Cisco Nexus 7000 F2-Series 48-Port 1 and 10 Gigabit Ethernet Module

Product Overview

The Cisco Nexus® 7000 48-Port 1 and 10 Gigabit Ethernet F2-Series Module (referred to as the Cisco Nexus 7000 F2-Series Module in this document) offers outstanding flexibility and wire-rate performance on each port. The module enables the deployment of high-density, low-latency, scalable data center architectures.

The Cisco Nexus 7000 Series Switches provide the foundation of the Cisco® Unified Fabric. They are a modular data center-class product line designed for highly scalable 10 Gigabit Ethernet networks. The fabric architecture scales beyond 15 terabits per second (Tbps), designed to support future 40 and 100 Gigabit Ethernet interfaces. To meet the requirements of the most mission-critical network environments, the switches deliver continuous system operations and virtualized services. The Cisco Nexus 7000 Series is powered by the proven Cisco NX-OS Software operating system, with enhanced features to deliver real-time system upgrades with exceptional manageability and serviceability. Its innovative unified fabric design is purpose built to support consolidation of IP and storage networks on a single lossless Ethernet fabric.

Features and Benefits

The Cisco Nexus 7000 F2-Series Module (Figure 1) is a low-latency, high-performance, high-density 10 Gigabit Ethernet module designed for mission-critical data center networks. Up to 768 wire-rate 10 Gigabit Ethernet ports are supported in a single system through the use of the Cisco Nexus 7000 18-Slot Switch chassis, providing the highest-density of wire-rate 10 Gigabit Ethernet ports on the market (Table 1).

Figure 1.   Cisco Nexus 7000 F2-Series Module

Table 1.   Wire-Rate Port Density

Cisco Nexus 7000 Series Chassis	Maximum 10G port density
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	96

The Cisco Nexus 7000 F2-Series Module is built with switch-on-chip (SoC) architecture, in which a single ASIC implements all the module functions: from ingress buffering, to forwarding lookups and access control lists (ACLs) and quality-of-service (QoS) tables, to fabric interfaces and virtual output queuing (VOQ). Each SoC manages four front-panel interfaces. This type of design increases performance while lowering the power and cooling requirements of the module.

Powered by the Cisco Nexus 7000 F2-Series SoC architecture, the module delivers 720 million packets per second (mpps) of distributed Layer 2 and Layer 3 forwarding and up to 480 Gbps of data throughput. A Cisco Nexus 7000 18-Slot Switch fully populated with the Cisco Nexus 7000 F2-Series Module has the capability to deliver up to 11.5 billion packets per second and 15.4 terabits per second (Tbps) of switching performance, with a typical power consumption of around 7.5 watts (W) per port.

The module protects investments with standards-based 10 Gigabit Ethernet, Fibre Channel over Ethernet (FCoE) features, and virtual machine-awareness features that allow IT departments to consolidate networks based on their own unique requirements and timing. Each port can also be used at 1 Gigabit Ethernet speed, allowing IT departments to migrate to 10 Gigabit Ethernet based on the specific needs of their networks.

With the Cisco Nexus 7000 F-Series module, FCoE can be deployed in director-class modular platforms for the access and core of converged networks. In addition to FCoE host and target support, the module provides VE-port support, allowing creating of FCoE Inter-Switch Links (ISLs) and enabling scalable, multi-hop FCoE topologies. The FCoE traffic in a Cisco Nexus 7000 Series Switch can be segmented using a dedicated storage virtual device context (VDC), providing isolation within the shared physical infrastructure. Cisco Nexus 7000 Series FCoE converged networks can be transparently bridged to Cisco® MDS 9500 Series Fibre Channel SANs with the Cisco MDS 10-Gbps 8-Port FCoE Module. This capability preserves existing and continued investments in Fibre Channel SANs and offers a single unified OS (Cisco NX-OS Software) and management platform (Cisco Data Center Network Manager [DCNM]) for both the LAN and SAN.

The comprehensive feature set of the Cisco Nexus 7000 F2-Series Module includes classic Layer 2 and Layer 3 forwarding, with the feature richness offered by Cisco NX-OS Software: a modular multitasking and multithreaded operating system built with high availability, granular fault management, resiliency, and nondisruptive serviceability at its foundation. This extremely comprehensive set of Layer 2 and Layer 3 functions makes this module ideal for data center networks, where density, performance, and continuous system operation are critical.

