Cisco Nexus 3548x and 3524x Switches

Cisco Nexus 3000 Series Switches Overview

The Cisco Nexus® 3000 Series Switches are a comprehensive portfolio of 1, 10, and 40 Gigabit Ethernet switches built from a switch-on-a-chip (SoC) architecture. Introduced in April 2011, this series of switches provides line-rate Layer 2 and 3 performance and is suitable for top-of-the-rack (ToR) architecture. This series of switches has established itself as a leader in high-frequency trading (HFT), high-performance computing (HPC), and big data environments by pairing high performance and low latency with innovations in performance visibility, automation, and time synchronization.

Cisco Nexus 3500 Platform Overview

The Cisco Nexus 3500 platform further extends the leadership of the Cisco Nexus 3000 Series by including the innovative Cisco® Algorithm Boost (or Algo Boost) technology. Algo Boost technology, built into the switch application-specific integrated circuit (ASIC), allows the Cisco Nexus 3500 platform to achieve exceptional Layer 2 and 3 switching latencies of less than 200 nanoseconds (ns). In addition, Algo Boost offers several innovations in latency, forwarding, and performance visibility capabilities:

- Three configurable modes for low latency
  - Normal mode: This mode is excellent for environments needing low latency and high scalability. In this mode, latencies as low as 250 ns can be paired with the higher of the Layer 2 and 3 scaling values listed later in this document, in Table 6 and 7.
  - Warp mode: For those customers with smaller environments who demand the lowest latencies possible, warp mode consolidates forwarding operations within the switch ASIC, lowering latency by up to an additional 20 percent compared to normal operation. In this mode, latencies as low as 190 ns can be paired with the smaller of the Layer 2 and 3 scaling values listed later in this document, in Table 6 and 7.
  - Warp SPAN: In some environments, a stream of traffic entering one port simply needs to be copied to a list of outgoing ports as quickly as possible without processing or modification. The Cisco Nexus 3500 platform's warp SPAN capability allows all traffic entering a single port on the switch to be replicated to any number of destination ports at latencies as low as 50 ns.
- Hitless Network Address Translation (NAT): In many financial trading environments, trade orders must be sourced from the IP space of the provider, requiring NAT at the border between networks. The Cisco Nexus 3500 platform can perform NAT for IPv4 unicast routed packets without incurring any additional latency. The Cisco Nexus 3548x and 3524x introduce multicast NAT to the platform's capability. Customers hosting co-locations will find this feature useful in simplifying their network topologies and concealing details of their data centers.
- Latency monitoring: When nanoseconds matter, switch latency monitoring is essential to your company's profitability. The Cisco Nexus 3548x and 3524x enable users to finely control their environments to increase network performance. Customers can identify latency on a specific egress port through the command-line interface (CLI) and export this information to a file. The programmability of the Cisco Nexus 3548x allows users to use this information in real time.

- Active buffer monitoring: Even on the lowest-latency switches, data packets can incur a millisecond or more of latency during periods of congestion. Today's switches do not adequately inform administrators about the presence of this congestion, leaving them unaware and hindered in their ability to address the conditions causing suboptimal performance. Previous buffer utilization monitoring techniques were based entirely on software polling algorithms with polling intervals higher than 100 ms, which can miss important congestion events. In contrast, Algo Boost accelerates the collection of buffer utilization data in hardware, allowing sampling intervals of 10 ns or less.
- Advanced traffic mirroring: The Algo Boost technology on the Cisco Nexus 3500 platform facilitates not only network troubleshooting by supporting Cisco Switched Port Analyzer (SPAN) and Encapsulated Remote SPAN (ERSPAN) technologies, but also in-service network monitoring with enhancements including the capability to:
  - Apply user-configurable filters to reduce the amount of captured traffic to a specified flow or protocol
  - Capture a sample of eligible packets, such as one out of every thousand
  - Truncate packets after a user-defined threshold
  - Insert a nanosecond-level timestamp in the ERSPAN header of captured packets (requires ERSPAN and Precision Time Protocol [PTP])
- IEEE 1588 PTP with pulse-per-second (PPS) output*
  - The capability to build and maintain a synchronized, accurate timing solution is the basis for successful provisioning and management of HFT networks and applications. Using IEEE 1588 PTP, Cisco Nexus 3000 Series Switches can deliver highly accurate precision time synchronization to applications within existing network infrastructure with no need to invest in and deploy a separate timing network.
  - Network administrators deploying IEEE 1588 PTP often find it challenging to measure the accuracy to which each device is synchronized. To assist in this effort, the Cisco Nexus 3500 platform includes a 1-PPS output port that can be used to measure timing drift from the grandmaster clock.
- Network traffic monitoring with Cisco Nexus Data Broker
  - Build simple, scalable and cost-effective network tap or SPAN aggregation for network traffic monitoring and analysis. With Cisco Nexus 3500 platform switches, you can:
    - Truncate packets after a user-defined threshold at ingress
    - Time-stamp packets using Precision Time Protocol (PTP) with nanosecond accuracy

Cisco Nexus 3548 and 3524 Switches

The Cisco Nexus 3548 and 3524 Switches (Figure 1) are based on identical hardware, differentiated only by their software licenses, which allow the Cisco Nexus 3524 to operate 24 ports, and enable the use of all 48 ports on the Cisco Nexus 3548. These fixed switches are compact one-rack-unit (1RU) form-factor 10 Gigabit Ethernet switches that provide line-rate Layer 2 and 3 switching with ultra-low latency. Both software licenses run the industry-leading Cisco NX-OS Software operating system, providing customers with comprehensive features and functions that are deployed globally. The Cisco Nexus 3548 and 3524 contain no physical layer (PHY) chips, allowing low latency and low power consumption. These switches support both forward and reversed airflow schemes and both AC and DC power inputs.

