7705 SAR-Hm
7705 SAR-Hmc | Release 19.10.R1

Interface Configuration Guide

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1 Preface

1.1 How to Use This Guide

The 7705 SAR-Hm series of routers is made up of the 7705 SAR-Hm and the 7705 SAR-Hmc. Unless specified otherwise, references in this guide to the router, the node, or the system apply to both chassis.

This guide is organized into functional chapters that describe the operation of the routers. It provides conceptual information as well as Command Line Interface (CLI) syntax and command descriptions for provisioning ports, interfaces, and functionality that is specifically related to the 7705 SAR-Hm series.

The 7705 SAR-Hm series shares functionality with the SR OS and the Virtualized Service Router (VSR). This guide is intended to be used in conjunction with guides from the SR software documentation set. Chapters in this guide map to the SR software guides. Shared functionality between the SR OS and the 7705 SAR-Hm series is referenced in each chapter of this guide but described in the relevant SR software guide; users are directed to the appropriate location in the SR guide for information. For ease of use, all references are mapped to section headings in the SR guides. When a high-level section heading from an SR guide is referenced without references to lower-level sections, this indicates that all the functionality described in that section is supported on the 7705 SAR-Hm series. When lower-level section headings are specified, this indicates that only the functionality described in those sections is supported. Lower-level section headings are omitted if those areas of functionality are not supported on the 7705 SAR-Hm series.

Note: This manual generically covers 7705 SAR-Hm Release 19.x.Rx content and may contain some content that will be released in later maintenance loads. Please refer to the 7705 SAR-Hm and SAR-Hmc 19.x.Rx Software Release Notes, part number 3HE1542800xx TQZZA, for information about the features supported in each load of the Release 19.x.Rx software.

1.1.1 Software Documents in this Documentation Suite

The software guides that make up the documentation suite for the 7705 SAR-Hm series of routers are as follows:

- 7705 SAR-Hm and SAR-Hmc Main Configuration Guide
- 7705 SAR-Hm and SAR-Hmc Interface Configuration Guide

Table 1 lists the guides from the SR software documentation suite that are intended to be used with the guides from the 7705 SAR-Hm series.

Table 1 **7450 ESS, 7750 SR, 7950 XRS, and VSR Software Guides**

Guide Title	Description
7450 ESS, 7750 SR, 7950 XRS, and VSR Basic System Configuration Guide	This guide describes CLI usage, BOF configuration, and file system management, as well as how to configure basic system management, node timing, and synchronization functions.
7450 ESS, 7750 SR, 7950 XRS, and VSR System Management Guide	This guide describes system security features, SNMP, and event and accounting logs. It covers basic tasks such as configuring management access filters, passwords, and user profiles.
7450 ESS, 7750 SR, 7950 XRS, and VSR Router Configuration Guide	This guide describes logical IP routing interfaces and associated attributes such as IP addresses, as well as IP and MAC-based filtering.
7450 ESS, 7750 SR, 7950 XRS, and VSR Unicast Routing Protocols Guide	This guide provides an overview of unicast routing concepts and provides configuration examples for Routing Information Protocol (RIP) and Border Gateway Protocol (BGP) routing protocols and for route policies.
7450 ESS, 7750 SR, 7950 XRS, and VSR Multicast Routing Protocols Guide	This guide provides an overview of multicast routing concepts and provides configuration examples for Internet Group Management Protocol (IGMP), Multicast Listener Discovery (MLD), Protocol Independent Multicast (PIM), Multicast Source Discovery Protocol (MSDP), Multipoint LDP, multicast extensions to BGP, and Multicast Connection Admission Control (MCAC).
7450 ESS, 7750 SR, 7950 XRS, and VSR MPLS Guide	This guide describes how to configure Multiprotocol Label Switching (MPLS), Resource Reservation Protocol (RSVP), and Label Distribution Protocol (LDP).

Table 1 **7450 ESS, 7750 SR, 7950 XRS, and VSR Software Guides**

Guide Title	Description
7450 ESS, 7750 SR, 7950 XRS, and VSR Services Overview Guide	This guide provides a general overview of functionality provided by the routers and describes how to configure service parameters such as Service Access Points (SAPs), Service Distribution Points (SDPs), customer information, and user services.
7450 ESS, 7750 SR, 7950 XRS, and VSR Layer 2 Services and EVPN Guide: VLL, VPLS, PBB, and EVPN	This guide describes Layer 2 service and Ethernet Virtual Private Network (EVPN) functionality and provides examples to configure and implement Virtual Leased Lines (VLLs), Virtual Private LAN Service (VPLS), Provider Backbone Bridging (PBB), and EVPN.
7450 ESS, 7750 SR, 7950 XRS, and VSR Layer 3 Services Guide: IES and VPRN	This guide describes Layer 3 service functionality and provides examples to configure and implement Internet Enhanced Services (IES) and Virtual Private Routed Network (VPRN) services.
7450 ESS, 7750 SR, 7950 XRS, and VSR Quality of Service Guide	This guide describes how to configure Quality of Service (QoS) policy management.
7450 ESS, 7750 SR, 7950 XRS, and VSR OAM and Diagnostics Guide	This guide describes how to use the Operations, Administration and Management (OAM) and diagnostics tools.
7450 ESS, 7750 SR, 7950 XRS, and VSR Interface Configuration Guide	This guide describes how to provision Input/Output Modules (IOMs), Media Dependent Adapters (MDAs), connectors, and ports.
7450 ESS, 7750 SR, and VSR Multiservice Integrated Service Adapter and Extended Services Appliance Guide	This guide describes services provided by integrated service adapters, such as Application Assurance, IPSec, ad insertion (ADI), and Network Address Translation (NAT).
7450 ESS, 7750 SR, 7950 XRS, and VSR Log Events Guide	This guide describes log events that apply to the 7705 SAR-Hm series of routers.
7450 ESS, 7750 SR, and VSR Triple Play Service Delivery Architecture Guide	This guide describes the Triple Play Service Delivery Architecture (TPSDA) support and provides examples to configure and implement various protocols and services.

1.1.2 Technical Support

If you purchased a service agreement for your 7705 SAR-Hm series router and related products from a distributor or authorized reseller, contact the technical support staff for that distributor or reseller for assistance. If you purchased a Nokia service agreement, follow this link to contact a Nokia support representative and to access product manuals and documentation updates:

Product Support Portal

2 Interfaces

This chapter provides overview information about the types of interfaces supported on 7705 SAR-Hm series routers.

Note: For specific information about the topics that are not explicitly described in this guide (in black text in the list below), refer to the corresponding sections in the 7450 ESS, 7750 SR, 7950 XRS, and VSR Interface Configuration Guide.

Topics in this chapter include:

2.1 Configuration Overview

This guide uses the term preprovisioning in the context of preparing or preconfiguring ports and interfaces prior to enabling them. When the entity is in a **no shutdown** state (administratively enabled), the entity is considered provisioned.

2.1.1 Chassis IOM and MDAs

The 7705 SAR-Hm series routers have a fixed physical configuration that uses an integrated control and switching functional block. The Input/Output module (IOM) and Media Dependent Adapters (MDAs) are also integrated into the chassis.

On the CLI, a port is identified using the format *slot*/*mda*/*port*. The slot ID identifies the IOM and is always 1. The MDA identifiers are:

- 1/1 for the cellular MDA and for the GNSS receiver
- 1/2 for the Ethernet MDA
- 1/3 for the serial port MDA
- 1/4 for the WLAN port MDA
- 1/5 for the virtualized integrated ISA MDA, for IPSec and IP tunnel functionality
- 1/6 for the virtualized integrated BB ISA MDA, for Network Address Translation (NAT) functionality

On the 7705 SAR-Hm, MDAs 1/1 through 1/5 are automatically provisioned and cannot be deprovisioned. MDA 1/6 is not automatically provisioned, but can be provisioned and deprovisioned.

On the 7705 SAR-Hmc, MDAs 1/1, 1/2, and 1/3 are automatically provisioned. MDAs 1/5 and 1/6 are not automatically provisioned, but can be provisioned and deprovisioned.

Table 2 lists the CLI port identifiers for each port type on the chassis.

Table 2 **CLI Port Identifiers**

Port Type	CLI Identifier	Variable Definition
Cellular	1/1/*port-id*	*port-id* is the port number, 1 or 2
Ethernet	1/2/*port-id*	*port-id* is the port number: • from 1 to 6 on the 7705 SAR-Hm • from 1 to 3 on the 7705 SAR-Hmc

Table 2 **CLI Port Identifiers (Continued)**

Port Type	CLI Identifier	Variable Definition
RS-232	1/3/*port-id*	*port-id* is the port number, 1 or 2
WLAN	1/4/*port-id*	*port-id* is the port number, 1

There are virtual ports in the CLI for the isa-tunnel-v and the isa-bb-v virtualized MDAs.

The following chassis and card names are used on the CLI:

- integrated control and switching functional block—**cpm-sar-hm** or **cpm-sar-hmc**
- IOM—**iom-sar-hm** or **iom-sar-hmc**
- cellular MDA 1/1—**i2-cellular**
- Ethernet MDA in slot 1/2—**i6-10/100eth-tx** or **i3-10/100eth-tx**
- serial port MDA in slot 1/3—**i2-sdi**
- WLAN port MDA is slot 1/4—**i1-wlan** or blank
- virtualized integrated ISA MDA in slot 1/5—**isa-tunnel-v**
- virtualized integrated BB ISA MDA in slot 1/6—**isa-bb-v**

The following CLI output shows the factory-provisioned settings when the **show card state** command is issued on the 7705 SAR-Hm.

```
*A:cses-V34# show card state
===============================================================================
Card State
===============================================================================
Slot/  Provisioned Type                  Admin Operational   Num   Num Comments
Id         Equipped Type (if different)  State State         Ports MDA
-------------------------------------------------------------------------------
1      iom-sar-hm                        up    up                  6
1/1    i2-cellular                       up    up            2
1/2    i6-10/100eth-tx                   up    up            6
1/3    i2-sdi                            up    up            2
1/4    i1-wlan                           up    up            2
1/5    isa-tunnel-v                      up    up            2
1/6    (not provisioned)                 up    unprovisioned
           isa-bb-v
A      cpm-sar-hm                        up    up                     Active
===============================================================================
*A:cses-V34#
```

The CLI output for the example above looks similar to the following output when the **config**>**card 1** and the **info** commands are issued on the 7705 SAR-Hm:

```
*A:cses-V34>config# card 1
```

```
*A:cses-V34>config>card# info
----------------------------------------------
        card-type iom-sar-hm
        mda 1
            mda-type i2-cellular
            no shutdown
        exit
        mda 2
            mda-type i6-10/100eth-tx
            no shutdown
        exit
        mda 3
            mda-type i2-sdi
            no shutdown
        exit
        mda 4
            mda-type i1-wlan
            no shutdown
        exit
        mda 5
            mda-type isa-tunnel-v
            no shutdown
        exit
        no shutdown
----------------------------------------------
*A:cses-V34>config>card#
```

The following CLI output shows the factory-provisioned settings when the **show card state** command is issued on the 7705 SAR-Hmc.

```
A:kansarhmc1: Dut-A>show# show card state
===============================================================================
Card State
===============================================================================
Slot/  Provisioned Type                  Admin Operational   Num   Num Comments
Id         Equipped Type (if different)  State State         Ports MDA
-------------------------------------------------------------------------------
1      iom-sar-hmc                       up    up                    6
1/1    i2-cellular                       up    up            2
1/2    i3-10/100eth-tx                   up    up            3
1/3    i2-sdi                            up    up            2
1/5    (not provisioned)                 up    unprovisioned
           isa-tunnel-v
1/6    (not provisioned)                 up    unprovisioned
           isa-bb-v
A      cpm-sar-hmc                       up    up                       Active
===============================================================================
*A:kansarhmc1: Dut-A>show#
```

The CLI output for the example above looks similar to the following output when the **config**>**card 1** and the **info** commands are issued on the 7705 SAR-Hmc:

```
A:kansarhmc1: Dut-A>config>card# info
----------------------------------------------
        card-type iom-sar-hmc
        mda 1
            mda-type i2-cellular
```

```
            no shutdown
        exit
        mda 2
            mda-type i3-10/100eth-tx
            no shutdown
        exit
        mda 3
            mda-type i2-sdi
            no shutdown
        exit
        no shutdown
-------------------------------------------
*A:kansarhmc1: Dut-A>config>card#
```

2.2 Ports

This section provides information about the types of ports supported on the system.

2.2.1 Port Types

The system supports the port types listed below.

- Cellular

  The cellular interface supports dual SIM operation using major carrier frequency bands in North America, EMEA, and APAC. For more information on cellular ports, see Cellular MDA and Ports.

- Ethernet

  The system supports Fast Ethernet (10/100Base-T) ports. The Ethernet ports are typically connected to field devices, such as Intelligent Electronic Devices (IEDs), AMI collectors, supervisory modules, weather monitoring devices, cameras, and other hosts.

  In some cases, an Ethernet port may be connected to a 7705 SAR-18, 7705 SAR-8, 7705 SAR-H, or 7705 SAR-Hc node, which will use the system's cellular port as a backup link.

  For more information on Fast Ethernet ports, refer to the 7450 ESS, 7750 SR, 7950 XRS, and VSR Interface Configuration Guide, "Port Types".

- Serial

  RS-232 asynchronous ports are typically used for connecting to remote SCADA equipment. The ports support full-duplex communication and interface speeds of 600 b/s, 1200 b/s, 2400 b/s, 4800 b/s, 9600 b/s, 19 200 b/s, 38 400 b/s, 57 600 b/s, and 115 200 b/s. The serial ports can be configured to support raw socket transport; see Serial Transport Over Raw Sockets for more information.

- Alarm

  For information about the alarm port and the number of supported alarm inputs and outputs, refer to the SAR-Hm and SAR-Hmc Chassis Installation Guide.

  For information about configuring alarm outputs, refer to the 7450 ESS, 7750 SR, 7950 XRS, and VSR Basic System Configuration Guide.

Alarm inputs are configured using the **config>system>alarm-contact-input** CLI command and sub-commands. For information, refer to “System Alarm Contact Input Commands” in the 7450 ESS, 7750 SR, 7950 XRS, and VSR Basic System Configuration Guide. To display the status of the alarm inputs, use the **show>system>alarm-contact-input all** CLI command; refer to “Show Commands” in the 7450 ESS, 7750 SR, 7950 XRS, and VSR Basic System Configuration Guide for information.

- WLAN

  The WLAN interface supports the IEEE 802.11 b/g/n WLAN standard. The interface is enabled as a WLAN access point (AP) that remote WLAN stations can connect to. For more information, see Wireless LAN Interface. WLAN traffic that is received from WLAN stations connected to the WLAN AP is transported over a Layer 2 service using an Epipe. Refer to the 7705 SAR-Hm and SAR-Hmc Main Configuration Guide for details about configuring services for the WLAN AP.

2.2.2 Port Features

For general information about port features, refer to the “Port State and Operational State” section in the 7450 ESS, 7750 SR, 7950 XRS, and VSR Interface Configuration Guide.

2.3 MTU Configuration Guidelines

Observe the general rules described in the 7450 ESS, 7750 SR, 7950 XRS, and VSR Interface Configuration Guide, “MTU Configuration Guidelines”, when planning service and physical MTU configurations.

2.3.1 Default and Maximum MTU Values

Table 3 lists the default and maximum MTU values for Fast Ethernet ports, cellular ports, and the WLAN interface.

For information on how to modify the MTU defaults, refer to the 7450 ESS, 7750 SR, 7950 XRS, and VSR Interface Configuration Guide, “Modifying MTU Defaults”.

Table 3 **MTU Default and Maximum Values**

Port Type	Mode	Default	Maximum
Fast Ethernet	Access/network	1514 bytes (includes Ethernet header, but excludes Ethernet CRC)	1622 bytes
Cellular interface	Network (PDN router interface)	None Operators must configure this value on the PDN router interface to ensure proper operation of a cellular port.	1486 bytes
WLAN interface	Access	1500 bytes (non-configurable)	1500 bytes (non-configurable)

2.3.2 MTU Considerations Over a Cellular Port

The cellular port IP layer MTU is derived from the PDN router interface that is configured for the cellular port. By default, the PDN router interface MTU is not set. To operate the cellular interface without failures, an MTU value that is less than or equal to 1486 bytes must be configured (using the **ip-mtu** command) for the PDN router interface. For information about configuring the PDN router interface, refer to “PDN Router Interface Command Reference” in the 7705 SAR-Hm and SAR-Hmc Main Configuration Guide.

Mobile networks often require a strict IP layer MTU for the LTE interface that is less than or equal to1486 bytes. Consult with the cellular service provider regarding the correct IP layer MTU value to set for the associated PDN router interface.

The SAP MTU settings must also correctly account for the PDN router interface IP layer MTU, as services that are transported over the cellular interface are impacted by this configuration.

For example, if a cellular provider allows an IP layer MTU of 1486 bytes, the following calculations and values must be considered when setting up services over a cellular port.

For BGP and T-LDP protocols, the MTU of protocol packets must be set to 1486 bytes or less. For information about BGP path MTU discovery, refer to the **path-mtu-discovery** command in the 7450 ESS, 7750 SR, 7950 XRS, and VSR Unicast Routing Protocols Guide. For information about LDP path MTU discovery, refer to the refer to the **path-mtu-discovery** command in 7450 ESS, 7750 SR, 7950 XRS, and VSR MPLS Guide.