Besides the classic Layer 2 and Layer 3 forwarding capability, the Cisco Nexus 7000 F2-Series Module delivers Cisco FabricPath technology based on IETF TRILL. Cisco FabricPath consists of a set of multipath Ethernet technologies, combining the reliability and scalability benefits of Layer 3 routing with the flexibility and "plug-and-play" aspects of Layer 2 Ethernet networks.

With Cisco FabricPath, organizations can now build resilient, flexible, and, when needed, massively scalable Layer 2 networks, no longer relying on Spanning Tree Protocol and its inherent bisectional bandwidth limitations. Cisco FabricPath protects enterprises' investments by allowing existing Ethernet infrastructure to be connected to a Cisco FabricPath network. Enhanced virtual PortChannel (vPC+) technology is part of Cisco FabricPath and allows the redundant interconnection of classic Spanning Tree Protocol-based Layer 2 environments.

The benefits of Cisco FabricPath include:

- Operational simplicity: Cisco FabricPath embeds an autodiscovery mechanism that does not require any additional platform configuration. By offering Layer 2 connectivity, this "VLAN anywhere" characteristic simplifies provisioning and offers workload flexibility across the network.
- High resiliency and performance: Since Cisco FabricPath is a Layer 2 routed protocol, it offers stability, scalability, and optimized resiliency along with network failure containment.
- Massively scalable fabric: By building a forwarding model on 16-way equal-cost multipath (ECMP), Cisco FabricPath helps prevent bandwidth bottlenecks and allows capacity to be added dynamically, without network disruption.

The Cisco Nexus 7000 F2-Series Module can also be used in conjunction with the Cisco Nexus 2000 Series Fabric Extenders (Figure 2).

Figure 2. Cisco Nexus 2000 Series Fabric Extenders

The Cisco Nexus 2000 Series Fabric Extenders comprise a category of data center products that provide a server-access platform that scales across a multitude of 1 Gigabit Ethernet, 10 Gigabit Ethernet, unified fabric, rack, and blade server environments. The Cisco Nexus 2000 Series Fabric Extenders are designed to simplify data center architecture and operations by dramatically reducing the points of management and by meeting the business and application needs of a data center. Working in conjunction with Cisco Nexus switches, the Cisco Nexus 2000 Series Fabric Extenders offer a cost-effective and efficient way to support today's Gigabit Ethernet environments while allowing easy migration to 10 Gigabit Ethernet, virtual machine-aware Cisco unified fabric technologies.

The Cisco Nexus 7000 F2-Series Module also delivers integrated FCoE, greatly simplifying the network infrastructure and reducing costs by enabling the deployment of unified data center fabrics to consolidate data center traffic onto a single, general-purpose, high-performance, highly available network. With the Cisco Nexus 7000 F2-Series Module, FCoE can be deployed in director-class modular platforms for the access and core of converged networks. In addition to FCoE host and target support, the module provides virtual expansion port (VE-port) support, allowing creation of FCoE Inter-Switch Links (ISLs) and enabling scalable, multi-hop FCoE topologies.

Table 2 summarizes the features and benefits of the Cisco Nexus 7000 F2-Series Module.

Table 2. Features and Benefits

Feature	Benefit
Support for 1 and 10 Gigabit Ethernet	Each port can be used at 1 or 10 Gigabit Ethernet speed, allowing IT departments to migrate to 10 Gigabit Ethernet based on the unique requirements of their networks.
Comprehensive Layer 2 and Layer 3 capabilities[1]	The comprehensive set of Layer 2 and Layer 3 functions makes this module ideal for data center networks.

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[1] Refer to Cisco NX-OS release notes for up-to-date software version information and feature support. Initial software releases may support a subset of the overall hardware capabilities.

