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ADTRAN

Configuration Guide

Configuring Busy-Out Monitoring in AOS

This configuration guide describes the busy-out monitoring feature for voice trunks and analog users on ADTRAN Operating System (AOS) devices. This guide includes a brief overview of the feature, the configuration steps necessary to implement busy-out monitoring, and information about troubleshooting the busy-out monitoring configuration.

This guide includes the following sections:

Busy-Out Monitoring Overview

The busy-out monitoring feature is used to monitor IP connectivity and disable Primary Rate Interfaces (PRIs), T1 interfaces, and Foreign Exchange Station (FXS) interfaces if IP connectivity is lost. If IP connectivity is lost, the busy-out monitoring feature disables the voice trunk or user, preventing the user or private branch exchange (PBX) from attempting to make a call using that FXS port or trunk. This feature uses network monitoring, namely probe and track objects, to monitor the state of the IP connection. Each voice user or trunk is disabled when an associated probe changes states from PASS to FAIL. The following illustrations depict this process. *Figure 1* describes a probe in a PASS state that is used to monitor the IP connection. *Figure 2* describes a probe in a FAIL state used in the same type of network.

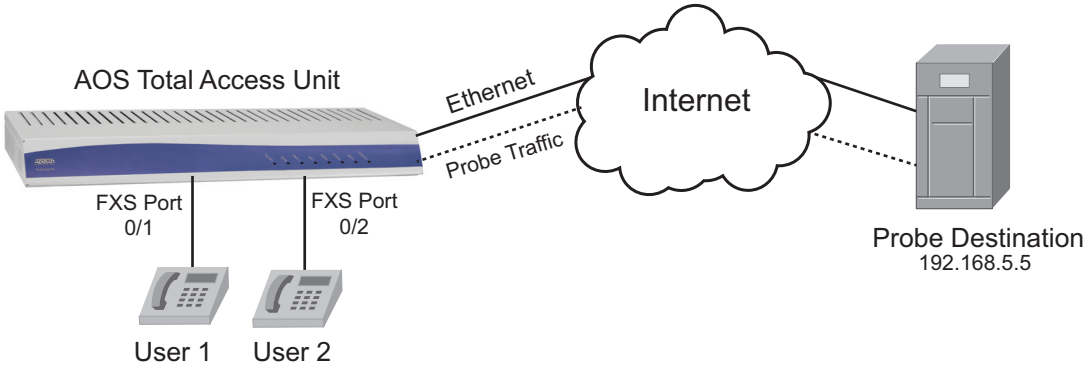

Figure 1. Busy-Out Monitoring Showing FXS Ports Available

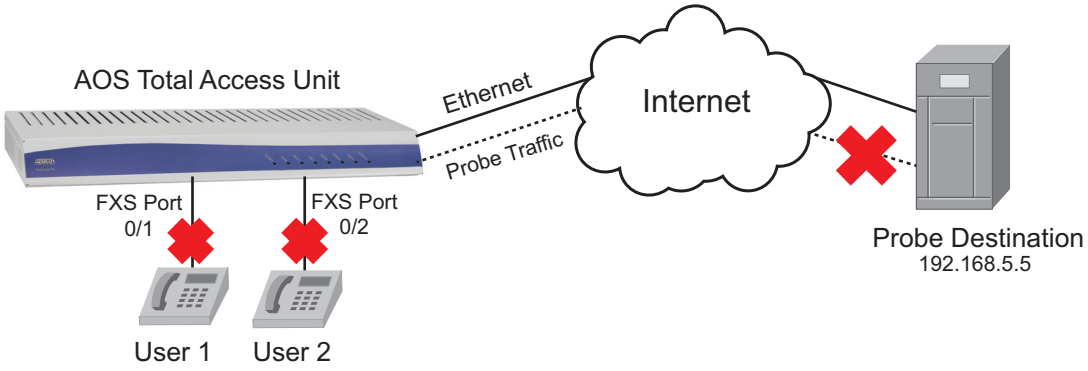

Figure 2. Busy-Out Monitoring Showing FXS Ports Unavailable

Once the track transitions to a FAIL state, the voice users are *busied out*. When the voice user attempts to make a call on an FXS port, they are alerted that the line is unavailable by a configurable alert type, such as no dial tone or a fast busy signal. Any calls that are placed to a voice user that is busied out are either rolled to another user or rejected, depending on other enabled voice features. Once the probe associated with the busied out user returns to a PASS state, the user is cleared from busy-out mode and is fully functional.

