

Nokia 7705 Service Aggregation Router-Hm/Hmc

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

The Nokia 7705 SAR-Hm/Hmc feature-rich IP/MPLS service routers are ruggedized and compact. With these routers, operators can 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/Hmc 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 Service Router Operating System (SR OS) software base, the 7705 SAR-Hm/Hmc offer 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.



7705 SAR-Hm



7705 SAR-Hmc

Cellular

The 7705 SAR-Hm/Hmc have a cellular interface to connect to 5G, Long Term Evolution (LTE) and 3G networks. They support the most commonly used cellular frequency bands and are able to connect to most mobile network operators worldwide. The cellular interface supports 2x2 multi-in multi-out (MIMO) to provide better signal performance and higher data rates.

The SAR-Hm/Hmc support dual SIM applications. They 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 model supports IEEE 802.11 b/g/n WLANs with the flexibility to act as both an access point (AP) and client concurrently.¹ 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/Hmc are 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/Hmc more tolerant to dust and corrosive environments. They are compliant with IEEE 1613-Class 2 and IEC 61850-3 standards for power utility applications, and EN 50155 and IEC 61373 for rail applications. They are certified for hazardous locations (HazLoc) including Class 1, Division 2 and ATEX Zone 2.

Cyber security protection

The 7705 SAR-Hm/Hmc provide 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. They support 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/Hmc support, but are 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 RS-232 serial data over MPLS services for DNP3, IEC101/104 and other SCADA protocol transport
- Network Address Translation (NAT)/Port Address Translation (PAT) for VPRN and IES services.

¹ Client functionality is a future software deliverable.

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 WLAN 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/Hmc specifications

	7705 SAR-Hm	7705 SAR-Hmc
Fixed interfaces	• 6 x RJ-45 10/100 Mb/s • 2 x RS-232 (async) (raw socket)	• 3 x RJ-45 10/100 Mb/s • 2 x RS-232 (in 1 x RJ-45) (async) (raw socket)
Cellular interface	• See Table 2 • Dual SIM support (2FF mini-SIM)	• See Tables 3,4,5 • Dual SIM support (2FF mini-SIM)
Wi-Fi specifications	• 802.11b/g/n • 2.4 or 5 GHz • Access and client support • Simultaneous access point/client mode	• Does not have Wi-Fi
GNSS port	Global Navigation Satellite System (GNSS) receiver supporting GPS, GLONASS	Global Navigation Satellite System (GNSS) receiver supporting GPS, GLONASS
Physical dimensions and mounting	• Height: 15.2 cm (6 in) • Width: 6.7cm (2.7 in) • Depth: 14 cm (5.5 in) • DIN rail and desktop mountable • IP40; IP66/IP67 with custom enclosure	• Height: 14 cm (5.5 in) • Width: 3.9 cm (1.5 in) • Depth: 12.7 cm (5 in) • Wall/panel, shelf, and DIN rail mountable • IP40; IP66/IP67 with custom enclosure
Power	• +12/24 V DC • HV power solution available: 90 V AC to 264 V AC; 88 V DC to 300 V DC	• +12/24/48 V DC • HV power solution available: 90 V AC to 264 V AC; 88 V DC to 300 V DC
Power consumption	13-16 W typical; <19 W maximum	7 W typical; <8 W maximum
Cooling	Fanless, passively cooled	
Operating temperature range	-40°C to +65°C (-40°F to +149°F) in a still air environment	
Shipping and storage temperature	-40°C to +85°C (-40°F to +185°F)	
Hazardous locations	• Class I, Division 2, Group A,B,C,D T4 • Ex ec IIC T4 Gc • Class I, Zone 2, AEx ec IIC, T4 Gc • -40°C ≤ Ta ≤ 65°C	