Feature	Benefit
Virtual Device Context (VDC)	The F2-Series Cisco's VDC feature helps enable the virtualization of a single physical device in one or more logical devices. Each of the provisioned logical devices is configured and managed as if it were a separate physical device[2].
Cisco FabricPath technology based on IETF TRILL	Cisco FabricPath uses routing principles in the data plane and control plane to bring reliability and scalability to transparent bridging while maintaining flexibility and ease of use.
Support for Cisco Nexus 2000 Series	The Cisco Nexus 2000 Series Fabric Extenders are designed to simplify data center architectures and operations by dramatically reducing the points of management.
FCoE support	I/O consolidation at the access layer and core of the network reduces the physical infrastructure that needs to be acquired, managed, and maintained.
Ideally suited for deployment in latency-sensitive environments	Port-to-port latency is less than 6 microseconds, enabling support for latency-sensitive applications.
Interface flexibility with SFP and SFP+ support	Interface flexibility allows fulfillment of any Gigabit Ethernet and 10 Gigabit Ethernet deployment needs, per port, with a variety of media types.
Efficient power use combined with high performance	Power consumption is exceptionally low, typically less than 9W per port.
VOQ with centralized arbitration	This feature enables fairness when one or more destinations is congested and support for lossless unified fabric.
Load sharing across all fabric modules	Through the high-availability design, bandwidth is shared across all fabric modules simultaneously for optimal performance.
Online insertion and removal (OIR)	Hot insertion and removal is supported for continuous system operation.
Identification (ID) LED	Through the beacon feature, administrators can clearly identify the module for a service condition; ports on the I/O module can send beacons as well.

Product Specifications

Table 3 lists product specifications for the Cisco Nexus 7000 F2-Series Module. Tables 4 and 5 list specifications for transceivers. Not all optics are supported in the first software release. Refer to the release notes for up-to-date software version information to see what optics are supported.

Table 3.   Product Specifications

Item	Specifications
System	
Product compatibility	• Supported in all Cisco Nexus 7000 Series chassis
Software compatibility	• Cisco NX-OS Software Release 6.0 or later (minimum requirement)
Front-panel LEDs	• Status: Green (operational), red (faulty), or orange (module booting) • Link: Green (port enabled and connected), orange (port disabled), off (port enabled and not connected), or blinking green and orange in conjunction with ID LED blue (port flagged for identification; beacon) • ID: Blue (operator has flagged this card for identification; beacon) or off (module not flagged)
Programming interfaces	• XML • Scriptable command-line interface (CLI) • Cisco Data Center Network Manager (DCNM) GUI
Physical Interfaces	
Connectivity	• 48 ports of 1 and 10 Gigabit Ethernet (SFP or SFP+ pluggable optic modules)
Maximum port density	• 768 ports of Gigabit Ethernet and 10 Gigabit Ethernet for 18-slot chassis • 384 ports of Gigabit Ethernet and 10 Gigabit Ethernet for 10-slot chassis • 336 ports of Gigabit Ethernet and 10 Gigabit Ethernet for 9-slot chassis • 96 ports of Gigabit Ethernet and 10 Gigabit Ethernet for 4-slot chassis

[2] A separate Virtual Device Context (VDC) is needed when deploying the F2-Series in a chassis that contains other modules. There is no need for the VDC license when the Nexus 7000 chassis contains only F2-Series modules.

