Nokia 7250 IXR-X series and IXR-s Interconnect Routers

Release 26

The Nokia 7250 Interconnect Router-X (IXR-X)[1] series and IXR-s deliver up to 14.4 Tb/s of full-duplex (FD) capacity and support up to 400GE interfaces in a compact 1RU form factor. Designed to excel as leaf nodes in data-center and multi-access edge-computing sites, the routers support access, aggregation, and 5G-interconnectivity applications for telecommunication providers, AI and cloud providers, and mission-critical enterprise environments.

Overview

The Nokia 7250 IXR-X series, comprising the 7250 IXR-Xs, IXR-X1, and IXR-X3, along with the Nokia 7250 IXR-s, provides a broad portfolio of high-speed, high-density, power-efficient routing platforms supporting 400GE, 100GE, 50GE, 40GE, 25GE, 10GE, 1GE, and FE interfaces. These fixed-connector systems are distinguished by their capacity and optical interface options, flexible breakouts, and precise timing and synchronization capabilities, all within a compact 1RU form factor.

The 7250 IXR-X series and IXR-s offer capacity options of 800 Gb/s FD, 4.8 Tb/s FD, and 14.4 Tb/s FD. They support 400G QSFP-DD, 100G QSFP28, 50G SFP56, 10G SFP+, 1G SFP, and 100M SFP optics, as well as Class C synchronization. It also supports pluggable Digital Coherent Optics (DCO), including 100ZR and 400ZR+, and pluggable line systems (QSFP-LS).

Powered by the Nokia Service Router Operating System (SR OS), the 7250 IXR-X series and IXR-s provide a robust networking foundation with feature-rich capabilities for a wide range of applications.



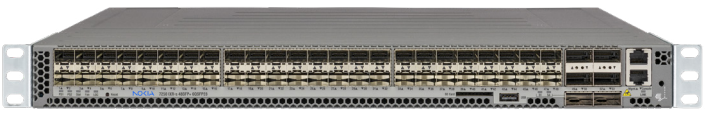
7250 IXR-Xs



7250 IXR-X1



7250 IXR-X3



7250 IXR-s

1 The 7250 IXR-X series and 7250 IXR-s are part of the 7250 IXR product family. An additional data sheet is available for the SR Linux-based 7250 IXR-X series variants.

Differentiated services

The Nokia 7250 IXR-X series and IXR-s enable a wide range of differentiated service applications through per-service hierarchical queuing with support for differentiated QoS, making it ideal for any-G aggregation and fixed-mobile convergence (FMC) deployments. These capabilities also help industrial enterprises achieve information technology/operational technology (IT/OT) convergence by simultaneously carrying both business and operational traffic. Through SR OS, it provides feature-rich layer 2, layer 3, IP/MPLS, SDN, resiliency and OAM capabilities.

Diverse applications

The 7250 IXR-X series and IXR-s use a common fixed-form design with options for port interfaces, modular power supplies and fans with airflow direction options that provide the versatility and resiliency needed to fit a wide variety of network requirements.

The 7250 IXR-X series and IXR-s are ideal for data center applications where their flexible port interfaces support multiple layers of aggregation. For example, a first leaf layer of 10GE to 100GE aggregation and a second layer of 100GE to 400GE aggregation. Optical breakout options provide high-density 25GE and 10GE port counts and flexibility to mix connector types and port speeds.

Low latency and advanced synchronization

The 7250 IXR-X series and IXR-s combine low nodal latency with advanced synchronization capabilities to support latency-sensitive applications and meet 4G and 5G fronthaul requirements. Equipped with a high-precision clock, they support both ITU-T SyncE and IEEE 1588v2, as well as ITU-T G.8273.2 Class C clock performance, to deliver precise timing and synchronization for a wide range of applications.

Advanced QoS features allow high-priority packets to traverse the network without queuing delay. This makes it ideal for centralized and virtualized RAN applications, BBU aggregation and edge computing applications.

