

Nokia 7750 SR-s Service Router

Release 21

The Nokia 7750 SR-s series of IP routers takes performance to new heights. It delivers the massive scale, comprehensive features and platform versatility essential for IP networking in the 5G and cloud era. With continuous design innovation and proven investment protection, the 7750 SR-s helps build an IP network that can evolve with changing needs for years to come.

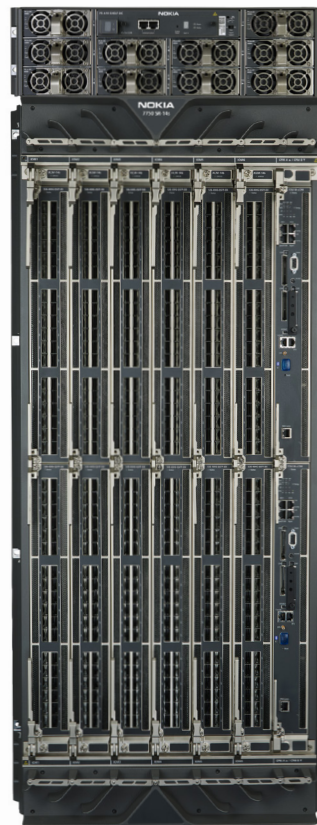
Overview

More than ever, networks keep us going. As networks experience unprecedented traffic growth and unpredictable demands, operators are on a quest to meet ever-increasing performance requirements while at the same time looking to create a robust network designed to protect itself.

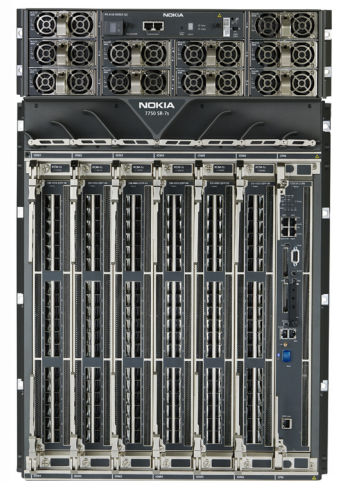
The 7750 SR-s addresses these imperatives, enabling operators to build a bigger, smarter, automated and secure network, with superior return on investment.

At the heart of the 7750 SR-s is the highly programmable Nokia FP4 network processing (NP) silicon. It is an essential element for high performance, driving industry-leading capacity and density with deterministic performance at scale, without compromise. It provides enhanced packet intelligence and control capabilities to optimize traffic flows and protect network infrastructure against distributed denial of service (DDoS) attacks.

Powered by the comprehensive features of the Nokia Service Router Operating System (SR OS), the 7750 SR-s supports a full array of network functions and services, achieving scale and efficiency without compromising versatility.



7750 SR-14s



7750 SR-7s



7750 SR-2s



7750 SR-1s

For webscale operators, the 7750 SR-s delivers massive scalability and comprehensive features for deployment in data centers and point-of-presence (PoP) locations to maximize application performance for exceptional customer experience.

For service providers the 7750 SR-s is deployed in data center, WAN and aggregation networks to support the full spectrum of provider edge, gateway and core functions for advanced residential, mobile and enterprise services.

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

The Nokia 7750 SR product family consists of the Nokia 7750 SR-s series, the Nokia 7750 SR series, the Nokia 7750 SR-a series and the Nokia 7750 SR-e series.

Features and benefits

FP4: Performance at scale

Nokia FP4 silicon features innovative architectural advantages. Intelligent memory provides multidimensional scale and future evolution. The fully buffered chipset with ingress and egress shaping provides superior upstream and downstream throughput. The external media access control (MAC) with pre-classifiers and buffers is used to set the quality priority for individual traffic flows to fully respect QoS and guarantee priority when performing intelligent fan-in/fan-out (iFIFO).

FP4 design innovations provide deterministic behavior for assured performance at scale, even when complex intensive packet processing operations are required. They enable the 7750 SR-s to deliver line-rate capacity that does not degrade as advanced capabilities are enabled. Networks can be engineered according to strict rules and policies that will stand up in all service combinations and usage circumstances—without compromise.

FP4 provides enhanced packet intelligence and control capabilities used for DDoS protection. It collects granular, real-time telemetry data samples, delivers iFiFo and enables and a 400G control plane.

Massive scale

The 7750 SR-s is available in five chassis variants: the 7750 SR-1s (fixed and modular), 7750 SR-2s, 7750 SR-7s and 7750 SR-14s.

The 7750 SR-s scales in system capacity from 3.2 Tb/s half duplex (HD) up to 288 Tb/s HD to fit a variety of locations and deployment models.

The 7750 SR-s is optimized to enable next-generation network functions and services with high-density interfaces for 10GE, 40GE, 100GE and 400GE networking environments. It provides up to 4,320 x 10GE, 1,440 x 100GE and 288 400GE interfaces with flexible breakout options, including 10 x 10GE and 4 x 100GE.

The modular system architecture and universal line-card connectors give the 7750 SR-s flexible interface expansion options and economic scaling of switching capacity, density and connector type.

