Nokia 7250 IXR-10/IXR-6/IXR-s Interconnect Routers
Release 13.1

The Nokia 7250 Interconnect Router (IXR) family addresses evolving demands driven by the cloud, 5G and the Internet of Things. The IXR-10, IXR-6 and IXR-s routers enable high-scale interconnectivity in data centers and across WANs and aggregation networks in service provider, enterprise and webscale environments.

The 7250 IXR product family also includes the Nokia 7250 IXR-R6. This data sheet discusses the 7250 IXR-10, IXR-6 and IXR-s, referred to collectively as the 7250 IXR hereafter.

High-density aggregation

The 7250 IXR is optimized for high-density aggregation, supporting up to 57.6 Tb/s (7250 IXR-10), 28.8 Tb/s (7250 IXR-6) or 1.6 Tb/s (IXR-s) of system capacity, and is equipped with high-performance Gigabit Ethernet (GE), 10GE, 25GE, 40GE, 50GE and 100GE interfaces to scale networks to meet evolving traffic demands.

Feature-rich router OS

The 7250 IXR implements the Nokia Service Router Operating System (SR OS) to deliver a rich set of IP routing and MPLS features. The SR OS is a proven and highly-resilient router OS common across the entire Nokia IP-routing portfolio. This single OS approach results in simplified operations for networks that already run the SR OS, and also ensures the highest software quality possible.
Optimized for interconnect functions

Interconnect functions include data center aggregation, WAN aggregation and IP mobile backhaul.

The 7250 IXR delivers a comprehensive set of IP/MPLS, synchronization and QoS capabilities. Flexible traffic management capabilities include big buffering, per-port queuing, shaping and policing. Interconnect functions can complement existing IP edge router and IP core router platforms, to deliver enhanced IP network architectures for service provider, webscale and enterprise networks.

High availability

The 7250 IXR sets the benchmark for high availability. Systems support a full suite of 1+1 control, 5+1 fabric, and redundant fan and power configurations.

In addition to full hardware redundancy, the robust SR OS supports numerous features to maximize network stability, ensuring that IP/MPLS protocols and services run without interruption. These features include innovative non-stop routing, non-stop services, and stateful failover.

Carrier SDN and network management

The 7250 IXR is managed by the Nokia Network Services Platform (NSP), which provides integrated network management across the IP network. The NSP can be deployed as part of a carrier software-defined networking (SDN) solution, supporting unified service automation and network optimization across IP, MPLS, Ethernet and optical transport layers.

Software features

The 7250 IXR-10/6/s supports, but is not limited to, the following features.

Services

• Point-to-point Ethernet VPN services
• Ethernet pseudowires/virtual leased line (VLL)
• Ethernet Virtual Private Wire Service (EVPN-VPWS) and Flexible Cross Connect (FXC) with virtual LAN (VLAN) normalization
  – Multihoming with single active or active/active
• Multipoint Ethernet VPN services with Virtual Private LAN Service (VPLS) based on Targeted Label Distribution Protocol (T-LDP) and Border Gateway Protocol (BGP)
• IP VPN (VPRN), Inter-Autonomous System (Inter-AS) Option A, B, and C
• IPv6 VPN Provider Edge (6VPE)
• Internet Enhanced Services (IES)

Interfaces

• Ethernet – 9K jumbo frames

Network protocols

• Segment routing
  – Intermediate System-to-Intermediate System (IS-IS) and Open Shortest Path First (OSPF)
  – BGP Labeled Unicast (LU) (RFC 3107) route tunnels
• MPLS label edge router (LER) and label switching router (LSR) functions
  – Label Distribution Protocol (LDP)
  – Resource Reservation Protocol (RSVP)
• IP routing
  – Dual-stack Interior Gateway Protocol (IGP)
  – Multi-topology, multi-instance Intermediate System to Intermediate System (IS-IS)
  – Multi-instance Open Shortest Path First (OSPF)
  – Multiprotocol BGP (MBGP)
  – 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)

- Multicast
  - Internet Group Management Protocol (IGMP)
  - IGMP snooping
  - Protocol Independent Multicast – Sparse Mode (PIM-SM), Source Specific Multicast (SSM)