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

Table 2. 7705 SAR-Hm cellular radio specifications

	Americas and EMEA	APAC and Rest of World
Air interface	LTE-FDD, LTE-TDD, HSPA+	LTE-FDD, LTE-TDD, HSPA+, TD-SCDMA
4G LTE bands – In MHz	FDD bands B1, B2, B3, B4, B5, B7, B8, B12, B13, B20, B25, B26, B29, B30 TDD bands B41	FDD bands B1, B3, B5, B7, B8, B18, B19, B21, B28 TDD bands B38, B39, B40, B41
3G UMTS(WCDMA)/HSPA+ bands	B1, B2, B3, B4, B5, B8	B1, B5, B6, B8, B9, B19
TD-SCDMA	Not supported	B39
LTE user equipment category (UL/DL)	6/6	6/6
Certifications	PCS Type Certification Review Board (PTCRB) Global Certification Forum (GCF), AT&T, Verizon Wireless	GCF, ANATEL

The 7705 SAR-Hmc includes one of the following cellular radios.

Table 3. 7705 SAR-Hmc cellular radio specifications for all countries worldwide

	World Variant	5G World variant
Air interface	LTE-FDD, LTE-TDD, P-LTE	5G RedCap, LTE-FDD, LTE-TDD, P-LTE
5G FR1	Not applicable	FDD Bands n1, n2, n3, n5, n7, n8, n12, n13, n14, n18, n20, n25, n26, n28, n30, n66, n70, n71 TDD Bands n38, n40, n41, n48/CBRS, n53, n77, n78, n79
4G LTE bands – In MHz	FDD bands B1, B2, B3, B4, B5, B7, B8, B12, B13, B14, B18, B19, B20, B25, B26, B28, B66, B71 TDD bands B38, B39, B40, B41, B42, B43, B48/CBRS	FDD Bands B1, B2, B3, B4, B5, B7, B8, B12, B13, B14, B17, B18, B19, B20, B25, B26, B28, B30, B66, B71 TDD Bands B34, B38, B39, B40, B41, B42, B43, B48/CBRS
3G UMTS	B1, B2, B4, B5, B6, B8, B9, B19	Not applicable
LTE user equipment category (UL/DL)	13/13	4/4
Certifications	PTCRB*, GCF*, AT&T including FirstNet*, Verizon*, FCC Part 96 (CBRS EUD, CBSD Category A and B)*	PTCRB, GCF, AT&T including FirstNet, Verizon, FCC Part 96 (CBRS EUD, CBSD Category A and B)*

*Certification is pending

Table 4. 7705 SAR-Hmc cellular radio specifications for USA and Canada

	USA and Canada – Variant 1	USA and Canada – Variant 2
Air interface	LTE-FDD, LTE-TDD, P-LTE	LLTE-FDD, LTE-TDD, HSPA+, P-LTE
4G LTE bands – In MHz	FDD bands B2, B4, B5, B8, B12, B13, B14, B25, B26, B66 TDD bands B41, B42, B43, B48	FDD bands B2, B4, B5, B7, B12, B13, B14, B25, B26, B66, B71 TDD bands B41, B42, B43, B48/CRBS
3G UMTS (WCDMA)/ HSPA+ bands		B2, B4, B5
LTE user equipment category (UL/DL)	4/4	13/7
Certifications	PTCRB, GCF, AT&T including FirstNet, US Cellular, Telus, FCC Part 96 (CBRS EUD, CBSD Category A and B)	PTCRB, GCF, Verizon, AT&T including FirstNet, US Cellular, FCC Part 96 (CBRS EUD, CBSD Category A and B)

Table 5. 7705 SAR-Hmc cellular radio specifications for EMEA, CALA and APAC

	EMEA and CALA B31/B72	EMEA and CALA B87	EMEA and APAC
EMEA and APAC interface	LTE-FDD, LTE-TDD	LTE-FDD, LTE-TDD	LTE-FDD, LTE-TDD, HSPA+, P-LTE
4G LTE bands – In MHz	FDD bands B3, B4, B7, B20, B28, B31, B72 TDD bands B38, B42, B43	FDD bands B3, B4, B7, B20, B28, B87 TDD bands B38, B42, B43	FDD bands B1, B3, B7, B8, B20, B28, B32 TDD bands B38, B40, B41, B42, B43
3G UMTS (WCDMA)/ HSPA+ bands			B1, B5, B8
LTE user equipment category (UL/DL)	4/4	4/4	13/7
Certifications	GCF		GCF

