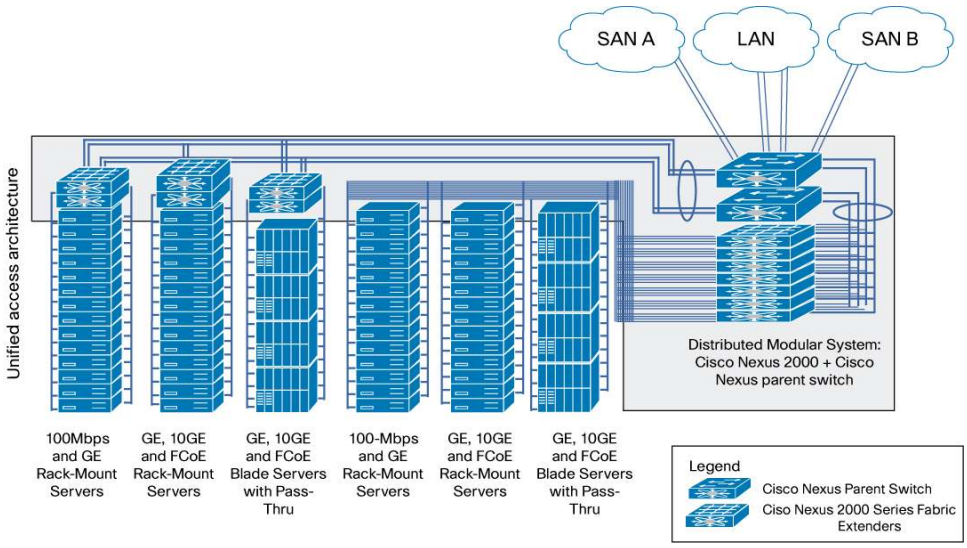
Cisco Nexus 2000 Series Fabric Extenders

Product Overview

The Cisco Nexus® 2000 Series Fabric Extenders (FEX) comprise a category of data center products designed to simplify data center access architecture and operations. The Cisco Nexus 2000 Series uses the Cisco® FEX-link architecture to provide a highly scalable unified server-access platform across a range of 100 Megabit Ethernet, Gigabit Ethernet, 10 Gigabit Ethernet, unified fabric, copper and fiber connectivity, rack, and blade server environments. The platform is ideal to support today's traditional Gigabit Ethernet while allowing transparent migration to 10 Gigabit Ethernet, virtual machine-aware unified fabric technologies.

The Cisco Nexus 2000 Series Fabric Extenders behave as remote line cards for a parent Cisco Nexus switch. The fabric extenders are essentially extensions of the parent Cisco Nexus switch fabric, with the fabric extenders and the parent Cisco Nexus switch together forming a distributed modular system. This architecture enables physical topologies with the flexibility and benefits of both top-of-rack (ToR) and end-of-row (EoR) deployments (Figure 1).

Figure 1. Cisco Nexus 2000 Series Fabric Extenders Provide Highly Scalable Unified Server-Access Connectivity



The Cisco Nexus 2000 Series architecture provides the following benefits:

- Architecture flexibility: Common, scalable, and adaptive architecture across data center racks and points of delivery (PoDs)[1] that supports various server options, connectivity options, physical topologies and evolving needs.
- Highly scalable server access: Scalable Gigabit and 10 Gigabit Ethernet server access with no reliance on Spanning Tree.
- Simplified operations: One single point of management and policy enforcement using upstream Cisco Nexus switches eases the commissioning and decommissioning of server racks through zero-touch installation and automatic configuration of fabric extenders.

[1] A PoD is a module or group of network, compute, storage, and application components that work together to deliver a network service. The PoD is a repeatable pattern, and its components increase the modularity, scalability, and manageability of data centers.

- Increased business benefits: Consolidation, cabling reduction, rack space reduction, reduced power and cooling, investment protection through feature inheritance from the parent switch, and the capability to add functions without the need for a major equipment upgrade of server-attached infrastructure all contribute to reduced operating expenses (OpEx) and capital expenditures (CapEx).

The Cisco Nexus 2000 Series design aligns with that of servers. It offers front-to-back cooling, compatible with data center hot-aisle and cold-aisle designs, all switch ports at the rear of the unit in close proximity to server ports, and all user-serviceable components accessible from the front panel. It also offers back-to-front cooling, with switch ports in front of the chassis, aligned with the cold aisle, for optimized cabling in network racks. The Cisco Nexus 2000 Series is built for nonstop operation, with redundant hot-swappable power supplies and a hot-swappable fan tray with redundant fans. Its compact one-rack-unit (1RU) form factor takes up relatively little space, making it easy to incorporate into rack designs. The fabric extenders are available in several models to provide speed, connectivity, and port-density options (Figure 2).

Figure 2. Cisco Nexus 2000 Series Fabric Extenders from Bottom Left to Top Right: Cisco Nexus 2148T, 2224TP GE, 2248TP GE, and 2232PP 10GE; Cost-Effective Fabric Extender Transceivers for Cisco Nexus 2000 Series and Cisco Nexus Parent Switch Interconnect Are in Front of the Fabric Extenders

The Cisco Nexus 2000 Series provides two types of ports: ports for end-host attachment (host interfaces) and uplink ports (fabric interfaces). Fabric interfaces, differentiated with a yellow color, are for connectivity to the upstream parent Cisco Nexus switch.

Table 1 lists the Cisco Nexus 2000 Series Fabric Extenders. Fabric extenders can be mixed and matched to a parent switch to provide connectivity options.

