



# QFX5130 SWITCH

## Product Overview

*The QFX5130 Switch offers a high-density, cost-optimized 1 U 400GbE fixed-configuration platform ideal for data centers where cloud services are being added. These services require higher network bandwidth per rack, as well as flexibility, making the 10/25/40/100/400GbE interface options ideal for server and intra-fabric connectivity. The QFX5130 is an optimal choice for spine-and-leaf deployments in enterprise, service provider, and cloud provider data centers.*

*Coupled with the widespread adoption of overlay technologies, the QFX5130 lays a strong foundation for your evolving business and network needs, offering deployment versatility to future-proof your network investment.*

## Product Description

The Juniper Networks® QFX5130 Switch is a next-generation, fixed-configuration spine-and-leaf switch that offers flexible, cost-effective, high-density 400GbE, 100GbE, 50GbE, 40GbE, 25GbE, and 10GbE interfaces for server and intra-fabric connectivity.

A versatile, future-proofed solution for today's data centers, the QFX5130 leverages the power of a fully programmable chipset to support and deliver a diverse set of use cases. It supports advanced Layer 2, Layer 3, and Ethernet VPN (EVPN)-Virtual Extensible LAN (VXLAN) features. For large public cloud providers—early adopters of high-performance servers to meet explosive workload growth—the QFX5130 supports very large, dense, and fast 400GbE IP fabrics based on proven Internet scale technology. For enterprise customers seeking investment protection as they transition their server farms from 10GbE to 25GbE, the QFX5130 switch also provides a high radix-native 100GbE/400GbE EVPN-VXLAN spine option at reduced power and a smaller footprint.

The QFX5130 supports diverse use cases such as neural networks for AI applications, including autonomous driving, disaggregated storage, high frequency trading, packet brokering, and over-the-top streaming services. Delivering 25.6 Tbps of bidirectional bandwidth, the switch is optimally designed for spine-and-leaf deployments in enterprise, high-performance computing (HPC), service provider, and cloud data centers.

The QFX5130-32CD offers 32 ports in a low-profile 1 U form factor. High-speed interfaces support a wide variety of port configurations, including 400GbE, 100GbE, 25GbE, 40GbE, and 10GbE. The QFX5130-32CD is equipped with two AC or DC power supplies, providing 1+1 redundancy when all power supplies are present. Six hot-swappable fans offer back-to-front (AFO) or front-to-back (AFI) airflow options, providing 5+1 redundancy.

The QFX5130 includes an Intel XeonD-1500 processor to drive the control plane, which runs the Junos® OS Evolved operating system software.

## Product Highlights

The QFX5130 includes the following capabilities. Please refer to the Specifications section for currently shipping features.

### Native 400GbE Configuration

The QFX5130-32CD offers 32 ports in a 1 U form factor. The high-speed ports support a wide variety of configurations, including 100GbE and 40GbE.

### High-Density Configurations

The QFX5130 is optimized for high-density fabric deployments, providing options for 32 ports of 400GbE, 100GbE, or 40GbE.

### Flexible Connectivity Options

The QFX5130 offers a choice of interface speeds for server and intra-fabric connectivity, providing deployment versatility and investment protection.

## Key Product Differentiators

### Increased Scale and Buffer

The QFX5130 provides enhanced scale with up to 1.24 million routes, 80,000 firewall filters, and 160,000 media access control (MAC) addresses. It supports high numbers of egress IPv4/IPv6 rules by programming matches in egress ternary content addressable memory (TCAM) along with ingress TCAM.

### 132MB Shared Packet Buffer

Today's cloud-native applications have critical dependency on buffer size to prevent congestion and packet drops. The QFX5130 has 132 MB shared packet buffer that is allocated dynamically to congested ports.

### Programmability

The QFX5130 revolutionizes performance for data center networks by providing a programmable software-defined pipeline in addition to the comprehensive feature set provided in the Juniper Networks QFX5120 Switch line. The QFX5130 uses a compiler-driven switch data plane with full software program control to enable and serve a diverse set of use cases, including in-band telemetry, fine-grained filtering for traffic steering, traffic monitoring, and support for new protocol encapsulations.

### Power Efficiency

With its low-power 7 nm process, the QFX5130 consumes a maximum of 973 W, bringing improvements in speed, less power consumption, and higher density on chip.

