Nokia 7750 Service Router

Release 15

The Nokia 7750 Service Router (SR) series of IP edge routers enables the delivery of advanced residential, enterprise, and mobile services. For enterprises, the 7750 SR series provides high-performance networking for cloud, data center, and branch office applications. Designed to stay ahead of evolving service demands driven by the cloud, 5G, and the Internet of Things, the 7750 SR product family consists of the 7750 SR series, the 7750 SR-e series, and the 7750 SR-a series.

High-performance IP edge

The Nokia 7750 SR series delivers high-performance routing and an extensive range of IP applications for service provider and enterprise networks. The 7750 SR scales system capacity from 2 Tb/s (half duplex) to 9.6 Tb/s (half duplex) and is equipped with high-density Gigabit Ethernet (GE), 10GE, 40GE and 100GE interfaces. At the heart of the 7750 SR is the highly programmable Nokia FP3 network processing silicon, an essential element in the quest for no compromise, high-speed, intelligent services and applications that can adapt to evolving customer requirements.

7750 SR-12e

7750 SR-12

7750 SR-7

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Service richness

With Nokia's feature-rich Service Router Operating System (SR OS) and extensive QoS capabilities, the Nokia 7750 SR has the service richness and tools to define and deliver the most stringent SLAs for high-value, differentiated services. With specialized application processing, the 7750 SR leverages embedded subscriber, service and application intelligence to enable deeper levels of integrated service capabilities. The 7750 SR supports tens of thousands of service flows for the delivery of residential mobile and enterprise internet access, Carrier Ethernet and IP VPN services, and more—all without compromising performance.

Full array of IP edge functions

The MEF Carrier Ethernet (CE) 2.0-certified 7750 SR supports a full array of IP network functions and applications, including:

- Broadband Network Gateway (BNG) for residential subscriber management
- Provider edge (PE) router for MPLS-enabled enterprise VPN, internet access, and cloud and data center interconnect services
- Mobile aggregation router for 3G, LTE, and LTE-A mobile backhaul applications
- Mobile packet core gateway supports 2G/3G/4G SGW/PGW functions and ePDG/TWAG for Wi-Fi® access
- WLAN gateway for Wi-Fi network aggregation
- Security gateway for securing mobile backhaul networks
- High-performance IP routing for enterprise WANs, including connectivity to the data center, internet and branch offices.

High availability

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

Carrier SDN integration

The 7750 SR and SR OS enable multivendor software-defined networking (SDN) control integration is enabled through OpenFlow, Path Computation Element Protocol (PCEP), Border Gateway Protocol with Link State (BGP-LS) and NETCONF/YANG interfaces. In combination with the Nokia Network Services Platform (NSP), the 7750 SR can be deployed as part of a Carrier SDN solution, supporting unified service automation and network optimization across IP, MPLS, Ethernet and optical transport layers.

IP/optical integration

Tunable 10G and integrated 100G coherent PM-QPSK tunable DWDM optics enable the 7750 SR to interface directly with the photonic transport layer without requiring optical transponders. A standards-based GMPLS user-network interface (UNI) enables the 7750 SR to efficiently coordinate IP routing and transport requirements across administrative boundaries and dynamically provision optical segments and end-to-end transport connections.

Network management

The Nokia 7750 SR is fully managed by the Nokia NSP, resulting in integrated network management across the access, aggregation, edge, and core network.

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Hardware overview

The Nokia 7750 SR series is available in three chassis variants—the 7750 SR-12e, 7750 SR-12 and 7750 SR-7—and supports a wide range of interfaces, integrated service adapters (ISAs) and common system modules that are optimized to address various network and application requirements. For details on the Nokia 7750 SR-e series and 7750 SR-a series, refer to the 7750 SR-e and 7750 SR-a data sheets.

Switch Fabric Module (SFM5-12e) – The SFM5-12e enables 400 Gb/s line rate connectivity between all slots of the 7750 SR-12e chassis. The fabric cards are 3+1 redundant with active-active load-sharing design and are hot-swappable. The SFM5-12e is a full-height card that is modular in design and houses the pluggable CPM5 for investment protection.

Switch Fabric Module (SFM5-12, SFM5-7) – The SFM5-12 and SFM5-7 enable 200-Gb/s (redundant) line rate connectivity between all slots of the 7750 SR-12 and SR-7 chassis. The fabric cards are 1+1 redundant with active-active load-sharing design and are hot-swappable. The SFM-12 and SFM5-7 are full-height cards that are modular in design and house the pluggable CPM5 for investment protection.

