

## Nokia 7705 Service Aggregation Router - Mx/Hx

Release 26

The Nokia 7705 Service Aggregation Router (SAR)-Mx and SAR-Hx deliver versatile services and applications in compact systems. These routers are part of the Nokia 7705 SAR family, which is industry-leading in reliability, flexibility, and performance in mission-critical, enterprise and service provider networks.

### Overview

The 7705 SAR<sup>1</sup> is designed to deliver best-in-class capabilities, with a fully programmable datapath providing enhanced features today and flexibility to evolve with changing requirements. The 7705 SAR leverages the Nokia Service Router Operating System (SR OS), which is built to power the most demanding and dynamic Ethernet and IP/MPLS networks. These routers are temperature, EMC and surge hardened and include options for passive and active cooling. Support for multi-service connectivity for Ethernet and legacy enable network convergence and operational efficiency. The routers offer robust timing capabilities, including built in GNSS receivers, with accurate timing distribution. Furthermore, comprehensive built-in security measures enable network operators to safeguard against cybersecurity threats, ensuring the protection of sensitive data.



7705 SAR-Mx



7705 SAR-Hx

<sup>1</sup> In this document 7705 SAR refers to 7705 SAR-Hx / SAR-Mx routers

## Versatile capabilities

The 7705 SAR is built with a fully-programmable datapath, which allows it to deliver on feature requirements today and to accommodate new services and standards as they evolve over time. This allows network operators to protect their investment by integrating new capabilities as they emerge and to stay ahead of the innovation curve. Industry proven IP/MPLS multi-service functions, security and reliability are an integrated part of the SR OS, which is used across Nokia products and product lines. This includes services for Ethernet, serial, teleprotection, and many more interfaces.

The 7705 SAR inherits the software reliability and evolution of the SR OS, reflecting the move towards automation, programmability, and agility for scalable and secure network connectivity.

## Robust design

The Nokia 7705 SAR is designed to provide robustness in many operational scenarios and networking environments. Temperature hardening allows deployments in outside plant environments, including mobile and railway applications. Additionally, EMC and surge hardening enable deployments in power utility substations. Furthermore, it features PCB-enhanced plating (PEP) for internal boards and conformal coating for modular Power Supply Units (PSUs) and fans, which enhances the performance, durability, and reliability of the platform no matter which environment it gets deployed in. Redundant power supplies, with low-voltage DC (LVDC) or AC/high-voltage DC (HVDC) options, passively cooled designs and redundant fans in actively cooled designs make the 7705 SAR the go-to platform for many access networks.

## Multiservice evolution

Full-fledged IP/MPLS router with advanced service capabilities and QoS to support the needs of both modern and legacy-based applications over a single network. The 7705 SAR offers a range of legacy interfaces for customers who still rely on TDM-

based applications and plan to migrate to Ethernet in the future. Using tailored software features, such as asymmetrical delay and jitter compensation, ensures that legacy applications perform exactly as they did on TDM networks.

It is critical to maintain end-to-end Quality of Service (QoS) for different types of traffic, as not all traffic shares the same set of requirements. Hierarchical QoS, traffic classification, traffic management policies, and QoS statistics and monitoring are among the capabilities of the 7705 SAR. These features make it an excellent choice for mission-critical applications and service providers seeking to deliver high-performance, SLA-compliant services while optimizing network resource utilization.

To achieve superior service reliability, the Nokia 7705 SAR is equipped with a full set of operations, administration and maintenance (OAM) features. These features ensure rapid fault detection as well as efficient troubleshooting.

## Network synchronization

Precise network synchronization is a foundation for many communication systems; the 7705 SAR is equipped with a built-in dual-band GNSS receiver providing comprehensive suite of time synchronization solutions. The 7705 SAR supports time-sensitive packet transport and fronthaul networks with a Class C-based<sup>2</sup> Telecom Boundary Clock. Additionally, the 7705 SAR supports the IEEE 1588 Power Utility Profile for time distribution within the utility's substation and offers profile interworking capabilities.

## Network Security

The 7705 SAR offers a multi-faceted approach to security. It ensures traffic encryption through various methods, including IPsec, NGE and MACsec<sup>2</sup>. Its NAT capabilities enhance security by obfuscating internal addresses. Additionally, it incorporates Trusted Platform Module (TPM) 2.0 technology, along with support for secure boot and measured boot, to strengthen system integrity.