Table 1. Cisco Nexus 2000 Series Specifications

Description	Specification
Cisco Nexus 2148T	48 1000BASE-T host interfaces and 4 10 Gigabit Ethernet fabric interfaces (Small Form-Factor Pluggable Plus [SFP+])
Cisco Nexus 2224TP	24 100/1000BASE-T host interfaces and 2 10 Gigabit Ethernet fabric interfaces (SFP+)
Cisco Nexus 2248TP	48 100/1000BASE-T host interfaces and 4 10 Gigabit Ethernet fabric interfaces (SFP+)
Cisco Nexus 2232PP	32 1/10 Gigabit Ethernet and Fibre Channel over Ethernet (FCoE) host interfaces (SFP+) and 8 10 Gigabit Ethernet and FCoE fabric interfaces (SFP+)

The Cisco Nexus 2224TP and 2248TP provide port density options for highly scalable 100-Mbps and Gigabit Ethernet connectivity. The Cisco Nexus 2232PP provides ease of migration from Gigabit Ethernet to 10 Gigabit Ethernet while supporting highly scalable 10 Gigabit environments.

The Cisco Nexus 2232PP 1/10GE Fabric Extender is the ideal platform for migration from Gigabit Ethernet to 10 Gigabit Ethernet and unified fabric environments. It supports FCoE and a set of network technologies known collectively as Data Center Bridging (DCB) that increase the reliability, efficiency, and scalability of Ethernet networks. These features allow the switches to support multiple traffic classes over a lossless Ethernet fabric, thus enabling consolidation of LAN, SAN, and cluster environments.

Cisco Nexus 2000 Series Fabric Extenders connect to a parent Cisco Nexus switch through their fabric links using CX1 copper cable, short-reach or long-reach optics, and the cost-effective Cisco Fabric Extender Transceivers.

Cisco Fabric Extender Transceivers are optical transceivers that provide a highly cost-effective solution for connecting the fabric extender to its parent switch.

The Cisco Nexus 2000 Series Fabric Extenders behave like remote line cards for a parent Cisco Nexus 5000 or 7000 Series Switch. Working in conjunction with Cisco Nexus switches, the Cisco Nexus 2000 Series Fabric Extenders extend the capabilities and benefits offered by the parent Cisco Nexus switch while providing flexible, scalable, and cost-effective server access. Table 2 summarizes the Cisco Nexus 2000 Series parent switch support matrix.

Table 2. Cisco Nexus Fabric Extender Parent Switch Support Matrix

Cisco Nexus Parent Switch		
	Cisco Nexus 5000 Series	**Cisco Nexus 7000 Series**
Cisco Nexus fabric extender models	• Cisco Nexus 2148T • Cisco Nexus 2224TP • Cisco Nexus 2248TP • Cisco Nexus 2232PP	• Cisco Nexus 2224TP • Cisco Nexus 2248TP • Cisco Nexus 2232PP
Cisco Nexus parent model	• Cisco Nexus 5010P or 5020P Switch • Cisco Nexus 5548P Switch • Cisco Nexus 5548UP Switch • Cisco Nexus 5596UP Switch	• Cisco Nexus 7000 Series 32-port 10 Gigabit Ethernet Module SFP+ • Cisco Nexus 7000 Series 32-port 10 Gigabit Ethernet Module (XL) SFP+
Scalability	• Up to 24 fabric extenders per Cisco Nexus 5548P, 5548UP, 5596UP switch (8 fabric extenders for L3 configurations): up to 1152 Gigabit Ethernet servers and 768 10 Gigabit Ethernet servers per switch • Up to 12 fabric extenders per Cisco Nexus 5010P and 5020P switch: up to 576 Gigabit Ethernet servers and 384 10 Gigabit Ethernet servers per switch	• Up to 32 fabric extenders per Cisco Nexus 7000 Series Switch • Up to 1536 Gigabit Ethernet servers per Cisco Nexus 7000 Series Switch • Up to 1024 10 Gigabit Ethernet servers per Cisco Nexus 7000 Series Switch

Benefits

Architecture Flexibility

- Unified server access architecture: The Cisco Nexus 2000 Series offers a highly cost-effective access-layer architecture for 100 Megabit Ethernet, Gigabit Ethernet, 10 Gigabit Ethernet, mixed Gigabit Ethernet and 10 Gigabit Ethernet servers, Ethernet or unified fabric, physical or virtual server, and rack or blade server environments.
- Flexible physical topologies: The Cisco Nexus 2000 Series architecture allows decoupling of the Layer 1 and 2 topologies, therefore providing flexibility in designing physical architectures, including ToR, middle-of-row (MoR), and EoR deployments, while allowing quick expansion of network capacity and remote line-card portability across multiple parent switches. It is also space optimized for all these architectures.

Highly Scalable Access Layer

Today's data centers must have massive scalability to manage the combination of an increasing number of servers and a higher demand for bandwidth from each server. The Cisco Nexus 2000 Series increases the scalability of the access layer to accommodate both sets of demands without increasing management points within the network.

- Massive scalability: A deployment of Cisco Nexus 2000 Series Fabric Extenders connected to a Cisco Nexus 5000 or 7000 Series Switch supports highly scalable Gigabit and 10 Gigabit Ethernet environments as shown in Table 2.
- Layer 2 scalability: Reliance on Spanning Tree Protocol is eliminated between the fabric extender and the parent switch, thus enabling a large, multipath, loop-free topology. Use of a single management entity to support a large server domain allows policy to be enforced more efficiently and enhances Layer 2 data center access scalability. Use of the Virtual PortChannel (vPC) feature also allows fast convergence and effective utilization of bandwidth in Layer 2 environments.

