Nokia 7250 IXR-6/IXR-10 Interconnect Routers for SR Linux

Release 22

As part of the Nokia Data Center Fabric solution, the Nokia 7250 IXR-6/IXR-10 Interconnect Routers for SR Linux are modular routers designed for data center spine and WAN deployments. These platforms deliver massive-scale interconnectivity for webscale, communications service provider, enterprise data center and cloud environments.

Overview

The Nokia Data Center platforms include the Nokia 7250 IXR-6/IXR-10, the Nokia 7220 IXR-H series and the Nokia 7220 IXR-D series of interconnect routers—all of which implement the Nokia Service Router Linux (SR Linux) network operating system (NOS). This data sheet discusses the 7250 IXR-6 and 7250 IXR-10, referred to collectively as the 7250 IXR-6/10 hereafter.

Data centers require massively scalable, modular, reliable platforms that are designed to support high-speed interfaces for current and future data center network build-outs. These platforms must also support a comprehensive set of features that enable flexible interconnectivity within and across data centers.

The Nokia 7250 IXR-6/10 is a high-performance, high-density, modular router designed for data center spine deployments. It offers hardware support for 400GE, 100GE, 40GE, 25GE and 10GE interfaces for intra-fabric and server connectivity.

The 7250 IXR-6/10 delivers a robust and comprehensive set of capabilities, including IP routing, Layer 2 Ethernet, QoS, MPLS, segment routing, router security, scalable telemetry and model-driven programmability.

7250 IXR-6

7250 IXR-10

The Nokia 7250 IXR-6/10 routers provide unmatched scalability, flexibility and operational simplicity, enabling rapid deployment and easy adaptation to evolving needs in data center and cloud environments.

The 7250 IXR-6 is a 6-slot platform supporting a system capacity up to 115.2 Tb/s. The 7250 IXR-10 is a 10-slot platform supporting a system capacity up to 230.4 Tb/s.

These platforms support a full suite of features that set the benchmark for high availability, including redundant control, fabric, fan and power configurations.

Nokia Service Router Linux

Nokia Service Router Linux (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 7250 IXR-6/10 implements Nokia SR Linux.

SR Linux is a key component of the Nokia Data Center Fabric Solution, which also includes the Nokia Fabric Services System and the Nokia Data Center platforms.

Ground-up, model-driven architecture delivers extensibility

In cloud-scale data center networks, the primary challenges are scalability and 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.

Webscale, service provider and enterprise 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 operators can immediately benefit from the stability, scalability and interoperability of a resilient NOS.

Superior CLI programmability and integration of third-party applications

Operators 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, combining them with system state/configuration to allow advanced logic.

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 Fabric Services System

The Nokia Fabric Services System is a declarative, intent-based automation and operations toolkit that delivers agile and scalable network operations for data center and cloud environments.

Scalable automation for all phases of data center fabric operations

The Fabric Services System is designed from the ground up for intent-based automations for all phases of data center fabric operations, including Day 0 design, Day 1 deployment and Day 2+ configuration, operation, measurement and analysis of a data center fabric.

The system uses the Kubernetes framework and benefits from an established open platform instead of reinventing key platform components. All fabric services use a distributed microservices approach, allowing Nokia to deliver a true cloud-native platform for automation and operations.

Digital Sandbox

The Fabric Services System delivers a cloud-native Digital Sandbox that is a true emulation of a single data center router as a containerized SR Linux (cSR Linux) instance and a fabric of multiple cSR Linux instances. The Digital Sandbox as an operational tool is capable of emulating a data center fabric, application workloads and external BGP speakers.

Setting up the data center fabric with intent-based approaches

The Fabric Services System allows operators to represent the design and configuration of the data center fabric in an intent-based, declarative way. This approach provides a strong NetOps foundation that leverages DevOps principles and fits into the bigger movement toward infrastructure as code (IaC).

Design intent, fabric intent and workload intent can be validated on the Fabric Services System Digital Sandbox, allowing operations teams to manage the risk of a change confidently and quickly. The Digital Sandbox allows the operator to first try out the changes, perform detailed validations and then apply the changes to the production network.

