Nokia 7750 SR-s Service Router
Release 20

The Nokia 7750 SR-s series of IP routers takes router performance to new heights. It delivers the massive scale, comprehensive feature set and platform versatility needed to stay ahead of evolving demands driven by 5G, cloud and the Internet of Things (IoT). 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.

As the demand for network bandwidth continues to grow unabated, operators are on a quest to meet ever-increasing performance requirements while at the same time looking to drive down network costs. The scale, feature breadth and versatility of the 7750 SR-s address 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.

Flexible FP4-based licensing allows the 7750 SR-s to be tuned to meet evolving needs through software upgrades without hardware swap-outs. This provides cost savings, ensuring operators pay for only the functionality they require.
For webscale operators, the 7750 SR-s delivers massive scale 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 it can be deployed in data center, WAN and aggregation networks to support the full spectrum of provider edge (PE), 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.

Features and benefits

**FP4 - deterministic performance**

The 7750 SR-s leverages the latest generation of Nokia IP routing silicon, FP4, which combines a disaggregated, fully buffered chipset architecture and intelligent memory design to provide deterministic packet forwarding performance at scale, without compromise, even when complex processing-intensive operations are required.

With the FP4 traffic manager, buffering is always deterministic, ensuring consistent system performance even when IP, MPLS, QoS and access control list (ACL) capabilities are scaled concurrently. The 7750 SR-s delivers line-rate performance that does not degrade as advanced capabilities and applications are enabled.

By contrast, products with partially buffered chipset architectures typically result in non-deterministic performance and unpredictable system behavior as the scale on the chipset increases.

**Massive scale**

The 7750 SR-s is available in four chassis variants: the 7750 SR-1s, 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 10GE, 1,440 100GE or 288 400GE interfaces with flexible 10GE and 100GE breakout options.

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

**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.

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.

**Comprehensive features**

Nokia’s feature-rich 64-bit SR OS addresses the full spectrum of IP routing requirements. With extensive QoS, IP/MPLS, segment routing and model-driven management capabilities, the 7750 SR-s has the intelligence 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 ACLs with high performance at scale, even when multiple advanced 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. It supports a leading number of statistics counts per packet, enabling comprehensive statistics for existing and future applications.
Versatile platform
The comprehensive routing features of the 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—all 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: access aggregation for broadband services and Broadband Network Gateway (BNG) for residential subscriber management; PE for enterprise VPN, internet access, and cloud and data center interconnect (DCI) services; PE for backhaul, IPsec and security gateway, WLAN gateway and hybrid access gateway in IP mobile anyhaul. In data centers, support includes gateway, interconnect and internet.peering functions. In network backbones, core routing functions support includes Border Gateway Protocol (BGP) peering, MPLS switching, and Layer 2/Layer 3 virtual private network (VPN) infrastructure services.
For enterprises, the 7750 SR-s provides high-performance IP routing, including connectivity to the data center, internet and WAN applications.

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 eXpansible Media Adapter-s (XMA-s) and 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.
This differentiated 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.

SDN integration and automation
The 7750 SR-s and 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 through CLI, NETCONF and gRPC/gNMI using YANG models.
In combination with the Nokia Network Services Platform (NSP), the 7750 SR-s can be deployed to introduce scalable and integrated SDN control across IP, MPLS, Ethernet and optical transport layers.
The Nokia 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.
Revolutionary and innovative 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 upgradeability 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 and improved energy efficiency, avoids optics hot spots, and delivers a high optics power-tolerant design.

High availability
For always-on service delivery, the 7750 SR-s sets the benchmark for high availability. Moving beyond full system redundancy, the robust SR OS supports numerous 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.

Network management
The 7750 SR-s is managed by the Nokia NSP, supporting integrated element and network management with end-to-end orchestration of network resource provisioning and assurance operations.