Simplified Operations

- Single point of management: The Cisco Nexus 2000 Series Fabric Extenders are remote line cards for a Cisco Nexus parent switch. All device configurations are managed on the Cisco Nexus parent switch, and configuration information is downloaded to the Cisco Nexus 2000 Series Fabric Extender using in-band communication.
- Software maintenance simplification: The Cisco Nexus 2000 Series software is embedded in the Cisco Nexus parent switch software. The fabric extender is a plug-and-play device that automatically downloads the software image from the Cisco Nexus parent switch in the same way that a line card downloads software from the supervisor engine in a modular chassis. In-Service Software Upgrade (ISSU) on the fabric extenders provides the capability to perform transparent software upgrades, reducing downtime and allowing customers to integrate the newest features and functions with little or no effect on network operation for Ethernet, storage, and converged network environments.
- Switch feature consistency across a large number of servers: The Cisco Nexus 2000 Series forwards all traffic to the parent Cisco Nexus switch over 10 Gigabit Ethernet fabric uplinks. Passing all traffic to the parent switch allows traffic to be shaped according to policies established on the parent Cisco Nexus switch with a single point of management. Standardizing on the Cisco Nexus switches allows data centers to support the same switch features across the entire access layer with a single point of management.
- Tenfold management points reduction: The number of management points is significantly less than when discrete switches are used at the top of the rack. A traditional 12-rack design using a discrete, redundant pair of Gigabit Ethernet switches at the top of each rack has 24 management points. The equivalent architecture using the Cisco Nexus 2000 Series has only 2 management points: a tenfold reduction in management complexity.

Business Benefits

- Cost-effective 10 Gigabit Ethernet solution: The Cisco Nexus 2000 Series is the ideal platform for migration from Gigabit Ethernet to 10 Gigabit Ethernet. Scalable 10 Gigabit Ethernet provides 10 times the bandwidth for approximately twice the price of Gigabit Ethernet.
- Consolidation: The Cisco Nexus 2000 Series protects investment into the future, supporting evolving data center needs by providing an easy migration path to low-latency 10 Gigabit Ethernet, high-performance computing (HPC), virtual machine-aware networks. In addition, the combination of the Cisco Nexus 5000 Series and Cisco Nexus 2232PP provides a unified network fabric that supports LAN and SAN consolidation. Another benefit of the Nexus 2000 architecture is the ability to collapse datacenter access and aggregation layers into one single layer.
- Investment protection: The Cisco Nexus 2000 Series Fabric Extenders can be mixed and matched with a common parent Cisco Nexus switch. New functions can be derived from upstream Cisco Nexus switches, resulting in the capability to add new functions without the need for a major equipment upgrade.
- Rack space reduction: The Cisco Nexus 2000 Series consists of 1RU fabric extenders. The fabric extenders are not physically constrained by the position of the Cisco Nexus parent switch in the physical topology and are attached to the upstream Cisco Nexus switch through fabric links.
- Cabling reduction with optimal Intra-rack and Inter-rack cabling options: The Cisco Nexus 2000 Series supports ToR, EoR, and MoR deployment models. Placing the fabric extender at the top of the rack allows the use of short cables from the rack to servers, reducing cable costs, air dams, complexity, and opportunities for error. The only inter-rack cabling required is for uplinks from the fabric extender to the parent switch. Placing the parent Cisco Nexus switch at the end or middle of a row of racks makes efficient use of powerful switching resources.

The Cisco Nexus 2000 Series supports an optimal cabling strategy that simplifies network operations and prepares for future technologies:

  - Short intra-rack runs of copper: Intra-rack cables connecting to Gigabit Ethernet servers can be Cat5e, 6, 6A, or 7 with the Cisco Nexus 2148T, 2224TP, and 2248TP fabric extenders. Twinax cables connect servers to ToR Cisco Nexus 2232PP Fabric Extenders. This model allows server racks and PoDs to be preconfigured by server vendors so they can be rolled into place and put into service upon arrival.
  - Longer inter-rack horizontal runs of fiber: Cisco Nexus 2000 Series Fabric Extenders in each rack are connected to parent switches that are placed at the end or middle of the row: For long reach between the fabric extender and the parent switch, Cisco Fabric Extender Transceiver, SFP+ short-reach (SR), and SFP+ long-reach (LR) optics over OM2 or OM3 cables can be used. Fiber protects investments into the future because it will support upcoming Ethernet standards, including 40 and 100 Gigabit Ethernet. If the distance to the Cisco Nexus 5000 Series Switch or Cisco Nexus 7000 Series Switch is less than 10 meters, Twinax cables (CX1 direct attach) can be used.

- Effective bandwidth utilization: Today's data center servers are either single- or dual-homed to the network. However, network designs almost always involve redundant deployment. Through the virtual PortChannel (vPC) feature support on the Cisco Nexus 5000 Series, a server can be dually connected to a pair of fabric extenders, or each fabric extender can be connected to a pair of Cisco Nexus 5000 Series Switches, thus giving customers both server and fabric extender connectivity redundancy and providing active-active connectivity with twice the bandwidth utilization as in active-standby or forwarding-blocking configurations.
- Reduced power and cooling: Cost-effective 10 Gigabit Ethernet solutions, optimal cabling, device consolidation, rack-space reduction, and efficient bandwidth utilization all contribute to a significant reduction in power and cooling needs in the data center.

Cisco Nexus 2000 Series Deployment Scenarios

The fabric extenders can be used in the following deployment scenarios:

- Rack servers with 100 Megabit Ethernet, Gigabit Ethernet, or 10 Gigabit Ethernet network interface cards (NICs); the fabric extender can be physically located at the top of the rack and the Cisco Nexus parent switch can reside in the middle or at the end of the row, or the fabric extender and the Cisco Nexus parent switch can both reside at the end or middle of the row
- 10 Gigabit Ethernet and FCoE deployments, using servers with converged network adapters (CNAs) for unified fabric environments with the Cisco Nexus 2232PP
- Server racks with integrated lights-out (iLO) management, with 100 Megabit Ethernet or Gigabit Ethernet management and iLO interfaces
- Gigabit Ethernet and 10 Gigabit Ethernet blade servers with pass-through blades
- Low-latency, high-performance computing environments
- Virtualized access

