

## Nokia 7750 SR-a Service Router

Release 23

The Nokia 7750 SR-a series of IP routers delivers the comprehensive features, platform versatility and compact platform that are essential for IP networking in the 5G and cloud era. The 7750 SR product family consists of the 7750 SR-s series, the 7750 SR series, the 7750 SR-a series and the 7750 SR-e series.

### Compact platform

For service providers, the Nokia 7750 SR-a enables delivery of advanced residential, enterprise and mobile services. For webscale companies and enterprises, the 7750 SR-a provides high-performance networking for cloud, data center and WAN applications.

The 7750 SR-a is based on the Nokia FP3 network processing silicon and is available in 100 Gb/s full duplex (FD) and 200 Gb/s FD system capacities. Having a depth of just 24 cm, the 7750 SR-a4 measures 22 cm (5 RU) in height and the 7750 SR-a8 is 31 cm (7 RU) in height. For IP/optical integration applications requiring collocation with transport equipment, the 7750 SR-a easily fits into a 300-mm, ETSI-compliant cabinet. To ensure maximum system up time, the 7750 SR-a offers control plane and power redundancy, and all system components are modular and hot-swappable.

The 7750 SR-a delivers high-density Gigabit Ethernet (GE) and 10GE interfaces and is ideally suited for GE and 10GE fan-out in subscribed and over-subscribed access and aggregation networks. With support for 100GE interfaces, the 7750 SR-a can scale access and aggregation networks in step with evolving traffic demands for years to come.



7750 SR-a8



7750 SR-a4

## Deterministic performance

The Nokia 7750 SR-a leverages the Nokia FP3, which combines a disaggregated chipset architecture and a flexible memory design to provide deterministic packet forwarding performance even when complex processing-intensive operations are required. With the FP3 traffic manager, buffering is always deterministic and does not degrade or cause control plane discards if the buffer rate increases.

## Comprehensive features

Nokia's feature-rich 64-bit Service Router Operating System (SR OS) addresses the full spectrum of IP routing requirements. With comprehensive QoS, IP/MPLS, segment routing and model-driven management features, the 7750 SR-a has the capabilities and tools to define and deliver the most stringent SLAs and end-user quality of experience (QoE) requirements. It supports thousands of IP flows and access control lists with high performance and scale even when multiple advanced features are enabled concurrently.

## Versatile platform

The comprehensive routing features of the Nokia SR OS enable the 7750 SR-a to support a wide range of IP network services and functions.

Service providers can deploy the 7750 SR-a in aggregation and WAN networks to support Broadband Network Gateway (BNG) for residential subscriber management; provider edge (PE) router for MPLS-enabled enterprise VPN, internet access, cloud services and data center interconnect; and as a mobile aggregation router for 3G, 4G and 5G backhaul.

For webscale companies and enterprises, the 7750 SR-a provides high-performance IP routing for cloud, data center and WAN applications.

## Model-driven management

To simplify and automate network operations, the 7750 SR-a enables model-driven network element management through the Nokia SR OS. YANG-based data modeling delivers the foundation for programmability and model-driven interface support includes NETCONF, gRPC (gNMI and gNOI) and the Model-Driven CLI (MD-CLI). The Nokia Network Services Platform (NSP) also supports these interfaces using YANG models to customize automation for operational use cases.

## SDN integration and automation

The 7750 SR-a and the programmability of the Nokia SR OS enable multivendor software-defined networking (SDN). Control integration is enabled through OpenFlow, Path Computation Element Protocol (PCEP), and model-driven network element management.

In combination with the Nokia NSP, the 7750 SR-a can be deployed to introduce scalable and integrated SDN control across IP, MPLS, Ethernet and optical transport layers. The NSP delivers best-in-class SDN capabilities for multi-layer, cross-domain, multi-technology and coordinated management of IP and optical assets.

The NSP supports unified service automation and network optimization with comprehensive path computation capabilities to enable source-based routing and traffic steering with segment routing support, online traffic engineering and resource optimization, and elastic bandwidth services for dynamic cloud applications.