## Features and Benefits

- **Automation and programmability:** The QFX5130-32CD supports a number of network automation features for plug-and-play operations, including zero-touch provisioning (ZTP), Network Configuration Protocol (NETCONF), Juniper Extension Toolkit (JET), Junos telemetry interface, operations and event scripts, automation rollback, and Python scripting.
  - **Cloud-level scale and performance:** The QFX5130 supports best-in-class cloud-scale L2/L3 deployments with a low latency of 630 ns and superior scale and performance. This includes L2 support for 160,000 MAC addresses and Address Resolution Protocol (ARP) learning, which scales up to 64,000 entries at 500 frames per second. It also includes L3 support for 1.24 million longest prefix match (LPM) routes and 160,000 host routes on IPv4. Additionally, the QFX5130 supports 610,000 LPM routes and 80,000 host routes on IPv6, 128-way equal-cost multipath (ECMP) routes, and a filter that supports 80,000 ingress and 18,000 egress exact match filtering rules. The QFX5130 supports up to 128 link aggregation
- groups, 4096 VLANs, and Jumbo frames of 9216 bytes. Junos OS Evolved provides configurable options through a CLI, enabling each QFX5130 to be optimized for different deployment scenarios.
- **VXLAN overlays\*:** The QFX5130 is capable of both L2 and L3 gateway services. Customers can deploy overlay networks to provide L2 adjacencies for applications over L3 fabrics. The overlay networks use VXLAN in the data plane and EVPN or Open vSwitch Database (OVSDDB) for programming the overlays, which can operate without a controller or be orchestrated with an SDN controller.
  - **IEEE 1588 PTP Boundary Clock with Hardware Timestamping\*:** IEEE 1588 PTP transparent/boundary clock is supported on QFX5130, enabling accurate and precise sub-microsecond timing information in today's data center networks. In addition, the QFX5130 supports hardware timestamping; timestamps in Precision Time Protocol (PTP) packets are captured and inserted by an onboard field-programmable gate array (FPGA) on the switch at the physical (PHY) level.
  - **Data packet timestamping\*:** When the optional data packet timestamping feature is enabled, select packets flowing through the QFX5130 are timestamped with references to the recovered PTP clock. When these packets are received by nodes in the network, the timestamping information can be mirrored onto monitoring tools to identify network bottlenecks that cause latency. This analysis can also be used for legal and compliance purposes in institutions such as financial trading, video streaming, and research establishments.
  - **RoCEv2\*:** As a switch capable of transporting data as well as storage traffic over Ethernet, the QFX5130 provides an IEEE data center bridging (DCB) converged network between servers with disaggregated flash storage arrays or an NVMe-enabled storage-area network (SAN). The QFX5130 offers a full-featured DCB implementation that provides strong monitoring capabilities on the top-of-rack switch for SAN and LAN administration teams to maintain clear separation of management. The RDMA over Converged Ethernet version 2 (RoCEv2) transit switch functionality, including priority-based flow control (PFC) and Data Center Bridging Capability Exchange (DCBX), are included as part of the default software.
  - **Junos Evolved features:** The QFX5130 switch supports features such as L2/L3 unicast, EVPN-VXLAN\*, BGP add-path, RoCEv2 and congestion management, multicast, 128-way ECMP, dynamic load balancing capabilities, enhanced firewall capabilities, and monitoring.

\* Reserved for a future release

- Junos OS Evolved Architecture:** Junos OS Evolved is a native Linux operating system that incorporates a modular design of independent functional components and enables individual components to be upgraded independently while the system remains operational. Component failures are localized to the specific component involved and can be corrected by upgrading and restarting that specific component without having to bring down the entire device. The switches control and data plane processes can run in parallel, maximizing CPU utilization, providing support for containerization, and enabling application deployment using LXC or Docker.
- Retained state:** State is the retained information or status pertaining to physical and logical entities. It includes both operational and configuration state, comprising committed configuration, interface state, routes, hardware state, and what is held in a central database called the distributed data store (DDS). State information remains persistent, is shared across the system, and is supplied during restarts.
- Feature support:** All key networking functions such as routing, bridging, management software, and management plane interfaces, as well as APIs such as CLI, NETCONF, JET, Junos telemetry interface, and the underlying data models, resemble those supported by the Junos operating system. This ensures compatibility and eases the transition to Junos Evolved.