Automation

To simplify and automate network operations, the 7250 IXR-X series and IXR-s leverage model-driven management capabilities in Nokia SR OS and are managed through the Nokia Network Services Platform (NSP). The Nokia NSP offers a rich set of service management features that automate new service delivery and reduce operating costs.

Standards-based software-defined networking (SDN) interfaces enable best-path computation to be offloaded to path computation elements (PCEs) such as the Nokia NSP. Each 7250 IXR variant operates as a path computation client (PCC), collecting and reporting per-link and per-service delay, jitter and loss metrics, as well as port utilization levels, for efficient path computation.

Technical specifications

Table 1. Nokia 7250 IXR-Xs, IXR-X1 and IXR-X3 specifications

Feature	7250 IXR-Xs	7250 IXR-X1	7250 IXR-X3
System throughput Full duplex (FD) IMIX traffic	4.8 Tb/s	4.8 Tb/s	14.4 Tb/s
Connectors	• 6 x 400G QSFP-DD • 48 x 50/25/10G SFP56/SFP28/SFP+	• 4 x 400G QSFP-DD • 32 x 100/40G QSFP28/QSFP+	36 x 400G QSFP-DD
Optical breakouts	QSFP-DD: 4 x 100G, 2 x 100G, 1 x 100G, 4 x 25G, 4 x 10G	QSFP-DD: 4 x 100G, 2 x 100G, 1 x 100G, 4 x 25G, 4 x 10G QSFP28: 4 x 25G, 4 x 10G	QSFP-DD: 4 x 100G, 2 x 100G, 1 x 100G, 4 x 25G, 8 x 10G, 4 x 10G
Control interfaces	Console, management, USB, SD slot	Console, management, USB, SD slot	Console, management, USB, SD slot
Satellite Mode option	Supported	Supported	NA
Timing and synchronization	• Includes Stratum 3E oscillator • ITU-T Synchronous Ethernet (SyncE) – G.8262 EEC / G.8262.1 eEEC • IEEE 1588v2 PTP Clock Types – Boundary – Slave • IEEE 1588v2 PTP Profiles – ITU-T G.8275.1 – ITU-T G.8275.2 with PTS – ITU-T G.8265.1 – IEEE 1588v2 Default – IEC/IEEE 61850-9-3 and C37.238-2017 Power Utility • IEEE 1588v2 PTP Encapsulations – Ethernet – UDP/IPv4 – UDP/IPv6 • PTP Profile Interworking • SyncE/1588 timing port • ITU-T G.8273.2 Class C performance • RFC 5905 Network Time Protocol (NTP)		
Memory buffer size	8 GB	8 GB	24 GB
Internal storage	N/A	N/A	SSD drive
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: 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	Power supplies (1+1), cooling fans	Power supplies (1+1), cooling fans
Power supply options	Power supplies (1+1), cooling fans		
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		

Table 1. Nokia 7250 IXR-Xs, IXR-X1 and IXR-X3 specifications (continued)

Feature	7250 IXR-Xs	7250 IXR-X1	7250 IXR-X3
Cooling	• Modular replaceable fans (3 total) • Front-to-back airflow • Back-to-front airflow	• Modular replaceable fans (3 total) • Front-to-back airflow • Back-to-front airflow	• 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. Nokia 7250 IXR-s specifications