Platform
- Counters per service access point (SAP) and network interface in addition to port-based statistics
- Virtual Output Queue (VoQ) enqueued packet and byte counters
- Per state policer counters
- Configuration rollback
- Accounting records
- Dynamic Host Configuration Protocol (DHCP) server for IPv4 IES, VPNv4
- DHCP relay for IPv4 IES, VPNv4, VPNv6
- Cflowd

Timing and synchronization
- Built-in Stratum 3E clock
- ITU-T Synchronous Ethernet (SyncE)
- IEEE 1588v2
- Boundary clock (BC), slave clock (SC)
- RFC 5905 Network Time Protocol (NTP)
- Building Integrated Timing Supply (BITS) ports (T1, E1, 2M) and pulse-per-second (1PPS) timing

QoS and traffic management
- 16 queues per port
  - Unicast and multicast queue separation
  - Shapers per forwarding class per port
  - Port sub-rate
- Intelligent packet classification, including complex multfield classification
- Hierarchical policing, including broadcast, multicast and unknown policers
- Aggregate policers for hierarchical rate enforcement
- Strict priority, weighted fair queuing schedulers
- Congestion management via weighted random early discard (WRED)
- Marking or re-marking at egress

System management
- Management by CLI, Simple Network Management Protocol (SNMP) MIBs, and service assurance agent (SAA) with comprehensive support through the Nokia NSP

Operations, administration and maintenance
- IEEE 802.1ag, ITU-T Y.1731: Ethernet Connectivity Fault Management (CFM) for both fault detection and performance monitoring, including delay, jitter, and loss tests
- IEEE 802.3ah: Ethernet in the First Mile (EFM)
- Bidirectional Forwarding Detection (BFD)
- Two-Way Active Measurement Protocol (TWAMP), TWAMP Light
- A full suite of MPLS OAM tools
- Mirroring
  - Port
  - VLAN
  - Filter output (MAC/IPv4/IPv6 filters)
  - Local/remote
- SAP and port loopback

Load Balancing & Resiliency
- Nonstop routing
- BGP Edge and Core Prefix Independent Convergence (PIC)
- RSVP-TE Fast Reroute (FRR)
- Segment routing remote loop-free alternate (LFA)
- LDP LFA
- Virtual Router Redundancy Protocol (VRRP)
- IEEE 802.3.ad Link Aggregation Group (LAG) and multi-chassis (MC) LAG

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1 Supported only on 7250 IXR-10/IXR-6
• Pseudowire and LSP redundancy
• IP and MPLS load balancing by equal-cost multipath (ECMP)
• Entropy label (RFC-6790)

Security
• Remote Authentication Dial-In User Service (RADIUS), Terminal Access Controller Access Control System Plus (TACACS+), and comprehensive control-plane protection capabilities
• Access control lists (ACLs) and Multifield Classifiers (MFCs)
  – IPv4, IPv6, and MAC access lists
• Per-port MAC security (MACsec)
• SNMP v3
• Secure Shell (SSH)

Hardware overview
The 7250 IXR combines the capabilities of the Nokia SR OS with new high-density, high-capacity platforms, complementing the already leading Nokia IP routing portfolio.

7250 IXR-10 and IXR-6 platforms
The 7250 IXR-10 is 13 RU high and supports eight Integrated Media Module (IMMs). The 7250 IXR-6 is 7 RU high and supports four IMM slots. They share common IMMs, control processor modules (CPMs) and power supply units (PSUs).

Each chassis is front-to-back air cooled and uses an orthogonal direct cross-connect architecture, with IMMs connecting in front and switch fabrics and fans connecting at the rear. The lack of a backplane, midplane or midplane connector system provides a compact chassis design, optimal cooling and easy capacity upgrades.

The 7250 IXR supports a 5+1 fabric design for full fabric redundancy with graceful degradation. Fans and switch fabrics are separate, ensuring a complete separation of cooling from the dataplane and enabling non-service-impacting fan replacement options. The system implements a complete Faraday Cage design to ensure EMI containment, a critical requirement for platform evolution that supports next-generation application-specific integrated circuits (ASICs).