For Layer 3 services over a VPRN service using GRE transport, the SAP MTU must be set as follows:

- SAP MTU = {1486 bytes – (GRE packet overhead) – (VPRN service label)}
- SAP MTU = {1486 bytes – (24 bytes) – (4 bytes)}
- SAP MTU = 1458 bytes

For Layer 3 services over a VPRN service using GRE transport with NGE enabled, the SAP MTU must be set as follows:

- SAP MTU = {1486 bytes – (GRE packet overhead) – (VPRN service label) – (NGE overhead)}
- SAP MTU = {1486 bytes – (24 bytes) – (4 bytes) – (77 bytes)}
- SAP MTU = 1381 bytes

For Layer 2 services over a VPLS service using GRE transport, the SAP (port) MTU must be set as follows:

- SAP MTU = {1486 bytes – (GRE packet overhead) – (VPLS service label)}
- SAP MTU = {1486 bytes – (24 bytes) – (4 bytes)}
- SAP MTU = 1458 bytes

For Layer 2 services over a VPLS service using GRE transport with NGE enabled, the SAP MTU must be set as follows:

- SAP MTU = {1486 bytes – (GRE packet overhead) – (VPLS service label) – (NGE overhead)}
- SAP MTU = {1486 bytes – (24 bytes) – (4 bytes) – (77 bytes)}
- SAP MTU = 1381 bytes

For Layer 2 services using an Epipe VLL/VPWS service with a control word, an additional 4 bytes of overhead is required for the control word. Therefore, the following SAP (port) MTU must be set as follows:

- SAP MTU = {1486 bytes – (GRE packet overhead) – (VLL service label) – (CTL word)}
- SAP MTU = {1486 bytes – (24 bytes) – (4 bytes) – (4 bytes)}
- SAP MTU = 1454 bytes

For Layer 2 services using an Epipe VLL/VPWS service with a control word and NGE enabled, an additional 4 bytes of overhead is required for the control word and 4 bytes of NGE overhead is added. Therefore, the following SAP (port) MTU must be set as follows:

- SAP MTU = {1486 bytes – (GRE packet overhead) – (VLL service label) – (CTL word) – (NGE overhead)}
- SAP MTU = {1486 bytes – (24 bytes) – (4 bytes) – (4 bytes) – (81 bytes)}
- SAP MTU = 1373 bytes

The SAP MTU of Layer 2 services can be increased to accommodate larger packets that are closer to the Ethernet port maximum MTU value by using GRE SDP fragmentation and reassembly. Refer to “GRE SDP Tunnel Fragmentation and Reassembly” in the 7705 SAR-Hm and SAR-Hmc Main Configuration Guide.

2.3.3 MTU Considerations Over the WLAN Interface

The WLAN port MTU value is set to 1500 bytes and cannot be changed. Since cellular ports have a lower MTU with a maximum of 1486 bytes, and WLAN traffic from stations connected to the WLAN AP is carried over an IP/MPLS service that adds additional overhead to traffic traveling over cellular ports, the operator must understand the requirements of the MTU for their applications in order to successfully use the WLAN interface.

For example, when the WLAN interface AP is connected to the Nokia WLAN GW using an Epipe service, there is at most 1454 bytes available to carry a Layer 2 packet for the WLAN AP packet that includes a Layer 2 header of 14 bytes (see MTU Considerations Over a Cellular Port for information about the SAP MTU of an Epipe service over a cellular port). In order to successfully send these packets over a cellular port without further modification, the MTU of the IP payload in the WLAN AP Layer 2 packet must be restricted to 1440 bytes.

The MTU of the WLAN interface can be handled in one of two ways:

- by modifying the MTU value on clients that are connecting to the WLAN AP such that they send traffic that conforms to the service MTU of the IP/MPLS transport service, minus the 14 byte Layer 2 overhead
- by configuring GRE SDP fragmentation and reassembly on the node to allow packets that require an MTU greater than that available on the cellular interface to be fragmented and reassembled when carried over the cellular interface

2.4 Serial Transport Over Raw Sockets

Serial transport over raw sockets provides the capability of transporting serial data, in the form of characters, over an IP transport service within a Layer 3 IP/MPLS VPRN service. A raw socket allows direct sending and receiving of IP packets without any protocol-specific transport layer formatting. For information about raw socket IP transport services, refer to the 7705 SAR-Hm and SAR-Hmc Main Configuration Guide, Layer 2 and Layer 3 Services chapter, “Raw Socket IP Transport Service”.

The feature provides the functionality for a local host to listen to and open raw socket sessions from remote hosts, and for a remote host to initiate and open raw socket sessions to local hosts. The local and remote host functions support TCP or UDP sessions (but not both concurrently) over the IP transport service.

Raw sockets are supported for RS-232 ports on the node.

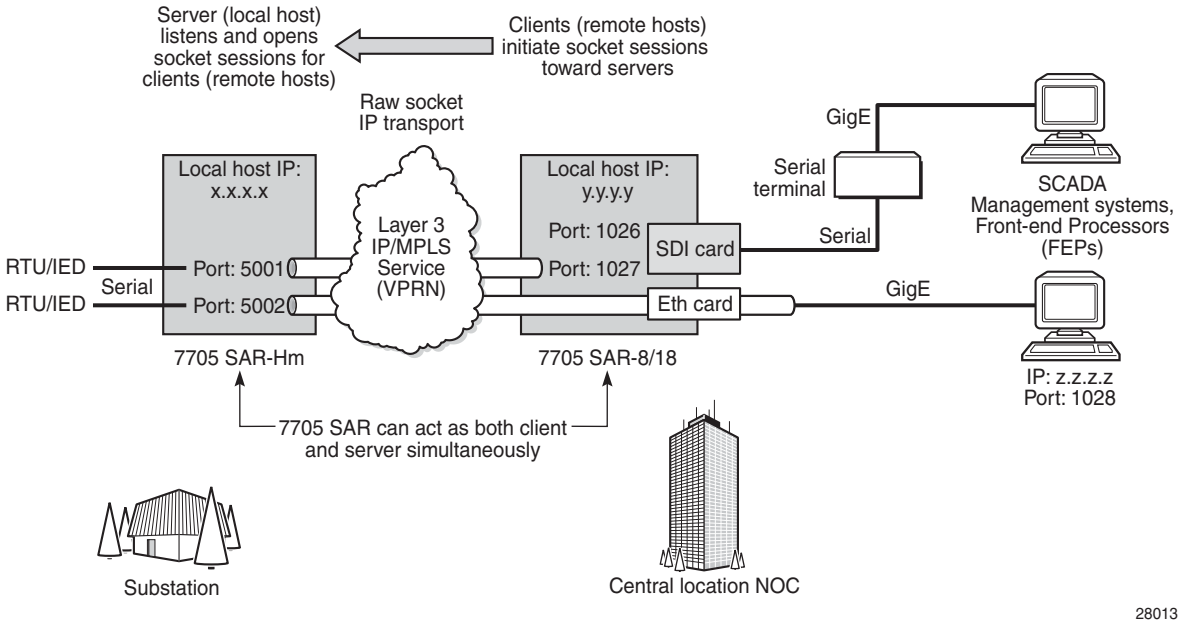
Figure 1 shows an example of a raw socket application, where serial data is transferred between RTUs and a utility’s SCADA management system using an IP transport service across a Layer 3 VPRN service that includes 7705 SAR-Hm and 7705 SAR-8/7705 SAR-18 nodes.

A raw socket local host (acting as a server) at the 7705 SAR-Hm substation listens to TCP sessions that originate at the 7705 SAR-8 or 7705 SAR-18 central location network operations center (NOC). The 7705 SAR-8 or 7705 SAR-18 at the NOC is connected to two front-end processors (FEPs), one via a serial port and another via an Ethernet port. The serial port on the 7705 SAR-8 or 7705 SAR-18 is configured as a remote host (acting as a client) that initiates TCP/UDP sessions towards the RTU at the 7705 SAR-Hm substation when traffic is received from the FEP over the serial port. These TCP/UDP sessions are transported over the IP/MPLS network using IP transport service over a VPRN service. The serial data transported over the TCP/UDP session and received at the 7705 SAR-Hm is then sent over the serial link towards the RTU. TCP/UDP sessions received from the FEP over the Ethernet port are transported over a VPRN service (that is, there is no need for serial port remote host configuration in this case).

Multiple FEPs can poll a single RTU. If multiple sessions attempt to transmit serial data on the serial port simultaneously, the 7705 SAR-Hm queues packets per session and ensures that all data for one session is sent out before processing another session’s data, ensuring that sessions do not overlap one another.

Note: A serial port can be concurrently configured as both a server (local host) and a client (remote host). This is accomplished with the **local-host** command configuration to support the server function and the **remote-host** command configuration to set up client sessions to far-end remote hosts.

Figure 1 **Serial Transport Over Raw Socket Application**



2.4.1 Raw Socket Configuration

A raw socket IP transport interface can be configured for each RS-232 serial port on a node. This allows the serial port to receive TCP connections or UDP session packets from multiple remote hosts, or to create new sessions to remote hosts in order to send and receive serial data to and from those remote hosts.

There are port-level and service-level configuration requirements for a raw socket serial port to send and receive serial data in either server mode, client mode, or both modes.

Raw socket port-level configuration includes defining the end of packet checking parameters (idle time, length, special character) and the inter-session delay for transmitting session data over the serial link.

At the service level, an IP transport subservice is created within a VPRN service to associate the serial port with the VPRN service. TCP/UDP encapsulated serial data is routed within the corresponding Layer 3 VPRN service. The required configuration includes IP transport subservice local host and remote host configuration, TCP timers, and session control.

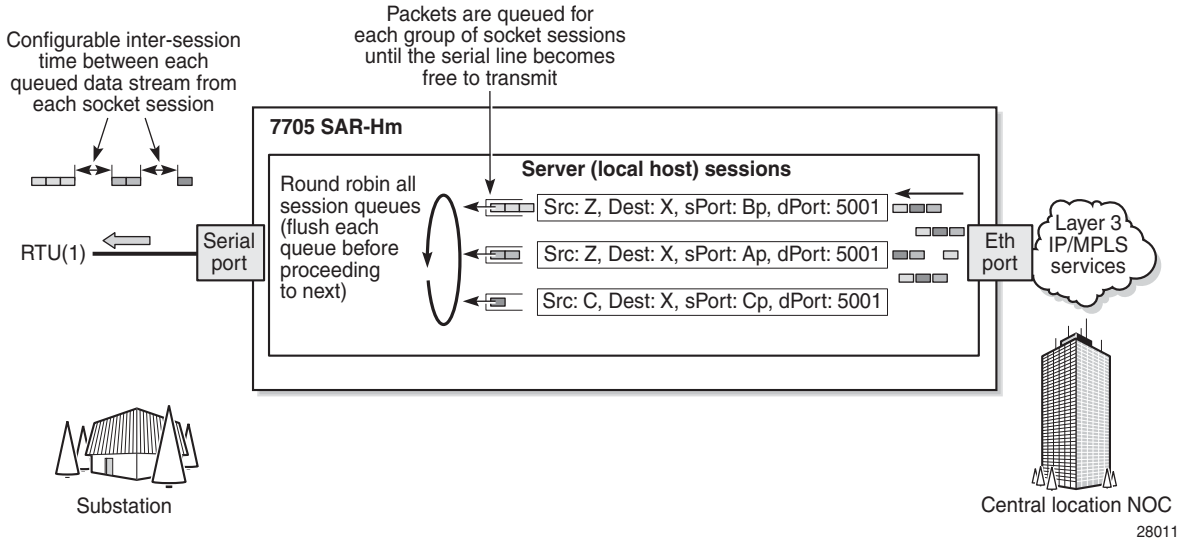
See Serial Raw Socket Interface Configuration Commands for information about the required port-level configuration. For information on how the IP transport subservice operates within a VPRN service, as well as information on the required system-level configuration, refer to the 7705 SAR-Hm and SAR-Hmc Main Configuration Guide, Layer 2 and Layer 3 Services chapter, “Raw Socket IP Transport Service”.

2.4.2 Raw Socket Packet Processing

Figure 2 illustrates how raw socket packets are processed over a serial link.

Session data attempting to access the serial port is queued. One queue is maintained per session. The purpose of the session queue is to prevent two different flows of packets from interleaving out the serial port and creating unreadable messages. When data is being transmitted over the serial link for a session, any other session’s data is queued until the first session has emptied its queue. The next session’s data is transmitted over the serial link only after the **inter-session-delay** timer expires. Each session’s data is sent out in round-robin fashion.

Figure 2 **Raw Socket Packet Processing**



2.4.2.1 Raw Socket Processing for UDP Sessions

When the local host receives a UDP packet from a remote host, it queues the packet and sends it over the serial link. The local host remembers the UDP session while there is still data to send from the serial link. If further packets are received for the same session, they are queued behind the already queued packet. After all the queued data has been sent over the serial link, the session is removed from the system. An associated UDP remote host for the serial link must be configured to have serial data sent back to the remote host from the serial port.

When a packet is received from the serial link based on end-of-packet (EOP) requirements, the data is copied and sent in a UDP packet to each configured remote host.

2.4.2.2 Raw Socket Processing for TCP Sessions

An open TCP session from a remote host to a raw socket's local host is kept open until either the remote host terminates the session or the TCP inactivity timer expires. When a TCP session is open, all packets received from the remote host are queued for the raw socket serial link and sent over the serial link until no packets remain in the queue. If multiple sessions are open towards the local host, and each is receiving data, then each session's data is queued and then sent over the serial link in round-robin fashion for each session until no packets remain. When a packet is received over the serial link, it is copied to each open TCP session and transmitted to the remote host.

2.4.3 Raw Socket Squelch Functionality

A condition may occur where the end device connected to the serial port continues to send out a continuous stream of data after the normal response period has expired. This can prevent the far-end remote host or master equipment from receiving data from other end devices in the network. To resolve this condition, the **squelch** command can be used on the raw socket at the port level (it is disabled by default). This stops the socket from receiving any more data from the problematic device.

If the command is enabled, the node will monitor the serial port for a constant character stream. A configurable squelch delay period, using the **squelch-delay** command, is used to determine how long to measure the constant character stream before initiating the squelch function. If the squelch function is initiated, the port is considered locked up and an alarm is raised indicating the lock-up and that the squelching function has been triggered.

The serial port can be forced out of squelch and put back to normal, either manually using the **squelch-reset** command or automatically using the **unsquelch-delay** command. The **unsquelch-delay** command defines the time to wait after squelch is initiated before it is removed.

3 Cellular MDA and Ports

3.1 In This Chapter

This chapter describes the cellular MDA and cellular ports. Topics include:

- Overview
- Prerequisites and Required Configurations
- Cellular MDA Management
- Cellular Port Management
- Per-SIM Firmware Update and Management

For more information about using the cellular MDA and ports for establishing IP/MPLS service, refer to the following sections in the 7705 SAR-Hm and SAR-Hmc Main Configuration Guide:

- PDN Router Interfaces
- Services over the Cellular PDN Interface
- Dedicated Bearers

3.2 Overview

The cellular MDA supports 4G LTE and 3G connectivity, depending on the radio module installed in the node. Refer to the SAR-Hm and SAR-Hmc Chassis Installation Guide for the types of supported modules.

Each node supports a single cellular MDA. Each cellular MDA supports two cellular ports, one for each SIM that can be configured on the node. Each cellular port has its own PDN router interface. A PDN router interface is a network-facing interface that is used to route traffic to and from the node over a cellular network, providing WAN connectivity over the cellular port.

3.3 Prerequisites and Required Configurations

Before configuring the cellular MDA and cellular ports, the following prerequisites must be considered.

- Depending on the radio module selected, 4G LTE/3G network coverage is required where the node is to be physically installed.
- The operator must subscribe to a service plan with a wireless service provider. For private cellular networks, the operator must procure a SIM that allows the node to connect to the private cellular network being deployed. If dual SIM functionality is required, the operator must subscribe to a second service plan with another wireless provider and procure a second SIM.
- The radio firmware shipped with the node is a generic firmware version. Some service providers require a specific radio firmware version to run on the node, depending on the radio variant used on the node and the wireless service provider being connected to; in this case, the firmware on the node must be updated to the correct version. Refer to the 7705 SAR-Hm and SAR-Hmc Software Release Notes for details about updating the radio firmware to the correct version. If dual SIM functionality is enabled, the firmware associated with the second wireless service provider must be updated for the associated SIM.
- The SIM or SIMs must be physically installed before powering up the router and configuring the cellular MDA and cellular ports.
- For a typical GSM profile, and if required by the service plan, the following information must be obtained from the service provider: Access Point Name (APN), username, and password. For dual SIM deployments, obtain the GSM profile information for each SIM.

When the prerequisites have been met, the following configurations are required.

- A cellular port interface must be configured for each installed SIM.
- The required SIMs must be configured under the cellular MDA.

The following CLI syntax shows an example of the required cellular MDA and cellular port parameters:

```
*A:Dut# configure card 1 mda 1 cellular sim 1
*A:Dut>config>card>mda>cellular>sim# pin
Enter PIN: xxxx
Re-enter PIN: xxxx
*A:Dut>config>>card>mda>cellular>sim# exit
*A:Dut# configure port 1/1/1 cellular pdn
*A:Dut>config>port>cellular>pdn# pdn-profile 1
*A:Dut>config>port>cellular>pdn# exit
*A:Dut#
```

- A cellular system PDN profile must be created and the corresponding APN, GSM parameters (such as username, password, and authentication), and protocol must be configured for each installed SIM. For an example of the CLI syntax required for the PDN profile configuration, see PDN Profile.
- A PDN router interface must be created for each cellular port to enable services over the cellular port; for information, refer to the 7705 SAR-Hm and SAR-Hmc Main Configuration Guide, “PDN Router Interfaces”.

3.4 Cellular MDA Management

Cellular MDA management activities include the following:

- setting SIM control parameters such as specifying the active SIM and the preferred SIM to use after a node reset
- specifying the SIM PIN value needed to operate each SIM if SIM security is enabled
- specifying failover criteria on each SIM to determine when to automatically switch to the backup SIM when the system is operating in dual SIM mode
- configuring optional recovery criteria for cellular ports or BGP sessions that are operationally down, and an associated interval when it is desirable to perform a node reset due to a potential cellular lockup as a result of a modem failure

3.4.1 SIM Installation and Configuration

Up to two valid SIMs must be procured before configuring the cellular MDA or cellular ports. The SIMs must be inserted into the proper SIM slots before the node is powered up. SIMs cannot be installed when the node is powered on. To run the Automatic Discovery Protocol (ADP-Hm) on the node, a SIM must be inserted into slot 1; otherwise, ADP-Hm will not function. For more information on ADP-Hm, refer to the 7705 SAR-Hm and SAR-Hmc Main Configuration Guide “Basic System Configuration”.