Feature	Description
System throughput: Full duplex (FD) IMIX traffic	800 Gb/s
System configuration	Single integrated CPM
Connectors	• 6 x 100G/40G QSFP28/QSFP+ • 48 x 10/1G/100M SFP+/SFP
Optical breakouts	• QSFP28/QSFP+ ports: 4 x 25G, 4 x 10G
Control interfaces	• Console • Management • USB • SD slot
Timing and synchronization	• Built-in Stratum 3E oscillator • ITU-T Synchronous Ethernet (SyncE) – G.8262 EEC / G.8262.1 eEEC • IEEE 1588v2 PTP Clock Types – Boundary – Slave • IEEE 1588v2 PTP Profiles – ITU-T G.8275.1 – ITU-T G.8275.2 with PTS – ITU-T G.8265.1 – IEEE 1588v2 Default – IEC/IEEE 61850-9-3 and C37.238-2017 Power Utility • IEEE 1588v2 PTP Encapsulations – Ethernet – UDP/IPv4 – UDP/IPv6 • ITU-T G.8273.2 Class C (for noise generation) • PTP Profile Interworking • 1pps output port • RFC 5905 Network Time Protocol (NTP)

Table 2. Nokia 7250 IXR-s specifications (continued)

Feature	Description
Memory buffer size	8 GB
Redundant hardware	• Power redundancy (1+1) • Fan redundancy (5+1)
Dimensions	• Height: 4.35 cm (1.75 in); 1 RU • Width: 43.84 cm (17.26 in) • Depth: 51.5 cm (20.28 in) Fits in standard 19-in rack
Power	• 2 PSUs with 1+1 redundancy • LVDC input (single feed, rated): -48 V /-60 V • AC input (rated): 100 V to 220 V • Rear mounted
Cooling	• 6 trays of 1 ultra-quiet fan each • Fan trays separate from switch fabric • Safety electronic breaks on removal • 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

Software features

The Nokia 7250 IXR-X series supports, but is not limited to, the following features.[2]

Services

- Point-to-point Ethernet pseudowires/virtual leased line (VLL)
- Ethernet Virtual Private Network (EVPN) – Virtual Private Wire Service (EVPN-VPWS)
  - Virtual Private LAN Services (EVPN-VPLS): IPv4 and IPv6 support, including Virtual Router Redundancy Protocol (VRRP)
  - Multihoming with single active or active/active modes
  - Virtual eXtensible LAN (VXLAN) tunnel termination in VPLS and Routed-VPLS[3]
- Multipoint VPLS services based on Targeted Label Distribution Protocol (T-LDP) and Border Gateway Protocol (BGP) Autodiscovery
- Multipoint VPLS services based on Border Gateway Protocol (BGP)
- Routed-VPLS services with Internet Enhances Services (IES)/IP-VPN IPv4 and IPv6
- Ingress and egress VLAN manipulation for L2 services
- IP VPN Virtual Private Routed Network (VPRN), Inter- Autonomous System (Inter-AS) Option A, B, and C
- IPv6 VPN Provider Edge (6VPE)
- EVPN Interface-less IPv4 and IPv6 prefix routes (EVPN-IFL)
- MPLS (including SR-MPLS) to SRv6 interworking GW, Multi-Instance Services[3]
- E1 TDM PW (CESoPSN and SATOP)[4]

2 This section provides an overview of key features supported. Consult Nokia documentation for detailed feature support, interdependencies, exclusions and exceptions.
3 Supported on the 7250 IXR-X series only
4 Supported on the 7250 IXR-s only

