

Cisco Nexus 7700 M3-Series 100 Gigabit Ethernet Module

The Cisco Nexus[®] 7700 M3-Series 100 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.

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 Cisco Nexus 7700 platform, which supports more than 83 terabits per second (Tbps), is the latest extension to the Cisco Nexus 7000 Series modular switches. The Cisco Nexus 7700 platform switches are operationally consistent with the existing Cisco Nexus 7000 Series Switches and have a similar system architecture. The Cisco Nexus 7700 platform switches are designed using the same application-specific integrated circuit (ASIC) technology and run on the same proven NX-OS releases as the Cisco Nexus 7000 Series Switches. Table 1 summarizes the 100 Gigabit Ethernet port density of switches in this platform.

Table 1. Cisco Nexus 7700 Platform Switches 100 Gigabit Ethernet Port Density

Cisco Nexus 7700 Platform Chassis	Maximum Number of Wire-Rate 100 Gigabit Ethernet Ports
Cisco Nexus 7700 18-Slot Switch	192
Cisco Nexus 7700 10-Slot Switch	96
Cisco Nexus 7700 6-Slot Switch	48
Cisco Nexus 7700 2-Slot Switch	12

The Cisco Nexus 7700 M3-Series 12-Port 100 Gigabit Ethernet Module (Figure 1) is a high-performance, high-density 100 Gigabit Ethernet module designed for the Cisco Nexus 7700 platform. It delivers up to 192 wire-rate 100 Gigabit Ethernet ports in a single Cisco Nexus 7700 18-Slot Switch chassis. The module delivers 1.8 billion packets per second (bps) of distributed Layer 2 and 3 forwarding and up to 1.2 Tbps of data throughput. A Cisco Nexus 7700 18-Slot Switch fully populated with sixteen 12-port 100 Gigabit Ethernet M3-Series modules can deliver up to 28.8 bpps and 38.4 Tbps of switching performance.

Figure 1. Nexus 7700 M3 12-Port 100G 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 7700 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 7700 M3-Series 12-Port 100 Gigabit Ethernet Module provides flexible deployment options and investment protection for organizations that are consolidating their data centers and migrating to 100 Gigabit Ethernet networks.

Wire-Rate 256-Bit AES Encryption

The Cisco Nexus 7700 M3-Series 12-Port 100 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 7700 M3-Series 12-Port 100 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 7700 M-Series 12-Port 100 Gigabit Ethernet Module.

Table 2. Product Specifications

Item	Specification
System	
Product compatibility	<ul style="list-style-type: none"> • Supported on Cisco Nexus 7700 2-, 6-, 10-, and 18-Slot Switch chassis • Supported with Cisco Fabric-2 modules • Supported with Cisco Nexus 7700 Supervisor 2E Modules
Software compatibility	Cisco NX-OS Software Release 8.0 or later
Memory	8 GB of dynamic RAM (DRAM)
Front-panel LEDs	<ul style="list-style-type: none"> • Status <ul style="list-style-type: none"> ◦ Green (operational) ◦ Orange (module booting) ◦ Red (fault) • Link <ul style="list-style-type: none"> ◦ 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) • ID

Item	Specification
	<ul style="list-style-type: none"> ◦ Blue (operator has flagged this card for identification; beacon) ◦ Off (module not flagged)
Programming interfaces	<ul style="list-style-type: none"> • 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	12 ports of 100 Gigabit Ethernet (Quad Small Form-Factor 28 Pluggable [QSFP28])
Port density	<ul style="list-style-type: none"> • 192 x 100 Gigabit Ethernet ports in Cisco Nexus 7700 18-Slot chassis • 96 x 100 Gigabit Ethernet ports in Cisco Nexus 7700 10-Slot chassis • 48 x 100 Gigabit Ethernet ports in Cisco Nexus 7700 6-Slot chassis • 12 x 100 Gigabit Ethernet ports in Cisco Nexus 7700 2-Slot chassis
MACsec	All 12 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	4 GB
Jumbo frames	Up to 9216 bytes for bridged and routed packets
Forwarding Engine	
Forwarding performance	28.8 bpps 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	<ul style="list-style-type: none"> • Occupies one I/O module slot in a Cisco Nexus 7700 platform chassis • Dimensions: 1.75 x 15.9 x 21.8 in. (4.4 x 40.39 x 55.37 cm) • Weight: 12 lbs
Environmental conditions	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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 • EN61000-3-2

Item	Specification
Environmental standards	<ul style="list-style-type: none"> • EN61000-3-3 • EN61000-6-1 • EN300 386 Designed to meet: <ul style="list-style-type: none"> • GR-1089-CORE[†] • GR-63-CORE[‡] • ETSI[†] <ul style="list-style-type: none"> ◦ 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 exception apply
Safety	<ul style="list-style-type: none"> • UL/CSA/IEC/EN 60950-1 • AS/NZS 60950
Warranty	Cisco Nexus 7700 platform switches come with the standard Cisco 1-year limited hardware warranty.

Table 3 summarizes distances and options for 100 Gigabit Ethernet Interface.

