ADTRAN

Configuration Guide

3G CDMA NIM and the Cellular Interface

This configuration guide describes ADTRAN's third generation (3G) code division multiple access (CDMA) network interface module (NIM) and its use with ADTRAN Operating System (AOS) products. This guide provides all necessary information for step-by-step configuration of the 3G CDMA NIM and the AOS cellular interface, including an overview of the 3G CDMA technology, applications, and detailed configurations. Information on configuring the demand routing interface is also included because it is necessary for 3G CDMA cellular connectivity. This guide also includes a troubleshooting section outlining the proper uses of the Web-based graphical user interface (GUI) and the AOS command line interface (CLI) to verify that the 3G CDMA NIM and cellular interface have been configured correctly.

This guide consists of the following sections:

3G CDMA NIM Product Overview

The 3G CDMA NIM is an alternative method for providing primary and backup wide area network (WAN) connections, allowing small and large businesses more cost-effective methods for staying connected. Whether large businesses need backup connections, or small businesses need immediate high-speed connections without the cost and delay of waiting for installation of an integrated services digital network (ISDN) line, the 3G CDMA NIM provides the necessary access at a fraction of the cost, when paired with a wireless data plan service provider.

The 3G CDMA NIM provides access to remote sites, such as remote kiosks, temporary sites, or remote office branches, through cellular connections at speeds approaching those of a T1 network. The 3G CDMA NIM also provides an alternative to ISDN, cable, and digital subscriber line (DSL) backup solutions.

Physical Description

The 3G CDMA NIM uses two dipole antennas (one primary and one diversity) to connect to the cellular network. The NIM also includes four LEDs, which signify the type of connection being used, and the signal strength. Figure 1 depicts the rear panel of the 3G CDMA NIM.

Figure 1. 3G CDMA NIM Rear Panel

The 3G NIM's LEDs reveal information regarding signal strength, power status, transmission status, and service availability. Table 1 describes the LED, its color, and its indication.

Table 1. 3G CDMA NIM LED Descriptions

LED Label	LED Color	Indication
WWAN	Off	3G modem is not powered.
	Green (solid)	3G modem is powered, associated, and authenticated, but not transmitting or receiving.
	Green (slow flash)	3G modem is powered and searching, but not associated or authenticated.
	Green (intermittent flash)	3G modem activity proportional to transmitting/receiving speed (3 Hz minimum rate, 20 Hz maximum rate).
RSSI (Received Signal Strength Indication)	Off	No service or no signal detected.
	Red (solid)	Low signal strength.
	Amber (solid)	Medium signal strength.
	Green (solid)	High signal strength.
1xRTT	Off	No 1xRTT service is available.
	Green (solid)	1xRTT service is available.
EVDO	Off	No 1xEVDO service is available.
	Green (solid)	1xEVDO service is available.

To begin using the 3G CDMA NIM, the module must be installed in a supported AOS product (refer to www.adtran.com/3G for a complete list of supported platforms), and the antennas must be installed. For more information regarding the installation and initial configuration of the 3G CDMA NIM, refer to the *3G CDMA NIM Quick Start Guide* shipped with the product, or available on the Web at http://kb.adtran.com (article number 2330). Other helpful information regarding detailed product specifications, safety information, and installation instructions are located in the appropriate hardware installation guide for your AOS routing or switching product. Hardware installation guides are available on the *AOS Documentation* CD shipped with the product, or on the Web at http://kb.adtran.com.

3G CDMA and Cellular Technology Overview

CDMA is a digital radio technology with multiple access channels able to send voice, data, and signalling data wirelessly through cellular bands. The 3G CDMA NIM operates in both Band Class 0 (Cellular 800 MHz) and Band Class 1 (PCS 1.9 GHz).

CDMA, as a technology, has been in use since 1995. The technology transmits information through pseudo-random noise sequences (PN sequences), that allow cellular frequencies to be re-used universally and reduce interference between users. 3G, the latest version of CDMA technology, allows a greater opportunity for quick connection to wireless services at a much faster rate than previous versions.

Cellular Wireless Technologies

The 3G CDMA NIM operates using one of three technologies. All three are incorporated into the NIM to ensure optimal use of wireless technology. The three technologies, described in the subsequent sections, are 1xRTT, 1xEVDO (Revision 0), and 1xEVDO (Revision A).

1xRTT

1xRTT stands for *one times radio transmission technology.* The name indicates that the technology operates at a speed one times that of standard radio transmissions. The bandwidth in this technology is the same as a duplex pair of 1.25 MHz radio channels. 1xRTT is sometimes referred to as 2.5G, and although it supports data speeds peaking at 144 kbps, it is the slowest of the three standard cellular wireless technologies. Typical real-world speeds for this transmission type are 60 to 90 kbps, or two-to-three times the speed of dial-up connections.

1xEVDO (Revision 0)

1xEVDO Revision 0 stands for *one times evolution-data optimized*. EVDO is a high-speed packet-switched transmission technology designed for data-centric broadband networks. Revision 0 provides high-speed data access of up to 2.4 Mbps in a single 1.25 MHz frequency division duplex (FDD) carrier, download speeds of up to 2.4 Mbps, and updload speeds of 158 kbps. Revision 0 offers support for Internet Protocol (IP) protocols and network connectivity, and functions as a good substitute for DSL lines.

1xEVDO (Revision A)

1xEVDO Revision A is the latest improvement of 1xEVDO Revision 0. Revision A provides greater data access speeds than Revision 0, is more efficient in its use of airlink resources, provides a more synchronic broadband experience, and supports prioritization and delivery of individual information packets based on application type or user profiles. Revision A is capable of transfer speeds of up to 3.1 Mbps in a single 1.25 MHz FDD carrier, and speeds up to 800 kbps in commercial networks.

Cellular Technology Speed Influences

Although the 3G CDMA NIM is capable of operating at any of the available speeds, transfer rate and signal type will depend upon the coverage area in which the unit is operating. Performance decreases as proximity to the cell tower decreases, and performance decreases as the number of cell tower users increases. The 3G CDMA NIM will operate at the fastest speed available in the coverage area. To verify the speeds available in your area, contact your cellular provider.

3G CDMA NIM, Cellular Interfaces, and Your Network

The 3G CDMA NIM functions as a cellular interface and a cellular modem. The cellular interface is a physical interface, designated as part of a demand routing resource pool. The demand interface draws on the demand routing resource pool to connect with the public network, while the cellular interface connects with physical interface on the public side of the network to complete the connection. The relationship of the 3G CDMA NIM, the cellular interface, and the demand interface is shown in Figure 2.
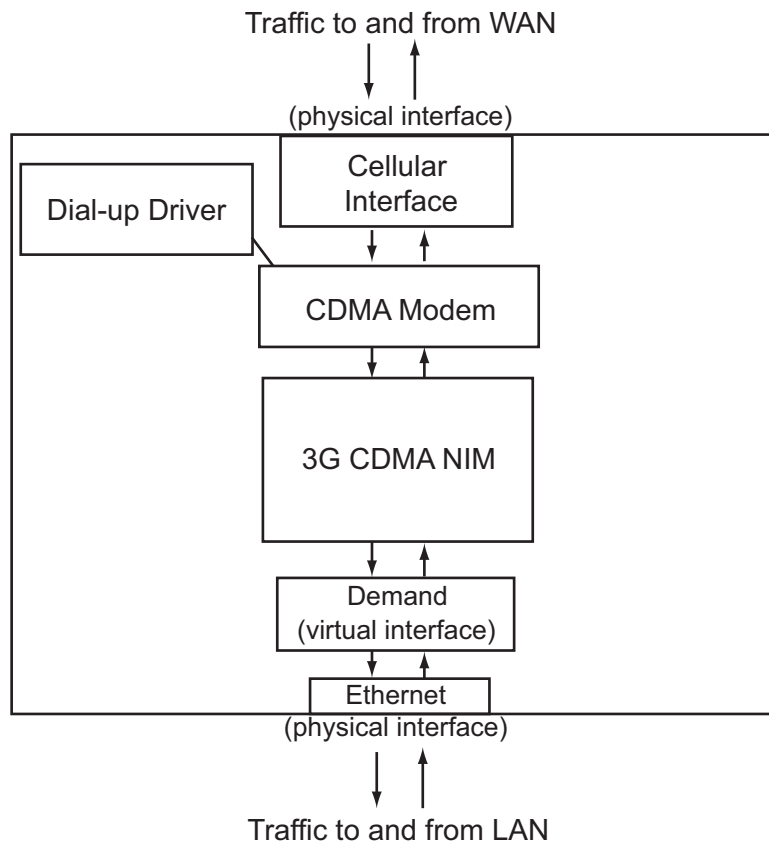
Figure 2. Internal Traffic Flow with the 3G CDMA NIM

Hardware and Software Requirements and Limitations

Visit www.adtran.com/3G for details on NetVanta platforms supporting the NetVanta 3G CDMA NIM.

The 3G CDMA NIM can be upgraded by copying the new firmware from either the AOS base product's flash or CompactFlash®.

The cellular interface only supports originating data calls; it does not support answering calls.

For users that require large amounts of bandwidth, it is recommended that the 3G CDMA NIM and cellular interface be used as backup for primary connections, rather than the primary connection itself.

It is not recommended to use two 3G CDMA NIMs in products that have two NIM slots.

The NetVanta 1335 with internal WiFi has not been certified to operate with the 3G CDMA NIM.

3G CDMA NIM hardware is designed for particular cellular service carriers. The 17.2 version only supports Verizon wireless services, and cannot be upgraded to support services from other carriers. The 17.4 version also supports Sprint wireless services. The 3G CDMA NIM supporting Verizon wireless services is P/N 1700801G1. The 3G CDMA NIM supporting Sprint wireless services is P/N 1700802G1.

To function properly, keepalive packets must not be transmitted by the 3G CDMA NIM. The keepalive value must be set to **0**, using the **keepalive** *<value>* CLI command on the demand routing interface. For more details about this command, refer to the *AOS Command Reference Guide* available on the *AOS Documentation* CD shipped with your base unit or online at http://kb.adtran.com (article number 2219).

In addition, the Verizon 3G CDMA NIM requires a backoff algorithm that delays calls for 15 minutes in the event of a failed call. Even across reboots, the card will not be permitted to make a call until the 15-minute time limit has been reached. For more information about this call delay, refer to *Attempted Call Delay on Verizon 3G CDMA NIM on page 57*.

The 3G CDMA NIM supporting Sprint wireless services also incorporates Simple Network Management Protocol (SNMP) support. This support is available in firmware version 17.4 and later. For more information about SNMP, refer to the *AOS SNMP* configuration guide available on the *AOS Documentation* CD shipped with your base unit or online at http://kb.adtran.com.

Configuring the 3G CDMA NIM Using the GUI

The 3G CDMA NIM and the cellular interface can be configured by either using the CLI or the GUI. To configure the 3G CDMA NIM and cellular interface using the GUI, complete the following tasks:

- Subscribe to a wireless cellular account.
- Activate the 3G CDMA NIM.
- Define the interesting traffic to activate the demand routing interface.
- Configure the demand routing interface.
- Set the 3G CDMA NIM/cellular interface as a member of a demand routing resource pool.

- Set the demand routing interface sequence number.
- Configure a route to the Internet through the demand routing interface.
- Configure network address translation (NAT) parameters.

In addition to the preceding configurations, custom profile setting can be configured for the 3G CDMA NIM through the GUI. These profile settings can be used to utilize services that require private IP services, such as Sprint's DataLink services. To learn more about configuring custom profile settings for the 3G CDMA NIM, refer to *Configuring Custom Profile Settings on page 18*.

Subscribing to a Cellular Network

Before attempting to connect the 3G CDMA NIM to the cellular network, make sure you have subscribed to an appropriate CDMA service plan with your wireless service provider. The electronic serial number (ESN) might be needed for this process. The ESN can be obtained from the label on the 3G modem or by using the **show interface cellular hardware** command. Refer to *Viewing Cellular Hardware Statistics on page 49* for more details.

Accessing the GUI

To begin configuring the 3G CDMA NIM and cellular interface through the GUI, follow these steps:

1. Follow the directions on the *3G CDMA NIM Quick Start Guide* shipped with the NIM to enable the base product to access the GUI. Make sure that the Ethernet interface is configured and the **ip http server** has been enabled.

> **NOTE**
> *Refer to the **AOS Command Reference Guide** on the CD shipped with the base unit or online at http://kb.adtran.com (article number 2219) for more information about the **ip http server** command.*

2. Open a new Web page in your Internet browser.
3. Enter your AOS product's IP address in the Internet browser's address field in the following form: **http://<ip address>**.