Hardware overview
The 7750 SR-s is available in four chassis variants: 7750 SR-1s, SR-2s, SR-7s and SR-14s. It supports a wide range of common system modules and interfaces that are optimized to address various network 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 upgradeability 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 CPM-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 CPM-s provides the management, security and control plane processing for the 7750 SR-7s and 7750 SR-14s. The 7750 SR-2s supports two pluggable, hot-swappable CPM-s modules and is installed directly on the front of the SR-2s chassis. The CPM-2s provides the management and control plane processing while the XCM-2s performs security functions.

Redundant CPM-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 CPM-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 optical breakout options.

The XMA-s is available in four base adapters:

- **36 connectors of QSFP-DD at 4.8 Tb/s full duplex (FD) (with four FP4 complexes)**
- **36 connectors of QSFP28 at 3.6 Tb/s FD (with three FP4 complexes)**
- **36 connectors of QSFP28 at 2.4 Tb/s FD (with two FP4 complexes)**
- **18 connectors of QSFP28 at 1.2 Tb/s FD (with one 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 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.

QSFP-DD and QSFP56-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.

**7750 SR-1s**

The 7750 SR-1s is a fixed system with 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 and 2 x 100GE optical breakout options. With iFIFO it can support up to 12 Tb/s FD per slot. It is available in a number of licensable configurations to provide flexible entry points and to grow capabilities and scale 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.
### Table 1. Hardware specifications for the 7750 SR-s

