The Nokia 7750 SR-1x family of compact IP routers delivers high performance with the speed, power efficiency, flexible capability, network security and automation tools essential for IP networking in the 5G and cloud era. With continuous design innovation and sustainability, the 7750 SR-1x helps build a sustainable IP network that can evolve with changing needs for years to come.

**Overview**

As networks experience unprecedented traffic growth and unexpected demand, operators are challenged to increase network capacity efficiently and meet ever-increasing performance requirements while rolling out new services over a secure, self-defending network.

Leveraging Nokia 6.0 Tb/s FP5 silicon, the 7750 SR-1x addresses these imperatives, enabling operators to build a scalable, secure, automated and efficient network with superior return on investment.

Available in six compact options, the 7750 SR-1x scales capacity up to 6 Tb/s full duplex (FD) and delivers power-efficient performance certainty 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).

At the heart of the 7750 SR-1x is Nokia 6.0 Tb/s FP5 silicon—an essential element for high-performance routing. Leveraging a fully programmable network processor (NP) architecture, the systems are designed to be deterministic, enabling diverse deployment needs for demanding applications under all network operating conditions. With energy-saving innovations, FP5 consumes 75 percent less power than previous-generation FP4 silicon while supporting line-rate...
memory for buffers and tables and unmatched real-world, deterministic network performance.

Running the Nokia Service Routing Operating System (SR OS), the 7750 SR-1x supports a full array of network applications and services. These industry-leading features enable network designs without trade-offs among performance, capacity, scalability and power consumption.

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 security features allow the network to be part of a holistic solution for network security.

The Nokia 7750 SR-1x product family is part of the Nokia 7750 SR series, which includes the Nokia 7750 SR-7, SR-12 and SR-12e.

### Speed and compact platforms

Demanding network roles demand in-house silicon. Designed to meet the requirements of critical IP networks, Nokia delivers its fifth generation of in-house FP silicon. The Nokia 6.0 Tb/s FP5 NP 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-1x 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-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 6.4 Tb/s FD with IA
  - 48 x 800G 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 simple 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, 10 x 10G, 4 x 25G, 2 x 100G, 4 x 100G, 2 x 400G and 8 x 100G. For further port extension options, Nokia 7210 Service Access Switch (SAS) satellites offer local or remote GE, 10GE and SONET/SDH port expansion as a locally managed port extender.

### Power

#### Power efficiency for sustainability

The power-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 power consumption in the order of 0.1W/ Gig in chassis-based systems. Even more, with FP5 silicon, performance is always deterministic.
This power consumption is realized with full features while concurrently being fully buffered on both ingress and egress. 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 power consumption based on licensing levels and connectors in use. This significantly reduces consumption 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 power 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 power 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 power efficiency advantages of next-generation optics. Compared to 400G optics, 800G optics save in the order of 25 to 43 percent of the optical power budget. The 7750 SR-1x is hardware-ready to support power-efficient 100G/200G SFP112 and 400G/800G QSFP112 optics. As systems densify, optics become a large part of overall system power consumption, and the power savings behind 800G optics quickly become compelling.

FlexE 2.0\(^\text{1}\) is supported across all of channelization, sub-rating and bonding. Bonding support enables 1.6 Tb/s clear-channel flows in hardware today, in advance of 1.6 Tb/s optics availability, and can help to further drive system-level efficiencies by mitigating against 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

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\(^{1}\) Enabled via software in a future release
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 line card 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 line cards. This capability significantly reduces the number of network elements for power 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 power 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 power consumption proportionally and to provide the right power, 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.

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 complete configuration versatility to support multiple, demanding network roles with deterministic performance on a single platform.

For service providers, the 7750 SR-1x is deployed in mission-critical WAN, data center and aggregation networks to support IP edge, BNG, security gateway, peering and core applications for advanced residential, mobile and enterprise services.

For webscale companies looking to maximize application performance, the 7750 SR-1x delivers massive scalability along with leading features for data center edge applications, including aggregation, gateway, interconnect and internet/peering. In point of presence (PoP) locations it supports internet/peering edge and core router applications.
For 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.