   For example: **http://65.162.109.202**

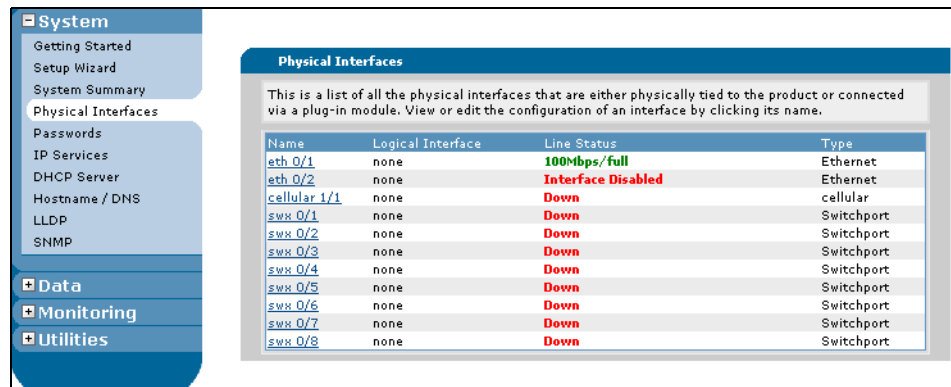4. At the prompt, enter your user name and password and select **OK**.

> **NOTE** *The default user name is **admin** and the default password is **password**.*

Activating the 3G CDMA NIM

1. Navigate to **System** > **Physical Interfaces** in the menu on the left.

2. Select the cellular interface from the list of interfaces.

3. Select the **Activate** button to activate the 3G CDMA NIM and cellular interface.

4. Enter a **Description** of the cellular interface, check the **Enable** box, and select **Apply**.

The 3G CDMA NIM and cellular interface is now activated and enabled.

> **NOTE**
> *The **Reset** button reboots the module and erases any configuration changes made in the current configuration session.*

The next step in configuration is to specify interesting traffic to be used by the demand routing interface.

Defining Interesting Traffic for the Demand Routing Interface

Interesting traffic must be defined for the demand routing interface by configuring an access control list (ACL). When the defined type of traffic is detected by the demand routing interface, it will attempt to connect to the cellular network.

Interesting traffic can be specified for inbound or outbound traffic directions. When the demand routing interface intercepts interesting outbound traffic, it will attempt to originate a connection and will reset the idle timer on a connected link. When the demand routing interface intercepts interesting inbound traffic, it allows the call to remain connected.

To create an ACL used for defining demand routing interface interesting traffic, follow these steps:

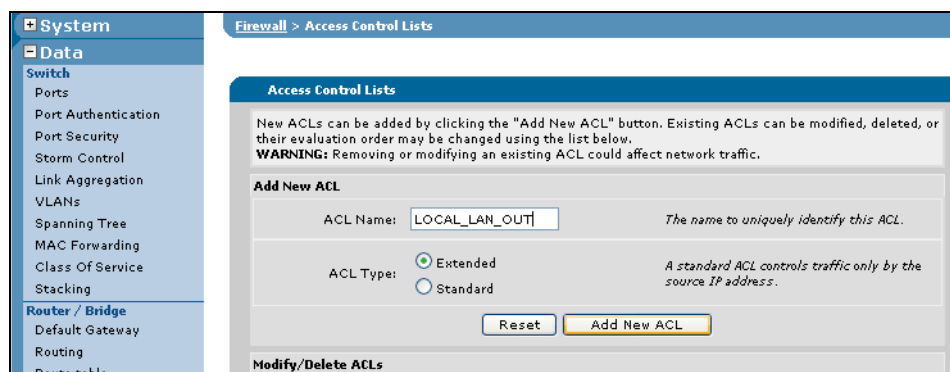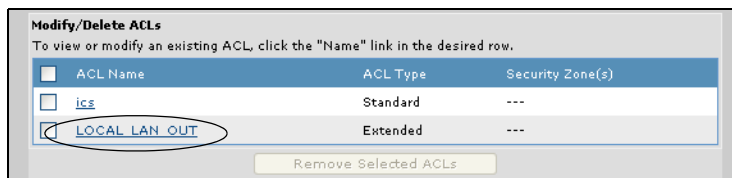1. Navigate to **Data** > **Firewall** > **Firewall/ACLs**.
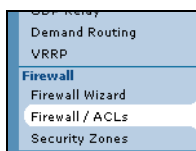
2. Scroll down to the **Access Control Lists** dialog box, and select **Configure ACLs**.
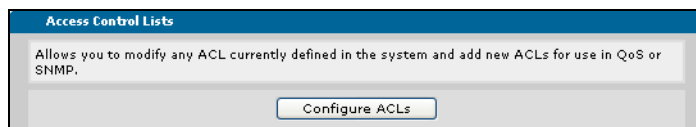
3. Enter the **ACL Name** and select **Extended** for the **ACL Type**. Then select **Add New ACL**.

4. The new ACL will appear in the ACL list for modification.

5. Select the ACL that will be applied to the demand routing interface from the ACL list.

6. Select **Add New Traffic Selector**.

7. Enter the parameters to define which packets will be monitored by the ACL.

8. In this example, the ACL is set to:
    *   **Filter Type: Permit**
    *   **Protocol: any**

> NOTE *To limit what brings up the demand routing interface, or what brings it down, consider setting the protocol to your specific network needs.*

- **Source Data: Any**
- **Destination Data: Any**

9.   Once the action, source, and destination information for the ACL has been entered, select **Apply**. The ACL has now been defined, and can be applied to the demand routing interface.

> *The ACL examples in this configuration guide are specific to using the ACLs for demand routing interface activation and cellular connection. For more options and configurations of ACLs, refer to the **Configuring IP ACLs in AOS** available online at http://kb.adtran.com (article number 3087).*

Configuring the Demand Interface

Because the demand routing interface controls connection to the cellular network, the demand interface must be configured for cellular network connection. To configure the demand routing interface, follow these steps:

1.   Navigate to **Data** > **Router/Bridge** > **Demand Routing**.

2.   Select the **demand 1** interface.

3.   Enter the demand configuration parameters as shown:
- **Resource Pool: CELLULAR**
- **Connect Mode: Originate**
- **Interface Recovery: Enabled**
- **Acl Name: LOCAL_LAN_OUT**
- **Match traffic Direction: both**
- **IP Address Type: Negotiated**

The other parameters should be left at their default values. Select **Apply** when completed.

> **NOTE**
>
> *To function properly, keepalive packets must not be transmitted by the 3G CDMA NIM. The keepalive value must be set to **0**, using the **keepalive** <value> CLI command on the demand routing interface. For more details about this command, refer to the **AOS Command Reference Guide** available on the **AOS Documentation** CD shipped with your base unit or online at http://kb.adtran.com (article number 2219).*

4. After selecting **Apply**, you will get a message acknowledging the new demand interface has been configured.

Configuring the 3G CDMA NIM/Cellular Interface as a Member of the Demand Routing Resource Pool

For the demand routing interface to connect with the cellular network, the cellular interface must be defined as a resource in the demand routing interface configuration. To configure the cellular interface as a demand routing resource, follow these steps:

1. Navigate to **Data** > **Router/Bridge** > **Demand Routing**.
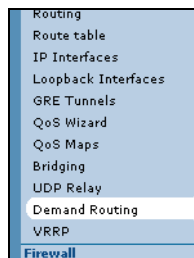
2. Use the **Assign Dial Interfaces to a Resource Pool** dialog box to add the cellular interface to the demand routing resource pool. Select **cellular 1/1** from the **Member** drop-down menu. Select **CELLULAR** from the **Resource Pool** drop-down menu. Enter **1** for the **Priority**. When the parameters have been set, select **Add**.
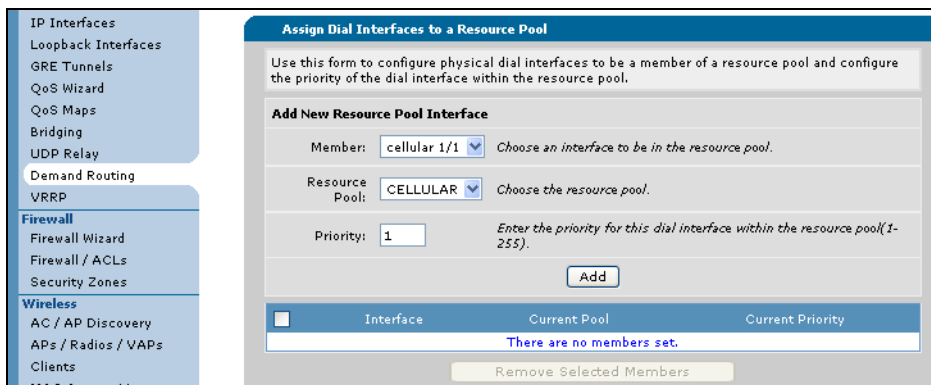
3. The cellular interface appears as a member of the current resource pool.
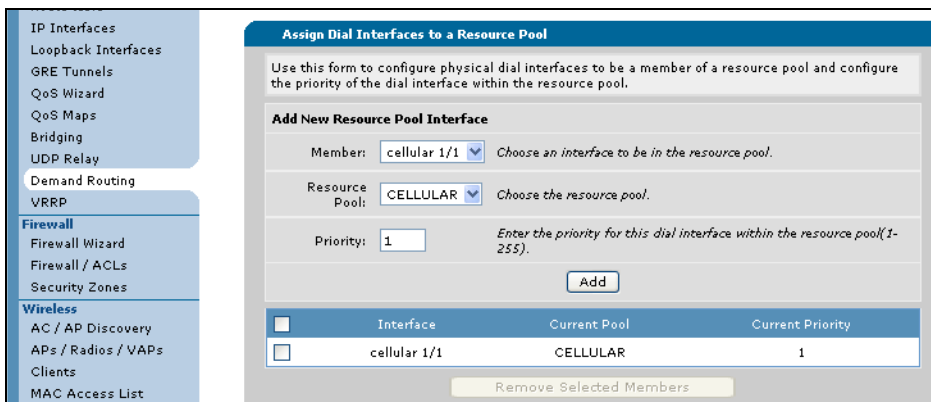
Setting the Demand Routing Sequence Number

The demand routing interface connect sequences provide instructions to the demand routing interface on how to use the resource pool and dial string number to connect to the cellular network. To configure the sequence number, follow these steps:

1. Navigate to **Data** > **Router/Bridge** > **Demand Routing**.
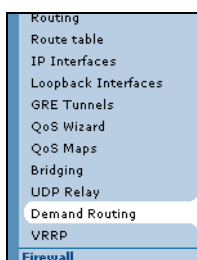
2.   Scroll down to the **Add Connect Sequences** dialog box.

3.   Enter **1** for the **Sequence Number**. Select **1** for the **Demand Interface**. Select **Add**. The **Sequence 1** configuration parameters are now available.

4.   Enter **#777** as the **Dial String**. Select **forced-cellular** from the drop-down menu. Select **Apply**.

This configuration specifies the number to dial for connection, which is **#777**. The **forced-cellular** option constrains the resource pool so that this interface will only use cellular interfaces for this particular connect sequence.

5.   The created cellular connect sequence now appears.

Configure a Route to the Internet Through the Demand Routing Interface

The demand interface must have a route to the Internet. To set the Internet route for the demand interface, follow these steps:

1. Navigate to **Data** > **Router/Bridge** > **Route table**.
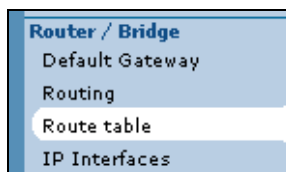
2. Enter a route of **0.0.0.0 0.0.0.0** in the **Destination Address** and **Destination Mask** fields. Add this route to the **demand 1** interface by selecting it from the drop-down menu, and select **Add**.

3. The new route appears in the route table, and the demand interface now has a route to the Internet.

> *If the new route is the primary connection to the Internet, then either the previously existing default routes must be deleted, or the newly created route must be set to a higher administrative distance for backup applications. For more information, refer to **Configuring WAN Failover in AOS** available online at http://kb.adtran.com (article number 2311).*

Configuring NAT

NAT is a standard method of preserving valuable Internet address space. Additionally, it can be used to hide the structure of server farms behind a router, in order to provide bandwidth sharing to Web, File Transfer Protocol (FTP), and application servers. To use NAT in conjunction with cellular network access, it is necessary to configure a public interface, one that makes the connection to the WAN, and a private interface, one that is connected to the local area network (LAN). These configurations allow for communication between protected LAN environments and larger, public WAN environments.

NAT can be configured by executing the Firewall Wizard located in the menu on the left of the GUI (**Data** > **Firewall** > **Firewall Wizard**). To learn more about configuring NAT, refer to the *Configuring Internet Access (Many to one NAT) with the Firewall Wizard in AOS* training video (article number 2185) available online at http://kb.adtran.com.