<table>
<thead>
<tr>
<th></th>
<th>7750 SR-1s</th>
<th>7750 SR-2s</th>
<th>7750 SR-7s</th>
<th>7750 SR-14s</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>System capacity (HD)</strong></td>
<td>9.6 Tb/s</td>
<td>19.2 Tb/s</td>
<td>57.6 Tb/s</td>
<td>115.2 Tb/s</td>
</tr>
<tr>
<td><strong>Per-slot capacity (FD)</strong></td>
<td>4.8 Tb/s</td>
<td>4.8 Tb/s</td>
<td>4.8 Tb/s</td>
<td>4.8 Tb/s</td>
</tr>
<tr>
<td><strong>Per-slot iFIFO capacity (FD)</strong></td>
<td>12 Tb/s</td>
<td>12 Tb/s</td>
<td>12 Tb/s</td>
<td>12 Tb/s</td>
</tr>
<tr>
<td><strong>System design</strong></td>
<td>Centralized</td>
<td>Centralized; control redundant</td>
<td>Orthogonal direct cross-connect; control and fabric redundant</td>
<td>Orthogonal direct cross-connect; control and fabric redundant</td>
</tr>
<tr>
<td><strong>Number of XMA-s</strong></td>
<td>1; integrated</td>
<td>2</td>
<td>6</td>
<td>12</td>
</tr>
<tr>
<td><strong>Common equipment redundancy</strong></td>
<td>PSU, fan</td>
<td>XMA-s, XCM-2s, CPM-2s, PSU, fan</td>
<td>XMA-s, XCM-7s, SFM-s, CPM-s, PSU, fan</td>
<td>XMA-s, XCM-14s, SFM-s, CPM-s, PSU, fan</td>
</tr>
<tr>
<td><strong>Hot-swappable modules</strong></td>
<td>PSU, fan</td>
<td>XMA-s, XCM-2s, CPM-2s, PSU, fan</td>
<td>XMA-s, XCM-7s, SFM-s, CPM-s, PSU, fan</td>
<td>XMA-s, XCM-14s, SFM-s, CPM-s, PSU, fan</td>
</tr>
<tr>
<td><strong>Dimensions</strong></td>
<td>3RU, includes integrated power shelf</td>
<td>5RU, includes integrated power shelf</td>
<td>13RU + 3RU (LVDC) or 4RU (AC/HVDC) power shelf</td>
<td>24RU + 3RU (LVDC) or 4RU (AC/HVDC) power shelf</td>
</tr>
<tr>
<td></td>
<td>Height: 13.3 cm (5.25 in)</td>
<td>Height: 22.2 cm (8.75 in)</td>
<td>Height: 71.1 cm (28 in); (16RU)</td>
<td>Height: 120.0 cm (47.2 in); (27RU)</td>
</tr>
<tr>
<td></td>
<td>Width: 44.5 cm (17.5 in)</td>
<td>Width: 44.5 cm (17.5 in)</td>
<td>Width: 75.6 cm (29.75 in); (17RU)</td>
<td>Width: 124.5 cm (49 in); (28RU)</td>
</tr>
<tr>
<td></td>
<td>Depth: 67.8 cm (26.69 in)</td>
<td>Depth: 81.38 cm (32.04 in)</td>
<td>Depth: 85.8 cm (33.8 in)</td>
<td>Depth: 87.9 cm (34.6 in)</td>
</tr>
<tr>
<td><strong>Weight</strong></td>
<td>1.2 Tb/s and 2.4 Tb/s variants:</td>
<td>Empty: 27.21 kg (60.0 lb)</td>
<td>Empty: 45.45 kg (100.0 lb)</td>
<td>Empty: 62.4 kg (137.5 lb)</td>
</tr>
<tr>
<td></td>
<td>- Empty: 23.8 kg (52.5 lb)</td>
<td>Loaded: 102.06 kg (225 lb); excludes optics</td>
<td>Loaded: 215.3 kg (473.6 lb); excludes power shelf and optics</td>
<td>Loaded: 370.1 kg (815.7 lb); excludes power shelf and optics</td>
</tr>
<tr>
<td></td>
<td>- Loaded: 48.8 kg (107.5 lb); excludes optics</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3.6 Tb/s, 4.8 Tb/s, and 12 Tb/s variants:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Empty: 25.4 kg (56 lb)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Loaded: 50.3 kg (111 lb); excludes optics</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Power</strong></td>
<td>LVDC: -48 V/-60 V, 80 A max per feed</td>
<td>LVDC: -48 V/-60 V, 80 A max per feed</td>
<td>LVDC: -48 V/-60 V, 80 A max per feed</td>
<td>LVDC: -48 V/-60 V, 80 A max per feed</td>
</tr>
<tr>
<td></td>
<td>HVDC: 260-400 V DC, 12 A max per source</td>
<td>HVDC: 260-400 V DC, 12 A max per source</td>
<td>HVDC: 260-400 V DC, 12 A max per source</td>
<td>HVDC: 260-400 V DC, 12 A max per source</td>
</tr>
<tr>
<td></td>
<td>AC: 200 V–240 V AC, 50 Hz/60 Hz, 16 A per feed</td>
<td>AC: 200 V–240 V AC, 50 Hz/60 Hz, 16 A per feed</td>
<td>AC: 200 V–240 V AC, 50 Hz/60 Hz, 16 A per feed</td>
<td>AC: 200 V–240 V AC, 50 Hz/60 Hz, 16 A per feed</td>
</tr>
<tr>
<td></td>
<td>N+N redundancy</td>
<td>N+N redundancy</td>
<td>N+N redundancy</td>
<td>N+N redundancy</td>
</tr>
<tr>
<td></td>
<td>Integrated 1RU power shelf</td>
<td>Integrated 1RU power shelf</td>
<td>Shelf common with the SR-14s</td>
<td>Shelf common with the SR-14s</td>
</tr>
<tr>
<td></td>
<td>Common PSUs across all 7750 SR-s variants</td>
<td>Common PSUs across all 7750 SR-s variants</td>
<td>Common PSUs across all 7750 SR-s variants</td>
<td>Common PSUs across all 7750 SR-s variants</td>
</tr>
<tr>
<td><strong>Cooling</strong></td>
<td>Front to back</td>
<td>Front to back</td>
<td>Front to back</td>
<td>Front to back</td>
</tr>
</tbody>
</table>
Table 2. Nokia 7750 SR-s maximum density

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

* Intelligent fan-in/fan-out (iFIFO)