Control Processor Module (CPM5) – The CPM5 is a pluggable, hot-swappable module housed within the SFM5-12e, SFM5-12 and SFM5-7. The CPM5 provides the management, security and control plane processing for the Nokia 7750 SR-12e, SR-12, and SR-7. Redundant CPMs 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. Face plate interfaces include an RJ-45 BITS port and a 1PPS port and a 10/100/1000BASE (RJ-45) management interface port.

Switch Fabric/Control Processor Module (SF/CPM) – The SF/CPM provides data plane and control plane functionality in a full-height, hot-swappable module. The SF/CPM is 1+1 redundant with an active-active load-sharing design and is housed in an SR-12e, SR-12, and SR-7. Redundant SF/CPMs 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. Face plate interfaces include an RJ-45 BITS port and a 1PPS port and a 10/100/1000BASE (RJ-45) management interface port.

Integrated Media Module (IMM) – IMMs are line cards providing integrated processing and physical interfaces on a single module. IMMs are hot-swappable and provide high-capacity Ethernet interfaces, including variants with integrated tunable DWDM optics, and deliver up to 400 Gb/s (full duplex) per slot performance. For synchronization requirements, they also support ITU-T Synchronous Ethernet (Sync-E) and IEEE 1588v2.

Input/Output Module (IOM) – IOMs are optimized for versatility in deploying a variety of multiservice and Ethernet-based applications. Each IOM supports up to two MDA and ISA module types. IOMs are hot-swappable. The IOM4-e delivers up to 200 Gb/s (full duplex) per slot performance and the IOM3-XP supports up to 50 Gb/s (full duplex) per slot performance.

Media Dependent Adapter-e (MDA-e) – MDA-e's, common with the 7750 SR-12e, SR-12, and SR-7 and the 7750 SR-e series, support up to 100 Gb/s (full duplex) and provide physical Ethernet interface connectivity. They are available in a variety of interface and density configurations and are hot-swappable. They are supported with the IOM4-e in the SR-12e, SR-12, and SR-7 and with the IOM-e in the SR-e. For synchronization requirements, they support ITU-T Sync-E and IEEE 1588v2. They also support a wide range of Optical Transport Networking (OTN) signals: OTU1e, OTU2, OTU2e, OTU4; ITU-T G.709 and Forward Error Correction (FEC)*.

* Some features are not supported on all MDA-e variants.

Media Dependent Adapter (MDA) – MDAs, available in two hot-swappable types, provide modular physical interface connectivity and are available in a variety of interface and density configurations. MDA-XPs and MDAs support Ethernet and multiservice interfaces and support up to 25 Gb/s and 10 Gb/s respectively. For synchronization requirements, they also support ITU-T Sync-E and IEEE 1588v2.

Multiservice Integrated Service Module (MS-ISM) – MS-ISMs are hot-swappable, full-height resource modules. They provide specialized processing and buffering for deeper levels of integrated services and advanced applications. They leverage two embedded ISA2 general purpose multi-core processors and support up to 80 Gb/s of processing. Combination IMMs support Ethernet and an embedded ISA2, which supports up to 40 Gb/s of processing.

Multiservice Integrated Service Adapter 2 (MS-ISA2) - MS-ISA2s, common with the SR-12e, SR-12, and SR-7 and the SR-e series, are hot-swappable, half-height resource adapters. They provide specialized processing and buffering for deeper levels of integrated services and advanced applications. They support up to 40 Gb/s of processing and insert into an IOM4-e.

Integrated Service Module - Mobile Gateway (ISM-MG) – ISM-MGs are hot-swappable, full-height modules that fit into any 7750 SR I/O slot and provide the bearer functions for 2G/3G/4G and Wi-Fi access networks.

