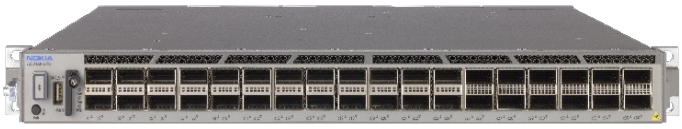
Nokia 7250 IXR-X1b and IXR-X3b Interconnect Routers

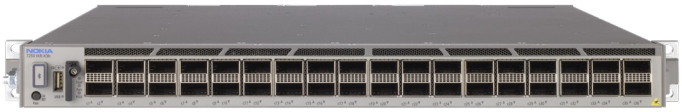
Release 25

The Nokia 7250 Interconnect Routers (IXR)-X1b and IXR-X3b are IP routing platforms that offer high-speed, high-density interfaces in a 1RU form factor. They are suitable for data center and multi-access edge computing applications, and are valuable for access, aggregation, and 5G interconnectivity.

Growing bandwidth demands are easily met by the 7250 IXR-X1b and IXR-X3b, compact routers with capacities of 7.2 Tb/s and 14.4 Tb/s respectively. These routers deliver high-speed interfaces at scale. Powered by SR Linux network operating system (NOS), these systems provide a robust networking foundation for cloud-native architectures, offering scalable automation and unmatched extensibility.



7250 IXR-X1b



7250 IXR-X3b

High-speed and high-density platform

High-bandwidth interfaces are driving the need for higher port speeds and density in data center architectures.

The 7250 IXR-X1b offers 12 x 400G QSFP-DD and 24 x QSFP28 connectors, while the 7250 IXR-X3b offers 36 x 400G QSFP-DD connectors, all within a 1RU space.

- 7250 IXR-X1b
  - Fixed, 7.2 Tb/s
  - 24 x QSFP28 and 12 x 400G QSFP-DD
- 7250 IXR-X3b
  - Fixed, 14.4 Tb/s
  - 36 x 400G QSFP-DD

400G QSFP-DD connectors are fully backward compatible to QSFP28-DD and QSFP28, supporting various combinations such as 4x10GE, 4x25GE, 100GE, 2x100GE, 4x100GE, and 1x400GE.

All odd numbered QSFP28 ports support 4 x 25GE and 4 x 10GE breakout.

Pluggable Digital Coherent Optics (DCO) 100/400ZR/ZR+ are supported on the platforms.

Network security

The 7250 IXR-X1b/X3b hardware provides user plane protection through low-latency, line-rate encryption based on MACsec. This ensures that data is safeguarded against snooping or tampering by any intermediate device or network. Furthermore, the hardware supports IPsec without requiring dedicated appliances.[1]

1 MACsec/IPsec are future roadmap items

The 7250 IXR-X1b/X3b with Root-of-Trust features a multi-core x86e CPU that delivers control plane scalability and performance, crucial for data center leaf-spine designs. It includes an integrated 80G SSD, a discrete trusted platform module, and is designed to meet all demanding performance benchmarks.

The RoT enables Secure Boot to ensure the system executes trusted software. The Trusted Platform Module (TPM 2.0) is provisioned with Nokia Initial Device Identity (IDevID) and Initial Attestation Key (IAK). TPM 2.0 technology supports secure boot and measured boot, utilizing hardware-processed security keys for enhanced security over software-processed keys.

Advance timing and sync capabilities

The 7250 IXR-X1b/X3b platforms are equipped with a high-precision clock to meet the strict timing requirements of applications such as 5G transport. They support both Sync-E and IEEE 1588, offering precise time synchronization for various applications.

Innovative hardware design

The 7250 IXR-X1b/X3b are designed with a component- minimizing approach to ensure that only essential components are used, and system layouts are optimized, leveraging Nokia intellectual property throughout.

The intellectual property integrated into the hardware design of each platform includes the integration of the Bell Labs 1588 algorithm, honeycomb mesh air intakes, and leveraging the capabilities of the inmate chipset in each platform to its maximum potential. The net result is leading low power consumption, a design that is optimized for the supply chain, and inherently supports a leading ESG model.

Honeycomb mesh air intakes on the IXR not only create a 90% open faceplate, compared to a 50 - 60% open faceplate with holes punched in bent metal but also create a full Faraday Cage for the platform. This ensures that EMI is always best isolated platform-to-platform.

The 7250 IXR-X1b/X3b platforms share common fans and power supply units (PSUs) with the 7250 IXR-X1/X3. Redundant fans and PSUs enhance network availability.

Nokia Service Router Linux

Nokia SR Linux Network OS (NOS) is a specialized operating system tailored to meet the demands of modern networking. It features a cloud-native software architecture, robust foundation, and exceptional scalability, making it open and resilient.