Configuring Custom Profile Settings

Custom profile settings can be configured for the 3G CDMA NIM. These profile settings can be enabled or disabled at any time, and are useful for services that require manual activation rather than automatic activation, such as over-the-air service provisioning (OTASP) or Open Mobile Alliance Device Management (OMA DM) activation. Even with stored manual activation settings, users can still use automatic activation to connect to a service provider's general 3G network.

An example of a service requiring custom profile settings is Sprint's DataLink service, which enables enterprise users to use the Sprint network to access their private network. This service can be used as a means for primary access or as a backup for wireline access, as well as for providing wireless remote access to the private network. Figure 3 illustrates a network that uses Sprint's DataLink service to allow data to travel over a private connection between remote locations and the enterprise network.
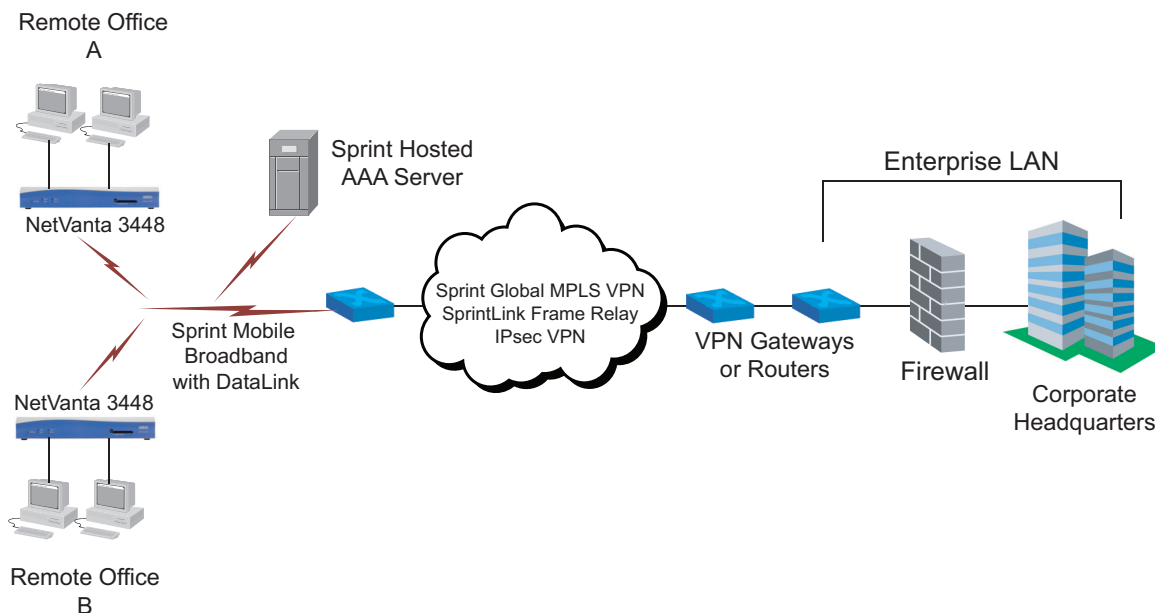
Figure 3. Private Remote Connections Using Sprint's DataLink Service

To use services requiring custom profiles, these profiles must be created by manually entering a user name and password for authentication, authorization, and accounting (AAA), primary home agent address, secondary home agent address, shared secret, and the profile home address.

> **NOTE**
>
> *Not all service providers use the same methods for establishing private IP services over 3G networks. Check with your service provider to ensure that your custom profiles are configured correctly.*

1. To create custom profile settings for manual activation, navigate to **System** > **Physical Interfaces**.

2. Select the cellular interface from the list of interfaces.

Physical Interfaces

This is a list of all the physical interfaces that are either physically tied to the product or connected via a plug-in module. View or edit the configuration of an interface by clicking its name.

Name	Logical Interface	Line Status	Type
eth 0/1	none	100Mbps/full	Ethernet
eth 0/2	none	Interface Disabled	Ethernet
cellular 1/1	none	Down	cellular
swx 0/1	none	Down	Switchport
swx 0/2	none	Down	Switchport
swx 0/3	none	Down	Switchport
swx 0/4	none	Down	Switchport
swx 0/5	none	Down	Switchport
swx 0/6	none	Down	Switchport
swx 0/7	none	Down	Switchport
swx 0/8	none	Down	Switchport

3. Choose the **Custom Profile (Optional)** tab and configure the parameters.

There are a number of parameters you can specify for the custom settings.

*   Specify a user name and password. The user name is equivalent to the network access identifier (NAI) user identification, and the password is equivalent to an AAA shared secret. The user name can consist of up to 72 characters and the password can consist of up to 16 characters.
*   Specify the home agent shared secret. The home agent shared secret can be up to 16 characters in length.
*   Specify the primary home agent IP address.
*   Specify the secondary home agent IP address.
*   Specify the home IP address.

After entering the information, select **Apply** to apply the custom settings.

> *These settings come from your service provider. You must consult with them to obtain these settings.*

Configuring the 3G CDMA NIM Using the CLI

The 3G CDMA NIM and the cellular interface can also be configured using the CLI. To configure the 3G CDMA NIM and cellular interface using the CLI, you must complete the following tasks:

- Subscribe to a wireless cellular account.
- Activate the 3G CDMA NIM.
- Set the 3G CDMA NIM/cellular interface as a member of a demand routing resource pool.
- Define the interesting traffic to active the demand routing interface.
- Configure the demand routing interface.
- Configure a route to the Internet through the demand routing interface.
- Configure NAT parameters.

In addition to the preceding configurations, custom profile settings can be configured for the 3G CDMA NIM through the CLI. These profile settings can be used to utilize services that require private IP services, such as Sprint's DataLink services. To learn more about configuring custom profile settings for the 3G CDMA NIM, refer to *Configuring Custom Profile Settings on page 29*.

Before beginning to configure the 3G CDMA NIM, you must have subscribed to an appropriate CDMA service plan. Refer to the *Subscribing to a Cellular Network on page 7* of this document, or to the *3G CDMA NIM Quick Start Guide* shipped with the NIM or available online at http://kb.adtran.com (article number 2330).

Activating the 3G CDMA NIM

The 3G CDMA NIM and cellular interface are activated through the CLI using either the **cdma activate otasp** or the **cdma activate oma-dm** command. This command activates the cellular modem, setting the default cellular network, and updating the modem's preferred roaming list (PRL). This command operates through OTASP in Verizon wireless services and through OMA DM in Sprint wireless services. In addition to activating the modem, this command can be used to periodically update the PRL if needed.

The command is entered in the cellular interface configuration mode. To access the cellular interface configuration mode, enter the **interface** command from the Global Configuration mode:

(config)#**interface cellular** *<slot/port>*

Slots are numbered **0** to **1**, with slot **0** being the integrated system controller slot, and ports are numbered from **1** to the number of ports on your unit. To enter configuration for a cellular interface connected at slot **1**, port **1**, enter the command as follows:

(config)#**interface cellular 1/1**
(config-cellular 1/1)#

Once in the cellular interface configuration mode, you will enter either the **cdma activate otasp** or the **cdma activate oma-dm** command.

For activation using Verizon wireless services, enter the command as follows:

(config-cellular 1/1)#**cdma activate otasp**

The 3G CDMA NIM and cellular interface is now activated.

For activation using Sprint wireless services, enter the command as follows:

(config-cellular 1/1)#**cdma activate oma-dm**

The 3G CDMA NIM and cellular interface is now activated.

Configuring the 3G CDMA NIM/Cellular Interface as a Member of the Demand Routing Resource Pool

Because the demand routing interface connects with the cellular network, the cellular interface must be defined as a resource the demand routing interface can use for connection. To configure the cellular interface as a resource, name the interface and then set it as a resource. To name the cellular interface, use the **description** command. To define the cellular interface as a resource for the demand routing interface, use the **resource pool-member** command.

To name the cellular interface, enter the **description** *<text>* command from the cellular interface configuration mode. The *<text>* parameter is the name of the cellular interface, up to 80 characters long. A **no** parameter in the command removes the interface name.

Enter the command as follows:

(config-cellular 1/1)#**description CELLULAR 1**
(config-cellular 1/1)#

To configure the cellular interface as a resource in the resource pool, enter the **resource pool-member** *<name>* *<priority>* command from the cellular interface configuration mode. The *<name>* parameter in this command specifies the resource pool to which the cellular interface will be assigned. The *<priority>* parameter is optional, and specifies the priority value of using this interface as a demand routing interface resource over other interfaces in the same pool. The priority is set by using numbers between **1** and **255**, with lower numbers indicating a higher priority. Interfaces with the same priority are selected in alphabetical order by interface name. Using a **no** parameter in the command removes the interface from the resource pool.

Enter the command as follows:

(config-cellular 1/1)#**resource pool-member CELLULAR 1**
(config-cellular 1/1)#

The 3G CDMA NIM/cellular interface is now named and defined as a resource pool member for the demand routing interface to draw upon when connecting to the cellular network.

Defining Interesting Traffic for the Demand Routing Interface

After the cellular interface is defined as a resource for the demand routing interface, and prior to configuring the demand routing interface for cellular connection, interesting traffic must be defined for the demand routing interface. Interesting traffic is traffic that activates the demand routing interface. This traffic is defined as interesting by the user, and when the defined type of traffic is detected by the demand routing interface, it will attempt to connect to the cellular network.

When the demand routing interface intercepts interesting outbound traffic, it will attempt to originate a connection and will reset the idle timer on a connected link.

Interesting traffic is defined using the **ip access-list extended** *<name>* command. The **ip access-list extended** command is issued from the Global Configuration mode, and creates an empty ACL. The ACL is used in conjunction with the demand routing interface to determine which traffic is deemed interesting and will cause the demand interface to dial. When the **ip access-list extended** *<name>* command is entered, the extended access control list command set becomes accessible. In the extended access control list command set, specify the action, protocol, source, and destination to be used for the ACL. To enter the extended access control list command set, enter the **ip access-list extended** command as follows:

(config)#**ip access-list extended LOCAL_LAN_OUT**
(config-ext-nacl)#

LOCAL_LAN_OUT is an example name, but serves to describe the type of ACL that will be used to activate the demand routing interface. Once you have access to the extended access control list commands, enter the *<action> <protocol> <source> <destination>* parameters to define traffic to be observed for packet matching purposes. Enter the parameters as follows:

(config-ext-nacl)#*<action> <protocol> <source> <destination>*
(config-ext-nacl)#**permit ip any any**

In creating ACLs for cellular connection purposes, the action will be **permit**, the protocol will be **ip**, the source will be **any**, and the keyword **any** will be specified so that attempted connection to any external IP address will be deemed interesting.

> **NOTE**
>
> *The **ip access-list extended** command has many uses not always associated with using the demand routing interface to connect to a cellular network. The ACL examples in this configuration guide are specific to using the ACLs for demand routing interface activation and cellular connection. For more options and configurations of ACLs, refer to **Configuring IP ACLs in AOS** available online at http://kb.adtran.com (article number 3087).*

Interesting traffic has now been defined, and the demand routing interface (once configured) will use detection of the specified traffic to attempt to connect to the cellular network.

Configuring the Demand Routing Interface

Configuring the demand routing interface for cellular network connection requires a number of steps and commands. To configure the demand routing interface, you will need to do the following:

- Enter the demand routing interface configuration mode (**interface demand** command).
- Specify that interesting traffic should be matched (**match-interesting ip** commands).
- Specify the resource pool that demand routing interface will use (**resource pool** command).
- Specify the connect sequence the demand routing interface will use (**connect-sequence** commands).
- Specify the connection mode the demand routing interface will use (**connect-mode** command).
- Specify that the demand routing interface IP address will be negotiated (**ip address negotiated** command).
- Specify a Point-to-Point Protocol (PPP) Challenge-Handshake Authentication Protocol (CHAP) password (**ppp chap password** command).
- Activate the demand routing interface (**no shutdown** command).
- Specify optional demand routing interface parameters.