For further port extension options, Nokia 7210 Service Access Switch (SAS) satellites offer local or remote GE and 10GE port expansion through an external system.

400GE IP-optical integration

The advent of 400ZR and 400G ZR+ coherent router optics presents an opportunity for operators to optimize IP/optical network designs in the 400G era.

Based on open interworking standards and powered by state-of-the-art silicon photonics, these compact and modular 400GE transceivers offer a low-cost/high-density alternative to conventional solutions using grey router optics in combination with integrated wavelength division multiplexing (WDM) transponders in optical line systems.

The 7750 SR-s is ready for the 400GE era. 400ZR and 400ZR+ pluggable transceivers are supported in QSFP56-DD form factors to optimize density and performance for high-capacity data center interconnect, metro and regional access, edge and core network applications.

Foresight drove innovative power and cooling designs of 7750 SR-s line cards at product inception to anticipate the future introduction of high-powered optics. This Nokia design advantage enables you to equip 400ZR, 400ZR+ and 400G multihaul transceivers in deployed systems and in any cage without changing hardware.

A standards-based Generalized MPLS (GMPLS) user-network interface (UNI) enables IP-optical control plane integration, allowing the 7750 SR-s to efficiently coordinate IP routing and transport requirements across administrative boundaries and to dynamically set up optical segments and end-to-end transport connections.

Pay-as-you-grow licensing

A flexible FP4 pay-as-you-grow licensing model provides a choice of entry points for immediate requirements and the ability to scale in-place for evolving needs with software-only upgrades. This provides cost savings, ensuring operators pay only for the required functionality.

Capacity licenses scale bandwidth, connector density and intelligent aggregation mode options. Functional licenses scale services through control options on egress hardware queues and egress policers. Each line card supports multiple combinations of these licenses to scale all attributes of capacity and functionality to cost-effectively scale the system while protecting hardware investments.

Energy efficiency for sustainability

Energy-efficient design innovations of the 7750 SR-s increases the sustainability of IP networks through reduced emissions.

The FP4 chipset architecture enables line card designs with fewer FP4 complexes and fewer components on each board to lower power consumption. The FP4 memory architecture is also exceptionally power-efficient. Power consumption scales with licensing level to drastically reduce power when only a fraction of a line card is in use. With Nokia FP4, these and other mechanisms are dynamic, enabling each 7750 SR-s system to quickly and automatically adapt to lower power consumption.

The innovative 7750 SR-s line card design has dedicated air cooling channels, dual-sided circuit boards and no stacked optical cages. This design improves energy efficiency with reduced component pre-heating and even cooling to all cages to support 400G ZR and 400G ZR+ optics in all cage positions.

The innovative 7750 SR-7s and SR-14s chassis design uses an orthogonal, direct connect design to provide straight-through, unobstructed front-to-back airflow. With no air turns, this design reduces fan speeds and lowers fan power consumption.

Intelligent fan-in/fan-out

To cost-effectively meet stringent high-density aggregation scenarios and maximize asset utilization, the 7750 SR-s delivers unprecedented intelligent fan-in/fan-out (iFIFO) capabilities. This is a leading capability with FP4, enabling an eXpandable Media Adapter-s (XMA-s) and an Input Output Module (IOM-s) to handle more aggregation than capacity in an exceptionally smart way.

The pre-classification and pre-buffering capabilities of FP4 allow the 7750 SR-s to support up to 2.5 times intelligent aggregation per slot. This enables a single 4.8 Tb/s FD XMA-s to support up to 12 Tb/s FD of iFIFO, with up to 64 GB of packet buffering plus micro-buffering consisting of a 12 million packet pre-buffer for strict priority pre-classification and scheduling, ensuring that aggregation is always intelligent and fully scheduled.

The 3.0 Tb/s FD IOM-s supports up to 4 Tb/s FD of iFIFO and the 1.5 Tb/s FD IOM-s supports up to 4.0 Tb/s of iFIFO.

This innovative approach to aggregation allows multiple network layers to be collapsed into a single layer, enables superior peering capabilities, and provides industry-leading support for a high degree of fractional flows. Where competing solutions do not support native aggregation or will drop traffic indiscriminately when oversubscribed, all generations of FP are always deterministic and fully scheduled based on strict QoS priorities.

This approach also significantly reduces the number of network elements for huge power savings and saves up to one third the cost of a traditional leaf/

spine topology to significantly lower the TCO. Even more, the use of iFIFO is extremely power efficient. For example, the same line card, when maximally deployed in a 7750 SR-14s, will drop the watts/Gigabit by 65 percent for a huge power savings.

Innovative system design

The 7750 SR-s combines principles from data center networking with traditional high-quality telecom standards and FP-based system design. Key design innovations include:

- Front-to-back cooling with orthogonal direct cross-connect, removing the need for a midplane/backplane and providing upgradability beyond midplane/backplane-constrained systems
- Decoupled power subsystem design for maximum flexibility and with any of AC, DC or HVDC
- Enhanced EMI protection with a complete Faraday cage design, a requirement for any system supporting next-generation Serializer/Deserializer (SERDES) speeds
- Innovative line card design with no stacked QSFP28 or QSFP-DD cages, dual-sided PCBs with components distributed top and bottom, and dedicated cooling air channels for those same top and bottom components. This design results in less component pre-heating, improved energy efficiency and even cooling to all cages, enabling 20w optics in any cage.