For information about dual SIM operation, see Dual SIM Deployment.

3.4.1.1 SIM Security and Security Commands

A SIM that is installed on the node can be secured using a personal identification number (PIN). The PIN is a 4- to 8-digit code that is used to control access to information stored on the SIM. The PIN is stored on the SIM and is used to lock the SIM, unlock the SIM, or change the PIN value.

To secure a node, the PIN needs to be set and the SIM must be locked using the PIN. When locked, the SIM cannot be used to access the cellular network unless the PIN is present in the configuration file of the node operating the SIM. If the locked SIM is inserted into another node that does not have the correct PIN configured for the SIM, the SIM will not allow access to the cellular network. If the number of attempts made to access the cellular network using an incorrect PIN exceeds the number of attempts allowed by the SIM, then the SIM will become blocked and will not allow any further attempts to gain access the cellular network.

When a SIM is procured from a carrier, the PIN is either not set or sometimes set to a default value such as 0000 or 1111. When a locked SIM is first installed in the node, the operator must enter the default PIN in the node system configuration twice. When stored in the system configuration, the PIN provides access to the locked SIM, both to read information from the SIM and to grant access to the cellular network.

The PIN can be stored in the system configuration in encrypted form to keep the PIN value secret.

Caution: Avoid entering an invalid PIN in the system configuration. If an invalid PIN is saved to the system configuration file, the system will attempt to enter that PIN on the SIM each time the system reboots. This will eventually exhaust the number of available PIN retries for the SIM and make the SIM inoperative until it is unblocked with the personal unblocking key (PUK).

In addition, if multiple attempts are made to either lock or unlock the SIM using an incorrect PIN, the SIM becomes blocked. In both cases, the SIM must be unblocked using the PUK.

The number of allowed attempts to access a SIM depends on the SIM. The “PIN retries left” field under the SIM Card heading in the **show>port** CLI output indicates the number of attempts left before the SIM is blocked and must be unblocked to establish cellular connections.

If the SIM becomes blocked, the operator must enter the personal unblocking key (PUK) in the CLI to unblock the SIM and reset the PIN. The PUK is stored on the SIM and must be acquired from the service provider or administrator.

Many carriers provide unlocked SIMs. If an unlocked SIM is installed in a node, the operator does not need to know the PIN or configure the PIN in order for a cellular port to become operational. For example, during the ADP-Hm process, setting the PIN before attempting to connect to the network is not required.

The default PIN can be changed on the SIM using the **tools>perform>mda>cellular>sim**>**change-pin** command. If the default PIN is changed on the SIM, the system configuration must be updated with the new PIN value using the **config>card>mda>cellular>sim>pin** command.

The commands described below are available for SIM security. All of the SIM security commands are in the **tools>perform>mda>cellular>sim** context.

Note: The SIM specified in the **tools>perform>mda>cellular>sim** commands must be the currently active SIM. If the SIM is not the currently active SIM, the commands fail.

- **lock-sim**—this command locks the SIM and enables the PIN verification function on the SIM. A locked SIM verifies the PIN stored in the system configuration for operation. To lock the SIM, the operator must enter the current PIN.
- **unlock-sim**—this command unlocks the SIM and disables the PIN verification function on the SIM. To unlock the SIM, the operator must enter the current PIN.

- **unblock-sim**—this command unblocks a SIM that is currently blocked because too many attempts were made to access the SIM with an incorrect PIN. To unblock the SIM, the operator must enter the PUK for the SIM and then enter a new PIN twice. The lock/unlock state of the SIM does not change when it becomes unblocked.
- **change-pin**—this command allows the operator to change the PIN value on the SIM. The operator must enter the existing PIN and then enter the new PIN twice correctly to change the PIN. The command is shown in the output below.

```
A:Dut-A# tools perform mda 1/1 cellular sim 1 change-pin
Enter current PIN:
Enter new PIN:
Re-enter new PIN:
```

Warning:

- When an operator successfully locks a SIM, unblocks a SIM, or changes a SIM PIN, the system updates the PIN value in the system configuration. However, the system does not automatically save the system configuration containing the new PIN. The operator must perform an **admin>save** command immediately after changing the PIN in order to save the new PIN in the system configuration file and avoid potential service interruptions such as the node becoming unreachable.
- If the SIM becomes blocked when setting the PIN remotely using in-band management over a cellular port, the node will be unreachable. Physical access to the node will be required to unblock the SIM.

Note: Changes can only be made to the currently active SIM. If changes to the backup SIM in a dual SIM deployment are required, then a SIM switchover must be performed in order to modify the backup. Before switching over to the backup SIM, the operator must ensure that it is operational and not locked. The operator should configure the **down-recovery-interval** command and ensure that one of the SIMs is operational in order to reduce the risk of the node becoming unreachable.

3.4.2 Down-Recovery Timer and Criteria

A down-recovery timer can be set so that if the cellular MDA fails to establish cellular service for any SIM within a specified duration, the node will reboot. The **down-recovery-interval** is configured at the cellular MDA level and is not specific to a particular SIM. It can be set when there is a single SIM or two SIMs installed in the node.

The operator can specify criteria that are monitored during the **down-recovery-interval** by configuring the **down-recovery-criteria** command. The **down-recovery-criteria** can be set to **port** or **bgp**. When set to **port**, all cellular ports configured on the system are monitored during the down-recovery interval. When set to **bgp**, all BGP sessions whose **local-address** is configured on a PDN interface are monitored during the down-recovery interval. Both criteria can be specified concurrently, and the node will use either the cellular port state or BGP session state to declare the SIM state as down.

When set, the **down-recovery-interval** specifies the length of time that the configured down-recovery criteria are monitored from the moment when either criterion is declared operationally down. If the interval is exceeded without any criteria going operationally up, the node resets so that the preferred SIM can try to connect to a cellular network again. As soon as one criterion is operationally up, the down-recovery timer stops.

In a dual SIM deployment, the **down-recovery-interval** guards against persistent cycling of automatic switchovers between SIMs when a node hardware reset may be required. The timer provides a mechanism to allow the node to start again from the preferred SIM after the node resets. In a single SIM deployment, the **down-recovery-interval** can help resolve hardware lockup conditions on the cellular port by resetting the node.

The **down-recovery-interval** is measured in minutes, with a range of 1 to 240 minutes. Sixty seconds before the timer expires, the node will issue a log event stating that the node will reboot in 60 seconds if the down-recovery condition (based on the configured criteria) is not resolved. This 60-second warning interval can be used for further debugging and diagnostics before the node resets.

3.4.3 Dual SIM Deployment

The node supports dual SIM deployment for users who require a redundancy option using two wireless carriers.

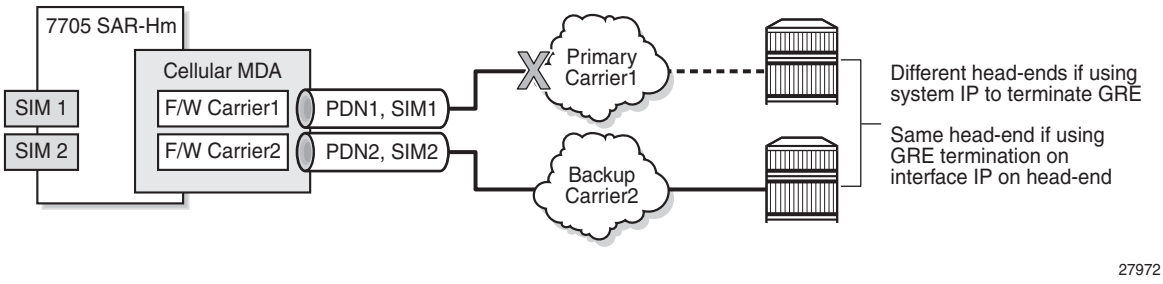
With dual SIM deployment, two SIMs are installed in the node, one from each carrier. Only one SIM is active at a time to establish a cellular service WAN connection. The operator choses which SIM is primary and which is secondary or manually selects which SIM to keep active.

Configurable criteria give the operator some control over when it is appropriate for the system to perform a SIM switchover. For example, the BGP operational state associated with the cellular port can be used as a criterion for determining when a SIM switchover should occur. If the BGP operational state is down for a specified interval, a SIM switchover occurs. See Criteria for Automatic Failover for more information.

Caution: A SIM switchover is service-affecting. Operators should perform a SIM switchover only when necessary, as overly frequent switchovers will impact service operation.

Figure 3 shows dual SIM operation on a 7705 SAR-Hm.

Figure 3 **Dual SIM Operation**



For information on IP/MPLS services when dual SIM functionality is enabled, refer to the 7705 SAR-Hm and SAR-Hmc Main Configuration Guide.

3.4.3.1 Enabling Dual SIM Operation

To enable dual SIM operation on the node, operators must perform the following tasks.

- procure two SIMs, each for a different cellular network
- if ADP-Hm is required, insert the SIM needed to operate with ADP-Hm into SIM slot 1. For more information on ADP-Hm, refer to the 7705 SAR-Hm and SAR-Hmc Main Configuration Guide, “Basic System Configuration”.
- ensure that each SIM is associated with a unique packet data network (PDN) by configuring a PDN profile and a PDN router interface that will be assigned a unique IP address during the PDN attach process. The PDN profiles and PDN router interfaces must be configured beforehand.
- choose whether the SIMs will be switched manually or use automatic failover. If automatic failover is chosen, the operator must determine the criteria for failover. See Criteria for Automatic Failover for information.

3.4.3.2 Active SIM Selection

When the two SIMs have been installed in the node, the operator chooses which SIM will be active by configuring the **active-sim** command under the cellular MDA. This command can be configured either with a specific SIM (**1** or **2**) or with the **auto** parameter. The default is **1**. The configuration of this command determines whether the SIMs are switched manually or use automatic failover.

3.4.3.2.1 Manual Selection

The operator can manually select the active SIM by configuring a specific SIM as active, either **1** or **2**. This configuration makes the selected SIM permanently active.

The active SIM can be manually switched by changing the **active-sim** setting from **1** to **2** or from **2** to **1**.

Caution: Changing the active SIM from 1 to 2 or from 2 to 1 is service-affecting. The recovery time after making this change can range from a few seconds to up to a few minutes.

When the system powers up or reboots, it uses the **active-sim** setting to determine which SIM is the active SIM. If the operator configures the **active-sim** as **1** but there is no physical SIM in the associated SIM slot, the cellular port remains operationally down. The operator must either install the SIM in the appropriate slot or change the configuration in order to bring the service up.

3.4.3.2.2 Automatic Failover

An automatic failover occurs when activity switches from one SIM to the other.

Automatic failover is enabled in a dual SIM deployment when the **active-sim** command is set to **auto**. In this case, the operator must select the SIM to use as the primary SIM by setting the **preferred-sim** value. The node uses the **preferred-sim** setting to determine which SIM to use for a cellular port after a system reset.

If the operator changes the **active-sim** value from **auto** to **1** or from **auto** to **2** and the active SIM is the same as the new configuration, there is no change to service of the active SIM.

Caution: Changing the **active-sim** setting so that the newly active SIM is different from the currently active SIM is service-affecting. The recovery time after making this change could range from a few seconds to up to a few minutes.

If the operator changes the active SIM from **1** to **auto** or from **2** to **auto**, there is no service outage. The system keeps the currently active SIM up and does not perform any switchover.

When **active-sim** is set to **auto**, the operator can use the **tools>perform>mda>cellular>force-sim-switch** command to manually force a SIM switch.

The **auto** parameter can be set if there is only one SIM installed in the system; however, the system keeps the currently active SIM up and does not perform any switchover.

3.4.3.3 Criteria for Automatic Failover

When the **active-sim** command is set to **auto**, the operator can configure the parameters that will cause an automatic failover to occur. The parameters that serve as criteria for automatic failover are:

- the cellular port operational state
- the BGP operational state

These parameters are configured per SIM and can be different for each SIM. As well, one or both parameters can be configured for each SIM.

An automatic failover occurs when the conditions are met for either of the configured criterion on the currently active SIM.

Note: Automatic failover between SIMs can continue indefinitely until either the recovery timer expires, which will reboot the entire system and bring up a cellular port based on the preferred SIM, or the operator manually intervenes to halt automatic failover by configuring a specific SIM as the active SIM.

3.4.3.3.1 Cellular Port Operational State

The cellular port operational state can be specified as a failover criterion for the currently active SIM. The operational state of cellular port 1/1/1 is used as the failover criterion for SIM 1 and the operational state of cellular port 1/1/2 is used as the failover criterion for SIM 2.

When the cellular port operational state criterion is specified, the system monitors the operational state of the PDN. If the PDN is operationally down for a specified **failure-duration**, the system performs a SIM failover and attempts to establish cellular service using the other SIM. See Failure Duration for more information.

3.4.3.3.2 BGP Operational State

The operational state of BGP sessions associated with the currently active SIM can be specified as a failover criterion for the currently active SIM. The state of all the BGP sessions whose **local-address** is set to the PDN interface name that is configured under SIM 1 is used as the failover criterion for SIM 1. Similarly, the state of the BGP sessions whose **local-address** is set to the PDN interface name associated with SIM 2 is used as the failover criterion for SIM 2.

When the BGP operational state criterion is specified, the system monitors the operational state of the BGP sessions. If all the BGP sessions are operationally down for a specified **failure-duration**, the system performs a SIM failover and attempts to establish cellular service using the other SIM. See Failure Duration for more information.

3.4.3.3.3 Failure Duration

When the **active-sim** command is set to **auto** and a least one failure criterion is configured, the system uses the length of time configured for the **failure-duration** to determine when to perform an automatic failover from one SIM to the other.

The **failure-duration** value is configured per SIM but it applies to both failure criteria. It is not possible to configure one failure duration value for the cellular port operational state and another value for the BGP session operational state.

The default value is 5 minutes. The valid range is from 1 minute to 60 minutes.

Note: It is recommended that the **failure-duration** be set to a high value so that the system does not perform frequent switches between SIMs.

3.5 Cellular Port Management

A cellular port enables a specific cellular service for an associated SIM. Each cellular port is managed separately per SIM and per PDN.

Cellular port 1/1/1 is associated with SIM 1 and cellular port 1/1/2 is associated with SIM 2.

A cellular port can be shut down by using the **port**>**shutdown** command. When a cellular port is shut down, the cellular service for that port is disabled. To enable cellular service for the port, use the **port**>**no shutdown** command. See Common Configuration Commands for more information on the **shutdown** command.

Warning: Use caution when executing the **port>shutdown** command on a cellular port. Shutting down a cellular port when it is the only means of communication to a remote node over a wireless network may cause permanent loss of connectivity to the node.

3.5.1 Cellular Port and its PDN

The node provides a single PDN connection for each cellular port. A cellular port must have an associated PDN router interface in order to allow routed traffic and services over the PDN connection and over the cellular network. For more information on the PDN router interface, refer to the 7705 SAR-Hm and SAR-Hmc Main Configuration Guide, “PDN Router Interfaces”.

The node supports the configuration of an access point name (APN) as part of a PDN profile in order to establish the PDN connection. In many cases, the default PDN profile is sufficient to establish a connection. For example, often the only configuration that is necessary to establish a connection is to enable the port using the **config>port** *port-id* **no shutdown** command. However, some carriers may require the user to configure a specific APN before allowing a connection to be established. In those cases, the user must configure a PDN profile and configure the cellular port to use that PDN profile. See PDN Profile for more information.

3.5.1.1 PDN Profile

The node uses PDN profiles to establish PDN connections over a cellular port. When the default PDN profile is not sufficient to establish connections, a PDN profile must be created. Manually created PDN profiles contain additional cellular network access configuration items that are not stored on the SIM but that are required in order to establish a PDN connection. PDN profiles can be created, modified, and deleted.

A PDN profile is referenced using a PDN profile ID. When a PDN profile is created at the system level and then configured on a cellular port, it cannot be modified or deleted until it is removed from the cellular port.

PDN profiles are necessary so that CLI or SNMP changes can be made to cellular ports without first having to shut down the ports. For example, when changing the APN information for a cellular port, another PDN profile can be configured with the changed information and assigned to the cellular port. This change will cause the cellular port to connect to the cellular network using the new PDN profile information immediately.

The following items can be configured as part of a PDN profile:

- APN—the Access Point Name provided by the service provider to use for the cellular service
- authentication—the type of authentication to use for establishing the connection, either Password Authentication Protocol (PAP) or Challenge Handshake Authentication Protocol (CHAP)
- description—a description for the PDN profile
- password—a password for the PAP or CHAP authentication
- protocol—the protocol for the associated PDN interface, either IPv4 or IPv6
- username—a username for the PAP or CHAP authentication

The following CLI syntax shows an example of how to configure a PDN profile.

```
*A:Dut# config>system>cellular# pdn-profile 1
*A:Dut>config>system>cellular>pdn-prof# apn apn1
*A:Dut>config>system>cellular>pdn-prof# authentication pap
*A:Dut>config>system>cellular>pdn-prof# description "PDNprofile1"
*A:Dut>config>system>cellular>pdn-prof# no password
*A:Dut>config>system>cellular>pdn-prof# protocol ipv6
*A:Dut>config>system>cellular>pdn-prof# username waldowaldo
*A:Dut>config>system>cellular>pdn-prof# exit
*A:Dut>config>system>cellular# exit
*A:Du>config>system# exit
*A:Dut>config# exit
*A:Dut#
```

For more information, see Cellular PDN Profile Configuration Commands.

3.5.1.1.1 Default PDN Profile

Table 4 lists the settings for the default PDN profile. The default PDN profile is always used when installing a new SIM and running the ADP-Hm process. It can also be used to establish cellular connections that do not require PDN profile configurations. The default PDN profile cannot be modified by the user.

Table 4 **Default PDN Profile Values**

Profile Parameter	Value
APN	Blank
Authentication	None
Username	Blank
Password	Blank
Protocol	IPv4

3.5.1.1.2 Assigning a PDN Profile to a Cellular Port

To assign a PDN profile to a cellular port, configure the PDN profile under the **config>port>cellular>pdn** CLI context.

