Nokia 7750 Service Router-1x

Release 26

The Nokia 7750 SR-1x family of compact IP routers delivers high performance, combining speed, energy efficiency, flexible capability, network security, and automation tools essential for modern, dynamic IP networks of telecommunication providers, AI and cloud providers, and mission-critical enterprise environments.

Overview

Powered by Nokia FP5 routing silicon, the 7750 SR-1x is designed to meet modern network imperatives, enabling operators to build a high-performance, scalable, energy-efficient, secure and automated network that delivers a superior return on investment.

At the heart of the 7750 SR-1x is Nokia FP5 routing silicon—an essential element for high-performance routing. Leveraging the fully programmable network processor (NP) architecture of FP5, the platform is deterministic and can meet diverse deployment needs for demanding applications and services under all network operating conditions.

Available in six compact variants, the 7750 SR-1x scales capacity up to 6 Tb/s full duplex (FD), delivering deterministic performance, energy efficiency and enhanced IEEE 802.1AE quantum-safe MACsec (ANYsec) cryptography for demanding network roles. Universal 800G QSFP-DD and 200G SFP-DD connectors enable high-density 10GE, 25GE, 50GE, 100GE, 200GE, 400GE and 800GE networking environments. All 7750 SR-1x variants also support integrated Global Navigation Satellite Systems (GNSS).



7750 SR-1x-92S



7750 SR-1-92S



7750 SR-1x-48D



7750 SR-1-48D



7750 SR-1-46S



7750 SR-1-24D

To protect against increasing security threats, the 7750 SR-1x embeds security across all aspects of the data path without impacting router performance. This includes support for line rate-based, low-latency encryption across Layer 2, Layer 2.5 and Layer 3 as well as surgical IP payload filters to mitigate against distributed denial of service (DDoS) attacks. These robust security features allow the network to be part of a holistic solution for network security.

Running the Nokia Service Routing Operating System (SR OS), the 7750 SR-1x provides service richness and configuration versatility in support of IP edge, data center gateway, broadband gateway, IPsec gateway and aggregation applications and services. These industry-leading features enable network designs without trade-offs among performance, capacity, scalability and energy consumption.

Compact platforms

Demanding network roles demand in-house silicon. Designed to meet the requirements of critical IP networks, FP5 silicon supports high-density 800G QSFP-DD and up to 1.6 Tb/s clear channel flows in advance of standardized 1.6 Tb/s optics. This support enables a capacity increase up to four times compared to the FP4-based 7750 SR-1 with many additional value-added capabilities, including intelligent aggregation (IA).

At 2RU in height, the compact 7750 SR-1x is available in six licensed variants:

- 7750 SR-1x-48D
  - Fixed, 6.0 Tb/s FD, up to 19.2 Tb/s FD with IA
  - 48 x 800G QSFP-DD
- 7750 SR-1-48D
  - Fixed, 2.8 Tb/s FD, up to 19.2 Tb/s FD with IA
  - 48 x 400G QSFP-DD
- 7750 SR-1-24D
  - Fixed, 2.8 Tb/s FD, up to 9.6 Tb/s FD with IA
  - 24 x 800G QSFP-DD
- 7750 SR-1x-92S
  - Fixed, 6.0 Tb/s FD, up to 12.8 Tb/s FD with IA
  - 80 x 200G SFP-DD (10G/25G/50G/100G/200G) + 12 x 800G QSFP-DD
- 7750 SR-1-92S
  - Fixed, 2.8 Tb/s FD, up to 12.8 Tb/s FD with IA
  - 80 x 200G SFP-DD (10G/25G/50G/100G/200G) + 12 x 400G QSFP-DD
- 7750 SR-1-46S
  - Fixed, 2.8 Tb/s FD, up to 6.4 Tb/s FD with IA
  - 40 x 200G SFP-DD (10G/25G/50G/100G/200G) + 6 x 800G QSFP-DD

The 7750 SR-1x architecture is centralized, with an FP5-based integrated media module (IMM), fixed connectors and a simplex control plane. All 400G and 800G QSFP-DD cages support a variety of compatible optics, including QSFP+ and QSFP28. 200G SFP-DD cages are compatible with SFP56-DD, SFP56, SFP28 and SFP+. Breakout options are available for 4 x 10G, 8 x 10G, 10 x 10G, 4 x 25G, 2 x 100G, 4 x 100G, 2 x 400G and 8 x 100G.