Table 3. Nokia 7750 SR-s XMA-s variant and capacity licensing overview

<table>
<thead>
<tr>
<th>XMA-s base hardware description</th>
<th>Capacity licensing options</th>
<th>Maximum density per slot</th>
<th>Connectors</th>
<th>Capacity</th>
<th>10GBASE</th>
<th>40GBASE</th>
<th>100GBASE</th>
<th>400GBASE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.2 Tb/s QSFP28 Universal XMA-s:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Flexible 10GBASE and 100GBASE</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Packet buffering of 16 GB plus</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>micro-buffering consisting of</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a 3 million packet pre-buffer</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Connectors</td>
<td>6</td>
<td>0.6 Tb/s</td>
<td>60</td>
<td>6</td>
<td>6</td>
<td>—</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capacity</td>
<td>12</td>
<td>1.2 Tb/s</td>
<td>120</td>
<td>12</td>
<td>12</td>
<td>—</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximum density per slot</td>
<td>18</td>
<td>1.2 Tb/s with iFIFO of 1.8 Tb/s</td>
<td>180</td>
<td>18</td>
<td>18</td>
<td>—</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.4 Tb/s QSFP28 Universal XMA-s:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Flexible 10GBASE and 100GBASE</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Packet buffering of 32 GB plus</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>micro-buffering consisting of a</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 million packet pre-buffer</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Connectors</td>
<td>16</td>
<td>1.6 Tb/s</td>
<td>160</td>
<td>16</td>
<td>16</td>
<td>—</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capacity</td>
<td>24</td>
<td>2.4 Tb/s</td>
<td>240</td>
<td>24</td>
<td>24</td>
<td>—</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximum density per slot</td>
<td>36</td>
<td>2.4 Tb/s with iFIFO of 3.6 Tb/s</td>
<td>360</td>
<td>36</td>
<td>36</td>
<td>—</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.6 Tb/s FD QSFP28 Universal XMA-s:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Flexible 10GBASE and 100GBASE</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Packet buffering of 48 GB plus</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>micro-buffering consisting of a</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 million packet pre-buffer</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Connectors</td>
<td>36</td>
<td>3.6 Tb/s</td>
<td>360</td>
<td>36</td>
<td>36</td>
<td>—</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capacity</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.8 Tb/s QSFP-DD Universal XMA-s:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Flexible 10GBASE and 100GBASE</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Packet buffering of 64 GB plus</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>micro-buffering consisting of a</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12 million packet pre-buffer</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Connectors</td>
<td>36, QSFP28</td>
<td>3.6 Tb/s</td>
<td>360</td>
<td>36</td>
<td>36</td>
<td>—</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capacity</td>
<td>36</td>
<td>3.6 Tb/s</td>
<td>360</td>
<td>36</td>
<td>36</td>
<td>—</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximum density per slot</td>
<td>36</td>
<td>4.8 Tb/s with iFIFO of 12 Tb/s</td>
<td>360</td>
<td>36</td>
<td>48*</td>
<td>12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.8 Tb/s QSFP-DD Universal XMA-s:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Flexible 10GBASE and 100GBASE</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Packet buffering of 64 GB plus</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>micro-buffering consisting of a</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12 million packet pre-buffer</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Connectors</td>
<td>36</td>
<td>4.8 Tb/s</td>
<td>360</td>
<td>36</td>
<td>48*</td>
<td>12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capacity</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.8 Tb/s with iFIFO of 12 Tb/s</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Requires future 4 x 100G QSFP56-DD breakout to get to 48 connector density
** 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), Multicast Protocol Border Gateway Protocol (MBGP), Unicast Reverse Path Forwarding (uRPF), comprehensive control plane protection features for security, and 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), and 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, and static and BGP SR policy. The 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