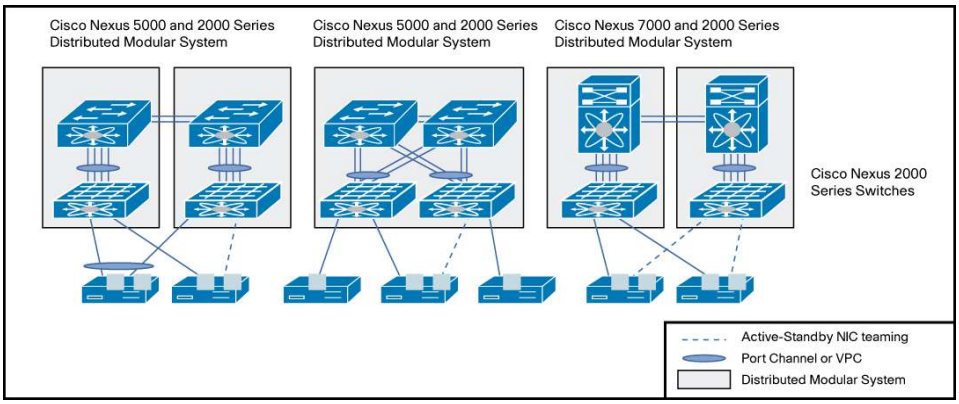
For more information, visit the Cisco Nexus 2000 Series case studies page: http://www.cisco.com/en/US/products/ps10110/prod_case_studies_list.html.

The Cisco Nexus 2000 Series can be used in conjunction with a Cisco Nexus parent switch in two main design scenarios (shown in Figure 3):

- Cisco Nexus 2000 Series Fabric Extenders single-connected to one upstream Cisco Nexus 5000 or 7000 Series Switch: In this deployment scenario, access-layer redundancy is achieved through redundant server connections to two upstream distributed modular systems, using vPC (Cisco Nexus 5000 Series) or server NIC teaming to two Cisco Nexus 2000 Series Fabric Extenders.

- Cisco Nexus 2000 Series Fabric Extenders dual-connected to two upstream Cisco Nexus 5000 Series Switches (vPC): In this deployment scenario, access-layer redundancy is achieved through a combination of Cisco Nexus 2000 Series Fabric Extenders dual-connected to an upstream parent switch and server NIC teaming.

Figure 3. Cisco Nexus 2000 Series Fabric Extenders Design Scenarios, from Left to Right: Cisco Nexus 2000 Series Single-Connected to One Upstream Cisco Nexus 5000 Series Switch, Cisco Nexus 2000 Series Dual-Connected to Two Upstream Cisco Nexus 5000 Series Switches, and Cisco Nexus 2000 Series Single-Connected to One Upstream Cisco Nexus 7000 Series Switch



Product Specifications

Tables 3 through 8 provide product specifications. Table 9 lists standards support, and Table 10 lists feature support.

Table 3. Cisco Nexus 2000 Series Gigabit Ethernet Fabric Extenders Product Specifications

Description	Cisco Nexus 2148T	Cisco Nexus 2248TP	Cisco Nexus 2224TP
Fabric extender host interfaces	• 48	• 48	• 24
Fabric extender host interfaces type	• 1000BASE-T ports: RJ-45 connectors	• 100BASE-T/1000BASE-T ports: RJ-45 connectors	• 100BASE-T/1000BASE-T ports: RJ-45 connectors
Fabric extender fabric interfaces	• 4	• 4	• 2
Fabric extender fabric interfaces type	• Fiber: SFP+ optics (SFP-10G-SR and SFP-10G-LR) • Copper: 10 Gigabit Ethernet SFP+ passive Twinax copper cables (SFP-H10GB-CU1M, SFP-H10GB-CU3M, and SFP-H10GB-CU5M) and active Twinax copper cables (SFP-H10GB-ACU7M, SFP-H10GB-ACU10M) • Distance between Cisco Nexus 2000 Series Fabric Extender and Cisco Nexus 5000 Series Switch: Up to 3 km	• Fiber: Cisco Fabric Extender Transceiver (FET-10G) and SFP+ optics (SFP-10G-SR and SFP-10G-LR) • Copper: 10 Gigabit Ethernet SFP+ passive Twinax copper cables (SFP-H10GB-CU1M, SFP-H10GB-CU3M, and SFP-H10GB-CU5M) and active Twinax copper cables (SFP-H10GB-ACU7M, SFP-H10GB-ACU10M) • Distance between Cisco Nexus 2000 Series Fabric Extender and Cisco Nexus 5000 Series Switch: Up to 3 km • Distance between Cisco Nexus 2000 Series Fabric Extender and Cisco Nexus 7000 Series Switch: Up to 10 km	• Fiber: Cisco Fabric Extender Transceiver (FET-10G) and SFP+ optics (SFP-10G-SR and SFP-10G-LR) • Copper: 10 Gigabit Ethernet SFP+ passive Twinax copper cables (SFP-H10GB-CU1M, SFP-H10GB-CU3M, and SFP-H10GB-CU5M) and active Twinax copper cables (SFP-H10GB-ACU7M, SFP-H10GB-ACU10M) • Distance between Cisco Nexus 2000 Series Fabric Extender and Cisco Nexus 5000 Series Switch: Up to 3 km
Fabric speed	• 40 Gbps in each direction (80 Gbps full duplex)	• 40 Gbps in each direction (80 Gbps full duplex)	• 20 Gbps in each direction (40 Gbps full duplex)
Oversubscription	• 1.2:1	• 1.2:1	• 1.2:1
Performance	• Hardware forwarding at 176 Gbps or 131 million packets per second (mpps)	• Hardware forwarding at 176 Gbps or 131 mpps	• Hardware forwarding at 88 Gbps or 65 mpps
Cisco parent switch	• Cisco Nexus 5000 Series	• Cisco Nexus 5000 Series	• Cisco Nexus 5000 Series