<sup>2</sup> Future software deliverable

## Automation

The 7705 SAR simplifies and automates network operations by leveraging model-driven network management capabilities through the Nokia SR OS. It is managed by the Nokia Network Services Platform (NSP), which provides an extensive suite of service management features to automate end-to-end service provisioning, operations, administration, and maintenance. Additionally, the system offers Zero touch provisioning (ZTP) solution that enables automatic node configuration. These features enhance the end-user experience while reducing operating costs.

The model-driven management capabilities of SR OS enable configuration and state management using a YANG-based CLI, the NETCONF protocol, and gRPC/gNMI interfaces. They also support real-time streaming telemetry through gRPC and gNMI subscriptions, ensuring seamless operations via YANG-based CLI and NETCONF protocols.

## Technical specifications

**Table 1. 7705 SAR-Mx/Hx platform specifications**

The 7705 SAR is available in a range of models to suit a broad range of mission-critical, enterprise, communication service providers applications.

Please visit the [7705 SAR portfolio](#) to learn more about the different variants available.

Feature	7705 SAR-Mx	7705 SAR-Hx
System throughput: Full duplex (FD)	Up to 50 Gb/s	
MDA slots	1 slot	1 slot
Ports	<ul style="list-style-type: none"> <li>• 2 x SFP28/SFP+</li> <li>• 6 x SFP/SFP+</li> <li>• 4 x GE/FE RJ45 10/100/1000 Mb/s</li> </ul> All ports are MACsec-capable <sup>3</sup>	
Control interfaces	<ul style="list-style-type: none"> <li>• Console, management, USB, 1PPS out, alarm input/output, SD slot</li> <li>• GNSS antenna</li> </ul>	
Time and synchronization	<ul style="list-style-type: none"> <li>• Includes Stratum 3E oscillator</li> <li>• ITU-T Synchronous Ethernet (SyncE) – ITU-T G.8262.1 (eEEEC)</li> <li>• IEEE 1588v2 clock types: Grandmaster, Boundary, Slave</li> <li>• IEEE 1588v2 PTP profiles:                             <ul style="list-style-type: none"> <li>– ITU-T G.8275.1</li> <li>– Profile IEEE 1588-2008</li> <li>– Ethernet encapsulation</li> <li>– UDP/IPv4 and UPD/IPv6 encapsulation<sup>2</sup></li> <li>– IEC/IEEE 61850-9-3 power utility</li> <li>– C37.238-2017 power</li> </ul> </li> <li>• ITU-T G.8273.2 Class C performance<sup>3</sup></li> <li>• Integrated dual-band GNSS receiver – PRTC-B capable (GPS/Galileo)</li> <li>• Profile interworking from G.8275.1 to power profiles<sup>2</sup></li> <li>• RFC 5905 Network Time Protocol (NTP)</li> <li>• Pulse-per-second (1PPS) output timing</li> </ul>	
Indicators	<ul style="list-style-type: none"> <li>• Management, power supply status LEDs</li> <li>• System (Stat), fan status LED</li> <li>• GNSS stats LED</li> <li>• Per port link and activity status LEDs</li> </ul>	
RAM	32 GB	16 GB
Memory buffer size	Up to 2 GB	
Hardware redundancy	Power supplies, cooling fans	Power supplies
Dimensions	<ul style="list-style-type: none"> <li>• Height: 4.3 cm (1.7 in); 1 RU</li> <li>• Width: 44.45 cm (17.5 in)</li> <li>• Depth: 24.0 cm (9.44 in)</li> <li>• Fits in standard 19-in rack</li> </ul>	<ul style="list-style-type: none"> <li>• Height: 4.3 cm (1.7 in); 1 RU</li> <li>• Width: 44.45 cm (17.5 in)</li> <li>• Depth: 26.5 cm (10.43 in)</li> <li>• Fits in standard 19-in rack</li> </ul>
Power supply options	Two feeds: Modular AC/HVDC or DC power supplies	
Power requirements	<ul style="list-style-type: none"> <li>• High voltage DC/AC input: 88 VDC to 300 VDC; 90 VAC to 264 VAC</li> <li>• Low voltage DC input (rated): -48 V / -60V dc</li> </ul>	
PCB enhanced plating (PEP)	Supported on the system with conformal coating on the power supply	
Cooling	<ul style="list-style-type: none"> <li>• Internal fans</li> <li>• replaceable Fan filter</li> <li>• Side-to-side airflow</li> </ul>	<ul style="list-style-type: none"> <li>• Passively cooled</li> </ul>
Normal operating temperature range	-40°C to +65°C (-40°F to +149°F)	
Shipping and storage temperature range	-40°C to +70°C (-40°F to +158°F)	
Normal humidity	5% to 95%, non-condensing	