Fabric operations

After the data center fabric is designed and deployed, the Day 2+ operations phase begins. Because new workloads can still be created during this phase, workload intent can also be leveraged here. Other types of intent are also supported in this phase, including design intent, maintenance intent, topology intent and deviation intent. These intents allow the network operator to define, in an abstract manner, the desired end state of the fabric.

The Fabric Services System combines design intent with all the telemetry data collected from the fabric and presents the data in a context relevant to the operational task. These contextual views combined with the Digital Sandbox enable the operations team to deliver agility with confidence and removes the barriers between cross-functional teams.

Fabric integrations

The Fabric Services System enables a flexible, cloud-native approach for external integrations, resulting in faster, customized integration in customer environments. The system can be integrated with compute virtualization, storage solutions, in-house operational tools and cloud environments.

The cloud-native integration model enables data center teams to develop their integrations in a loosely coupled manner that fits into a standard Kubernetes framework.

Software features

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

For additional details about SR Linux, including NOS architecture and differentiators, see the Nokia Service Router Linux data sheet.

Open Linux support

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

Layer 2 features

- Dot1q and untagged 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

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
    - eBGP multi-hop
- IS-IS v4/v6
- 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
- Maintenance modes
- Bidirectional forwarding detection (BFD), micro BFD (mBFD)
- Interfaces: Loopback interfaces
- Routing policy: Layer 3/Layer 4 access control lists (ACLs) with validation; accept, reject and log actions

MPLS and segment routing (SR)

- Interface Label Distribution Protocol (LDP) over IPv4
- Service router – intermediate system-to-intermediate system (SR-ISIS) over IPv4
- BGP shortcuts over LDP
- BGP shortcuts over SR-ISIS
- MPLS QoS via EXP to forwarding class mapping
- MPLS ACL filters
- Internet Control Message Protocol (ICMP) tunneling
- ICMP extensions for MPLS

QoS

- Intelligent packet classification, including IPv4 and IPv6 match-criteria-based classification
- Queuing/scheduling:
    - Strict priority
    - Weighted round robin (WRR)
    - Weighted Random Early Detection (WRED)
    - Explicit Congestion Notification (ECN)
- QoS classification based on DiffServ Code Point (DSCP)

System management and automation

- Native model-driven architecture, configuration candidates, exclusive mode, checkpoints and rollbacks
    - Support for SR Linux and OpenConfig data models
- Management interfaces: gNMI, gRIBI (gRPC Routing Information Base Interface), JSON and CLI (transactional, Python CLI and CLI plugins)
- Per-user configurable options for CLI
    - Local Authentication, Authorization and Accounting (AAA) with Role Based Access Control (RBAC)
    - Terminal Access Controller Access Control System (TACACS+) AAA

- Access to common Linux utilities: Bash, cron and Python
- Telemetry
  - Subscription-based telemetry for modeled data structures, either changed or sampled
  - sFlow
  - Logging infrastructure
- 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
- 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 in data center hardware platforms
- Support for hot-swappable, redundant control and fabric modules

Security

- Distributed and aggregated ACLs and policers for control and management plane

Hardware overview

The 7250 IXR-6/10 hardware delivers massive scale, openness, aggregation and interconnectivity for data center and cloud environments.

Modular and high-availability platforms

The 7250 IXR-6 and IXR-10 share common control processor modules (CPMs), integrated media module (IMM) cards and power supply units (PSUs).

The 7250 IXR-6/10 sets the benchmark for high availability, supporting a full suite of 1+1 control, 5+1 fabric, and redundant fan and power configurations.

Each chassis 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 system uses a complete Faraday Cage design to ensure EMI containment, a critical requirement for platform evolution that will support next-generation application-specific integrated circuits (ASICs).

Switch Fabric Module (SFM2)

The 7250 IXR-6/10 supports a 5+1 switch fabric design for full fabric redundancy with graceful degradation. Fans and the SFM2s are separate, ensuring a complete separation of cooling from the dataplane and enabling non-service-impacting fan replacement.

Control Processor Module (CPM2)

The CPM2 features a multi-core x86 CPU that delivers control plane scalability and performance—a key requirement for data center leaf-spine designs. The 7250 IXR-6/10 supports dual-redundant CPMs and 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.

Integrated Media Module (IMM)

IMMs are line cards providing integrated processing and physical interfaces on a single module.