Figure 1. Cisco Nexus 3548 and 3524 Switch

The Cisco Nexus 3548 and 3524 have the following hardware configuration:

- 48 fixed Enhanced Small Form-Factor Pluggable (SFP+) ports (1 or 10 Gbps); the Cisco Nexus 3524 enables only 24 ports
- Dual redundant hot-swappable power supplies
- Four individual redundant hot-swappable fans
- One 1-PPS timing port, with the RF1.0/2.3 QuickConnect connector type*
- Two 10/100/1000 management ports
- One RS-232 serial console port
- One USB port
- Locator LED
- Locator LED button

Support for both forward (port-side exhaust) and reversed (port-side intake) airflow schemes is available. Forward airflow is useful when the port side of the switch sits on a hot aisle and the power supply side sits on a cold aisle. Reverse airflow is useful when the power supply side of the switch sits on a hot aisle and the port side sits on a cold aisle.

Colored handles on each fan or power supply clearly indicate the airflow direction, as seen in Figures 2 and 3.

Figure 2. Cisco Nexus 3548 and 3524 with Blue Handles Indicating Forward Airflow

Figure 3. Cisco Nexus 3548 and 3524 with Red Handles Indicating Reversed Airflow

Cisco Nexus 3548x and 3524x Switches

The Cisco Nexus 3548x and 3524x Switches (Figure 4) are the next generation of the Cisco Nexus 3500 platform. Like the previous generation, these switches are compact 1RU form-factor 10 Gigabit Ethernet switches and provide line-rate Layer 2 and 3 switching with ultra-low latency. In addition, they consume 25% less power. This new generation introduces powerful hardware-based multicast NAT and latency monitoring capabilities and a second USB port for easier manageability.

Figure 4. Cisco Nexus 3548x and 3524x Switches

The Cisco Nexus 3548x and 3524x have the following hardware configuration:

- 48 fixed SFP+ ports (1 or 10 Gbps); the Cisco Nexus 3524x enables only 24 ports
- Dual redundant hot-swappable power supplies
- Four individual redundant hot-swappable fans
- One 1-PPS timing port, with the RF1.0/2.3 QuickConnect connector type*
- One 10/100/1000 management port
- One RS-232 serial console port
- Two USB ports
- Locator LED
- Locator LED button

Support for both forward (port-side exhaust) and reversed (port-side intake) airflow schemes is available. Forward airflow is useful when the port side of the switch sits on a cold aisle and the power supply side sits on a hot aisle. Reverse airflow is useful when the power supply side of the switch sits on a cold aisle and the port side sits on a hot aisle.

Colored handles on each fan or power supply clearly indicate the airflow direction, as seen in Figures 5 and 6.

Figure 5. Cisco Nexus 3848x and 3524x with Blue Handles Indicating Forward Airflow

Figure 6. Cisco Nexus 3848x and 3524x with Red Handles Indicating Reversed Airflow

Cisco NX-OS Software Overview

Cisco NX-OS is a data center-class operating system built with modularity, resiliency, and serviceability at its foundation. Cisco NX-OS helps ensure continuous availability and sets the standard for mission-critical data center environments. The self-healing and highly modular design of Cisco NX-OS makes zero-impact operations a reality and provides exceptional operational flexibility.

Focused on the requirements of the data center, Cisco NX-OS provides a robust and comprehensive feature set that meets the networking requirements of present and future data centers. With an XML interface and a command-line interface (CLI) like that of Cisco IOS® Software, Cisco NX-OS provides state-of-the-art implementations of relevant networking standards as well as a variety of true data center-class Cisco innovations.

Cisco NX-OS Software Benefits

Table 1 summarizes the benefits that Cisco NX-OS Software offers.