## Cross-domain management

The 7750 SR-a is managed by the Nokia NSP, supporting automated network management, service assurance and resource optimization across IP and optical networks and orchestrated network slicing across transport and core domains.

## Industrial environments

The 7750 SR-a series is designed to withstand stringent electromagnetic immunity levels for power utility substation and railway environments. The 7750 SR-a meets the IEEE 1613, IEC 61850-3 and EN50121-4 standards.

## Hardware overview

The Nokia 7750 SR-a series is available in two chassis variants—the 7750 SR-a4 and the 7750 SR-a8—and supports a wide range of Ethernet interfaces and common system modules that are optimized to address various network service and function requirements.

### Control Processing Module (CPM-a)

The CPM-a, available in 8GB and 4GB DRAM variants, provides intelligent control and processing functionality. It offers optional 1+1 redundancy in an active-active load-sharing design and is hot-swappable. Redundant CPM-a's operate in a hitless, stateful failover mode. Central processing and memory are intentionally separated from the forwarding function on the interface modules to ensure utmost system resiliency. Timing, alarm and management ports are accessible from the face plate.

### Input/Output Module (IOM-a)

Each IOM-a provides up to 100 Gb/s FD connectivity to MDA-a's and MDA-a XPs and is optimized for versatility in deploying a variety of Ethernet and IP-based services and functions. Each hot-swappable IOM-a uses a multi-core processor and supports up to four MDA-a and MDA-a XP modules. These FP3-based IOM-a modules provide forwarding and service functions along with high-end traffic management capabilities. The programmability of the FP3 ensures that services, applications and protocols can easily adapt to changing standards and requirements.

### Media Dependent Adapter (MDA-a)

MDA-a's and MDA-a XPs provide physical Ethernet interface connectivity, are available in a variety of interface and density configurations and are hot-swappable. MDA-a XPs provide up to 100 Gb/s performance over 10GE and 100GE interfaces. MDA-a's provide up to 25 Gb/s performance over GE and 10GE interfaces. They support a wide range of pluggable optical modules, including support for copper SFPs and digital diagnostic monitoring (DDM).

### Power supply unit (PSU)

Modular, hot-swappable PSUs provide universal AC and/or -48 V DC power, with redundancy in a load-sharing design for each system. A power status LED is mounted on the face plate and is also available from the CLI or the Nokia NSP.

### Fan tray

The fan tray provides side-to-side system cooling. For vertical mounting configurations, the fan tray supports front-to-back airflow. The fan tray has six redundant fans configured in a load-sharing design and is hot-swappable. Fans are variable speed for power efficiency. A power status LED is mounted on the face plate and is also available from the CLI or the Nokia NSP.

### 7210 Service Access Switch (SAS) satellites

Nokia 7210 SAS satellites provide flexibility and improve the cost efficiency of the 7750 SR-a. They offer GE, 10GE and SONET/SDH port extension through an external system to the 7750 SR-a. They can be co-located in the same 7750 SR-a rack or located remotely, within the distance of pluggable optics. They are logically integrated into the 7750 SR-a with one single IP address. Configuration is done on the 7750 SR-a and they utilize the 7750 SR-a QoS, buffering, multicast and rich service provisioning.