## Deployment Options

The QFX5130-32CD can be deployed as a universal device in cloud data centers to support 100GbE server access and 400GbE spine-and-leaf configurations, optimizing data center operations by using a single device across multiple network layers (see Figure 1). The QFX5130-32CD can also be deployed in more advanced overlay architectures like an EVPN-VXLAN fabric. Depending on where tunnel terminations are desired, the QFX5130-32CD can be deployed in either a centrally routed (Figure 2) or edge-routed (Figure 3) architecture.

| Port Combinations        | Switch       | Deployment                                |
|--------------------------|--------------|---|
| 128x100GbE               | QFX5130-32CD | 100GbE access or leaf                     |
| 128x25GbE                | QFX5130-32CD | 25GbE access or leaf with 25GbE break out |
| 128x10GbE + 2 SFP+ ports | QFX5130-32CD | 10GbE access or leaf with 10GbE break out |
| 32x400GbE                | QFX5130-32CD | 400GbE spine                              |
| 32x100GbE                | QFX5130-32CD | 100GbE spine or leaf                      |
| 32x40GbE                 | QFX5130-32CD | 40GbE access or leaf                      |

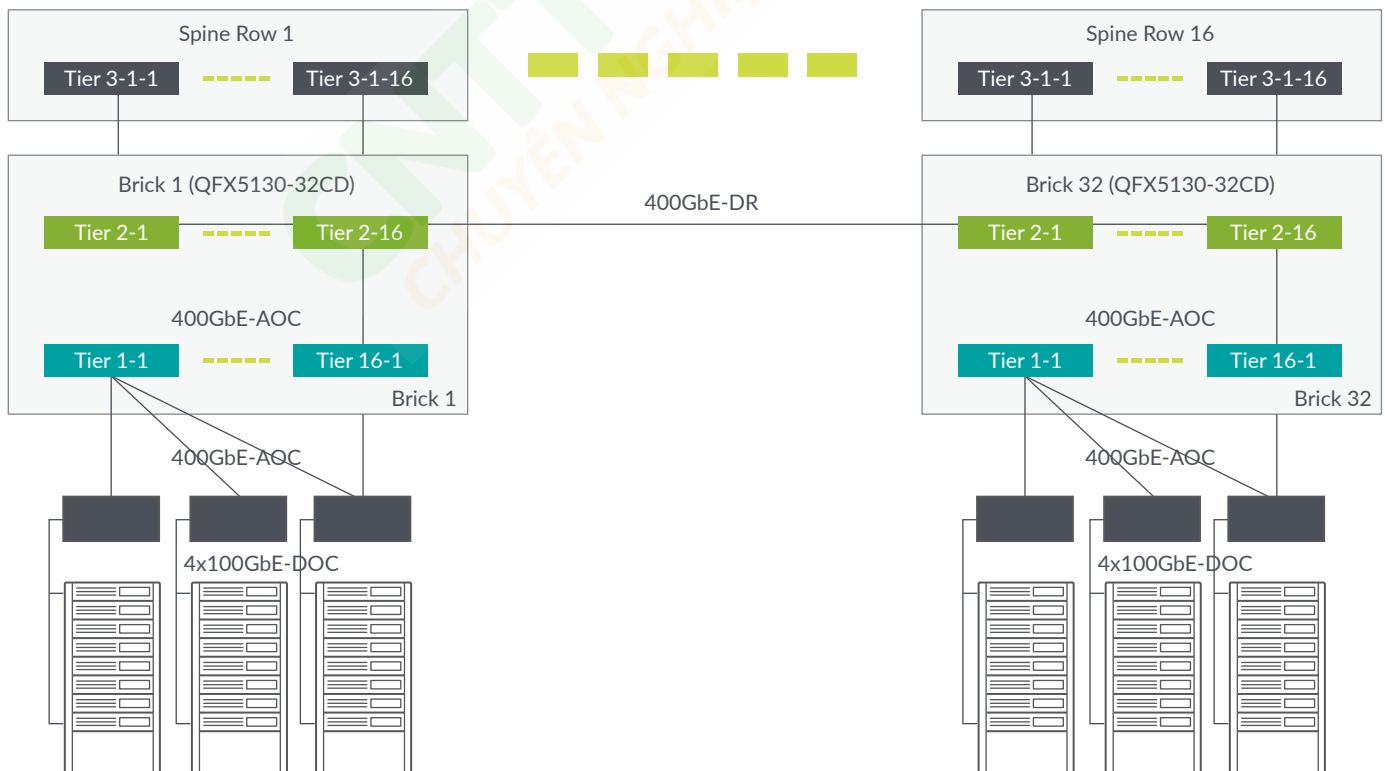


Figure 1: Typical cloud data center deployment for the QFX5130-32CD

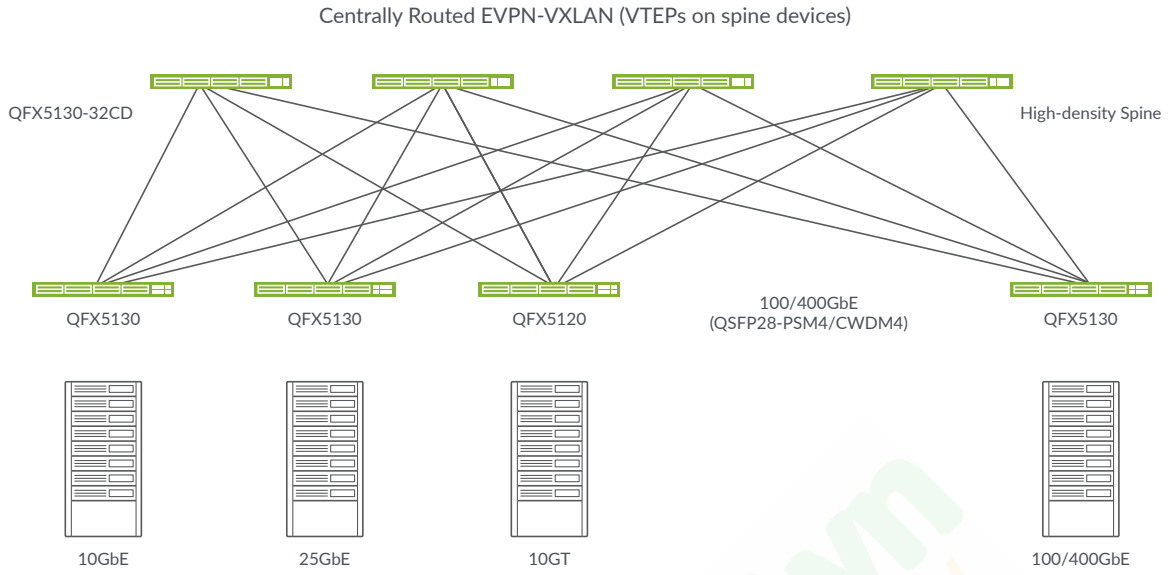


Figure 2: QFX5130-32CD as a 100GbE/400GbE ToR in a typical cloud data center

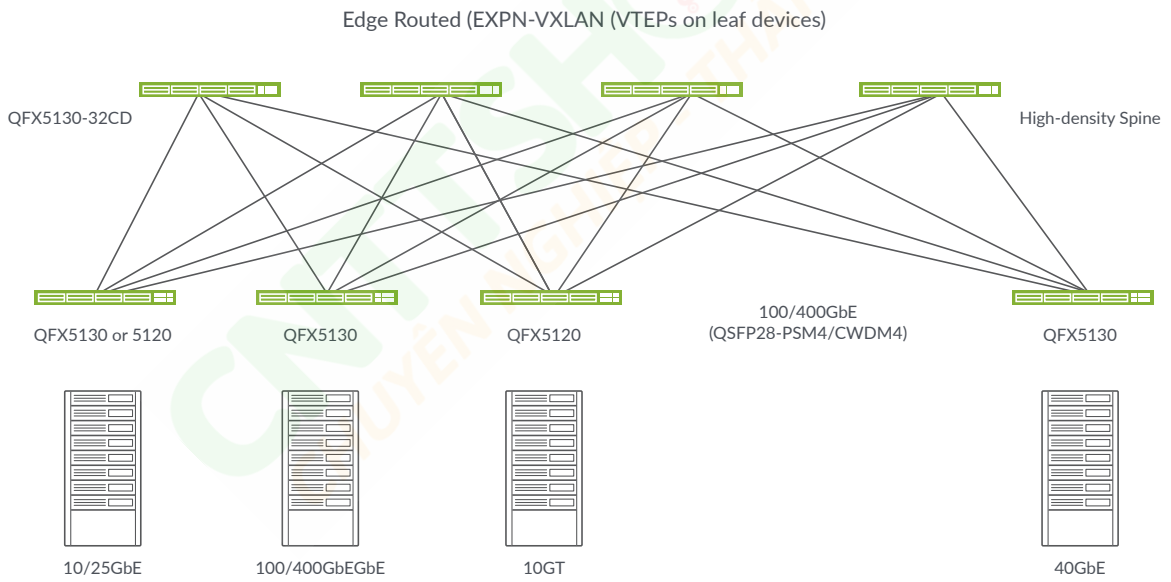


Figure 3: Private cloud data center with the QFX5130-32CD as high-density spine

