Nokia 7220 IXR-D series Interconnect Routers

Release 25

As part of the Nokia Data Center Fabric solution, the Nokia 7220 IXR-D series platforms are designed for the leaf and spine layers of data center fabrics, delivering high-scale interconnectivity for enterprise, service provider and webscale data center and cloud environments.

Overview

High-bandwidth servers are driving the need for higher port speeds and density in data center architectures. Similarly, the need for more power-efficient and state-of-the-art hardware designs is driving the modernization of network aggregation and interconnect within data centers.

The Nokia 7220 IXR-D family offers versatile platforms for enterprise and modern data centers builders, making them well-suited for leaf-type deployments in data center CLOS architectures. They offer 400GE, 200GE, 100GE, 50GE, 40GE and 10GE interfaces for intra-fabric and workload connectivity.

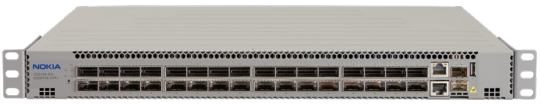
The Nokia 7220 IXR-D series provides a comprehensive set of advanced features that support scalable multi-tenant solutions in data centers. By utilizing EVPN VxLAN tunnels, the 7220 IXR-D series enables efficient layer 2 and layer 3 overlay networking. Additionally, the 7220 IXR-D series supports EVPN multicast for layer 2, optimizing multicast delivery within data center networks.

7220 IXR-D series offer traffic steering using forwarding policies based on defined criteria making the data center network more intelligent.

The 7220 IXR-D series is available in five variants.

7220 IXR-D1 48T 4SFP+

7220 IXR-D2L 48SFP28 8QSFP28 2SFP+



7220 IXR-D3L 32QSFP28 2SFP+

7220 IXR-D4 28QSFP28 8QSFPDD

7220 IXR-D5 32QSFPDD 2SFP+

7220 IXR-D1 48T 4SFP+

The 7220 IXR-D1 is 1 RU high with a system capacity of 88 Gb/s full duplex (FD). It is equipped with 48 10/100/1000 Mb/s RJ45 ports and four SFP+ ports.

The SFP+ ports include hardware support for native 10GE speeds. The 7220 IXR-D1 is optimized for leaf-spine designs, which require server connectivity at 1GE speeds.

The 7220 IXR-D1 supports two power supplies with 1+1 redundancy using either AC or DC power options. The system supports both front-to-back and back-to-front airflow configuration with three N+1 hot-swappable fans.

7220 IXR-D2L 48SFP28 8QSFP28 2SFP+

The 7220 IXR-D2L platform is 1 RU high with a system capacity of 2.0 Tb/s FD. It is equipped with 48 25GE SFP28 ports, eight 100GE QSFP28 ports and two 10GE SFP+ ports.

All QSFP28 ports include hardware support for native 100GE and 40GE speeds. The QSFP28 ports also include hardware support for breakout options for 50GE, 25GE and 10GE speeds.

The SFP28 ports include hardware support for native 25GE,10GE and 1GE speeds. These port options provide high-performance intra-fabric uplinks, storage and server connectivity.

The 7220 IXR-D2L platform supports two power supplies with 1+1 redundancy using either AC or DC power options.

The 7220 IXR-D2L platform supports front-to-back and back-to-front airflow configuration with six N+1 hot-swappable fans.

7220 IXR-D3L 32QSFP28 2SFP+

The 7220 IXR-D3L platform is 1 RU high with a system capacity of 3.2 Tb/s FD. It is equipped with 32 100GE QSFP28 ports and two SFP+ ports.

All QSFP28 ports include hardware support for native 100GE and 40GE speeds. The QSFP28 ports also include hardware support for breakout options for 50GE, 25GE and 10GE speeds. The SFP+ ports include hardware support for native 10GE speeds. These port options provide exceptional flexibility in a variety of leaf or spine deployment configurations.

The 7220 IXR-D3L platform supports two power supplies with 1+1 redundancy using either AC or DC power options.

The 7220 IXR-D3L platform supports front-to-back and back-to-front airflow configuration with six N+1 hot-swappable fans.

7220 IXR-D4 28QSFP28 8QSFPDD

The 7220 IXR-D4 is 1 RU high with a system capacity of 6.0 Tb/s FD. It is equipped with 28 100GE QSFP28 ports and eight 400GE QSFP-DD ports.

All QSFP-DD ports include hardware support for native 400GE, 100GE, 50GE and 40GE speeds. These port options provide exceptional flexibility in a variety of leaf or spine deployment configurations.