Item	Specifications
Queues per port	Configurable template-based queuing modes: • Ingress (4q1t and 2q1t) • Egress (1p3q1t, 2p2q1t, and 3p1q1t)
VoQ buffer	• 72 MB per module
Scheduler	• Deficit-Weighted Round-Robin (DWRR)
Jumbo frame support for bridged and routed packets	• Up to 9216 bytes
Switch On Chip (SoC)	
Performance	• 720-mpps Layer 2 and Layer 3 forwarding capacity for both IPv4 and IPv6 packets
MAC address entries	• 16,384 per SoC, and up to 196,608 per module (depending on VLAN allocation)
VLAN	• 4096 simultaneous VLANs per virtual device context (VDC)
IPv4 entries	• 32,768
IPv6 entries	• 16,384
Adjacency entries	• 16,384
ACLs	• 16,384 per SoC, and up to 196,608 per module (depending on ACL type and interface configuration)
FCoE features	• T11 VF-, VN-, and VE-port for multi-hop FCoE • T11 FCoE Initialization Protocol (FIP) • Fibre Channel Forwarder (FCF)
Advanced FCoE features	• Virtual SANs (VSANs) • Inter-VSAN Routing (IVR) • PortChannels (up to 16 links) • SAN trunking • Storage VDC
Policers	• 1024 per SoC
Control Plane Policing (CPP)	• Supported
Sampled NetFlow	• Up to 256 programmable sampling rates
Fabric Interface	
Switch fabric interface	• 550 Gbps in each direction (1.1 Tbps full duplex) distributed across up to five fabric modules
OIR	• Online insertion and removal
IEEE Data Center Bridging (DCB)	
• Priority-based flow control (PFC): IEEE P802.1Qbb • Enhanced transmission selection (ETS): IEEE P802.1Qaz • Data Center Bridging Exchange (DCBX)	
Environmental	
Physical dimensions	• Occupies one I/O module slot in a Cisco Nexus 7000 Series chassis • Dimensions (H x W x D): 1.733 x 15.3 x 21.9 in. (4.4 x 38.9 x 55.6 cm) • Weight: 14 lb (6.3 kg); 16 lb (7.2 kg) with transceivers
Power consumption	Typical: 350W Maximum: 450W
Environmental conditions	• Operating temperature: 32 to 104°F (0 to 40°C) • Operational relative humidity: 5 to 90%, noncondensing • Storage temperature: -40F to 158°F (-40 to 70°C) • Storage relative humidity: 5 to 95%, noncondensing

Item	Specifications
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 - KN22 (Korea) Class A - CNS13438 (Taiwan) Class A - CISPR24 - EN55024 - EN50082-1 - EN61000-3-2 - EN300 386
Environmental standards	- NEBS criteria levels - SR-3580 NEBS Level 3 (GR-63-CORE, issue 3, and GR-1089-CORE, issue 5) - Verizon NEBS compliance - Telecommunications Carrier Group (TCG) Checklist - Qwest NEBS requirements - Telecommunications Carrier Group (TCG) Checklist - ATT NEBS requirements - ATT TP76200 level 3 and TCG Checklist - 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
Safety	- UL/CSA/IEC/EN 60950-1 Second Ed - AS/NZS 60950-1
Warranty	Cisco Nexus 7000 Series Switches come with the standard Cisco 1-year limited hardware warranty

Table 4.   10 Gigabit Ethernet Interface Distances and Options

10 Gigabit Ethernet SFP+ Part Number	Wavelength (nanometers)	Fiber and Cable Type	Core Size (microns)	Model Bandwidth (MHz per km)[1]	Cable Distance[2]
SFP-10G-SR	850	- 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	1310	- MMF[6]	- 62.5 - 50 - 50	- 500 - 400 - 500	- 220m - 100m - 220m
		- SMF	- G.652		- 300m
SFP-10G-LR	1310	- SMF	- G.652	-	- 10 km
FET-10G	850	- MMF (OM2) - MMF (OM3 and OM4)	- 50 - 50	- 500 - 2000	- 25m - 100m
SFP-10G-ER	1550	- SMF	- G.652	-	- 40 km[3]
SPF-10G-ZR	1550	- SMF	- G.652	-	- 80 km
DWDM-SFP10G-xx.xx=	4	- SMF			5
SFP-H10GB-CU1M	-	- Twinax cable, passive, 30AWG cable assembly	-	-	- 1m

10 Gigabit Ethernet SFP+ Part Number	Wavelength (nanometers)	Fiber and Cable Type	Core Size (microns)	Model Bandwidth (MHz per km)[1]	Cable Distance[2]
SFP-H10GB-CU1-5M	-	• Twinax cable, passive, 30AWG cable assembly	-	-	• 1.5m
SFP-H10GB-CU2M	-	• Twinax cable, passive, 30AWG cable assembly	-	-	• 2m
SFP-H10GB-CU2-5M	-	• Twinax cable, passive, 30AWG cable assembly	-	-	• 2.5m
SFP-H10GB-CU3M	-	• Twinax cable, passive, 30AWG cable assembly	-	-	• 3m
SFP-H10GB-CU5M	-	• Twinax cable, 24AWG cable assembly	-	-	• 5m
SFP-H10GB-ACU7M	-	• Twinax cable, active, 30 AWG cable assembly	-	-	• 7m
SFP-H10GB-ACU10M	-	• Twinax cable, active, 28 AWG cable assembly	-	-	• 10m
SFP-10G-AOC1M	-	• Active Optical Cable assembly	-	-	• 1m
SFP-10G-AOC2M	-	• Active Optical Cable assembly	-	-	• 2m
SFP-10G-AOC3M	-	• Active Optical Cable assembly	-	-	• 3m
SFP-10G-AOC5M	-	• Active Optical Cable assembly	-	-	• 5m
SFP-10G-AOC7M	-	• Active Optical Cable assembly	-	-	• 7m
SFP-10G-AOC10M	-	• Active Optical Cable assembly	-	-	• 10m