Table 1. Benefits of Cisco NX-OS Software

Feature	Benefit
Common software throughout the data center: Cisco NX-OS runs on all Cisco data center switch platforms (Cisco Nexus 7000, 5000, 4000, and 1000V Series Switches and Cisco Nexus 2000 Series Fabric Extenders).	• Simplification of data center operating environment • End-to-end Cisco Nexus and Cisco NX-OS fabric • No retraining necessary for data center engineering and operations teams
Software compatibility: Cisco NX-OS interoperates with Cisco products running any variant of Cisco IOS Software and also with any networking OS that conforms to the networking standards listed as supported in this data sheet.	• Transparent operation with existing network infrastructure • Open standards • No compatibility concerns
Modular software design: Cisco NX-OS is designed to support distributed multithreaded processing. Cisco NX-OS modular processes are instantiated on demand, each in a separate protected memory space. Thus, processes are started and system resources allocated only when a feature is enabled. The modular processes are governed by a real-time preemptive scheduler that helps ensure timely processing of critical functions.	• Robust software • Fault tolerance • Increased scalability • Increased network availability
Troubleshooting and diagnostics: Cisco NX-OS is built with unique serviceability functions to allow network operators to take early action based on network trends and events, enhancing network planning and improving network operations center (NOC) and vendor response times. Cisco Smart Call Home and Cisco Online Health Management System (OHMS) are some of the features that enhance the serviceability of Cisco NX-OS.	• Quick problem isolation and resolution • Continuous system monitoring and proactive notifications • Improved productivity of operations teams
Ease of management: Cisco NX-OS provides a programmatic XML interface based on the NETCONF industry standard. The Cisco NX-OS XML interface provides a consistent API for devices. Cisco NX-OS also provides support for Simple Network Management Protocol (SNMP) Versions 1, 2, and 3 MIBs. **Using the Cisco Nexus Data Broker software and Cisco Plug-in for OpenFlow agent, the Cisco Nexus 3500 platform can be used to build a scalable, cost-effective, and programmable tap or SPAN aggregation infrastructure. This approach replaces the traditional purpose-built matrix switches with these switches. You can interconnect these switches to build a multilayer topology for tap or SPAN aggregation infrastructure.**	• Rapid development and creation of tools for enhanced management • Comprehensive SNMP MIB support for efficient remote monitoring • Scalable and cost effective • Traffic aggregation from multiple input ports across different switches • Traffic replication and forwarding to multiple monitoring tools • Support for packet truncation and time stamping
Role-based access control (RBAC): With RBAC, Cisco NX-OS enables administrators to limit access to switch operations by assigning roles to users. Administrators can customize access and restrict it to only the users who require it.	• Effective access control mechanism based on user roles • Improved network device security • Reduction in network problems arising from human error

Cisco NX-OS Software Packages for the Cisco Nexus 3500 Platform

The software packages for the Cisco Nexus 3500 offer flexibility and a comprehensive feature set and are consistent with Cisco Nexus access switches. The default system software has a comprehensive Layer 2 feature set with extensive security and management features. To enable certain Layer 3 IP unicast and multicast routing functions, NAT, warp mode, and warp SPAN, additional licenses must be installed, as described in Table 2. See Table 9 later in this document for a complete software feature list.

Table 2. Software Licensing for Cisco Nexus 3500

Software Package	Features Supported
System default (no license required)	• Comprehensive Layer 2 feature set: VLAN, IEEE 802.1Q trunking, Link Aggregation Control Protocol (LACP), Unidirectional Link Detection (UDLD; Standard and Aggressive), Multiple Spanning Tree Protocol (MSTP), Rapid Spanning Tree Protocol (RSTP), and Spanning Tree Protocol guard • Security: Authentication, authorization, and accounting (AAA), access control lists (ACLs), storm control, and configurable Control-Plane Policing (CoPP) • Management features: Cisco Data Center Network Manager (DCNM) support, Secure Shell Version 2 (SSHv2) access, Cisco Discovery Protocol, SNMP, syslog, and IEEE 1588 PTP • Monitoring features: Advanced buffer monitoring, SPAN, and ERSPAN
Base license	• Layer 3 IP routing: Inter-VLAN routing (IVR), static routes, Routing Information Protocol Version 2 (RIPv2), ACLs, Open Shortest Path First Version 2 (OSPFv2; limited to 256 routes), Enhanced Interior Gateway Routing Protocol (EIGRP) stub, Hot Standby Router Protocol (HSRP), and Virtual Router Redundancy Protocol (VRRP) • Multicast: Protocol-Independent Multicast Sparse Mode (PIM-SM), Source-Specific Multicast (SSM), and Multicast Source Discovery Protocol (MSDP)
LAN Enterprise license (N3K-LAN1K9); requires Base license	• Advanced Layer 3 IP routing: OSPFv2, EIGRP, Border Gateway Protocol (BGP), and Virtual Routing and Forwarding Lite (VRF-Lite)
Algo Boost license (N3K-ALGK9)	• Algo Boost features: NAT, warp mode, and warp SPAN
Cisco Nexus Data Broker license (NDB-FX-SWT-K9)	• License for using the tap and SPAN aggregation functions with Cisco Nexus Data Broker; only the Base license is needed for this feature
N3548-24P-UPG=	• Cisco Nexus 3524 24-Port Upgrade License
N3548x-24P-UPG=	• Cisco Nexus 3524x 24-Port Upgrade License

Cisco Data Center Network Manager

The Cisco Nexus 3500 platform is supported in Cisco DCNM. Cisco DCNM is designed for the Cisco Nexus hardware platforms, which are enabled for Cisco NX-OS. Cisco DCNM is a Cisco management solution that increases overall data center infrastructure uptime and reliability, improving business continuity. Focused on the management requirements of the data center network, Cisco DCNM provides a robust framework and comprehensive feature set that can meet the routing, switching, and storage administration needs of present and future data centers. Cisco DCNM automates the provisioning process, proactively monitors the LAN by detecting performance degradation, secures the network, and simplifies the diagnosis of dysfunctional network elements.

