

Cisco Nexus 3264Q Switch

Product Overview

The Cisco Nexus[®] 3264Q Switch is a Low Latency, ultra-high-density, power-efficient, 40-Gbps switch designed for the data center. This compact, two-rack-unit (2RU) model offers wire-rate Layer 2 and Layer 3 switching on all ports with latency around 400ns. It runs the same modern Cisco[®] NX-OS image that also supports the Cisco Nexus 9000 Series Switches. It provides a comprehensive feature set and simplifies image management. The robust programmability features help enable organizations to run today's applications while also preparing them for demanding and changing application needs such as big data, cloud services, and virtualization.

The Cisco Nexus 3264Q (Figure 1) is a 40-Gbps Quad Small Form-Factor Pluggable (QSFP) based switch with 64 Enhanced QSFP (QSFP+) ports.

Figure 1. Cisco Nexus 3264Q Switch



Main Benefits

The Cisco Nexus 3264Q provides the following benefits:

- **Wire-rate Layer 2 and 3 switching on all ports**¹ up to 5.12 terabits per second (Tbps) and up to 3.8 billion packets per second (bps)
- **Robust programmability**, with support for Cisco NX-API, Linux containers, XML and JavaScript Object Notation (JSON) APIs, OpenStack plug-in, Python, and Puppet and Chef configuration and automation tools
- **High performance and scalability** with a two-core CPU with 8 GB DRAM making it excellent for massively scalable data centers and big data applications
- **Flexibility**
 - Cisco QSFP 40-Gbps bidirectional (BiDi) transceiver technology allows the reuse of existing 10-Gbps cabling, for a smooth transition from 10 to 40 Gigabit Ethernet infrastructure in data centers.
 - Both fiber and copper cabling solutions are available for 40-Gbps connectivity, including 40G BiDi, 40G active optical cable (AOC), 40G twinax cable, and 40G LR4 optics as well as QSA for 10G connectivity.

¹ Wire-rate on all ports for packets >200bytes

- **High availability**
 - Virtual PortChannel (vPC) technology provides Layer 2 multipathing through the elimination of Spanning Tree Protocol. It also enables fully utilized bisectonal bandwidth and simplified Layer 2 logical topologies without the need to change the existing management and deployment models.
 - The 64-way equal-cost multipath (ECMP) routing enables the use of Layer 3 fat-tree designs. This feature allows organizations to prevent network bottlenecks, increase resiliency, and add capacity with little network disruption.
 - Advanced reboot capabilities include hot and cold patching and fast reboot capabilities.
 - The solution uses hot-swappable power-supply units (PSUs) and fans.
- Modern NX-OS operating system with comprehensive, proven innovations
 - PowerOn Auto Provisioning (POAP) enables touchless bootup and configuration of the switch, drastically reducing provisioning time.
 - Cisco Embedded Event Manager (EEM) and Python scripting enable automation and remote operations in the data center.
 - Advanced buffer monitoring reports real-time buffer utilization per port and per queue, which allows organizations to monitor traffic bursts and application traffic patterns.
 - EtherAnalyzer is a built-in packet analyzer for monitoring and troubleshooting control-plane traffic and is based on the popular Wireshark open-source network protocol analyzer.
 - Complete Layer 3 unicast and multicast routing protocol suites are supported, including Border Gateway Protocol (BGP), Open Shortest Path First (OSPF), Enhanced Interior Gateway Routing Protocol (EIGRP), Routing Information Protocol Version 2 (RIPv2), Protocol Independent Multicast sparse mode (PIM-SM), Source-Specific Multicast (SSM), and Multicast Source Discovery Protocol (MSDP).

Configuration

The Cisco Nexus 3264Q has the following configuration:

- 64 fixed 40 Gigabit Ethernet QSFP+ ports
- Locator LED
- Environment LED
- Status LED
- Dual redundant power supplies
- Redundant (3+1) fans
- Lane-selected LED
- One 10/100/1000-Mbps management port
- One RS-232 serial console port
- Two USB ports

Transceiver and Cabling Options

The Cisco Nexus 3264Q has 64 QSFP+ ports. QSFP+ technology allows a smooth transition from 10 to 40 Gigabit Ethernet infrastructure in data centers.. This switch supports both fiber and copper cabling solutions.