---

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

<table>
<thead>
<tr>
<th>SR-1s base hardware variant</th>
<th>Capacity licensing options</th>
<th>Maximum density</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Connectors</td>
<td>Capacity</td>
</tr>
<tr>
<td>4.8 Tbps QSFP28 SR-1s:</td>
<td>16</td>
<td>1.6 Tbps</td>
</tr>
<tr>
<td>• Flexible 10GBASE and 100GBASE breakout options</td>
<td>24</td>
<td>2.4 Tbps</td>
</tr>
<tr>
<td>• Packet buffering of 32 GB plus micro-buffering consisting of a 6 million packet pre-buffer</td>
<td>36</td>
<td>2.4 Tbps with iFIFO of 3.6 Tbps</td>
</tr>
<tr>
<td>9.6 Tbps QSFP-DD Universal XMA-s:</td>
<td>36, QSFP28</td>
<td>3.6 Tbps</td>
</tr>
<tr>
<td>• Flexible 10GBASE and 100GBASE breakout options</td>
<td>36</td>
<td>3.6 Tbps</td>
</tr>
<tr>
<td>• Packet buffering of 64 GB plus micro-buffering consisting of a 12 million packet pre-buffer</td>
<td>36</td>
<td>4.8 Tbps</td>
</tr>
<tr>
<td></td>
<td>36</td>
<td>4.8 Tbps with iFIFO of 12 Tbps</td>
</tr>
</tbody>
</table>

* Requires future 4 x 100G QSFP56-DD breakout to get to 48 connector density
** Intelligent fan-in/fan-out (iFIFO)

**Table 5. Nokia 7750 SR-s XMA-s functional feature licenses**

<table>
<thead>
<tr>
<th>Functional level</th>
<th>Number of egress hardware queues</th>
<th>Number of egress policers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Core routing</td>
<td>1,024</td>
<td>1,024</td>
</tr>
<tr>
<td>Edge routing</td>
<td>16,384</td>
<td>16,384</td>
</tr>
<tr>
<td>High scale edge routing</td>
<td>128,000</td>
<td>Up to 384,000</td>
</tr>
</tbody>
</table>

---

Nokia 7750 SR-s Service Router
protection with primary/secondary paths for SR-TE tunnels. 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/RSP/RSVP-TE/MPLS-TP LSP and virtual routing and forwarding (VRF), and in 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), Ethernet VPN (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, EVPVPN for Layer 3 unicast and Optimized Inter-Subnet Multicast (OISM) services with integrated routing and bridging (EVPN-IRB), and 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. 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), cflowd, Two-Way Active Measurement Protocol (TWAMP/TWAMP-Light), and 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), and 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, and end-to-end consistent QoS regardless of oversubscription or congestion
- High availability: Nonstop routing\(^1\), nonstop services\(^1\), in-service software upgrade (ISSU)\(^1\), fast reroute for IP, RSVP, LDP and segment routing, pseudowire redundancy, ITU-T G.8031 and G.8032, weighted ECMP, and weighted, mixed-speed link aggregation

Management features
- Model-driven management through the CLI, NETCONF and gRPC/gNMI using YANG models, streaming telemetry through gRPC/gNMI subscriptions
- Full SNMP management support, including configuration
- Comprehensive network and node management through the 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-s modules
Standards support

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 (SR-1s and SR-2s)
- 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 55024 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 (SR-1s and SR-2s)
- 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 (SR-1s and SR-2s)
- 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
- 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)

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

1 System design intent is according to the listed standards. Refer to product documentation for detailed compliance status.
NEBS/RBOC requirements
- ATIS 0600010
- ATIS-0600015
- 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
- CE Mark - Common Europe
- CRoHS - China RoHS
- BSMI Mark - Taiwan
- EU Directive 2011/65/EU Restriction of the use of certain Hazardous Substances in Electrical and Electronic Equipment (Recast) Directive (RoHS2)
- EU Directive 2012/19/EU Waste Electrical and Electronic Equipment (WEEE)
- EU Directive 2014/30/EU Electromagnetic Compatibility (EMC)
- KC Mark - South Korea
- NEBS Level 3
- RCM Mark - Australia
- VCCI Mark - Japan

MEF certifications
- CE 1.0 (MEF 9 and MEF 14)
- 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)

Note: 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.