7250 IXR-10 and IXR-6 line cards
Line card designs deliver up to 3.6 Tb/s full duplex (FD) forwarding capacity per slot with up to 48 GB of buffering per line card. All QSFP28 cages offer five speeds of flexible 10GE, 25GE, 40GE, 50GE and 100GE with full hardware breakout for 4 x 10GE, 4 x 25GE and 2 x 50GE.

The 7250 IXR supports a line-card density of up to 36 x 100GE QSFP28 cages per slot and can support up to 288 (IXR-10) or 144 (IXR-6) 100GE interfaces in a single system. Using the 7250 IXR-10, a single full rack can support up to 864 100GE interfaces.

QSFP28 interfaces provide support of 1 x 40GE and standardized break-out of 4 x 10GE when used with QSFP+ optics. This configuration leads to a 10GE system density of 1,152 10GE ports per system and 3,456 10GE ports per full rack.

All line cards support native MACsec capabilities that can be enabled via a software license. This capability enhances system synchronization functions, delivering highly accurate time stamping and timing accuracy compared to systems that mix MACsec and non-MACsec line cards.

In addition, 1588 Precision Time Protocol (PTP) is driven through the innovative Bell Labs 1588 algorithm, providing best-in-class performance for packet-based phase and time synchronization.

7250 IXR-s platform
The 7250 IXR-s is 1 RU high and is equipped with 6 ports of QSFP28 and 48 ports of SFP+/SFP. All QSFP28 ports support native break-out options. With support for both SFP+ and GE SFP in all cages, the 7250 IXR-s allows for a seamless migration from GE rates to 10GE rates without the need to perform a router replacement. Any of the 7250 IXR-s 100GE ports support 1x100GE, 2x50GE, 4x25GE, 1x40GE or 4x10GE, allowing for exceptional flexibility with the platform in a variety of deployment configurations.

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2 Break-out will be supported in a future software release.
Control plane
Control-plane performance is a key requirement in networking. Multicore CPUs with support for symmetric multiprocessing (SMP) provide leading capabilities in task distribution and concurrent processing, leveraging the hardened capabilities of the SR OS. This is a capability common to all platforms in the 7250 IXR product series.

The 7250 IXR-10/IXR-6 supports dual-redundant CPMs for hot-standby control-plane redundancy and supports a fully distributed control infrastructure with dedicated CPUs per line card. Compared to single monolithic control plane systems, this distributed architecture provides optimized control plane processing without any detrimental impacts to the central CPM during system maintenance, IMM commissioning and heavy data loads. The distributed architecture also improves system security.

Power supplies
The 7250 IXR-10/IXR-6 platforms support 12 and 6 PSUs respectively, allowing for full N+M (N is active and M is the number of protecting power supplies) power supply redundancy and full power feed redundancy. In contrast to systems with fewer power supplies, the 7250 IXR provides added headroom for power growth for system enhancements with next-generation ASICs.

On the IXR-10/IXR-6, two PSU variants are available: a low-voltage DC PSU (LVDC) and a combined high-voltage DC (HVDC) and AC PSU. The PSUs are fully interchangeable between the chassis variants. The HVDC PSU option enables OPEX and CAPEX savings as a result of the power-supply and infrastructure design.

The 7250 IXR-s support two PSUs with 1+1 redundancy with support for either AC or LVDC power options.