Network protocols

- Segment routing
  - Intermediate System-to-Intermediate System (SR-IS-IS) and Open Shortest Path First (SR-OSPF)
  - Traffic engineering (SR-TE) IPv4, IPv6
- Segment Routing IPv6 (SRv6)[5]
  - SRv6 IS-IS shortest path tunnel support in MT=0 and MT=2
- Flexible Algorithms
  - Admin-group include/exclude, IGP/TE/Latency metric
- MPLS label edge router (LER) and label switching router (LSR) functions
  - Label Distribution Protocol (LDP)
  - Resource Reservation Protocol with traffic engineering (RSVP-TE)
- BGP Labeled Unicast (LU) (RFC 3107) route tunnels
- Segment Routing with IPv6 dataplane (SRv6)[5]
  - Classic SID, uSID
  - PSP and USP of SRH, USD
  - FlexAlgo
  - BGP SRv6 Policy
  - Hashing based on flow label
  - IPv4/v6 IP-VRF, GRT
  - EVPN-VPLS/VPWS with MH'ing
  - OAM, ping/traceroute SID/locator, VRF
- IP routing
  - Dual-stack Interior Gateway Protocol (IGP)
  - Multi-topology, multi-instance IS-IS
  - Multi-instance OSPF
  - Multiprotocol BGP (MP-BGP)
  - BGP-LU support in edge, area border router (ABR) and autonomous system boundary router (ASBR) roles
  - Usage-triggered download of BGP label routes to Label - Forwarding Information Base (L-FIB)
  - BGP Prefiix SID
  - Accumulated IGP (AIGP) metric for BGP
  - BGP monitoring protocol (BMP)
  - BGP route-reflector for EVPN and IP-VPN with VPNv4 and VPNv6 address families (AFs)
  - BGP confederations
  - BGP Flowspec[5]
  - IGP and BGP shortcuts
  - IP Fragmentation (IPv4)
- Layer 3 Multicast – base routing
  - Internet Group Management Protocol (IGMP)
  - Protocol Independent Multicast – Sparse Mode (PIM-SM), Source Specific Multicast (SSM)
  - Multicast Listener Discovery (MLD)
  - Multicast Source Discovery Protocol (MSDP)
- Layer 3 Multicast – VPRN
  - IGMP/MLD
  - IGMP/MLD on Routed VPLS Interface
- Layer 2 Multicast
  - IGMP/MLD snooping
- IP-GRE tunnel support[5]

SDN

- SR-TE LSPs, RSVP-TE LSPs, SR Policy
  - PCC initialized, PCC controlled – PCC initialized, PCE computed
  - PCC initialized, PCE controlled
- SR-TE LSPs: PCE initialized, PCE controlled
- SR policy: BGP and static
- Topology discovery: BGP-Link State (BGP LS) IPv4 and IPv6
- Telemetry: Streaming interface statistics, service delay and jitter metrics
- Netflow/cflowd
- LSP stats[5]

5 Supported on the 7250 IXR-X series only

Load balancing and resiliency

- IEEE 802.1.AX Link Aggregation Group (LAG) and multi-chassis (MC) LAG
- Weighted LAG hash
- GTP/teid based hashing
- VRRP
- IP and MPLS load balancing by equal-cost multipath (ECMP)
- ECMP for SRv6 tunnels[6]
- Fast reroute: Segment routing topology independent loop-free alternate (TI-LFA) and remote loop-free alternate (rLFA) in both SR-MPLS and SRv6
  - LDP with loop-free alternate (LFA) and remote loop-free alternate (rLFA) policies
  - RSVP-TE
  - Segment routing with rLFA and topology independent LFA (TI-LFA) in both SR-MPLS and SRv6 (The IXR-s does not support the SRv6 capability)
  - BGP Edge a Core Prefix Independent Convergence (BGP PIC)
- Entropy label (RFC 6790)
- Pseudowire and LSP redundancy
- Ethernet Ring Protection Switching ITU-T G.8032v2
- Configurable polynomial and hash seed shift
- IEEE 802.1d Classic spanning tree (STP)
- IEEE 802.1s Multiple spanning trees (MSTP)
- IEEE 802.1w Rapid reconfiguration of spanning tree (RSTP)
- IEEE 802.1ax (2008) Link Aggregation Group (LAG) and multi-chassis (MC) LAG Pseudowire and LSP redundancy
- Control plane high availability (HA)
- LAG adaptive load balancing[6]

Platform

- Ethernet IEEE 802.1Q (VLAN) and 802.1ad (QinQ) with 9K jumbo frames
- Detailed forwarded and discarded counters for service access points (SAPs) and network interfaces in addition to port-based statistics: per Virtual Output Queue (VoQ) packet and byte counters
- VLAN range-based SAPs
- Dynamic Host Configuration Protocol (DHCP server for IPv4 IES, VPNv4
- DHCP relay, IPv4 and IPV6, IES, IP-VPN, EVPN-VPLS
- Accounting records