[1] Bandwidth is specified at 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] 40 different wavelengths offered. See the dense wavelength-division multiplexing (DWDM) SFP+ optics data sheet for additional product numbers and information:
http://www.cisco.com/en/US/prod/collateral/modules/ps5455/ps6576/data_sheet_c78-711186.html.
[5] FCoE traffic supported upto 80 km.
[6] A mode-conditioning patch is required for use over legacy multimode fiber types such as FDDI-grade, OM1and OM2. Please refer to the product bulletin: http://www.cisco.com/en/US/prod/collateral/modules/ps5455/product_bulletin_c25-530836.html.

Note: Complete 10 Gigabit Ethernet transceiver information can be found at

http://cisco.com/en/US/prod/collateral/modules/ps5455/data_sheet_c78-455693.html.

Please refer to the release notes for software version requirement information.

Table 5.   Gigabit Ethernet Interface Distances and Options

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

[1] A mode-conditioning patch is required for use over legacy multimode fiber types such as FDDI-grade, OM1 and OM2. Please refer to the product bulletin: http://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 fiber quality, number of splices, and connectors.
[3] 8 different wavelengths offered. See the coarse wavelength-division multiplexing (CWDM) SFP optics data sheet for additional product numbers and information:
http://cisco.com/en/US/prod/collateral/modules/ps5455/ps6575/product_data_sheet09186a00801a557c.html.
[4] 40 different wavelengths offered. See the dense wavelength-division multiplexing (DWDM) SFP optics data sheet for additional product numbers and information:
http://cisco.com/en/US/prod/collateral/modules/ps5455/ps6576/product_data_sheet0900aecd80582763.html.

Note: Complete Gigabit Ethernet transceiver information can be found at

http://cisco.com/en/US/prod/collateral/modules/ps5455/ps6577/product_data_sheet0900aecd8033f885.html.

Please refer to the release notes for software version requirement information.

Ordering Information

To place an order, visit the Cisco Ordering homepage. To download software, visit the Cisco Software Center.

Table 6 provides ordering information.

Table 6.   Ordering Information

Product Name	Part Number
Nexus 7000 - F2-Series 48 Port 1G/10G Ethernet Module, SFP/SFP+ (and spare)	N7K-F248XP-25 N7K-F248XP-25=
FCoE License for Nexus 7000 48-port 10G SFP+ (F2) (and spare)	N7K-FCOEF248XP N7K-FCOEF248XP=

Service and Support

Cisco offers a wide range of services to help accelerate your success in deploying and optimizing Cisco Nexus 7000 Series Switches in your data center. Our innovative services are delivered through a unique combination of people, processes, tools, and partners and are focused on helping you increase operating efficiency and improve your data center network. Cisco Advanced Services uses an architecture-led approach to help you align your data center infrastructure with your business goals and provide long-term value. Cisco SMARTnet® Service helps you resolve mission-critical problems with direct access at any time to Cisco network experts and award-winning resources. With this service, you can take advantage of the Cisco Smart Call Home service capability, which offers proactive diagnostics and real-time alerts on your Cisco Nexus 7000 Series Switches. Spanning the entire network lifecycle, Cisco Services helps increase investment protection, optimize network operations, support migration, and strengthen your IT expertise. For more information about Cisco Data Center Services, visit http://www.cisco.com/go/dcservices.

For More Information

For more information about the Cisco Nexus 7000 Series, visit the product homepage at http://www.cisco.com/go/nexus or contact your local account representative.

Printed in USA

C78-685394-08   11/13