For port extension options, the Nokia 7210 Service Access System (SAS) and 7250 Interconnect Router (IXR) satellite systems offer fiber and copper variants with interfaces ranging from GE up to 100GE.

Energy efficiency

Reduce energy use without compromising performance

The energy-efficient design of the 7750 SR-1x makes IP networks more sustainable through reduced emissions. With power density optimization, a best-in-class mechanical design for optimal cooling, 112G SERDES, and smaller silicon geometries the FP5-based 7750 SR-1x delivers typical energy efficiency in the order of 0.1W/Gig. Even more, with FP5 silicon, performance is always deterministic.

This energy efficiency is realized with all features enabled, full buffering on ingress and egress, and line rate memory on buffers and tables. The memory architecture of FP5 silicon is line rate and is designed to be deterministic under all network operating conditions for both buffers and tables.

The design of the 7750 SR-1x dynamically scales energy consumption based on licensing levels and connectors in use. This significantly reduces energy costs when only a fraction of a system is in use. With licensing, intelligent aggregation and a choice of variant options, operators have flexibility to design network locations with the right energy consumption, performance, capacity and scalability to achieve sustainability goals.

System efficiency

The mechanical and thermal design of the FP5-based 7750 SR-1x is focused on enabling operators to maximize the density and usability of coherent optics. Today's coherent optics, such as 400G ZR/ZR+, can consume up to 23.5W of energy and are a challenge to cool in data center-focused designs. The best-in-class design of the 7750 SR-1x allows for a full set of coherent 400G ZR+ optics in all cages and is designed to support 800G coherent optics in the order of 26W without trade-offs. The intent of coherent optics is to leverage full router density without losing ports, and that is what the 7750 SR-1x delivers.

Leveraging 112G SERDES technology, the 7750 SR-1x unlocks the energy efficiency advantages of next-generation optics. Compared to 400G optics, 800G optics save in the order of 25 to 43 percent of the optical energy budget. The 7750 SR-1x is hardware-ready to support energy-efficient 100G/200G SFP112 and 400G/800G QSFP112 optics. As systems densify, optics become a large part of overall system energy consumption, and the energy savings behind 800G optics quickly become compelling.

FlexE 2.0 is supported for super-rating and bonding. This support enables the bonding of 4 x 400GE interfaces to create a single interface with the full 1.6 Tb/s bandwidth available to the 7750 SR-1x. It can also help further drive system-level efficiencies by mitigating the inefficiencies associated with link aggregation group (LAG) hashing.

In combination, these capabilities provide a future-ready set of functions to deliver investment protection over the long term.

Flexible capability

Network processor-based architecture

Every generation of Nokia FP silicon has been based on an NP design. A Nokia NP offers the highest degree of flexibility and programmability in the industry. With a fully programmable data path and zero hard-coded logic, the data path is fully upgradable to new hardware-based performance standards with a simple software update.

Capabilities such as segment routing (SR), Ethernet virtual private network (EVPN) and IEEE 1588 Precision Time Protocol (PTP) edge timestamping have been activated in hardware without the need for hardware replacement on platforms delivered well before these standards were conceived. With uncertainty around future evolving network standards, an NP-based architecture delivers the lowest TCO compared to any other chipset architecture on the market.

Deterministic performance with FP5: tables, buffers and QoS

The NP architecture of FP5 silicon is designed to be fully deterministic across tables and buffering under all network loading conditions. Nokia-designed smart memories for tables and line rate buffer memories make this design possible, allowing high-scale routing with full access control lists (ACLs) and services with no performance trade-off. This enables certainty at full scale and under real-world network conditions from Day 1 through Year 10 and beyond. A line rate memory system will always outperform a non-line rate memory system under all network loading conditions—without exception.

Full buffering for ingress as well as egress data combined with packet pre-classification and pre-buffering ensures superior performance for all critical flows. This guarantees the traffic that

matters most regardless of port configuration, microbursting or network congestion. Our FP5 silicon supports all necessary QoS features, from basic to advanced, in a highly granular way. They support a full set of QoS with up to 16 queues per service, five-layer hierarchical QoS (H-QoS), and an industry-leading total number of queues and policers.