Cisco Nexus Data Broker

The Cisco Nexus 3500 platform switches with Cisco Nexus Data Broker can be used to build a scalable and cost-effective traffic monitoring infrastructure using network taps and SPAN. This approach replaces the traditional purpose-built matrix switches with one or more OpenFlow-enabled Cisco Nexus switches. You can interconnect these switches to build a scalable tap or SPAN aggregation infrastructure. You also can combine tap and SPAN sources to bring the copy of the production traffic to this tap or SPAN aggregation infrastructure. In addition, you can distribute these sources and traffic monitoring and analysis tools across multiple Cisco Nexus switches. For more details, visit http://www.cisco.com/go/nexusdatabroker.

Transceiver and Cabling Options

The Cisco Nexus 3500 platform supports a wide variety of 100 Megabit Ethernet and 1, 10, and 40 Gigabit Ethernet connectivity options. For in-rack or adjacent-rack cabling, the Cisco Nexus 3500 platform supports SFP+ direct-attach copper cabling, an innovative solution that integrates transceivers with Twinax cables into an energy-efficient and low-cost solution. For longer cable runs, multimode and single-mode optical SFP+ transceivers are supported.

Table 3 lists the supported 40 Gigabit Ethernet transceiver options. 40 Gigabit Ethernet is achieved on the Cisco Nexus 3500 platform by combining four sequential SFP+ interfaces into a logical 40 Gigabit Ethernet port. The resulting interface is fully compliant with the IEEE standard for 40 Gigabit Ethernet and thus is interoperable with any other 40 Gigabit Ethernet device, regardless of interface form factor, including Quad SFP (QSFP).

Table 3. Cisco Nexus 3500 Platform 40 Gigabit Transceiver Support Matrix

Part Number	Description
SFP-10G-SR	10GBASE-SR SFP+ module (multimode fiber [MMF])
SFP-10G-LR	10GBASE-LR SFP+ module (single-mode fiber [SMF])
QSFP-4SFP10G-CU1M	QSFP to 4 x SFP 10-Gbps passive copper splitter cable, 1m (Twinax cable)
QSFP-4SFP10G-CU3M	QSFP to 4 x SFP 10-Gbps passive copper splitter cable, 3m (Twinax cable)
QSFP-4SFP10G-CU5M	QSFP to 4 x SFP 10-Gbps passive copper splitter cable, 5m (Twinax cable)

Table 4 lists the supported 10 Gigabit Ethernet transceiver options.

Table 4. Cisco Nexus 3500 Platform 10 Gigabit Transceiver Support Matrix

Part Number	Description
SFP-10G-SR	10GBASE-SR SFP+ module (MMF)
SFP-10G-LR	10GBASE-LR SFP+ module (single-mode fiber [SMF])
SFP-10G-ER	Cisco 10GBASE-ER SFP+ module for SMF
DWDM-SFP10G-*	10GBASE-DWDM modules (multiple varieties)
SFP-H10GB-CU1M	10GBASE-CU SFP+ cable, 1m (Twinax cable)
SFP-H10GB-CU3M	10GBASE-CU SFP+ cable, 3m (Twinax cable)
SFP-H10GB-CU5M	10GBASE-CU SFP+ cable, 5m (Twinax cable)
SFP-H10GB-ACU7M	Active Twinax cable assembly, 7m
SFP-H10GB-ACU10M	Active Twinax cable assembly, 10m

The Cisco Nexus 3500 platform is compatible with existing Gigabit Ethernet infrastructures. Both the uplink and downlink 10 Gigabit Ethernet interfaces can also operate in 100 Megabit Ethernet and 1 Gigabit Ethernet modes. Table 5 lists the Gigabit Ethernet SFP transceivers that are supported. 100 Megabit Ethernet connectivity can be achieved by using copper-based SFP transceivers (GLC-T).

Table 5. Cisco Nexus 3500 Platform Gigabit Ethernet Transceiver Support Matrix

Part Number	Description
GLC-T	1000BASE-T SFP
GLC-SX-MM	GE SFP, LC connector SX transceiver (MMF)
GLC-SX-MMD	1000BASE-SX SFP transceiver module, MMF, 850 nm, DOM
GLC-LH-SM	GE SFP, LC connector LX and LH transceiver
GLC-LH-SMD	1000BASE-LX/LH SFP transceiver module, MMF and SMF, 1310 nm, DOM

For more information about the transceiver types, see http://www.cisco.com/en/US/products/hw/modules/ps5455/prod_module_series_home.html.

Product Specifications

Table 6 lists the specifications for the Cisco Nexus 3548 and 3524 Switches, and Table 7 lists the specifications for the Cisco Nexus 3548x and 3524x Switches. Table 8 lists hardware specifications common to all four switches, and Table 9 lists software features common to all four switches. Table 10 lists management standards and support.