The following CLI syntax shows an example of how to assign a PDN profile to a cellular port.

```
*A:Dut# configure port 1/1/1 cellular pdn
*A:Dut>config>port>cellular>pdn# pdn-profile 1
*A:Dut>config>port>cellular>pdn# exit
*A:Dut#
```

For more information, see Cellular MDA and Cellular Port Configuration Commands.

3.6 Per-SIM Firmware Update and Management

The **update-firmware** command allows the operator to preload the correct firmware associated with each SIM's network operator onto the cellular modem for those node types that require firmware updates per operator. See the 7705 SAR-Hm and SAR-Hmc Software Release Notes for the node types and variants that require per network operator firmware management.

For example, if an ATT SIM is installed in SIM slot 1 and a VZW SIM is installed in SIM slot 2, the **update-firmware** command is used to ensure that ATT-supported firmware is loaded for SIM 1 operation and VZW-supported firmware is loaded for SIM 2 operation. The command is as follows:

tools perform mda 1/1 cellular update-firmware *firmware-file* **sim 1** | **2**

Depending on which SIM is active based on the **active-sim** command, the corresponding radio firmware for that carrier SIM is used by the radio.

If an automatic failover occurs, the associated firmware for the new SIM is used by the radio to establish service using the new SIM.

By default, the generic firmware that is shipped with the node is used for both SIM 1 and SIM 2 when either SIM is active and no other firmware is specified for that SIM. Operators must check which firmware is being used for each SIM when operating on wireless carriers that require specific firmware.

4 GNSS Receiver

4.1 In This Chapter

This chapter provides information about the GNSS receiver. Topics include:

4.2 Overview

The GNSS receiver is used for streaming location information from the node (for example, for vehicle position information) or for querying GNSS information on the node.

4.3 GNSS Configuration

GNSS services are enabled in the CLI under the cellular MDA (**mda 1/1**). Use the CLI for the following:

- enabling or disabling GNSS
- configuring the GNSS satellite constellation
- configuring NMEA parameters
- displaying GNSS location information and satellite information

4.3.1 Enabling or Disabling GNSS

GNSS services are enabled using the **config>card>mda>gnss no shutdown** command. When GNSS services are enabled, the GNSS receiver begins acquiring GPS and/or GLONASS satellite signals and determines the position of the system. The GPS LED on the chassis blinks green during this process. The GPS LED is lit solid green when the GNSS receiver has determined the position of the node. The GPS LED is unlit when the GNSS receiver is disabled.

When NMEA services are also enabled, NMEA sentences are streamed according to the parameters associated with that service. See Configuring NMEA Parameters for information.

GNSS services are disabled using the **shutdown** command. When GNSS services are disabled, the GNSS receiver is disabled and satellite information is reset. The GPS LED is unlit when the GNSS receiver is disabled.

GNSS services are disabled by default.

The GNSS receiver generates a logging event when it starts to acquire a position fix and when it has acquired a position fix.

4.3.2 Configuring the GNSS Satellite Constellation

The constellation of the GNSS receiver can be set to either GPS (**gps**) or GPS and GLONASS (**gps-glonass**). The constellation can be modified only when the GNSS service is shut down. The default constellation setting is **gps**.

4.3.3 Configuring NMEA Parameters

The node can be configured to send position, velocity, and time information at regular intervals to servers that can process the data. When the data is formatted as an ASCII string according to National Marine Electronics Association (NMEA) standards, it is called an NMEA sentence. The node uses an IP transport service to send NMEA sentences to remote hosts. For information about enabling IP transport for NMEA sentences, refer to the 7705 SAR-Hm and SAR-Hmc Main Configuration Guide, “GNSS NMEA Data IP Transport Service”.

NMEA data streaming is enabled on the node when the IP transport *ipt-id* parameter is configured as **gnss** and the **nmea no shutdown** command is issued.

The following NMEA parameters must be configured on the node when streaming is enabled:

- sentence-type
- sentence-interval

The NMEA defines a number of sentence types for streaming. The node supports the following sentence types:

- GPGGA — this sentence is for time, position, and fix-related data for a GNSS receiver
- GPRMC — this sentence is for time, date, position, course, and speed data provided by the GNSS receiver
- GPVTG — this sentence is for vector track and speed relative to the ground
- GNGNS — this sentence is for time, position, and fix-related data for single or combined constellations for a GNSS receiver

For information about the sentence types, refer to NMEA 0183, *Standard For Interfacing Marine Electronic Devices*.

The sentence interval specifies the frequency with which NMEA sentences are sent from the GNSS receiver. The interval can be set from 1 s to 3600 s. Different sentence types can be enabled concurrently so that multiple sentences can be streamed per sentence interval.

4.3.4 Displaying GNSS Location and Satellite Information

The following GNSS location information can be displayed on the CLI:

- latitude of the last position fix
- longitude of the last position fix
- time at which the last position fix was taken
- altitude at which the last position fix was taken
- heading and speed of the system

The following satellite information can be displayed on the CLI for up to 30 satellites:

- the satellite NMEA identifier—for GPS, the range is from 1 to 32; for GLONASS, the range is from 65 to 96
- the elevation of the satellite relative to the node, from 0 to 90°
- the azimuth relative to the node position, from 0 to 360°
- the signal-to-noise ratio (SNR), from 0 to 99 dB

5 Wireless LAN Interface

5.1 In This Chapter

This chapter provides information about the wireless LAN (WLAN) interface. Topics include:

5.2 Overview

The node provides IEEE 802.11 b/g/n WLAN interface support.

The WLAN interface acts as an access point (AP) that clients can use to connect to the node. The interface can provide connectivity from the AP to the Nokia WLAN gateway (GW) for subscriber and WLAN access, and for WLAN mobility management. Refer to the 7705 SAR-Hm and SAR-Hmc Main Configuration Guide for details about configuring the WLAN interface with IP/MPLS services.

There are two areas of configuration for the WLAN interface:

- the MDA-level configuration, which includes parameters such as channel, frequency band, and country code
- the port-level configuration, which includes elements such as the network service set identifier (SSID), security parameters, dot1x parameters, and access point parameters

The WLAN MDA has a fixed port configuration that represents the access point. The WLAN port on the node shares the same WLAN MDA-level configuration and is independently configurable per network (SSID).

A WLAN network SSID is configured in the **configure>port>wlan** CLI context.

5.3 WLAN Radio MDA Configuration

The following parameters must be configured for the WLAN MDA:

- country code
- AP frequency band
- AP channel
- AP bandwidth
- administrative status
- beacon interval

The **country-code** is required to bring the radio up. The country code must be configured before any other MDA-level configuration can proceed and before the WLAN radio can be enabled with the **no shutdown** command. The **country-code** command is configured by entering one of the following country names in the CLI: Australia, Belgium, Bolivia, Brazil, Canada, Chile, Colombia, France, Germany, India, Iran, Italy, Japan, Malaysia, Mexico, New Zealand, Peru, Russia, Singapore, South Africa, United States, or Venezuela.

The **access-point frequency-band** can be configured as either 2.4 GHz or 5 GHz. The default is 2.4 GHz. If the configured country code changes, the frequency band resets to the default value.

The **access-point channel** can be configured either as **auto** or set to a specific channel identifier. The channel ID supported by the node depends on the configured country code. See the Appendix for channel ID and country code mappings. The default **access-point channel** setting is **auto**. If the configured country code changes, the channel resets to the default value.

The **access-point bandwidth** can be configured as either 20 MHz or 40 MHz, depending on the configured country code. See the Appendix for bandwidth and country code mapping. The default bandwidth is 20 MHz. If the configured country code changes, the bandwidth resets to the default value.

The AP broadcasts a beacon packet in order to synchronize the wireless network. It is possible to configure the frequency with which the packet is sent using the **beacon-interval** command.

The WLAN radio can be turned off using the **shutdown** command in the **config>card>mda>wlan-radio** context. When the WLAN radio is turned off, any configured WLAN ports become operationally down if they were not already shut down. When the **no shutdown** command is issued in this context, the radio is turned on and configured WLAN ports can begin operating; however, the **no shutdown** command cannot be issued until the country code is configured.

The WLAN radio can be put into reset mode using the **shutdown** command in the **config>card>mda** context. Any configured WLAN ports become operationally down when the WLAN radio is in reset mode. When the **no shutdown** command is issued in this context, the radio comes out of reset and configured WLAN ports can begin operating.

5.4 WLAN Port Configuration

The WLAN port operates as an access point (AP) and can be configured with the following:

- the network service set identifier (SSID), including the security parameters for the WLAN network (see WLAN Security)
- AP-specific parameters, including dot1x parameters, DHCP relay, and access point control parameters

5.4.1 Network SSID

The network service set identifier (SSID) defines the name of the WLAN network. The WLAN AP port uses this name to allow WLAN clients to connect to the WLAN network. Operators can optionally configure security parameters for each configured network SSID.

The SSID can be changed only when the WLAN AP port has been shut down.

5.4.2 AP-Specific Parameters

Operators can configure the following on a WLAN AP port:

- security parameters (see WLAN Security)
- dot1x parameters, depending on the type of security configured
- enable or disable DHCP relay
- broadcast of the SSID, using the **broadcast-ssid** command
- the maximum number of clients that can connect to the AP, using the **client-limit** command

- the length of time the port waits before releasing and disconnecting a client when the client has not transmitted nor received any data, using the **client-timeou**t command

The DHCP relay setting can be modified without shutting down the WLAN AP port. All other AP parameters can only be modified when the WLAN port is shut down.

5.5 WLAN Security

The WLAN ports support the following security options:

- open
- WPA2-PSK
- WPA2-Enterprise

When no WLAN security is required, a WLAN port is configured with **no wlan-security** and WLAN AP security is open.

When WLAN security is required, a WLAN port can be configured with WPA2-PSK or WPA2-Enterprise security. When configuring either of these security types, the encryption must be set to either TKIP or AES using the **wpa-encryption** command. AES is the default.

When a WLAN AP port is configured for WPA2-PSK security, operators must use the **wpa-passphrase** command to configure a pre-shared secret pass phrase that is used by clients to connect to the AP.

When a WLAN AP port is configured for WPA2-Enterprise security, operators must configure a RADIUS policy under the **config>system>security>dot1x** context in the CLI. For information about configuring a RADIUS policy in this context, refer to the “Dot1x Commands” section in the 7450 ESS, 7750 SR, 7950 XRS, and VSR System Management Guide. The dot1x RADIUS policy ID used to configure the RADIUS policy above is then configured on the WLAN AP port using the **config>port>wlan>access-point> dot1x>radius-plcy** command.

The **retry** and **timeout** commands in the **config>system>security>dot1x** context are ignored by the WLAN AP port. Instead, the retry count is set to 3 and the timeout value is set to 5 s so that the node will retry each server four times before moving on to the next server if multiple servers are configured.

A WLAN AP port configured for WPA2-Enterprise security requires connected clients to periodically re-authenticate themselves to the WLAN network. The interval is configured using the **re-auth-period** command.

Table 5 lists the authentication methods that the node supports for clients that attach to the WLAN AP port.

Table 5 **WLAN Client Authentication Types**

Authentication Type	Description	User Password	User Certificate	Server Certificate
EAP-TLS	The EAP-Transport Layer Security (TLS) authentication type uses a user certificate and optionally verifies a server certificate. The certificates are programmed on the client device.	No	Yes	Optional
EAP-TTLS	The EAP-Tunneled Transport Layer Security (TTLS) authentication type establishes a tunnel in which the username and password are verified. A user and server certificate are optional. The username, password, and certificates are programmed on the client device.	Yes	Optional	Optional
EAP-FAST	The EAP-Flexible Authentication via Secure Tunneling (FAST) authentication type uses Protected Access Credentials (PAC) to establish a tunnel and the selected tunnel type to verify username and password credentials. PACs are handled behind the scenes, transparently to the user. Automatic PAC provisioning can require a user certificate and the validation of a server certificate depending on the tunnel type. The username, password, and certificates are programmed on the client device.	Yes	Optional	Optional
EAP-PEAP	The EAP-Protected Extensible Authentication Protocol (PEAP) authentication type establishes a tunnel and based on the tunnel type, uses a user certificate and/or a username and password. Validating a server certificate is optional. The username, password, and certificates are programmed on the client device.	Optional	Optional	Optional

Security parameters can only be modified when the WLAN port is shut down.

5.6 WLAN Interface Status

Table 6 describes the operational states that apply to the WLAN interface.

Table 6 **WLAN Interface Status**

Status	Description
AdminDown	the WLAN port is administratively disabled
RfAdminDown	the WLAN radio is administratively disabled
RfChScanInProgress	the WLAN radio is scanning frequencies for ACS (Auto-Channel Select)
NoRadiusPlcy	WPA2-Enterprise security is enabled, but no RADIUS policy is configured
Dot1xDisabled	WPA2-Enterprise security is enabled and dot1x authentication is disabled at the system level
RadiusPlcyDisabled	WP2-Enterprise security is enabled, but the configured RADIUS policy is administratively disabled
NoAuthRadiusSvr	WPA2-Enterprise security is enabled, but the configured RADIUS policy contains no authorization servers
NoRadiusNasIp	WPA2-Enterprise security is enabled, but no NAS IP address is found. The NAS IP address is the address specified in the RADIUS policy.

5.7 WLAN Statistics

Statistics items can be displayed on the CLI for the WLAN port and for each WLAN instance. The node also collects access point and client-specific data transfer and operational statistics.

5.7.1 WLAN Port Statistics

On the WLAN port, the CLI displays a summary of the total port traffic in and out of the WLAN radio.

5.7.2 WLAN AP Statistics and Information

The node collects statistics and information that summarize the use of the WLAN AP, as listed below.

- port-level traffic statistics (packets and bytes)
- RADIUS information
- AP-level operational statistics:
  - number of clients currently connected
  - total number of client attachments
  - total number of client detachments
  - total number of successful client authentications
  - total number of failed client authentications

6 Configuring Physical Ports

This chapter provides information about configuring physical ports with the CLI on the node.

Topics in this chapter include:

- Configuring Ethernet Port Parameters
- Configuring Cellular Port Parameters
- Configuring Serial Port Parameters
- Configuring RS-232 Raw Socket Serial Port Parameters

6.1 Configuring Ethernet Port Parameters

Refer to the 7450 ESS, 7750 SR, 7950 XRS, and VSR Interface Configuration Guide, “Configuring Ethernet Port Parameters”.

6.2 Configuring Cellular Port Parameters

The **pdn-profile** parameter must be configured for the cellular port.

The PDN profile defines the specific APN that the node can connect to. Configure the **pdn-profile** under the appropriate cellular port. If a PDN profile is not specified, the default profile is used; this default PDN profile cannot be changed.

For more information, see Cellular PDN Profile Configuration Commands and Cellular MDA and Cellular Port Configuration Commands.

6.3 Configuring Serial Port Parameters

Use the following CLI syntax to configure parameters on an RS-232 serial port.

CLI Syntax:

```
config# port port-id
     no shutdown
     serial
          rs232
               character-length {6 | 7 | 8}
               control-lead
                    input
                         dtr-dsr high
                         rts-dcd high
                    exit
                    output
                         dcd-rts high
                         cts-alb high
                         ri-rdl high
                    exit
                    monitor
                         dtr-dsr off
                         rts-dcd off
                    exit
               hold-time {[up hold-time-up] [down
                 hold-time-down]}
               no loopback
               parity {odd | even | mark | space}
               speed {600 | 1200 | 2400 | 4800 |
                 9600 | 19200 | 38400 | 57600 | 115200}
               stop-bits {1|2}
               exit
          exit
     exit
```

The following CLI syntax shows an example of configuring an RS-232 serial port.

Example:

```
config# port 1/3/2
config>port# no shutdown
config>port# description "RS-232 Serial"
config>port# serial
config>port>serial# rs232
config>port>serial>rs232# character-length 8
config>port>serial>rs232# control-lead
config>port>serial>rs232>control-lead# input
config>port>serial>rs232>control-lead>input# dtr-dsr
 high
```

```
config>port>serial>rs232>control-lead>input# rts-dcd
 high
config>port>serial>rs232>control-lead>input# exit
config>port>serial>rs232>control-lead# output
config>port>serial>rs232>control-lead>output# dcd-rts
 high
config>port>serial>rs232>control-lead>output# cts-alb
 high
config>port>serial>rs232>control-lead>output# ri-rdl
 high
config>port>serial>rs232>control-lead>output# exit
config>port>serial>rs232>control-lead# monitor
config>port>serial>rs232>control-lead>monitor# dtr-dsr
 off
config>port>serial>rs232>control-lead>monitor# rts-dcd
 off
config>port>serial>rs232>control-lead>monitor# exit
config>port>serial>rs232>control-lead# exit
config>port>serial>rs232# hold-time up 100
config>port>serial>rs232# no loopback
config>port>serial>rs232# parity odd
config>port>serial>rs232# speed 9600
config>port>serial>rs232# stop-bits 1
config>port>serial>rs232# exit
config>port>serial# exit
config>port# exit
```

Use the **admin>display-config detail** command to display the serial RS-232 port configuration information.

```
*A:Dut>admin# display-config detail
#--------------------------------------------------
echo "Port Configuration"
#--------------------------------------------------
  .....
port 1/3/2
        description "RS-232 Serial"
        serial
            rs232
                speed 9600
                control-lead
                    input
                        dtr-dsr high
                        rts-dcd high
                    exit
                    output
                        dcd-rts high
                        cts-alb high
                        ri-rdl high
                    exit
                    monitor
                        dtr-dsr off
                        rts-dcd off
```

```
                exit
            exit
            character-length 8
            parity odd
            stop-bits 1
            hold-time up 100 down 100
                exit
            exit
        exit
    exit
  exit
.....
#--------------------------------------------------
```

6.4 Configuring RS-232 Raw Socket Serial Port Parameters

Use the following CLI syntax to configure an RS-232 raw socket serial port.