## Architecture and Key Components

The QFX5130 can be used in L3 fabrics and L2 networks. You can choose the architecture that best suits your deployment needs and easily adapt and evolve as requirements change over time. The QFX5130 serves as the universal building block for these switching architectures, enabling data center operators to build cloud networks in their own way.

**Layer 3 fabric:** For customers looking to build scale-out data centers, a Layer 3 spine-and-leaf Clos fabric provides predictable, nonblocking performance and scale characteristics. A two-tier fabric built with QFX5130 switches as leaf devices and Juniper Networks QFX10000 modular switches in the spine can scale to support up to 128 40GbE ports or 128 25GbE and/or 10GbE server ports in a single fabric.

Junos OS Evolved ensures a high feature and bug fix velocity and provides first-class access to system state, allowing customers to run DevOps tools, containerized applications, management agents, specialized telemetry agents, and more.

## Junos Telemetry Interface

The QFX5130 supports Junos telemetry interface, a modern telemetry streaming tool that provides performance monitoring in complex, dynamic data centers. Streaming data to a performance management system lets network administrators measure trends in link and node utilization and troubleshoot issues such as network congestion in real time.

Junos telemetry interface provides:

- Application visibility and performance management by provisioning sensors to collect and stream data and analyze the application and workload flow path through the network
- Capacity planning and optimization by proactively detecting hotspots and monitoring latency and microbursts