Intelligent aggregation

Intelligent aggregation allows the 7750 SR-1x to cost-effectively aggregate port capacity beyond the forwarding capacity of a system in a deterministic way while guaranteeing QoS and packet priority. The 7750 SR-1x supports up to 19.2 Tb/s FD of intelligent aggregation, enabling it to integrate the pre-aggregation layer or expand port availability without adding more systems. This capability significantly reduces the number of network elements for energy savings and can deliver savings in the order of one-third the cost of a traditional leaf/spine topology, resulting in significantly lower the TCO from both CAPEX and OPEX savings. This is all possible without increased energy or feature trade-offs.

Pay-as-you-grow licensing

The flexible pay-as-you-grow licensing model for hardware capacity and functions provides a choice of entry points for immediate requirements and the ability to scale in-place for evolving needs with software-only upgrades for evolving needs without changing hardware. For example, operators may opt to deploy QSFP-DD at 100G rates and enable 400G later or to start at 400G rates and enable 800G later. On systems with SFP-DD connectors, they can start with 10/25G rates and enable 200G later. Throughput rates can also be scaled down, lowering energy consumption proportionally and to provide the right energy, performance and port mix in the most economical way.

In-service SR OS right to use (RTU) licenses can be activated with many pay-as-you grow license options, ensuring that performance and port capacity are not constrained by maintenance windows.

Service richness

Nokia's feature-rich 64-bit SR OS addresses the full spectrum of IP routing requirements. With comprehensive QoS, IP/MPLS, SR and model-driven management features, the 7750 SR-1x has the service capabilities and tools to meet the most stringent SLAs and deliver the highest end-user quality of experience (QoE).

The 7750 SR-1x supports hundreds of thousands of IP flows and access control lists (ACLs) with high performance at scale, even when multiple processing-intensive features are enabled concurrently. It supports advanced push-based telemetry models to stream flow-level data and insights in near-real time for network assurance and DDoS security.

Leveraging the Nokia SR OS, the 7750 SR-1x supports value-added services and network functions through the 7750 SR Extended Services Appliance (ESA), including application assurance (AA), Layer 7 stateful firewall, Carrier Grade - Network Address Translation (CG-NAT) and IPsec gateways.

The 7750 SR-1x supports multi-dimensional table scaling where IP, MPLS, and ACL and MAC addresses can all scale concurrently. Tables can all grow simultaneously, allowing the true potential of network designs to be unleashed without constraint. Trading off scale in one dimension for another is a recipe for compromise and will constrain network growth over the long term.

Platform versatility

Demanding network roles demand in-house silicon. The 7750 SR-1x supports a full array of network applications and services. Leading SR OS capabilities combined with licensing provide configuration versatility to support multiple, demanding network roles with deterministic performance on a single platform.

For telecommunication providers, the 7750 SR-1x is deployed in mission-critical WAN, data center and aggregation networks to support IP edge, data center gateway/interconnect, broadband edge gateways (Multi-Access Gateway (MAG), Broadband Network Gateway (BNG) and Fixed-Wireless Gateway FWG)),

IPsec gateway, peering, core and multi-service aggregation applications.

For AI and cloud providers looking to maximize application performance, the 7750 SR-1x supports IP edge, data center gateway/interconnect and peering applications.

For mission-critical enterprises, the 7750 SR-1x provides high-performance IP routing, including connectivity to the data center, internet and WAN applications.

IP network security

DDoS mitigation

Nokia Deepfield Defender in combination with the 7750 SR-1x can mitigate 100 percent of all DDoS attacks in-band at the edge of the network without the need to redirect any traffic to a scrubbing center. The solution is uniquely enabled by the massive filtering scale and performance in FP5 silicon that allow the 7750 SR-1x to act as highly precise attack sensor and mitigation element without compromising the performance of any function or service running on it.

Security policies are continuously monitored and tuned using Nokia SR OS telemetry from the 7750 SR-1x. With automated workflows in Deepfield Defender, tens of thousands of ACL filters are updated in seconds to respond to changing security conditions without delay. The filters associated with DDoS mitigation are signature ACLs. These are ACLs beyond typical 5-tuple ACLs that only serve to complete DDoS attacks by impacting all traffic. Signature-based ACLs provide surgical payload-level inspection capabilities at line rate to truly filter out DDoS traffic in a cost-effective way.