CLI Syntax:

```
config# port port-id
        serial
            rs232
                socket
                    description description-string
                    rx
                        eop
                            length bytes
                            idle-timeout milliseconds
                            [no] special-char value
                            exit
                        no squelch-delay
                        no unsquelch-delay
                        exit
                    tx
                        inter-session-delay ms
                        exit
                exit
            exit
```

The following CLI syntax shows an example of configuring an RS-232 raw socket serial port.

Example:

```
config# port 1/3/2
config>port# description "RS-232 Serial"
config>port# serial
config>port>serial# rs232
config>port>serial>rs232# socket
config>port>serial>rs232>socket# rx
config>port>serial>rs232>socket>rx# eop
config>port>serial>rs232>socket>rx>eop# idle-timeout 50
config>port>serial>rs232>socket>rx>eop# length 1500
config>port>serial>rs232>socket>rx>eop# no special-char
config>port>serial>rs232>socket>rx>eop# exit
config>port>serial>rs232>socket>rx# no squelch-delay
config>port>serial>rs232>socket>rx# no unsquelch-delay
config>port>serial>rs232>socket>rx# exit
config>port>serial>rs232>socket# tx
config>port>serial>rs232>socket>tx# inter-session-delay
 10
config>port>serial>rs232>socket>tx# exit
config>port>serial>rs232>socket# exit
config>port>serial>rs232# exit
config>port>serial# exit
config>port# exit
```

Use the **admin>display-config detail** command to display the raw socket port configuration information.

```
*A:Dut>admin# display-config detail
#--------------------------------------------------
echo "Port Configuration"
#--------------------------------------------------
  .....
port 1/3/2
        description "RS-232 Serial"
        serial
            rs232
                socket
                    rx
                        eop
                            length 1500
                            idle-timeout 50
                            no special-char
                        exit
                        no squelch-delay
                        no unsquelch-delay
                    exit
                    tx
                        inter-session-delay 10
                    exit
                exit
            exit
```

```
        exit
    exit
  .....
#--------------------------------------------------
```

7 Interface Command Reference

This chapter describes the following:

- Configuration Commands
- Show, Clear, and Tools Commands

7.1 Configuration Commands

Note: The commands described in this section apply specifically to the 7705 SAR-Hm series nodes. All other applicable commands supported on the nodes are described in the 7450 ESS, 7750 SR, 7950 XRS, and VSR Router Configuration Guide, “Router Interface Commands”; and the 7450 ESS, 7750 SR, 7950 XRS, and VSR Interface Configuration Guide, “Ethernet Commands”.

7.1.1 Configuration Command Hierarchies

- Ethernet Commands
- Ethernet Access and Network Commands
- Cellular MDA and Cellular Port Configuration Commands
- Cellular PDN Profile Configuration Commands
- GNSS Receiver Configuration Commands
- Serial Interface Configuration Commands
- Serial Raw Socket Interface Configuration Commands
- WLAN MDA Radio Configuration Commands
- WLAN Port Configuration Commands

7.1.1.1 Ethernet Commands

The following commands are supported on 7705 SAR-Hm series nodes. Refer to the 7450 ESS, 7750 SR, 7950 XRS, and VSR Interface Configuration Guide, “Ethernet Commands”, for the command descriptions.

Note: Not all commands that are visible in the CLI, and described in the 7450 ESS, 7750 SR, 7950 XRS, and VSR Interface Configuration Guide, are supported on 7705 SAR-Hm series nodes. Only the commands that are listed below are supported.

config
- [**no**] **port** {*port-id*}
  - **ethernet**
    - **autonegotiate** [**limited**]
    - **no autonegotiate**
    - **dot1q-etype value**
    - **no dot1q-etype**
    - **down-on-internal-error** [**tx-disable**]
    - **no down-on-internal-error**
    - **duplex** {**full** | **half**}
    - **egress-scheduler-override** [**create**]
    - **no egress-scheduler-override**
      - **level** *priority-level* **rate** *pir-rate* [**cir** *cir-rate*]
      - **level** *priority-level* **percent-rate** *pir-percent* [**percent-cir** *cir-percent*]
      - **no level** *priority-level*
      - **max-rate** *rate*
      - **max-rate percent** *percent-rate*
      - **no max-rate**
    - **egress-scheduler-policy** *port-scheduler-policy-name*
    - **no egress-scheduler-policy**
    - **encap-type** {**dot1q** | **null**}
    - **no encap-type**
    - **hold-time** {[**up** *hold-time up*] [**down** *hold-time down*] [**seconds** | **centiseconds**]}
    - **no hold-time**
    - **mac** *ieee-address*
    - **no mac**
    - **min-frame-length** *byte-length*
    - **mode** {**access** | **network** | **hybrid**}
    - **no mode**
    - **mtu** *mtu-bytes*
    - **no mtu**
    - **speed** {**10** | **100**}

7.1.1.2 Ethernet Access and Network Commands

config>port>ethernet
- **— access**
  - **— bandwidth** *bandwidth*
  - **— no bandwidth**
  - **— booking-factor** *factor*
  - **— no booking-factor**
  - **— egress**
  - **— ingress**
- **— network**
  - **— accounting-policy** *policy-id*
  - **— no accounting-policy**
  - **—** [**no**] **collect-stats**
  - **— egress**
  - **— queue-policy** *name*
  - **— no queue-policy**

7.1.1.3 Cellular MDA and Cellular Port Configuration Commands

```
config
    — card 1
        — mda 1
            — cellular
                — active-sim {1 | 2 | auto}
                — b125-max-tx-power power-level
                — no b125-max-tx-power
                — down-recovery-interval interval
                — no down-recovery-interval
                — down-recovery-criteria criterion [criterion...(up to two)]
                — no down-recovery-criteria
                — preferred-sim {1 | 2}
                — no preferred-sim
                — sim sim-card-number
                    — description description-string
                    — no description
                    — pin
                    — pin pin-value [hash | hash2]
                    — no pin
                    — failover-criteria
                        — [no] port-oper-state
                        — [no] bgp-neighbor-state
                        — failure-duration minutes

config
    — port port-id
        — description description-string
        — no description
        — [no] shutdown
        — cellular
            — pdn
                — pdn-profile pdn-profile-id
                — no pdn-profile
```

7.1.1.4 Cellular PDN Profile Configuration Commands

```
config
    — system
        — cellular
            — pdn-profile pdn-profile-number [create]
            — no pdn-profile
                — apn apn-name
                — no apn
                — authentication {pap | chap}
                — no authentication
                — description description-string
                — no description
                — password password [hash | hash2 | custom]
```

```
— no password
— protocol {ipv4 | ipv6}
— username user-name
— no username
```

7.1.1.5 GNSS Receiver Configuration Commands

```
config
    — card 1
        — mda 1
            — gnss
                — constellation {gps | gps-glonass}
                — nmea
                    — sentence-types sentence-type [sentence-type...(up to 4 max)]
                    — sentence-interval interval
                    — [no] shutdown
                — [no] shutdown
```

7.1.1.6 Serial Interface Configuration Commands

```
config
    — [no] port port-id
        — serial
            — rs232
                — character-length {6 | 7 | 8}
                — control-lead {input | output}
                    — input
                        — dtr-dsr {high | low}
                        — rts-dcd {high | low}
                    — monitor
                        — dtr-dsr off
                        — rts-dcd off
                    — output
                        — cts-alb {high | low}
                        — dcd-rts {high | low}
                        — ri-rdl {high | low}
                — hold-time {[up hold-time-up] [down hold-time-down]}
                — no hold-time
                — loopback bidir-e
                — no loopback
                — parity {odd | even | mark | space}
                — no parity
                — [no] shutdown
                — speed {600 | 1200 | 2400 | 4800 | 9600 | 19200 | 38400 |
                  57600 | 115200}
                — stop-bits {1 | 2}
```

7.1.1.7 Serial Raw Socket Interface Configuration Commands

Note: To enable the serial transport over raw socket functionality on 7705 SAR-Hm series nodes, configure an RS-232 raw socket serial port and create an IP transport subservice within a VPRN service. For information on how to configure an IP transport subservice within a VPRN, refer to the 7705 SAR-Hm and SAR-Hmc Main Configuration Guide, Layer 2 and Layer 3 Services chapter, “Serial Raw Socket IP Transport Configuration Commands Hierarchy”.

```
config
    — [no] port port-id
        — serial
            — [no] rs232
                — socket
                    — rx
                        — eop
                            — idle-timeout milliseconds
                            — length bytes
                            — special-char value
                            — no special-char
                        — squelch-delay seconds
                        — no squelch-delay
                        — squelch-reset
                        — unsquelch-delay seconds
                        — no unsquelch-delay
                    — tx
                        — inter-session-delay milliseconds
```

7.1.1.8 WLAN MDA Radio Configuration Commands

```
config
    — card 1
        — mda 4
            — [no] shutdown
            — wlan-radio
                — access-point
                    — bandwidth {20MHz | 40MHz}
                    — beacon-interval milliseconds
                    — channel {auto | channel-id}
                    — frequency-band {2400 | 5000}
                — [no] country-code country-string
                — [no] shutdown
```

7.1.1.9 WLAN Port Configuration Commands

```
config
    — port
        — description description-string
        — no description
        — [no] shutdown
        — wlan
            — access-point
                — [no] broadcast-ssid
                — client-timeout seconds
                — dhcp
                    — [no] shutdown
                — dot1x
                    — radius-plcy policy-name
                    — no radius-plcy
                    — re-auth-period seconds
                — client-limit clients
            — network ssid ssid-name [create]
            — no network
                — wlan-security [type {wpa2-psk | wpa2-enterprise}]
                — no wlan-security
                    — wpa-encryption [tkip | aes]
                    — no wpa-encryption
                    — wpa-passphrase ascii-passphrase [hash | hash2]
                    — no wpa-passphrase
```

7.1.2 Configuration Command Descriptions

The commands described in this section apply specifically to 7705 SAR-Hm series nodes. All other applicable commands supported on the 7705 SAR-Hm series are described in the 7450 ESS, 7750 SR, 7950 XRS, and VSR Router Configuration Guide, “Router Interface Commands”; and the 7450 ESS, 7750 SR, 7950 XRS, and VSR Interface Configuration Guide, “Ethernet Commands”.

- Common Configuration Commands
- Cellular MDA and Cellular Port Configuration Commands
- Cellular PDN Profile Configuration Commands
- Ethernet Configuration Commands
- GNSS Receiver Configuration Commands
- Serial Interface Configuration Commands
- Raw Socket Configuration Commands
- WLAN MDA Radio Configuration Commands
- WLAN Port Configuration Commands

7.1.2.1 Common Configuration Commands

description

Syntax **description** *description-string*
no description

Context config>card>mda>cellular>sim
config>port
config>system>cellular>pdn-profile

Description This command creates a text description for a configuration context to help identify the content in the configuration file.

The **no** form of this command removes the description string from the context.

Default n/a

Parameters *description-string* — a description character string. Allowed values are any string up to 80 or 160 characters long (depending on the command), composed of printable, 7-bit ASCII characters. If the string contains special characters (#, $, spaces, etc.), the entire string must be enclosed within double quotes.

shutdown

Syntax [**no**] **shutdown**

Context config>port
config>port>serial>rs232

Description This command administratively disables an entity. When disabled, an entity does not change, reset, or remove any configuration settings or statistics.

The operational state of the entity is disabled as well as the operational state of any entities contained within. Many objects must be shut down before they can be deleted.

The **no** form of this command administratively enables an entity.

Default no shutdown

7.1.2.2 Cellular MDA and Cellular Port Configuration Commands

port

Syntax **port** *port-id*

Context config

Description This command configures an identifier for a cellular port on the node. Up to two cellular ports can be configured and each cellular port is associated with a SIM. Cellular port 1/1/1 is associated with SIM 1 and cellular port 1/1/2 is associated with SIM 2. The relationship between the ports and the SIMs cannot be changed.

Default 1/1/1

Parameters *port-id* — the cellular port identifier

Values 1/1/1 or 1/1/2, in the format *slot/mda/port*

active-sim

Syntax **active-sim** {**1** | **2** | **auto**}

Context config>card>mda>cellular

Description This command assigns a SIM to be the active SIM.

When the system powers up or reboots, it uses the **active-sim** setting to determine which SIM is the active SIM. Selecting **1** or **2** makes the selected SIM permanently active. The active SIM can be manually switched by changing the **active-sim** setting from **1** to **2** or from **2** to **1**.

Caution: Changing the active SIM from **1** to **2** or vice versa is considered a manual switchover and is service-affecting. The recovery time after making the change can range from a few seconds to up to a few minutes. Ensure that there is service on the other SIM before changing the active SIM.

If a SIM is specified but is not physically installed in the associated SIM slot, the cellular port remains operationally down. The operator must either install the SIM in the appropriate slot or change the configuration in order to bring up the service.

Selecting **auto** enables automatic failover in a dual SIM deployment. An automatic failover occurs when activity switches from one SIM to the other. The settings configured for the **failover-criteria** command determine when an automatic failover will occur.

When the **auto** parameter is set in a dual SIM deployment, the node must be configured with a preferred SIM. The **preferred-sim** command specifies whether SIM 1 or SIM 2 is used for a cellular port after a system reset.

If the **active-sim** value is changed from **auto** to **1** or from **auto** to **2** and the active SIM is the same as the new configuration, there is no change to service of the active SIM.

Caution: Changing the **active-sim** setting so that the newly active SIM is different from the currently active SIM is service-affecting. The recovery time after making this change could range from a few seconds to up to a few minutes.

If the **active-sim** value is changed from **1** to **auto** or from **2** to **auto**, there is no service outage. The system keeps the currently active SIM up and does not perform any switchover.

When **active-sim** is set to **auto**, operators can use the **tools>perform>mda>cellular>force-sim-switch** command to manually force a SIM switch.

The **auto** parameter can be set even if there is only one SIM installed in the system. In this case, the system keeps the currently active SIM up and does not perform any switchover.

Default 1

Parameters **1** — sets the active SIM to SIM 1

2 — sets the active SIM to SIM 2

auto — enables automatic failover between the two SIMs in a dual SIM deployment

b125-max-tx-power

Syntax **b125-max-tx-power** *power-level*
no b125-max-tx-power

Context config>card>mda>cellular

Description This command configures the maximum transmit power level of the B125 radio module. The B125 power level depends on the installation height of the B125 variant antenna, and the value must be set based on the guidelines provided in the SAR-Hm and SAR-Hmc Chassis Installation Guide for B125 antenna locations.

For more information, refer to the SAR-Hm and SAR-Hmc Chassis Installation Guide.

Default 1

Parameters *power-level* — the B125 antenna power level

Values 1 to 20

down-recovery-interval

Syntax **down-recovery-interval** *interval*
no down-recovery-interval

Context config>card>mda>cellular

Description This command configures the length of time in which the cellular MDA must establish cellular service for a SIM before the node resets. It is used in conjunction with the **down-recovery-criteria** command.

When configured, this option provides a hardware reset to unblock any potential hardware lockup conditions related to the cellular radio modem or to guard against persistent cycling of automatic switchovers between SIMs in a dual SIM deployment. If the cellular MDA has not successfully achieved service based on the **down-recovery-criteria** value set for either SIM 1 or SIM 2 within the specified length of time, the node resets.

Prior to resetting, the node will issue a log event stating that the node will reset within 60 seconds. This interval can be used to collect information for further debugging and analysis.

The **no** form of the command disables the **down-recovery-interval,** and the state of the cellular MDA is not monitored other than for dual SIM operation and criteria configured for automatic failover (see failover-criteria for more information).

Default no down-recovery-interval

Parameters *interval* — the length of time, in minutes, before a down-recovery condition is declared

Values 1 to 240

down-recovery-criteria

Syntax **down-recovery-criteria** *criterion* [*criterion*...(**up to two**)]
no down-recovery-criteria

Context config>card>mda>cellular

Description This command configures criteria used to detect a problem with the cellular radio modem. It is used in conjunction with the **down-recovery-interval** command. The criteria are **port** and **bgp**.

When the command is set to **port**, the node detects if any cellular port has connected to a wireless network and is operationally up within the configured **down-recovery-interval**. When a port connects successfully, the down-recovery timer stops. The down-recovery timer restarts when all PDN interfaces are operationally down.

When the command is set to **bgp**, the node detects if any BGP session whose **local-address** is configured to a PDN interface name has come up within the configured **down-recovery-interval**. When a BGP session comes up, the down-recovery timer stops. The down-recovery timer restarts when all BGP sessions associated with PDN interfaces (associated with the configured **local-address**) are down.

Both **port** and **bgp** can be set concurrently as criteria.

Default port

Parameters *criterion* — specifies the criterion to use for detecting a problem with the cellular radio modem

Values **port** —all cellular ports are monitored
bgp—all BGP sessions associated with PDNs are monitored

preferred-sim

Syntax **preferred-sim** {**1** | **2**}
no preferred-sim

Context config>card>mda>cellular

Description This command configures which SIM to use when the node resets. The configuration is used in a dual SIM deployment when the **active-sim** command is set to **auto**. When the node resets, the system uses the preferred SIM to bring up the associated cellular port.

Note: Before setting the preferred SIM, the operator must ensure that the corresponding SIM is installed and configured.

Default 1

Parameters **1** — sets the preferred SIM to SIM 1

2 — sets the preferred SIM to SIM 2

sim

Syntax **sim** *sim-card-number*

Context config>card>mda>cellular

Description This command enables the context to configure parameters for the specified SIM.

Parameters *sim-card-number* — identifies the SIM

Values 1 or 2

pin

Syntax **pin**
pin *pin-value* [**hash** | **hash2**]
no pin

Context config>card>mda>cellular>sim

Description This command stores the SIM PIN in the system configuration file. This command does not change the PIN on the SIM.

Use the **pin** command to enter the PIN in the system configuration file from an interactive CLI session. The system prompts you to enter the PIN twice. If the two entered PINs do not match, the system rejects the configuration.

Use the **pin** command with a specified PIN value and the **hash** or **hash2** keyword to load the PIN in encrypted form in the configuration file.

The **no** form of this command removes the PIN from the system configuration.