> **NOTE**
>
> *The following sections deal specifically with configuring the demand routing interface for cellular network connection. These sections do not address all available configurations or applications of a demand routing interface. For more information about configuring demand routing interfaces, refer to either the **Demand Interface Configuration Command Set** in the **AOS Command Reference Guide** available on the **AOS Documentation** CD, or the **Configuring Demand Routing in AOS** technical note online at http://kb.adtran.com (article number 2225).*

> **NOTE**
>
> *To function properly, keepalive packets must not be transmitted by the 3G CDMA NIM. The keepalive value must be set to **0**, using the **keepalive** <value> CLI command on the demand routing interface. For more details about this command, refer to the **AOS Command Reference Guide** available on the **AOS Documentation** CD shipped with your base unit or online at http://kb.adtran.com (article number 2219).*

Accessing the Demand Routing Interface

The demand routing interface configuration mode is accessed from the Global Configuration mode using the **interface demand** <number> command. The number parameter specifies the interface number, a range of **1** to **1024**. Enter the command as follows:

(config)#**interface demand 1**
(config-demand 1)#

Matching Interesting Traffic

Once you have accessed the demand routing interface configuration mode, specify the ACL that the demand routing interface will use to define interesting traffic. Use the **match-interesting ip list** *<name>* **out** and **match-interesting ip reverse list** *<name>* **in** commands to configure the demand routing interface to match outbound interesting traffic. Enter the commands as follows:

(config-demand 1)#**match-interesting ip LOCAL_LAN_OUT out**
(config-demand 1)#**match-interesting ip reverse list LOCAL_LAN_OUT in**

The *<name>* parameter is the name given to the previously configured ACL. The **out** keyword specifies that only outgoing traffic is interesting, and the **in** keyword specifies that only incoming traffic is interesting. The **reverse list** keywords specify that the demand routing interface will use an ACL with reverse (destination, source) ACL matching logic. By using the first command (**match-interesting ip list** *<name>* **out**), the demand routing interface is configured to match outbound traffic to traffic specified as interesting by an ACL using normal ACL matching logic (matches source, then destination). By using the second command (**match-interesting ip reverse list** *<name>* **in**), the demand routing interface is configured to match incoming traffic to traffic specified as interesting by an ACL using reverse ACL matching logic (matches destination, then source). The reverse logic allows the demand routing interface to keep a call active as long as inbound interesting traffic is received.

For more information, refer to the **match-interesting ip** command in the *AOS Command Reference Guide* available on the *AOS Documentation* CD or online at http://kb.adtran.com (article number 2219).

> **NOTE**
>
> *In AOS firmware release 17.09.00, the **match-interesting** command was changed to require the **ip** keyword. If you are using firmware released prior to 17.09.00, enter the **match-interesting list** <name> [in | out] or the **match-interesting reverse list** <name> [in | out] commands (rather than the **match-interesting ip** commands) from the Demand Interface Configuration mode to define interesting traffic.*

Defining the Demand Routing Interface Resource Pool

Once matching traffic has been specified, the demand routing interface must be associated with a physical interface. In this case, the demand routing interface must be associated with the cellular interface. To associate the demand routing interface with the cellular interface, use the **resource pool** *<name>* command. Enter the command as follows:

(config-demand 1)#**resource pool CELLULAR**

The *<name>* parameter is the name given to the resource pool in the cellular interface when it was defined as a resource pool member (see page 22).

Specifying the Demand Routing Interface Connect Sequence

The **connect sequence** commands provide instructions to the demand routing interface on how to use the resource pool and dial string number to connect to the cellular network. These commands specify the number to dial for connection, the number of times the connection will be attempted, and the instructions to the interface if connection attempts fail.

To specify how the demand routing interface will use the resource pool and connect to the cellular network, use the **connect-sequence** *<value>* **dial-string** *<string>* **forced-cellular** command.

The *<value>* parameter of this command specifies the sequence number for the connection. For cellular connections, the value should be set to **1**, because this resource pool and connection sequence is for cellular connections only.

Dial-string indicates the number the demand routing interface will call to connect to the network. For cellular connections, the dial string is **#777**.

The **forced-cellular** keywords constrain the resource pool so that this interface will only use cellular interfaces for this particular connect sequence command, and also specifies that the dial string will be over-ridden to be #777 in case another dial string was entered.

Enter the command as follows:

(config-demand 1)#**connect-sequence 1 dial-string #777 forced-cellular**

To specify the number of times the connection to the cellular network will be attempted, use the **connect-sequence attempts** *<value>* command. The *<value>* parameter specifies the number of times the connection will be attempted. In cellular network connection attempts, the value is set to **0**, indicating the interface will attempt to connect to the cellular network an unlimited number of times. To set the number of connection attempts, enter the command as follows:

(config-demand 1)#**connect-sequence attempts 0**

The last of the connect sequence commands instructs the behavior of the demand routing interface should the connection attempt fail. These instructions are given through the **connect-sequence interface-recovery** command. This command specifies that the interface will go down when the **connect-sequence attempts** value is exhausted. In the case of cellular configuration, this command specifies that this demand routing interface will go down if the attempted connection to the cellular network fails. Enter the command as follows:

(config-demand 1)#**connect-sequence interface-recovery**

The sequence used by the demand routing interface to connect to the cellular network is now established.

Specifying the Demand Routing Interface Connection Mode

The demand routing interface has the ability to answer calls, originate calls, or do both. In the case of cellular connections, the demand routing interface is limited to only originating calls. The **connect-mode** command specifies whether the demand routing interface will answer or originate calls, or do both. To set the demand routing interface to originate calls only, enter the command as follows:

(config-demand 1)#**connect-mode originate**

If the demand routing interface is set to answer calls, or to do both (using the **answer** or **either** keywords), the demand routing interface will only originate calls out of the cellular interface. A demand routing interface configured to use other resource types, such as analog modem or ISDN, can be set to answer calls. For more information on **connect-mode** command options, refer to the *AOS Command Reference Guide* available on the *AOS Documentation* CD or online at http://kb.adtran.com (article number 2219).

Setting the Demand Routing Interface IP Address to Negotiated

The **ip address negotiated** command specifies that an interface will be assigned an IP address from the far end PPP connection. To allow the demand routing interface to be assigned an IP address from the far end PPP connection for default routing purposes, enter the command as follows:

(config-demand 1)#**ip address negotiated**

Specifying a PPP Password

Some cellular modem services support both Mobile IP (MIP) and Simple IP (SIP) protocols for authentication. If your provider supports MIP with SIP fallback, the modem will always try to authenticate with the network using MIP first. However, if the MIP authentication fails the modem will fall back to using SIP. If the modem falls back to using SIP, it will expect a PPP CHAP password. The password does not have to be specific, as the modem supplies a valid PPP CHAP password to the network, but it must exist so that the modem can sync Link Control Protocol (LCP) messages between the router and the network. To add the PPP CHAP password, enter the **ppp chap password** *<password>* command as follows:

(config-demand 1)#**ppp chap password mypassword**

> 📝 **NOTE** *Not all service providers support MIP with SIP fallback. Check with your service provider to see if this feature is supported.*

Activating the Demand Routing Interface

To activate the demand routing interface, use the **no shutdown** command. This command specifies that the interface is enabled and active, allowing data to pass through. Enter the command as follows:

(config-demand 1)#**no shutdown**

Specifying Optional Demand Routing Interface Commands

The demand routing interface can be configured with optional parameters, depending upon the specific configuration needs.

Access Policies

The demand routing interface can be connected with an access policy for firewall protection. To apply a configured access policy to the demand routing interface, use the **ip access-policy** *<name>* command. The *<name>* parameter indicates the name of the configured access policy. Using the **no** keyword with this command removes the association between the demand routing interface and the access policy. Enter the command as follows:

(config-demand 1)#**ip access-policy Public**

> 📝 **NOTE** *In AOS firmware release 17.09.00, the **access-policy** command was changed to require the **ip** keyword. If you are using firmware released prior to 17.09.00, enter the **access-policy** <name> command (rather than the **ip access-policy** command) from the Demand Interface Configuration mode to apply the access control policy.*

For more information regarding how to configure access policies, refer to the **ip policy-class** *<name>* *<action>* command in the *AOS Command Reference Guide* available on the *AOS Documentation* CD or online at http://kb.adtran.com (article number 2219).

> **NOTE**
> *Configured access policies will only be active if the **ip firewall** command has been entered at the Global Configuration mode prompt to enable the AOS security features. All configuration parameters are valid, but no security data processing will be attempted unless the security features are enabled.*

Timeout Parameters

The demand routing interface can also be configured to timeout after a certain amount of time if no interesting traffic has been detected by using the **idle-timeout** *<value>* command. The timeout value is the number of seconds that the interface link will remain up in the absence of interesting traffic, within a range of **1** to **2147483** seconds. Using the **no** keyword with this command removes the timeout configuration and returns the timeout value to the default **120** seconds. To set a timeout value for the demand routing interface, enter the command as follows:

(config-demand 1)**#idle-timeout 600**

Demand Routing Interface Description

A descriptive name can be entered for the demand routing interface. This can be useful in configurations with multiple demand routing interfaces. The descriptive name is entered using the **description** *<text>* command. Enter the command as follows:

(config-demand 1)**#description Cellular Demand Interface**

Example Demand Routing Interface Configuration

Using the previous examples, the following is a sample demand routing interface configuration for use with a cellular interface (3G CDMA NIM).

(config)**#interface demand 1**
(config-demand 1)**#match-interesting ip LOCAL_LAN_OUT out**
(config-demand 1)**#match-interesting ip reverse list LOCAL_LAN_OUT in**
(config-demand 1)**#resource pool CELLULAR**
(config-demand 1)**#connect-sequence 1 dial-string #777 forced-cellular**
(config-demand 1)**#connect-sequence attempts 0**
(config-demand 1)**#connect-sequence interface-recovery**
(config-demand 1)**#connect-mode originate**
(config-demand 1)**#ip address negotiated**
(config-demand 1)**#ppp chap password mypassword**
(config-demand 1)**#no shutdown**

> **NOTE**
> *For more information about configuring demand routing interfaces, refer to either the **Demand Interface Configuration Command Set** in the **AOS Command Reference Guide** available on the **AOS Documentation** CD, or the **Configuring Demand Routing in AOS** technical note online at http://kb.adtran.com (article number 2225).*

> **NOTE**
> *In AOS firmware release 17.09.00, the **match-interesting** command was changed to require the **ip** keyword. If you are using firmware released prior to 17.09.00, enter the **match-interesting list** <name> [in | out] or the **match-interesting reverse list** <name> [in | out] commands (rather than the **match-interesting ip** commands) from the Demand Interface Configuration mode to define interesting traffic.*

Configure a Route to the Internet Through the Demand Routing Interface

The demand interface must have a route to the Internet. To configure a new route for the demand routing interface to use in cellular connections, enter the **ip route** *<ip address> <subnet mask> <interface>* command from the Global Configuration mode as follows:

(config)#**ip route 0.0.0.0 0.0.0.0 demand 1**

> **NOTE**
> *If this route is the primary connection to the Internet, then any previously existing default routes must be deleted or this route should be set to a higher administrative distance for backup applications. For more information, refer to **Configuring WAN Failover in AOS**, available online at <u>http://kb.adtran.com</u> (article number 2311).*

Configuring NAT

NAT is a standard method of preserving valuable Internet address space. Additionally, it can be used to hide the structure of server farms behind a router, in order to provide bandwidth sharing to Web, FTP, and application servers. To use NAT in conjunction with cellular network access, it is necessary to configure a public interface, one that makes the connection to the WAN, and a private interface, one that is connected to the LAN. These configurations allow for communication between protected LAN environments and larger, public WAN environments.

To learn more about configuring NAT, refer to the *Configuring Internet Access (Many to one NAT) with the Firewall Wizard in AOS* training video (article number 2185) available online at <u>http://kb.adtran.com</u>.

Configuring Custom Profile Settings

Custom profile settings can be configured for the 3G CDMA NIM. These profile settings can be enabled or disabled at any time, and are useful for services that require manual activation rather than automatic activation, such as OTASP or OMA DM activation. Even with stored manual activation settings, users can still use automatic activation to connect to a service provider's general 3G network.