Description	Cisco Nexus 2148T	Cisco Nexus 2248TP	Cisco Nexus 2224TP
		• Cisco Nexus 7000 Series	• Cisco Nexus 7000 Series
Minimum software	• Cisco NX-OS Release 4.0(1A)N2(1) on the Cisco Nexus 5000 Series	• Cisco NX-OS Release 4.2(1)N1(1) on the Cisco Nexus 5000 Series • Cisco NX-OS Release 5.1 on the Cisco Nexus 7000 Series	• Cisco NX-OS Release 4.2(1)N2(1) on the Cisco Nexus 5000 Series • Cisco NX-OS Release 5.2 on the Cisco Nexus 7000 Series
Cisco Nexus 2000 Series Gigabit Ethernet Fabric Extenders Environment			
Dimensions (height x width x depth)	• 1.72 x 17.3 x 20.0 in. • (4.37 x 43.94 x 50.8 cm)	• 1.72 x 17.3 x 17.7 in. • (4.37 x 43.94 x 44.96 cm)	• 1.72 x 17.3 x 17.7 in. • (4.37 x 43.94 x 44.96 cm)
Weight	• 18 lb (8.2 kg) • * Systems are fully loaded with two power supplies and one fan tray.	• 17.7 lb (8.0 kg) • * Systems are fully loaded with two power supplies and one fan tray.	• 16.6 lb (7.53 kg) • * Systems are fully loaded with two power supplies and one fan tray.
Indicator and port specification	• System status: green (operational), amber (fault), flashing amber (POST boot up), off (no power) • Locator LED: bright blue locator • Port status: green (link established), amber (administratively disabled), flashing amber (fault) • Fan status: green (operational), amber (fault) • Power status: green (operational), amber (fault)		
Environment	• Operating temperature: 32 to 104℉ (0 to 40℃) • Nonoperating temperature: -4 to 158℉ (-20 to 70℃) • Humidity: 5 to 95 percent (noncondensing) Altitude: 0 to 10,000 ft (0 to 3000m)		
Power supply	• N2K-PAC-200W	• N2K-PAC-400W, N2K-PAC-400W-B, and N2K-PDC-400W	• N2K-PAC-400W, N2K-PAC-400W-B, and N2K-PDC-400W
Fan tray	• N2K-C2148-FAN	• N2K-C2248-FAN and N2K-C2248-FAN-B	• N2K-C2248-FAN and N2K-C2248-FAN-B
Typical input operating power	• 165W	• 110W	• 95W
Input current	• 1.5A/2.2A (typical/maximum) • Note: Input currents listed for 110V; divide by 2 for 220V • Supply will surge on AC power-up for a fraction of a second beyond this rating	• 1.0A/1.2A (typical/maximum) • Note: Input currents listed for 110V; divide by 2 for 220V • Supply will surge on AC power-up for a fraction of a second beyond this rating	• 0.75A/0.90A (typical/maximum) • Note: Input currents listed for 110V; divide by 2 for 220V • Supply will surge on AC power-up for a fraction of a second beyond this rating
Output current	• 11.5A/16.7A (typical/maximum)	• 8A/10A (typical/maximum)	• 5A/7A (typical/maximum)
Heat dissipation	• 670 BTU/hr	• 322/403 BTU/hour (typical/maximum)	• 201/282 BTU/hour (typical/maximum)

Table 4. Cisco Nexus 2000 Series 10 Gigabit Ethernet Fabric Extender Product Specifications

Description	Cisco Nexus 2232PP
Fabric extender host interfaces	• 32
Fabric extender host interfaces	• 1/10 Gigabit Ethernet ports SFP/SFP+ (Supported transceiver and cables include Twinax SFP-H10GB-CU1M, SFP-H10GB-CU3M, SFP-H10GB-CU5M, SFP-H10GB-ACU7M, and SFP-H10GB-ACU10M, include SFP+ SFP-10G-SR, SFP-10G-LR, and include SFP GLC-T, GLC-SX-MM, GLC-LH-SM, SFP-GE-T, SFP-GE-S, SFP-GE-L)
Fabric extender fabric interfaces	• 8
Fabric extender fabric interfaces	• Fiber: Cisco Fabric Extender Transceiver (FET-10G) and SFP+ optics (SFP-10G-SR and SFP-10G-LR) • Copper: 10 Gigabit Ethernet SFP+ passive Twinax copper cables (SFP-H10GB-CU1M, SFP-H10GB-CU3M, and SFP-H10GB-CU5M) and active Twinax copper cables (SFP-H10GB-ACU7M, SFP-H10GB-ACU10M) • Distance between Cisco Nexus 2000 Series Fabric Extender and Cisco Nexus 5000 Series Switch: Up to 3 km (300m for FCoE traffic)
Fabric speed	• 80 Gbps in each direction (160 Gbps full duplex)
Oversubscription	• 4:1
Performance	• Hardware forwarding at 560 Gbps or 595 mpps
Cisco parent switch	• Cisco Nexus 5000 Series • Cisco Nexus 7000 Series
Minimum software	• Cisco NX-OS Release 4.2(1)N1(1) • Cisco NX-OS Release 5.2 on the Cisco Nexus 7000 Series

Description	Cisco Nexus 2232PP
Cisco Nexus 2000 Series 10 Gigabit Ethernet Fabric Extenders Environment	
Dimensions (height x width x depth)	• 1.72 x 17.3 x 17.7 in. • (4.37 x 43.94 x 44.96 cm)
Weight	• 18.3 lb[2] (8.3 kg[2])
Indicator and port specification	• System status: green (operational), amber (fault), flashing amber (POST boot up), off (no power) • Locator LED: bright blue locator • Port status: green (link established), amber (administratively disabled), flashing amber (fault) • Fan status: green (operational), amber (fault) • Power status: green (operational), amber (fault)
Environment	• Operating temperature: 32 to 104℉ (0 to 40℃) • Nonoperating temperature: -4 to 158℉ (-20 to 70℃) • Humidity: 5 to 95 percent (noncondensing) • Altitude: 0 to 10,000 ft (0 to 3000m)
Power supply	• N2K-PAC-400W, N2K-PAC-400W-B, and N2K-PDC-400W
Fan Tray	• N2K-C2232-FAN and N2K-C2232-FAN-B
Typical input operating power	• 270W
Input current	• 2.5A/4.1A (typical/maximum) • Note: Input currents listed for 110V; divide by 2 for 220V • Supply will surge on AC power-up for a fraction of a second beyond this rating
Output current	• 20A/33A (typical/maximum)
Heat dissipation	• 806/1330 BTU/hour (typical/maximum)