Default n/a

Parameters *pin-value* — the 4-to-8 digit PIN code

hash — specifies that the PIN is entered in an encrypted form. If the **hash** or **hash2** keyword is not used, the PIN is assumed to be in an unencrypted, clear text form. For security, all PINs are stored in encrypted form in the configuration file with the specified **hash** or **hash2** parameter.

hash2 — specifies that the PIN is entered in a more complex, encrypted form that involves more variables than the PIN value alone, meaning that the **hash2** encrypted variable cannot be copied and pasted. If the **hash** or **hash2** keyword is not used, the PIN is assumed to be in an unencrypted, clear text form. For security, all PINs are stored in encrypted form in the configuration file with the specified **hash** or **hash2** parameter.

failover-criteria

Syntax **failover-criteria**

Context config>card>mda>cellular>sim

Description This command enables the context to configure the criteria that will cause an automatic SIM switchover in a dual SIM deployment.

The **failover-criteria** parameters are used when the **active-sim** command is set to **auto**. The parameters are configured per SIM, so each SIM can have different failover criteria. The system uses the criteria configured on the currently active SIM to determine when a switchover should occur.

Default n/a

port-oper-state

Syntax [**no**] **port-oper-state**

Context config>card>mda>cellular>sim>failover-criteria

Description This command sets the operational status of the cellular port as a failover criterion for the specified SIM.

If the operational status of the cellular port remains down for the **failure-duration** interval, the SIM is considered to be in a failed state and the system performs an automatic switch from the currently active SIM to the other SIM.

The **no** form of the command disables the **port-oper-state** from being used as a failover criterion.

Default port-oper-state

bgp-neighbor-state

Syntax [**no**] **bgp-neighbor-state**

Context config>card>mda>cellular>sim>failover-criteria

Description This command sets the operational status of BGP sessions as a failover criterion for the specified SIM.

The BGP sessions monitored by the system are those that are configured with the **local-address** set to the PDN interface name that uses the associated SIM cellular *port-id*.

If the operational status of BGP sessions remain down for the **failure-duration** interval, the SIM is considered to be in a failed state and the system performs an automatic switch from the currently active SIM to the other SIM.

The **no** form of the command disables the **bgp-neighbor-state** from being used as a failover criterion.

Default no bgp-neighbor-state

failure-duration

Syntax **failure-duration** *minutes*

Context config>card>mda>cellular>sim>failover-criteria

Description This command configures the length of time before the SIM is considered to be in a failed state based on the specified failover criteria. The value is used for both configured failover criteria.

When the node detects a down state for the **failure-duration** time, the SIM is considered to be in a failed state and the node performs an automatic switch from the currently active SIM to the other SIM.

Note: It is recommended that the **failure-duration** be set to a high value so that the system does not perform frequent switches between SIMs.

Default 5

Parameters *minutes* — the length of time, in minutes, before the SIM is considered to be in a failed state

Values 1 to 60

pdn

Syntax **pdn**

Context config>port>cellular

Description This command enables the context to configure PDN parameters for the cellular port.

Default n/a

pdn-profile

Syntax **pdn-profile** *pdn-profile-id*
no pdn-profile

Context config>port>cellular>pdn

Description This command assigns a PDN profile to the cellular port. The PDN profile must be configured at the system level before this command can be used; see Cellular PDN Profile Configuration Commands for information.

The **no** form of this command assigns the default PDN profile to the PDN.

Default no pdn-profile

Parameters *pdn-profile-id* — the PDN profile identifier

Values 1 or 2

7.1.2.3 Cellular PDN Profile Configuration Commands

pdn-profile

Syntax **pdn-profile** *pdn-profile-number* [**create**]
no pdn-profile

Context config>system>cellular

Description This command creates a PDN profile with an associated ID when used with the **create** keyword.

The system supports up to three PDN profiles: a default profile and two user-created profiles identified as **pdn-profile** 1 and **pdn-profile** 2.

The default PDN profile is used during the ADP-Hm process and cannot be modified.

The **no** form of this command deletes the PDN profile if the profile is not in use. If the profile is in use, the **no** form of the command cannot be executed.

Default n/a

Parameters *pdn-profile-number* — the PDN profile identifier

Values 1 or 2

create — the keyword used to create the PDN profile

apn

Syntax **apn** *apn-name*
no apn

Context config>system>cellular>pdn-profile

Description This command configures the Access Point Name (APN) for the PDN profile.

The **no** form of this command removes the APN.

Default no apn

Parameters *apn-name* — a character string up to a maximum of 100 characters

authentication

Syntax **authentication** {**pap** | **chap**}
no authentication

Context config>system>cellular>pdn-profile

Description This command configures the authentication type used by the PDN profile.

The **no** form of this command removes authentication from the PDN profile.

Default n/a

Parameters **pap** — sets the authentication type to PAP

chap — sets the authentication type to CHAP

password

Syntax **password** *password* [**hash** | **hash2** | **custom**]
no password

Context config>system>cellular>pdn-profile

Description This command configures the password for PAP or CHAP authentication of the PDN profile. The password must be confirmed by entering it twice.

The **no** version of this command removes the authentication password from the PDN profile.

Default no password

Parameters *password* — a character string up to a maximum of 64 characters

hash — specifies that the key is entered in an encrypted form. If the hash parameter is not used, the key is assumed to be in a non-encrypted, clear text form For security, all keys are stored in encrypted form in the configuration file with the hash or hash2 parameter specified.

hash2 — specifies that the key is entered in a more complex encrypted form that involves more variables than the key value alone. This means that a hash2 encrypted variable cannot be copied and pasted. If the hash2 parameter is not used, the key is assumed to be in a non-encrypted, clear text form. For security, all keys are stored in encrypted form in the configuration file with the hash or hash2 parameter specified.

custom — specifies the custom encryption to management interface

protocol

Syntax **protocol** {**ipv4** | **ipv6**}

Context config>system>cellular>pdn-profile

Description This command configures the address type, either IPv4 or IPv6, that is learned by the PDN router interface during the PDN attachment process. When set to IPv4, the PDN router interface can operate in static cellular system mode, static cellular interface mode, or dynamic cellular interface mode. When set to IPv6, the PDN router interface can operate in either static cellular interface mode or dynamic cellular interface mode. For more information on the PDN router interface modes, refer to “PDN Router Interfaces” in the 7705 SAR-Hm and SAR-Hmc Main Configuration Guide.

Default ipv4

Parameters **ipv4** — sets the IP address type for the PDN connection to IPv4

ipv6 — sets the IP address type for the PDN connection to IPv6

username

Syntax **username** *user-name*
no username

Context config>system>cellular>pdn-profile

Description This command configures the user name for PAP or CHAP authentication of the PDN profile.

The **no** form of this command removes the user name.

Default n/a

Parameters *user-name* — a character string up to a maximum of 255 characters

7.1.2.4 Ethernet Configuration Commands

duplex

Syntax **duplex** (**full** | **half**}

Context config>port>ethernet

Description This command configures the duplex mode of a Fast Ethernet port when autonegotiation is disabled. If the port is configured to **autonegotiate**, this parameter is ignored.

The 7705 SAR-Hm only supports full-duplex mode.

Default full

Parameters **full** — sets the link to full-duplex mode

half — sets the link to half duplex mode

7.1.2.5 GNSS Receiver Configuration Commands

constellation

Syntax **constellation** {**gps** | **gps-glonass**}

Context config>card>mda>gnss

Description This command configures which GNSS system or systems will be used by the GNSS receiver. The configuration can be modified only when the GNSS service is shut down.

Default gps

Parameters **gps** — configures the GNSS receiver to use the American GPS GNSS system

gps-glonass — configures the GNSS receiver to use both the American GPS GNSS system and the Russian GLONASS GNSS system

nmea

Syntax **nmea**

Context config>card>mda>gnss

Description This command enables the context for configuring NMEA parameters.

sentence-types

Syntax **sentence-types** *sentence-type* [*sentence-type*...(**up to 4 max**)]

Context config>card>mda>gnss>nmea

Description This command configures NMEA sentence types that are sent from the GNSS receiver over the associated IP transport service when the service is configured for NMEA streaming. The following sentence types are supported: GPGGA, GPRMC, GPVTG, and GNGNS. For information about the sentence types, refer to NMEA 0183, *Standard For Interfacing Marine Electronic Devices*.

At least one sentence type must be specified, up to a maximum of four. Different sentence types can be specified concurrently so that multiple sentences can be streamed per NMEA sentence interval.

Default gpgga

Parameters *sentence-type* — an NMEA sentence type to be streamed

Values **gpgga** — this sentence is for time, position, and fix-related data for a GNSS receiver

gprmc — this sentence is for time, date, position, course, and speed data provided by the GNSS receiver

gpvtg — this sentence is for vector track and speed relative to the ground

gngns — this sentence is for time, position, and fix-related data for single or combined constellations for a GNSS receiver

sentence-interval

Syntax **sentence-interval** *interval*

Context config>card>mda>gnss>nmea

Description This command configures the intervals at which NMEA sentences are retrieved from the GNSS receiver and sent over the associated IP transport service configured for NMEA streaming.

Default 5 s

Parameters *interval* — time, in seconds, between the sending of NMEA sentences

Values 1 to 3600

shutdown

Syntax [**no**] **shutdown**

Context config>card>mda>gnss>nmea

Description This command enables or disables NMEA streaming from the GNSS receiver. The **no** form of the command enables NMEA streaming. Using the **shutdown** command disables NMEA streaming.

The node uses an IP transport service to send NMEA sentences from the GNSS receiver to remote hosts. For information about enabling IP transport for NMEA sentences, refer to the 7705 SAR-Hm and SAR-Hmc Main Configuration Guide, “GNSS NMEA Data IP Transport Service”.

Default shutdown

shutdown

Syntax [**no**] **shutdown**

Context config>card>mda>gnss

Description This command enables or disables the GNSS service on the GNSS receiver. Enabling the GNSS receiver causes MDA 1/1 to reset under the following conditions:

- when the configuration of the **constellation** command changes
- the first time the GNSS receiver is enabled after a firmware update of the cellular MDA

The **no** form of the command enables the GNSS service. Using the **shutdown** command disables the GNSS receiver and resets the position fix and associated information.

Default shutdown

7.1.2.6 Serial Interface Configuration Commands

serial

Syntax **serial**

Context config>port

Description This command enables the context to configure parameters for an RS-232 serial port on the node.

Default n/a

rs232

Syntax **rs232**

Context config>port>serial

Description This command enables the context to configure RS-232 parameters for a serial port.

Default n/a

character-length

Syntax **character-length** {**6** | **7** | **8**}

Context config>port>serial>rs232

Description This command configures the number of data bits used to transmit a character. The value for this command cannot be 8 if the value for parity is anything other than no parity (that is, anything other than none) and the value for stop-bits is 2.

Default 8

Parameters **6** — specifies six bits in a character

7 — specifies seven bits in a character

8 — specifies eight bits in a character

control-lead

Syntax **control-lead** {**input** | **output**}

Context config>port>serial>rs232

Description This command enables access to the context to configure the input and output leads that carry control signals. Control signals provide the handshaking for call setup, teardown, and synchronization.

Default n/a

input

Syntax **input**

Context config>port>serial>rs232>control-lead

Description This command enables access to the context to configure the input control leads.

Default n/a

dtr-dsr

Syntax **dtr-dsr** {**high** | **low**}

Context config>port>serial>rs232>control-lead>input

Description This command configures the Data Terminal Ready (DTR) or Data Set Ready (DSR) input control lead. For a DCE device, the input signal is DTR. For a DTE device, the input signal is DSR.

Default high

Parameters **high** — the input control lead is assumed to be on

low — the input control lead is assumed to be off

rts-dcd

Syntax **rts-dcd** {**high** | **low**}

Context config>port>serial>rs232>control-lead>input

Description This command configures the Request To Send (RTS) or Data Carrier Detect (DCD) input control lead. For a DCE device, the input signal is RTS. For a DTE device, the input signal is DCD.

Default high

Parameters **high** — the input control lead is assumed to be on

monitor

Syntax **monitor**

Context config>port>serial>rs232>control-lead

Description This command enables access to the context to monitor the input control leads. When monitoring is enabled on a control lead, the node polls the status of the control lead every second. Any change in state of the control lead causes an alarm to be raised. This functionality provides an indication to the operator of a problem in the DTE-to-DCE path; for example, it can indicate that the far-end device is disconnected.

Monitoring is enabled on a per-lead basis.

Default n/a

dtr-dsr

Syntax **dtr-dsr off**

Context config>port>serial>rs232>control-lead>monitor

Description This command enables monitoring on the Data Terminal Ready (DTR) or Data Set Ready (DSR) input control lead. For a DCE device, the input control lead is DTR. For a DTE device, the input control lead is DSR.

Default off

Parameters **off** — monitoring is disabled on the lead

rts-dcd

Syntax **rts-dcd off**

Context config>port>serial>rs232>control-lead>monitor

Description This command enables monitoring on the Request To Send (RTS) or Data Carrier Detect (DCD) input control lead. For a DCE device, the input control lead is RTS. For a DTE device, the input control lead is DCD.

Default off

Parameters **off** — monitoring is disabled on the lead

output

Syntax **output**

Context config>port>serial>rs232>control-lead

Description This command enables access to the context to configure the output control leads.

Default n/a

cts-alb

Syntax **cts-alb** {**high** | **low**}

Context config>port>serial>rs232>control-lead>output

Description This command configures the Clear To Send (CTS) or Analog Loopback (ALB) output control lead. For a DCE device, the output signal is CTS. For a DTE device, the output signal is ALB.

Default high

Parameters **high** — the output control lead is forced on

low — the output control lead is forced off

dcd-rts

Syntax **dcd-rts** {**high** | **low**}

Context config>port>serial>rs232>control-lead>output

Description This command configures the Data Carrier Detect (DCD) or Request To Send (RTS) output control lead. For a DCE device, the output signal is DCD. For a DTE device, the output signal is RTS.

Default high

Parameters **high** — the output control lead is forced on

low — the output control lead is forced off

ri-rdl

Syntax **ri-rdl** {**high** | **low**}

Context config>port>serial>rs232>control-lead>output

Description This command configures the Ring Indicator (RI) or Remote Digital Loopback (RDL) output control lead. For a DCE device, the output signal is RI. For a DTE device, the output signal is RDL.

Default high

Parameters **high** — the output control lead is forced on

low — the output control lead is forced off

hold-time

Syntax **hold-time** {[**up** *hold-time-up*] [**down** *hold-time-down*]}
no hold-time

Context config>port>serial>rs232

Description This command configures the serial link dampening timers in 100s of milliseconds, which guards against reporting excessive interface transitions. Once implemented, subsequent transitions of the interface from one state to another are not advertised to upper layer protocols until the configured timer has expired.

Default no hold-time

Parameters *hold-time-up* — the hold-timer for link-up event dampening. A value of zero (0) indicates that an up transition is reported immediately.

Values 0 to 100 (in 100s of milliseconds)

hold-time-down — the hold-timer for link-down event dampening. A value of zero (0) indicates that a down transition is reported immediately.

Values 0 to 100 (in 100s of milliseconds)

loopback

Syntax **loopback bidir-e**
no loopback

Context config>port>serial>rs232

Description This command puts the specified interface into a loopback mode. The corresponding interface must be in a shutdown state in order for the loopback mode to be enabled.

In the serial context, it is possible to configure a a bidirectional loopback E. A bidirectional loopback is a circuit loopback that loops traffic from the line back to the line. Bidirectional loopback E takes place on the data device side of the adapter card, and is closer to the line.

This command is not saved in the system configuration between boots.

The **no** form of this command disables the loopback on the interface.

Default no loopback

Parameters **bidir-e** — configures a bidirectional loopback E

parity

Syntax **parity** {**odd** | **even** | **mark** | **space**}
no parity

Context config>port>serial>rs232

Description This command configures the parity bit in a character. Parity is an error detection method that adds an extra bit to each character, based on the number of 0s or 1s in the character.

The value for this command must be **no parity** (that is, none) if the character-length value is 8 and the stop-bits value is 2.

The **no** form of this command disables the parity bit in a character.

Default no parity

Parameters **odd** — the parity bit is set to 0 or 1 to make the total number of 1s in the set of bits odd

even — the parity bit is set to 0 or 1 to make the total number of 1s in the set of bits even

mark — the parity bit is present but not used and is always set to 1

space — the parity bit is present but not used and is always set to 0

speed

Syntax **speed** {**600** | **1200** | **2400** | **4800** | **9600** | **19200** | **38400** | **57600** | **115200**}

Context config>port>serial>rs232

Description This command configures the speed of the interface. The speed also determines the DS0 timeslots assigned to the channel group.

Default 9600

Parameters **600** — sets the link speed to 600 b/s

1200 — sets the link speed to 1200 b/s

2400 — sets the link speed to 2400 b/s

4800 — sets the link speed to 4800 b/s

9600 — sets the link speed to 9600 b/s

19200 — sets the link speed to 19 200 b/s

38400 — sets the link speed to 38 400 b/s

57600 — sets the link speed to 57 600 b/s

115200 — sets the link speed to 115 200 b/s

stop-bits

Syntax **stop-bits** {**1** | **2**}

Context config>port>serial>rs232

Description This command configures the number of stop bits used to signify the end of a character.

This command cannot have a value of 2 if the character-length value is 8 and the parity value is anything other than **no parity** (that is, anything other than none).

Default 1

Parameters **1** — specifies one stop bit in a character

2 — specifies two stop bits in a character

7.1.2.7 Raw Socket Configuration Commands

7.1.2.7.1 Raw Socket Port Configuration Commands

Note: The speed command must be set to a value that supports raw sockets; see Serial Interface Configuration Commands for the required information.

socket

Syntax **socket**

Context config>port>serial>rs232

Description This command creates a raw socket on an RS-232 port.

The **no** form of the command deletes the socket from the serial port.

Default n/a

rx

Syntax **rx**

Context config>port>serial>rs232>socket

Description This command enables the context to configure parameters for data packets received over a serial port's raw socket.

Default n/a

eop

Syntax **eop**

Context config>port>serial>rs232>socket>rx

Description This command enables the context to configure end of packet (EOP) parameters for data packets received over the raw socket.