<sup>3</sup> Future software deliverable

Table 2. 7705 SAR Gen 2 card

The expansion module card can support one of the following plug-in MDA

Card name	Details
M4-RS232-RJ45 + 4-C3794-SFP	Serial and teleprotection card <ul style="list-style-type: none"> <li>• 4 ports RS232/RS485 (async)</li> <li>• 4 ports C37.94 SFP LC single-mode or multi-mode</li> </ul>
M2-1G-SFP + 2-10G-SFP+	<ul style="list-style-type: none"> <li>• 2 ports SFP 10/100/1000 Mb/s</li> <li>• 2 ports SFP+ 1/10G</li> </ul> All ports are MACsec-capable <sup>4</sup>
M8-T1E1-RJ48	8 ports T1/E1 RJ48

## Software features

The 7705 SAR-Mx/Hx supports, but is not limited to, the following SR OS software features.

### L1/L2 networking

- Ethernet ports: access, network, hybrid
- Link aggregation groups (LAG)
- Link Aggregation Control Protocol (LACP)
- Multi chassis LAG (MC LAG)
- Encapsulation on ports and LAGs: null, 802.1Q VLANs (dot1q), Q in Q (802.1ad)
- Configurable media access control (MAC) addresses
- Configurable MTU and jumbo frame support
- Interface statistics at multiple levels: ports, LAGs, router/MPLS interfaces, SAPs, services
- Spoke Service Distribution Point (SDP) tunnel

### IPv4 and IPv6 routing protocols

- IPv4 and IPv6 forwarding
- Static routes
- Open Shortest Path First (OSPF) v2, v3
- Intermediate System to Intermediate System (IS IS)
- Routing Information Protocol (RIP) and Routing Information Protocol next generation (RIPng)
- Border Gateway Protocol v4 (BGP4) and Multiprotocol BGP (MP BGP)

- Address Resolution Protocol (ARP), IPv6 Neighbor Discovery (ND)
- Internet Control Message Protocol (ICMP), v6
- Equal cost multipath (ECMP)
- Virtual Router Redundancy Protocol (VRRP)

### IPv4 and IPv6 multicast protocols

- Base router and Virtual Private Routed Network (VPRN) support for:
  - Internet Group Management Protocol (IGMP) v1, v2, v3
  - Multicast Listener Discovery (MLD) v1, v2
  - Protocol Independent Multicast (PIM) v4/v6
  - Multicast Source Discovery Protocol (MSDP)
- Multicast aware VPLS with IGMP snooping, MLD snooping, and PIM snooping to constrain Layer 2 multicast flooding

### MPLS and segment routing

- Label Distribution Protocol (LDP) for IPv4 FECs
- Point to point RSVP label switched paths (LSPs)
- LDP over RSVP
- BGP label unicast IPv4 (RFC 3107)
- OSPFv2/IS IS shortcuts to IPv4 prefixes (using LDP or RSVP)
- BGP shortcuts to IPv4 prefixes (using LDP, RSVP or BGP 3107)
- OSPFv2 segment routing extensions

<sup>4</sup> Future software deliverable

- IS IS segment routing extensions
- Segment Routing – Traffic Engineering (SR TE)
- BGP segment routing policies

## Layer 2 VPNs

- E pipe:
  - Ethernet virtual leased line (VLL) signaled by T LDP using MPLS or GRE transport
  - Ethernet VLL signaled by BGP using MPLS or auto bind GRE SDP transport
  - Ethernet VLL signaled by BGP EVPN using MPLS
- Virtual Private LAN Service (VPLS):
  - Ethernet VPLS signaled by T LDP using MPLS or GRE transport
  - Ethernet VPLS signaled by BGP using MPLS or auto bind GRE transport
  - Ethernet VPLS signaled by BGP EVPN (Ethernet VPN) using MPLS
- Routed VPLS (R VPLS)
- Resiliency:
  - Pseudowire redundancy
  - Dual homed virtual private wire service (VPWS)/VLL
  - BGP multihoming for VPLS
  - MC LAG (with L2 Services)
  - Spanning Tree Protocol (STP), Rapid STP (RSTP) and Multiple STP (MSTP)
- Circuit Emulation Services (CES):
  - TDM PW with CESoPSN (RFC 5086) for C37.94 and RS232
  - Asymmetric Delay Control (ADC) for Teleprotection services
- Raw socket IP transport for asynchronous RS 232 serial data
- Dot1q and QinQ VLAN translation in L2 services
- Layer 2 Control Protocols tunneling

