

## Nokia 7750 SR-e Service Router

Release 25

The 7750 SR-e series of modular IP routers scales from 200 Gb/s FD to 600 Gb/s full duplex (FD), offering flexible performance to match a variety of network needs. With support for interfaces ranging from 1GE to 100GE, it provides extensive service capabilities and configuration versatility, making it ideal for small IP edge, aggregation and gateway applications.

### Highly scalable

Available in 200 Gb/s (FD), 400 Gb/s FD and 600 Gb/s FD system variants, the 7750 SR-e delivers high-density Gigabit Ethernet (GE), 10GE, 25GE and 100GE interfaces, utilizing QSFP28, SFP28, SFP+, SFP and cSFP connector variants with flexible breakout options. Its modular, mid-plane design offers MACsec line rate encryption, control plane, fan and power redundancy along with a NEBS-compliant front-to-back thermal design.

At the heart of the 7750 SR-e is Nokia FP3 routing silicon. Leveraging a fully programmable network processor (NP) architecture, it is designed to be deterministic, enabling diverse deployment needs for demanding applications under all network operating conditions.

For service providers, the 7750 SR-e supports a wide range of applications and is optimized to extend the network edge closer to end users. At the IP edge, it supports mobile, residential broadband and business VPN services on a common platform. It enables multi-access aggregation in mobile anyhaul, functions as a Broadband Network Gateway (BNG) in residential broadband services, and supports data centre and IPsec gateways. For webscale companies and enterprises, it provides high-performance IP routing, including connectivity to data center, internet and WAN applications.



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.

## 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; an edge router for MPLS-enabled enterprise VPN, internet access and cloud services and data center interconnect; mobile applications include as an aggregation router for 4G and 5G backhaul, a WLAN gateway for Wi-Fi® network aggregation, and an IP security gateway for securing backhaul networks.

For webscale companies, the 7750 SR-e delivers leading features for data center aggregation, gateway and interconnect 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.

The 7750 SR-e is managed by the Nokia NSP, supporting automated network management, service assurance and resource optimization across IP and optical networks.

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.

## 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 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 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 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.

### 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 SAS and 7250 IXR satellites

The 7750 SR-e is supported by the Nokia [7210 SAS and 7250 IXR satellite systems](#) to offer GE to 100GE port extension external to the 7750 SR-e.

## 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 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, CPM-e, CCM-e, PSU, fan tray, fan filter	IOM-e, MDA-e, CPM-e, CCM-e, PSU, fan tray, fan filter	IOM-e, MDA-e, CPM-e, CCM-e, PSU, fan tray, fan filter
Dimensions	<ul style="list-style-type: none"> <li>Height (6 RU): 26.7 cm (10.5 in)</li> <li>Width: 44.45 cm (17.5 in)</li> <li>Depth (600 mm ETSI-compliant): 53.8 cm (21.2 in)</li> </ul>	<ul style="list-style-type: none"> <li>Height (10 RU): 44.5 cm (17.5 in)</li> <li>Width: 44.45 cm (17.5 in)</li> <li>Depth (600 mm ETSI-compliant): 53.8 cm (21.2 in)</li> </ul>	<ul style="list-style-type: none"> <li>Height (13 RU): 57.8 cm (22.75 in)</li> <li>Width: 44.45 cm (17.5 in)</li> <li>Depth (600 mm ETSI-compliant): 53.8 cm (21.2 in)</li> </ul>
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"> <li>AC and DC power options</li> <li>Up to 4 PSUs per chassis</li> <li>N+N redundancy</li> </ul>	<ul style="list-style-type: none"> <li>AC and DC power options</li> <li>Up to 8 PSUs per chassis</li> <li>N+N redundancy</li> </ul>	<ul style="list-style-type: none"> <li>AC and DC power options</li> <li>Up to 8 PSUs per chassis</li> <li>N+N redundancy</li> </ul>
Cooling	<ul style="list-style-type: none"> <li>N+1 internal redundant fans</li> <li>Front-to-back airflow</li> <li>Variable speed for power efficiency</li> </ul>	<ul style="list-style-type: none"> <li>N+1 internal redundant fans</li> <li>Front-to-back airflow</li> <li>Variable speed for power efficiency</li> </ul>	<ul style="list-style-type: none"> <li>N+1 internal redundant fans</li> <li>Front-to-back airflow</li> <li>Variable speed for power efficiency</li> </ul>

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

## 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:
  - Full Label edge router (LER) and Label switch router (LSR) functionality with comprehensive SR-MPLS and MPLS-SRv6 interworking 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 (SR) 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

## Layer 2 features

- Ethernet LAN (E-LAN): BGP-VPLS, PBB-VPLS, EVPN and PBB-EVPN
- E-Line: BGP Virtual Private Wire Service (BGP-VPWS), EVPN-VPWS, EVPN Flexible Cross Connect (FXC), PBB-EVPN E-line, and EVPN-VPWS service gateway functionality
- E-Tree: EVPN and PBB-EVPN
- DCI: EVPN Virtual eXtensible LAN (VXLAN) to VPLS/EVPN-MPLS/EVPN-VXLAN/EVPN-SRv6 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 and remote Nokia 7210 SAS and 7250 IXR satellite systems to fit a wide variety of deployment needs. Fiber, copper, and PoE/PoE+ (IEEE 802.3af/at) capable copper models are available with Ethernet interfaces ranging from GE to 100GE
- 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)
- Link Layer Discovery Protocols (LLDP) (IEEE 802.3AB-2005)
- Bidirectional Forwarding Detection (BFD), including Seamless BFD
- BIER
- Cflowd
- Two-Way Active Measurement Protocol (TWAMP and TWAMP Light/STAMP)
- A full suite of MPLS and SR fault and performance tools
- Service mirroring
- Lawful intercept
- 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 routing<sup>1</sup>
  - Nonstop services<sup>1</sup>
  - In-Service Software Upgrade (ISSU)<sup>1</sup>
  - IP: ECMP with up to 64 x 64 paths (2-level hierarchical ECMP: BGP ECMP and link/tunnel ECMP), IP FRR with LFA, BGP Edge and Core PIC
  - MPLS: LDP with ECMP and LFA/RLFA; RSVP-TE LSP with primary/standby secondary paths; BGP-LU tunnel with ECMP and Edge PIC

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

- SR-MPLS: LFA/RLFA/TI-LFA, SR-TE LSP with ECMP and primary/standby secondary paths; SR policy with linear and ECMP protection modes
- SRv6: LFA/RLFA/TI-LFA, SRv6 policy with linear and ECMP protection modes
- PW redundancy
- EVPN single-active and all-active multi-homing with revertive and non-revertive mode
- Multi-chassis LAG
- Multi-chassis PW endpoint redundancy
- BGP multi-homing for VPLS/VPWS services

## 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 support<sup>2</sup>

### 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
- EN 55035
- 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 CISPR 35
- 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

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



### 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 networks that sense, think and act by leveraging our work across mobile, fixed and cloud networks. In addition, we create value with intellectual property and long-term research, led by the award-winning Nokia Bell Labs.

With truly open architectures that seamlessly integrate into any ecosystem, our high-performance networks create new opportunities for monetization and scale. Service providers, enterprises and partners worldwide trust Nokia to deliver secure, reliable and sustainable networks today – and work with us to create the digital services and applications of the future.

Nokia operates a policy of ongoing development and has made all reasonable efforts to ensure that the content of this document is adequate and free of material errors and omissions. Nokia assumes no responsibility for any inaccuracies in this document and reserves the right to change, modify, transfer, or otherwise revise this publication without notice.

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