Note: An EOP will be declared by whichever EOP condition is encountered first.

idle-timeout

Syntax **idle-timeout** *milliseconds*

Context config>port>serial>rs232>socket>rx>eop

Description This command specifies how long a serial port can remain idle before an EOP is declared and the packet is sent over the raw socket.

Default 50 ms

Parameters *milliseconds* — the length of time, in milliseconds, that a serial port can remain idle before an EOP is declared

Values 10 to 5000

length

Syntax **length** *bytes*

Context config>port>serial>rs232>socket>rx>eop

Description This command specifies the number of characters (converted to bytes) received on the serial port that triggers the node to encapsulate the characters in an IP transport packet and send it over a VPRN service.

Default 1500

Parameters *bytes* — the number of characters (in bytes) to trigger sending an IP transport packet

Values 1 to 1500

special-char

Syntax **special-char** *value*
no special-char

Context config>port>serial>rs232>socket>rx>eop

Description This command specifies a special character that, if received on the serial port, declares EOP and triggers the node to encapsulate previously received queued characters in an IP transport packet and send it over a VPRN service.

Note: Other than declaring the EOP, the special character is otherwise treated as regular data; that is, it is added to the packet.

The **no** form of the command disables checking for a special character.

Default no special-char

Parameters *value* — specifies the special character, in a decimal or hexadecimal format, that triggers end of packet

Values 0 to 255, or 0x00 to 0xFF

squelch-delay

Syntax **squelch-delay** *seconds*
no squelch-delay

Context config>port>serial>rs232>socket>rx

Description This command specifies how long a serial port can receive a continuous data stream before an alarm is raised indicating that the serial port has locked up and triggering the squelching function.

The **no** form of the command disables the squelching function on the serial port.

Default no squelch-delay

Parameters *seconds* — the number of seconds that a serial port can receive data before the squelching function is triggered

Values 1 to 120

squelch-reset

Syntax **squelch-reset**

Context config>port>serial>rs232>socket>rx

Description This command allows an operator to manually clear squelching on a serial port's raw socket without having to configure a time limit on the squelching function.

Squelching can also be set to clear automatically after a time limit has been reached with the unsquelch-delay command.

Default n/a

unsquelch-delay

Syntax **unsquelch-delay** *seconds*
no unsquelch-delay

Context config>port>serial>rs232>socket>rx

Description This command clears squelching on a raw socket by setting a limit on the amount of time that squelching can remain active on the port. When the time limit is reached, the auto-clear function is enabled and the serial port's raw socket is put back into a normal state.

Squelching can also be cleared manually with the squelch-reset command.

The **no** form of the command disables the auto-clear function on a serial port.

Default no unsquelch-delay

Parameters *seconds* — the number of seconds before the auto-clear function is activated

Values 1 to 120

tx

Syntax **tx**

Context config>port>serial>rs232>socket

Description This command enables the context to configure parameters for data packets transmitted over a serial port's raw socket.

inter-session-delay

Syntax **inter-session-delay** *milliseconds*

Context config>port>serial>rs232>socket>tx

Description This command specifies a time delay that the node inserts between a session's data that is being transmitted over a serial port and the next queued session's data. The next session's data is not sent until the current session's data is sent and the **inter-session-delay** is reached.

Default 10 ms

Parameters *milliseconds* — the time delay, in milliseconds, between a session's data that is being transmitted over a serial port and the next queued session's data

Values 0 to 5000

7.1.2.8 WLAN MDA Radio Configuration Commands

wlan-radio

Syntax **wlan-radio**

Context config>card>mda

Description This command enables the context to configure WLAN radio commands.

Default n/a

country-code

Syntax [**no**] **country-code** *country-string*

Context config>card>mda>wlan-radio

Description This command configures the country code for the WLAN radio. Because the values configured for the **channel** and **bandwidth** commands depend on the **country-code** configuration, the country code must be configured before any other MDA parameters. The **country-code** must be configured in order to enable the radio; otherwise, executing a **no shutdown** command returns an error.

The **no** form of the command removes the specified country code from the WLAN radio, and resets the MDA AP **frequency-band**, **channel**, and **bandwidth** commands to their default values. The **no** form can only be executed when the WLAN radio is shutdown.

Default none

Parameters *country-string* — the name of the country

Values australia, belgium, bolivia, brazil, canada, chile, colombia, france, germany, india, iran, italy, japan, malaysia, mexico, new-zealand, peru, russia, singapore, south-africa, usa, venezuela

access-point

Syntax **access-point**

Context config>card>mda>wlan-radio

Description This command enables the context to configure WLAN radio AP parameters.

Default n/a

frequency-band

Syntax **frequency-band** {**2400** | **5000**}

Context config>card>mda>wlan-radio>access-point

Description This command sets the frequency band for the access point configured under the WLAN radio MDA.

Default 2400

Parameters **2400** — sets the frequency band to 2.4 GHz

5000 — sets the frequency band to 5.0 GHz

channel

Syntax **channel** {**auto** | *channel-id*}

Context config>card>mda>wlan-radio>access-point

Description This command sets the channel of the WLAN radio. The *channel-id* values that are available for this command depend on the configured **country-code** and **frequency-band**. See the Appendix for information about the available values.

When the WLAN radio channel is set to **auto**, the node scans the frequency bands supported by the configured **county-code** for the most appropriate channel.

Default auto

Parameters **auto** — specifies that the WLAN radio can select the most appropriate channel to use

channel-id — see the Appendix for information

bandwidth

Syntax **bandwidth** {**20MHz** | **40MHz**}

Context config>card>mda>wlan-radio>access-point

Description This command sets the channel bandwidth of the WLAN radio.

Default 20MHz

Parameters **20MHz** — sets the channel bandwidth to 20 MHz

40MHz — sets the channel bandwidth to 40 MHz

beacon-interval

Syntax **beacon-interval** *milliseconds*

Context config>card>mda>wlan-radio>access-point

Description This command sets the beacon interval for WLAN radio access points. The interval is the frequency with which an AP broadcasts a packet in order to synchronize with the wireless network. This command is configured at the MDA level and is used by all APs for their associated beacon.

.

Default 200

Parameters *milliseconds* — the interval at which an AP broadcasts a packet that is used to synchronize with the wireless network

Values 75 to 999

shutdown

Syntax [**no**] **shutdown**

Context config>card>mda
config>card>mda>wlan-radio

Description In the **config>card>mda>wlan-radio** context, this command shuts down the WLAN radio. When the radio is turned off, a configured AP becomes operationally down. The **no** form of this command enables the WLAN radio, and any configured WLAN ports that are operationally down can begin operating.

In the **config>card>mda** context, this command shuts down the WLAN MDA and puts the WLAN radio into reset mode. Any WLAN ports configured under the MDA become operationally down. The **no** form of this command brings the WLAN radio out of reset

Default shutdown

7.1.2.9 WLAN Port Configuration Commands

port

Syntax **port** *port-id*

Context config

Description This command configures a WLAN port. The WLAN port identifier for the WLAN MDA is fixed and represents an access point (AP).

Default n/a

Parameters *port-id* — specifies the physical port ID in the format *slot/mda/port*, where the slot ID is always 1, the MDA is always 4, and the port ID is from 1 to 3

shutdown

Syntax [**no**] **shutdown**

Context config>port

Description This command administratively disables the specified WLAN port. When disabled, the port does not change, reset, or remove any configuration settings or statistics. The operational state of the port is also disabled.

When the WLAN port on the node is shut down, the following occurs:

- All WLAN clients connected to the AP are released.
- If the AP is configured as a SAP towards the WLAN gateway, the SAP and associated service become operationally down.

The **no** form of this command administratively enables the specified port.

Default shutdown

description

Syntax **description** *description-string*
no description

Context config>port

Description This command creates a text description for a configuration context to help identify the content in the configuration file.

The **no** form of this command removes any description string from the context.

Default n/a

Parameters *description-string* — description character string. Allowed values are any string up to 80 or 160 characters long (depending on the command) composed of printable, 7-bit ASCII characters. If the string contains special characters (#, $, spaces, etc.), the entire string must be enclosed within double quotes.

wlan

Syntax **wlan**

Context config>port

Description This command enables the context to configure WLAN port parameters.

Default n/a

network

Syntax **network ssid** *ssid-name* [**create**]
no network

Context config>port>wlan

Description This command configures the network service set identifier (SSID). Only one network SSID can be configured on a port. The network SSID can be changed only when the WLAN AP port is shutdown.

The **no** form of this command removes the network and all the configurations within the network context.

Default none

Parameters *ssid-name* — a 32-character string that defines the SSID

create — keyword used create the network SSID

wlan-security

Syntax **wlan-security** [**type** {**wpa2-psk** | **wpa2-enterprise**}]
no wlan-security

Context config>port>wlan>network

Description This command configures the network security type for the specified WLAN interface.

When no security type is set, the WLAN interface is considered to be open. When the security type is set to **wpa2-psk**, the WPA2 PSK pass phrase must be configured. When the security type is set to **wpa2-enterprise**, the **radius-plcy** command under the **access-point** context must be configured in order to authenticate clients connecting to the WLAN access point.

The **no** form of the command disables security and the WLAN interface is considered to be open.

Default no wlan-security

Parameters **type** — keyword used to select the security type

wpa2-psk — the WLAN interface uses WPA2-PSK security

wpa2-enterprise — the WLAN interface uses WPA2-enterprise security

wpa-encryption

Syntax **wpa-encryption** [**tkip** | **aes**]
no wpa-encryption

Context config>port>wlan>network>wlan-security

Description This command sets the WPA2 encryption type when network WLAN security is configured as either **wpa2-psk** or **wpa2-enterprise**.

When WLAN security is set to either **wpa2-psk** or **wpa2-enterprise**, the encryption type defaults to **aes**.

The **no** form of the command removes the configured encryption type.

Default aes

Parameters **tkip** — sets the encryption type to TKIP

aes — sets the encryption type to AES

wpa-passphrase

Syntax **wpa-passphrase** *ascii-passphrase* [**hash** | **hash2**]
no wpa-passphrase

Context config>port>wlan>network>wlan-security

Description This command configures the WPA2-PSK pass phrase when network WLAN security is configured as **wpa2-psk**. The pass phrase is a pre-shared secret pass phrase that is used to connect potential clients to the AP.

The **no** form of the command clears the pass phrase. The default setting is the string **passphrase**.

Default passphrase

Parameters *ascii-passphrase* — a 64-character alpha-numeric string that identifies the pass phrase to use for WPA2-PSK security

hash — specifies that the hash key is entered in an encrypted form. If the hash or hash2 parameter is not used, the key is assumed to be in an unencrypted, clear text form. For security, all keys are stored in encrypted form in the configuration file with the specified hash or hash2 parameter.

hash2 — specifies that the hash key is entered in a more complex, encrypted form that involves more variables than the key value alone, meaning that the hash2 encrypted variable cannot be copied and pasted. If the hash or hash2 parameter is not used, the key is assumed to be in an unencrypted, clear text form. For security, all keys are stored in encrypted form in the configuration file with the specified hash or hash2 parameter.

access-point

Syntax **access-point**

Context config>port>wlan

Description This command enables the context to configure WLAN port AP parameters.

dot1x

Syntax **dot1x**

Context config>port>wlan>access-point

Description This command enables the context to configure Dot1X parameters for the specified WLAN port AP.

radius-plcy

Syntax **radius-plcy** *policy-name*
no radius-plcy

Context config>port>wlan>access-point>dot1x

Description This command configures a RADIUS policy for the specified WLAN access point to use when network WLAN security is set to **wpa2-enterprise**.

The RADIUS policy name must have already been configured under the **config>system>security>dot1x** context before executing this command. For information about configuring a RADIUS policy name in the **config>system>security>dot1x** context, refer to the “Dot1X Commands” section of the 7450 ESS, 7750 SR, 7950 XRS, and VSR System Management Guide

The **no** form of the command clears the radius policy name from the WLAN AP.

Default none

Parameters *policy-name* — the radius policy to use for a WLAN AP

re-auth-period

Syntax **re-auth-period** *seconds*

Context config>port>wlan>access-point>dot1x

Description This command configures the re-authentication period when network LAN security for a WLAN AP is set to **wpa2-enterprise**. Clients that are connected to the WLAN AP must re-authenticate after the re-authentication period expires.

Default 300 s

Parameters *seconds* — the length of time in seconds the WLAN access points wait before re-authenticating connected clients

Values 1 to 9000

broadcast-ssid

Syntax [**no**] **broadcast-ssid**

Context config>port>wlan>access-point

Description This command enables WLAN access points to broadcast the network SSID.

The **no** form of the command disables the broadcast of the network SSID.

Default no broadcast-ssid

client-limit

Syntax **client-limit** *clients*

Context config>port>wlan>access-point

Description This command configures the maximum number of clients that can connect to the WLAN AP concurrently.

Default 24

Parameters *clients* — the number concurrent clients that can connect to the WLAN AP

Values 1 to 24

client-timeout

Syntax **client-timeout** *seconds*

Context config>port>wlan>access-point

Description This command configures the timeout period for inactive clients. If a client does not send or receive data over the WLAN connection within the specified period, then the client is disconnected from the WLAN AP.

Default 300 s

Parameters *seconds* — the length of time, in seconds, that the WLAN AP waits before disconnecting an inactive client

Values 60 (1 minute) to 86400 (24 hours)

shutdown

Syntax [**no**] **shutdown**

Context config>port>wlan>access-point>dhcp

Description This command disables the DHCP relay function for the specified AP.

The **no** form of the command enables the DHCP relay function on the AP. When a DHCP request is received by a client trying to connect to the AP, the node inserts option-82 with specific information needed to connect to the WLAN gateway. If an option-82 sub-option is already present in the DHCP request, then it is replaced with the version expected by the WLAN gateway.

Default shutdown

7.2 Show, Clear, and Tools Commands

Note: The commands described in this section apply specifically to 7705 SAR-Hm series nodes. All other applicable commands supported on the 7705 SAR-Hm are described in the 7450 ESS, 7750 SR, 7950 XRS, and VSR Router Configuration Guide, “Router Interface Commands”; and the 7450 ESS, 7750 SR, 7950 XRS, and VSR Interface Configuration Guide, “Ethernet Commands”.

7.2.1 Command Hierarchies

7.2.1.1 Show Commands

7.2.1.1.1 Cellular Port Commands

show
— **port** *port-id*

7.2.1.1.2 GNSS Receiver Commands

show
— **mda 1/1**
— **gnss**

7.2.1.1.3 Serial and Raw Socket Commands

show
— **port 1/3/1**

7.2.1.1.4 WLAN Radio Commands

show
- **mda 1/4** [**detail**]
- **port** *port-id* [**statistics**] [**detail**]

7.2.1.2 Clear Commands

7.2.1.2.1 Cellular Port Commands

clear
- **port** *port-id* **statistics**

7.2.1.2.2 Socket Statistics Commands

clear
- **port 1/3/1 statistics**

7.2.1.2.3 WLAN Statistics Commands

clear
- **port** *port-id* **statistics**

7.2.1.3 Tools Commands

7.2.1.3.1 Tools ADP Commands

```
tools
    — auto-discovery {complete | retry | terminate}
```

7.2.1.3.2 Tools Perform Commands

```
tools
    — perform
        — mda 1/1
            — cellular
                — at-command at-command
                — force-sim-switch
                — update-firmware firmware-file
                — update-firmware firmware-file sim 1 | 2
```

```
tools
    — perform
        — mda 1/1
            — cellular
                — sim {1 | 2}
                    — change-pin
                    — lock-sim
                    — unblock-sim
                    — unlock-sim
```

7.2.2 Command Descriptions

- Show Commands
- Clear Commands
- Tools Commands

7.2.2.1 Show Commands

- Show Cellular Port Commands
- Show GNSS Receiver Commands
- Show Serial and Raw Socket Commands
- Show WLAN Radio Commands

Note: The command outputs shown in this section are examples only; actual displays may differ depending on supported functionality and user configuration.

7.2.2.1.1 Show Cellular Port Commands

port

Syntax **port** *port-id*

Context show

Description This command displays operational state information for a cellular port, including information for the cellular PDN interface, the installed SIM, and the packet data network (PDN). It also displays port statistics.

Parameters *port-id* — the identifier for the cellular port

Values 1/1/1 or 1/1/2

Output The following output is an example of cellular interface information.

Output Example

```
*A:Dut-A# show port 1/1/1
===============================================================================
Cellular PDN Interface
===============================================================================
Description       : Cellular
```

```
Interface         : 1/1/1                IfIndex           : 35684352
Admin State       : up                   Oper State        : up
IMEI              : 35-907206-011054-7
Network Status    : registered-home      Radio Mode        : lte
Band              : 4                    Channel           : 2175
RSSI              : -67 dBm              RSRP              : -86 dBm
Tracking Area Code: 0001                 Cell Identity     : 00000101

-------------------------------------------------------------------------------
SIM Card 1
-------------------------------------------------------------------------------
Description       : (Not Specified)
Specified Firmware: GENERIC 02.24.05.06 002.026_000
Equipped          : yes
Locked            : no                   PIN status        : ready
PIN retries left  : 3                    PUK retries left  : 10
ICCID             : 89442016100100000361 IMSI              : 001001000000036

-------------------------------------------------------------------------------
Packet Data Network
-------------------------------------------------------------------------------
PDN State         : connected            IP Address        : 10.99.2.96
Primary DNS       : 8.8.8.8              Secondary DNS     : 4.4.4.4
IP MTU            : 1500
APN               : internet
===============================================================================

===============================================================================
Port Statistics
===============================================================================
                                                    Input                Output
-------------------------------------------------------------------------------
Packets                                                 5                     5
Discards                                                0                     0
Unknown Proto Discards                                  0
===============================================================================
```

7.2.2.1.2 Show GNSS Receiver Commands

gnss

Syntax **gnss**

Context show>mda

Description This command displays detailed GNSS information, including position and satellite information.

Output The following output is an example of GNSS information.