By leveraging established protocol stacks and networking applications from the Nokia Service Router Operating System (SR OS), SR Linux ensures reliability and is deployed in networks worldwide.

The SR Linux EVPN and IPVPN services implementation offers proven resiliency, stability, scalability, and interoperability, providing mature solutions for customers.

Scalable streaming telemetry

SR Linux was built with an open, scalable telemetry framework at its core, internally using gRPC, gRPC Network Management Interface (gNMI) and protobufs. Because SR Linux is natively model driven, it is immediately ready for streaming telemetry without requiring any translation layers.

Support for differentiated services

The 7250 IXR-X1b/X3b platforms support low-latency applications while also providing large buffer memory for delay-tolerant applications.

Network automation

The 7250 IXR-X1b/X3b products, powered by the SR Linux NOS, can be deployed across a wide range of applications. Nokia's network automation platforms deliver solutions that meet the requirements of every network domain.

The Nokia Network Services Platform (NSP) provides IP network automation, a consistent user experience, and management capabilities across all Nokia IP routing platforms. NSP reduces risk and accelerates implementation with prepackaged software and services.

The Nokia Event-Driven Automation (EDA) platform enables reliable, simplified, and adaptable data center network operations. EDA aims to minimize network disruptions and service downtime by eliminating human errors in data center operations.

Nokia is the right partner to accompany you on your journey to network automation in all network domains.

Technical specifications

Table 1. 7250 IXR-X1b and IXR-X3b specifications

Feature	7250 IXR-X1b	7250 IXR-X3b
System throughput: Full duplex	7.2 Tb/s	14.4 Tb/s
Ports	• 12 x 400G QSFP-DD • 24 x QSFP28	• 36 x 400G QSFP-DD
Control interfaces	Console, management, Bluetooth, USB, SD slot with security cover	
Security	MACsec/IPsec[1] Root-of-Trust TPM2.0, Secure boot	
Timing and synchronization	• Stratum 3E oscillator • ITU-T Synchronous Ethernet (SyncE) • IEEE 1588v2 PTP Clock Types – Boundary clock • IEEE 1588v2 PTP Profiles: – ITU-T G.8275.1 – ITU-T G.8275.2 with PTS • ITU-T G.8273.2 Class D performance • IEEE 1588v2 PTP Encapsulations: – Ethernet – UDP/IPv4 • RFC 5905 Network Time Protocol (NTP)	
Internal storage	80GB SSD	80GB SSD
Memory buffer size	8 GB	16 GB
Dimensions	• Height: 1RU, 4.5 cm (1.75 in) • Depth: 54.6 cm (21.5 in) • Width: 44.45 cm (17.5 in)	• Height: 1RU, 4.5 cm (1.75 in) • Depth: 64.7 cm (25.5 in) • Width: 44.45 cm (17.5 in)
Common equipment redundancy	Power supplies (1+1), cooling fans (n+1)	
Power supply options	Modular AC or DC power supplies	
Power requirements	• HV AC input (rated): 200 V AC to 240 V AC, 50 Hz to 60 Hz • DC input (rated): -48 V DC/-60 V DC	
Cooling	• Modular replaceable fans (3 total) • Front-to-back airflow	
Normal operating temperature range	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)	
Normal humidity	5% to 95%, non-condensing	

Table 2. 7250 IXR-X1b /IXR-X3b maximum density

Ethernet speed	7250 IXR-X1b	7250 IXR-X3b
10GE*	96	144
25GE*	96	144
40GE*	36	36
100GE	72	144
400GE	12	36

* Future software support

1 MACsec/IPsec are future roadmap items

Software features

The 7250 IXR-X1b/X3b platforms support the following SR Linux software features, among others.

Open Linux support

- Support for unmodified Linux kernel
- Linux control groups (cgroupsv2)

Layer 2 features

- Ethernet IEEE 802.1Q (VLAN) and 802.1ad (QinQ) 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

Layer 3 features

- IPv4/v6 routing
- BGP with iBGP/eBGP: Support for IPv4/v6, including:
  - Core Prefix Independent Convergence (PIC)
  - 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
- Graceful restart client for IS-IS
- Open Shortest Path First (OSPFv2 and OSPFv3)
- Static routes for IPv4/v6
- Equal cost multi-path (ECMP) with consistent and resilient hashing and configurable hash fields
- IPv6 flow label hashing
- VRF: Multiple VRF support
- BGP maintenance modes
- BGP route flap damping
- Bi-directional forwarding detection (BFD), micro BFD
- Interfaces: Loopback interfaces
- 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.
  - Policy-based forwarding based on DiffServ Code Point (DSCP) and/or IP protocol
  - Route leaking between network instances
- Layer 3/Layer 4 access control lists (ACLs) with validation; accept, reject and log actions