Proven investment protection

System-driven innovations are implemented with longevity in mind. Proven across four generations of FP silicon, each new generation of FP silicon supports seamless backwards compatibility to extend the product life of deployed systems. Line card designs anticipate future requirements for higher powered optics and speeds along with flexible licensing to cost-effectively scale capacity.

The programmability of FP and SR OS integration ensures quick adaptation of new protocols and features, and a future-ready architecture to 800G links and beyond. This means adding new silicon enhancements, capacity and capabilities are field extensible, without a forklift.

Combined, these attributes provide the best investment protection in the industry and allow operators to build an IP network that can evolve with changing needs for years to come.

Comprehensive features

Nokia's feature-rich 64-bit 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-s has the intelligent capabilities and tools to define and deliver the most stringent SLAs and end-user quality of experience (QoE).

The 7750 SR-s 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 automation and DDoS security.

Leveraging Nokia SR OS, the 7750 SR-s supports value-added services and network functions through the 7750 SR Extended Services Appliance (ESA), including Application Assurance (AA), Layer 7 Stateful Firewall, Network Address Translation (NAT) and gateways.

Versatile platform

The comprehensive routing features of the Nokia SR OS enable the 7750 SR-s to support a full array of network functions and services. The SR OS combined with licensing and line card modularity provides complete configuration versatility to support multiple network roles with deterministic performance on a single platform.

For webscale companies, the 7750 SR-s delivers massive scalability along with leading features for data center edge functions, including aggregation, gateway, interconnect and internet/peering. In the PoP it supports internet/peering edge and core router functions.

For service providers, the 7750 SR-s is deployed in WAN and aggregation networks to support IP edge and gateway functions, including:

- Broadband services: IP aggregation, peering edge and multi-access broadband network edge functions:
 - Broadband Network Gateway (BNG)
 - Security Gateway (SeGW)
 - Trusted Wireless Access Gateway (TWAG)
 - Hybrid Access Gateway (HAG)
 - Disaggregated BNG
 - Network Enhanced Residential Gateway (NERG)
- Mobile services:
 - IP aggregation
 - IP security gateway
 - WLGW
 - Multi-access edge in IP mobile anyhaul
- Enterprise VPN services:
 - IP aggregation
 - Provider edge
 - Internet access
 - Cloud and data center interconnect (DCI) services.

In service provider data centers, support includes gateway, interconnect and internet/peering functions. In network backbones, core routing functions support includes Border Gateway Protocol (BGP) peering, internet peering, MPLS switching, and infrastructure service requirements.

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

High availability

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

Cross-domain management

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

Model-driven management

To simplify and automate network operations, the 7750 SR-s 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 NSP also supports these interfaces using YANG models to customize automation into operational use cases.

SDN integration and automation

The 7750 SR-s 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-s 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.

The NSP is further assisted by Deepfield analytics to support insight-driven automation of network and flow optimization as well as DDoS attack mitigation.

Hardware overview

The 7750 SR-s is available in four chassis variants: the 7750 SR-1s, SR-2s, SR-7s and SR-14s.

It supports a wide range of common system modules and interfaces and the 7750 SR ESA, all of which are optimized to address various network service and function requirements.

Switch Fabric Module-s (SFM-s)

The SFM-s and the XMA-s Control Module-s (XCM-s) leverage orthogonal direct cross-connect technology to create a system design that does away with a backplane/midplane, providing upgradability well beyond traditional system designs with the 7750 SR-7s and 7750 SR-14s chassis. Fabrics are fully redundant, supporting graceful capacity degradation in case multiple SFM-s modules fail.

Control Processor Module-s (CPM-s)

The CPM2-s is a pluggable, hot-swappable module housed in a Control Management Adapter-s (CMA-s) on the 7750 SR-7s and 7750 SR-14s. The CPM2-s provides the management, security and control plane processing for the 7750 SR-7s and 7750 SR-14s.

With its 48-core CPU and 64G of DRAM, the CPM2-s enables a 400G FD control plane with performance and buffering enhancements for telemetry, operations, administration and maintenance (OAM), an additional optical GE SFP sync port, and a 20 percent clock frequency boost. It enables a six-slot, control redundant configuration for the 7750 SR-7s, for a 20 percent increase in capacity.

The 7750 SR-2s supports two pluggable, hot-swappable CPM-2s modules and is installed directly on the front of the 7750 SR-2s chassis. The CPM-2s provides the management and control plane processing while the XCM-2s performs security functions.

Redundant CPM2-s and CPM-2s modules operate in a hitless, stateful failover mode with full nonstop routing and nonstop services in line with capabilities on all 7750 SR platforms. Central processing and memory are separated from the forwarding function

on the interface modules to ensure the utmost system resiliency.