Table 5. Cisco Nexus Fabric Extender Transceiver Specifications

Cisco Fabric Extender Transceiver	Specifications					
	Support Matrix	**Form Factor**	**Cable**	**Distance**	**Power**	**Latency**
Cisco Fabric Extender Transceiver (FET-10G)	Supported for fabric links only (Cisco Nexus 2000 Series to Cisco parent switch) Cisco Fabric Extender Transceiver must be connected to another Cisco Fabric Extender Transceiver Supported on Cisco Nexus 2200 platform uplinks Supported on Cisco Nexus 5000 and Nexus 7000 Series Switch fabric links	SFP	Multimode fiber (MMF)	• 25m (OM2) • 100m (OM3)	Approximately 1W per transceiver	Approximately 0.1 microsecond

Table 6. Cisco Nexus 2000 Series Spare Weight Specifications

Cisco Nexus 2000 Series	Weight	
	Pounds	**Kilograms**
N2K-PAC-200W=	1.5 lb	0.7 kg
N2200-PAC-400W=	2.2 lb	1 kg
N2200-PAC-400W-B=	2.2 lb	1 kg
N2200-PDC-400W=	2.2 lb	1 kg
N2K-C2148-FAN=	0.5 lb	0.2 kg
N2K-C2248-FAN=	1.4 lb	0.64 kg

[2] Systems are fully loaded with two power supplies and one fan tray.

Cisco Nexus 2000 Series	Weight	
N2K-C2232-FAN=	1.8 lb	0.8 kg
N2K-C2248-FAN-B=	1.4 lb	0.64 kg
N2K-C2232-FAN-B=	1.8 lb	0.8 kg

Table 7. Cisco Nexus 2000 Series Power Specifications

Cisco Nexus 2000 Series	Power Supply			
	N2K-PAC-200W	**N2K-PAC-400W**	**N2K-PAC-400W-B**	**N2K-PDC-400W**
Platform	Cisco Nexus 2148T	Cisco Nexus 2224TP, 2248TP, 2232PP	Cisco Nexus 2224TP, 2248TP, 2232PP	Cisco Nexus 2224TP, 2248TP, 2232PP
Compatible fan tray	N2K-C2148-FAN	N2K-C2248-FAN and N2K-C2232-FAN	N2K-C2248-FAN-B and N2K-C2232-FAN-B	N2K-C2248-FAN and N2K-C2232-FAN
Compatible Power Supply	N2K-PAC-200W	N2K-PAC-200W	N2K-PAC-400W-B	N2K-PDC-400W
Airflow	Front-to-back airflow	Front-to-back airflow	Back-to-front airflow	Back-to-front airflow
Minimum software	• Cisco NX-OS Release 4.0(1A)N2(1) on the Cisco Nexus 5000 Series	Cisco NX-OS Release 4.2(1)N1(1) on the Cisco Nexus 5000 Series Cisco NX-OS Release 5.1 on the Cisco Nexus 7000 Series	Cisco NX-OS Release 5.0(3)N1(1) 5000 Series	Cisco NX-OS Release 5.0(3)N1(1) 5000 Series
Input voltage	90 to 264 VAC	90 to 264 VAC	90 to 264 VAC	48 to -60 VDC
Frequency	50 to 60 Hz	50 to 60 Hz	50 to 60 Hz	N/A
Efficiency	84% at typical power draw	• 90/92% (110/240Vin) at typical power draw • 88/91% (110/240Vin) at maximum power draw	• 90/92% (110/240Vin) at typical power draw • 88/91% (110/240Vin) at maximum power draw	• 93% (-48Vin) at typical power draw • 91% (-48Vin) at maximum power draw
RoHS compliance	RoHS-5 compliant	RoHS-6 compliant	RoHS-6 compliant	RoHS-6 compliant
Hot swappable	Yes	Yes	Yes	Yes
Maximum rated output power	200W	400W	400W	400W
Power cord rating	3A@100Vin/1.5A@240Vin maximum	6A@100Vin/3A@240Vin maximum	6A@100Vin/3A@240Vin maximum	15A@-48Vin/8A@-60Vin maximum

Table 8. Cisco Nexus 2000 Series Fan Specifications

Cisco Nexus 2000 Series	Fan Module				
	N2K-C2148-FAN	**N2K-C2248-FAN**	**N2K-C2232-FAN**	**N2K-C2248-FAN-B**	**N2K-C2232-FAN-B**
Platform	Cisco Nexus 2148T	Cisco Nexus 2224TP and 2248TP	Cisco Nexus 2232PP	Cisco Nexus 2224TP and 2248TP	Cisco Nexus 2232PP
Airflow	Front-to-back airflow, with power supplies in front of the chassis aligned with cold aisle and port side in the back aligned with hot aisle			Back-to-front airflow, with port side in front of the chassis aligned with cold aisle and power supplies in the back aligned with hot aisle	
Compatible power supply	N2K-PAC-200W	N2K-PAC-400W and N2K-PDC-400W	N2K-PAC-400W and N2K-PDC-400W	N2K-PAC-400W-B	N2K-PAC-400W-B

Table 9. Cisco Nexus 2000 Series Compliance Information

Specification	Description
Regulatory compliance	Products should comply with CE Markings according to directives 2004/108/EC and 2006/95/EC.
Safety	• UL 60950-1 • CAN/CSA-C22.2 No. 60950-1EN 60950-1 • IEC 60950-1AS/NZS 60950-1GB4943
EMC: Emissions	• 47CFR Part 15 (CFR 47) Class A

Specification	Description
	• AS/NZS CISPR22 Class A • CISPR22 Class A • EN55022 Class A • ICES003 Class A • VCCI Class A • EN61000-3-2 • EN61000-3-3 • KN22 Class A • CNS13438 Class A
EMC: Immunity	• EN50082-1 • EN61000-6-1 • EN55024 • CISPR24 • EN300386 • KN 61000-4 series
RoHS	The Nexus 2148T is RoHS 5 compliant, the Nexus 2224T, 2248TP, 2232PP are RoHS 6 compliant.

