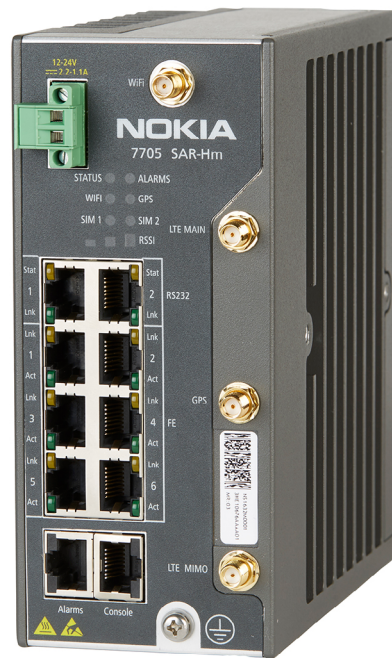


## Nokia 7705 Service Aggregation Router-Hm

The Nokia 7705 Service Aggregation Router-Hm (SAR-Hm) extends IP/MPLS services over cellular and WLAN networks. It is ideal for mission-critical and IoT applications in energy, public safety, mining, transportation, and government market segments.

The Nokia 7705 SAR-Hm is a feature-rich IP/MPLS service router in a ruggedized and compact platform. With it, operators are able to support IP VPN, VPLS, and VPWS services over wireless networks, enabling an end-to-end, seamless, IP/MPLS service offering between wireless and wired devices. This enables critical infrastructure operators to fully realize the promise of smart grids, smart cities, and public safety mobile broadband to enhance safety, efficiency, and responsiveness. The 7705 SAR-Hm can be used in fixed or mobile locations for a variety of applications, such as supervisory control and data acquisition (SCADA), security monitoring, workforce voice and data connectivity in offices or vehicles, mass transit, fleet management, and vehicle remote control and monitoring.

Using the Nokia SR OS software base, the 7705 SAR-Hm offers the same IP/MPLS feature richness, reliability, manageability, flexibility and extensive quality of service (QoS) capabilities that are common across the service router portfolio. The 7705 SAR product line is widely used globally with a proven track record of overcoming diverse challenges in a variety of mission-critical networks. It is managed by the Nokia Network Services Platform (NSP) for seamless deployment and end-to-end management across a resilient IP/MPLS network from wireless access to core.



## Cellular

The 7705 SAR-Hm supports a cellular interface to connect to LTE, 3G, and 2G networks. It supports the most commonly used cellular frequency bands and is able to connect to most mobile network operators worldwide. The interface also supports AT&T's WCS C/D bands to allow specific private LTE applications in the United States. The cellular interface supports 2x2 multi-in multi-out (MIMO) to provide better signal performance and higher data rates.

The SAR-Hm supports dual SIM applications as it can be equipped with two industrial 2FF mini-SIM cards to provide a primary and backup cellular connection to different service providers for better resiliency.

## WLAN

The 7705 SAR-Hm supports IEEE 802.11 b/g/n WLANs with the flexibility to act as both an access point (AP) and client concurrently. When operating as an AP, the 7705 SAR-Hm provides WLAN connections between wireless and wired networks. Alternatively, it can be used as the center point of a stand-alone wireless network. With the 7705 SAR-Hm operating as an AP, client, or both, IP/MPLS services and routing can be delivered over a variety of WLAN topologies to increase connectivity and reach in mission-critical applications.

## Built for harsh environmental conditions

With temperature, electromagnetic shock, and vibration hardening, the 7705 SAR-Hm is ideally suited for use in remote environments, particularly smart grid distribution automation and field area networks or vehicle-mounted applications such as public safety, mining, or rolling stock. Fanless operation makes the 7705 SAR-Hm more tolerant to dust and corrosive environments. The 7705 SAR-Hm is compliant with IEEE 1613-Class 2 and IEC 61850-3 standards for power utility applications, and EN 50155 and IEC 61373 for rail applications.

## Cyber security protection

The 7705 SAR-Hm provides a robust set of security features to maintain network integrity in the face of threatening cyberattacks. Its encryption features, including Network Group Encryption (NGE) and IP Security (IPsec), that use advanced encryption and authentication algorithms, seamlessly protect confidentiality, integrity, and authenticity of communications from the IP/MPLS core to the wireless access locations without compromising performance. NGE is supported over both cellular and Wi-Fi interfaces for end-to-end encryption of IP/MPLS services and their associated control plane. The 7705 SAR-Hm supports a comprehensive set of security features for nodal protection, including management access controls, CPU protection, and login controls. Many types of access control lists are available for added security of services traffic over wireless networks.