IP network cryptography

Network security can no longer be an afterthought in IP network design and deployment. Network operators must move toward a holistic approach of end-to-end quantum-safe network security.

As part of our multi-layer defense-in-depth IP cryptography, we deliver on networking requirements to provide end-to-end secure and trusted quantum-safe network connectivity. The Nokia 7750 SR-1x supports IEEE 802.1AE MACsec and the MAC Security Key Agreement 802.1X protocol (combined with quantum-safe pre-shared key cryptography), to deliver quantum-safe network connectivity.

To extend our defence-in-depth IP cryptography capabilities, we have enhanced IEEE 802.1AE MACsec, which we call ANYsec. It delivers universal line rate MACsec and ANYsec encryption across L2, L2.5, and L3 on all connectors and all speeds from 10 Gb/s to 1.6 Tb/s. Additionally, it extends hardware low-latency secure and trusted quantum-safe network connectivity to MPLS- and IP-based flows.

ANYsec runs hop-by-hop or end-to-end and can be extended to any network topology at scale. ANYsec interworks with legacy network equipment and can be added as a network overlay. In addition to securing internal network links and connections, it is a valuable, revenue-generating option for new service enablement. It can significantly increase the competitiveness and operations of network solutions, speeding the velocity of deployment and deliver quantum-safe network connectivity today.

Network automation

Model-driven management

To simplify and automate network operations, the 7750 SR-1x 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, including NETCONF, gRPC (gNMI and gNOI) and 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-1x and the Nokia SR OS enable multivendor software-defined networking (SDN). Control integration is enabled through OpenFlow, the Path Computation Element Protocol (PCEP) and model-driven network element management.

In combination with the Nokia NSP, the 7750 SR-1x 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 SR support, online traffic engineering and resource optimization, and elastic bandwidth services for dynamic cloud applications.

Hardware overview

The 7750 SR-1x is available in six compact, 2RU variant options supporting 800G QSFP-DD and 200G SFP-DD connectors, a simplex control plane and front-to-back airflow with an optional air filter kit. The FP5-based chassis has an integrated chassis control module that houses the main card assembly that provides the connectivity function and CPU control plane functions such as packet lookups, traffic classification, processing and forwarding, service enablement, and QoS, as well as the switch fabric functionality.

Each system supports optical SyncE/1588, console, management, 1PPS, dual-band GNSS, SD cards and one USB. All of these are accessible from the front. Alarms, OES and BITs ports are accessible from the rear.

The 7750 SR-1x is supported by the 7750 SR Extended Services Appliance (ESA) to offer value-added services and network applications external to the 7750 SR-1x. It is also supported by the Nokia 7210 SAS and 7250 IXR satellite systems to offer GE to 100GE port extension external to the 7750 SR-1x.