MPLS and segment routing (SR)

- Interface LDP over IPv4/v6
- SR-ISIS over IPv4/v6
- BGP shortcuts over tunnels
- Traffic engineering (SR-TE) policies with active/standby LSP redundancy
  - sBFD
  - SRLG
  - Admin-tag for constraint based SVC/shortcut to tunnel binding
- LSP ping and trace for LDP and SR-ISIS tunnels
- Topology Independent Loop Free Alternate for SR-ISIS and SR-TE tunnels
- LDP (LFA) fast re-route, Remote-LFA including auto-LFA

QoS

- Intelligent packet classification, including IPv4 and IPv6 match-criteria-based classification
- MPLS QoS via EXP to forwarding class mapping
- Queuing/scheduling:
  - Strict priority
  - Weighted round robin (WRR)
  - Weighted Random Early Detection (WRED)
  - Explicit Congestion Notification (ECN)
- QoS classification and marking based on DSCP

Operations, administration and maintenance

- Two-Way Active Measurement Protocol (TWAMP) server and session reflector
- STAMP session reflector
- OAM Performance Monitoring (PM) IP
- Dynamic IP Link Measurement
- ETH-CFM infrastructure support

System management and automation

- Native model-driven architecture, configuration candidates, exclusive mode, checkpoints and rollbacks
  - Support for SR Linux and OpenConfigdata 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)
- P4 runtime packet extraction and injection
- 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
- 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 HostConfiguration Protocol (DHCP) v4/v6 relay
- DHCP v4/v6 server with static allocations
- Interactive mirroring

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

Load balancing and resiliency

- Support for redundant fan and power configurations in data center hardware platforms
- BGP fast reroute using labeled/unlabeled unicast routes
- Graceful restart client for BGPv4/v6

Security

- Distributed and aggregated ACLs and policers for control and management plane
- Layer 3, Layer 4 Control Plane Policing (CoPP)
- Mirroring to Switch Port Analyzer (SPAN) and Encapsulated Remote SPAN (ERSPAN)
- MAC security (MACsec) and Internet Protocol Security (IPsec)[2]
- Secure boot
- Disk encryption

2 Future software release

Standards compliance[3]

Environmental

- ATIS-0600015.03
- 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)
- GR-63-CORE
- GR-295-CORE
- GR-3160-CORE
- VZ.TPR.9205
- VZ.TPR.9203 (Data Centers)

Safety

- AS/NZS 62368.1
- IEC/EN 60825-1
- IEC/EN 60825-2
- IEC/EN/UL/CSA 62368-1
- IEC 60529 IP20

Electromagnetic compatibility

- AS/NZS CISPR 32 (Class A)
- ATIS-600315.01.2015
- BT GS-7
- EN 300 386
- EN 301 489-1
- EN 301 489-17 (Bluetooth)
- BSMI CNS 15936 (Taiwan)
- EN 55035
- EN 55032 (Class A)
- ES 201 468
- ETSI EN 300 132-2 (LVDC)
- ETSI EN 300 132-1 (AC)
- FCC Part 15 (Class A)
- GR-1089-CORE
- ICES-003 (Class A)
- IEC 61000-3-2
- IEC 61000-3-3
- IEC CISPR 35
- IEC CISPR 32 (Class A)
- IEC 61000-6-2
- IEC 61000-6-4
- IEC/EN 61000-4-2 ESD
- IEC/EN 61000-4-3 Radiated Immunity
- IEC/EN 61000-4-4 EFT
- IEC/EN 61000-4-5 Surge
- IEC/EN 61000-4-6 Conducted Immunity
- EC/EN 61000-4-11 Voltage Interruptions
- KS C 9832 Class A (Emissions; South Korea)
- KS C 9835 (Immunity; South Korea)
- KS C 3124 (South Korea)
- KS C 3126 (Bluetooth; South Korea)
- VCCI CISPR32 Class A (Japan)

Directives, regional approvals and certifications

- DIRECTIVE 2011/65/EU RoHS
- DIRECTIVE 2012/19/EU WEEE
- DIRECTIVE 2014/30/EU EMC
- DIRECTIVE 2014/35/EU LVD
- DIRECTIVE 2014/53/EU RED
- MEF CE 3.0 compliant
- Australia: RCM Mark
- United Kingdom: UKCA Mark
- China RoHS: CRoHS
- Europe: CE Mark
- Japan: VCCI Mark
- South Korea: KC Mark
- Taiwan: BSMI Mark
- TL9000
- ISO 14001
- ISO 9001

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

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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