

Nokia 7705 SAR-H

Service Aggregation Router

The Nokia 7705 Service Aggregation Router – H (SAR-H) provides industry-leading IP/MPLS communications capabilities in a fanless platform featuring temperature and electromagnetic hardening for deployment in harsh environments. It is ideal for the delivery of services requiring high availability in mission-critical applications including utilities, transportation, government and public safety networks.



The Nokia 7705 SAR-H is an IP/MPLS-based temperature- and electromagnetic-hardened router designed for communications in environments where size, power and flexibility are critical, while providing powerful service-oriented networking capabilities. As part of the Nokia IP/MPLS service routing solutions, it is well suited for utility, transportation and other industry markets. Power utilities, for example, require highly reliable communications infrastructures for their smart grid projects such as grid modernization, substation automation, distribution automation and advanced metering infrastructure.

In a cost-effective platform with two module slots, the Nokia 7705 SAR-H is a feature-rich IP/MPLS router that can be deployed in utility substations for instance, to aggregate traffic from different smart grid applications such as supervisory control and data acquisition (SCADA) systems and distribution automation field sensors and control devices. The 7705 SAR-H is managed by the Nokia 5620 Service Aware Manager (SAM) portfolio for end-to-end service consistency and management across a resilient IP/MPLS network in flexible topologies from the core to access.

Features

Service aggregation and networking

To provide a converged IP/MPLS networking solution, the Nokia 7705 SAR-H supports Layer 1, Layer 2 and Layer 3 virtual private networks (VPNs) to allow the separation of traffic between different applications or organizations. Example VPNs are as follows:

- Pseudowire transport for SCADA over RS-232 serial interface
- Virtual Private LAN Service (VPLS) for IEC 61850 Generic Object Oriented Substation Events (GOOSE) Messaging over multipoint Ethernet connections
- IP-VPN for SCADA over IP, IP-based video surveillance or Voice over IP (VoIP)

Flexible network infrastructure options

Various tunneling options are supported including MPLS, IP and Generic Routing Encapsulation (GRE) for aggregated traffic. When dynamic MPLS signaling is enabled, the end-to-end pseudowire is established using Targeted Label Distribution Protocol (T-LDP) and the MPLS tunnel using LDP and Resource Reservation Protocol with Traffic Engineering (RSVP-TE), as well as seamless MPLS. In addition, static provisioning of both MPLS tunnel and pseudowire is supported.

Label switched routing

The Nokia 7705 SAR-H can be configured as either a Label Edge Router (LER) or a full Label Switched Router (LSR), allowing deployment in access as well as aggregation applications. Label Switched Paths (LSPs) can be signaled using either the Label Distribution Protocol (LDP) or RSVP-TE. The 7705 SAR-H brings a strong suite of traffic engineering and resiliency capabilities using functions such as Constraint-based Shortest Path First (CSPF) routing, Fast Reroute (FRR), primary and secondary LSPs and redundant pseudowires.

Quality of service and traffic management

It is critical to maintain the end-to-end quality of service (QoS) for different traffic. Not all types of traffic have the same set of requirements. Protection and control traffic in particular require low latency, whereas other data traffic often has less stringent delay requirements but may be very sensitive to loss. To offer the required treatment throughout the network, traffic flows with different requirements are identified at the access and marked in-line with the appropriate QoS metrics.

The Nokia 7705 SAR-H utilizes extensive traffic management policies to ensure fairness with detailed classification and hierarchical scheduling including minimum/maximum, queue-based weighted round robin or strict priority and profiled scheduling, as well as multi-tier policing to differentiate and prioritize individual services and flows.

Operations, administration and maintenance

In order to ensure continuity of services, the Nokia 7705 SAR-H has a full set of operations, administration and maintenance (OAM) features. These features ensure rapid fault detection as well as efficient troubleshooting. Rapid commissioning of remote devices is supported through an integrated auto-discovery protocol.