For low-cost cabling, copper-based 40-Gbps Twinax cables can be used, and for longer cable reaches, short-reach optical transceivers are excellent.

Table 1. Cisco Nexus 3264Q QSFP Transceiver Support Matrix

Part Number	Description
QSFP-40G-SR-BD	Cisco QSFP40G BiDi Short-reach Transceiver
QSFP-40G-SR4-S=	40GBASE-SR4 (IEEE 802.3ba Spec.) QSFP+ transceiver module for MMF, MPO/MTP connector
QSFP-H40G-AOC1M	QSFP 40G Active Optical Cable 1m
QSFP-H40G-AOC2M	QSFP 40G Active Optical Cable 2m
QSFP-H40G-AOC3M	QSFP 40G Active Optical Cable 3m
QSFP-H40G-AOC5M	QSFP 40G Active Optical Cable 5m
QSFP-H40G-AOC7M	QSFP 40G Active Optical Cable 7m
QSFP-H40G-AOC10M	QSFP 40G Active Optical Cable 10m
QSFP-H40G-CU3M	40GBASE-CR4 passive copper cable, 3m
QSFP-H40G-CU1M	40GBASE-CR4 passive copper cable, 1m
WSP-Q40GLR4L	40GBASE-LR4 QSFP transceiver module for SMF, duplex LC connector, up to 2km
QSFP-40G-CSR4	40GBASE-CSR4 QSFP+ transceiver module for MMF, MPO/MTP connector, 300 m reach with OM3 fiber
QSFP-40GE-LR4-S	40GBASE-LR4 QSFP+ transceiver module for SMF, duplex LC connector, 10 km reach

* Coming soon with software release

For more information about the transceiver types, see

http://www.cisco.com/en/US/products/hw/modules/ps5455/prod_module_series_home.html.

Cisco QSFP 40-Gbps Bidirectional Short-Reach Transceiver

The Cisco QSFP 40-Gbps BiDi transceiver is a short-reach pluggable optical transceiver with a duplex LC connector for 40 Gigabit Ethernet short-reach data communications and interconnect applications using multimode fiber (MMF). The Cisco QSFP 40-Gbps BiDi transceiver offers customers a solution that uses existing duplex MMF infrastructure for 40 Gigabit Ethernet connectivity. Unlike other existing 40 Gigabit Ethernet solutions on the market, with the Cisco QSFP 40-Gbps BiDi transceiver customers can upgrade their network from 10 Gigabit Ethernet to 40 Gigabit Ethernet without incurring any fiber infrastructure upgrade cost. The transceiver can enable 40 Gigabit Ethernet connectivity in a range of up to 100 meters over OM3 fiber, which meets most data center reach requirements. It complies with the Multiple Source Agreement (MSA) QSFP specification, enabling customers to use it on all Cisco QSFP 40-Gbps platforms and achieve high density in a 40 Gigabit Ethernet network. It can be used in data centers, high-performance computing (HPC) networks, enterprise and distribution layers, and service provider transport applications.

Cisco NX-OS Software Overview

NX-OS is a data center purpose-built operating system designed for performance, resiliency, scalability, manageability, and programmability at its foundation. NX-OS provides a robust and comprehensive feature set that meets the demanding requirements of virtualization and automation in present and future data centers.

The Cisco Nexus 3264Q uses an enhanced version of NX-OS with a single binary image that supports the switch in the both modular (Cisco Nexus 9500 platform) and fixed-port (Cisco Nexus 9300 platform) switches, simplifying image management. The operating system is modular, with a dedicated process for each routing protocol, a design that isolates faults while increasing availability. In the event of a process failure, the process can be restarted without loss of state. The operating system supports hot and cold patching and online diagnostics.