Technical specifications

Table 1. Hardware specifications for the 7750 SR-1x systems

	7750 SR-1x-48D	7750 SR-1-48D	7750 SR-1-24D
System architecture	Centralized, fixed connectors, non-redundant control	Centralized, fixed connectors, non-redundant control	Centralized, fixed connectors, non-redundant control
System capacity (FD)	6.0 Tb/s	2.8 Tb/s	2.8 Tb/s
Intelligent aggregation (IA)	19.2Tb/s FD	19.2Tb/s FD	9.6Tb/s FD
Connectors	48 x 800G QSFP-DD	48 x 400G QSFP-DD	24 x 800G QSFP-DD
Optical transceivers	40G QSFP+, 100G QSFP28, 2 x 100G QSFP28-DD, 400G QSFP-DD, 800G QSFP-DD	40G QSFP+, 100G QSFP28, 2 x 100G QSFP28-DD, 400G QSFP-DD	40G QSFP+, 100G QSFP28, 2 x 100G QSFP28-DD, 400G QSFP-DD, 800G QSFP-DD
Pre-classification & pre-buffering	21.6 million 64B packet micro-buffer	21.6 million 64B packet micro-buffer	10.8 million 64B packet micro-buffer
Buffering	64GB	32GB	32GB
Hot-swappable modules	4 PSUs, 3 fan trays	4 PSUs, 3 fan trays	3 PSUs, 3 fan trays
Control ports	Front: Optical SyncE/1588, console, management, 1PPS, dual-band GNSS, SD cards, and USB ports Rear: Alarms, OES and BITs ports	Front: Optical SyncE/1588, console, management, 1PPS, dual-band GNSS, SD cards, and USB ports Rear: Alarms, OES and BITs ports	Front: Optical SyncE/1588, console, management, 1PPS, dual-band GNSS, SD cards, and USB ports Rear: Alarms, OES and BITs ports
Cooling	Front to back	Front to back	Front to back
Dimensions (with air filter kit)	• Height: 8.81 cm (3.47 in), 2RU • Width: 48.26 cm (19 in) • Depth: 70.87 cm (27.9 in)	• Height: 8.81 cm (3.47 in), 2RU • Width: 48.26 cm (19 in) • Depth: 70.87 cm (27.9 in)	• Height: 8.81 cm (3.47 in), 2RU • Width: 48.26 cm (19 in) • Depth: 70.87 cm (27.9 in)
Weight	Loaded: 25.05 kg (55.22 lbs); excludes optics	Loaded: 24.59 kg (54.22 lbs); excludes optics	Loaded: 20.89 kg (46.05 lbs); excludes optics
Power	**DC power** • DC input: -40 V to -72 V, 80A max per feed • Power feed redundancy • 1+1 PSU redundancy **AC power** • AC input: 180V AC to 264 V AC, 50 Hz/60 Hz; 20A max per feed • 1+1 PSU redundancy	**DC power** • DC input: -40 V to -72 V, 80A max per feed • Power feed redundancy • 1+1 PSU redundancy **AC power** • AC input: 180V AC to 264 V AC, 50 Hz/60 Hz; 20A max per feed • 1+1 PSU redundancy	**DC power** • DC input: -40 V to -72 V, 80A max per feed • Power feed redundancy • 1+1 PSU redundancy **AC power** • AC input: 180V AC to 264 V AC, 50 Hz/60 Hz; 20A max per feed • 1+1 PSU redundancy

Table 1. Hardware specifications for the 7750 SR-1x systems (Continued)

	7750 SR-1x-92S	7750 SR-1-92S	7750 SR-1-46S
System architecture	Centralized, fixed connectors, non-redundant control	Centralized, fixed connectors, non-redundant control	Centralized, fixed connectors, non-redundant control
System capacity (FD)	6.0 Tb/s	2.8 Tb/s	2.8 Tb/s
Intelligent aggregation (IA)	12.8Tb/s FD	12.8Tb/s FD	6.4Tb/s FD
Connectors	12 x 800G QSFP-DD + 80 x 200G SFP-DD	12 x 400G QSFP-DD + 80 x 200G SFP-DD	6 x 800G QSFP-DD + 40 x 200G SFP-DD
Optical transceivers	40G QSFP+, 100G QSFP28, 2 x 100G QSFP28-DD, 400G QSFP-DD, 800G QSFP-DD, 100G SFP-DD, 100G SFP112, 200G SFP-DD	40G QSFP+, 100G QSFP28, 2 x 100G QSFP28-DD, 400G QSFP-DD, 100G SFP-DD, 100G SFP112, 200G SFP-DD	40G QSFP+, 100G QSFP28, 2 x 100G QSFP28-DD, 400G QSFP-DD, 800G QSFP-DD, 100G SFP-DD, 100G SFP112, 200G SFP-DD
Pre-classification & pre-buffering	14.4 million 64B packet micro-buffer	14.4 million 64B packet micro-buffer	7.2 million 64B packet micro-buffer
Buffering	64GB	32GB	32GB
Hot-swappable modules	4 PSUs, 3 fan trays	4 PSUs, 3 fan trays	3 PSUs, 3 fan trays
Control ports	Front: Optical SyncE/1588, console, management, 1PPS, dual-band GNSS, SD cards, and USB ports Rear: Alarms, OES and BITs ports	Front: Optical SyncE/1588, console, management, 1PPS, dual-band GNSS, SD cards, and USB ports Rear: Alarms, OES and BITs ports	Front: Optical SyncE/1588, console, management, 1PPS, dual-band GNSS, SD cards, and USB ports Rear: Alarms, OES and BITs ports
Cooling	Front to back	Front to back	Front to back
Dimensions (with air filter kit)	• Height: 8.81 cm (3.47 in), 2RU • Width: 48.26 cm (19 in) • Depth: 70.87 cm (27.9 in)	• Height: 8.81 cm (3.47 in), 2RU • Width: 48.26 cm (19 in) • Depth: 70.87 cm (27.9 in)	• Height: 8.81 cm (3.47 in), 2RU • Width: 48.26 cm (19 in) • Depth: 70.87 cm (27.9 in)
Weight	Loaded: 25.05 kg (55.22 lbs); excludes optics	Loaded: 25.05 kg (55.22 lbs); excludes optics	Loaded: 20.43 kg (45.05 lbs); excludes optics
Power	**DC power** • DC input: -40 V to -72 V, 80A max per feed • Power feed redundancy • 1+1 PSU redundancy **AC power** • AC Input: 180V AC to 264 V AC, 50 Hz/60 Hz; 20A max per feed • 1+1 redundancy	**DC power** • DC input: -40 V to -72 V, 80A max per feed • Power feed redundancy • 1+1 PSU redundancy **AC power** • AC Input: 180V AC to 264 V AC, 50 Hz/60 Hz; 20A max per feed • 1+1 redundancy	**DC power** • DC input: -40 V to -72 V, 80A max per feed • Power feed redundancy • 1+1 PSU redundancy **AC power** • AC Input: 180V AC to 264 V AC, 50 Hz/60 Hz; 20A max per feed • 1+1 redundancy