Cyber security

The Nokia 7705 SAR-H has extensive integrated security features that help utilities defend against cyber security threats, ensure data privacy in general, and help meet North American Electric Reliability Corporation (NERC) Version 5 Critical Infrastructure Protection (CIP) compliance or other government cyber security regulations in particular. Key security features include the following:

- Wide variety of access control lists (ACLs)
- Extensive authentication features for control plane protection and user account management and profiling

- Network group encryption (NGE) and IPSec – Encryption supported includes AES 256/128, 3DES, and DES encryption. Authentication supported includes HMAC-SHA-512, HMAC-SHA-256, HMAC-MD5, and SHA-1-96.
- Network address translation (NAT)
- Zone-based stateful firewall

Synchronization

Accurate synchronization is important in communications networks in maintaining network operational integrity. The Nokia 7705 SAR-H supports the following range of timing options:

- External reference timing
- Line timing
- IEEE 1588v2 Precision Timing Protocol – slave and boundary clock
- Synchronous Ethernet
- Adaptive clock recovery (ACR) timing
- IRIG-B (B000/B127) synchronization output
- Global Positioning System (GPS) receiver

Features and benefits

Features	Benefits
Purpose-built temperature/ electromagnetic-hardened fanless platform	Enables deployment in utility substations and other harsh environments
Conformal coating option	Protection against environmental contaminants
Range of built-in and modular interfaces	Provides flexibility, expandability and scalability in deployments
Full-featured IP/MPLS router	Extends powerful IP/MPLS capabilities from core to the access in flexible topologies
Power over Ethernet (PoE), PoE+ capability	Enables the direct connection of PoE/PoE+ power devices
Stateful zone-based firewall	<ul style="list-style-type: none"> • MPLS and service-aware configuration of firewall zones and policies (e.g. VPRN, IES) • Stateful session tracking for strong mitigation of attack scenarios • Firewall
NAT/port address translation (PAT)	Network address translation between public and private domains or as an added security layer to hide internal addressing from potential snooping attackers or other cyber security threats
Local DHCP server	<ul style="list-style-type: none"> • Allows users to decentralize IP address management deeper into the network • Supports public and private addressing, including overlapped private addressing in the form of VPRNs in the same router
High and low input voltages	Accommodates various substation and industry operating requirements
Full range of timing options	Ensures end-to-end network synchronization

Technical specifications

Hardware

The 7705 SAR-H is available in two chassis types to suit a broad range of applications. Tables 1, 2 and 3 provide a summary of the technical specifications of the 7705 SAR-H.

Nokia 7705 SAR-H interface types

- Main chassis
 - Four 10/100/1000BASE-T ports (PoE/PoE+ capable)
 - Two 100/1000BASE-TX ports (SFP)
 - Two combo 100/1000 Ethernet ports (SFP/RJ-45)
- Combo T1/E1/RS-232 module
 - Two T1/E1 ports for TDM and IP services
 - Two RS-232 (async) ports
- 4-port Fast Ethernet module
 - Four 10/100BASE-T ports

Nokia 7705 SAR-H technical specifications

- Operating temperature: -40°C (-40°F) to +65°C (+149°F)

- Power (redundant DC feeds)
 - High voltage: 88 V to 300 V AC/DC
 - Low voltage: +24 V/-48 V DC
- Physical dimensions
 - Height: 1.7RU (76.2 mm) (3 in)
 - Width: 254 mm (10 in)
 - Depth: 279.4 mm (11 in)
 - Weight: 7.7 kg (16.98 lb)
- Mounting
 - Standard 19-inch equipment rack- front and reverse options
 - Wall
 - IP40 packaging
- Cooling
 - Fanless, passively cooled
- Power utility substation
 - IEEE 1613 Class 2
 - IEC 61850-3
- Railway
 - EN 50121-4