The 7220 IXR-D4 supports two power supplies with 1+1 redundancy using either AC or DC power options.

The system supports front-to-back and back-to-front airflow configuration with six N+1 hot-swappable fans.

7220 IXR-D5 32QSFPDD 2SFP+

The 7220 IXR-D5 is 1 RU high with a system capacity of 12.8 Tb/s FD. It is equipped with 32 400GE QSFP-DD ports and two SFP+ ports.

All QSFP-DD ports include hardware support for native 400GE, 200GE, 100GE, 50GE and 40GE speeds. The SFP+ ports include hardware support for native 10GE speeds. These port options provide exceptional flexibility in a variety of leaf or spine deployment configurations.

The 7220 IXR-D5 supports two power supplies with 1+1 redundancy using either AC or DC power options.

The system supports front-to-back and back-to-front airflow configuration with six N+1 hot-swappable fans.

Nokia Service Router Linux

Nokia SR Linux is a Linux®-based open, extensible and resilient NOS that enables scalability, flexibility and efficiency in data center and cloud environments. The Nokia 7220 IXR-D series implements Nokia SR Linux.

SR Linux is a key component of the Nokia Data Center Fabric solution, which also includes the Nokia Event-Driven Automation (EDA) and the Nokia Data Center hardware platforms.

Ground-up, model-driven architecture delivers extensibility

In cloud-scale data center networks, the primary challenges are scalability and/or ease of operations. SR Linux is designed from the ground up with a management architecture that meets the demands of a model-driven world where visibility—and the scalability and granularity of that visibility—are paramount.

SR Linux features a completely model-driven architecture for flexible and simplified management and operations. SR Linux delivers an extensible and open infrastructure that allows applications to define and declare their own schemas, enabling the retrieval of fine-grained system state and setting of configuration.

Modular, state-sharing architecture

SR Linux uses an unmodified Linux kernel as the foundation on which applications share state via a publish/subscribe (pub/sub) architecture. The Nokia pub/sub architecture is implemented using generalized Remote Procedure Call (gRPC), protocol buffers (protobufs) and the Nokia Impart Database (IDB).

The Nokia IDB is a lightweight database that is optimized to handle high volumes of messages while protecting against any one application slowing down the whole system.

Field-proven protocol stacks

SR Linux leverages field-proven protocol stacks from the Nokia Service Router Operating System (SR OS), which has a strong pedigree in IP routing.

Enterprise, service provider and webscale data centers are increasingly adopting leaf-spine fabric designs using enhanced IP routing with Multiprotocol-Border Gateway Protocol (MP-BGP), EVPN, Virtual Extensible LAN (VXLAN), MPLS and segment routing protocols. By using field-proven protocol stacks, data center planning and operations teams can immediately benefit from the stability, scalability and interoperability of a resilient NOS.

Superior CLI programmability and integration of third-party applications

Operations teams can leverage command line interface (CLI) plugins to completely customize the way the CLI operates, plugging in Linux commands or pulling the state/configuration from various locations.

SR Linux allows third-party applications to be fully integrated into the system and given all the same benefits as Nokia applications. This includes consistent configuration via YANG, telemetry support, life-cycle management and visibility of system resources.

SR Linux offers a state-of-the-art NetOps Development Kit (NDK) for data center teams to develop new applications and operational tools in the language of their choice with deep programmatic access to, and control of, the entire system.

Nokia Event-Driven Automation

The Nokia Event Driven Automation framework (EDA) is an extensible, declarative, intent-based automation and operations NetOps platform that delivers agile and scalable network operations for data center and cloud environments of any size.

The declarative, intent-based framework and the automation capabilities of the EDA framework are only made possible by leveraging a modern NOS that offers an open, model-driven, stream-anything foundation.

By using Nokia SR Linux modern streaming telemetry approach for the NOS, the EDA framework has timely and efficient access to more granular data across the entire fabric. This data can then be used to understand the state of the network, which is essential for event-driven applications to determine if the network is behaving according to their intent. This approach is also highly scalable, which is essential in today's networks.