Hardware and Software Requirements and Limitations

The busy-out monitoring feature for PRI and robbed-bit signaling (RBS) trunks is available on AOS platforms running AOS firmware 16.01 or later as outlined in the *Product Feature Matrix*, available online at http://kb.adtran.com (article number 2272).

The busy-out monitoring feature for FXS ports is available on AOS platforms running AOS firmware R10.1.0 or later as outlined in the *Product Feature Matrix*, available online at http://kb.adtran.com (article number 2272).

This feature relies heavily on the principles of network monitoring. You should have a full understanding of tracks and probes and their configuration logic before configuring busy-out monitoring. This guide does not go into detail about network monitoring features or configuration. For more information about network monitoring, refer to the configuration guide *Network Monitoring in AOS*, available online at http://kb.adtran.com (article number 3007).

If the busy-out monitor disables a trunk or user, it will not be brought back up if the **no shutdown** command is issued on that interface. Likewise, if an interface has been shut down with the **shutdown** command, the busy-out monitor will not attempt to bring up the trunk or user connected to that interface even when the monitored probe is in a PASS state.

If a track is deleted, any associations with that track in the busy-out monitor will be deleted automatically. When an association is deleted, the busy-out monitor restores the previous state of the trunk if it is currently busied out due to a track/probe failure.

If a trunk is deleted using the **no voice trunk** command, any attempt to busy-out the deleted trunk receives a message that the trunk no longer exists. Track associations with a deleted trunk are not deleted automatically when the trunk is deleted, as they can also be used for other purposes.

Only one type of busy-out alert is permissible per trunk or user. Even if the trunk or user is controlled by multiple tracks, there cannot be a different busy-out alert for each track.

When PRI integrated services digital network (ISDN) trunks are busied out, the busy-out monitor takes down the D channel. When RBS trunks are busied out, the AOS product sends alarm indication signal (AIS) to the destination, effectively preventing the PBX from routing calls toward the AOS unit. When FXS ports are busied out, the port is put into the configured mode (fast-busy, no dialtone, or no battery).

Busy-out monitoring for FXS ports is done on a per-user basis (whereas PRI and RBS busy-out monitoring is configured on a per-trunk basis). Busy-out monitoring is not supported for Session Initiation Protocol (SIP) users or Media Gateway Control Protocol (MGCP) endpoints.

Configuring Busy-Out Monitoring

Busy-out monitoring is configured using the command line interface (CLI). The following steps are necessary to configure busy-out monitoring:

1. Access the CLI.
2. Create a probe to monitor IP connectivity.
3. Create a track that monitors the probe's state.
4. Enable busy-out monitoring on the trunk or user.

Step 1: Accessing the CLI

To access the CLI on your AOS unit, follow these steps:

1. Boot up the unit.
2. Telnet to the unit (**telnet** <*ip address*>). For example:

   telnet 10.10.10.1.

   > NOTE *If during the unit's setup process you have changed the default IP address (10.10.10.1), use the configured IP address.*

3. Enter your user name and password at the prompt.

   > NOTE *The AOS default user name is **admin** and the default password is **password**. If your product no longer has the default user name and password, contact your system administrator for the appropriate user name and password.*

4. Enable your unit by entering **enable** at the prompt as follows:

   >enable

5. If configured, enter your Enable mode password at the prompt.
6. Enter the unit's Global Configuration mode as follows:

   #configure terminal
   (config)#

Step 2: Configuring a Probe

Probes are objects in the unit's configuration that collect information about network connectivity by sending test traffic across network paths. The probes used by Network Monitor are either in a PASS or a FAIL state at any given time.

PASS states indicate that a probe is successfully receiving responses to the test packets sent to the designated destination, and FAIL states indicate the probe is not receiving a response to the test traffic. Each probe is defined by a number of parameters. These parameters include:

- Probe Destination: The IP address or host name where the probe test packets are sent (the address to be monitored).
- Probe Period: The time (in seconds) between probe test attempts.
- Probe Source: The source IP address for the probe packets.
- Probe Timeout: The time it takes for a test to be considered as failed.
- Probe Tolerance: The number of tests that must pass or fail before the probe changes states.

ICMP echo probes are used to test network connectivity by sending packets which either do or do not reach their destination and either do or do not receive a response. Packet size and packet data patterns can be specified for each ICMP echo probe, in addition to configurable parameters common to all probes. Most probes used in network monitoring for testing link connectivity are ICMP echo probes. Usually an ICMP echo probe is the simplest option for busy-out monitoring, with a destination as your softswitch (assuming your softswitch accepts ICMP).