## Layer 3 services

- Internet Enhanced Services (IES)
- IPv6 PE router (6PE)
- MPLS and GRE auto bind and spoke SDPs
- RFC 4364 IPv4 VPNs using MPLS or GRE transport
- RFC 4659 IPv6 VPNs using MPLS or GRE transport
- IP VPN inter AS option B
- GRE IP tunnelling
- Global Routing Table (GRT) lookup and VPRN to GRT route leaking

## Filtering and control plane protection

- Ingress and egress IPv4 and IPv6 filters
- Wide range of match criteria including: src/dst port/IP, tcp flags
- Standard actions: forward, drop
- Conditional actions:
  - Drop extracted traffic (for control plane protection)
  - Drop based on packet length
  - Drop based on time to live (TTL)
- Ingress policy based routing (PBR) actions:
  - Forward to next hop
  - Forward to router (another routing instance)
  - redirect policy
- Advanced forward processing actions:
  - NAT action
  - TCP MSS adjust action
- Filter logging (ingress and egress)
- Distributed CPU protection (static policers)

## OAM

- IEEE 802.1ag / ITU T Y.1731 ETH CFM:
  - Down/Up MEPs
  - Continuity Check Messages (ETH-CC)
  - Linktrace (ETH-LT)
  - Loopback (ETH-LB)
  - Delay Measurement (ETH-DM)
  - Link Loss Forwarding (ETH-LLF)

- Ethernet Synthetic Loss Measurement (ETH-SLM)
- Ethernet Performance Monitoring and Fault Management
- G.8013/Y.1731 Ethernet Bandwidth Notification (ETH-BN) with egress-rate adjust
- IEEE 802.3ah EFM-OAM
- SAA for ETH-CFM loopback and linktrace
- Bidirectional Forwarding Detection (BFD) single hop, multi hop
- LSP-BFD for RSVP-TE and SR-TE LSPs
- LLDP
- TWAMP-light/STAMP sender and reflector
- TWAMP server
- OAM tools: lsp-ping/trace, sdp-ping/sdp-mtu, sdp-keepalive ping/trace, ping/mtu keepalive
- ETH-CFM integration with MC-LAG
- Egress queue shaping based on configurable Peak Information Rate (PIR) and Maximum Burst Size (MBS)
- LAG degradation aware IGP cost and operational state control

## Security

## Model driven management

- Configuration via model driven interfaces:
  - NETCONF
  - MD CLI
  - gRPC/gNMI
- State information retrieval via model driven interfaces:
  - NETCONF
  - MD CLI
  - gRPC/gNMI
- Streaming telemetry through gRPC/gNMI subscriptions; operations via NETCONF and gNOI using YANG models

## Quality of Service

- Ingress classification to forwarding class based on 802.1p, DSCP, MPLS EXP or IPv4/IPv6 filter rules
- Egress re classification
- Ingress and egress unicast policing and hierarchical policing
- Egress marking of 802.1p, DSCP or MPLS EXP

- Network Address Translation (NAT)
- IP Security (IPsec)
- Internet Key Exchange (IKEv1 and IKEv2), including support for post quantum PPK as per RFC 8784
- Network Group Encryption (NGE) for:
  - MPLS SDPs (VPLS, VPRN, IES, VPWS)
  - VPRN unicast and multicast (NG mVPN)
  - Router interfaces (IPv4 only) for user plane and control plane encryption
  - PW templates
- Public Key Infrastructure (PKI) supporting X.509v3 certificates
- IEEE 802.1x EAP
- IPv4 and IPv6 filters using access control lists (ACLs)
- Management access control filters
- User profile management, strict login controls and scope of command/control
- Remote Authentication Dial In User Service (RADIUS) client
- Terminal Access Controller Access Control System Plus (TACACS+)
- Simple Network Management Protocol (SNMP) v3
- Secure Shell v2 (SSHv2)
- Transport layer security (TLS)

## Network synchronization

- Includes Stratum 3E oscillator
- ITU-T Synchronous Ethernet (SyncE) – ITU-T G.8262.1 (eEEC)
- IEEE 1588v2 clock types: Grandmaster, Boundary, Slave