- Troubleshooting and root cause analysis via high frequency monitoring and correlating overlay and underlay networks



## Specifications

### Hardware

Table 1. QFX5130 System Capacity

| Specification       | QFX5130-32CD   |
|---------------------|--|
| System throughput   | Up to 25.6 Tbps (bidirectional)  |
| Forwarding capacity | 5.68 billion packets per second  |
| Port density        | 32 ports of QSFP56-DD 400GbE   |
| SFP+/SFP28          | 2 small form-factor pluggable plus (SFP+) transceiver ports for in-band network management |

Table 2. QFX5130 System Specifications

| Specification                | QFX5130-32CD   |
|------------------------------|--|
| Dimensions (W x H x D)       | 17.26 x 1.72 x 21.1 in. (43.8 x 4.3 x 53.59 cm)  |
| Rack units                   | 1 U  |
| Weight                       | 24.5 lb (11.11 kg) with power supplies and fans installed  |
| Operating system             | Junos OS Evolved   |
| CPU                          | Intel Xeon D-1500  |
| Power                        | <ul style="list-style-type: none"> <li>• Redundant (1+1) hot-pluggable 1600 W AC/DC power supplies (2n)</li> <li>• 115-240 V single phase AC power</li> </ul>  |
| Cooling                      | <ul style="list-style-type: none"> <li>• Ports-to-FRUs (AFO) and FRUs-to-ports (AFI) cooling</li> <li>• Redundant (5 +1) hot-pluggable fan modules with variable speed to minimize power draw</li> </ul> |
| Total packet buffer          | 132MB  |
| Recommended Software Version | Junos OS Evolved 20.3R1 and Later  |
| Warranty                     | Juniper standard one-year warranty   |