Table 6. Cisco Nexus 3548 and 3524 Specifications

Specification	Cisco Nexus 3548	Cisco Nexus 3524
Physical	• 48 fixed SFP+ ports (1 or 10 Gbps) • Dual redundant hot-swappable power supplies • Four individual redundant hot-swappable fans • One 1-PPS timing port, with the RF1.0/2.3 QuickConnect connector type* • Two 10/100/1000-Mbps management ports • One RS-232 serial console port • One USB port • Locator LED • Locator LED button	• 24 fixed SFP+ ports (1 or 10 Gbps); expandable to 48 ports • Dual redundant hot-swappable power supplies • Four individual redundant hot-swappable fans • One 1-PPS timing port, with the RF1.0/2.3 QuickConnect connector type* • Two 10/100/1000-Mbps management ports • One RS-232 serial console port • One USB port • Locator LED • Locator LED button
Performance	• 960-Gbps switching capacity • Forwarding rate of 720 million packets per second (mpps) • Line-rate traffic throughput (both Layer 2 and 3) on all ports • Configurable maximum transmission units (MTUs) of up to 9216 bytes (jumbo frames)	• 480-Gbps switching capacity • Forwarding rate of 360 mpps • Line-rate traffic throughput (both Layer 2 and 3) on all ports • Configurable MTUs of up to 9216 bytes (jumbo frames)
Typical operating power	• 152 watts (W): 48p with Twinax at 100% load; 2 power supply units (PSUs) at 25°C • 180W: 48p with SR optics at 100% load; 2 PSUs at 25°C	• 142W: 24p with Twinax at 100% load; 2 power supply units (PSUs) at 25°C • 160W: 24p with SR optics at 100% load; 2 PSUs at 25°C
Maximum power	• 265W	• 245W
Typical heat dissipation	• 519 BTUs per hr: 48p with Twinax at 100% load; 2 PSUs at 25°C • 614 BTUs per hr: 48p with SR optics at 100% load; 2 PSUs at 25°C	• 484 BTUs per hr: 24p with Twinax at 100% load; 2 PSUs at 25°C • 545 BTUs per hr: 24p with SR optics at 100% load; 2 PSUs at 25°C
Maximum heat dissipation	• 904 BTUs per hr	• 835 BTUs per hr

* 1-PPS output will be enabled in a future software revision.

Table 7. Cisco Nexus 3548x and 3524x Specifications

Specification	Cisco Nexus 3548x	Cisco Nexus 3524x
Physical	• 48 fixed SFP+ ports (1 or 10 Gbps) • Dual redundant hot-swappable power supplies • Four individual redundant hot-swappable fans • One 1-PPS timing port, with the RF1.0/2.3 QuickConnect connector type* • One 10/100/1000-Mbps management port • One RS-232 serial console port • Two USB ports • Locator LED • Locator LED button	• 24 fixed SFP+ ports (1 or 10 Gbps); expandable to 48 ports • Dual redundant hot-swappable power supplies • Four individual redundant hot-swappable fans • One 1-PPS timing port, with the RF1.0/2.3 QuickConnect connector type* • One 10/100/1000-Mbps management port • One RS-232 serial console port • Two USB ports • Locator LED • Locator LED button
Performance	• 960-Gbps switching capacity • Forwarding rate of 720 mpps • Line-rate traffic throughput (both Layer 2 and 3) on all ports • Configurable MTUs of up to 9216 bytes (jumbo frames)	• 480-Gbps switching capacity • Forwarding rate of 360 mpps • Line-rate traffic throughput (both Layer 2 and 3) on all ports • Configurable MTUs of up to 9216 bytes (jumbo frames)

Specification	Cisco Nexus 3548x	Cisco Nexus 3524x
Typical operating power	• 112W: 48p with Twinax at 100% load; 2 power supply units (PSUs) at 25°C • 140W: 48p with SR optics at 100% load; 2 PSUs at 25°C	• 102W: 24p with Twinax at 100% load; 2 power supply units (PSUs) at 25°C • 120W: 24p with SR optics at 100% load; 2 PSUs at 25°C
Maximum power	• 213W	• 193W
Typical heat dissipation	• 383 BTUs per hr: 48p with Twinax at 100% load; 2 PSUs at 25°C • 478 BTUs per hr: 48p with SR optics at 100% load; 2 PSUs at 25°C	• 348 BTUs per hr: 48p with Twinax at 100% load; 2 PSUs at 25°C • 409 BTUs per hr: 48p with SR optics at 100% load; 2 PSUs at 25°C
Maximum heat dissipation	• 727 BTUs per hr	• 658 BTUs per hr

* 1-PPS output will be enabled in a future software revision.

Table 8. Hardware Specifications Common to All Switches

	Mode	Normal Mode	Warp Mode
Hardware tables and scalability	Number of MAC addresses	64,000	8000
	Number of IPv4 unicast routes	24,000	4000
	Number of IPv4 hosts	64,000	8000
	Number of IPv4 multicast routes	8000	8000
	Number of VLANS	4096	
	Number of ACL entries	4096	
	Number of spanning-tree instances	Rapid Spanning Tree Protocol (RSTP): 512 Multiple Spanning Tree (MST) Protocol: 64	
	Number of EtherChannels	24	
	Number of ports per EtherChannel	24	
	Buffer size	6 MB shared among 16 ports; 18 MB total	
	Boot flash memory	2 GB	
Power	Number of power supplies	2 (redundant)	
	Power supply types	• AC (forward and reversed airflow) • DC (forward and reversed airflow)	
	Input voltage	100 to 240 VAC	
	Frequency	50 to 60 Hz	
	Power supply efficiency	89 to 91% at 220V	
Cooling	Forward and reversed airflow schemes • Forward airflow: Port-side exhaust (air enters through fan tray and power supplies and exits through ports) • Reversed airflow: Port-side intake (air enters through ports and exits through fan tray and power supplies) Four individual, hot-swappable fans (3+1 redundant)		
Environment	Dimensions (height x width x depth)	1.72 x 17.3 x 18.38 in. (4.36 x 43.9 x 46.7 cm)	
	Weight	17.4 lb (7.9 kg)	
	Operating temperature	32 to 104° F (0 to 40°C)	
	Storage temperature	-40 to 158° F (-40 to 70°C)	
	Relative humidity (operating)	• 10 to 85% noncondensing • Up to 5 days at maximum (85%) humidity • Recommend ASHRAE data center environment	
	Relative humidity (nonoperating)	5 to 95% noncondensing	
	Altitude	0 to 10,000 ft (0 to 3000m)	
	Mean time between failure (MTBF)	317,030 hours	