Feature support for the Cisco Nexus 2000 Series is mainly derived from the parent switch feature set. Therefore, consult the Cisco Nexus 5000 and 7000 Series data sheets for a comprehensive list of feature supported. Table 10 lists the hardware capabilities of the Cisco Nexus 2000 Series.

Table 10. Feature Support for the Cisco Nexus 2000 Series

Description	Specification
Layer 2 features	• Layer 2 VLAN trunks • IEEE 802.1Q VLAN encapsulation • Cisco EtherChannel technology on uplinks • PortChannel on server ports on Cisco Nexus 2200 platforms • Advanced PortChannel hashing • Jumbo frames on all ports (up to 9216 bytes) • Pause frames (priority flow control [PFC] and IEEE 802.3x) • Private VLANs (promiscuous only on uplinks) • Local multicast replication on Cisco Nexus 2200 platform (8000 entries) • Autonegotiation to 1000BASE-T; full duplex on host interfaces
Enhanced Ethernet	• DCB (Cisco Nexus 2232PP)
Quality of service (QoS)	• Layer 2 IEEE 802.1p (class of service [CoS]) • 8 hardware queues per port (Cisco Nexus 2200 platforms), or 4 hardware queues per port (Cisco Nexus 2148T) • Per-port QoS configuration • Local policing on Cisco Nexus 2200 platform (64 policers) • CoS trust • Configurable tail-drop threshold on Cisco Nexus 2200 platforms • Egress strict-priority queuing • Egress port-based scheduling: Weighted Round Robin (WRR)
High availability	• Hot-swappable field-replaceable power supplies and fan modules • 1:1 power redundancy • Uplink traffic management through Cisco EtherChannel hashing or static port pinning • vPCs for dual-homed active-active connectivity across two Cisco Nexus 5000 Series Switches • vPCs for dual-homed straight-through NIC connectivity across two Cisco Nexus 2000 Series Fabric Extenders • ISSU
Security	• Local classification (256 access control list [ACL] entries)

Description	Specification
Management	• Fabric extender management using in-band management • Locator and beacon LEDs on front and back of chassis (locator beacons on the front and rear of the chassis help reduce errors when the equipment is serviced) • Per-port locator and beacon LEDs • Syslog • Simple Network Management Protocol Versions 1, 2, and 3 (SNMP v1, v2, and v3) • Enhanced SNMP MIB support • XML (NETCONF) support • Remote monitoring (RMON) • Cisco Discovery Protocol Versions 1 and 2 • Switched Port Analyzer (SPAN) source on server ports • Power-on self-test (POST) • Cisco Generic Online Diagnostics (GOLD): Ethernet • Comprehensive bootup diagnostic tests • CiscoWorks • Cisco Data Center Network Manager (DCNM); the Cisco Nexus 2000 Series is managed through the parent Cisco Nexus Series Switch using Cisco DCNM and standard SNMP, XML interfaces, and command-line interface (CLI)
Configuration MIBs	• ENTITY-MIB • IF-MIB • FABRIC-EXTENDER MIB • CISCO-ENTITY-EXT-MIB • CISCO-ENTITY-FRU-CONTROL-MIB • CISCO-ENTITY-SENSOR-MIB • CISCO-ETHERNET-FABRIC-EXTENDER-MIB
Monitoring MIBs	• RMON-MIB
Industry standards	• IEEE 802.1p: CoS prioritization • IEEE 802.1Q: VLAN tagging • IEEE 802.3: Ethernet • IEEE 802.3ae: 10 Gigabit Ethernet • SFF 8431 SFP+ support • IEEE 802.3u 100BASE-TX specification • IEEE 802.3ab 1000BASE-T specification • 10GBASE-SR • 10GBASE-LR • RMON • SFF-8461

Cisco Nexus 2000 Series Ordering Information

Table 11 provides ordering information for the Cisco Nexus 2000 Series Fabric Extenders.

Table 11. Ordering Information

Part Number	Description
Chassis	
N2K-C2148T-1GE	Cisco Nexus 2000 Series 1GE Fabric Extender, 1PS, 1 Fan Module, 48x1GBase-T + 4x10GE (req SFP+)
N2K-C2224TP-1GE	Cisco Nexus 2000 Series 1GE Fabric Extender, 2PS, 1 Fan Module, 24x100/1000Base-T + 2x10GE (req SFP+)
N2K-C2224TF-1GE	Cisco Nexus 2000 Series 1GE Fabric Extender, 2PS, 1 Fan Module, 24x100/1000Base-T + 2x10GE (includes 4 Fabric Extender Transceivers)
N2K-C2248TP-1GE	Cisco Nexus 2000 Series 1GE Fabric Extender, 2PS, 1 Fan Module, 48x100/1000Base-T + 4x10GE (req SFP+)
N2K-C2248TF-1GE	Cisco Nexus 2000 Series 1GE Fabric Extender, 2PS, 1 Fan Module, 48x100/1000Base-T + 4x10GE (includes 8 Fabric Extender Transceivers)
N2K-C2232PP-10GE	Cisco Nexus 2000 Series 10GE Fabric Extender, 2PS, 1 Fan Module, 32x1/10GE (req SFP/SFP+) + 8x10GE (req SFP+)
N2K-C2232PF-10GE	Cisco Nexus 2000 Series 10GE Fabric Extender, 2PS, 1 Fan Module, 32x1/10GE (req SFP/SFP+) + 8x10GE (includes 16 Fabric Extender Transceivers)