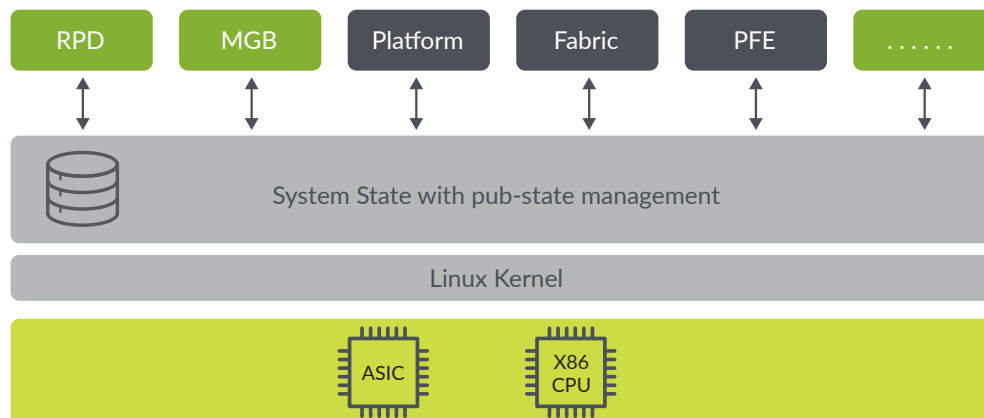


Figure 4: Cloud/Carrier-Class Junos OS Evolved Network Operating System

**Software**

- MAC addresses per system: 160,000
- VLAN IDs: 4000 (QFX5130-32CD)
- Number of link aggregation groups (LAGs): 128
- Number of ports per LAG: 64
- Firewall filters: up to 80,000 ACLs
- IPv4 unicast routes: 1.24 million\* prefixes; 160,000 host routes
- IPv6 unicast routes: 610,000 prefixes; 80,000 host routes
- ARP entries: 32,000 (tunnel mode); 64,000 (non-tunnel mode)
- Neighbor Discovery Protocol (NDP) entries: 32,000 (tunnel mode); 64,000 (non-tunnel mode)
- Generic routing encapsulation (GRE) tunnels: 1000
- Jumbo frame: 9216 bytes
- Traffic mirroring: 8 destination ports per switch

**Layer 2 Features**

- STP—IEEE 802.1D (802.1D-2004)\*
- Rapid Spanning Tree Protocol (RSTP) (IEEE 802.1w); MSTP (IEEE 802.1s)\*
- Bridge protocol data unit (BPDU) protect\*
- Loop protect\*
- Root protect\*
- RSTP and VLAN Spanning Tree Protocol (VSTP) running concurrently\*
- VLAN—IEEE 802.1Q VLAN trunking
- Routed VLAN interface (RVI)
- Port-based VLAN
- MAC address filtering\*
- Static MAC address assignment for interface
- MAC learning disable
- Link Aggregation and Link Aggregation Control Protocol (LACP) (IEEE 802.3ad)
- IEEE 802.1AB Link Layer Discovery Protocol (LLDP)

**Link Aggregation**

- LAG load sharing algorithm—bridged or routed (unicast or multicast) traffic:
  - IP: Session Initiation Protocol (SIP), Dynamic Internet Protocol (DIP), TCP/UDP source port, TCP/UDP destination port
  - L2 and non-IP: MAC SA, MAC DA, Ether type, VLAN ID, source port

**Layer 3 Features**

- Static routing
- OSPF v1/v2
- OSPF v3
- Filter-based forwarding

- Virtual Router Redundancy Protocol (VRRP)\*
- IPv6
- Virtual routers
- Loop-free alternate (LFA)
- BGP (Advanced Services or Premium Services license)
- IS-IS (Advanced Services or Premium Services license)
- Dynamic Host Configuration Protocol (DHCP) v4/v6 relay
- VR-aware DHCP
- IPv4/IPv6 over GRE tunnels (interface-based with decap/encap only)

**Multicast\***

- Internet Group Management Protocol (IGMP) v1/v2
- Multicast Listener Discovery (MLD) v1/v2
- IGMP proxy, querier
- IGMP v1/v2/v3 snooping\*
- Intersubnet multicast using IRB interface\*
- MLD snooping\*
- Protocol Independent Multicast PIM-SM, PIM-SSM, PIM-DM, PIM-Bidir\*
- Multicast Source Discovery Protocol (MSDP)\*

**Security and Filters**

- Secure interface login and password
- Secure boot
- RADIUS
- TACACS+
- Ingress and egress filters: Allow and deny, port filters, VLAN filters, and routed filters, including management port filters and loopback filters for control plane protection
- Filter actions: Logging, system logging, reject, mirror to an interface, counters, assign forwarding class, permit, drop, police, mark
- SSH v1, v2
- Static ARP support
- Storm control, port error disable, and autorecovery\*
- Control plane denial-of-service (DoS) protection
- Image rollback