## Technical specifications

Table 1. Technical specifications for the Nokia 7750 SR-a series

	7750 SR-a4	7750 SR-a8
System throughput (full duplex, maximum)	Up to 100 Gb/s	Up to 200 Gb/s
Number of MDA-a's and MDA-a XPs per chassis	4	8
Number of IOM-a's per chassis	1	2
Common equipment redundancy	CPM-a, PSU, fan	CPM-a, PSU, fan
Hot-swappable equipment	IOM-a, MDA-a, MDA-a XP, CPM-a, PSU, fan tray, fan filter	IOM-a, MDA-a, MDA-a XP, CPM-a, PSU, fan, fan filter
Dimensions	<ul style="list-style-type: none"> <li>Height (5 RU): 22.23 cm (8.75 in)</li> <li>Width: 48.26 cm (19.0 in)</li> <li>Depth (300 mm ETSI-compliant): 24.28 cm (9.56 in)</li> </ul>	<ul style="list-style-type: none"> <li>Height (7 RU): 31.11 cm (12.25 in)</li> <li>Width: 48.26 cm (19.0 in)</li> <li>Depth (300 mm ETSI-compliant): 24.8 cm (9.56 in)</li> </ul>
Weight	Empty: 10.30 kg (22.71 lb) Full: 26.31 kg (58 lb)	Empty: 13.61 kg (30.0 lb) Full: 38.10 kg (84.0 lb)
Power	<ul style="list-style-type: none"> <li>AC and DC power options</li> <li>2 PSUs per chassis</li> <li>1+1 redundancy</li> </ul>	<ul style="list-style-type: none"> <li>AC and DC power options</li> <li>3 PSUs per chassis</li> <li>2+1 redundancy</li> </ul>
Cooling	<ul style="list-style-type: none"> <li>N+1 internal redundant fans</li> <li>Right-to-left airflow</li> <li>Variable speed for power efficiency</li> </ul>	<ul style="list-style-type: none"> <li>N+1 internal redundant fans</li> <li>Right-to-left airflow</li> <li>Variable speed for power efficiency</li> </ul>

Table 2. Nokia 7750 SR-a MDA-a XP and MDA-a summary

MDA-a type	Ports	Connector type	Maximum density	
			7750 SR-a4	7750 SR-a8
<b>MDA-a XP</b>				
10/1GBASE (MACsec)	10	SFP+/SFP	40	80
10GBASE	10	SFP+	40	80
100GBASE	1	CFP2	4	8
<b>MDA-a</b>				
1000BASE	44 or 22	CSFP or SFP	176 or 88	352 or 176
10/100/1000BASE-TX	20	RJ-45	80	160
10GBASE/1000BASE (combination)	2/12	SFP+/SFP	8/48	16/96
10GBASE	4	SFP+	16	32

## Feature and protocol support highlights

Feature and protocol support within the 7750 SR-a series includes, but is not limited to, the following.

### IP and MPLS routing features

- IP unicast routing:
  - Intermediate System-to-Intermediate System (IS-IS)
  - Open Shortest Path First (OSPF)
  - Routing Information Protocol (RIP)
  - Multiprotocol Border Gateway Protocol (MBGP)
  - Unicast Reverse Path Forwarding (uRPF)
  - Comprehensive control plane protection features for security
  - IPv4 and IPv6 feature parity
- IP multicast routing:
  - Internet Group Management Protocol (IGMP)
  - Multicast Listener Discovery (MLD)
  - Protocol Independent Multicast (PIM)
  - Multicast Source Discovery Protocol (MSDP)
  - Bit Indexed Explicit Replication (BIER)
  - IPv4 and IPv6 feature parity
- MPLS:
  - Label Edge Router (LER) and Label Switch Router (LSR) functions with support for seamless MPLS designs
  - MPLS-Transport Profile (MPLS-TP)
  - Label Distribution Protocol (LDP) and Resource Reservation Protocol (RSVP) for MPLS signaling and traffic engineering
  - Includes Point-to-Point (P2P) and Point-to-Multipoint (P2MP) Label Switched Paths (LSPs) with Multicast LDP (MLDP), P2MP RSVP and weighted Equal Cost Multi Path (ECMP)
- Nokia SR OS platforms support intra-area and/or inter-area shortest path using IGP metric, TE-metric or delay, as well as traffic engineered tunnels. In addition, SR OS supports selecting a subset of links to be included or excluded for each flexible algorithm.
- Multiple-instance IS-IS and OSPF SR support with shortest path tunnel, Segment Routing - Traffic Engineering (SR-TE) LSP, flexible algorithms, and static and BGP SR policy.
  - Implementation provides Loop Free Alternate (LFA), remote LFA and Topology Independent - LFA (TI-LFA) protection for all types of tunnels as well as end-to-end protection with primary/secondary paths for SR-TE tunnels and SR policies.
  - PCEP allows delegation of the SR-TE LSP to the Nokia NSP or a third-party PCE function
- Programmable forwarding tables via gRPC-based routing information base (RIB) API feature and MPLS forwarding policy
- Extensive set of capabilities using ACL logic to steer routes/flows towards various target types, such as IP next-hop, SR-TE/RSVP-TE/MPLS-TP LSP and Virtual Routing and Forwarding (VRF)
  - Applicable to a wide range of routing and service contexts, such as global routing table, Virtual Private Routed Network (VPRN), virtual private LAN service (VPLS) and E-Pipe service
  - Supports control interfaces such as OpenFlow, FlowSpec, CLI and NETCONF
- Multivendor SDN control integration through OpenFlow, PCEP, BGP-Link State (BGP-LS) and BGP SR Policy support
- Collection of traffic statistics on an extensive set of constructs:
  - LDP
  - RSVP-TE, and SR-TE LSPs
  - MPLS forwarding policies
  - SR-MPLS and SRv6 policies
  - RIB API tunnel entries
  - Interior Gateway Protocol (IGP) SIDs