Table 2. Nokia 7750 SR-1x port density

Speed	System variant					
	7750 SR-1x-48D		7750 SR-1-48D		7750 SR-1-24D	
	Line rate port count (max)	IA port count (max)	Line rate port count (max)	IA port count (max)	Line rate port count (max)	IA port count (max)
800G	6	24	—	—	3	12
400G	12	48	6	48	6	24
100G	60	192	28	192	28	96
10G	480	480	240	480	240	240

Table 2. Nokia 7750 SR-1x port density (Continued)

Speed	System variant					
	7750 SR-1x-92S		7750 SR-1-92S		7750 SR-1-46S	
	Line rate port count (max)	IA port count (max)	Line rate port count (max)	IA port count (max)	Line rate port count (max)	IA port count (max)
800G	4	4	—	—	2	2
400G	12	12	6	12	6	6
100G	60	128	28	64	28	64
10G	200	200	200	200	100	100

Table 3. Nokia 7750 SR-1x licensing overview

System	Capacity licenses	Functional licenses
7750 SR-1x-48D	• 7750 SR-1x 4.8T FD 48p 400G QSFP-DD • 7750 SR-1x 6.0T FD 48p 800G QSFP-DD to 19.2T with IA	• Core routing • Edge routing • High-scale edge routing
7750 SR-1-48D	• 7750 SR-1 2.8T FD 48p 400G QSFP-DD to 19.2T with IA	• Core routing • Edge routing • High-scale edge routing
7750 SR-1-24D	• 7750 SR-1 2.4T FD 24p 400G QSFP-DD • 7750 SR-1 2.8T FD 24p 800G QSFP-DD to 9.6T with IA	• Core routing • Edge routing • High-scale edge routing
7750 SR-1x-92S	• 7750 SR-1x 4.8T FD 80p 10G/25G SFP-DD +12p 400G QSFP-DD • 7750 SR-1x 6.0T FD 80p 200G SFP-DD + 12p 800G QSFP-DD to 12.8T with IA	• Core routing • Edge routing • High-scale edge routing
7750 SR-1-92S	• 7750 SR-1 2.4T FD 80p 10G/25G SFP-DD + 12p 400G QSFP-DD • 7750 SR-1 2.8T FD 80p 200G SFP-DD +12p 400G QSFP-DD to 12.8T with IA	• Core routing • Edge routing • High-scale edge routing
7750 SR-1-46S	• 7750 SR-1 2.4T FD 40p 10G/25G SFP-DD + 6p 400G QSFP-DD • 7750 SR-1 2.8T FD 40p 200G SFP-DD + 6p 800G QSFP-DD to 6.4T with IA	• Core routing • Edge routing • High-scale edge routing