An example of a service requiring custom profile settings is Sprint's DataLink service, which enables enterprise users to use the Sprint network to access their private network. This service can be used as a means for primary access or as a backup for wireline access, as well as for providing wireless remote access to the private network. Figure 4 illustrates a network that uses Sprint's DataLink service to allow data to travel over a private connection between remote locations and the enterprise network.
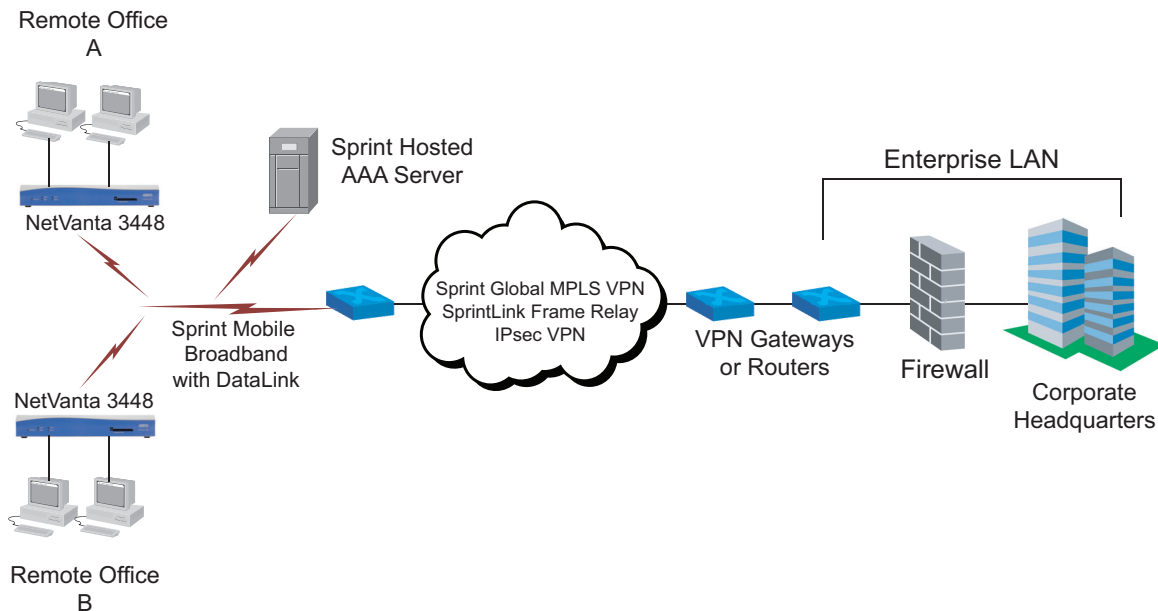
Figure 4. Private Remote Connections Using Sprint's DataLink Service

To use services requiring custom profiles, these profiles must be created by manually entering a user name and password for AAA, primary home agent address, secondary home agent address, shared secret, and the profile home address.

> *Not all service providers use the same methods for establishing private IP services over 3G networks. Check with your service provider to receive your custom profile settings and to ensure that they are configured correctly.*

To create custom profile settings for manual activation, enter the following commands as described in this section.

1. Create a user name using either the **custom-profile username** *<username>* **password ascii** *<password>* command or the **custom-profile username** *<username>* **password hexadecimal** *<password>*. These commands specify the user name, which is equivalent to NAI user identification, and the password, which is equivalent to an AAA shared secret. The first command uses a plain text password, and the second uses a hexadecimal password. The user name can consist of up to 72 characters, and the password can consist of up to 16 characters. The **no** form of this command removes the user name and password. To specify a user name and password, enter the command from the cellular interface configuration mode as follows:

    (config-cellular 1/1)#**custom-profile username USERNAME password ascii PASSWORD**

2. Specify the primary home agent address using the **custom-profile primary-ha-address** *<ip address>*
    command. Enter the IP address in dotted decimal notation (**XX.XX.XX.XX**). Using the **no** form of this
    command removes the primary address. Enter the command from the cellular interface configuration
    prompt as follows:

    (config-cellular 1/1)#**custom-profile primary-ha-address XX.XX.XX.XX**

3. Specify the secondary home agent address using the **custom-profile secondary-ha-address**
    <ip address> command. Enter the IP address in dotted decimal notation (**XX.XX.XX.XX**). Using the
    no form of this command removes the secondary address. Enter the command from the cellular interface
    configuration prompt as follows:

    (config-cellular 1/1)#**custom-profile secondary-ha-address XX.XX.XX.XX**

4. Specify the custom home agent shared secret using either the **custom-profile ha-shared-secret ascii**
    <shared secret> command or the **custom-profile ha-shared secret hexadecimal** *<shared secret>*
    command. The first command uses a plain text secret, and the second uses a hexadecimal secret. The
    shared secret can be up to 16 characters long. Using the **no** form of this command removes the shared
    secret from the custom profile configuration. Enter either command from the cellular interface
    configuration prompt as follows:

    (config-cellular 1/1)#**custom-profile ha-shared-secret ascii SHAREDSECRET**

5. Specify the custom profile home address using the **custom-profile home-address** *<ip address>*
    command. Enter the IP address in dotted decimal notation (**XX.XX.XX.XX**). Using the **no** form of this
    command removes the home address. Enter the command from the cellular interface configuration
    prompt as follows:

    (config-cellular 1/1)#**custom-profile home-address XX.XX.XX.XX**

To use the default profile settings (those that are already present on the 3G CDMA NIM), you can do one
of two things. Either do not configure a custom profile, or enter the **no custom-profile** command from the
cellular interface configuration prompt as follows:

(config-cellular 1/1)#**no custom-profile**

If only some of the custom profile settings are configured, the blank settings will use the default profile's
settings. Default settings can be viewed using the **show interface cellular** *<slot/port>* **profile** command
(detailed on). If custom settings are configured, they will override the values initially displayed in
the **show interface cellular** *<slot/port>* **profile** command.

Example 3G CDMA NIM/Cellular Interface Configurations

The following section describes different scenarios for configuring and applying the 3G CDMA NIM. The first scenario applies the 3G CDMA NIM as a primary WAN connection, the second scenario applies the 3G CDMA NIM as a secondary connection, and the third scenario applies a schedule and probe to the 3G CDMA NIM. Each scenario is provided for example purposes only. Example configurations should be modified to fit your specific configuration needs.

3G CDMA NIM as a Primary WAN Connection

The following network diagram and configuration example show the application of the 3G CDMA NIM as a primary WAN connection. In this example, a small business has decided to use the 3G CDMA NIM in conjunction with a NetVanta 3448 to create a cellular connection for Internet access. The cellular connection is chosen by this company because they do not want to wait for an asymmetric digital subscriber line (ADSL) to be installed, nor do they need the bandwidth provided by the ADSL. Once the 3G CDMA NIM is installed in the NetVanta 3448, the company sets up a connection to the public network by creating a demand interface, connecting it to the cellular NIM, and making the demand interface the public interface for NAT. Then, the Ethernet interface is configured to be the private interface for NAT. The network diagram for this example is shown in Figure 5.

Figure 5. Network Example of 3G CDMA NIM as Primary WAN Connection

Sample CLI Configuration

The following is a sample CLI configuration for the 3G CDMA NIM as a primary WAN connection:

```
!
ip routing
ip firewall
!
interface cellular 1/1
    description Cellular Physical Interface
    resource pool-member CELLULAR 1
    no shutdown
!
interface demand 1
    ip access-policy Public
    resource pool CELLULAR
    match-interesting ip list LOCAL_LAN_OUT out
    match-interesting ip reverse list LOCAL_LAN_OUT in
    connect-sequence 1 dial-string #777 forced-cellular
    connect-sequence attempts 0
    connect-sequence interface-recovery
    connect-mode originate
    description Cellular Demand Interface
    keepalive 0
    ip address negotiated
    no shutdown
!
interface ethernet 0/1
    ip access-policy Private
    ip address 192.168.1.1 255.255.255.0
    no shutdown
!
ip access-list standard wizard-ics
    remark Internet Connection Sharing
    permit any
!
ip access-list extended LOCAL_LAN_OUT
    permit ip any any
!
ip access-list extended self
    remark Traffic to NetVanta
    permit ip any any log
!
ip policy-class Private
    allow list self self
    nat source list wizard-ics interface demand 1 overload policy Public
!
ip policy-class Public
!
ip route 0.0.0.0 0.0.0.0 demand 1
```

!

> **NOTE**
> *To function properly, keepalive packets must not be transmitted by the 3G CDMA NIM. The keepalive value must be set to **0**, using the **keepalive** <value> CLI command on the demand routing interface. For more details about this command, refer to the **AOS Command Reference Guide** available on the **AOS Documentation** CD shipped with your base unit or online at http://kb.adtran.com (article number 2219).*

> **NOTE**
> *In AOS firmware release 17.09.00, the **match-interesting** command was changed to require the **ip** keyword. If you are using firmware released prior to 17.09.00, enter the **match-interesting list** <name> **[in | out]** or the **match-interesting reverse list** <name> **[in | out]** commands (rather than the **match-interesting ip** commands) from the Demand Interface Configuration mode to define interesting traffic.*

> **NOTE**
> *In AOS firmware release 17.09.00, the **access-policy** command was changed to require the **ip** keyword. If you are using firmware released prior to 17.09.00, enter the **access-policy** <name> command (rather than the **ip access-policy** command) from the Demand Interface Configuration mode to apply the access control policy.*

Sample GUI Configuration

The same cellular interface parameters can be set using the GUI configuration method as described beginning on page 8.

3G CDMA NIM as a Secondary WAN Connection

The following network diagram and configuration example show the application of the 3G CDMA NIM as a secondary WAN connection. In this example, a medium-sized business has decided to use a T1 NIM in conjunction with the 3G CDMA NIM as backup in case the T1 connection ever goes down. The cellular connection is chosen by this company because it is an affordable choice to make sure they can still connect to the WAN if something happens to their primary connection. Once the 3G CDMA NIM is installed in the second slot of the NetVanta 3305, the company sets up a secondary connection to the network. The network diagram for this example is shown in Figure 6.

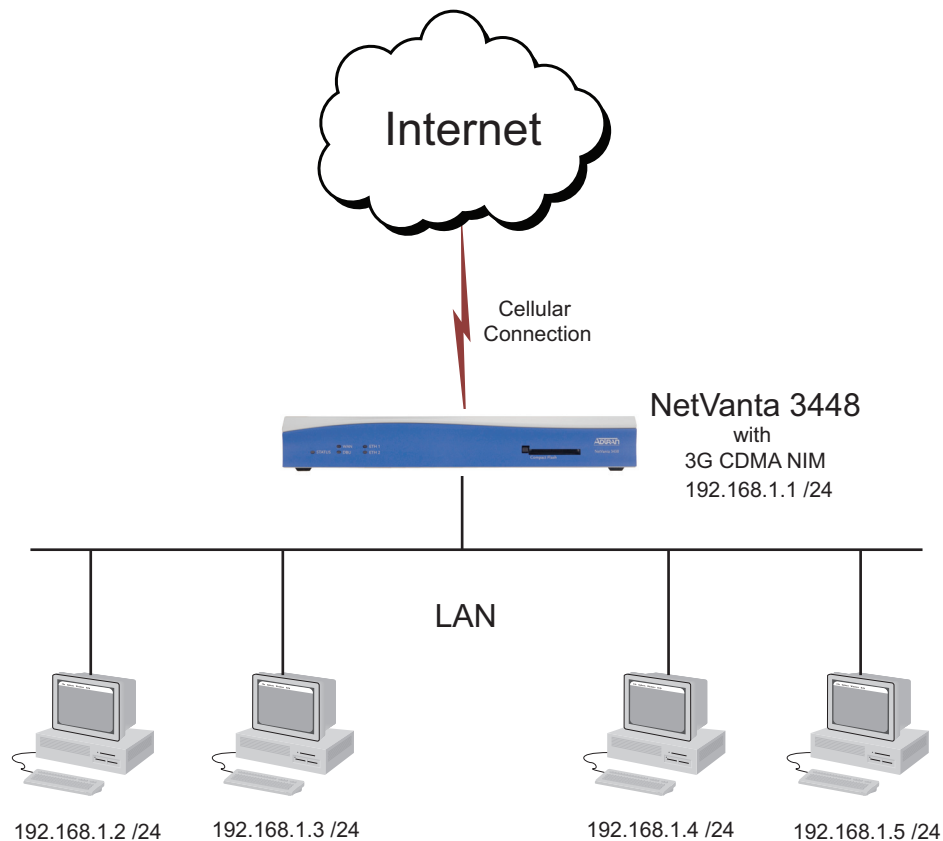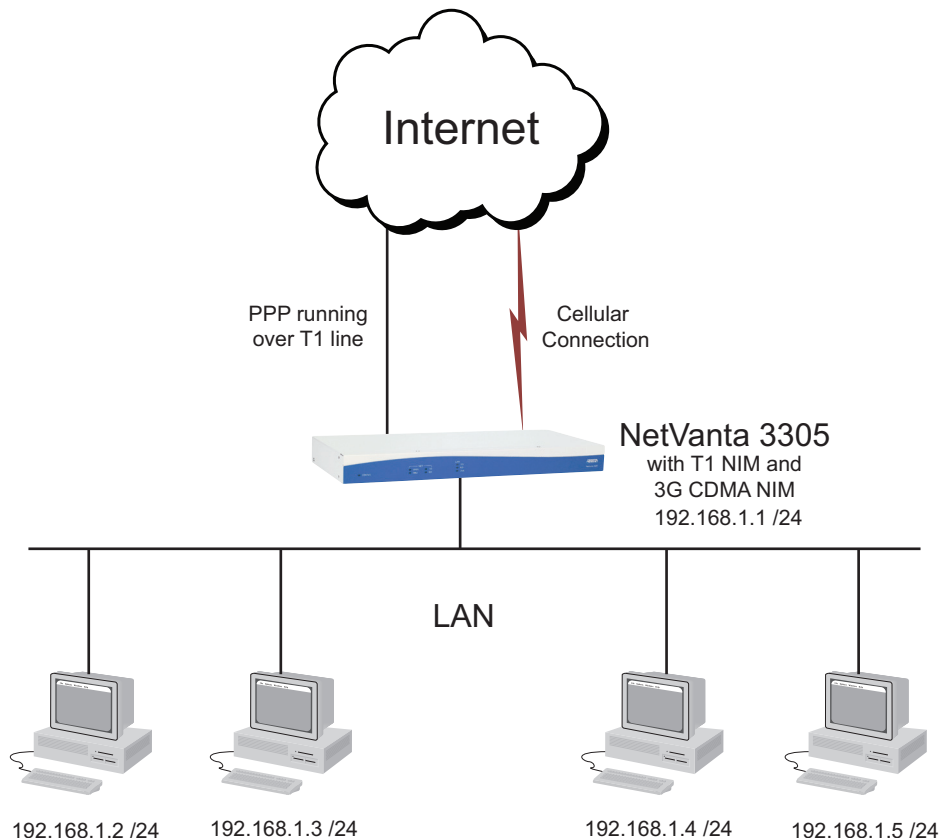**Figure 6. 3G CDMA NIM as Backup WAN Connection**