**ANYsec line rate encryption**

Network security can no longer be an afterthought in IP network design and deployment. Operators must move toward a holistic approach of end-to-end network security, avoiding trade-offs with piecemeal MACsec or IPsec solutions. Network security is embedded into the FP5 silicon, enabling the 7750 SR-1x to deliver a unique, network-embedded approach to IP network security called ANYsec. ANYsec delivers universal, line rate encryption across L2, L2.5 and L3 at the full system bandwidth. It delivers line rate MACsec on all connectors and all speeds from 10 Gb/s to 1.6 Tb/s and also extends hardware low-latency encryption to MPLS- and IP-based flows.

ANYsec is service oriented, operating across SR, EVPN, MPLS, IPv4 and IPv6 traffic with support for all routing protocols. It interworks with all legacy equipment in a network that does not support encryption by allowing encryption to be added as a network overlay. ANYsec runs hop-by-hop or end-to-end and can be extended to any network topology at scale. In addition to securing internal network links, it is a valuable, revenue-generating option for new service enablement and can significantly increase the competitiveness of a provider's network solutions when securing new, encryption-based transport customers.

**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. It has a fixed, FP5-based IMM with 800G QSFP-DD and 200G SFP-DD connectors, an internal CPU supporting a simplex control plane, and front-to-back airflow with an optional air filter kit.

Each system supports optical SyncE/1588, console, management, 1PPS, dual-band GNSS, Bluetooth, 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 Service Access Switch (SAS) satellite systems to offer GE, 10GE and SONET/SDH port extension external to the 7750 SR-1x.
## Technical specifications

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

<table>
<thead>
<tr>
<th></th>
<th>7750 SR-1x-48D</th>
<th>7750 SR-1-48D</th>
<th>7750 SR-1-24D</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>System architecture</strong></td>
<td>Centralized, fixed connectors, non-redundant control</td>
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</tr>
<tr>
<td><strong>System capacity (FD)</strong></td>
<td>6.0 Tb/s</td>
<td>2.8 Tb/s</td>
<td>2.8 Tb/s</td>
</tr>
<tr>
<td><strong>Intelligent aggregation (IA)</strong></td>
<td>19.2 Tbps FD</td>
<td>19.2 Tbps FD</td>
<td>9.6 Tbps FD</td>
</tr>
<tr>
<td><strong>Connectors</strong></td>
<td>48 x 800G QSFP-DD</td>
<td>48 x 400G QSFP-DD</td>
<td>24 x 800G QSFP-DD</td>
</tr>
<tr>
<td><strong>Optical transceivers</strong></td>
<td>40G QSFP+, 100G QSFP28, 2 x 100G QSFP28-DD, 400G QSFP-DD, 800G QSFP-DD</td>
<td>40G QSFP+, 100G QSFP28, 2 x 100G QSFP28-DD, 400G QSFP-DD, 800G QSFP-DD</td>
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</tr>
<tr>
<td><strong>Pre-classification &amp; pre-buffering</strong></td>
<td>21.6 million 64B packet micro-buffer</td>
<td>21.6 million 64B packet micro-buffer</td>
<td>10.8 million 64B packet micro-buffer</td>
</tr>
<tr>
<td><strong>Buffering</strong></td>
<td>64GB</td>
<td>32GB</td>
<td>32GB</td>
</tr>
<tr>
<td><strong>Hot-swappable modules</strong></td>
<td>4 PSUs, 3 fan trays</td>
<td>2 PSUs, 3 fan trays</td>
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</tr>
<tr>
<td><strong>Control ports</strong></td>
<td>Front: Optical SyncE/1588, console, management, 1PPS, dual-band GNSS, Bluetooth, SD cards, and USB ports</td>
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<td><strong>Cooling</strong></td>
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<tr>
<td><strong>Dimensions (with air filter kit)</strong></td>
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<td><strong>Weight</strong></td>
<td>Loaded: 25.05 kg (55.22 lbs); excludes optics</td>
<td>Loaded: 24.59 kg (54.22 lbs); excludes optics</td>
<td>Loaded: 20.89 kg (46.05 lbs); excludes optics</td>
</tr>
<tr>
<td><strong>Power</strong></td>
<td><strong>DC power</strong> • DC input: -40 V to -72 V, 80A max per feed • Power feed redundancy • 2+2 PSU redundancy</td>
<td><strong>DC power</strong> • DC input: -40 V to -72 V, 80A max per feed • Power feed redundancy • 1+1 PSU redundancy</td>
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<td><strong>Connectors</strong></td>
<td>12 x 800G QSFP-DD + 80 x 200G SFP-DD</td>
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<td>6 x 800G QSFP-DD + 40 x 200G SFP-DD</td>
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Table 2. Nokia 7750 SR-1x port density