Feature and protocol support highlights[1]

Feature and protocol support within the 7750 SR-1x 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

1 Some systems may have feature exclusions or exceptions

- 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 per AC E-Tree and EVPN per PE E-Tree
- 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
- ARP/ND control plane synchronization on Layer 3 interfaces

Security

- Management plane
  - SSHv2
  - TLS 1.2 and 1.3
  - AAA (local, RADIUS, TACACS+, LDAP)
    Note: LDAP is only for user authentication
  - User policy and access control
  - Anomaly logging/monitoring; log locally or via syslog
- Control plane
  - CPM filtering based on IP/MAC criteria
  - IP filtering and rate limiting
  - Distributed CPU protection
- Platform trust
  - System integrity verification
  - TPM 2.0 Initial Device Identity (IDevID) and Initial Attestation Key (IAK)
  - Secure boot
- Data plane
  - ACL filtering for DDoS mitigation
  - Quantum-safe entropy and ESV certified
  - Quantum-safe IEEE 802.1AE MACsec in LAN and WAN mode
  - IEEE 802.1X MACsec Key Agreement (MKA)
    - Keychain
    - Auto-generate auto-distribute of PSK
  - Quantum-safe TLS 26.10
  - IEEE 802.1X authenticatorSystem 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)
  - Service Activation Test (SAT) (ITU-T Y.1564)
  - 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)
  - GNSS receiver
  - 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:
  - 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
- 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[2]

Environmental specifications

- Operating temperature: 5°C to 40°C (41°F to 104°F)
- Operating relative humidity: 5% to 95% non-condensing
- Operating altitude: Up to 3,960 m (13,000 ft); operating temperature range de-rated above 1,829 m (6,000 ft)

Safety

- AS/NZS 62368.1
- IEC/EN 60825-1
- IEC/EN 60825-2
- IEC/EN/UL/CSA 62368-1

EMC emission

- AS/NZS CISPR 32 Class A
- BSMI CNS15936 Class A
- EN 55032 Class A
- FCC Part 15 Class A
- IEC/EN 61000-3-2 Power Line Harmonics
- IEC/EN 61000-3-3 Voltage Fluctuations and Flicker
- ICES-003 Class A
- IEC CISPR Class A
- IEC 61000-6-4
- KS C 9832 Class A
- VCCI Class A

EMC immunity

- BT GS-7
- EN 55035
- ETSI EN 300 132-1 AC Power Supply Interface
- ETSI EN 300 132-2 DC Power Supply Interface
- ETSI EN 300 386
- ETSI ES 201 468
- IEC CISPR 35
- IEC/EN 61000-4-2 Electric Static Discharge
- IEC/EN 61000-4-3 Radiated, RF, EM field
- IEC/EN 61000-4-4 Electrical Fast Transients
- IEC/EN 61000-4-5 Surge Immunity
- IEC/EN 61000-4-6 Immunity to Conducted Disturbances

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

- IEC/EN 61000-4-11 Voltage Interruptions
- IEC/EN 61000-6-2 Immunity for Industrial Environments
- KS C 9835

Environmental

- 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 300 753 Acoustic Noise Class 3.2

Wireless

- ETSI EN 301 489-1
- ETSI EN 301 489-19 (GNSS)

NEBS/RBOC requirements

- ATIS 0600010
- ATIS 0600015.03
- ATT-TP-76200
- GR-63-CORE, Level 3
- GR-1089-CORE, Level 3
- VZ.TPR.9205
- VZ.TPR.9305

Directives, regional approvals and certifications

- 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)
- Directive 2012/19/EU Waste Electrical and Electronic Equipment (WEEE)
- Directive 2014/30/EU Electromagnetic Compatibility (EMC)
- Directive 2014/35/EU Low Voltage Directive (LVD)
- Directive 2014/53/EU Radio Equipment Directive (RED)
- CRoHS - China RoHS
- NEBS Level 3
- BSMI Mark - Taiwan
- CE Mark - Common Europe
- KC Mark - South Korea
- RCM Mark – Australia
- TEC Mark - India (excludes SR-1x-48D and SR-1x-92S)
- UKCA Mark - United Kingdom
- VCCI Mark – Japan

Refer to the 7750 SR-1x 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 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.

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