**Quality of Service (QoS)**

- L2 and L3 QoS: Classification, rewrite, queuing
- Rate limiting:
  - Ingress policing: 1 rate 2 color, 2 rate 3 color
  - Egress policing: Policer, policer mark down action
  - Egress shaping: Per queue, per port
- 12 hardware queues per port (8 unicast and 4 multicast)
- Strict priority queuing (LLQ), shaped-deficit weighted round-robin (SDWRR), weighted random early detection (WRED)
- 802.1p remarking

\* Reserved for a future release

- Layer 2 classification criteria: Interface, MAC address, Ethertype, 802.1p, VLAN
- Congestion avoidance capabilities: WRED
- Trust IEEE 802.1p (ingress)
- Remarking of bridged packets

#### EVPN-VXLAN\*

- EVPN support with VXLAN transport
- EVPN pure type-5 route support with symmetric inter-irb routing
- All-active multihoming support for EVPN-VXLAN (ESI-LAG aka EVPN-LAG)
- Multiple EVI (EVPN instances) aka multiple MAC-VRF for Mac advertisement
- MAC-VRF (EVI) multiple EVPN service-type support: vlan-based, vlan-aware, vlan-bundle
- ARP/ND suppression aka proxy-arp/nd
- Ingress multicast Replication
- IGMPv2 snooping support fabric wide: using EVPN route type-6,
- IGMPv2 snooping support for L2 multihoming scenarios: EVPN route type-7 and type-8
- IP prefix advertisement using EVPN with VxLAN encapsulation

#### Data Center Bridging (DCB)\*

- Explicit congestion notification (ECN)
- Priority-based flow control (PFC)—IEEE 802.1Qbb\*

#### High Availability

- Bidirectional Forwarding Detection (BFD)
- Uplink failure detection (UFD)\*

#### Visibility and Analytics

- Switched Port Analyzer (SPAN)
- Remote SPAN (RSPAN)
- Encapsulated Remote SPAN (ERSPAN)
- sFlow v5
- Junos telemetry interface

#### Management and Operations

- Role-based CLI management and access
- CLI via console, telnet, or SSH
- Extended ping and traceroute
- Junos OS Evolved configuration rescue and rollback
- SNMP v1/v2/v3
- Junos OS Evolved XML management protocol
- High frequency statistics collection
- Automation and orchestration
- Zero-touch provisioning (ZTP)
- Python
- Junos OS Evolved event, commit, and OP scripts

#### Standards Compliance

##### IEEE Standards

- IEEE 802.1D
- IEEE 802.1w
- IEEE 802.1
- IEEE 802.1Q
- IEEE 802.1p
- IEEE 802.1ad
- IEEE 802.3ad
- IEEE 802.1AB
- IEEE 802.3x
- IEEE 802.1Qbb\*
- IEEE 802.1Qaz
- T11 Standards
- INCITS T11 FC-BB-5

##### Environmental Ranges

| Parameters                     | QFX5130-32CD   |
|--------------------------------|--|
| Operating temperature          | 32° to 104° F (0° to 40° C)                            |
| Storage temperature            | -40° through 158° F                                    |
| Operating altitude             | Up to 6000 feet (1828.8 meters)                        |
| Relative humidity operating    | 5 to 90% (noncondensing)                               |
| Relative humidity nonoperating | 5 to 95% (noncondensing)                               |
| Seismic                        | Designed to meet GR-63, Zone 4 earthquake requirements |

##### Maximum Thermal Output

| Parameters         | QFX5130-32CD     |
|--------------------|------------------|
| Maximum power draw | 115-127 V: 973 W |
| Typical power draw | 115-127 V: 730 W |

#### Safety and Compliance

##### Safety

- CAN/CSA-C22.2 No. 60950-1 Information Technology Equipment—Safety
- UL 60950-1 Information Technology Equipment—Safety
- EN 60950-1 Information Technology Equipment—Safety
- IEC 60950-1 Information Technology Equipment—Safety (All country deviations)
- EN 60825-1 Safety of Laser Products—Part 1: Equipment Classification