Technical specifications

Table 1. 7220 IXR-D series specifications

Feature	7220 IXR-D1	7220 IXR-D2L	7220 IXR-D3L	7220 IXR-D4	7220 IXR-D5
System throughput: Full duplex (FD)	88 Gb/s	2.0 Tb/s	3.2 Tb/s	6.0 Tb/s	12.8 Tb/s
Ports	4 x SFP+ 48 x RJ-45	8 x QSFP28/QSFP+ 48 x SFP28 2 x SFP+	32 x QSFP28/ QSFP+ 2 x SFP+	28 x QSFP28 8 x QSFPDD	32 x QSFPDD 2 x SFP+
Hardware support (maximum ports per chassis)					
400GE	NA	NA	NA	8	32
200GE	NA	NA	NA	12*	64
100GE	NA	8	32	57	128
50GE	NA	16*	32	46*	144*
40GE	NA	8	32	36	32
25GE	NA	48	124	40	128
10GE	4	50	126	40	130
1GE SFP	NA	48	NA	NA	NA
1000/100/10 Mb/s	48	NA	NA	NA	NA
Management ports	1 x 1000BASE-T	1 x 1000BASE-T	1 x 1000BASE-T	1 x 1000BASE-T	1 x 1000BASE-T
USB ports	1 x USB2.0	1 x USB2.0	1 x USB2.0	1 x USB2.0	1 x USB2.0
Console port	1 x RJ-45	1 x RJ-45	1 x RJ-45	1 x RJ-45	1 x RJ-45
Processor	4-core x 86	4-core x 86	4-core x 86	8-core x 86	8-core x 86
Memory	8G DDR4	16G DDR4	16G DDR4	16G DDR4	16G DDR4
Memory buffer size	8 MB	32 MB	32 MB	82 MB	132 MB
SSD	16G SLC	32G MLC	32G MLC	50G MLC	50G MLC
Power	1+1 redundant AC: 100 V to 240 V DC:-48 V/-60 V 240 W AC 550 W DC	1+1 redundant AC: 100 V to 240 V DC:-48 V/-60 V 650 W AC 800 W DC	1+1 redundant AC: 100 V to 240 V DC:-48 V/-60 V 650 W AC 800 W DC	1+1 redundant AC: 100 V to 240 V DC:-48 V/-60 V 650 W AC 800 W DC	1+1 redundant AC: 100 V to 240 V DC:-48 V/-72 V 1500 W AC 1600 W DC
Fan modules	3 fans, N+1 redundant Front-to-back or back-to-front airflow	6 fans, N+1 redundant Front-to-back or back-to-front airflow	6 fans, N+1 redundant Front-to-back or back-to-front airflow	6 fans, N+1 redundant Front-to-back or back- to-front airflow	6 fans, N+1 redundant Front-to-back or back-to-front airflow
Hot-swappable fan modules	Yes	Yes	Yes	Yes	Yes
Hot-swappable power supplies	Yes	Yes	Yes	Yes	Yes

* Future deliverable

Feature	7220 IXR-D1	7220 IXR-D2L	7220 IXR-D3L	7220 IXR-D4	7220 IXR-D5
Dimensions	Height: 4.35 cm (1.75 in); 1 RU Width: 43.85 cm (17.26 in) Depth: 40 cm (15.75 in) Fits in standard 19-in mounting rack	Height: 4.31 cm (1.70 in); 1 RU Width: 43.84 cm (17.26 in) Depth: 53.6 cm (21.10 in) Fits in standard 19-in mounting rack	Height: 4.32 cm (1.70 in); 1 RU Width: 43.84 cm (17.26 in) Depth: 51.5 cm (20.28 in) Fits in standard 19-in mounting rack	Height: 4.35 cm (1.75 in); 1 RU Width: 43.84 cm (17.26 in) Depth: 59 cm (23.23 in) Fits in standard 19-in mounting rack	Height: 4.35 cm (1.75 in); 1 RU Width: 43.84 cm (17.26 in) Depth: 59 cm (23.23 in) Fits in standard 19-in mounting rack
Weight	7.5 kg (16.53 lb) (unpopulated) 9.5 kg (20.94 lb) (fully populated)	7.36 kg (16.23 lb) (unpopulated) 10 kg (22 lb) (fully populated)	6.65 kg (14.66 lb) (unpopulated) 9.38 kg (20.68 lb) (fully populated)	7.88 kg (17.37 lb) (unpopulated) 10.93 kg (24.09 lb) (fully populated)	8.57 kg (18.89 lb) (unpopulated) 11.85 kg (26.12 lb) (fully populated)
4-post mounting	Yes; rail kit option	Yes; rail kit option	Yes; rail kit option	Yes; rail kit option	Yes; rail kit option
Discrete Trusted Platform Module (TPM)	Yes	Yes	Yes	Yes	Yes
Normal operating temperature range	0°C to +40°C (32°F to +104°F) sustained	0°C to +40°C (32°F to +104°F) sustained	0°C to +40°C (32°F to +104°F) sustained	0°C to +40°C (32°F to +104°F) sustained	0°C to +40°C** (32°F to +104°F) sustained
Shipping and storage temperature	-40°C to +70°C (-40°F to +158°F)	-40°C to +70°C (-40°F to +158°F)	-40°C to +70°C (-40°F to +158°F)	-40°C to +70°C (-40°F to +158°F)	-40°C to +70°C (-40°F to +158°F)
Normal humidity	5% to 95%, non-condensing	5% to 95%, non-condensing	5% to 95%, non-condensing	5% to 95%, non-condensing	5% to 95%, non-condensing