Sample CLI Configuration

The following is a sample CLI configuration for the 3G CDMA NIM as a secondary WAN connection:

```
!
ip routing
ip firewall
!
probe PROBE_PPP icmp-echo
    destination http://www.example.com port 80
    no shutdown
!
```

```
track TRACK_PPP
    test probe PROBE_PPP
    no shutdown
!
interface t1 1/1
    description Primary WAN Interface
    tdm-group 1 timeslots 1-24
    no shutdown
!
interface ppp 1
    ip access-policy Public-T1
    ip address negotiated track TRACK_PPP
    no shutdown
!
cross-connect 1 t1 1/1 1 ppp 1
interface cellular 2/1
    description Cellular Physical Interface
    resource pool-member CELLULAR 1
    no shutdown
!
interface demand 1
    ip access-policy Public-DR
    resource pool CELLULAR
    match-interesting ip list LOCAL_LAN_OUT out
    match-interesting ip reverse list LOCAL_LAN_OUT in
    connect-sequence 1 dial-string #777 forced-cellular
    connect-sequence attempts 0
    connect-sequence interface-recovery
    connect-mode originate
    description Cellular Demand Interface
    ip address negotiated
    no shutdown
!
interface ethernet 0/1
    ip access-policy Private
    ip address 192.168.1.1 255.255.255.0
    no shutdown
!
ip access-list standard wizard-ics
    remark Internet Connection Sharing
    permit any
!
ip access-list extended LOCAL_LAN_OUT
permit ip any any
!
ip access-list extended self
    remark Traffic to NetVanta
    permit ip any any log
!
```

ip policy-class Private
    allow list self self
    nat source list wizard-ics interface ppp1 overload policy Public-T1
    nat source list wizard-ics interface demand 1 overload policy Public-DR
!
ip policy-class Public-T1
!
ip policy-class Public-DR
!
ip route 0.0.0.0 0.0.0.0 demand 1 10
!

> *NOTE*　　*In AOS firmware release 17.09.00, the **match-interesting** command was changed to require the **ip** keyword. If you are using firmware released prior to 17.09.00, enter the **match-interesting list** <name> [in | out] or the **match-interesting reverse list** <name> [in | out] commands (rather than the **match-interesting ip** commands) from the Demand Interface Configuration mode to define interesting traffic.*

> *NOTE*　　*In AOS firmware release 17.09.00, the **access-policy** command was changed to require the **ip** keyword. If you are using firmware released prior to 17.09.00, enter the **access-policy** <name> command (rather than the **ip access-policy** command) from the Demand Interface Configuration mode to apply the access control policy.*

Sample GUI Configuration

The same cellular interface parameters can be set by using the GUI configuration method described beginning on page 8.

Using the 3G CDMA NIM with Schedules and Probes

The cellular interface can be configured to operate with schedules and probes, which can connect the cellular interface to the cellular network at predetermined times. This can be useful in a situation where remote access to the unit is needed. For example, when SNMP or network management is desired from the service provider. Since the cellular interface only dials out, a schedule and probe are needed to connect the cellular interface to the cellular network to allow remote access to the unit. To configure the interface so that it is connected to the 3G network at a specific time, the following are needed: a configured schedule that is activated at the desired time, a probe to test the connection and send interesting traffic using the demand interface, and a track whose state is reliant upon the schedule. In addition, the demand interface must be configured in a manner similar to the following example and an ACL must be created that allows traffic based on the previously configured track state.

> *NOTE*　　*The remote access as described in this example requires that the managing cellular service know the IP address of the demand interface.*

For additional information about configuring schedules, probes, and tracks, refer to the ADTRAN configuration guide, *Network Monitoring in AOS*, available on the *AOS Documentation* CD shipped with your unit or online at http://kb.adtran.com (article number 3007).

Sample CLI Configuration

The following is a sample CLI configuration that allows the cellular interface to automatically connect to the Internet at midnight.

schedule MIDNIGHT
    periodic daily 00:00 to 01:00
!
probe Ping1 icmp-echo
    destination 10.1.1.1
    period 60
    tolerance consecutive fail 3 pass 2
    no shutdown
!
track INBAND-3G
    test if schedule MIDNIGHT
    no shutdown
!
interface demand 1
    idle-timeout 70
    resource pool 3G
    match-interesting ip list Interesting out
    match-interesting ip reverse list Interesting in
    connect-sequence 1 dial-string 5555000
    connect-sequence attempts 0
    connect-mode originate
    ip address negotiated
    ppp chap hostname netvanta
    ppp chap password adtran
    no shutdown
!
ip access-list extended Interesting
    Configuring New Extended ACL "Interesting"
    permit icmp any host 10.10.10.1 track INBAND-3G
    permit ip any any
!

> **NOTE**
> *In AOS firmware release 17.09.00, the **match-interesting** command was changed to require the **ip** keyword. If you are using firmware released prior to 17.09.00, enter the **match-interesting list** <name> [in | out] or the **match-interesting reverse list** <name> [in | out] commands (rather than the **match-interesting ip** commands) from the Demand Interface Configuration mode to define interesting traffic.*

Sample GUI Configuration

The same cellular interface parameters can be set by using the GUI configuration method described beginning on page 8.

Configuration Command Summaries

> **NOTE** *These tables include configuration commands necessary for configuring the 3G CDMA NIM and cellular interface, an ACL, and the demand routing interface.* **Show** *and* **Debug** *troubleshooting commands are summarized in* Troubleshooting on page 44.

Table 2. 3G CDMA NIM/Cellular Interface Command Summary

Prompt	Command	Description
(config)#	**interface cellular** *<slot/port>*	Accesses the cellular interface configuration mode.
(config-cellular 1/1)#	**cdma activate otasp**	Activates the 3G CDMA NIM and cellular interface for Verizon wireless services.
(config-cellular 1/1)#	**cdma activate oma-dm**	Activates the 3G CDMA NIM and cellular interface for Sprint wireless services.
(config-cellular 1/1)#	**reset**	Resets the cellular interface configuration.
(config-cellular 1/1)#	**description** *<text>*	Creates a descriptive name to identify the interface (up to 80 alphanumeric characters).
(config-cellular 1/1)#	**resource pool-member** *<name> <priority>*	Assigns the cellular interface to a resource pool for the demand routing interface.
(config-cellular 1/1)#	**no custom-profile**	Clears all custom profile settings and returns profile settings to the default values.
(config-cellular 1/1)#	**[no] custom-profile username** *<username>* **password [ascii | hexadecimal]** *<password>*	Specifies the user name and password for the custom profile. User names can be up to 72 characters in length, passwords can be up to 16 characters in length.
(config-cellular 1/1)#	**[no] custom-profile primary-ha-address** *<ip address>*	Specifies the primary home agent address for the custom profile. Specify IP addresses in dotted decimal notation (**XX.XX.XX.XX**).
(config-cellular 1/1)#	**[no] custom-profile secondary-ha-address** *<ip address>*	Specifies the secondary home agent address for the custom profile. Specify IP addresses in dotted decimal notation (**XX.XX.XX.XX**).

Table 2. 3G CDMA NIM/Cellular Interface Command Summary *(Continued)*

Prompt	Command	Description
(config-cellular 1/1)#	**[no] custom-profile ha-shared-secret [ascii | hexadecimal]** *<shared secret>*	Specifies the home agent shared secret for the custom profile. Secrets are character strings of up to 16 characters in length.
(config-cellular 1/1)#	**[no] custom-profile home-address** *<ip address>*	Specifies the home address for the custom profile. Specify IP addresses in dotted decimal notation (**XX.XX.XX.XX**).

Table 3. ACL Command Summary

Prompt	Command	Description
(config)#	**ip access-list extended** *<name>*	Names an ACL to create and enters the ACL configuration mode.
(config-ext-nacl)#	*<action> <protocol> <source> <destination>*	Specifies the traffic that the ACL will monitor. For more information about ACLs, refer to *Configuring IP ACLs in AOS* available online at http://kb.adtran.com (article number 3087).

Table 4. Demand Routing Interface Configuration Commands

Prompt	Command	Description
(config)#	**interface demand** *<number>*	Accesses the demand interface configuration mode.
(config-demand 1)#	**match-interesting ip [reverse | list]** *<name>* **[in | out]**	Specifies an ACL for interface activation and the matching logic the ACL will use. If you are using AOS firmware prior to 17.09.00, this command syntax is **match-interesting [reverse | list]** *<name>* **[in | out]**.
(config-demand 1)#	**resource pool** *<name>*	Specifies the resource pool the demand interface will use.

Table 4. Demand Routing Interface Configuration Commands *(Continued)*

Prompt	Command	Description
(config-demand 1)#	**connect-sequence** *<value>* **dial-string** *<string>* **forced-cellular**	Specifies the connection method the demand interface will use when connecting to the cellular network. For cellular connections, the dial string must be **#777**.
(config-demand 1)#	**connect-sequence attempts** *<value>*	Specifies the number of times the demand interface will attempt to connect to the cellular network. Range is **0** to **65535**. Zero indicates unlimited attempts will be made and should be used for cellular applications.
(config-demand 1)#	**connect-sequence interface-recovery**	Specifies the interface will go down if attempted connections to the cellular network fail.
(config-demand 1)#	**connect-mode [answer | originate | either]**	Specifies that the demand interface will answer or originate calls, or both. For cellular connections, the demand routing interface should be set to **originate**.
(config-demand 1)#	**ip address negotiated**	Specifies that the demand interface will be assigned an IP address from the far end PPP connection.
(config-demand 1)#	**no shutdown**	Specifies that the interface is enabled.
(config-demand 1)#	**ip access-policy** *<name>*	Assigns an access policy to the demand interface.If you are using AOS firmware prior to 17.09.00, this command syntax is **access-policy** *<name>*.
(config-demand 1)#	**idle-timeout** *<value>*	Specifies the amount of time before the demand routing interface times out if no interesting traffic is detected. Range is **1** to **2147483** seconds.
(config-demand 1)#	**description** *<text>*	Creates a descriptive name to identify the interface (up to 80 alphanumeric characters).

Table 4. Demand Routing Interface Configuration Commands *(Continued)*

Prompt	Command	Description
(config-demand 1)#	**ppp chap password** *<password>*	Creates an authentication password for the modem to use in SIP connections.

> NOTE
> *The commands listed for configuring the demand routing interface pertain only to configuring the interface to connect with a cellular network. For a complete list of commands available on the demand interface, refer to the **Demand Interface Configuration Command Set** in the **AOS Command Reference Guide** available on the **AOS Documentation** CD or online at http://kb.adtran.com (article number 2219).*

Troubleshooting

Troubleshooting the 3G CDMA NIM/cellular interface can be done from either the GUI or the CLI. Both methods are described in the following sections.

Viewing Interface Statistics Using the GUI

Some statistics for the 3G CDMA cellular interface and the demand routing interface are available on the GUI. Specific statistics related to the 3G CDMA cellular interface, such as profile, version, and hardware statistics, are only available through the CLI. The GUI provides summary statistics that aid in monitoring the activity and status of each interface.