Main switch features include the following:

- POAP automates the process of upgrading software images and installing configuration files on Cisco Nexus switches that are being deployed in the network for the first time.
- Intelligent API (NX-API) provides operators with a way to manage the switch through remote procedure calls (RPCs; JSON or XML) over HTTP/HTTPS infrastructure including NX-API.
- Patching allows NX-OS Software to be upgraded and patched without any interruption in switch operations.
- Line-rate overlay support provides Virtual Extensible LAN (VXLAN) bridging at full line rate, facilitating and accelerating communication between virtual and physical servers as well as between multiple data centers in a campus environment.

Cisco NX-OS Features and Benefits

The software packaging for the Cisco Nexus 3264Q offers flexibility and a comprehensive feature set while being consistent with Cisco Nexus access switches. The default system software has a comprehensive Layer 2 security and management feature set and base-level Layer 3 feature set. To enable advanced Layer 3 IP unicast and IP multicast routing functions, you must install additional licenses. Table 2 lists the software packaging and licensing available to enable advanced features.

Table 2. Software Packaging and Licensing

Packaging	Chassis Based	Part Number	Supported Features
Cisco Nexus 3264Q Enhanced Layer 3 license	Chassis	N3K-LAN1K9	Layer 3 including full OSPF, EIGRP, BGP, and VXLAN

Product Specifications

Table 3 lists the specifications for the Cisco Nexus 3264Q, Table 4 lists software features and management standards and support.

Table 3. Specifications

Description	Specification
Physical	<ul style="list-style-type: none"> • 2RU fixed form-factor switch • 64 QSFP+ ports; each supports native 40 Gigabit Ethernet. • 2 redundant power supplies • 3+1 redundant fans • Management, console, and USB flash-memory ports
Performance	<ul style="list-style-type: none"> • 5.12 Tbps switching capacity • Forwarding rate up to 3.8 bpps • Line-rate traffic throughput (both Layer 2 and 3) on all ports • Configurable maximum transmission unit (MTU) of up to 9216 bytes (jumbo frames)

Description	Specification	
Hardware tables and scalability	Number of VLANs	MSTP: 4096
	Number of spanning-tree instances	<ul style="list-style-type: none"> • MSTP: 64 • RPVST+: 507
	Number of access control list (ACL) entries	<ul style="list-style-type: none"> • 4000 to 16000 ingress • 1000 to 4000 egress
	Routing table	<ul style="list-style-type: none"> • Maximum number of longest prefix match (LPM) routes: 128,000 • Maximum number of IP host entries: 120,000 • Maximum number of MAC address entries: 96,000
	Number of EtherChannels	256
	Number of ports per EtherChannel	32
	Switch ASIC Buffer size	16 MB shared
	System memory	8 GB
Power	Frequency	50 to 60 Hz
	Power supply types	AC
	Typical operating power	350 watts (W) without optics
	Maximum power	800W
	AC PSUs <ul style="list-style-type: none"> • Input voltage • Frequency • Efficiency 	<ul style="list-style-type: none"> • 200 to 240 VAC • 50 to 60 Hz • 93% at 220V
	Typical heat dissipation	2739 BTU/hr (with SR4 optics at 100% load)
	Maximum heat dissipation	1160 BTU/hr
Cooling	Port-side intake and port-side exhaust options Port-side intake: Yes Port-side exhaust: Post FCS	
Dimensions	Dimensions (height x width x depth)	3.48 x 17.41 x 22.32 in. (88.4 x 442 x 566 mm)
Environment	Weight	37 lb (16.8 kg)
	Operating temperature	32 to 104°F (0 to 40°C)
	Storage temperature	-40 to 158°F (-40 to 70°C)
	Operating relative humidity	<ul style="list-style-type: none"> • 10 to 85% noncondensing • Up to 5 days at maximum (85%) humidity Recommend ASHRAE data center environment
	Storage relative humidity	5 to 95% noncondensing
	Altitude	0 to 10,000 ft (0 to 3000m)

* Please refer to Cisco Nexus 3000 Series Verified Scalability Guide documentation for exact scalability numbers validated for specific software releases:
http://www.cisco.com/en/US/products/ps11541/products_installation_and_configuration_guides_list.html.