Output Example

```
*A:Dut-A#: show mda 1/1 gnss
===============================================================================
GNSS Information
===============================================================================
Admin State                       : Enabled
Oper State                        : Up
Satellite  Constellation          : gps-glonass
NMEA Sentence Streaming           : Enabled
  Sentences                       : gpgga gprmc gpvtg gngns
  Sentence Interval (seconds)     : 5
-------------------------------------------------------------------------------
Acquired Fix                      : Yes
Time                              : 2018/07/27 12:59:47 UTC
Position (degrees)                : 45.34810, -75.92147
Position (degrees minutes seconds) : 45 20'53.1"N, 75 55'17.2"W
Altitude above mean sea level     : 124.8 meters
Heading                           : 0.0 degrees
Speed                             : 0.0 kph
===============================================================================

========================================
Visible Satellites
========================================
   #    type  elevation  azimuth  SNR(dB)
----------------------------------------
   1     gps         22      158       43
   7     gps         73      229       53
   8     gps         64       54       57
   9     gps          8      209       44
  11     gps         48      165       49
  13     gps          9      324       40
  16     gps          2       90       40
  18     gps         38      135       54
  27     gps         27       50       49
  28     gps         29      284       46
  30     gps         52      296       51
  69 glonass          7      302       31
  70 glonass          4      352       43
  77 glonass         49      113       44
  78 glonass         68      343       53
  79 glonass         28      316       47
  81 glonass         18      199       42
  86 glonass          0       28       45
  87 glonass         54       43       44
  88 glonass         66      177       43
----------------------------------------
No. of visible satellites: 20
========================================
*A:Dut-A#
```

7.2.2.1.3 Show Serial and Raw Socket Commands

port

Syntax **port 1/3/1**

Context show

Description This command displays serial and raw socket information.

Output The following output is an example of serial and raw socket information.

Output Example

```
*A:Dut# show port 1/3/1
===============================================================================
Serial RS-232 Interface
===============================================================================
Description        : RS-232 Serial
Interface          : 1/3/1                   Port IfIndex         : 39878656
Admin Status       : down                    Oper Status          : down
Physical Link      : no                      Mode                 : access
Device Mode        : asynchronous            Speed                : 9600
Character Length   : 8                       Parity               : none
Stop Bits          : 1
Device Gender      : dce                     Duplex               : full
Last State Change  : 07/17/2017 17:20:13
Loopback           : none
Hold time up       : 0 milliseconds
Hold time down     : 0 milliseconds
-------------------------------------------
Serial Control Leads
-------------------------------------------
Inputs          Cfg         Netw  Line  Mon
-------------------------------------------
dtr-dsr [DTR] : high              0     off
rts-dcd [RTS] : high              0     off
Outputs         Cfg         Netw  Line
-------------------------------------------
dcd-rts [DCD] : high              1
cts-alb [CTS] : high              1
ri-rdl  [RI]  : high              1
===============================================================================
===============================================================================
Serial Socket
===============================================================================
EOP Length         : 1500                    Squelch Delay        : Disabled
EOP Idle Timeout   : 50                      Unsquelch Delay      : Disabled
EOP Special Char   : Disabled                Inter-Session Delay  : 10
Squelch Status     : off
===============================================================================
-------------------------------------------------------------
Socket Statistics
-------------------------------------------------------------
                                                        Count
```

```
-------------------------------------------------------------
Characters received                                        0
Characters transmitted                                     0
End of packet idle timeout                                 0
End of packet length                                       0
End of packet special character                            0
Ingress forwarded packets                                  0
Egress forwarded packets                                   0
Ingress dropped packets                                    0
Egress dropped packets                                     0
Squelch activated                                          0
=============================================================
*A:Dut#
```

7.2.2.1.4 Show WLAN Radio Commands

mda

Syntax **mda 1/4** [**detail**]

Context show

Description This command displays WLAN radio MDA information.

Output The following output is an example of WLAN radio MDA information.

Output Example

```
*A:Dut# show mda 1/4 detail
===============================================================================
WLAN Radio Data
===============================================================================
    Radio                         : 1
    Type                          : Wifi Dualband 2.4/5.0 GHz
    Administrative state          : up
    Operational state             : down
    Country                       : usa
    Beacon Interval               : 200 msecs
    Cfg.  Band/Channel/Width      : 2400 MHz/Ch.1/20 MHz
    Oper. Band/Channel/Width      : 2400 MHz/Ch.1/20 MHz
    Oper. Center Frequency        : 2412 MHz
=============================================================
*A:Dut#
```

port

Syntax **port** *port-id* [**statistics**] [**detail**]

Context show

Description This command displays WLAN radio port statistics and RADIUS configuration information.

Parameters *port-id* — specifies the physical port identifier, in the format *slot/mda/port* where *slot* is always 1, *mda* is always 4, and *port* is 1 to 3

statistics — shows ingress and egress statistics for the port

detail — shows detailed information about the WLAN port

Output The following output is an example of WLAN radio port information.

Output Example

```
*A:Dut# show port 1/4/1
===============================================================================
WLAN Radio Data
===============================================================================
Description        : Wireless LAN
Interface          : 1/4/1                   Port IfIndex         : 41975808
Admin Status       : up                      Oper Status          : up
Oper Flags         :
Last State Change  : 05/13/2018 20:36:51

Hardware Address   : 00:23:a7:e5:39:18

Mode               : WLAN Access Point

-------------------------------------------------------------------------------
RF Interface
-------------------------------------------------------------------------------
Frequency          : 2417 MHz
Band/Channel       : 2400 MHz/Ch.2           Channel Width        : 40 Mhz
-------------------------------------------------------------------------------
Network Parameters
-------------------------------------------------------------------------------
SSID               : sarhm9_AP1
Security           : wpa2-psk
Passphrase         : kansarhm9A1
Encryption         : aes


SSID Broadcast     : enabled
Client Idle Timeout: 300 secs                Client Limit         : 24
DHCP Relay         : disabled                DHCP Action          : replace
Auth Radius Policy : N/A
  Re-Auth Period   : 3600 secs

-------------------------------------------------------------------------------
Connected Clients
-------------------------------------------------------------------------------
Client             Authorized                          Connect Time
```

```
-------------------------------------------------------------------------------
00:02:02:a5:a9:a1  Yes                                  05/13/2018 20:37:03
00:02:02:a5:a9:a2  Yes                                  05/13/2018 20:37:03
00:02:02:a5:a9:a3  Yes                                  05/13/2018 20:37:03
00:02:02:a5:a9:a4  Yes                                  05/13/2018 20:37:03
00:02:02:a5:a9:a5  Yes                                  05/13/2018 20:37:03
00:02:02:a5:a9:a6  Yes                                  05/13/2018 20:37:03
00:02:02:a5:a9:a7  Yes                                  05/13/2018 20:37:03
00:02:02:a5:a9:a8  Yes                                  05/13/2018 20:37:04
00:02:02:a5:a9:a9  Yes                                  05/13/2018 20:37:06
00:02:02:a5:a9:aa  Yes                                  05/13/2018 20:37:05
00:02:02:a5:a9:ab  Yes                                  05/13/2018 20:37:07
00:02:02:a5:a9:ac  Yes                                  05/13/2018 20:37:09
00:02:02:a5:a9:ad  Yes                                  05/13/2018 20:37:08
00:02:02:a5:a9:ae  Yes                                  05/13/2018 20:37:10
00:02:02:a5:a9:af  Yes                                  05/13/2018 20:37:12
00:02:02:a5:a9:b0  Yes                                  05/13/2018 20:37:11
00:02:02:a5:a9:b2  Yes                                  05/13/2018 20:37:15
00:02:02:a5:a9:b3  Yes                                  05/13/2018 20:37:15
00:02:02:a5:a9:b4  Yes                                  05/13/2018 20:37:16
00:02:02:a5:a9:b5  Yes                                  05/13/2018 20:37:18
-------------------------------------------------------------------------------
Count: 20 (Limit: 24)
-------------------------------------------------------------------------------
===============================================================================
=============================================================
Access Point Statistics
=============================================================
                                                        Count
-------------------------------------------------------------
Client attaches                                            21
Client detaches                                             1
Successful authentications                                 20
Failed authentications                                      1
=============================================================
===============================================================================
Port Statistics
===============================================================================
                                                  Input                  Output
-------------------------------------------------------------------------------
Packets                                             191                     253
Discards                                              0                       0
Unknown Proto Discards                                0
===============================================================================
```

7.2.2.2 Clear Commands

7.2.2.2.1 Clear Cellular Port Commands

port

Syntax **port** *port-id* **statistics**

Context clear

Description This command clears statistical information for a cellular interface port.

Parameters *port-id* — specifies the cellular port, from 1/1/1 to 1/1/2

statistics — clears statistical information

7.2.2.2.2 Clear Raw Socket Statistics Commands

port

Syntax **port 1/3/1 statistics**

Context clear

Description This command clears raw socket statistical information for a serial port.

Parameters **statistics** — clears statistical information

7.2.2.2.3 Clear WLAN Statistics Commands

port

Syntax **port** *port-id* **statistics**

Context clear

Description This command clears WLAN statistical information for a WLAN port.

Parameters *port-id* — the WLAN port identifier

Values 1/4/1 to 1/4/3

statistics — clears statistical information

7.2.2.3 Tools Commands

7.2.2.3.1 Tools ADP Commands

auto-discovery

Syntax **auto-discovery** {**complete** | **retry** | **terminate**}

Context tools

Description This command is used to configure the status of the ADP-Hm process running on the node.

Parameters **complete** — specifies that the ADP-Hm process is complete

retry — specifies that the ADP-Hm process is being retried

terminate — specifies that the ADP-Hm process has been terminated

7.2.2.3.2 Tools Perform Commands

at-command

Syntax **at-command** *at-command*

Context tools>perform>mda>cellular

Description This command executes an ATtention (AT) command on the cellular port. AT commands are instruction commands that are used to control a modem. The commands are issued to the modem, and responses to the commands from the modem are displayed directly on the CLI console.

These commands can also be used to view operational information about the cellular port.

Warning: Risk of service outage. Do not change any **at-command** settings.

Note: .

- The commands are reserved for use by Nokia personnel only.
- Some commands may take up to several minutes to complete.

Parameters *at-command* — a supported AT command

Values up to 256 characters; must be preceded by the string “at”

force-sim-switch

Syntax **force-sim-switch**

Context tools>perform>mda>cellular

Description This command manually forces a SIM activity switch. This command is used in a dual SIM deployment when the **active-sim** command is set to **auto**.

update-firmware

Syntax **update-firmware** *firmware-file*
update-firmware *firmware-file* **sim 1** | **2**

Context tools>perform>mda>cellular

Description This command preloads the correct firmware for the SIM's network operator onto the cellular modem.

The **tools>perform>port>cellular>update-firmware** *firmware-file* command updates the firmware only on SIM 1.

The version of this command that uses the **sim** keyword with the **1** | **2** option updates the firmware either on SIM 1 or SIM 2, or on both SIM 1 and SIM 2.

The firmware is updated only after the system reboots. Once either command is executed, a prompt appears asking the operator whether or not to proceed with a reboot in order to update the firmware. Entering **y** at the prompt reboots the node immediately and the firmware updates. Entering **n** at the prompt postpones the reboot and the firmware will update upon the next reboot of the system.

To update the firmware on both SIMs at the same time, the operator must execute the **update-firmware** command for the first SIM and enter **n** at the reboot prompt. The operator must then execute the **update-firmware** command for the second SIM and enter **y** at the reboot prompt in order to proceed with a system reboot. The firmware for both SIMs updates once the reboot is complete. If the operator enters **n** at the second reboot prompt, the reboot is postponed and the firmware for both SIMs is updated the next time the system is rebooted.

The order in which the **update-firmware** command is executed for both SIMs has no effect. Performing the command on SIM 1 first and then SIM 2 or on SIM 2 first and then on SIM 1 has the same result.

The firmware for both SIMs can be updated individually, but this requires the system to be rebooted twice.

If the **update-firmware** command is executed multiple times for the same SIM but with different firmware files and no reboot occurs at the time the command is performed, then when a system reboot does occur, the firmware will be updated with the last firmware file specified in the **update-firmware** command.

Parameters *firmware-file* — specifies the location of the firmware

change-pin

Syntax **change-pin**

Context tools>perform>mda>cellular>sim

Description This command launches an interactive CLI session to change the PIN on the SIM.

Note:

- Ensure that the specified SIM is the currently active SIM.
- It is not possible to change the PIN on a SIM unless the SIM is locked. See the lock-sim command.

When a SIM is procured from a carrier, the SIM PIN is set to a default value. When this command is issued, the CLI prompts the user to enter the current PIN once and then correctly enter the new PIN twice in order to change it.

Warning:

- When an operator successfully locks a SIM, unblocks a SIM, or changes a SIM PIN, the system updates the PIN value in the system configuration. However, the system does not automatically save the system configuration containing the new PIN. The operator must perform an **admin>save** command immediately after changing the PIN in order to save the new PIN in the system configuration file and avoid potential service interruptions such as the node becoming unreachable.
- If the SIM becomes blocked when setting the PIN remotely using in-band management over a cellular port, the node will be unreachable. Physical access to the node will be required to unblock the SIM.

lock-sim

Syntax **lock-sim**

Context tools>perform>mda>cellular>sim

Description This command enables the PIN verification function on the SIM and locks the SIM. When locked, the SIM can only be accessed if the operator enters the PIN stored in the configuration file.

Note: Ensure that the specified SIM is the currently active SIM.

When this command is issued, the CLI prompts the user to enter the current PIN in order to lock the SIM.

Warning:

- When an operator successfully locks a SIM, unblocks a SIM, or changes a SIM PIN, the system updates the PIN value in the system configuration. However, the system does not automatically save the system configuration containing the new PIN. The operator must perform an **admin>save** command immediately after changing the PIN in order to save the new PIN in the system configuration file and avoid potential service interruptions such as the node becoming unreachable.
- If the SIM becomes blocked when setting the PIN remotely using in-band management over a cellular port, the node will be unreachable. Physical access to the node will be required to unblock the SIM.

unblock-sim

Syntax **unblock-sim**

Context tools>perform>mda>cellular>sim

Description This command unblocks a SIM that is currently blocked as a result of too many attempts being made to access the SIM using an incorrect PIN.

Note: Ensure that the specified SIM is the currently active SIM.

When this command is issued, the CLI prompts the user to enter the personal unblocking key (PUK) for the SIM and then enter a new PIN value twice. The PUK is acquired from the service provider or administrator and is also stored on the SIM. The lock/unlock state of the SIM does not change when it becomes unblocked.

Warning:

- When an operator successfully locks a SIM, unblocks a SIM, or changes a SIM PIN, the system updates the PIN value in the system configuration. However, the system does not automatically save the system configuration containing the new PIN. The operator must perform an **admin>save** command immediately after changing the PIN in order to save the new PIN in the system configuration file and avoid potential service interruptions such as the node becoming unreachable.
- If the SIM becomes blocked when setting the PIN remotely using in-band management over a cellular port, the node will be unreachable. Physical access to the node will be required to unblock the SIM.

unlock-sim

Syntax **unlock-sim**

Context tools>perform>mda>cellular>sim

Description This command disables the PIN verification function on the SIM and unlocks the SIM. When unlocked, the PIN is not required in order to access the SIM.

Note: Ensure that the specified SIM is the currently active SIM.

When this command is issued, the CLI prompts the user to enter the current PIN in order to unlock the SIM.

8 Appendix

The channel and channel size of a WLAN access point (AP) depends on the country code. Table 7 lists the channel identifier and bandwidth per country code.

Table 7 **Channel Identifier and Size per Country Code**

Frequency	Bandwidth	Channel	Center Freq	Country																						
				Australia	Belgium	Canada	France	Germany	India	Iran	Italy	Japan	Malaysia	Mexico	New Zealand	Russia	Singapore	South Africa	USA	Bolivia	Brazil	Chile	Colombia	Peru	Venezuela
2.4	20	1	2412	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y
		2	2417	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y
		3	2422	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y
		4	2427	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y
		5	2432	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y
		6	2437	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y
		7	2442	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y
		8	2447	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y
		9	2452	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y
5		36	5180	y	y	y	y	y	y	n	y	y	y	y	y	y	y	y	y	n	y	y	y	y	y	y
		44	5220	y	y	y	y	y	y	n	y	y	y	y	y	y	y	y	y	n	y	y	y	y	y	y
		149		y	n	y	n	y	y	y	n	n	y	y	y	y	y	n	y	y	y	y	y	y	y	y
		157		y	n	y	n	y	y	y	n	n	y	y	y	y	y	n	y	y	y	y	y	y	y	y
2.4	40	1		y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y

Table 7 **Channel Identifier and Size per Country Code (Continued)**

Frequency	Bandwidth	Channel	Center Freq	Country																						
				Australia	Belgium	Canada	France	Germany	India	Iran	Italy	Japan	Malaysia	Mexico	New Zealand	Russia	Singapore	South Africa	USA	Bolivia	Brazil	Chile	Colombia	Peru	Venezuela
		2		y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y
		3		y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y
		4		y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y
		5		y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y
		6		y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y
		7		y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y
		8		y	y	n	y	y	y	y	y	y	y	y	y	y	y	y	y	n	y	y	y	y	y
		9		y	y	n	y	y	y	y	y	y	y	y	y	y	y	y	y	n	y	y	y	y	y
5	40	36		y	y	y	y	y	y	n	y	y	y	y	y	y	y	y	y	y	n	y	y	y	y
		44		y	y	y	y	y	y	n	y	y	y	y	y	y	y	y	y	y	n	y	y	y	y
		149		y	n	y	n	y	y	y	n	n	y	y	y	y	y	y	n	y	y	y	y	y	y
		157		y	n	y	n	y	y	y	n	n	y	y	y	y	y	y	n	y	y	y	y	y	y

9 Standards and Protocol Support

Refer to the software guides from the SR documentation suite for a list of standards and protocols supported by the SR OS. Use the features and descriptions outlined in this documentation set and in the relevant software release notes to identify the related standards and protocols that are supported by the 7705 SAR-Hm series.

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