Part Number	Description
Fan Modules	
N2K-C2148T-FAN=	Cisco Nexus 2148T FEX Fan Module, spare
N2K-C2248-FAN=	Cisco Nexus 2224TP and 2248TP FEX Fan Module, spare
N2K-C2232-FAN=	Cisco Nexus 2232PP FEX Fan Module, spare
N2K-C2248-FAN-B=	Cisco Nexus 2224TP and 2248TP FEX Fan Module, Back-to-front airflow, spare
N2K-C2232-FAN-B=	Cisco Nexus 2232PP FEX Fan Module, Back-to-front airflow, spare
Power Supplies	
N2K-PAC-200W(=)	Cisco Nexus 2148T FEX 1GE 200W Power supply, spare
N2200-PAC-400W=	Cisco Nexus 2200 AC Power supply, spare
N2200-PAC-400W-B=	Cisco Nexus 2200 AC Power supply, Back-to-front airflow, spare
N2200-PDC-400W=	Cisco Nexus 2200 DC Power supply, spare
N2K-P1-BLNK=	Cisco Nexus 2148T FEX 1GE Power supply Blank, spare
N2200-P-BLNK=	Cisco Nexus 2200 Power supply Blank, spare
Transceivers and Cables	
SFP-10G-SR(=)	10GBASE-SR SFP+ Module
SFP-10G-LR(=)	10GBASE-LR SFP+ Module
SFP-H10GB-CU1M(=)	10GBASE-CU SFP+ Passive Cable 1 Meter
SFP-H10GB-CU3M(=)	10GBASE-CU SFP+ Passive Cable 3 Meter
SFP-H10GB-CU5M(=)	10GBASE-CU SFP+ Passive Cable 5 Meter
SFP-H10GB-ACU7M(=)	10GBASE-CU SFP+ Active Cable 7 Meter
SFP-H10GB-ACU10M(=)	10GBASE-CU SFP+ Active Cable 10 Meter
GLC-T(=)	1000BASE-T SFP
GLC-SX-MM(=)	GE SFP, LC connector SX transceiver
GLC-LH-SM(=)	GE SFP, LC connector LX/LH transceiver
SFP-GE-T(=)	1000BASE-T SFP, Extended Temperature Range
SFP-GE-S(=)	GE SFP, LC connector SX transceiver, with Digital Optical Monitoring (DOM) and Extended Temperature Range
SFP-GE-L(=)	GE SFP, LC connector LX/LH transceiver, with Digital Optical Monitoring (DOM) and Extended Temperature Range
Accessory Kit	
N2K-C2148T-ACC=	Cisco Nexus 2000 FEX 1GE Accessory Kit, spare
N2200-ACC-KIT=	Cisco Nexus 2200 FEX Accessory Kit, spare
Power Cords	
CAB-N5K6A-NA(=)	Power Cord, 210/220V 30A North America
CAB-AC-250V/13A(=)	Power Cord for North America, 125VAC/13A
CAB-C13-C14-JMPR(=)	Recessed receptacle AC power cord 27
CAB-C13-C14-2M(=)	Power Cord Jumper, C13-C14 Connectors, 2 Meter Length
CAB-C13-C14-AC(=)	Power Cord Jumper, C13-C14 Connectors, 3 Meter Length
CAB-C13-CBN(=)	Cabinet Jumper Power Cord, 250 VAC 16A, C14-C13 Connectors
CAB-9K12A-NA(=)	Power Cord, 125VAC 15A NEMA 5-15 Plug, North America
SFS-250V-10A-AR(=)	SFS Power Cord - 250V, 10A - Argentina
CAB-9K10A-AU(=)	Power Cord, 250VAC 10A 3112 Plug, Australia
SFS-250V-10A-CN(=)	SFS Power Cord - 250V, 10A - PRC
CAB-9K10A-EU(=)	Power Cord, 250VAC 10A CEE 7/7 Plug, EU
SFS-250V-10A-ID(=)	SFS Power Cord - 250V, 10A - South Africa, UAE, India
CAB-IND-10A(=)	10A Power cable for India
SFS-250V-10A-IS(=)	SFS Power Cord - 250V, 10A - Israel

Part Number	Description
CAB-9K10A-IT(=)	Power Cord, 250VAC 10A CEI 23-16/VII Plug, Italy
CAB-9K10A-SW(=)	Power Cord, 250VAC 10A MP232 Plug, Switzerland
CAB-9K10A-UK(=)	Power Cord, 250VAC 13A BS1363 Plug (13 A fuse), UK

Warranty

The Cisco Nexus 2000 Series Fabric Extenders have a 1-year limited hardware warranty. The warranty includes hardware replacement with a 10-day turnaround from receipt of a return materials authorization (RMA).

Service and Support

Cisco offers a wide range of services to help accelerate your success in deploying and optimizing the Cisco Nexus 2000 Series Fabric Extenders in your data center. The innovative Cisco Services offerings are delivered through a unique combination of people, processes, tools, and partners and are focused on helping you increase operation 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 achieve 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 Smart Call Home capability, which offers proactive diagnostics and real-time alerts on your Cisco Nexus 5000 Series Switches, Cisco Nexus 7000 Series Switches, and Cisco Nexus 2000 Series Fabric Extenders. Spanning the entire network lifecycle, Cisco Services offerings help increase investment protection, optimize network operations, support migration operations, and strengthen your IT expertise. For more information about Cisco Nexus services, visit http://www.cisco.com/go/nexusservices.

For More Information

- Cisco Nexus 2000 Series Fabric Extenders: http://www.cisco.com/go/nexus2000
- Cisco Nexus 5000 Series Switches: http://www.cisco.com/go/nexus5000
- Cisco Nexus 7000 Series Switches: http://www.cisco.com/go/nexus7000
- Cisco NX-OS Software: http://www.cisco.com/go/nxos

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