Technical specifications

Table 1. Technical specifications for the 7750 SR series

	7750 SR-12e	7750 SR-12	7750 SR-7
System throughput	• Switching capacity: 9.6 Tb/s (half duplex, non-redundant) or 7.2 Tb/s (half duplex, redundant) • Per-slot throughput: 400 Gb/s (full duplex, redundant)	• Switching capacity: 4 Tb/s (half duplex, redundant) • Per-slot throughput: 200 Gb/s (full duplex, redundant)	• Switching capacity: 2 Tb/s (half duplex, redundant) • Per-slot throughput: 200 Gb/s (full duplex, redundant)
Number of MDA-e's/MDAs/ISA2s per chassis	18	20	10
Number of IOMs/IMMs/ISMs per chassis	9	10	5
Common equipment redundancy	SFM5-12e, CPM5, SF/CPM, Mini-SFM, advanced power equalizers (APEQs), fans	SFM5-12, CPM5, SF/CPM, Power Entry Modules (PEMs), fans	SFM5-7, CPM5, SF/CPM, PEMs, fans
Hot-swappable modules	SFM5-12e, CPM5, SFM/CPM-12e, Mini-SFM-12e, IOMs, MDA-e's, MDAs, IMMs, ISMs, ISA2s, VSMs, APEQs, Enhanced Fan Trays (EFTs)	SFM5-12, CPM5, SF/CPM, IOMs, IMMs, ISMs, MDA-e's, MDAs, ISA2s, PEMs, VSMs, EFTs	SFM5-7, CPM5, SF/CPM, IOMs, MDA-e's, MDAs, IMMs, ISMs, ISA2s, VSMs, EFTs
Dimensions*	• Height: 97.8 cm (38.5 in), 22 RU • Width: 44.5 cm (17.5 in) • Depth: 76.2 cm (30 in)	• Height: 62.2 cm (24.5 in), 14 RU • Width: 44.5 cm (17.5 in) • Depth (without cable management): 64.5 cm (25.4 in) • Depth (with cable management): 76.5 cm (30.1 in)	• Height: 35.6 cm (14 in), 8 RU • Width: 44.5 cm (17.5 in) • Depth: 64.8 cm (25.5 in)

	7750 SR-12e	7750 SR-12	7750 SR-7
Weight*	• Empty: 79.4 kg (175 lb) • Loaded: 249.5 kg (550 lb)	• Empty: 56.4 kg (124.3 lb) • Loaded: 155.7 kg (343.3 lb)	• Empty: 41 kg (90.4 lb) chassis weight with factory installed fan tray and air filter • Loaded: 70.5 kg (155.4 lb)
Power	DC power: • DC-40 V to -72 V, 60A or 80A per feed or • DC 260 to 400 V, 13A per feed • 4+1 redundancy External AC power (option): • Input voltage: 200V AC -240V AC, 16A, 50/60Hz per feed • Output voltage: 42 V DC to 56 V DC • Current: 50 A	DC power: • DC-40 to -72 V, 162 A max, 6480 W or • DC-46 to -72V, 175 A max, 8050 W or • DC-49 to -55 V, 175 A max, 8575 W or • DC-50.5 to -72 V, 175 A max, 8837.5 W • 1+1 redundancy External AC power (option): • Input voltage: 200 V AC to 240 V AC • Output voltage:42 V DC to 56 V DC • Current: 50 A	DC power: • DC-40 to -72V, 100A, 4000W max or • DC-46 to -72V, 100A, 4600W max • 1+1 redundancy External AC power (option): • Input voltage: 200 V AC to 240 V AC • Output voltage: 42 V DC to 56 V DC • Current: 50 A
Cooling	Front-to-back air flow	Front-to-back air flow	Side-to-back air flow

* Dimensions and weights are approximate and subject to change. Refer to the appropriate installation guide for the current dimensions and weights.

Table 2. Nokia 7750 SR IMM summary

IMM type	Ports	Connector type	Maximum density		
			7750 SR-12e	7750 SR-12	7750 SR-7
10/100/1000BASE	160 or 80	CSFP or SFP	1440 or 720	1600 or 800	800 or 400
10/100/1000BASE	48	SFP	432	480	240
10GBASE	40	SFP+	360	—	—
10GBASE/100/100BASE (combination)	10/20	SFP+/SFP	90/180	100/200	50/100
10GBASE + 7x50 ISA2 (combination)	10	SFP+	90	100	50
10GBASE	12, 20	SFP+	108, 180	120, 200	60, 100
40GBASE	6	QSFP+	54	60	30
40GBASE/100/100BASE (combination)	3/20	QSFP+/SFP	27/180	30/200	15/100
100GBASE	4	CXP and CFP4	36	—	—
100GBASE	1, 2	CFP	9, 18	10, 20	5, 10
100GBASE/10GBASE (combination)	1/10	CFP/SFP+	9/90	10/100	5/50
100GBASE + 7x50 ISA2 (combination)	1	CFP	9	10	5
100GBASE IMM (DWDM tunable optics)	1	LC	9	10	5

Table 3. Nokia 7750 SR MDA-e summary

MDA-e type	Ports	Connector type	Maximum density		
			7750 SR-12e	7750 SR-12	7750 SR-7
1000BASE	40 or 20	CSFP or SFP	720 or 360	800 or 400	400 or 200
10GBASE	10, 6	SFP+	180, 108	200, 120	100, 60
40GBASE/100GBASE	2	QSFP+/QSFP28	36	40	20
100GBASE	1, 2	CFP2, CFP4	18, 36	20, 40	10, 20