All 7750 SR-s systems support DEC/DTE Console, Bluetooth, Management, 1588/SyncE, OES, BITS port and a 1PPS port, Compact Flash and Alarm ports on every CPM2-s and CPM-2s. For the 7750 SR-1s, these control interfaces are fixed on the integrated chassis.

eXpandable Media Adapter-s (XMA-s)

The universal XMA-s provides flexible interface options for the 7750 SR-2s, 7750 SR-7s and 7750 SR-14s, including high-density 10GE, 40GE, 100GE and 400GE interfaces. They contain an FP4-based forwarding complex that performs typical functions such as packet lookups, traffic classification, processing and forwarding, service enablement and QoS.

The XMA-s uses front faceplate connectors capable of supporting native QSFP-DD and QSFP28 optical modules with any speed on any connector, and includes support for 4 x 10GE, 10 x 10GE and 2 x 100GE and 4 x 100GE breakout options. Optics support for the QSFP-DD XMA-s includes QSFP56-DD 400G ZR and 400G ZR+ pluggable transceivers.

The XMA-s is available in four base adapters:

- 36 connectors of QSFP-DD at 4.8 Tb/s full duplex (FD) (with 4 FP4 complexes)
- 36 connectors of QSFP28 at 3.6 Tb/s FD (with 3 FP4 complexes)
- 36 connectors of QSFP28 at 2.4 Tb/s FD (with 2 FP4 complexes)
- 18 connectors of QSFP28 at 1.2 Tb/s FD (with 1 FP4 complex).

With iFIFO an XMA-s can support up to 12 Tb/s FD per slot.

Smaller licensed versions of these base variants are available with lower capacities and densities to provide flexible entry points with growth options to tune capacity and functionality according to evolving needs, including iFIFO options—all enabled through software without hardware replacement.

QSFP28 and QSFP-DD optics with flexible breakout options enable high-density 10GE and 100GE interfaces. QSFP-DD is backwards compatible to QSFP28, and Nokia takes the additional step of supporting 10 x 10GE breakout per QSFP28. This enables leading 10GE density without the loss of 60 Gb/s of capacity per slot or forcing design shortcuts.

XMA Control Module-s (XCM-s)

The XMA-s is housed in an XCM-s. The XCM-s contains a slot-level control plane subsystem and fabric interface.

The 7750 SR-14s XCM-s delivers 9.6 Tb/s FD slot capacity, supporting a pair of XMA-s adapters. The SR-14s supports up to six XCM-s modules.

The 7750 SR-7s XCM-s delivers 4.8 Tb/s FD slot capacity per XMA-s. The SR-7s supports up to five or six XCM-s modules.

The 7750 SR-2s supports two XCM-2s modules, each supporting a single XMA-s of up to 4.8 Tb/s FD. The SR-2s system supports an integrated switch fabric per XCM-2s.

Input/Output Module-s (IOM-s)

The IOM-s provides a modular, pluggable FP4-based forwarding complex for the 7750 SR-2s, SR-7s and SR-14s. Based on two FP4 complexes, the 3.0 Tb/s IOM-s supports up to two pluggable Media Dependent Adapter-s (MDA-s) types and is software upgradable in increments from 1.6 Tb/s FD to 2.4 Tb/s FD to 3.0 Tb/s FD. With iFIFO it can support up to 4 Tb/s.

Based on one FP4 complex, the 1.5 Tb/s IOM-s supports up to two pluggable MDA-s types and is software upgradable in increments from 800 Gb/s FD to 1.5 Tb/s FD. With iFIFO it can support up to 4 Tb/s.

Pay-as-you-grow licensing provides flexible entry points with growth options to tune capacity and functionality according to evolving needs, including iFIFO options—all enabled through software without hardware replacement.

Media dependent adapter-s (MDA-s)

The MDA-s provides modular interface connectivity with a variety of interface types, variants and density configurations. It supports up to 1.5 Tb/s FD in capacity and is supported in the 7750 SR-14s, SR-7s, SR-2s and SR-1s (modular).

The hot-swappable MDA-s uses front faceplate connectors and supports QSFP-DD, QSFP28, SFP-DD, SFP+ and digital coherent optics (DCO) with flexible 4 x 10GE, 10 x 10GE, 2 x 100GE and 4 x 100GE breakout options. Optics support for MDA-s variants with QSFP-DD connectors includes QSFP56-DD 400G ZR and 400G ZR+ pluggable transceivers.

7750 SR-1s: Fixed and modular variants

The 7750 SR-1s is available in fixed and modular variants.

The fixed variant has an integrated XMA-s/ XCM-s and a simplex control plane. It comes in base variants of 36 connectors of QSFP-DD at 9.6 Tb/s HD and 36 connectors of QSFP28 at 4.8 Tb/s HD, and includes support for 4 x 10GE, 10 x 10GE, 2 x 100GE, and 4 x 100GE optical breakout options. With iFIFO it can support up to 12 Tb/s FD per slot. Optics support for the QSFP-DD variant includes QSFP56-DD 400G ZR and 400G ZR+ pluggable transceivers.