** Certain airflow configurations and the use of reduced case temperature optics may reduce the maximum operating temperature

Software features

The 7220 IXR-D series supports, but is not limited to, the following SR Linux software features[1].

Open Linux support

- Support for unmodified Linux kernel
- Access to Linux tools, patching and packaging
- SR Linux container
- Linux control groups (cgroupsv2)

Platform features

- Dynamic Ternary Content Addressable Memory (TCAM) table allocation

Layer 2 features

- Dot1q and untagged sub-interfaces, including VLAN ranges on bridged sub-interfaces
- Ethernet IEEE 802.1Q (VLAN) with support for jumbo frames
- Link aggregation: Link Aggregation Group (LAG) and Link Aggregation Control Protocol (LACP)
- Link Layer Discovery Protocol (LLDP) on all interfaces
- Media access control (MAC) loop prevention
- MAC storm control
- Virtual routing and forwarding (VRF): MAC-VRF
- MAC access control lists (ACLs) with validation: accept, reject and log actions
- Multicast Listener Discovery (MLD) snooping in Layer 2 broadcast domains

1 Some platforms may have feature exclusions or exceptions

Layer 3 features

- IPv4/v6 routing
- BGP with iBGP/eBGP:
  Support for IPv4/v6, including:
  - Core Prefix independent convergence
  - 4-byte autonomous system number
  - Route reflector
  - Dynamic BGP
  - BGP unnumbered
  - eBGP multi-hop
  - Add-paths for IPv4 and IPv6 routes
- IS-IS v4/v6
- Open Shortest Path First: OSPFv2 and OSPFv3
- Static routes for IPv4/v6
- Equal cost multi-path with consistent and resilient hashing and configurable hash fields
- IPv6 flow label hashing
- VRF: Multiple VRF support
- Maintenance modes
- Bi-directional forwarding detection (BFD), micro BFD (mBFD)
- Interfaces: Loopback interfaces, Integrated Routing and Bridging (IRB)
- Proxy Address Resolution Protocol (ARP)/ neighbor discover (ND)
- Routing policy:
  - Structured rules for accepting, rejecting and modifying routes that are learned and advertised to routing peers
  - Routes can be matched based on prefix lists, autonomous system (AS) path regular expressions, BGP communities, Address Family Indicator/Subsequent Address Family Indicator (AFI/SAFI) protocol, etc.
  - Route leaking between network instances
- Layer 3/Layer 4 ACLs with validation; accept, reject and log actions

Network virtualization

- EVPN with VXLANv4 encapsulation
- EVPN Layer 2 and Layer 3 connectivity
- EVPN all-active multi-homing; single-active multi-homing for Layer 2 and Layer 3
- EVPN host route mobility
- Provider edge-to-customer edge (PE-CE) BGP path attribute propagation in EVPN
- EVPN IP aliasing

QoS

- Intelligent packet classification, including IPv4, IPv6 match-criteria-based classification
- Ingress per forwarding class sub-interface policing
- Queuing/scheduling:
  - Strict priority
  - Weighted Round Robin (WRR)
  - Weighted Random Early Detection (WRED)
  - Explicit Congestion Notification (ECN)
- QoS classification and marking based on DiffServ Code Point (DSCP)
- Ingress DSCP rewrite
- QoS classification and marking based on IEEE 802.1p
- Multi-field classification

System management and automation

- Native model-driven architecture, configuration candidates, exclusive mode, checkpoints, rollbacks
  - Support for SR Linux and OpenConfig[2] data models
- Management interfaces: gNMI, gRPC Routing Information Base Interface (gRIBI), JSON-RPC and CLI (transactional, Python CLI and CLI plugins)
- gRPC network operations interface (gNOI)
- gRPC Network Security Interface (gNSI)

