

Nokia 7750 SR-e Service Router

Release 23

The Nokia 7750 SR-e series of IP routers delivers the scale, comprehensive features and platform versatility 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

Highly scalable

For service providers the 7750 SR-e is deployed in WAN and aggregation networks to support multiple services and functions, including aggregation, Broadband Network Gateway (BNG), mobile backhaul (IP anyhaul) and provider edge (PE) for the delivery of advanced residential, mobile and enterprise services. For webscale companies and enterprises, the 7750 SR-e provides high-performance IP routing, including connectivity to data center, internet and WAN applications.

The 7750 SR-e is based on the Nokia FP3 network processing silicon and scales system capacity from 200 Gb/s full duplex (FD) to 600 Gb/s FD. To extend the network edge closer to end users, the 7750 SR-e has the scale to support multiple services and functions on a common platform. The 7750 SR-e's innovative NEBS-compliant front-to-back thermal design provides the foundation for future growth and delivers investment protection.

The 7750 SR-e delivers high-density Gigabit Ethernet (GE), 10GE, 25GE and 100GE interfaces with breakout options and is ideally suited for GE and 10GE fan-out in subscribed and over-subscribed access and aggregation networks. With 100GE interfaces, the 7750 SR-e can scale access and aggregation networks in step with evolving traffic demands for years to come.



7750 SR-3e



7750 SR-2e



7750 SR-1e

Deterministic performance

The Nokia 7750 SR-e 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-e 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.

Leveraging SR OS, the 7750 SR-e supports the following value-added services and network functions through the Integrated Services Adapter (ISA): Application Assurance (AA), Layer 7 stateful firewall, Carrier Grade - Network Address Translation (CG-NAT), L2TP Network Server (LNS), Dual Stack Lite (DS Lite) Address Family Transition Router (AFTR) services, IPsec, IP tunneling, Wireless LAN Gateway (WLAN GW) and advanced video services.

Versatile platform

The comprehensive features of the Nokia SR OS enable the 7750 SR-e to support a full array of IP network functions and services.

Service providers can use the 7750 SR-e in WAN and aggregation networks supporting multiple network roles, including: Broadband Network Gateway (BNG) for residential subscriber management; provider edge (PE) router for MPLS-enabled enterprise VPN, internet access and cloud services and data center interconnect; mobile applications, including as an aggregation router for 3G, 4G and 5G backhaul, a

WLAN gateway for Wi-Fi® network aggregation, and a security gateway for securing backhaul networks.

For webscale companies, the 7750 SR-e delivers leading features for data center aggregation, gateway and interconnect, along with PoP edge and internet/peering functions.

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

Model-driven management

To simplify and automate network operations, the 7750 SR-e 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-e 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-e 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.

Hardware overview

The Nokia 7750 SR-e series uses a mid-plane system architecture and is available in three chassis variants—the 7750 SR-3e, 7750 SR-2e and 7750 SR-1e. It supports a wide range of Ethernet interfaces, integrated service adapters (ISAs) and common system modules that are optimized to address various network and application requirements.

Control Processing Module (CPM-e)

The CPM-e provides intelligent control and processing functionality. It is mounted in the rear of the chassis, offers optional 1+1 redundancy and is hot-swappable. Redundant CPM-e'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.

Chassis Control Module (CCM-e)

The CCM-e provides an interface to the CPM-e. It is mounted on the front of the chassis and is hot-swappable. It provides a one-to-one relationship with its associated CPM-e. For timing and synchronization, each CCM-e has an RJ-45 BITS port and a 1PPS port. For management, each CCM-e supports a 10/100/1000BASE (RJ-45) management interface: an RJ-45 serial console port (DCE/DTE switch). Alarms include the CPM-e status LED along with critical, major and minor alarm LEDs with a reset button. The module is also equipped with dry contacts to support alarm inputs and outputs (using a +24 V DC internal power source).

Input/Output Module (IOM-e)

Each IOM-e provides up to 200 Gb/s FD connectivity to MDA-e and MS-ISA2 modules and is hot swappable. It is optimized for versatility in deploying a variety of Ethernet and IP-based services and applications. Each IOM-e uses a multi-core processor and supports up to four MDA-e and MS-ISA2 modules. IOMs are FP3-based modules and provide the 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 as standards and requirements evolve.

Media Dependent Adapter (MDA-e)

The MDA-e provides up to 100 Gb/s FD throughput and provides physical Ethernet interface connectivity. It is available in a variety of interface and density configurations and is hot-swappable. It is supported by the IOM-e in the 7750 SR-e series and also by IOM4-e variants in 7750 SR-12e, SR-12 and SR-7 systems. For synchronization requirements, they support ITU-T Synchronous Ethernet (Sync-E) and IEEE 1588v2. Optical transport network (OTN) support includes ITU-T G.709 and FEC.

Multiservice Integrated Service Adapter 2 (MS-ISA2)

MS-ISA2s, common with the 7750 SR series (SR-12e, SR-12 and SR-7) and the SR-e series, are resource adapters that provide specialized processing and buffering for deeper levels of integrated services and advanced applications. They leverage Nokia FP3 network processing silicon to deliver up to 40 Gb/s of integrated service and application processing in a hot-swappable, half-slot form factor that inserts into an IOM-e.

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. Each system also supports a mix of AC and DC PSUs. A power status LED is mounted on the face plate. The power status is also available from the CLI or the Nokia NSP.

Fan tray

A single, hot-swappable fan tray provides front-to-back system cooling. The fan tray has redundant fans configured in a load-sharing design. Fans are variable-speed for power efficiency. A fan status LED is mounted on the face plate. The fan status is also available from the CLI or the Nokia NSP. Each system is also equipped with a fan filter.