Table 9. Software Features Common to All Switches

Description	Specifications
Layer 2	• Layer 2 switch ports and VLAN trunks • IEEE 802.1Q VLAN encapsulation • Support for up to 4096 VLANs • Rapid Per-VLAN Spanning Tree Plus (PVRST+) (IEEE 802.1w compatible) • MSTP (IEEE 802.1s): 64 instances • Spanning Tree PortFast • Spanning Tree Root Guard • Spanning Tree Bridge Assurance • Cisco EtherChannel technology (up to 24 ports per EtherChannel) • LACP: IEEE 802.3ad, IEEE 802.1ax • Advanced PortChannel hashing based on Layer 2, 3, and 4 information • Jumbo frames on all ports (up to 9216 bytes) • Storm control (multicast and broadcast) • Link-level flow control (IEEE 802.3x)
Layer 3	• Layer 3 interfaces: Routed ports on interfaces, switch virtual interfaces (SVIs), PortChannels, and subinterfaces (total: 1024) • 24-way Equal-Cost Multipath (ECMP) • 4096 ACL entries • Routing protocols: Static, RIPv2, EIGRP, OSPF, and BGP • HSRP and VRRP • ACL: Routed ACL with Layer 3 and 4 options to match ingress and egress ACLs • VRF: VRF-Lite (IP VPN), VRF-aware unicast (BGP, OSPF, and RIP), and VRF-aware multicast • VRF route leaking • Jumbo frame support (up to 9216 bytes)
Multicast	• Multicast: PIMv2, PIM Sparse Mode (PIM-SM), SSM, and BiDir • Bootstrap router (BSR), Auto-RP, and Static RP • MSDP and Anycast RP • Internet Group Management Protocol (IGMP) Versions 2 and 3
Security	• Ingress ACLs (standard and extended) on Ethernet • Standard and extended Layer 3 to 4 ACLs include IPv4, Internet Control Message Protocol (ICMP), TCP, and User Datagram Protocol (UDP) • VLAN-based ACLs (VACLs) • Port-based ACLs (PACLs) • Named ACLs • ACLs on virtual terminals (VTYs) • Dynamic Host Configuration Protocol (DHCP) relay • Control Plane Policing (CoPP)
Cisco Nexus Data Broker	• Topology support for tap and SPAN aggregation • Support for QinQ to tag input source tap and SPAN ports • Traffic load balancing to multiple monitoring tools • Time stamping using PTP • Packet truncation • Traffic filtering based on Layer 1 through Layer 4 header information • Traffic replication and forwarding to multiple monitoring tools • Robust RBAC • Northbound Representational State Transfer (REST) API for all programmability support
Management	• Power On Auto Provisioning (POAP) • Python scripting • Switch management using 10/100/1000-Mbps management or console ports • CLI-based console to provide detailed out-of-band management • In-band switch management • Locator and beacon LEDs • Configuration rollback

Description	Specifications
	• SSHv2 • Telnet • AAA • AAA with RBAC • RADIUS • TACACS+ • Syslog • Embedded packet analyzer • SNMP v1, v2, and v3 • Enhanced SNMP MIB support • XML (NETCONF) support • Remote monitoring (RMON) • Advanced Encryption Standard (AES) for management traffic • Unified username and passwords across CLI and SNMP • Microsoft Challenge Handshake Authentication Protocol (MS-CHAP) • Digital certificates for management between switch and RADIUS server • Cisco Discovery Protocol Versions 1 and 2 • RBAC • SPAN on physical, PortChannel, and VLAN • ERSPAN Versions 2 and 3 • Ingress and egress packet counters per interface • Network Time Protocol (NTP) • Cisco OHMS • Comprehensive bootup diagnostic tests • Cisco Call Home • Cisco DCNM • Active buffer monitoring • PTP (IEEE 1588) boundary clock