### Segment Routing and SDN features

- Segment Routing Flexible Algorithms for SR-MPLS and SRv6 (128-bit and micro-segment) data plane

## Layer 2 features

- Ethernet LAN (E-LAN): BGP-VPLS, Provider Backbone Bridging for VPLS (PBB-VPLS), EVPN and PBB-EVPN
- E-Line: BGP Virtual Private Wire Service (BGP-VPWS), EVPN-VPWS and PBB-EVPN
- E-Tree: EVPN and PBB-EVPN
- DCI: EVPN Virtual eXtensible LAN (VXLAN) to VPLS/EVPN-MPLS/EVPN-VXLAN gateway functions

## Layer 3 features

- IP-VPN, enhanced internet services
- EVPN for Layer 3 unicast and Optimized Inter-Subnet Multicast (OISM) services with Integrated Routing and Bridging (EVPN-IRB)
- Multicast VPN (MVPN), which includes inter-AS MVPN and Next Generation MVPN (NG-MVPN)
- EVPN and IP-VPN gateway interworking, including D-PATH attribute for loop protection in redundant gateways
- Seamless MPLS/SRv6 integration with IP-VRF for interworking or migration between MPLS and SRv6 transport technologies

## System features

- Ethernet satellites: Port expansion through local or remote Nokia 7210 SAS-S series GE, 10GE, 100GE and SONET/SDH satellite variants, offering 24/48 x GE ports, 64 x GE/10GE ports or legacy SONET/SDH ports over GE, 10GE and 100GE uplinks
- Extensive fault and performance monitoring. Operations, Administration and Maintenance (OAM) includes:
  - Ethernet Connectivity Fault Management (CFM) (IEEE 802.1ag, ITU-T Y.1731)
  - Ethernet in the First Mile (EFM) (IEEE 802.3ah)
  - Bidirectional Forwarding Detection (BFD), including Seamless BFD
  - Cflowd
  - Two-Way Active Measurement Protocol (TWAMP and TWAMP Light/STAMP)

- A full suite of MPLS and Segment Routing OAM tools
- Timing:
  - ITU-T Synchronous Ethernet (SyncE)
  - IEEE 1588v2 Precision Time Protocol (PTP)
  - Network Time Protocol (NTP)
  - BITS ports (T1, E1, 2M)
  - 1PPS
- QoS:
  - Flexible intelligent packet classification
  - Ingress and egress hierarchical QoS (H-QoS) with multitiered shaping
  - Advanced, scalable network and service QoS
  - End-to-end consistent QoS regardless of oversubscription or congestion
- High availability:
  - Nonstop routing<sup>1</sup>
  - Nonstop services<sup>1</sup>
  - In-Service Software Upgrade (ISSU)<sup>1</sup>
  - Fast reroute for IP, RSVP, LDP and SR
  - Pseudowire redundancy
  - ITU-T G.8031 and G.8032
  - Weighted ECMP
  - Weighted, mixed-speed link aggregation