Technical specifications

Table 1. 7250 IXR6-10/IXR-6/IXR-s specifications

<table>
<thead>
<tr>
<th></th>
<th>7250 IXR-10</th>
<th>7250 IXR-6</th>
<th>7250 IXR-s</th>
</tr>
</thead>
<tbody>
<tr>
<td>System configuration</td>
<td>Dual hot-standby CPMs with 8 IMM slots</td>
<td>Dual hot-standby CPMs with 4 IMM slots</td>
<td>Simplex integrated CPM</td>
</tr>
<tr>
<td>System capacity</td>
<td>57.6 Tb/s</td>
<td>28.8 Tb/s</td>
<td>1.6 Tb/s</td>
</tr>
<tr>
<td>Available line cards*</td>
<td>36 x 100GE QSFP28/QSFP+ with MACsec**</td>
<td>36 x 100GE QSFP28/QSFP+ with MACsec**</td>
<td>Integrated 48 x SFP+/SFP and 6 x QSFP28/QSFP+</td>
</tr>
<tr>
<td></td>
<td>- 48 GB packet buffer</td>
<td>- 48 GB packet buffer</td>
<td>- 8 GB packet buffer</td>
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<tr>
<td></td>
<td>- 1 x 100GE, 2 x 50GE, 1 x 40GE, 4 x 25GE or 4 x 10GE on any port</td>
<td>- 1 x 100GE, 2 x 50GE, 1 x 40GE, 4 x 25GE or 4 x 10GE on any port</td>
<td>- 6 QSFP28 ports enable 6 x 100GE, 12 x 50GE, 24 x 25GE, 6 x 40GE or 24 x 10GE</td>
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<tr>
<td></td>
<td>- 48 x SFP+/SFP and 2 x 100GE QSFP28/QSFP+ with MACsec**</td>
<td>- 48 x SFP+/SFP and 2 x 100GE QSFP28/QSFP+ with MACsec**</td>
<td>- 8 GB packet buffer</td>
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<tr>
<td></td>
<td>- 8 GB packet buffer</td>
<td>- 8 GB packet buffer</td>
<td>- 2 QSFP28 ports enable 2 x 100GE, 4 x 50GE, 8 x 25GE, 2 x 40GE or 8 x 10GE</td>
</tr>
<tr>
<td></td>
<td>- 2 QSFP28 ports enable 2 x 100GE, 4 x 50GE, 8 x 25GE, 2 x 40GE or 8 x 10GE</td>
<td>- 2 QSFP28 ports enable 2 x 100GE, 4 x 50GE, 8 x 25GE, 2 x 40GE or 8 x 10GE</td>
<td></td>
</tr>
<tr>
<td>Platform density</td>
<td>288 x 100GE QSFP28 ports/chassis</td>
<td>144 x 100GE QSFP28 ports/chassis</td>
<td>6 x 100GE ports/chassis</td>
</tr>
<tr>
<td></td>
<td>288 x 40GE ports/chassis</td>
<td>144 x 40GE QSFP+ ports/chassis</td>
<td>6 x 40GE QSFP+ ports/chassis</td>
</tr>
<tr>
<td></td>
<td>1,152 x 10GE ports/chassis with a standardized QSFP+ break-out</td>
<td>576 x 10GE ports/chassis with a standardized QSFP+ break-out</td>
<td>24 x 10GE ports/chassis with a standardized QSFP+ break-out</td>
</tr>
<tr>
<td></td>
<td>- Per-rack port density:</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>- 864 x 100GE QSFP28 ports/full rack</td>
<td></td>
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<tr>
<td></td>
<td>- 864 x 40GE ports/full rack with a standardized QSFP+ break-out to 40GE</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>- 3,456 x 10GE ports/full rack with a standardized QSFP+ break-out</td>
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</tbody>
</table>
### Power
- LVDC (single feed): -40 V DC to -72 V DC
- AC: 200 V AC to 240 V AC, 50 Hz/60 Hz
- HVDC: 240 V to 400 V
- 12 PSUs with N+M redundancy

- LVDC (single feed): -40 V DC to -72 V DC
- AC: 200 V AC to 240 V AC, 50 Hz/60 Hz
- HVDC: 240 V to 400 V
- 6 PSUs with N+M redundancy

- LVDC with single feed: -40 V DC/-72 V
- AC: 200 V AC to 240 V AC, 50 Hz/60 Hz
- HVDC: 240 V to 400 V
- 2 PSUs with 1+1 redundancy

### Dimensions
- Height: 57.78 cm (22.75 in); 13 RU
- Width: 44.45 cm (17.5 in)
- Depth: 81.28 cm (32.0 in)
  Fits in standard 19-in rack

- Height: 31.15 cm (12.25 in); 7 RU
- Width: 44.45 cm (17.5 in)
- Depth: 81.28 cm (32.0 in)
  Fits in standard 19-in rack