7210 Service Access Switch (SAS) satellites

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

Technical specifications

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

	7750 SR-1e	7750 SR-2e	7750 SR-3e
System throughput (full duplex, max)	Up to 200 Gb/s	Up to 400 Gb/s	Up to 600 Gb/s
Number of MDA-e's and MS-ISA2s per chassis (max)	4	8	12
Number of IOM-e's per chassis (max)	1	2	3
Common equipment redundancy	CPM-e, CCM-e, PSU, fan	CPM-e, CCM-e, PSU, fan	CPM-e, CCM-e, PSU, fan
Hot-swappable equipment	IOM-e, MDA-e, MS-ISA2, CPM-e, CCM-e, PSU, fan tray, fan filter	IOM-e, MDA-e, MS-ISA2, CPM-e, CCM-e, PSU, fan tray, fan filter	IOM-e, MDA-e, MS-ISA2, CPM-e, CCM-e, PSU, fan tray, fan filter
Dimensions	<ul style="list-style-type: none"> Height (6 RU): 26.7 cm (10.5 in) Width: 44.45 cm (17.5 in) Depth (600 mm ETSI-compliant): 53.8 cm (21.2 in) 	<ul style="list-style-type: none"> Height (10 RU): 44.5 cm (17.5 in) Width: 44.45 cm (17.5 in) Depth (600 mm ETSI-compliant): 53.8 cm (21.2 in) 	<ul style="list-style-type: none"> Height (13 RU): 57.8 cm (22.75 in) Width: 44.45 cm (17.5 in) Depth (600 mm ETSI-compliant): 53.8 cm (21.2 in)
Weight	Empty: 23.8 kg (52.5 lb) Full: 44.9 kg (98.8 lb)	Empty: 32.4 kg (71.4 lb) Full: 68.4 kg (150.5 lb)	Empty: 38.2 kg (84.2 lb) Full: 83.9 kg (184.6 lb)
Power	<ul style="list-style-type: none"> AC and DC power options Up to 4 PSUs per chassis N+N redundancy 	<ul style="list-style-type: none"> AC and DC power options Up to 8 PSUs per chassis N+N redundancy 	<ul style="list-style-type: none"> AC and DC power options Up to 8 PSUs per chassis N+N redundancy
Cooling	<ul style="list-style-type: none"> N+1 internal redundant fans Front-to-back airflow Variable speed for power efficiency 	<ul style="list-style-type: none"> N+1 internal redundant fans Front-to-back airflow Variable speed for power efficiency 	<ul style="list-style-type: none"> N+1 internal redundant fans Front-to-back airflow Variable speed for power efficiency

Table 2. Nokia 7750 SR-e MDA-e summary

MDA-e type	Connector/port	Connector/port type	Maximum density		
			7750 SR-1e	7750 SR-2e	7750 SR-3e
100GBASE/40GBASE/25GBASE/10GBASE (MACsec) *	2	QSFP28/QSFP+	8/8/32/32	16/16/64/64	24/24/96/96
100GBASE/40GBASE	2	QSFP28/QSFP+	8/8	16/16	24/24
10GBASE/25GBASE (MACsec)	8	SFP28/SFP+	32	64	96
100GBASE	1	CFP2	4	8	12
10GBASE	10, 6	SFP+	40, 24	80, 48	120, 72
10GBASE/1000BASE (MACsec)	12	SFP+/SFP	48	96	144
1000BASE	40 or 20	CSFP/SFP	160 or 80	320 or 160	480 or 240

* Leverages 4 x 10GE (QSFP+) and 4 x 25GE (QSFP28) breakout options

Table 3. Nokia 7750 SR MS-ISA2 summary

ISA type	Chassis variant		
	7750 SR-3e	7750 SR-2e	7750 SR-1e
MS-ISA2	√	√	√

Feature and protocol support highlights

Feature and protocol support within the 7750 SR-e 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)

Segment Routing and SDN features

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

Layer 2 features

- Ethernet LAN (E-LAN): BGP-VPLS, Provider Backbone Bridging for VPLS (PBB-VPLS), EVPN and PBB-EVPN

- 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 and two-tiered, class-fair hierarchical policing
 - Advanced, scalable network and service QoS
 - End-to-end consistent QoS regardless of oversubscription or congestion
- High availability:
 - Nonstop routing¹
 - Nonstop services¹
 - In-Service Software Upgrade (ISSU)¹
 - 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

- 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 support²

Environmental specifications

- Operating temperature: 5°C to 40°C (41°F to 104°F)
- Normal operating relative humidity: 5% to 95% (non-condensing)
- Operating altitude: Up to 4000 m (13,123 ft) at 30°C (86°F)

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
- ES 201 468
- ETSI EN 300 132-2
- ETSI EN 300 132-3
- FCC Part 15 Class A
- GR-1089-CORE
- ICES-003 Class A
- IEC 61000-6-2
- IEC 61000-6-4

¹ Requires redundant CPM modules

² System design intent is according to standards listing. Refer to product documentation for detailed compliance status.



- 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
- IEC/EN 61000-4-5 Surge
- IEC/EN 61000-4-6 Conducted Immunity
- IEC/EN 61000-4-11 Voltage Interruptions
- KCC Korea-Emissions & Immunity (in accordance KN32/35)
- VCCI Class A

Telecom standards

- ATIS 0900101
- 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)
- KC Mark - South Korea
- NEBS Level 3
- RCM Mark - Australia
- UKCA Mark - United Kingdom
- VCCI Mark - Japan

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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