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Table 4. Nokia 7750 SR MDA-XP and MDA summary

MDA type	Ports per MDA	Connector type	Maximum density		
			SR-12e	SR-12	SR-7
Ethernet MDA-XP					
10/100/1000BASE-TX	48	8 x mini RJ-21	864	960	480
1000BASE	10, 12, 20	SFP	180, 216, 360	200, 240, 400	100, 120, 200
10GBASE/1000BASE (LAN/WAN PHY) (combination)	2/12	XFP/SFP	36/216	40/240	20/120
10GBASE (LAN/WAN PHY)	1, 2, 4	XFP	18, 36, 72	20, 40, 80	10, 20, 40
SDH/SONET MDA-XP					
OC-192c/STM-64c	2	XFP	36	40	20
SDH/SONET MDA					
OC-3c/STM-1c/OC-12c/STM-4c (Multirate)	16	SFP	288	320	160
OC-48c/STM-16c	4	SFP	72	80	40
Any Service Any Port (ASAP) MDA					
Channelized DS3/E3 ASAP	4, 12	1.0/2.3 connectors	72, 216	80, 240	40, 120
Channelized OC-3/STM-1 ASAP	4	SFP	72	80	40
Channelized OC-12/STM-4 ASAP	1	SFP	18	20	10
Other					
Versatile Service Module-XP	N/A	N/A	√	√	√

Table 5. Nokia 7750 SR ISA support summary

ISA type	SR-12e	SR-12	SR-7
Multiservice Integrated Service Adapter 2 (MS-ISA2)	√	√	√
Multiservice Integrated Service Module (MS-ISM)	√	√	√
Integrated Service Module - Mobile Gateway (ISM-MG)*	—	√	√

* Consult the ISM-MG data sheet for details. Support requires SR-OS-MG.

Feature and protocol support highlights

Feature and protocol support within the Nokia 7750 SR series includes (but is not limited to):

- Intermediate System-to-Intermediate System (IS-IS), Open Shortest Path First (OSPF), and Multiprotocol Border Gateway Protocol (MBGP) IPv4 and IPv6 unicast routing
- Internet Group Management Protocol (IGMP), Multicast Listener Discovery (MLD), Protocol Independent Multicast (PIM), and Multicast Source Discovery Protocol (MSDP) IPv4 and IPv6 multicast routing
- MPLS Label Edge Router (LER) and Label Switching Router (LSR) functions, with support for seamless MPLS designs
- Label Distribution Protocol (LDP) and Resource Reservation Protocol (RSVP) for MPLS Signaling and Traffic Engineering with Segment Routing support, Point-to-Point (P2P) and Point-to-Multipoint (P2MP) Label Switched Paths (LSPs) with Multicast LDP (MLDP) and P2MP RSVP, weighted Equal-Cost Multi-path (ECMP), Inter-AS Multicast VPN (MVPN) and Next Generation Multicast VPN (NG-MVPN)
- P2P Ethernet virtual leased lines (VLLs), Ethernet VPNs (EVPNs), EVPN-MLDP, EVPN-VPWS, Virtual Extensible LAN (VXLAN), and EVPN-VXLAN to VPLS/EVPN-VPLS gateway functions
- Multipoint Ethernet VPLS, IP VPN and enhanced internet services, MPLS-Transport Profile (MPLS-TP) and provider backbone bridge (PBB)
- Ethernet satellite port expansion through local or remote Nokia 7210 Service Access Switch (SAS)-S GE, 10GE, 100GE, and SONET/SDH satellite variants, offering 24/48xGE ports, 64xGE/10GE ports, or legacy SONET/SDH ports over GE, 10GE, and 100GE uplinks*
- Unicast Reverse Path Forwarding (uRPF), RADIUS/TACACS+, and comprehensive control plane protection features for security
- Extensive OAM features, including Cflowd, Ethernet Connectivity Fault Management (CFM) (IEEE 802.1ag, ITU-T Y.1731), Ethernet in the First Mile (EFM) (IEEE 802.3ah), Two-Way Active Measurement Protocol (TWAMP), Bi-Directional Fault Detection (BFD), and a full suite of MPLS OAM tools including GMPLS UNI
- ITU-T Synchronous Ethernet (Sync-E), IEEE 1588v2, Network Time Protocol (NTP), BITS ports (T1, E1, 2M), 1PPS
- Intelligent packet classification, policing, queue servicing and buffer management
- Industry-leading high availability, including nonstop routing, nonstop services, in-service software upgrades (ISSUs), fast reroute, pseudowire redundancy, ITU-T G.8031 and G.8032, weighted mixed-speed link aggregation
- Management via CLI, SNMP MIBs, NETCONF/YANG and service assurance agent (SAA) with comprehensive support through the Nokia NSP
- Multivendor SDN control integration through OpenFlow, PCEP and BGP-LS interface support