Table 10. Management and Standards Support

Description	Specification	
MIB support	Generic MIBs • SNMPv2-SMI • CISCO-SMI • SNMPv2-TM • SNMPv2-TC • IANA-ADDRESS-FAMILY-NUMBERS-MIB • IANAifType-MIB • IANAiprouteprotocol-MIB • HCNUM-TC • CISCO-TC • SNMPv2-MIB • SNMP-COMMUNITY-MIB • SNMP-FRAMEWORK-MIB • SNMP-NOTIFICATION-MIB • SNMP-TARGET-MIB • SNMP-USER-BASED-SM-MIB • SNMP-VIEW-BASED-ACM-MIB • CISCO-SNMP-VACM-EXT-MIB Ethernet MIBs • CISCO-VLAN-MEMBERSHIP-MIB Configuration MIBs • ENTITY-MIB • IF-MIB • CISCO-ENTITY-EXT-MIB	Monitoring MIBs • NOTIFICATION-LOG-MIB • CISCO-SYSLOG-EXT-MIB • CISCO-PROCESS-MIB • RMON-MIB • CISCO-RMON-CONFIG-MIB • CISCO-HC-ALARM-MIB Security MIBs • CISCO-AAA-SERVER-MIB • CISCO-AAA-SERVER-EXT-MIB • CISCO-COMMON-ROLES-MIB • CISCO-COMMON-MGMT-MIB • CISCO-SECURE-SHELL-MIB Miscellaneous MIBs • CISCO-LICENSE-MGR-MIB • CISCO-FEATURE-CONTROL-MIB • CISCO-CDP-MIB • CISCO-RF-MIB Layer 3 and Routing MIBs • UDP-MIB • TCP-MIB • OSPF-MIB • OSPF-TRAP-MIB • BGP4-MIB

Description	Specification
	• CISCO-ENTITY-FRU-CONTROL-MIB • CISCO-ENTITY-SENSOR-MIB • CISCO-SYSTEM-MIB • CISCO-SYSTEM-EXT-MIB • CISCO-IP-IF-MIB • CISCO-IF-EXTENSION-MIB • CISCO-NTP-MIB • CISCO-IMAGE-MIB • CISCO-IMAGE-UPGRADE-MIB • CISCO-HSRP-MIB • PIM-MIB
Standards	• IEEE 802.1D: Spanning Tree Protocol • IEEE 802.1p: CoS Prioritization • IEEE 802.1Q: VLAN Tagging • IEEE 802.1s: Multiple VLAN Instances of Spanning Tree Protocol • IEEE 802.1w: Rapid Reconfiguration of Spanning Tree Protocol • IEEE 802.3z: Gigabit Ethernet • IEEE 802.3ad: Link Aggregation Control Protocol (LACP) • IEEE 802.1ax: Link Aggregation Control Protocol (LACP) • IEEE 802.3ae: 10 Gigabit Ethernet • IEEE 802.3ba: 40 Gigabit Ethernet • IEEE 802.1ab: LLDP
RFC	BGP • RFC 1997: BGP Communities Attribute • RFC 2385: Protection of BGP Sessions with the TCP MD5 Signature Option • RFC 2439: BGP Route Flap Damping • RFC 2519: A Framework for Inter-Domain Route Aggregation • RFC 2545: Use of BGPv4 Multiprotocol Extensions • RFC 2858: Multiprotocol Extensions for BGPv4 • RFC 3065: Autonomous System Confederations for BGP • RFC 3392: Capabilities Advertisement with BGPv4 • RFC 4271: BGPv4 • RFC 4273: BGPv4 MIB: Definitions of Managed Objects for BGPv4 • RFC 4456: BGP Route Reflection • RFC 4486: Subcodes for BGP Cease Notification Message • RFC 4724: Graceful Restart Mechanism for BGP • RFC 4893: BGP Support for Four-Octet AS Number Space OSPF • RFC 2328: OSPF Version 2 • 8431RFC 3101: OSPF Not-So-Stubby-Area (NSSA) Option • RFC 3137: OSPF Stub Router Advertisement • RFC 3509: Alternative Implementations of OSPF Area Border Routers • RFC 3623: Graceful OSPF Restart • RFC 4750: OSPF Version 2 MIB RIP • RFC 1724: RIPv2 MIB Extension • RFC 2082: RIPv2 MD5 Authentication • RFC 2453: RIP Version 2 • IP Services • RFC 768: User Datagram Protocol (UDP) • RFC 783: Trivial File Transfer Protocol (TFTP) • RFC 791: IP • RFC 792: Internet Control Message Protocol (ICMP) • RFC 793: TCP • RFC 826: ARP • RFC 854: Telnet • RFC 959: FTP • RFC 1027: Proxy ARP • RFC 1305: Network Time Protocol (NTP) Version 3

Description	Specification
	• RFC 1519: Classless Interdomain Routing (CIDR) • RFC 1542: BootP Relay • RFC 1591: Domain Name System (DNS) Client • RFC 1812: IPv4 Routers • RFC 2131: DHCP Helper • RFC 2338: VRRP IP Multicast • RFC 2236: Internet Group Management Protocol, version 2 • RFC 3376: Internet Group Management Protocol, Version 3 • RFC 3446: Anycast Rendezvous Point Mechanism Using PIM and MSDP • RFC 3569: An Overview of SSM • RFC 3618: Multicast Source Discovery Protocol (MSDP) • RFC 4601: Protocol Independent Multicast - Sparse Mode (PIM-SM): Protocol Specification (Revised) • RFC 4607: Source-Specific Multicast for IP • RFC 4610: Anycast-RP using PIM • RFC 5015: PIM BiDir • RFC 5132: IP Multicast MIB

Software Requirements

Cisco Nexus 3000 Series Switches are supported by Cisco NX-OS Software Release 5.0 and later. Cisco NX-OS interoperates with any networking OS, including Cisco IOS Software, that conforms to the networking standards mentioned in this data sheet.