- IEEE 1588v2 PTP profiles:
  - ITU-T G.8275.1
  - Profile IEEE 1588-2008
  - Ethernet encapsulation
  - UDP/IPv4 and UDP/IPv6 encapsulation
  - IEC/IEEE 61850-9-3 power utility
  - C37.238-2017 power
- ITU-T G.8273.2 Class C performance
- Integrated dual-band GNSS receiver – PRTC-B capable (GPS/Galileo)
- Profile interworking from G.8275.1 to power profiles
- PTP Performance Statistics (Annex J)
- RFC 5905 Network Time Protocol (NTP)
- Pulse-per-second (1PPS) output timing

## Standards compliance<sup>5</sup>

### Environmental specifications

- 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 300 753 Acoustic Noise Class 3.2
- GR-63-CORE
- GR-3108-CORE
- VZ-TPR-9205
- VZ.TPR.9203 (CO)

### Safety

- AS/NZS 62368.1
- IEC/EN 60825-1
- IEC/EN 60825-2
- IEC/EN/UL/CSA 62368-1
- IEC 60529 IP20

### Electromagnetic compatibility

- AS/NZS CISPR 32 Class A
- ATIS-0600315
- BSMI CNS15936 Class A
- BT GS-7
- EN 300 386
- EN 301 489-1
- EN 301 489-19 (GNSS)
- EN 55032 Class A
- EN 55035
- ES 201 468
- ETSI EN 300 132-1 (AC)
- ETSI EN 300 132-2 (DC)
- FCC Part 15 Class A
- GR-1089-CORE
- ICES-003 Class A
- IEC 61000-3-2
- IEC 61000-3-3
- IEC 61000-6-2
- IEC 61000-6-4
- IEC CISPR 35
- IEC CISPR 32 Class A
- IEC/EN 61000-4-2 ESD
- IEC/EN 61000-4-3 Radiated Immunity
- IEC/EN 61000-4-4 EFT
- IEC/EN 61000-4-5 Surge
- IEC/EN 61000-4-6 Conducted Immunity
- IEC 61000-4-8 Power frequency magnetic field immunity
- IEC 61000-4-9 Pulse magnetic field immunity
- IEC 61000-4-10 Damped oscillatory magnetic field immunity
- IEC/EN 61000-4-11 Voltage Interruptions
- IEC 61000-4-12 Ring wave immunity test
- IEC 61000-4-16 Immunity to conducted, common mode disturbances
- IEC 61000-4-17 Ripple on d.c. input power port immunity
- IEC 61000-4-18 Damped oscillatory wave immunity

<sup>5</sup> System design intent is according to the listed standards. Refer to product documentation for detailed compliance status.



- IEC 61000-4-29 Voltage dips, variations on d.c. input
- KCC Korea-Emissions & Immunity (KS C9832/KS C9835)
- VCCI CISPR32 Class A
- ITU-T K.20

## Radio

- EN 303 413 (GNSS)

## Power utility substations

- IEEE 1613 -2023<sup>6</sup>
- IEC 61000-6-5
- IEC 61850-3 (normal environmental conditions)
- IEC/AS 60870.2.1

## Railway

- EN 50121-4
- IEC 62236-4
- AREMA (Class C, D, E)

## Telecom

- IC CS-03 Issue 9 ( T1 – Canada)
- ACTA TIA-968-B (T1 – USA)
- AS/ACIF S016 (E1- Australia)
- ITU-T G.703 (E1)
- ITU-T V.24 (RS-232)

<sup>6</sup> 7705 SAR-Mx is a forced air system, uses fans.

## Directives, regional approvals and certifications

- Directive 2011/65/EU RoHS (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)
- NEBS Level 3
- BSMI Mark - Taiwan
- CE Mark - Common Europe
- CRoHS - China RoHS
- KC Mark - South Korea
- RCM Mark - Australia
- VCCI Mark – Japan
- UKCA Mark – United Kingdom

## About Nokia

At Nokia, we create technology that helps the world act together.

As a B2B technology innovation leader, we are pioneering networks that sense, think and act by leveraging our work across mobile, fixed and cloud networks. In addition, we create value with intellectual property and long-term research, led by the award-winning Nokia Bell Labs, which is celebrating 100 years of innovation.

With truly open architectures that seamlessly integrate into any ecosystem, our high-performance networks create new opportunities for monetization and scale. Service providers, enterprises and partners worldwide trust Nokia to deliver secure, reliable and sustainable networks today – and work with us to create the digital services and applications of the future.

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