The 6.0 Tb/s HD 7750 SR-1s modular variant has an integrated 3.0 Tb/s IOM-s/XCM-s, supports up to two MDA-s types and has a simplex control plane. It delivers up to 1.5 Tb/s FD to each MDA-s and includes support for 4 x 10GE, 10 x 10GE, 2 x 100GE and 4 x 100GE optical breakout options. With iFIFO it can support up to 4 Tb/s FD per slot. It shares the same MDA-s types with the SR-14s, SR-7s and SR-2s to provide fully modular interface flexibility across the 7750 SR-s series.

Both variants are available in a number of pay-as-you-grow licensable configurations to provide flexible entry points and to scale capacity and services through in-place licensing options, including iFIFO, enabled through software without hardware replacement.

Power shelf

The 7750 SR-7s and SR-14s implement a building-block approach with a decoupled power subsystem design. DC, AC or HVDC power type is available via a clip-on power shelf that can be flexibly changed and spared independent of the main chassis. This decoupled power design provides a high degree of flexibility along with better cooling efficiencies.

The two separate power shelves can be of the same power type or different power types.

The 7750 SR-7s and SR-14s share common power shelves. The 7750 SR-1s and SR-2s have an integrated power shelf that is either AC/HVDC or LVDC.

All 7750 SR-s systems share common power supply units (PSUs) that insert into the fixed or modular power shelves.

Decoupling power from the 7750 SR-7s and SR-14s ensures that the system has flexibility to evolve to future changing power requirements (type or amount) without a shelf or system upgrade. The physical position of power supplies at the top of the 7750 SR-s chassis also ensures that the system never needs to rely on rear-mounted power supply fans to cool next-generation ASICs/optics.

7750 SR Extended Services Appliance (ESA)

The Nokia 7750 SR ESA is mounted external to the 7750 SR-s system. It is used to extend the level of networking functionality and generalized processing for IP/MPLS routing applications for integrated services on the 7750 SR-s.

The 7750 SR-s forwards traffic from a selected port at speeds of 100G, 40G, 25G or 10G to connect to the Nokia ESA, relieving high-performance slots from needing to host service processing, value-added services and network functions.

Service support includes AA, Layer 7 Stateful Firewall, CG-NAT, LNS, IPsec, IP tunneling and WLGW.

7210 Service Access Switch (SAS) satellites

Nokia 7210 SAS satellites provide flexibility and improve the cost efficiency of the 7750 SR-s. They offer GE and 10GE port extension through an external system to the 7750 SR-s. They can be colocated in the same 7750 SR-s rack or located remotely, within distance of pluggable optics.

7210 SAS satellites are logically integrated into the 7750 SR-s with one single IP address. Configuration is done on the 7750 SR-s and satellites utilize the 7750 SR-s QoS, buffering, multicast and rich service provisioning.

