Cisco Nexus 7000 F2-Series Enhanced 48-Port 1 and 10GBASE-T Ethernet Copper Module

Product Overview

The Cisco Nexus® 7000 Enhanced F2-Series 48-Port 1 and 10GBASE-T Ethernet Copper Module (referred to as the Cisco Nexus 7000 F2e Copper 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 based on the IEEE 802.3an standard, best known as 10GBASE-T.

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) and is 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 Switches 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.

10GBASE-T Solution Benefits

The 10GBASE-T solution for the Cisco Nexus 7000 Switches delivers high-performance, cost-effective, and efficient next-generation RJ-45-based server connectivity. Based on the IEEE 802.3an standard, 10GBASE-T is a crucial technology for designing next-generation data center architectures with:

- Reduced deployment costs through integrated 10 Gigabit Ethernet, lower cable costs, and flexible cable lengths
- Simplified transition to 10 Gigabit Ethernet through backward compatibility with existing 1 Gigabit Ethernet networks
- Preserved user experience and expertise of previous generations of BASE-T
- New consolidation usage models to reduce total cost of ownership (TCO) with advanced I/O virtualization and unified networking

Module Features and Benefits

The Cisco Nexus 7000 F2e Copper Module (Figure 1) is a low-latency, high-performance, high-density 10GBASE-T Ethernet module designed for mission-critical data center networks. The Cisco Nexus 7000 F2e Copper Module provides the highest density of wire-rate 10GBASE-T Ethernet ports on the market, with up to 768 wire-rate 10GBASE-T Ethernet ports in a single system, through the use of the Cisco Nexus 7000 18-Slot Switch chassis (Table 1).

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Figure 1. Cisco Nexus 7000 F2e Copper Module

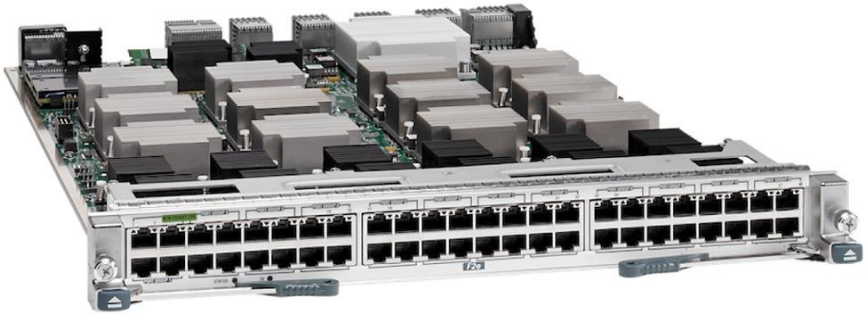


Table 1. Cisco Nexus 7000 10GBASE-T Maximum Port Density

Cisco Nexus 7000 Series Chassis	10GBASE-T Maximum 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 F2e-Series Copper Module is built with switch-on-chip (SoC) architecture, in which a single application-specific integrated circuit (ASIC) implements all the module functions, including ingress buffering, forwarding lookup operations, access control lists (ACLs), quality-of-service (QoS) tables, 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.

Each port of the Cisco Nexus 7000 F2e Copper Module can also be used at 1 Gigabit Ethernet speed, allowing IT departments to migrate their servers base to 10GBASE-T based on the specific needs of their networks. Excellent for end-of-row (EoR) and middle-of-row (MoR) designs, the Cisco Nexus 7000 F2e Copper Module provides flexibility and scalability and a comprehensive feature set.

The Cisco Nexus 7000 F2e Copper Module offers customers low 10GBASE-T power consumption, with less than 9 watts (W) per port for typical deployment scenarios. The power efficiency of the module is further improved by enabling the Energy-Efficient Ethernet function.

A standard developed by the IEEE 802.3az task force, Energy-Efficient Ethernet (Figure 2) is a set of enhancements that enables less power consumption in response to changes in network demand. By sending a low-power-idle (LPI) indication signal for a specified time, the transmit chips in the system can be turned off. LPI is sent periodically to refresh the sleep mode. When there is data to transmit, a normal idle signal is sent to wake the transmit system before data is sent. The data link is considered to be always operational because the receive signal circuit remains active even when the transmit path is in sleep mode.

Figure 2. Logo of the IEEE 802.3az Study Group and Standard Task Force



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By enabling Energy-Efficient Ethernet the Cisco Nexus 7000 F2e Copper Module, organizations can achieve an additional 15 percent power reduction in typical deployments.

The module's power efficiency is achieved without compromising its capabilities. Besides the traditional Layer 2 and Layer 3 forwarding capabilities, the Cisco Nexus 7000 F2e Copper 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 and flexible Layer 2 networks, no longer relying on Spanning Tree Protocol and its inherent bisectional bandwidth limitations.