Technical specifications²

Safety

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

Hazardous locations

- UL/CSA/IEC/EN 60079-0
- UL/CSA/IEC/EN 60079-7

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: SAR-Hm only)
- KN 301 489-52 (LTE)
- EN 301 489-1
- EN 301 489-7 (GSM)
- EN 301 489-17 (Wi-Fi: SAR-Hm only)
- EN 301 489-19 (GNSS)
- EN 301 489-52 (LTE)
- IEC 61000-3-2
- IEC 61000-3-3
- IEC 61000-4-2
- IEC 61000-4-3
- IEC 61000-4-4
- IEC 61000-4-5
- IEC 61000-4-6

- IEC 61000-4-8
- IEC 61000-4-10
- IEC 61000-4-11
- IEC 61000-4-12
- IEC 61000-4-16
- IEC 61000-4-17
- IEC 61000-4-18
- IEC 61000-4-29
- IEC 61000-6-2
- IEC 61000-6-4

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

² System design intent is according to the listed standards. Refer to product documentation for detailed compliance status.

Radio

- RSS - GEN
- RSS-130 (Band 12 and 13)
- 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)
- FCC Part 90
- FCC Part 96 (CBRS) (SAR-Hmc only)
- 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 2014/34/EU ATEX
- 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)

Enclosure system

The 7705 SAR-Hm/SAR-Hmc compact, outdoor enclosure provides full weather and security access protection for deployment in power substations, rail transport, mining trucks and other harsh environmental locations. The enclosure's thermally optimized design meets extended temperature and solar loading requirements. The enclosure system is IP66/IP67 tested to ensure dust and water protection, and it allows the 7705 SAR-Hm/Hmc routers to be mounted on a vertical surface, pole or wall. Security measures include a door open sensor as well as provisions for hasp-style locks. Accessory kits are available for Wi-Fi and GNSS connection.

Features

- IP66/IP67 rated
- Internal moisture control venting
- Extended temperature operation compliant with Telcordia GR-487 solar loading conditions based on an integrated heatsink design
- Sustains 30 g, 11 ms shock, 8.9 g vibration
- Certified for hazardous locations (HazLoc)
- Compact, UV-stabilized, durable, light grey polycarbonate construction
- Accommodates a 7705 SAR-Hm or SAR-Hmc router and an optional 35 W high-voltage power supply (HV-PS35)

Enclosure specifications

- 3HE12311AA: two 4.3-10 female LTE ports, plus two optional N-type connectors for Wi-Fi and GPS antenna termination
- 3HE12311BA: two N-type female LTE ports, plus two optional N-type connectors for Wi-Fi and GPS antenna termination
- 3HE12555BA for 7705 SAR-Hmc: two N-type female LTE ports, plus two optional N-type connectors for Wi-Fi and GPS antenna termination
- Three ¾-in NPT conduit ports for Ethernet, serial data, power and alarm connections
- Dimensions:
 - Height: 31.5 cm (12.4 in)

– Width: 28.4 cm (11.2 in)

– Depth: 15.7 cm (6.2 in)

- Used with the SAR-Hm/Hmc for hazardous locations

Certification Marking:

- II 3G
- Ex ec nC IIA Gc
- Class 1, Zone 2, AEx ec nC IIA Gc
- Class 1, Division 2, Group D
- $T_a = -25^{\circ}\text{C} \leq T_a \leq +46^{\circ}\text{C}$

Compliance

- IEC 60529 IP66/IP67
- IEC 60255-21-1/2/3 (shock and vibration)
- EN50155/EN 61373 (railway shock and random vibration)
- Mining vehicle-operational sinusoidal vibration:
 - 8.9 g; 5 to 200 Hz
 - 1”p-p displacement
 - 2.5 hours per axis

Hazardous locations

- UL/CSA/IEC/EN 60079-0
- UL/CSA/IEC/EN 60079-7
- UL/CSA/IEC/EN 60079-15

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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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