IMMs are hot-swappable and provide high-capacity Ethernet interfaces with full duplex (FD) per-slot performance up to 14.4 Tb/s.

Power Supply Units (PSU)

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

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.

Learn more

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

Technical specifications

Table 1. 7250 IXR specifications

Feature	7250 IXR-6	7250 IXR-10
System throughput: Half duplex (HD)	Up to 115.2 Tb/s	Up to 230.4 Tb/s
Switch fabric capabilities	• Single-stage fabric with graceful degradation • Separate fan module from switch fabric • Orthogonal direct cross-connect • Design that minimizes trace length • Ultra-efficient configuration focused on upgradability • 8-SFM design for enhanced resiliency	
Maximum IMM throughput per slot (FD)	Up to 14.4 Tb/s	Up to 14.4 Tb/s
IMM slots	4	8
Control interfaces	Console, management, Bluetooth, USB*, SD slot	
Memory buffer size	Per card (see Table 2)	Per card (see Table 2)
Redundant hardware	• Dual redundant CPMs • Switch fabric redundancy (5+1) • Power redundancy (M+N) • Fan redundancy (N+1)	• Dual redundant CPMs • Switch fabric redundancy (5+1) • Power redundancy (M+N) • Fan redundancy (N+1)
Dimensions	• 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: 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
Power	• 6 PSUs with N+M redundancy • LVDC* (single feed): -40 V DC to-72 V DC • HVDC: 240 V to 400 V • AC: 200 V AC to 240 V AC, 50 Hz to 60 Hz • Front-bottom mounted	• 12 PSUs with N+M redundancy • LVDC* (single feed): -40 V DC to-72 V DC • HVDC: 240 V to 400 V • AC: 200 V AC to 240 V AC, 50 Hz to 60 Hz • Front-bottom mounted

* Future software deliverable

Feature	7250 IXR-6	7250 IXR-10
Cooling	• 3 trays of 2 ultra-quiet fans • Fan trays separate from switch fabric • Safety electronic breaks on removal • Front-to-back airflow • Fan filter door kit (optional)	• 3 trays of 3 ultra-quiet fans • Fan trays separate from switch fabric • Safety electronic breaks on removal • Front-to-back airflow • Fan filter door kit (optional)
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
Shipping and storage temperature	-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

Table 2. 7250 IXR-6/10 IM cards

IMM	Details	
32-port 100GE + 4-port 400GE	• 32 x 100GE QSFP28 + 4 x 400GE QSFP-DD • Native hardware support for 400GE, 100GE and 40GE • Hardware breakout options for 4 x100GE, 2 x 100GE, 2 x 50GE, 4 x 25GE and 4 x 10GE • 8 GB packet buffer	

Table 3. 7250 IXR-6/10 platform density

7250 IXR-6	7250 IXR-10
• 16 x 400GE	• 32 x 400GE
• 128 x 100GE/40GE	• 256 x 100GE/40GE

Standards compliance[1]

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-295-CORE
- GR-3160-CORE
- NEBS Level 3

- VZ.TPR.9203 (CO)
- VZ.TPR.9205

Safety

- AS/NZS 60950.1
- AS/NZS 62368.1
- IEC 60529 IP20
- IEC/EN 60825-1
- IEC/EN 60825-2
- IEC/EN/UL/CSA60950-1 Ed2 Am2
- IEC/EN/UL/CSA 62368-1 Ed2

Electromagnetic compatibility

- AS/NZS CISPR 32 (Class A)
- ATIS-600315.01.2015
- BSMI CNS13438 (Class A)
- BT GS-7

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

- EN 300 386
- EN 55024
- EN 55032 (Class A)
- ES 201 468
- ETSI EN 300 132-2 (LVDC)
- ETSI EN 300 132-3 (AC)
- ETSI EN 300 132-3-1
- 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 and regional approvals

- Directive 2011/65/EU RoHS
- Directive 2012/19/EU WEEE
- Directive 2014/30/EU EMC
- Directive 2014/35/EU LVD
- BSMI Mark: Taiwan
- CE Mark: Europe
- CRoHS: China RoHS
- KC Mark: South Korea
- RCM Mark: Australia
- VCCI Mark: Japan

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