- 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

### Weights
- Chassis: 61.8 kg (136.2 lb)
- IMM (36 x 100GE): 10.9 kg (24.0 lb)
- IMM (48 x 10GE+2 x 100GE): 6.0 kg (13.2 lb)
- CPM (with SSD): 2.9 kg (6.4 lb)
- SFM: 3.1 kg (6.8 lb)
- IXR-10 fan tray: 5.1 kg (11.2 lb)
- LVDC PSU: 1.9 kg (4.2 lb)
- AC/HVDC PSU: 1.9 kg (4.2 lb)

- Chassis: 35.2 kg (77.4 lb)
- IMM (36 x 100GE): 10.9 kg (24.0 lb)
- IMM (48 x 10GE+2 x 100GE): 6.0 kg (13.2 lb)
- CPM (with SSD): 2.9 kg (6.4 lb)
- SFM: 2.3 kg (5.1 lb)
- IXR-6 fan tray: 3.3 kg (7.3 lb)
- LVDC PSU: 1.9 kg (4.2 lb)
- AC/HVDC PSU: 1.9 kg (4.2 lb)

- Chassis 7.5 kg (16.5 lb.)
- AC power supply 0.997 kg (2.19 lb)
- DC power supply 1.025 kg (2.25 lb)

### 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

### Operating altitude
Up to 4,000 m (13,123 ft) at 30°C (86°F)

### Fabric capabilities
- 5+1 redundant switch fabric
- Separate fan tray from switch fabric
- 5.76 Tb/s FD switch capacity per fabric module
- Single-stage fabric with graceful degradation
- Fabric module specific to 7250 IXR-10

- 5+1 redundant switch fabric
- Separate fan tray from switch fabric
- 2.88 Tb/s FD switch capacity per fabric module
- Single-stage fabric with graceful degradation
- Fabric module specific to 7250 IXR-6

### Chassis properties
- Dual-CPM configuration for control plane redundancy
- Front-to-back airflow
- Horizontal line card installation with vertical fabric installation
- Front- and bottom-mounted power modules

- Dual-CPM configuration for control plane redundancy
- Front-to-back airflow
- Horizontal line card installation with vertical fabric installation
- Front- and bottom-mounted power modules

- Single CPM configuration
- Front-to-back airflow
- Rear-mounted power modules

### Redundant hardware
- Full control and switch redundancy
- Power redundancy (M+N)
- Fan redundancy (N+1)

- Full control and switch redundancy
- Power redundancy (M+N)
- Fan redundancy (N+1)

- Power redundancy (1+1)
- Fan redundancy (5+1)

* Break-out will be supported in a future software release.
** Software support will be added in a future release.
Standards compliance

Environmental
• ATIS-0600015.03
• ATT-TP-76200
• 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-3160-CORE
• GR-295-CORE
• VZ-TPR-9205
• VZ.TPR.9203 (CO)

Safety
• AS/NZS 60950.1
• CSA/UL 62368-1 NRTL
• EN 62368-1 CE Mark
• IEC 60529 IP20
• IEC 62368-1 CB Scheme
• IEC/EN 60825-1
• IEC/EN 60825-2

Electromagnetic compatibility
• AS/NZS CISPR 32 (Class A)
• ATIS-600315.01.2015
• BSMI CNS13438 Class A
• BT GS-7
• EN 300 386
• EN 55024
• EN 55032 (Class A)
• ES 201 468
• ETSI EN 300 132-3-1

• ETSI EN 300 132-2 (LVDC)
• ETSI EN 300 132-3 (AC)
• FCC Part 15 (Class A)
• GR-1089-CORE
• ICES-003 (Class A)
• IEC 61000-3-2
• IEC 61000-3-3
• IEC CISPR 24
• 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
• IEC/EN 61000-4-11 Voltage Interruptions
• ITU-T L.1200
• KCC Korea-Emissions & Immunity
  (in accordance with KN32/35)
• VCCI (Class A)

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
• NEBS Level 3
• Australia: RCM Mark
• China RoHS: CRoHS
• Europe: CE Mark
• Japan: VCCI Mark
• South Korea: KC Mark
• Taiwan: BSMI Mark

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