2 Future software release

- Per-user configurable options for CLI
- Local Authentication, Authorization and Accounting (AAA) with Role Based Access Control (RBAC)
- Remote Authentication Dial-In User Service (RADIUS) support for AAA
- Terminal Access Controller Access Control System (TACACS+) AAA via privilege levels
- Password complexity policies and lockout management
- Access to common Linux utilities: Bash, cron and Python
- Syslog RFC 5424
- Telemetry:
  - Subscription-based telemetry for modeled data structures, either on change or sampled
  - sFlow
  - Logging infrastructure
- Telemetry-driven event management
- Python-based Zero Touch Provisioning (ZTP)
- Address management: Dynamic Host Configuration Protocol (DHCP) v4/v6 relay
- DHCP v4/v6 server with static allocations
- Interactive mirroring
- Unified Forwarding Tables (UFT) profiles

NetOps Development Kit (NDK)

- gRPC and protobuf-based interface for tight integration
- Leverages SR Linux model-driven architecture
- Direct access to other application functionality, e.g., forwarding information base (FIB), LLDP and BFD
- Native support for streaming telemetry

Resiliency

- Support for redundant fan and power configurations
- Warm reboot to perform soft reset or trigger an in-service software upgrade (ISSU)
  - Nonstop forwarding (NSF)
  - Graceful restart client for BGPv4/v6

Security

- Distributed and aggregated ACLs and policers for control and management plane
- Layer 2 through Layer 4 Control Plane Policing (CoPP)
- Mirroring from interface/sub-interface or ingress ACL
- Mirroring to Switch Port Analyzer (SPAN) and Encapsulated Remote SPAN (ERSPAN)
- IPv6 router advertisements guard

Timing and synchronization[3]

- Built-in Stratum 3E clock
- ITU-T Synchronous Ethernet (SyncE)
- IEEE 1588v2
  - Boundary clock (BC)
  - Profiles: ITU-T G.8275.1
  - Ethernet encapsulation
- RFC 5905 Network Time Protocol (NTP)

Standards compliance[4]

Environmental and NEBS

- ETSI EN 300 019-2-1; Storage Tests, Class 1.2
- ETSI EN 300 019-2-2; Transportation Tests, Class 2.3
- ETSI EN 300 019-2-3; Operational Tests, Class 3.2
- ETSI EN 300 753; Acoustic Noise, Class 3.2[5]
- GR-3160-CORE

3 Timing and synchronization supported on 7220 IXR-D5

4 System design intent is according to the listed standards. Refer to product documentation for detailed compliance status.

5 Certain airflow configurations will impact acoustics. Please contact Nokia for details

Safety

- AS/NZS 62368-1
- FDA CDRH 21-CFR 1040
- IEC/BS/EN 60825-1
- IEC/BS/EN 60825-2
- IEC/UL/CSA/BS/EN 62368-1

Electromagnetic compatibility

- AS/NZS CISPR 32 Class A
- BS EN 55035
- BS EN 61000-3-2
- BS EN 61000-3-3
- BS EN 55032 Class A
- BSMI CNS 15936 Class A
- BT GS-7
- EN 55035
- EN 55032 Class A
- ETSI EN 300 132-1 (AC)
- ETSI EN 300 132-2 (LVDC)
- ETSI EN 300 386
- ETSI ES 201 468
- FCC Part 15 Class A
- ICES-003 Class A
- IEC CISPR 32 Class A
- IEC CISPR 35
- IEC/ EN 61000-3-2
- IEC/EN 61000-3-3
- IEC/EN 61000-6-2
- IEC/EN 61000-6-4
- KCC Korea - Immunity KS C 9835
- KCC Korea - Emissions KS C 9832
- VCCI Class A

Directives and regional approvals

- Directive 2011/65/EU RoHS (including Commission Delegated Directive EU 215/863)
- Directive 2012/19/EU WEEE
- Directive 2014/30/EU EMC
- Directive 2014/35/EU Low LVD
- CE Mark: Europe
- CRoHS: China RoHS
- KC Mark: South Korea
- RCM Mark: Australia
- UKCA Mark: United Kingdom
- VCCI Mark: Japan

System scale and performance

Platform-specific scale and performance information is available and can be provided on request.

Learn more

To learn more about the Nokia Data Center Fabric solution, see the web page.

About Nokia

At Nokia, we create technology that helps the world act together.

As a B2B technology innovation leader, we are pioneering networks that sense, think and act by leveraging our work across mobile, fixed and cloud networks. In addition, we create value with intellectual property and long-term research, led by the award-winning Nokia Bell Labs.

Service providers, enterprises and partners worldwide trust Nokia to deliver secure, reliable and sustainable networks today – and work with us to create the digital services and applications of the future.

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