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<td></td>
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<tr>
<td>800G</td>
<td>6</td>
<td>24</td>
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<tr>
<td>400G</td>
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<tr>
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<th>Speed</th>
<th>7750 SR-1x-92S</th>
<th>7750 SR-1-92S</th>
<th>7750 SR-1-46S</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Line rate port count (max)</td>
<td>IA port count (max)</td>
<td>Line rate port count (max)</td>
</tr>
<tr>
<td>800G</td>
<td>4</td>
<td>4</td>
<td>-</td>
</tr>
<tr>
<td>400G</td>
<td>12</td>
<td>12</td>
<td>6</td>
</tr>
<tr>
<td>100G</td>
<td>60</td>
<td>128</td>
<td>28</td>
</tr>
<tr>
<td>10G</td>
<td>200</td>
<td>200</td>
<td>200</td>
</tr>
</tbody>
</table>

Table 3. Nokia 7750 SR-1x licensing overview

<table>
<thead>
<tr>
<th>System</th>
<th>Capacity licenses</th>
<th>Functional licenses</th>
</tr>
</thead>
</table>
| 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-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-1-48D | • 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-1x-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 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 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 |
| 7750 SR-1-46S | • 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 |

Feature and protocol support highlights

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)
- IPv4 and IPv6 feature parity
- Comprehensive control plane protection features for security
- 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 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 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, 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)
• EVPN and IP-VPN gateway interworking, including D-PATH attribute for loop protection in redundant gateways
• Seamless MPLS/SRv6 integration with IP-VRF for interworking or migration between MPLS and SRv6 transport technologies
**System features**

- Ethernet satellites: Port expansion through local or remote Nokia 7210 SAS-S series GE, 10GE, 100GE and SONET/SDH satellite variants, offering 24/48 x GE ports, 64 x GE/10GE ports or legacy SONET/SDH ports over GE, 10GE and 100GE uplinks
- 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)
  - 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:
  - Fast reroute for IP, RSVP, LDP and SR
  - Pseudowire redundancy
  - ITU-T G.8031 and ITU-T G.8032
  - Weighted ECMP
  - Weighted, mixed-speed link aggregation

**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**

**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 Ed2

**EMC emission**

- AS/NZS CISPR 32 Class A
- BSMI CNS13438 Class A
- EN 55032 Class A
- FCC Part 15 Class A

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2 System design intent is according to the listed standards. Refer to the product documentation for detailed compliance status.
- 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
- 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 301 489-17 (Bluetooth)
- ETSI EN 301 489-19 (GNSS)
- KS X 3124
- KS X 3125 (Bluetooth)

**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 2012/19/EU Waste Electrical and Electronic Equipment (WEEE)
- Directive 2014/30/EU Electromagnetic Compatibility (EMC)
- BSMI Mark - Taiwan
- CE Mark - Common Europe
- CRoHS - China RoHS
- KC Mark - South Korea
- NEBS Level 3
- RCM Mark – Australia
- 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 the future where networks meet cloud to realize the full potential of digital in every industry.

Through networks that sense, think and act, we work with our customers and partners to create the digital services and applications of the future.

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