Environmental specifications

- Operating temperature: 5°C to 40°C (41°F to 104°F)
- Operating relative humidity: 5% to 85%
- Operating altitude: Up to 4000 m (13,123 ft) at 30°C (86°F)

Safety standards and compliance agency certifications

Safety

- IEC/EN/UL/CSA60950-1 Ed2 Am2
- FDA CDRH 21-CFR 1040
- IEC/EN 60825-1
- IEC/EN 60825-2

* Requires CPM5, an appropriate chassis mode and an uplink via an FP2-based IOM/IMM at a minimum

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EMC emission

- ICES-003 Class A
- FCC Part 15 Class A
- AS/NZS CISPR 32 Class A
- VCCI Class A
- EN 55032 Class A
- IEC CISPR 32 Class A
- KN 32 Class A

EMC immunity

- EN 300 386
- EN 55024
- KN 35

Ethernet standards

- EEE 802.1AB, Station and Media Access Control Connectivity Discovery
- IEEE 802.1ad, Provider Bridges
- IEEE 802.1ag, Connectivity Fault Management
- IEEE 802.1ah, Provider Backbone Bridges
- IEEE 802.1ak, Multiple Registration Protocol
- IEEE 802.1aq, Shortest Path Bridging
- IEEE 802.1ax, Link Aggregation
- IEEE 802.1D, MAC Bridges
- IEEE 802.1p, Traffic Class Expediting
- IEEE 802.1Q, Virtual LANs
- IEEE 802.1s, Multiple Spanning Trees
- IEEE 802.1w, Rapid Reconfiguration of Spanning Tree
- IEEE 802.1X, Port Based Network Access Control
- IEEE 802.3ab, 1000BASE-T
- IEEE 802.3ac, VLAN Tag
- IEEE 802.3ad, Link Aggregation
- IEEE 802.3ae, 10 Gb/s Ethernet
- IEEE 802.3ah, Ethernet in the First Mile
- IEEE 802.3ba, 40 Gb/s and 100 Gb/s Ethernet
- IEEE 802.3i, Ethernet
- IEEE 802.3u, Fast Ethernet
- IEEE 802.3x, Ethernet Flow Control
- IEEE 802.3z, Gigabit Ethernet
- ITU-T G.8031, Ethernet Linear Protection Switching
- ITU-T G.8032, Ethernet Ring Protection Switching
- ITU-T Y.1731, OAM functions and mechanisms for Ethernet based networks

Telecom standards*

- ANSI T1.105.03
- ANSI T1.105.06
- ANSI T1.105.09
- ANSI T1.403 (DS1)
- ANSI T1.404 (DS3)
- ITU-T G.703
- ITU-T G.707
- ITU-T G.813
- ITU-T G.823
- ITU-T G.824
- ITU-T G.825
- ITU-T G.957
- Telcordia GR-253-CORE

* For ATM, frame relay, PPP and SONET/SDH standards, refer to the installation guide for the full set of compliance standards.

Environmental

- ETS 300 019-2-1 Storage Tests, Class 1.2
- ETS 300 019-2-2 Transportation Tests, Class 2.3
- ETS 300 019-2-3 Operational Tests, Class 3.2
- ETS 300 019-2-4, pr A 1 Seismic
- ETSI EN 300 132-2 Power Supply Interface
- WEEE
- RoHS
- China RoHS

Network Equipment Building System (NEBS)

- NEBS Level 3
- RBOC requirements:
  - ATIS-0600020
  - ATIS-0600019
  - ATIS-0600010.03
  - ATIS-0600015
  - ATIS-0600015.03
  - ATT-TP-76200
  - VZ.TPR.9205 TEEER
  - VZ.TPR.9305
  - VZ-TPR-9307

MEF Certifications

- CE 2.0
  - Certified (on E-LAN, E-Line, E-Tree and E-Access MEF service types)
  - 100G certified (on E-Line and E-Access MEF service types)
- CE 1.0 (MEF 9 and MEF 14)
  - Certified

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