## Software features

The 7705 SAR-Hm supports, but is not limited to, the following features:

### Services

- Generic Routing Encapsulation (GRE) service distribution points over cellular supporting MPLS services
- Layer 2 virtual private network (VPN) services – virtual leased line (VLL), BGP Virtual Private Wire Service (BGP-VPWS) and virtual private LAN service (both VPLS, and BGP-VPLS)
- IPv4 VPN services, and IPv6 Provider Edge (6VPE) using MP-BGP based MPLS VPRNs
- Internet Enhanced Service (IES)
- Raw Socket IP transport for asynchronous RS232 serial data over MPLS services.

## Network protocols

- MPLS Label Edge Router (LER)
- Open Shortest Path First (OSPFv2 and OSPFv3)
- Constraint-based Shortest Path First (CSPF)
- Routing Information Protocol (RIP)
- Border Gateway Protocol v4 (BGP) with multiprotocol extensions
- Dynamic Host Configuration Protocol (DHCP) server
- DHCP relay
- Network Time Protocol (NTP) client and server for v4 and v6
- Automatic discovery protocol (ADP) over LTE/3G for zero-touch provisioning

## Quality of service and traffic management

- Deep buffering on all interfaces
- Ingress intelligent packet classification using Dot1p, DSCP v4/v6
- Ingress coloring and metering
- Egress per-port queuing of up to 8 queues
- Mapping of FC to egress per-port queues
- Per-queue priority congestion management
- LTE dedicated bearers and queues for cellular-based QoS

## Operations, administration and maintenance

- Internet Control Message Protocol, ICMP and ICMP v6
- IP/MPLS services diagnostics
- VLL and VPLS MAC diagnostics
- GPS for location tracking and monitoring

## Resiliency

- Pseudowire redundancy for VLL services
- Dynamic IP protocol resiliency (OSPP, BGP)
- Dual SIM application support

## Security

- User and control plane encryption and authentication algorithms AES-128, AES-256, HMA-SHA-256, HMAC-SHA-512
- Network Group Encryption (NGE) for IP/MPLS services and Layer 3 user traffic and control plane protocols
- IP Security (IPsec)
- Internet Key Exchange (IKE) v1 and v2
- Public Key Infrastructure (PKI) supporting X.509v3 certificates
- IEEE 802.1x on access ports
- 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 Concentrator Access Control Server Plus (TACACS+)
- Simple Network Management Protocol (SNMP) v3
- Secure Shell v2 (SSHv2)
- WLAN security with WPA and WPA2

## Hardware features

Table 1. 7705 SAR-Hm specifications

	7705 SAR-Hm
Fixed interfaces	<ul style="list-style-type: none"> <li>• 6 x RJ-45 10/100 Mb/s</li> <li>• 2 x RS-232 (async) (raw socket)</li> </ul>
Cellular interface	<ul style="list-style-type: none"> <li>• See Table 2</li> <li>• Dual SIM support (2FF mini-SIM)</li> </ul>
Wi-Fi specifications	<ul style="list-style-type: none"> <li>• 802.11b/g/n</li> <li>• 2.4 or 5 GHz</li> <li>• Access and client support</li> <li>• Simultaneous access point/client mode</li> </ul>
Timing port	GNSS receiver supporting GPS, GLONASS
Physical dimensions and mounting	<ul style="list-style-type: none"> <li>• Height: 15.2 cm (6 in)</li> <li>• Width: 6.7cm (2.7 in)</li> <li>• Depth: 14 cm (5.5 in)</li> <li>• DIN rail and desktop mountable</li> <li>• IP 40; IP 65 with custom enclosure</li> </ul>
Power	<ul style="list-style-type: none"> <li>• +/- 12/24 V DC</li> <li>• HV power solution available: 90 V AC to 264 V AC; 88 V DC to 300 V DC</li> </ul>
Cooling	Fanless, passively cooled
Power consumption	13-16 W typical; <19 W maximum
Operating temperature range	<ul style="list-style-type: none"> <li>• -40°C to +65°C (-40°F to +149°F) in a still air environment</li> <li>• AT&amp;T radio model (see Table 2): -30°C to +65°C (-22°F to +149°F) in a still air environment</li> </ul>
Shipping and storage temperature	-40°C to +70°C (-40°F to +158°F)

Table 2. Cellular radio specifications

The 7705 SAR-Hm includes one of the following cellular radios:

	AT&T 2.3 GHz WCS C&D	Americas and EMEA	EMEA and Australia	APAC and Rest of World
Air interface	LTE-FDD	LTE-FDD, LTE-TDD, HSPA+	LTE, HSPA+, GSM/GPRS/EDGE	LTE-FDD, LTE-TDD, HSPA+, TD-SCDMA
4G LTE bands – In MHz	<b>FDD Bands</b> 1900(B2), AWS 1700/2100(B4), 700(B12), 2300 (B125 AT&T)	<b>FDD Bands</b> 2100(B1), 1900(B2), 1800(B3), AWS 1700/2100(B4), 850(B5), 2600(B7), 900(B8), 700(B12), 700(B13), 700(B17), 800(B20), 1900(B25), 850(B26), 700(B29), 2300(B30) <b>TDD Bands</b> 2500(B41)	<b>FDD Bands</b> 2100(B1), 1800(B3), 2600(B7), 900(B8), 800(B20)	<b>FDD Bands</b> 2100(B1), 1800(B3), 850(B5), 2600(B7), 900(B8), 850(B18), 850(B19), 1500(B21), 700(B28), <b>TDD Bands</b> 2600(B38), 1900(B39), 2300(B40), 2500(B41)
3G UMTS(WCDMA)/ HSPA+ bands		2100(B1), 1900(B2), 1800(B3), AWS 1700/2100(B4), 850(B5), 900(B8)	2100(B1), 1900(B2), 850(B5), 900(B8)	2100(B1), 850(B5), 800(B6), 900(B8), 1700(B9), 850(B19)
TD-SCDMA	Not supported	Not supported	Not supported	B39
2G GSM/GPRS/EDGE	Not supported	Not supported	Quad-band	Not supported
LTE user equipment category	4	6	3	6

## Technical specifications

The 7705 SAR-Hm complies with the following specifications. Certification testing is planned.

### Safety

- UL/CSA 60950-1
- UL/CSA 62368-1
- IEC/EN 60950-1
- IEC/EN 62368-1
- AS/NZS 60950.1
- IEC 60529

### Electromagnetic compatibility

- CISPR 32 (Class A)
- IC ICES-003 (Class A)
- FCC Part 15 (Class A)
- EN 55032 (Class A)
- AS/NZS CISPR 32 (Class A)
- VCCI V-3/2015 (Japan)
- KCC Notice Emission KN32 and Immunity KN35 (S. Korea)
- KN 301 489-1
- KN 301 489-7 (GSM)
- KN 301 489-17 (Wi-Fi)
- KN 301 489-24 (LTE)
- EN 301 489-1
- EN 301 489-7 (GSM)
- EN 301 489-17 (Wi-Fi)
- EN 301 489-24 (LTE)
- IEC 61000-6-2
- IEC 61000-6-4
- IEC 61000-3-2
- IEC 61000-3-3

### Environmental

- ETSI EN 300 019-2-1; Storage, Class 1.2
- ETSI EN 300 019-2-2; Transportation, Class 2.3
- ETSI EN 300 019-2-3; Operational, Class 3.2
- IEC 60255-21-1/2/3

### Railway

- EN 50121-4
- IEC 62236-4
- EN 50155
- IEC/EN 61373 (Category 1; Class B)

### Power utility substations

- IEEE 1613 – Class 2
- IEEE 1613.1 – Zone A; Class 2
- IEC 61850-3
- IEC/AS 60870.2.1
- IEC 61000-6-5

### Radio

- RSS - GEN
- RSS-132 (Band 5)
- RSS-133 (Band 2)
- RSS-139 (Band 4)
- RSS-199 (Band 7)
- RSS-210 (Wi-Fi)
- RSS-102 (RF Exposure)
- FCC OET Bulletin 65 (RF Exposure)
- FCC Part 22
- FCC Part 24
- FCC Part 27 (WCS)
- FCC Part 15 Subpart C (Wi-Fi)
- EN 301 908-1 (LTE/WCDMA)
- EN 301 908-13 (LTE)
- EN 301 511 (GSM)
- EN 300 328 (2.4 GHz Wi-Fi)
- EN 301 893 (5 GHz Wi-Fi)
- EN 62311 (RF Exposure)



### **Directives, regional approvals and certifications**

- DIRECTIVE 2014/53/EU RED
- DIRECTIVE 2014/30/EU EMC
- DIRECTIVE 2014/35/EU LVD
- DIRECTIVE 2012/19/EU WEEE
- DIRECTIVE 2011/65/EU RoHS2
- China RoHS
- Australia: RCM Mark
- South Korea: KC Mark
- Japan: VCCI Mark
- Europe: CE Mark

### **Telecom interoperability**

- IEEE 802.3 (Ethernet)
- ANSI/TIA/EIA-232-C (RS-232)
- ITU-T V.24 Feb 2000 (RS-232)
- IEEE 802.11 (Wi-Fi)

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