisco 1-year limited hardware warranty.

Tables 3 and 4 summarize distances and options for 1 and 10 Gigabit Ethernet interfaces.

Table 3.   10 Gigabit Ethernet Interface Distances and Options

10 Gigabit Ethernet SFP+ Part Number	Wavelength (nanometers)	Fiber and Cable Types	Core Size (microns)	Model Bandwidth (MHz * km)[1]	Cable Distance[2]
SFP-10G-SR **SFP-10G-SR-S**[7]	850	• Multimode fiber (MMF; FDDI grade) • MMF (OM1) • MMF (400/400) • MMF (OM2) • MMF (OM3) • MMF (OM4)	• 62.5 • 62.5 • 50.0 • 50.0 • 50.0 • 50.0	• 160 • 200 • 400 • 500 • 2000 • 4700	• 26m • 33m • 66m • 82m • 300m • 400m
SFP-10G-LRM[4]	1310	Single-mode fiber (SMF)	G.652	-	300m
SFP-10G-LR **SFP-10G-LR-S**[7]	1310	SMF	G.652	-	10 km
SFP-10G-ER[8] **SFP-10G-ER-S**[7, 8]	1550	SMF	G.652	-	40 km[3]
SFP-10G-ZR **SFP-10G-ZR-S**[7, 9]	1550	SMF	G.652	-	80 km
DWDM-SFP10G-xx.xx=	[5]	SMF	-	-	[6]
SFP-H10GB-CUxM (x=1, 3, or 5)	-	Twinax cable assembly, passive	-	-	1, 3, or 5m
SFP-H10GB-ACUxM (x=7 or 10)	-	Twinax cable assembly, active	-	-	7 or 10m
SFP-10G-AOCxM (x=1, 2, 3, 5, 7, or 10)	-	Active optical cable assembly	-	-	1, 2, 3, 5, 7, or 10m
SFP-10G-BXU-I	1270	SMF	G.652	-	10 km
SFP-10G-BXD-I	1330	SMF	G.652	-	10 km

[1] Bandwidth is specified at the transmission wavelength.

[2] Minimum cabling distance for -SR, -LRM, -LR, and -ER modules is 2m according to IEEE 802.3ae.

[3] Links longer than 30 km are considered engineered links according to IEEE 802.3ae.

[4] A mode-conditioning patch is required for use over traditional MMF types such as FDDI-grade, OM1, and OM2. Please refer to the product bulletin: https://www.cisco.com/en/US/prod/collateral/modules/ps5455/product_bulletin_c25-530836.html. Note that MMF support with SFP-10G-LRM is on ports 41 to 48 only. 300m SMF support is applicable to all ports.

[5] See the dense wavelength-division multiplexing (DWDM) SFP optics data sheet for additional product numbers and information: https://www.cisco.com/en/US/prod/collateral/modules/ps5455/ps6576/data_sheet_c78-711186.html.

[6] Fibre Channel over Ethernet (FCoE) traffic is supported up to 80 km.

[7] No Fibre Channel over Ethernet (FCoE) support.

[8] Requires 5-dB 1550-nm fixed loss attenuator for greater than 20 km. Attenuator is available as a spare.

[9] Requires 15dB attenuator if Link Distance < 5km.

Requires 10dB attenuator if Link Distance is between 5km and 25km.

Requires 5dB attenuator if Link Distance is between 25km and 45km.

Attenuator is available as a spare.

Table 4.   1 Gigabit Ethernet Interface Distances and Options

Gigabit Ethernet SFP Part Number	Wavelength (nm)	Fiber and Cable Type	Core Size (microns)	Model Bandwidth (MHz * km)	Cable Distance
GLC-SX-MMD	850	• MMF (FDDI grade) • MMF (OM1) • MMF (400/400) • MMF (OM2) • MMF (OM3 and OM4)	• 62.5 • 62.5 • 50 • 50 • 50	• 160 • 200 • 400 • 500 • 2000	• 220m • 275m • 500m • 550m • 1000m
GLC-LH-SMD	1310	MMF[1]	• 62.5 • 50 • 50	• 500 • 400 • 500	• 550m • 550m • 550m
		SMF	G.652	-	10 km
GLC-EX-SMD	1310	SMF	G.652	-	40 km
GLC-ZX-SMD	1550	SMF	G.652	-	70 to 100 km[2]
GLC-TE	-	Category 5	-	-	100m
GLC-BX-U	1310	SMF	G.652	-	10 km
GLC-BX-D	1490	SMF	G.652	-	10 km
CWDM-SFP-xxxx=	[3]	SMF	-	-	-
DWDM-SFP-xxxx=	[4]	SMF	-	-	-

[1] A mode-conditioning patch is required for use over traditional MMF types such as FDDI-grade, OM1, and OM2 cables. Please refer to the product bulletin: https://www.cisco.com/en/US/prod/collateral/modules/ps5455/product_bulletin_c25-530836.html.

[2] 1000BASE-ZX SFP can reach up to 100 km by using dispersion-shifted SMF or low-attenuation SMF. The distance depends on the fiber quality, number of splices, and connectors.

[3] See the CWDM SFP optics data sheet for additional product numbers and information: https://cisco.com/en/US/prod/collateral/modules/ps5455/ps6575/product_data_sheet09186a00801a557c.html.

[4] See the DWDM SFP optics data sheet for additional product numbers and information: https://cisco.com/en/US/prod/collateral/modules/ps5455/ps6576/product_data_sheet0900aecd80582763.html.

Note: This data sheet describes the hardware capabilities of the Cisco Nexus 7000 M3-Series 48-Port module. Please refer to the Cisco NX-OS Software release notes (https://www.cisco.com/c/en/us/support/switches/nexus-7000-series-switches/products-release-notes-list.html) or consult your Cisco representative to confirm the current or future NX-OS release required for any of these features.

Ordering Information

Table 5 provides ordering information for the Cisco Nexus 7000 M3-Series 48-Port 1 and 10 Gigabit Ethernet Module.

Table 5.   Ordering Information

Part Number	Product Description
N7K-M348XP-25L **N7K-M348XP-25L=**	Cisco Nexus 7000 M3-Series 48-Port 1/10G Ethernet Module (req. SFP/SFP+ modules)

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Printed in USA

C78-738173-03   04/18