Technical specifications

Table 1. Hardware specifications for the 7750 SR-s

	7750 SR-1s	7750 SR-2s	7750 SR-7s	7750 SR-14s
System capacity (HD)	9.6 Tb/s	19.2 Tb/s	57.6 Tb/s	115.2 Tb/s
Per-slot capacity (FD)	4.8 Tb/s	4.8 Tb/s	4.8 Tb/s	4.8 Tb/s
Per-slot iFIFO capacity (FD)	12 Tb/s	12 Tb/s	12 Tb/s	12 Tb/s
System design	Centralized; fixed and modular variants; control non-redundant	Centralized; control redundant	Orthogonal direct cross-connect; redundant control and redundant fabric	Orthogonal direct cross-connect; redundant control and redundant fabric
Number of XMA-s	1; integrated	2	6	12
Common equipment redundancy	MDA-s, PSU, fan	XMA-s, XCM-2s, MDA-s, IOM-s, CPM-2s, PSU, fan	XMA-s, XCM-7s, MDA-s, IOM-s, SFM-s, CPM2-s, CPM-s, PSU, fan	SFM-s, XMA-s, XCM-14s, MDA-s, IOM-s, CPM2-s, CPM-s, PSU, fan
Hot-swappable modules	PSU, fan	XMA-s, XCM-2s, CPM-2s, PSU, fan	XMA-s, XCM-7s, SFM-s, CPM2-s, CPM-s, PSU, fan	XMA-s, XCM-14s, SFM-s, CPM2-s, CPM-s, PSU, fan
Dimensions	<ul style="list-style-type: none"> • 3RU, includes integrated power shelf • Height: 13.3 cm (5.25 in) • Width: 44.5 cm (17.5 in) • Depth: 67.8 cm (26.69 in) 	<ul style="list-style-type: none"> • 5RU, includes integrated power shelf • Height: 22.2 cm (8.75 in) • Width: 44.5 cm (17.5 in) • Depth: 81.38 cm (32.04 in) 	<ul style="list-style-type: none"> • 13RU + 3RU (LVDC) or 4RU • (AC/HVDC) power shelf • Height: <ul style="list-style-type: none"> – 71.1 cm (28 in); (16RU) – 75.6 cm (29.75 in); (17RU) • Width: 44.5 cm (17.5 in) • Depth: 85.8 cm (33.8 in) 	<ul style="list-style-type: none"> • 24RU + 3RU (LVDC) or 4RU • (AC/HVDC) power shelf • Height: <ul style="list-style-type: none"> – 120.0 cm (47.2 in); (27RU) – 124.5 cm (49 in); (28RU) • Width: 44.5 cm (17.5 in) • Depth: 87.9 cm (34.6 in)
Weight	Fixed system <ul style="list-style-type: none"> • 1.2 Tb/s and 2.4 Tb/s variants: <ul style="list-style-type: none"> – Empty: 23.8 kg (52.5 lb) – Loaded: 48.8 kg (107.5 lb); excludes optics • 3.6 Tb/s, 4.8 Tb/s, and 12 Tb/s variants: <ul style="list-style-type: none"> – Empty: 25.4 kg (56 lb) – Loaded: 50.3 kg (111 lb); excludes optics 	<ul style="list-style-type: none"> • Empty: 27.21 kg (60.0 lb) • Loaded: 102.06 kg (225 lb); excludes optics 	<ul style="list-style-type: none"> • Empty: 45.45 kg (100.0 lb) • Loaded: 215.3 kg (473.6 lb); excludes power shelf and optics 	<ul style="list-style-type: none"> • Empty: 62.4 kg (137.5 lb) • Loaded: 370.1 kg (815.7 lb); excludes power shelf and optics
Power	<ul style="list-style-type: none"> • LVDC: -48 V/-60 V, 80 A max per feed • HVDC: 260-400 V DC, 12 A max per source • AC: 200 V-240 V AC, 50 Hz/60 Hz, 16 A per feed • N+N redundancy • Integrated 1RU power shelf • Common PSUs across all 7750 SR-s variants 	<ul style="list-style-type: none"> • LVDC: -48 V/-60 V, 80 A max per feed • HVDC: 260-400 V DC, 12 A max per source • AC: 200 V-240 V AC, 50 Hz/60 Hz, 16 A per feed • N+N redundancy • Integrated 1RU power shelf • Common PSUs across all 7750 SR-s variants 	<ul style="list-style-type: none"> • LVDC: -48 V/-60 V, 80 A max per feed • HVDC: 260-400 V DC, 12 A max per source • AC: 200 V-240 V AC, 50 Hz/60 Hz, 16 A per feed • N+N redundancy • Shelf common with the SR-14s • Common PSUs across all 7750 SR-s variants 	<ul style="list-style-type: none"> • LVDC: -48 V/-60 V, 80 A max per feed • HVDC: 260-400 V DC, 12 A max per source • AC: 200 V-240 V AC, 50 Hz/60 Hz, 16 A per feed • N+N redundancy • Shelf common with the SR-7s • Common PSUs across all 7750 SR-s variants
Cooling	Front to back	Front to back	Front to back	Front to back

Table 2. Nokia 7750 SR-s maximum density

Ethernet speed	7750 SR-1s	7750 SR-2s	7750 SR-7s	7750 SR-14s
10GBASE	360	720	2,160	4,320
40GBASE	36	72	216	432
100GBASE	48/120*	96/240*	288/720*	576/1,440*
400GBASE	12/24*	24/48*	72/144*	144/288*

* With intelligent fan-in/fan-out (iFIFO)

Table 3. Nokia 7750 SR-s XMA-s variant and capacity licensing overview (for SR-2s, SR-7s, SR-14s)

XMA-s base hardware description	Capacity licensing options		Maximum density per slot			
	Connectors	Capacity	10GBASE	40GBASE	100GBASE	400GBASE
1.2 Tb/s QSFP28 Universal XMA-s: <ul style="list-style-type: none"> Flexible 10GBASE breakout options Packet buffering of 16 GB plus micro-buffering consisting of a 3 million packet pre-buffer 	6	0.6 Tb/s	60	6	6	—
	12	1.2 Tb/s	120	12	12	—
	18	1.2 Tb/s with iFIFO of 1.8 Tb/s	180	18	18	—
2.4 Tb/s QSFP28 Universal XMA-s: <ul style="list-style-type: none"> Flexible 10GBASE breakout options Packet buffering of 32 GB plus micro-buffering consisting of a 6 million packet pre-buffer 	16	1.6 Tb/s	160	16	16	—
	24	2.4 Tb/s	240	24	24	—
	36	2.4 Tb/s with iFIFO of 3.6 Tb/s	360	36	36	—
3.6 Tb/s FD QSFP28 Universal XMA-s: <ul style="list-style-type: none"> Flexible 10GBASE breakout options Packet buffering of 48 GB plus micro-buffering consisting of a 6 million packet pre-buffer 	36	3.6 Tb/s	360	36	36	—
4.8 Tb/s QSFP-DD Universal XMA-s: <ul style="list-style-type: none"> Flexible 10GBASE, 2 x 100GBASE and 4 x 100GBASE breakout options Packet buffering of 64 GB plus micro-buffering consisting of a 12 million packet pre-buffer 	36, QSFP28	3.6 Tb/s	360	36	36	—
	36	3.6 Tb/s	360	36	36	—
	36	4.8 Tb/s	360	36	48	12
	36	4.8 Tb/s with iFIFO of 12 Tb/s	360	36	120	24