To access 3G CDMA cellular interface statistics, follow these steps:

1. Navigate to **System** > **Physical Interfaces**.

2. Select the appropriate cellular interface from the list of system interfaces.

3. Scroll to the bottom of the screen and view the statistics for the cellular interface.

To view the statistics for the demand routing interface, follow these steps:

1. Navigate to **Data** > **Router/Bridge** > **Demand Routing**.

2. Select the appropriate demand interface from the list.

3. Scroll to the bottom of the screen and view the statistics for the demand interface.

Status for 'Demand 1'	
Interface Status	
Admin Status	**Up**
Oper Status	**DOWN (recoveryActive)**
Current Values	
Output Queue Size	0
Output Queue (Highest/Max Total)	0 / 540
Output Queue (Threshold/Drops)	64 / 0
Active Conversations	0
Conversations (Max Active/Max Total)	0 / 256
Available Bandwidth	48
Connect Sequence	
Success	0 (success)
Failures	0 (failures)
Refresh in 1 seconds...	

Viewing Interface Statistics Using the CLI

Although the GUI provides some summary statistics for the 3G CDMA cellular and the demand routing interface, the CLI provides detailed views of the 3G CDMA cellular interface statistics, profile, version, and hardware. The CLI also provides detailed views of the demand routing interface statistics. These statistics are viewed using **show** commands from the Enable mode as shown in Table 5. Examples of command usage and output are contained in the following sections.

Table 5. Show Commands

Prompt	Command	Description
#	**show interface cellular** *<slot/port>*	Displays statistics for the specified cellular interface.
#	**show interface cellular** *<slot/port>* **profile**	Displays cellular profile statistics for the specified cellular interface.
#	**show interface cellular** *<slot/port>* **version**	Displays firmware and hardware versions for the specified cellular interface.
#	**show interface cellular** *<slot/port>* **hardware**	Displays hardware information for the specified cellular interface.
#	**show interface demand** *<number>*	Displays configuration and status statistics for the specified demand interface.

3G CDMA NIM/Cellular Interface Statistics

To view cellular interface statistics, enter the **show interface cellular** *<slot/port>* command from the Enable mode. The output from this command displays the RSSI, the ECIO, the pseudo-random (PN) offset, the CDMA frequency, the connection state, the network service type, the amount of time the interface has been connected, and other typical interface statistics. To view cellular interface statistics, enter the command in the following form:

#show interface cellular 1/1

Example output of this command is shown in Figure 7.

```
# show interface cellular 1/1
cell 1/1 is DOWN
  Service type is 1xEVDO (Rev A), RSSI is -90 dBm, ECIO is -5.0 dBm
  PN Offset is 192, Frequency is 1900MHz
  Connection state is IDLE
  Current connection uptime is 0 sec
  Total connection uptime is 0 sec
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
    0 packets input, 0 bytes, 0 no buffer
    0 runts, 0 giants, 0 throttles
    0 input errors, 0 CRC, 0 frame
    0 abort, 0 discards, 0 overruns
    0 packets output, 0 bytes, 0 underruns
```

Figure 7. Sample Output from Show Interface Cellular Command

Viewing Cellular Profile Statistics

Cellular profile statistics are viewed using a variation of the **show interface cellular** command. In this variation, the keyword **profile** is added to specify that statistics regarding a specific cellular profile are displayed. The command is entered from the Enable mode in the following form:

#show interface cellular 1/1 profile

The **profile** statistics contain information regarding the network access identifier (NAI) of the modem, the home agent shared secret (HA SS), the home agent security parameter index (HA SPI), the authentication, authorization, and accounting shared secret (AAA SS), the AAA security parameter index (AAA SPI), the reverse tunneling preference, the modem's permanent home address, and the primary and secondary home IP addresses of the modem's home agent. Example output of this command is shown in Figure 8.

```
# show interface cellular 1/1 profile
Network Access Identifier : 12345@abc123.org
HA SS : Set
HA SPI : 1234
AAA SS : Set
AAA SPI : 1234
Reverse Tunneling Preference : Set
Home Address : 0.0.0.0
Primary Home Agent Address : 12.34.56.78
Secondary Home Agent Address : 12.34.67.89
```

Figure 8. Sample Output from Show Interface Cellular Profile Command

Viewing Cellular Version Statistics

Cellular version statistics are displayed using another variation of the **show interface cellular** command. The **version** keyword is added, which specifies that the displayed statistics will include NIM firmware and bootware versions, and modem hardware and firmware versions. The command is entered from the Enable mode in the following form:

#show interface cellular 1/1 version

Example output from this command is shown in Figure 9. The modem firmware will display the version of firmware supported by your wireless carrier.

```
# show interface cellular 1/1 version
cell 1/1: firmware v17.2.1 boot v17.2.1
Modem Hardware: Merlin V725 v.2
Modem Firmware: Verizon v.4
```

Figure 9. Sample Output from Show Interface Cellular Version Command

Viewing Cellular Hardware Statistics

Cellular hardware statistics are displayed using a variation of the **show interface cellular** command. The **hardware** keyword is added, which specifies that the displayed statistics will include the ESN, the PRL, the mobile directory number (MDM), the mobile station ID (MSID), the system ID (SID), and the network ID (NID).

The ESN is the code that uniquely identifies the cellular modem; the PRL is the database of cell towers on which the cellular modem can roam; and the MDM is the 10-digit mobile phone number assigned to the modem. The MSID is a 10-digit number identifying the cellular modem on the network (it is typically the same as the MDN); the SID is the identifier for a region of cellular network coverage; and the NID is the identifier of particular SIDs corresponding to different rating areas, tolling areas, or private networks. The command is entered from the Enable mode in the following form:

#show interface cellular hardware

Example output from this command is shown in Figure 10.

```
# show interface cellular 1/1 hardware
Electronic Serial Number (ESN): 0x12345678
Preferred Roaming List (PRL) Version: 12345
Mobile Directory Number (MDN): 0123456789
Mobile Station ID (MSID): 0123456789
System ID (SID): 1234
Network ID (NID): 12
```

Figure 10. Sample Output from Show Interface Cellular Hardware Command

Demand Routing Interface Statistics

Demand routing interface statistics can be viewed from the CLI, as well as the GUI. The CLI statistics are accessed by using the **show interface demand** *<number>* command. The *<number>* parameter refers to the number of the interface.

The CLI statistics include information found on a PPP interface, with the addition of a spoofing and connected notification when Layers 1 and 2 are in the UP state, and also quality of service (QoS) information. The command is entered from the Enable mode in the following form:

#show interface demand 1

Examples of demand interface statistics are shown in Figure 11 and Figure 12.

```
Show Interface Demand – Not Connected
# show interface demand 1
Demand 1 is UP (Spoofing)
  Configuration:
    Keep-alive is set (10 sec.)
    Admin MTU = 1500
    Mode: Originate, 1 dial entry, idleTime = 120, fastIdle = 20
    Resource pool CELLULAR
    SentAuth = CHAP, SentUsername = Router
    IP address negotiated
Connect Sequence:  Successes = 0, Failures = 0
    Seq    DialString   Technology  Successes Busys NoAnswers NoAuths InUse
     1          #777   CellForced       0      0        0        0
Current values:
    Local IP address 0.0.0.0, Peer IP address 0.0.0.0
    Last interesting pkt: None
    Queueing method: weighted fair
    Output queue: 0/0/428/64/0 (size/highest/max total/threshold/drops)
      Conversations  0/0/256 (active/max active/max total)
      Available Bandwidth 48 kilobits/sec
    Bandwidth=64 Kbps
```

Figure 11. Sample Output from Show Interface Demand Command (unconnected)

```
Show Interface Demand – Connected
# show interface demand 1
Demand 1 is UP (Connected)
  Configuration:
    Keep-alive is set (10 sec.)
    Admin MTU = 1500
    Mode: Originate, 1 dial entry, idleTime = 120, fastIdle = 20
    Resource pool CELLULAR
    SentAuth = CHAP, SentUsername = Router
    IP address negotiated
  Connect Sequence:  Successes = 1, Failures = 0
    Seq    DialString   Technology  Successes Busys NoAnswers NoAuths InUse
     1          #777    CellForced      1       0        0        0    YES
  Current values:
    Local IP address 10.0.0.1, Peer IP address 10.0.0.2
    Last interesting pkt: None
    Queueing method: weighted fair
    Output queue: 0/0/428/64/0 (size/highest/max total/threshold/drops)
      Conversations  0/0/256 (active/max active/max total)
      Available Bandwidth 48 kilobits/sec
    Bandwidth=64 Kbps
```

Figure 12. Sample Output from Show Interface Demand Command (connected)

Troubleshooting Using the GUI

To access GUI debugging abilities, follow these steps:

1. Navigate to **Utilities** > **System** > **Debug Unit** menu.
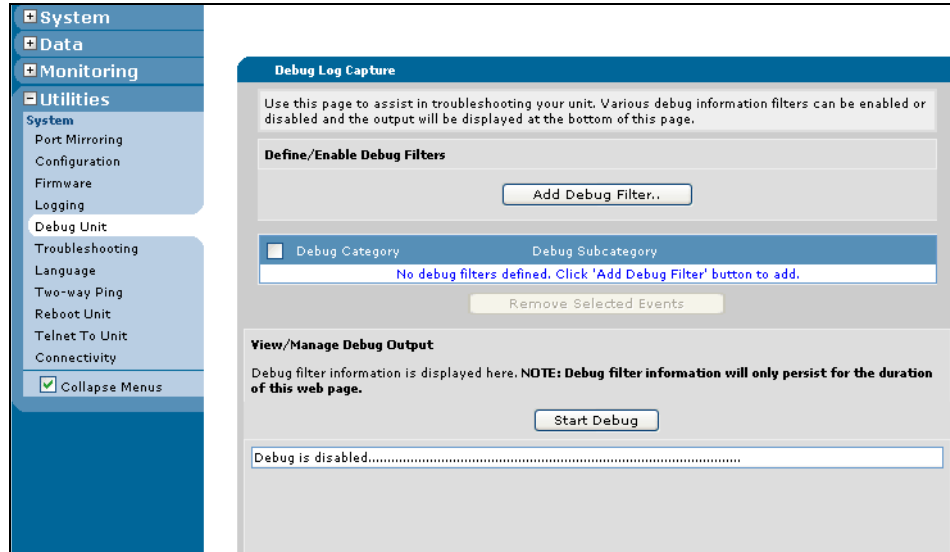
2. Select the **Add Debug Filter** button and choose the desired item to debug from the following **Category** drop-down menu. Select **Apply** when the correct item is chosen.
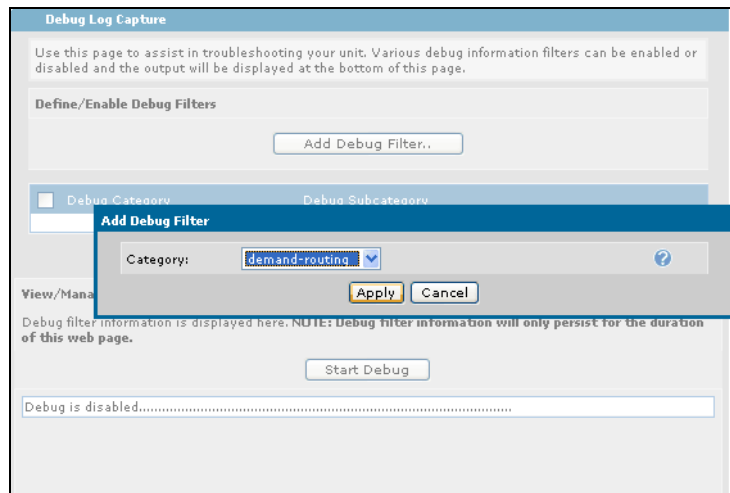
The item you have selected to debug will appear in the **Debug Category** tab in the middle of the screen.

3. You can then select **Start Debug** and begin receiving debug information for the item you selected.

CLI Troubleshooting

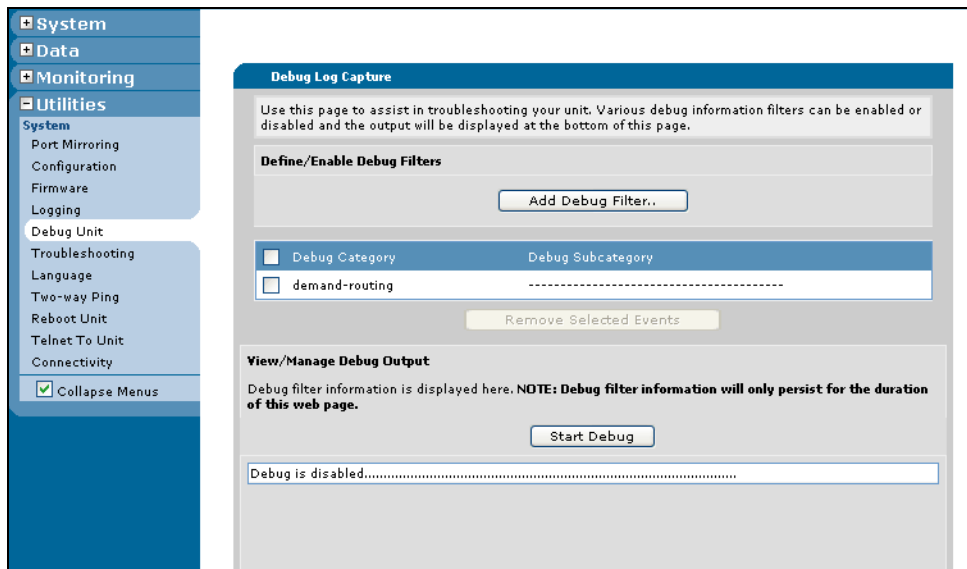After configuring the 3G CDMA cellular interface and the demand routing interface, several different **debug** commands can be issued from the Enable mode in the CLI to assist in troubleshooting. The **debug** commands send messages when certain types of activity are detected on the interface, and work hand-in-hand with the **show** commands to verify proper configuration and performance. The **show** commands are described in *Viewing Interface Statistics Using the CLI on page 47* of this guide. The **debug** commands are detailed in the following table.