Table 4. Software Features

Item	Cisco Nexus 3264Q Switch
Maximum number of longest-prefix-match (LPM) routes	128,000
Maximum number of IP host entries	120,000
Maximum number of MAC address entries	96,000
Number of multicast routes	16,000, up to 60,000
Number of Interior Gateway Management Protocol (IGMP) snooping groups	8,000, up to 60,000

Item	Cisco Nexus 3264Q Switch
Number of access control list (ACL) entries	<ul style="list-style-type: none"> • 1000 to 4000 egress • 4000 to 16000 ingress
Maximum number of VLANs	4000
Maximum number of Virtual Routing and Forwarding (VRF) instances	1000
Maximum number of links in a PortChannel	32
Maximum number of ECMP paths	64
Maximum number of PortChannels	256
Number of active Cisco Switched Port Analyzer (SPAN) sessions	4
Maximum number of Rapid per-VLAN Spanning Tree (RPVST) instances	507
Maximum number of Hot Standby Router Protocol (HSRP) groups	490
Maximum number of Multiple Spanning Tree (MST) instances	64
Maximum number of tunnel endpoints (VTEP) and VXLAN physical servers (per VLAN)	10,000

Table 5 summarizes the Cisco Nexus 3264Q platform features.

Table 5. Main Features

Layer 2 Features
VLANs <ul style="list-style-type: none"> • 4000 Private VLANs (PVLANS) [*] <ul style="list-style-type: none"> • Isolated ports and promiscuous ports • PVLAN on PortChannels and vPCs vPC Spanning Tree Protocol <ul style="list-style-type: none"> • IEEE 802.1w Rapid Spanning Tree (Rapid PVST+) • IEEE 802.1s Multiple Spanning Tree (MST) • Edge port and edge-port trunk • Extensions: Bridge Protocol Data Unit (BPDU) guard, BPDU filtering, bridge assurance, loop guard, and root guard VLAN Trunk Protocol (VTP) Versions 1 and 2 (v1 and v2): Transparent mode MAC addresses: Static <ul style="list-style-type: none"> • Unicast and multicast IEEE 802.1AB Link Layer Discovery Protocol (LLDP) User-configurable interface MTU and jumbo frames Unidirectional Link Detection (UDLD)
Layer 3 Features
IPv4 <ul style="list-style-type: none"> • Static routes • BGP, EIGRP, and OSPFv2 • VRF-Lite and VRF route leaking • HSRPv1 and v2 • Virtual Router Redundancy Protocol (VRRP) • Bidirectional Forwarding Detection (BFD) • Dynamic Host Configuration Protocol (DHCP) relay IPv6 <ul style="list-style-type: none"> • Static routes • BGP and OSPFv3 • VRF-Lite and VRF route leaking • HSRPv6 • DHCP relay BGP enhancements <ul style="list-style-type: none"> • disable-peer-as-check: Routes learned from one node in one autonomous system (as) will be advertised to another node in the same autonomous system.

- **allow-as in:** Allow routes having their own autonomous systems in the autonomous system path (as-path) to be installed in the BGP routing information base (BRIB).
- **best-as-path-relax:** Allow paths received from different autonomous systems to be handled as multipath if their as-path lengths are the same and other multipath conditions are met.
- **best-as-path-relax:** Allow paths received from different autonomous systems to be handled as multipath if their as-path lengths are the same and other multipath conditions are met.
- **transport connection-mode passive:** Allow a passive connection setup only.
- **remove private-as enhancements [no | default]: remove-private-as [all] [replace-as].**
- MD5 authentication for prefix-based neighbors: Allow authentication for prefix-based neighbors.
- Exterior BGP (eBGP) next-hop is unchanged.
- IPv6 route updates over IPv4 peering.
- eBGP scales to 192 peers with BFD.

