

Nokia 7750 SR-e Service Router

Release 20

The Nokia 7750 SR-e series of IP routers delivers the scale, comprehensive features and platform versatility needed to stay ahead of evolving demands driven by the cloud, 5G and the Internet of Things (IoT). 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 data center, WAN and aggregation networks to support multiple edge functions, including aggregation, Broadband Network Gateway (BNG), IP anyhaul, provider edge (PE) and data center interconnect 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 400 Gb/s half duplex (HD) to 1.2 Tb/s HD. To extend the network edge closer to end users, the 7750 SR-e has the service 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 and 25GE density with breakout options and is ideally suited for GE and 10GE fan-out in subscribed and over-subscribed access and aggregation networks. With high-performance 40GE and 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—common occurrence in partially buffered chipsets.

Comprehensive features

With Nokia's feature-rich 64-bit Service Router Operating System (SR OS) and extensive QoS, IP/MPLS, segment routing and model-driven management capabilities, the 7750 SR-e has the comprehensive features 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. The 7750 SR-e supports a leading number of statistics counts per packet, enabling comprehensive statistics for existing and future applications.

Versatile platform

The comprehensive features of the 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, aggregation and data center networks supporting multiple network functions, 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, LTE and LTE-A backhaul, a WLAN gateway for Wi-Fi® network aggregation, and a security gateway for securing backhaul networks; and value-added services, including application assurance (AA) and carrier-grade Network Address Translation (NAT).

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.

SDN integration and automation

The 7750 SR-e and 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 through CLI, NETCONF and gRPC/gNMI using YANG models.

In combination with the Nokia Network Services Platform (NSP), the 7750 SR-e can be deployed to introduce scalable and integrated SDN control across IP, MPLS, Ethernet and optical transport layers.

The Nokia 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.

High availability

For always-on service delivery, the Nokia 7750 SR-e sets the benchmark for high availability. Moving beyond full system redundancy, the robust SR OS supports numerous features to maximize network stability, ensuring IP/MPLS protocols and services run without interruption. These features include innovative nonstop routing, nonstop services, in-service software upgrade (ISSU) and multi-chassis resiliency mechanisms.

Network management

The 7750 SR-e is managed by the NSP, supporting integrated element and network management with end-to-end orchestration of network resource provisioning and assurance operations.

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 full duplex (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.

Technical specifications

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

	7750 SR-3e	7750 SR-2e	7750 SR-1e
System throughput (half duplex, max)	Up to 1.2 Tb/s	Up to 800 Gb/s	Up to 400 Gb/s
Number of MDA-e's and MS-ISA2s per chassis (max)	12	8	4
Number of IOM-e's per chassis (max)	3	2	1
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 (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) 	<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 (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)
Weight	Empty: 38.2 kg (84.2 lb) Full: 83.9 kg (184.6 lb)	Empty: 32.4 kg (71.4 lb) Full: 68.4 kg (150.5 lb)	Empty: 23.8 kg (52.5 lb) Full: 44.9 kg (98.8 lb)
Power	<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 	<ul style="list-style-type: none"> AC and DC power options Up to 4 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-3e	7750 SR-2e	7750 SR-1e
100GBASE/40GBASE/25GBASE/10GBASE (MACsec) *	2	QSFP28/QSFP+	24/24/96/96	16/16/64/64	8/8/32/32
100GBASE/40GBASE	2	QSFP28/QSFP+	24/24	16/16	8/8
10GBASE/25GBASE (MACsec)	8	SFP28/SFP+	96	64	32
100GBASE	1	CFP2	12	8	4
10GBASE	10, 6	SFP+	120, 72	80, 48	40, 24
10GBASE/1000BASE (MACsec)	12	SFP+/SFP	144	96	48
1000BASE	40 or 20	CSFP/SFP	480 or 240	320 or 160	160 or 80

* 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 in the Nokia 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, and 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), and 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 GMPLS UNI,

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

- Multiple-instance IS-IS and OSPF Segment Routing support with shortest path tunnel, Segment Routing - Traffic Engineering (SR-TE) LSP, and static and BGP SR policy. The 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. PCEP allows the delegation of the SR-TE LSP to the Nokia NSP or a third-party PCE function.
- 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 VRF, and in a wide range of routing and service contexts such as Global Routing table, VPRN, VPLS and E-PIPE service; supports control interfaces such as OpenFlow, FlowSpec, CLI and NETCONF

- Multivendor SDN control integration through OpenFlow, PCEP, 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 Policies, RIB API tunnel entries, Interior Gateway Protocol (IGP) SIDs)

Layer 2 features

- Ethernet LAN (E-LAN): BGP-VPLS (Virtual Private LAN Service), Provider Backbone Bridging for VPLS (PBB-VPLS), Ethernet VPN (EVPN) and PBB-EVPN
- E-Line: BGP-VPWS (Virtual Private Wire Service), EVPN-VPWS and PBB-EVPN
- E-Tree: EVPN and PBB-EVPN
- DCI: EVPN VXLAN (Virtual eXtensible LAN) 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), and Multicast VPN (MVPN), which includes Inter-AS MVPN and Next Generation MVPN (NG-MVPN)

System features

- Ethernet satellites: Port expansion through local or remote Nokia 7210 Service Access Switch (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
- OAM: Extensive fault and performance 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) Ethernet in the First Mile (EFM) (IEEE 802.3ah), Bidirectional Forwarding Detection (BFD), Cflowd, Two-Way Active Measurement Protocol (TWAMP/TWAMP-Light), and a full suite of MPLS and Segment Routing OAM tools
- Timing: ITU-T Synchronous Ethernet (SyncE), IEEE 1588v2 (PTP), Network Time Protocol (NTP), BITS ports (T1, E1, 2M) and 1PPS

- QoS: Flexible intelligent packet classification; ingress and egress hierarchical QoS with multitiered shaping and two-tiered class fair hierarchical policing; advanced, scalable network and service QoS, and end-to-end consistent QoS regardless of oversubscription or congestion
- High availability: Nonstop routing¹, nonstop services¹, ISSU¹, fast reroute for IP, RSVP, LDP and segment routing, pseudowire redundancy, ITU-T G.8031 and G.8032, weighted ECMP, and weighted, mixed-speed link aggregation

Management features

- Model-driven management through the CLI, NETCONF and gRPC/gNMI using YANG models, streaming telemetry through gRPC/gNMI subscriptions
- Full SNMP management support, including configuration
- 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
- CSA/UL 60950-1 2nd Ed NRTL
- EN 60950-1 2nd Ed CE Mark
- IEC 60950-1 2nd Ed CB Scheme
- IEC/EN 60825-1
- IEC/EN 60825-2

¹ Requires redundant CPM-e's

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

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
- 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
- Designed to comply with MEF CE 2.0
- EU Directive 2011/65/EU Restriction of the use of certain Hazardous Substances in Electrical and Electronic Equipment (RoHS2)
- 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
- VCCI Mark - Japan

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

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