Table 6. Cellular and Demand Routing Interface Debug Command Summary

Command	Explanation
#debug interface cellular *<slot/port>* **diagnostic [tx	rx	both]**	Enables debug events to decode the packets sent between the 3G CDMA NIM module and the cellular modem along the diagnostic channel. **Tx** specifies the debugging of packets sent from the NIM module to the modem (optional). **Rx** specifies the debugging of packets sent from the modem to the NIM module (optional). **Both** specifies the debugging of both transmitted and received packets (optional).
#debug interface cellular *<slot/port>* **data**	Activates debug messages for handshaking signals on the data channel.
#debug interface cellular *<slot/port>* **data-hdlc**	Activates debug messages for high-level data link control (HDLC) errors on the data channel.
#debug interface cellular *<slot/port>* **diag-hdlc**	Activates debug messages for HDLC errors on the diagnostic channel.
#debug interface cellular *<slot/port>* **download**	Activates debug messages for errors regarding application downloads.

Table 6. Cellular and Demand Routing Interface Debug Command Summary *(Continued)*

Command	Explanation
#debug demand-routing	Activates debug messages for demand routing errors and events.
#debug data-call	Activates debug messages for data call errors and events.
#debug dialup-interfaces	Activates debug messages to aid in troubleshooting dial-up interfaces.

By enabling **debug** commands, debug messages are sent to alert you whenever specified actions take place. These messages can be beneficial when you are troubleshooting your configuration.

> ✎ **NOTE**   *Using **debug** commands can be very processor intensive, and should be used with caution.*

Sample Debug Output

The following are samples of debug out put from various **debug** commands, including the **debug demand-routing**, **debug dialup-interfaces**, and **debug interface cellular** *<slot/port>* **diagnostic** commands. Each command is entered from the Enable mode prompt.

#debug demand-routing
2010.02.19 16:08:34 DEMANDROUTING.Demand Interface Demand 1 interesting traffic packet saved
2010.02.19 16:08:34 DEMANDROUTING.Demand Interface Demand 1 dialing *****
2010.02.19 16:08:45 DEMANDROUTING.Demand Interface Demand 1 no authentication passed
2010.02.19 16:08:45 PPP.NEGOTIATION LCP up
2010.02.19 16:08:45 DEMANDROUTING.Demand Interface Demand 1 - interface connected
2010.02.19 16:08:45 PPP.NEGOTIATION demand 1: IPCP up
2010.02.19 16:08:45 INTERFACE_STATUS.demand 1 changed state to up
2010.02.19 16:08:47 DEMANDROUTING.Demand Interface Demand 1 bundle is up !!!!!

#debug dialup-interfaces
2010.02.19 16:11:54 DIALUP_INTERFACE.cellular 1/1 Usb Device Has Been Removed***
2010.02.19 16:12:01 DIALUP_INTERFACE.cellular 1/1 Usb 3G Device Found**
2010.02.19 16:12:03 INTERFACE_STATUS.cellular 1/1 changed state to up*****
2010.02.19 16:12:15 DIALUP_INTERFACE.cellular 1/1 Dialing #777***
2010.02.19 16:12:20 DIALUP_INTERFACE.cellular 1/1 Connect (CONNECT)***
2010.02.19 16:12:25 PPP.NEGOTIATION LCP up
2010.02.19 16:12:25 PPP.NEGOTIATION demand 1: IPCP up
2010.02.19 16:12:26 INTERFACE_STATUS.demand 1 changed state to up**!!!!!!!!

#debug interface cellular 1/1 diagnostic
2010.02.19 16:04:54 CELL_INTERFACE.cellular 1/1 DIAG RX Incorrect SPC Attempts: 0
2010.02.19 16:04:54 CELL_INTERFACE.cellular 1/1 DIAG TX <STATUS_REQUEST>
2010.02.19 16:04:54 CELL_INTERFACE.cellular 1/1 DIAG RX <STATUS_REQUEST> SID:113 NID:5
    ESN:5bd2aef3 PN_OFFSET:240 CURRENT_CHANNEL:94
2010.02.19 16:04:54 CELL_INTERFACE.cellular 1/1 DIAG TX <PILOT_SET_REQUEST>
2010.02.19 16:04:54 CELL_INTERFACE.cellular 1/1 DIAG RX <PILOT_SET_REQUEST> PILOT_PN:240

PILOT_STRENGTH:20 ECIO:-20
2010.02.19 16:04:54 CELL_INTERFACE.cellular 1/1 DIAG TX <SUBSYSTEM_REQUEST> <RSSI>
2010.02.19 16:04:54 CELL_INTERFACE.cellular 1/1 DIAG RX <SUBSYSTEM_REQUEST> <RSSI>
    CDMA:25 CDMA_DBM:-84 EVDO:31 EVDO_DBM:-74
2010.02.19 16:04:54 CELL_INTERFACE.cellular 1/1 DIAG TX <SUBSYSTEM_REQUEST>
    <PRL_VERSION>
2010.02.19 16:04:54 CELL_INTERFACE.cellular 1/1 DIAG RX <SUBSYSTEM_REQUEST>
    <PRL_VERSION> PRL_VERSION:ca17
2010.02.19 16:04:54 CELL_INTERFACE.cellular 1/1 DIAG TX <SUBSYSTEM_REQUEST>
    <DEVICE_INFO>
2010.02.19 16:04:54 CELL_INTERFACE.cellular 1/1 DIAG RX <SUBSYSTEM_REQUEST>
    <DEVICE_INFO> MODEM_MODEL:MC760 VERIZON FW_VER:114 BOOT_VER:0
    BOOT_MODEL:MERLV760
2010.02.19 16:04:54 CELL_INTERFACE.cellular 1/1 DIAG TX <NONVOL_READ_REQUEST>
    NV_ITEM:178
2010.02.19 16:04:54 CELL_INTERFACE.cellular 1/1 DIAG RX <MDN_REQUEST> MDN:2023020919
2010.02.19 16:04:54 CELL_INTERFACE.cellular 1/1 DIAG TX <NONVOL_READ_REQUEST>
    NV_ITEM:10
2010.02.19 16:04:54 CELL_INTERFACE.cellular 1/1 DIAG RX <SERVICE_PREFERENCE_MODE>
    Mode: HYBRID
2010.02.19 16:04:54 CELL_INTERFACE.cellular 1/1 DIAG TX <SUBSYSTEM_REQUEST>
    <CM_STATE>
2010.02.19 16:04:54 CELL_INTERFACE.cellular 1/1 DIAG RX <SUBSYSTEM_REQUEST>
    <CM_STATE> OPERATION_MODE:ONLINE SYSTEM_MODE:2
2010.02.19 16:04:54 CELL_INTERFACE.cellular 1/1 DIAG TX <SUBSYSTEM_REQUEST>
    <HDR_STATE>
2010.02.19 16:04:54 CELL_INTERFACE.cellular 1/1 DIAG RX <SUBSYSTEM_REQUEST>
    <HDR_STATE> SESSION_STATE:4 ALMP_STATE:3 HYBRID:1
2010.02.19 16:04:54 CELL_INTERFACE.cellular 1/1 DIAG TX <SUBSYSTEM_REQUEST>
    <MODEM_STATUS>
--MORE--

Additional Troubleshooting Information

The following section outlines typical troubleshooting measures for common problems you might
experience with your 3G CDMA NIM card or cellular interface. Troubleshooting topics included in this
section are:

- Ping and connectivity failures
- Low throughput or dropped calls

Ping and Connectivity Failures

If you are experiencing ping and connectivity failures, you should verify your cellular connection information and configuration.

Verify the following:

1. That you have a good signal. Check the RSSI value using the **show interface cellular** *<slot/port>* command (detailed on page 48). This value should be between -60 and -90 dB.

2. That the modem is activated. Use the **show interface cellular** *<slot/port>* command to check the RSSI value and verify the modem is activated. If the modem is not activated, run automatic activation using OTASP or OMA-DM. If the modem is still not activated, contact the service provider to ensure that your account has been created and is active.

3. That the modem is receiving an IP address. To view the IP address, issue the **show interface demand** *<number>* command (detailed on page 50) and check the local IP address. You can also verify here that the demand interface is connected by making sure the interface has an IP address.

4. That your cellular configurations are correct. Verify these configurations using the **show running-config interface cellular** *<slot/port>* **verbose** command and the **show running-config interface demand** *<number>* command.

After you have verified the preceding information, and you are still having ping and connectivity failures, use the following **debug** utilities to verify your cellular configurations.

1. Debug the cellular interface using the **debug interface cellular** *<slot/port>* **data** command (detailed in *Table 6 on page 53*).

2. Debug demand routing using the **debug demand** command (detailed in *Table 6 on page 53*).

3. Debug the data call using the **debug data-call** command (detailed in *Table 6 on page 53*).

4. Debug the dialup interfaces using the **debug dialup-interfaces** command (detailed in *Table 6 on page 53*).

Low Throughput or Dropped Calls

If you are experiencing low throughput or dropped calls with your 3G CDMA or cellular interface, verify the following information:

1. That you are using the latest AOS firmware.

2. That the cellular modem is connected to the network and there is a good signal. Check the RSSI value using the **show interface cellular** *<slot/port>* command (detailed on page 48). This value should be between -60 and -90 dB.

3. That EVDO service is available in the area. To check this information, use the **show interface cellular** *<slot/port>* command (detailed on page 48).

4. That you are receiving a Rev A signal. You can verify the signal using the **show interface cellular** *<slot/port>* command (detailed on page 48).

5. That the ECIO value for both EVDO and 1xRTT is as low as possible (best is equal to or below -2 dB, good is between -5 to -6 dB).

6. That keepalives enabled on the demand interface are not contributing to dropped calls. To check this information, use the **show interface demand** *<number>* command (detailed on page 50). Refer to the notes on page 24 for more information about keepalives and the demand interface.

7. That you are using a diversity antenna.

> **NOTE**
>
> *If the RSSI and ECIO values are higher than optimal, you might be experiencing high levels of noise in your environment. This can cause packet retransmissions, lower throughput, and dropped calls.*

Attempted Call Delay on Verizon 3G CDMA NIM

The Verizon 3G NIM requires a backoff algorithm that delays calls for 15 minutes in the event of a failed call. Even across reboots, the card will not be permitted to make a call until the 15-minute limit has been reached. The following messages are shown in the event history when the 15-minute interval begins and expires. When the interval expires, the NIM can again attempt to make calls.

2010.02.22 08:35:27 CELL_INTERFACE.cellular 1/1 DATA Call failed. Initiating 15 minute backoff interval.

2010.02.22 08:50:27 CELLINTERFACE.cellular 1/1 DATA 15 minute backoff interval complete.1/1

During this backoff interval, the NIM is placed in a "retry" state. This can be seen in the output of the **show interface cellular** command when the service type is **None** and the connection state is **Disconnecting**. The following output is an example:

#show interface cellular 1/1
cellular 1/1 is DOWN (ACTIVATED)
     Service type setting is set to AUTO
     Service type is NONE
     PN Offset is Unavailable, Frequency is Unavailable
     Connection state is DISCONNECTING
     Current connection uptime is 0 sec
     Total connection uptime is 0 sec
     5 minute input rate 0 bits/sec, 0 packets/sec
     5 minute output rate 16 bits/sec, 1 packets/sec
     0 packets input, 0 bytes, 0 no buffer
     0 runts, 0 giants, 0 throttles
     0 input errors, 0 CRC, 0 frame
     0 abort, 0 discards, 0 overruns
     18 packets output, 72 bytes, 0 underruns

Resetting the 3G CDMA NIM

Once the 3G CDMA NIM is activated, it can be reset on command if necessary. The **reset** command reboots the module. To reboot the module, enter the command from the cellular interface configuration mode as follows:

(config-cellular 1/1)**#reset**