##### Security

- FIPS/CC\*
- TAA\*

\* Reserved for a future release

## Electromagnetic Compatibility

- 47 CFR Part 15, (FCC) Class A
- ICES-003 Class A
- EN 55022/EN 55032, Class A
- CISPR 22/CISPR 32, Class A
- EN 55024
- CISPR 24
- EN 300 386
- VCCI Class A
- AS/NZS CISPR 32, Class A
- KN32/KN35
- BSMI CNS 13438, Class A
- EN 61000-3-2
- EN 61000-3-3
- ETSI
- ETSI EN 300 019: Environmental Conditions & Environmental Tests for Telecommunications Equipment
- ETSI EN 300 019-2-1 (2000)—Storage
- ETSI EN 300 019-2-2 (1999)—Transportation
- ETSI EN 300 019-2-3 (2003)—Stationary Use at Weather-protected Locations
- ETSI EN 300 019-2-4 (2003)—Stationary Use at Non Weather-protected Locations
- ETS 300753 (1997)—Acoustic noise emitted by telecommunications equipment

## Telco

- Common Language Equipment Identifier (CLEI) code

## Environmental Compliance



Restriction of Hazardous Substances (ROHS) 6/6



China Restriction of Hazardous Substances (ROHS)



Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH)



Waste Electronics and Electrical Equipment (WEEE)



Recycled material



80 Plus Silver PSU Efficiency

## Telco

- Common Language Equipment Identifier (CLEI) code

## Juniper Networks Services and Support

Juniper Networks is the leader in performance-enabling services that are designed to accelerate, extend, and optimize your high-performance network. Our services allow you to maximize operational efficiency while reducing costs and minimizing risk, achieving a faster time to value for your network. Juniper Networks ensures operational excellence by optimizing the network to maintain required levels of performance, reliability, and availability. For more details, please visit [www.juniper.net/us/en/products-services](http://www.juniper.net/us/en/products-services).

## Ordering Information

| Product Number                | Description   |
|-------------------------------|---|
| <b>Hardware</b>               |   |
| QFX5130-32CD-AFI              | QFX5130 (hardware with base software), 32 QSFP-DD/QSFP+/QSFP28 ports, redundant fans, 2 AC power supplies, back-to-front airflow                      |
| QFX5130-32CD-AFO              | QFX5130 (hardware only; software services sold separately), 32 QSFP-DD/QSFP+/QSFP28 ports, redundant fans, 2 AC power supplies, front-to-back airflow |
| QFX5130-32CD-D-AFI            | QFX5130 (hardware only; software services sold separately), 32 QSFP-DD/QSFP+/QSFP28 ports, redundant fans, 2 DC power supplies, back-to-front airflow |
| QFX5130-32CD-D-AFO            | QFX5130 (hardware only; software services sold separately), 32 QSFP-DD/QSFP+/QSFP28 ports, redundant fans, 2 DC power supplies, front-to-back airflow |
| JPSU-1600W-1UACAFI            | QFX5130-32CD-AFI 1 U AC power supply unit   |
| JPSU-1600W-1UACAFO            | QFX5130-32CD-AFO 1 U AC power supply unit   |
| JPSU-1600W-1UDCAFI            | QFX5130-32CD-D-AFI 1 U DC power supply unit   |
| JPSU-1600W-1UDCAFO            | QFX5130-32CD-D-AFO 1 U DC power supply unit   |
| QFX5130-32CD-4PRMK            | 4-Post Rack Mount Kit for QFX5130-32CD  |
| QFX5220-32CD-FANAI            | Airflow in (AFI) back-to-front airflow fans for QFX5130-32CD  |
| QFX5220-32CD-FANAO            | Airflow out (AFO) front-to-back airflow fans for QFX5130-32CD   |
| <b>Software Licenses SKUs</b> |   |
| S-QFX5K-C3-A1-X (X=3,5)       | Base L3 Software Subscription (X Years; X=3,5) License for QFX5130-32CD   |
| S-QFX5K-C3-A2-X (X=3,5)       | Advanced Software Subscription (X Years; X=3,5) License for QFX5130-32CD  |
| S-QFX5K-C3-P1-X (X=3,5)       | Premium Software Subscription (X Years; X=3,5) License for QFX5130-32CD   |



## About Juniper Networks

Juniper Networks brings simplicity to networking with products, solutions and services that connect the world. Through engineering innovation, we remove the constraints and complexities of networking in the cloud era to solve the toughest challenges our customers and partners face daily. At Juniper Networks, we believe that the network is a resource for sharing knowledge and human advancement that changes the world. We are committed to imagining groundbreaking ways to deliver automated, scalable and secure networks to move at the speed of business.



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