## Management features

- Model-driven management of configuration and state through the MD-CLI, NETCONF and gRPC/gNMI using YANG models; streaming telemetry through gRPC/gNMI subscriptions; operations through NETCONF and gRPC/gNOI
- Enhanced automation framework provides personalization and automation with Python 3
- Event triggered and time-based Python 3 applications
- Full SNMP management support, including configuration, monitoring and traps

<sup>1</sup> Requires redundant CPM modules

- Comprehensive network and node management through the Nokia NSP
- Zero touch provisioning (ZTP) automatically downloads the image and configuration from a server via out-of-band management port or in-band interfaces

## Standards support<sup>2</sup>

### Environmental specifications

- Normal operating temperature: -5°C to +55°C (23°F to 131°F)
- Normal operating relative humidity: 5% to 95% (non-condensing)
- Operating altitude: Up to 4000 m (13,123 ft)

### Safety

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

### EMC

- AS/NZS CISPR 32 Class A
- BT GS-7
- EN 300 386
- EN 55024
- EN 55032 Class A
- ETSI EN 300 132-2
- ETSI EN 300 132-3
- ES 201 468
- FCC Part 15 Class A
- GR-1089-CORE
- ICES-003 Class A
- IEC 61000-6-2
- IEC 61000-6-4
- IEC CISPR 24

- IEC CISPR 32 Class A
- IEC/EN 61000-3-2 Power Line Harmonics
- IEC/EN 61000-3-3 Voltage Fluctuations and Flicker
- IEC/EN 61000-4-2 ESD
- IEC/EN 61000-4-3 Radiated Immunity
- IEC/EN 61000-4-4 EFT

### Telecom standards

- ITU-T G.813

### Environmental

- ATIS-0600010.03
- ATIS-0600015
- 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
- VZ-TPR-9205
- VZ-TPR-9305

### Directives, regional approvals and certifications

- CE Mark - Common Europe
- EU Directive 2011/65/EU Restriction of the use of certain Hazardous Substances in Electrical and Electronic Equipment (Recast) Directive (including Commission Delegated Directive (EU) 2015/863)
- EU Directive 2012/19/EU Waste Electrical and Electronic Equipment (WEEE)
- EU Directive 2014/30/EU Electromagnetic Compatibility (EMC)
- EU Directive 2014/35/EU Low Voltage Directive (LVD)

<sup>2</sup> System design intent is according to the listed standards. Refer to product documentation for detailed compliance status.



- KC Mark - South Korea
- NEBS Level 3
- RCM Mark - Australia
- UKCA Mark - United Kingdom
- VCCI Mark - Japan

#### Power utility substations

- IEEE 1613 (exception, forced air system)
- IEEE 1613.1 Zone A
- IEC 61000-6-5
- IEC 61850-3 (normal environmental conditions)
- IEC/AS 60870.2.1

#### Railway

- EN 50121-4
- IEC 62236-4

FDA CDRH 21-CFR 1040

#### European market

- ETSI EN 300 019-2-1 (Class 1.2)
- ETSI EN 300 019-2-2 (Class 2.3)
- ETSI EN 300 019-2-3 (Class 3.2)
- IEC 60825-1

Note: Refer to the 7750 SR-a product and release documentation for system details on dimensions, weights, hardware, safety standards, compliance agency certifications and protocol support.

#### About Nokia

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

As a B2B technology innovation leader, we are pioneering the future where networks meet cloud to realize the full potential of digital in every industry.

Through networks that sense, think and act, we work with our customers and partners to create the digital services and applications of the future.

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