QoS and traffic management

- Hierarchical QoS
  - Hierarchical egress schedulers and shapers per forwarding class, SAP, network interface, port or LAG
  - Port sub-rate
- Intelligent packet classification, including media access control (MAC), IPv4, IPv6 match-criteria-based classification
- Granular rate enforcement with up to 32 policers per SAP/VLAN, including broadcast, unicast, multicast and unknown policers
- Hierarchical policing for aggregate rate enforcement
- Strict priority, weighted fair queuing schedulers
- Congestion management via weighted random early discard (WRED)
- Egress marking or re-marking
- Low latency, low jitter forwarding

System management

- Simple Network Management Protocol (SNMP)
- Model-driven (MD) management interfaces
  - NETCONF
  - MD-CLI
- Comprehensive management with Nokia NSP

6 Supported on the 7250 IXR-X series only

Operations, administration and maintenance

- IEEE 802.1ag, ITU-T Y.1731: Ethernet Connectivity Fault Management for both fault detection and performance monitoring, including delay, jitter and loss
- Ethernet bandwidth notification with egress rate adjustment
- IEEE 802.3ah: Ethernet in the First Mile (EFM)
- ETH-CFM LBM Responder
- ITU-T Y.1564 Service Activation Test
- Bidirectional Forwarding Detection (BFD) IPv4 and IPv6
- Micro-BFD - per member link
- Hardware based sBFD[7]
- Link Layer Discovery Protocols (LLDP) (IEEE 802.3AB-2005)
- Two-Way Active Measurement Protocol (TWAMP), TWAMP Light/STAMP for base and flex-algo topologies
- A full suite of MPLS OAM tools, including LSP and virtual circuit connectivity verification ping
- Service assurance agent
- Mirroring with slicing support:
  - Port
  - VLAN
  - Filter output: Media Access Control (MAC), IPv4/IPv6 filters
  - Local/remote
  - Ingress label[7]
- Port and VLAN loopback with MAC-swap

Security

- Remote Authentication Dial-In User Service (RADIUS), Terminal Access Controller Access Control System Plus (TACACS+), and comprehensive control-plane protection capabilities
- Distributed CPU Protection (DCP)
- MAC-, IPv4- and IPv6-based access control lists and criteria-based classifiers
- Secure Shell (SSH)
- SR OS Secure Boot
- IP unicast RPF (uRPF)[7]

7 Supported on the 7250 IXR-X series only

Standards compliance[8]

Environmental

- ATIS-0600015.03
- ATT-TP-76200[9]
- 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 (CO)[9]
- VZ.TPR.9203 (Data Centers)
- VZ.TPR.9305 (CO)[9]

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)
- BT GS-7
- BSMI CNS 15936 (Taiwan)
- EN 300 386
- EN 55035
- EN 55032 (Class A)
- ETSI ES 201 468
- ETSI EN 300 132-2 (DC)
- ETSI EN 300 132-3 V1.2.1 (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
- ITU-T K20
- KS C 9832 Class A (Emissions; South Korea)
- KS C 9835 (Immunity; South Korea)
- VCCI CISPR 32 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
- Mplify Carrier Ethernet For Business Certified
- NEBS Level 3[9]
- China RoHS: CRoHS
- Australia: RCM Mark
- Europe: CE Mark
- India: TEC Mark
- Japan: VCCI Mark
- South Korea: KC Mark
- Taiwan: BSMI Mark
- United Kingdom: UKCA Mark
- TL9000
- ISO 14001
- ISO 9001

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

9 Supported on the 7250 IXR-s only



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, which is celebrating 100 years of innovation.

With truly open architectures that seamlessly integrate into any ecosystem, our high-performance networks create new opportunities for monetization and scale. 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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