Table 4. Nokia 7750 SR-1s fixed variant and capacity licensing overview

SR-1s base hardware variant	Capacity licensing options		Maximum density			
	Connectors	Capacity	10GBASE	40GBASE	100GBASE	400GBASE
4.8 Tb/s (HD) QSFP28 7750 SR-1s: <ul style="list-style-type: none"> Flexible 10GBASE breakout options Packet buffering of 32 GB plus micro-buffering consisting of a 6 million packet pre-buffer 	16	1.6 Tb/s	160	16	16	—
	24	2.4 Tb/s	240	24	24	—
	36	2.4 Tb/s with iFIFO of 3.6 Tb/s	360	36	36	—
9.6 Tb/s (HD) QSFP-DD 7750 SR-1s: <ul style="list-style-type: none"> Flexible 10GBASE and 100GBASE breakout options Packet buffering of 64 GB plus micro-buffering consisting of a 12 million packet pre-buffer 	36, QSFP28	3.6 Tb/s	360	36	36	—
	36	3.6 Tb/s	360	36	36	—
	36	4.8 Tb/s	360	36	48	12
	36	4.8 Tb/s with iFIFO of 12 Tb/s	360	36	120	24

Table 5. Nokia 7750 SR-s XMA-s functional feature licenses (for SR-1s, SR-2s, SR-7s and SR-14s)

Functional level	Number of egress hardware queues	Number of egress policers
Core routing	1,024	1,024
Edge routing	16,384	16,384
High scale edge routing	128,000	Up to 384,000

Table 6. Nokia 7750 SR-s IOM-s capacity licencing overview

	7750 SR-1s (modular)*	7750 SR-2s	7750 SR-7s	7750 SR-14s
	Slot capacity licenses (FD)	Slot capacity licenses (FD)	Slot capacity licenses (FD)	Slot capacity licenses (FD)
3.0 Tb/s IOM-s	1.6 Tb/s with iFIFO up to 4.0 Tb/s	1.6 Tb/s with iFIFO up to 4.0 Tb/s	1.6 Tb/s with iFIFO up to 4.0 Tb/s	1.6 Tb/s with iFIFO up to 4.0 Tb/s
	2.4 Tb/s with iFIFO up to 4.0 Tb/s	2.4 Tb/s with iFIFO up to 4.0 Tb/s	2.4 Tb/s with iFIFO up to 4.0 Tb/s	2.4 Tb/s with iFIFO up to 4.0 Tb/s
	3.0 Tb/s with iFIFO up to 4.0 Tb/s	3.0 Tb/s with iFIFO up to 4.0 Tb/s	3.0 Tb/s with iFIFO up to 4.0 Tb/s	3.0 Tb/s with iFIFO up to 4.0 Tb/s
1.5 Tb/s IOM-s	—	800 Gb/s with iFIFO up to 4.0 Tb/s	800 Gb/s with iFIFO up to 4.0 Tb/s	800 Gb/s with iFIFO up to 4.0 Tb/s
	—	1.5 Tb/s with iFIFO up to 4.0 Tb/s	1.5 Tb/s with iFIFO up to 4.0 Tb/s	1.5 Tb/s with iFIFO up to 4.0 Tb/s

* Integrated IOM-s

Table 7. Nokia 7750 SR-s MDA-s overview*

MDA-s types (connector optic)	Ethernet speed options	7750 SR-1s (modular)	7750 SR-2s	7750 SR-7s	7750 SR-14s
4-connector QSFP-DD + 4-connector QSFP28/QSFP+	400G/100G/10GBase	8/40/160	16/80/320	48/240/960	96/480/1920
2-connector QSFP-DD + 2-connector QSFP28/QSFP+	400G/100G/10GBase	4/20/80	8/40/160	24/120/480	48/240/960
18-connector QSFP28/QSFP+	100G/10GBase	36/360	72/720	216/2160	432/4320
24-connector SFP-DD/SFP+	100G/10GBase	40/48	80/96	240/288	480/576
16-connector SFP-DD/SFP+ (MACsec) + 4-connector QSFP28/QSFP+	100G/25G/10GBase	40/32/112	80/64/224	240/192/672	480/384/1344
8-connector SFP-DD/SFP+ (MACsec) + 2-connector QSFP28/QSFP+	100G/25G/10GBase	20/16/56	40/32/112	120/96/336	240/192/672
6-connector CFP2-DCO	100GBase	24	48	144	288
3-connector CFP2-DCO	100GBase	12	24	72	144

* With intelligent fan-in/fan-out (iFIFO)

Feature and protocol support highlights

Feature and protocol support in the 7750 SR-s 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 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, 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 the 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 toward 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 policies
 - RIB API tunnel entries
 - Interior Gateway Protocol (IGP) SIDs

Layer 2 features

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

Layer 3 features

- IP-VPN
- Enhanced internet services
- EVPN for Layer 3 unicast and Optimized Inter-Subnet Multicast (OISM) services with integrated routing and bridging (EVPN-IRB)
- Multicast VPN (MVPN), which includes Inter-AS MVPN and Next Generation MVPN (NG-MVPN)