64-way ECMP

User-configurable MAC addresses (16) on routed interfaces

Multicast Features

IGMPv1, v2, and v3
 IGMP snooping
 PIM-SM and Any Source Multicast (ASM)
 Anycast Routing Protocol (Anycast RP)
 MSDP

Availability Features

Single binary image across Cisco Nexus 9300 and 9500 platform switches
 Fault isolation per process
 Process patching
 Stateless process restart

Comprehensive Monitoring Features

Cisco Generic Online Diagnostics (GOLD)

- Complete, bypass, on-demand, and health checks

 Onboard fault logging (OBFL)
 EEM: Scheduler, monitor, and event manager
 Integrated packet capture and analysis with Wireshark
 Default SSD (chassis supervisor and top-of-rack [ToR] switch) for logging and data capture
 SPAN

- Source and destination on switch

 ERSPAN

- Ingress ACL filtering

Virtualization Support Features

VXLAN gateway
 VXLAN bridging

Security Features

Ingress and egress ACLs using Layer 2, 3, and 4 fields

- Extended ACLs, MAC addresses, port ACL (PACL), VLAN ACL (VACL), and routed ACL (RACL)
- Flexible ACL carving

 ACL counters
 Storm control

- Broadcast, multicast, and unknown unicast

 User-configurable Control-Plane Policing (CoPP)
 Authentication, authorization, and accounting (AAA)

- Challenge Handshake Authentication Protocol (CHAP), Password Authentication Protocol (PAP), Microsoft MS-CHAP, and MS-CHAPv2
- Capability to disable role-based access control (RBAC) and use AAA server authentication
- RBAC integration to replace privilege levels
- Logging
- Test parameters
- VRF context support
- LDAP support

 RADIUS
 RBAC
 TACACS+

Interface Types

Layer 2 switch port

- Access and trunk (VLAN list and native VLAN tagged and untagged)

Layer 3 routed

Loopback interface

Switched virtual interface (SVI)

PortChannel

- Static mode
- IEEE 802.3ad LACP
- Load balancing
- Minimum number of links

Layer 3 port subinterface

QoS Features

Up to 8 queues per port

Modular QoS command-line interface (CLI; MQC)

ACL-based classification

Marking and classification

- Differentiated services code point (DSCP) on switch
- Class of service (CoS)
- CoS preservation for Remote Direct Memory Access (RDMA) over Converged Enhanced Ethernet (RoCEE)

Policing

- Ingress

Explicit congestion notification (ECN)

Weighted Random Early Detection (WRED)

Priority flow control (PFC) with support for up to 3 PFC classes

Device Management Features

POAP

Configuration rollback

Configuration session manager

FTP, SFTP, and TFTP client

Network Time Protocol (NTP)

Client, peer, server, ACL, and authentication

Remote copy (RCP) and secure copy (SCP) client

Remote monitor (RMON)

Cisco Smart Call Home

Simple Network Management Protocol (SNMP) v1, v2, and v3

Syslog

Virtual terminal (vty)

XML (NETCONF)

Secure Shell (SSH) v2 (client and server)

Telnet (client and server)

USB port

100/1000-Mbps management port

Support for **copy <file> start**

Locator LED (beacon)

Supported in Cisco DCNM LAN and Cisco Prime™ Infrastructure

Supported in Cisco networking plug-in for OpenStack

Extensibility and Programmability Features

Linux tools

- Bash shell access
- Broadcom shell access

Python shell

NX-API

Extensible Messaging and Presence Protocol (XMPP) client

Standards Compliance

IEEE 802.1D Bridging and Spanning Tree
 IEEE 802.1p QoS/CoS
 IEEE 802.1Q VLAN Tagging
 IEEE 802.1w Rapid Spanning Tree
 IEEE 802.1s Multiple Spanning Tree Protocol
 IEEE 802.1AB Link Layer Discovery Protocol
 IEEE 802.3ad Link Aggregation with LACP
 IEEE 802.3ab 1000BASE-T
 IEEE 802.3z Gigabit Ethernet
 IEEE 802.3ae 10 Gigabit Ethernet
 IEEE 802.3ba 40 Gigabit Ethernet
 RFC 2460 IPv6
 RFC 2461 Neighbor Discovery for IPv6
 RFC 2462 IPv6 Stateless Address Autoconfiguration
 RFC 2463 ICMPv6