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: Because 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 F2e-Series Copper Module offers exceptional security with integrated hardware support for Cisco TrustSec® technology, including line-rate data confidentiality, data integrity, and ACL processing for security group tags (SGTs). Data confidentiality and integrity conforming to the IEEE MAC security standard (IEEE 802.1AE MACsec) is supported on all ports with Advanced Encryption Standard (AES) cipher, using a 128-bit key[1]. New security ACLs are enhanced through hardware support for Cisco metadata headers capable of carrying SGTs. Security group ACLs (SGACLs) use SGT information to provide hardware-based enforcement of security policies, removing dependencies on IP addresses, thus improving scalability and simplifying manageability.

Table 2 summarizes the features and benefits of the Cisco Nexus 7000 F2e Copper Module.

Table 2. Features and Benefits

Feature	Benefit
Support for 1 and 10 Gigabit Ethernet	Each port can be used at 1 or 10GBASE-T Ethernet speed, allowing IT departments to migrate to 10GBASE-T for their server connectivity according to the unique requirements of their networks.
Comprehensive Layer 2 and Layer 3 capabilities	The comprehensive set of Layer 2 and Layer 3 functions makes this module excellent for data center networks.
Virtual device context (VDC)	The Cisco 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.
Efficient power use	Power consumption is exceptionally low, typically less than 9W per port. By enabling Energy-Efficient Ethernet, organizations can achieve an additional 15% power reduction in typical configurations.

[1] Refer to the Cisco NX-OS release notes for up-to-date software version information and feature support. The initial software release does not support this capability.
[2] When deploying the Cisco Nexus 7000 F2e-Series Copper Module in a VDC together with the Cisco Nexus 7000 M-Series modules, the Cisco Nexus 7000 F2e-Series Copper Module will run in Layer 2-only mode, delegating all Layer 3 capabilities to the Cisco Nexus 7000 M-Series modules present in the VDC.

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Feature	Benefit
Virtual output queuing (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 provides specifications for the Cisco Nexus 7000 F2e Copper Module. Table 4 lists 10GBASE-T cabling types and distances.

Table 3. Product Specifications

Item	Specifications
System	
Product compatibility	• Supported in all Cisco Nexus 7000 Series chassis
Software compatibility	• Cisco NX-OS Software Release 6.1.2 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 10GBASE-T with RJ-45 cabling
Maximum port density	• 768 ports of 1 and 10GBASE-T Ethernet for 18-slot chassis • 384 ports of 1 and 10GBASE-T Ethernet for 10-slot chassis • 336 ports of 1 and 10GBASE-T Ethernet for 9-slot chassis • 96 ports of 1 and 10GBASE-T Ethernet for 4-slot chassis
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 a Chip (SoC)	
Performance	• 720-million packets per second (mpps) Layer 2 and Layer 3 forwarding capacity for both IPv4 and IPv6 packets
MAC address entries	• 16,384 per SoC
VLAN	• 4096 simultaneous VLANs per VDC
IPv4 entries	• 32,768
IPv6 entries	• 16,384
Adjacency entries	• 16,384
Access control lists (ACLs)	• 16,384 per SoC
Policers	• 1024 per SoC

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Item	Specifications
Control Plane Policing (CPP)	• Supported
Sampled NetFlow	• Up to 256 programmable sampling rates
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)
Power consumption	• Typical: 420W • Maximum: 550W
Environmental conditions	• Operating temperature: 32 to 104°F (0 to 40°C) • Operatiing relative humidity: 5 to 90%, noncondensing • Storage temperature: -40F 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 • KN22 (Korea) Class A • CNS13438 (Taiwan) Class A • CISPR24 • EN55024 • EN50082-1 • EN61000-3-2 • EN61000-3-3 • 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. 10GBASE-T Cabling Types and Distances

Cabling	Distance	Cabling Reference
Class E, Category 6	55 to 100m	ISO/IEC TR-24750 and TIA/EIA TSB-155
Class E, Category 6: Unscreened	55m	ISO/IEC TR-24750 and TIA/EIA TSB-155
Class E, Category 6: Screened	100m	ISO/IEC TR-24750 and TIA/EIA TSB-155
Class E_A, Augmented Category 6	100m	ISO/IEC 11801 Ed 2.1 and TIA/EIA-568-B-2-10
Class F, Category 7	100m	ISO/IEC TR-24750

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Ordering Information

To place an order, visit the Cisco Ordering homepage. To download software, visit the Cisco Software Center. Table 5 provides ordering information.

Table 5. Ordering Information

Product Name	Part Number
Nexus 7000 Enhanced F2-Series 48 Port 1 and 10GBASE-T Ethernet Module, RJ45 (and spare)	N7K-F248XT-25E N7K-F248XT-25E=

Service and Support

Cisco offers a wide range of services to help accelerate your success in deploying and optimizing Cisco Nexus 7000 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 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 Switches, visit the product homepage at https://www.cisco.com/site/us/en/products/networking/cloud-networking-switches/nexus-7000-series-switches/index.html or contact your local account representative.

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Printed in USA C78-719524-04 08/14

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