System features

- Ethernet satellites: Port expansion through local or remote Nokia 7210 SAS-S series GE, 10GE and 100GE satellite variants, offering 24/48 x GE ports or 64 x GE/10GE ports over 10GE and 100GE uplinks
- OAM: Extensive fault and performance monitoring. OAM includes:
 - Ethernet Connectivity Fault Management (CFM) (IEEE 802.1ag, ITU-T Y.1731)
 - Ethernet in the First Mile (EFM) (IEEE 802.3ah)
 - Bidirectional Forwarding Detection (BFD), including Seamless BFD
 - cflowd
 - Two-Way Active Measurement Protocol (TWAMP and TWAMP Light/STAMP)
 - A full suite of MPLS and Segment Routing OAM tools
- Timing:
 - ITU-T Synchronous Ethernet (SyncE)
 - IEEE 1588v2 Precision Time Protocol (PTP)

- Network Time Protocol (NTP)
- BITS ports (T1, E1, 2M)
- 1PPS
- QoS:
 - Flexible intelligent packet classification
 - Ingress and egress hierarchical QoS (H-QoS) with multitiered shaping 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
 - ISSU¹
 - Fast reroute for IP, RSVP, LDP and segment routing
 - Pseudowire redundancy
 - ITU-T G.8031 and G.8032
 - Weighted ECMP
 - Weighted, mixed-speed link aggregation

Management features

- Model-driven configuration and state management through the MD-CLI, NETCONF and gRPC/gNMI using YANG models; streaming telemetry through gRPC/gNMI subscriptions; operations through NETCONF using YANG models and gNOI.
- 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

¹ Requires redundant CPM modules

Standards support²

Environmental specifications

- Operating temperature: 5°C to 40°C (41°F to 104°F)
- Operating relative humidity: 5% to 85% non-condensing
- Operating altitude: Safety certified up to 3960 m (13,000 ft); operating temperature range de-rated above 1,829 m (6,000 ft)

Safety

- AS/NZS 60950.1
- AS/NZS 62368.1
- IEC/EN 60825-1
- IEC/EN 60825-2
- IEC/EN/UL/CSA 60950-1 Ed2 Am2
- IEC/EN/UL/CSA 62368-1 Ed2

EMC emission

- AS/NZS CISPR 32 Class A
- BSMI CNS13438 Class A
- EN 55032 Class A
- FCC Part 15 Class A
- ICES-003 Class A
- IEC CISPR 32 Class A
- IEC/EN 61000-6-4
- KN 32 Class A
- VCCI Class A

EMC immunity

- ATIS-0600315.01.2015 HVDC Power Supply Interface
- BT GS7
- EN 55024
- EN 55035
- ETSI EN 300 132-1 (SR7s and SR-14s)
- ETSI EN 300 132-2 DC Power Supply Interface
- ETSI EN 300 132-3 AC Power Supply Interface
- ETSI EN 300 132-3-1 HVDC Power Supply Interface

- ETSI EN 300 386
- ETSI ES 201 468
- IEC CISPR 24
- IEC CISPR 35 (SR-1s and SR-2s)
- IEC/EN 61000-3-2 Power Line Harmonics
- IEC/EN 61000-3-3 Voltage Fluctuations and Flicker
- IEC/EN 61000-4-2 Electric Static Discharge
- IEC/EN 61000-4-3 Radiated, RF, EM field immunity
- IEC/EN 61000-4-4 Electrical Fast Transients
- IEC/EN 61000-4-5 Surge Immunity
- IEC/EN 61000-4-6 Immunity to conducted disturbances
- IEC/EN 61000-4-11 Voltage Interruptions
- IEC/EN 61000-6-2 Immunity for industrial environments
- ITU-T L.1200
- KN 35

Environmental/NEBS

- ATIS 0600010
- 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 300 019-2-3 Earthquake
- ETSI 300 753 Acoustic Noise, Class 3.2 (SR-1s and SR-2s only)
- GR-63-CORE, Level 3
- GR-1089-CORE, Level 3
- VZ.TPR.9205
- VZ.TPR.9305

Wireless

- ETSI EN 301 489-1
- ETSI EN 301 489-17 (Bluetooth)
- KN 301 489-1
- KN 301 489-17 (Bluetooth)

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



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)
- BSMI Mark - Taiwan
- CE Mark - Common Europe
- CRoHS - China RoHS
- KC Mark - South Korea
- NEBS Level 3
- RCM Mark - Australia
- VCCI Mark - Japan

MEF certifications

For a list of Nokia CE 1.0-, CE 2.0- and CE 3.0-certified products, refer to the [MEF certification registry](#).

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

About Nokia

We create technology that helps the world act together.

As a trusted partner for critical networks, we are committed to innovation and technology leadership across mobile, fixed and cloud networks. We create value with intellectual property and long-term research, led by the award-winning Nokia Bell Labs.

Adhering to the highest standards of integrity and security, we help build the capabilities needed for a more productive, sustainable and inclusive world.

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