Table 1. Nokia 7705 SAR-H part numbers

Part Number	Part Name	Description
3HE06969AA	SAR-H High Voltage Shelf	SAR-H shelf with high voltage power input (88 V to 300 V AC or DC). Contains 4 x SFP GigE and 4 x RJ-45 10/100/1000 PoE-capable Ethernet ports and 2 module positions. Supports PoE on 2 ports without external supply
3HE06969CA	SAR-H High Voltage Shelf (Conformal Coated)	Conformal coated SAR-H shelf with high voltage power input (88 V to 300 V AC or DC). Contains 4 x SFP GigE and 4 x RJ-45 10/100/1000 PoE-capable Ethernet ports and 2 module positions. Supports PoE on 2 ports without external supply
3HE06969BA	SAR-H Low Voltage Shelf	SAR-H shelf with low voltage power input (+24 V/-48 V DC). Contains 4 x SFP GigE and 4 x RJ-45 10/100/1000 PoE-capable Ethernet ports and 2 module positions. Supports PoE on 2 ports without external supply
3HE06969DA	SAR-H Low Voltage Shelf (Conformal Coated)	Conformal coated variant of combo module supporting 2 x T1/E1 ports with TDM and IP functionality and 2 x RS-232 serial data ports. RJ-45 connectors for interconnection to end equipment. Supports PoE on 2 ports without external supply
3HE06973AA	SAR-H ASAP/Serial Combo Module	Combo module supporting 2 x T1/E1 ASAP ports and 2 x RS-232 serial data ports. RJ-45 connectors for interconnection to end equipment
3HE06973BA	SAR-H ASAP/Serial Combo Module (Conformal Coated)	Conformal coated variant of combo module supporting 2 x T1/E1 ports with TDM and IP functionality and 2 x RS-232 serial data ports. RJ-45 connectors for interconnection to end equipment.
3HE07955AA	GPS Receiver Module	An integrated GPS receiver, which can provide a PRC-traceable frequency, PRTC-traceable time of day clock and geographic location
3HE09303AA	SAR-H 4 Port Fast Ethernet Module	Fast Ethernet module supporting 4 x RJ-45 10/100 Ethernet data ports. RJ-45 connectors for interconnection to end equipment
3HE08607AA	Right-to-use (RTU) 7705 SAR-H Basic IP Sec License	RTU - SAR-H Basic IPsec license. Including encryption throughput of 150 Mb/s and maximum of 25 IPsec tunnels. One (1) OS license is required for each SAR-H in the network.
3HE08607AB	RTU - 7705 SAR-H UP-Basic to Full IPsec License	RTU - SAR-H Upgrade IPsec license. Upgrade Basic IPsec license to Full IPsec license. One (1) OS license is required for each SAR-H in the network.
3HE08607AC	RTU - 7705 SAR-H Full IPsec License	RTU - SAR-H full IPsec license
3HE09259AA	RTU - 7705 SAR-H NGE License	SAR-H Network Group Encryption license
3HE06970AA	100W 48V DC Power Supply - HV Input	External supply required to supply additional PoE power to the SAR-H. Can also be used to provide 48 V DC (nominal) to other equipment via 9-pin D-sub-connector. 85 V to 265 V AC or 88 V to 300 V DC input. 100 W output power. -40°C (-40°F) to +65°C (+149°F) operation. IP40 enclosure rating

Part Number	Part Name	Description
3HE6970BA	100W 48V DC Power Supply - HV Input (Conformal Coated)	Conformal coated variant of external supply required to supply additional PoE power to the SAR-H. Can also be used to provide 48 V DC (nominal) to other equipment via 9-pin D-sub-connector. 85 V to 265 V AC or 88 V to 300 V DC input. 100 W output power. -40°C(-40°F) to +65°C (+149°F) operation. IP40 enclosure rating
3HE06970BA	100W 48V DC Power Supply - LV Input	External supply required to supply additional PoE power to the SAR-H. Can be used to provide 48 V DC (nominal) to other equipment via 9-pin D-sub-connector. 20 V to 75 V DC input. 100 W output power. Operating temperature range is -40°C (-40°F) to +65°C (+149°F). IP40 enclosure rating
3HE06970DA	100W 48V DC Power Supply - LV Input (Conformal Coated)	Conformal coated variant of external supply required to supply additional PoE power to the SAR-H. Can be used to provide 48 V DC (nominal) to other equipment via 9-pin D-sub-connector. 20 V to 75 V DC input. 100 W output power. Operating temperature range is -40°C (-40°F) to +65°C (+149°F). IP40 enclosure rating
3HE06971AA	SAR-H PoE Power Supply Mounting Tray	1RU tray to house up to 2 x 3HE06970xA 100 W power supplies
3HE07769AA	7705 SAR-H Wall/Reverse Rack Mounting Kit	Kit contains brackets to wall-mount or reverse rack-mount a 7705 SAR-H
3HE07770AA	7705 SAR-H PoE Wall Mount Kit	Kit contains brackets to wall-mount a 7705 SAR-H PoE power supply (3HE06970xA)

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