Regulatory Standards Compliance

Table 11 summarizes regulatory standards compliance for the Cisco Nexus 3000 Series.

Table 11. Regulatory Standards Compliance: Safety and EMC

Specification	Description
Regulatory compliance	• Products should comply with CE Markings per directives 2004/108/EC and 2006/95/EC
Safety	• UL 60950-1 Second Edition • CAN/CSA-C22.2 No. 60950-1 Second Edition • EN 60950-1 Second Edition • IEC 60950-1 Second Edition • AS/NZS 60950-1 • GB4943
EMC: Emissions	• 47CFR Part 15 (CFR 47) Class A • 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	• EN55024 • CISPR24 • EN300386 • KN24
RoHS	RoHS 5 compliant except for lead press-fit connectors

Ordering Information

Table 12 provides ordering information for the Cisco Nexus 3548, 3524, 3548x, and 3524x.

Table 12. Ordering Information

Part Number	Description
Chassis	
N3K-C3548P-10G	Nexus 3548 Switch, 48 SFP+
N3K-C3524P-10G	Nexus 3524 Switch, 24 SFP+
N3K-C3548P-10GX	Nexus 3548x Switch, 48 SFP+
N3K-C3524P-10GX	Nexus 3524x Switch, 24 SFP+
NXA-FAN-30CFM-F	N2K/3K Individual Fan, Forward airflow (port side exhaust)
NXA-FAN-30CFM-B	N2K/3K Individual Fan, Reversed airflow (port side intake)
N2200-PAC-400W	N2K/3K 400W AC Power Supply, Forward airflow (port side exhaust)
N2200-PAC-400W-B	N2K/3K 400W AC Power Supply, Reversed airflow (port side intake)
N2200-PDC-400W	N2K/3K 400W DC Power Supply, Forward airflow (port side exhaust)
N3K-PDC-350W-B	N2K/3K 350W DC Power Supply, Reversed airflow (port side intake)
Software Licenses	
N3548-BAS1K9	Nexus 3000 Layer 3 Base License
N3524-LAN1K9	Nexus 3524 Layer 3 LAN Enterprise License (Requires N3K-BAS1K9 License)
N3548-LAN1K9	Nexus 3548 Layer 3 LAN Enterprise License (Requires N3K-BAS1K9 License)
N3548-ALGK9	Nexus 3500 Algo Boost License
NDB-FX-SWT-K9	License for Tap/SPAN aggregation using Cisco Nexus Data Broker
N3548-24P-UPG=	Nexus 3524 additional 24 port license
Spares	
NXA-FAN-30CFM-F=	N2K/3K Individual Fan, Forward airflow (port side exhaust), Spare
NXA-FAN-30CFM-B=	N2K/3K Individual Fan, Reversed airflow (port side intake), Spare
N2000-PAC-400W=	N2K/3K 400W AC Power Supply, Forward airflow (port side exhaust), Spare
N2000-PAC-400W-B=	N2K/3K 400W AC Power Supply, Reversed airflow (port side intake), Spare
N2200-PDC-400W=	N2K/3K 400W DC Power Supply, Forward airflow (port side exhaust), Spare
N3K-PDC-350W-B=	N3K Series 350W DC Power Supply, Reversed airflow (port side intake), Spare
N3K-C3064-ACC-KIT=	Nexus 3548 Accessory Kit (same as Nexus 3064)
Cables and Optics	
SFP-10G-SR(=)	10GBASE-SR SFP+ Module
SFP-10G-LR(=)	10GBASE-LR SFP+ Module
SFP-10G-ER(=)	Cisco 10GBASE-ER SFP+ Module for SMF
SFP-H10GB-CU1M(=)	10GBASE-CU SFP+ Cable 1 Meter, passive (twinax)
SFP-H10GB-CU3M(=)	10GBASE-CU SFP+ Cable 3 Meter, passive (twinax)
SFP-H10GB-CU5M(=)	10GBASE-CU SFP+ Cable 5 Meter, passive (twinax)
SFP-H10GB-ACU7M(=)	Active Twinax Cable Assembly, 7m
SFP-H10GB-ACU10M(=)	Active Twinax Cable Assembly, 10m
GLC-T(=)	1000BASE-T SFP
GLC-SX-MM(=)	GE SFP, LC Connector SX Transceiver
GLC-SX-MMD(=)	1000BASE-SX SFP transceiver module, MMF, 850nm, DOM
GLC-LH-SM(=)	GE SFP, LC Connector LX/LH Transceiver
GLC-LH-SMD(=)	1000BASE-LX/LH SFP transceiver module, MMF/SMF, 1310nm, DOM

Warranty

The Cisco Nexus 3000 Series Switches 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 3000 Series 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 Cisco Smart Call Home service capability, which offers proactive diagnostics and real-time alerts on your Cisco Nexus 3000 Series Switches. Spanning the entire network lifecycle, Cisco Services helps increase investment protection, optimize network operations, support migration operations, and strengthen your IT expertise.

For More Information

For more information, please visit http://www.cisco.com/go/nexus3000. For information about Cisco Nexus Data Broker, please visit http://www.cisco.com/go/nexusdatabroker.

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