Table 3. 100 Gigabit Ethernet Interface Distances and Options

Cisco QSFP	Nominal Wavelength (nm)	Cable Type	Core Size (Microns)	Modal Bandwidth (MHz* km)	Connector Type	Cable Distance
Cisco QSFP-100G-SR4-S	850	MMF	50.0 50.0	2000 (OM3) 4700 (OM4)	MPO-12 (12 fibers)	70m 100m
Cisco QSFP-100G-LR4-S	1295, 1300, 1304, 1309	SMF	G.652	-	LC	10km
Cisco QSFP-100G-CWDM4-S	1271, 1291, 1311, 1331	SMF	G.652	-	LC	2km
Cisco QSFP-100G-PSM4-S	1310	SMF	G.652	-	MPO-12 (12 fibers)	500m
Cisco QSFP-100G-AOCxM (x = 1, 2, 3, 5, 7, 10, 15, 20, 25, 30)	-	Active optical cable assembly	-	-		1m, 2m, 5m, 7m, 10m, 15m, 20m, 25m, 30m

Please refer to the Cisco 100GBASE QSFP-100G Modules Data Sheet

<https://www.cisco.com/c/en/us/products/collateral/interfaces-modules/transceiver-modules/datasheet-c78-736282.html> for further details about these QSFP-100G Modules.

Table 4 summarizes distances and options for 40 Gigabit Ethernet interfaces.

Table 4. 40 Gigabit Ethernet Interface Distances and Options

Cisco 40 Gigabit Ethernet QSFP+ Module	Wavelength (nm)	Fiber and Cable Type	Core Size (microns)	Modal Bandwidth (MHz * km) ³	Connector Type	Cable Distance ¹
QSFP-40G-SR4	850	<ul style="list-style-type: none"> • MMF (OM2) • MMF (OM3) • MMF (OM4) 	<ul style="list-style-type: none"> • 50.0 • 50.0 • 50.0 	<ul style="list-style-type: none"> • 500 • 2000 • 4700 	12-fiber MTP/MPO	<ul style="list-style-type: none"> • 30m • 100m • 150m³
QSFP-40G-SR4-S	850	<ul style="list-style-type: none"> • MMF (OM3) • MMF (OM4) 	<ul style="list-style-type: none"> • 50.0 • 50.0 	<ul style="list-style-type: none"> • 2000 • 4700 	12-fiber MTP/MPO	<ul style="list-style-type: none"> • 100m • 150m³
QSFP-40G-CSR4	850	<ul style="list-style-type: none"> • MMF (OM1) • MMF (OM2) • MMF (OM3) • MMF (OM4) 	<ul style="list-style-type: none"> • 62.5 • 50.0 • 50.0 • 50.0 	<ul style="list-style-type: none"> • 200 • 500 • 2000 • 4700 	12-fiber MTP/MPO	<ul style="list-style-type: none"> • 33m • 82m • 300m • 400m

Cisco 40 Gigabit Ethernet QSFP+ Module	Wavelength (nm)	Fiber and Cable Type	Core Size (microns)	Modal Bandwidth (MHz · km) ³	Connector Type	Cable Distance ¹
QSFP-40G-SR-BD	850/900	<ul style="list-style-type: none"> • MMF (OM2) • MMF (OM3) • MMF (OM4) 	<ul style="list-style-type: none"> • 50.0 • 50.0 • 50.0 	<ul style="list-style-type: none"> • 500 • 2000 • 4700 	LC duplex	<ul style="list-style-type: none"> • 30m • 100m • 150m³
QSFP-40GE-LR4	1310	Single-mode fiber (SMF)	G.652	-	LC Duplex	10 km
QSFP-H40G-ACUxM (X=7 or 10)	-	Direct-attach copper, active	-	-	QSFP+ to QSFP+	7 or 10m
QSFP-H40G-AOCxM (x=1, 2, 3, 5, 7, 10, or 15)	-	Active optical cable assembly	-	-	QSFP+ to QSFP+	1, 2, 3, 5, 7, 10, or 15m
WSP-Q40GLR4L	1310	SMF	G.652	-	LC	2 km
QSFP-40G-LR4	1310	SMF	G.652	-	LC	10 km
QSFP-40G-LR4-S	1310	SMF	G.652	-	LC	10 km
QSFP-40G-ER4	1310	SMF	G.652	-	LC	40 km ⁴

¹ Minimum cabling distance of 0.5m for -SR4 or -CSR4 modules and 2m for -LR4 modules according to the IEEE 802.3 standard

² Considered an engineered link with a maximum of 1 dB allocated to connectors and splice loss

³ Specified at transmission wavelength

⁴ Links longer than 30 km for the same link power budget are considered engineered links as per IEEE 802.3 Table 87-6. Depending on the link architecture, attenuation may be required to help ensure operation

Please refer to the Cisco 40GBASE QSFP Modules Data Sheet

(https://www.cisco.com/c/en/us/products/collateral/interfaces-modules/transceiver-modules/data_sheet_c78-660083.html) for further details about these QSFP Modules.

Note: This data sheet describes the hardware capabilities of the Cisco Nexus 7700 M3-Series 12-Port 100 Gigabit Ethernet 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 7700 M3-Series 12-Port 100 Gigabit Ethernet Module.

Table 5. Ordering Information

Part Number	Product Description
N77-M312CQ-26L N77-M312CQ-26L=	Cisco Nexus 7700 M3-Series 12-Port 100G Ethernet Module (req. QSFP28 modules)

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