SNMP MIBs

Cisco NX-OS Software Release 6.2 equivalent
 * Support post FCS via software upgrade

Regulatory Standards Compliance

Table 6 summarizes regulatory standards compliance for the Cisco Nexus 3200 platform.

Table 6. Regulatory Standards Compliance: Safety and EMC

Specification	Description
Regulatory compliance	<ul style="list-style-type: none"> Products should comply with CE Markings per directives 2004/108/EC and 2006/95/EC
Safety	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> EN55024 CISPR24 EN300386 KN24
RoHS	The product is RoHS 5 compliant except for lead press-fit connectors.

Ordering Information

Table 7 provides ordering information for the Cisco Nexus 3264Q.

Table 7. Ordering Information

Part Number	Description
Chassis	
N3K-C3264Q	Nexus 3264Q, 64 QSFP+ ports, 2RU switch
N9K-PAC-650W	Nexus 9300 650W AC PS, Port-side Intake
N9K-PAC-650W-B	Nexus 9300 650W AC PS, Port-side Exhaust
N9K-C9300-FAN1	Nexus 9300 Fan Module, Port side intake, Spare
N9K-C9300-FAN1-B	Nexus 9300 Fan Module, Port side Exhaust, Spare
Software Licenses	
N3K-LAN1K9	Nexus 3264 Layer 3 LAN Enterprise License
Spares	
N3K-C3264Q=	Nexus 3264Q, 64 QSFP+ ports, 2RU switch, Spare
N9K-C9300-FAN1-B=	Nexus 9300 Fan Module, Port side Exhaust, Spare
N9K-C9300-FAN1=	Nexus 9300 Fan Module, Port side intake, Spare
N9K-PAC-650W=	Nexus 9300 650W AC PS, Port-side Intake
N9K-PAC-650W-B=	Nexus 9300 650W AC PS, Port-side Exhaust
Cables and Optics	
QSFP-40G-SR-BD	Cisco QSFP40G BiDi Short-reach Transceiver
QSFP-40G-SR4-S=	40GBASE-SR4 (IEEE 802.3ba Spec.) QSFP+ transceiver module for MMF, MPO/MTP connector
QSFP-H40G-AOC1M	QSFP 40G Active Optical Cable 1m
QSFP-H40G-AOC2M	QSFP 40G Active Optical Cable 2m
QSFP-H40G-AOC3M	QSFP 40G Active Optical Cable 3m
QSFP-H40G-AOC5M	QSFP 40G Active Optical Cable 5m
QSFP-H40G-AOC7M	QSFP 40G Active Optical Cable 7m
QSFP-H40G-AOC10M	QSFP 40G Active Optical Cable 10m
QSFP-H40G-CU3M	40GBASE-CR4 passive copper cable, 3m
QSFP-H40G-CU1M	40GBASE-CR4 passive copper cable, 1m
WSP-Q40GLR4L	40GBASE-LR4 QSFP transceiver module for SMF, duplex LC connector, up to 2km
QSFP-40G-CSR4	40GBASE-CSR4 QSFP+ transceiver module for MMF, MPO/MTP connector, 300 m reach with OM3 fiber
QSFP-40GE-LR4-S	40GBASE-LR4 QSFP+ transceiver module for SMF, duplex LC connector, 10 km reach

Service and Support

Cisco offers a wide range of services to help accelerate your success in deploying and optimizing the Cisco Nexus 3200 platform 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 use 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 3200 platform switches. Spanning the entire network lifecycle, Cisco Services help 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>.




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