To configure a probe, follow these steps:

1. Create the probe using the **probe** <*name*> **icmp-echo** command. This command creates and names the probe, as well as enters the probe's configuration mode. Enter the command from the Global Configuration mode as follows:

   ```
   (config)#probe DROPTRUNK icmp-echo
   (config-probe-DROPTRUNK)#
   ```

2. Specify the probe's destination using the **destination** <*ipv4 address* | *hostname*> command from the probe's configuration mode. IPv4 addresses should be expressed in dotted decimal notation (for example, **10.10.10.1**) and host names should be fully qualified (for example, **www.company.com**). The destination will typically be the IPv4 address of your softswitch. Enter the command as follows:

   ```
   (config-probe-DROPTRUNK)#destination 192.168.1.1
   (config-probe-DROPTRUNK)#
   ```

3. Specify the probe's period using the **period** <*value*> command from the probe's configuration mode. The period specifies the time (in seconds) between the sending of probe packets. Valid range is **1** to **65535** seconds, with a default value of **60** seconds. Enter the command as follows:

   ```
   (config-probe-DROPTRUNK)#period 30
   (config-probe-DROPTRUNK)#
   ```

4. Specify the probe's tolerance by using the **tolerance consecutive fail** <*number*> **pass** <*number*> command. The **consecutive** keyword indicates that the probe must either pass or fail a certain number of times in a row to change states. Valid range for consecutive passes is **1** to **255**; valid range for consecutive failures is **1** to **255**. In **consecutive** mode, the default value is **1**. Enter the command from the probe's configuration mode as follows:

   ```
   (config-probe-DROPTRUNK)#tolerance consecutive fail 3 pass 2
   (config-probe-DROPTRUNK)#
   ```


5. Activate the probe using the **no shutdown** command. Enter the command at the probe's configuration mode as follows:

   ```
   (config-probe-DROPTRUNK)#no shutdown
   (config-probe-DROPTRUNK)#
   ```

Repeat this configuration for as many probes as needed.

Step 3: Configuring a Track

Tracks are objects in the unit's configuration created to monitor probes for state changes, and cause other objects to take action based on the probe's state. A probe can monitor network conditions, but cannot take any action on its own. The track is tied to the probe through configuration, and specifies that an object (interface, schedule, etc.) will perform an action based on the probe's (track's) state. Tracks have PASS or FAIL states just as probes do, and use these state changes to cause objects to perform specific actions. Specific actions tracks can make objects perform include removing faulty routes, logging events, executing a tool command language (Tcl) script, controlling individual statements inside access control lists (ACLs), or controlling the availability of crypto maps. In this case, the track is configured to make a trunk or user enter busied out mode when the associated probe enters a FAIL state. It is important to understand that although the track monitors the probe's state, and causes an object to perform an action based on the link between the track and the probe, it is not the track's configuration that causes the object to take the action. The action is specified in the object's configuration by specifying the action to be taken when the track changes state.

To create a track, follow these steps:

1. Create and name the track using the **track** <*name*> command from the Global Configuration mode prompt. Enter the command as follows:

   ```
   (config)#track TESTTRACK
   (config-track-TESTTRACK)#
   ```

2. Associate the appropriate probes with the track and specify the track's testing conditions using the **test if probe** <*name*> command from the track's configuration mode. This command allows you to select one object to be associated with and tested by the track. To associate a single probe with the created track, enter the command as follows:

   ```
   (config-track-TESTTRACK)#test if probe DROPTRUNK
   (config-track-TESTTRACK)#
   ```

   In the previous example, the track will mirror the state of probe **DROPTRUNK**. If the probe is in a PASS state, the track is in a PASS state. Conversely, if the probe is in a FAIL state, the track is in a FAIL state.

Repeat this configuration for as many tracks as needed.

Step 4: Enabling Busy-Out Monitoring

Once you have configured the necessary probe(s) and track(s) for your network, you must enable busy-out monitoring on the voice trunks (PRI and RBS) or voice users (FXS) that you want to monitor. To do this, follow the steps outlined in the sections below.

Configuring Busy-Out Monitoring on PRI or RBS Trunks

The following steps are used to configure busy-out monitoring on PRI or RBS trunks.

1. Enter the trunk configuration mode for an existing PRI or RBS voice trunk. To enter a PRI (ISDN) trunk configuration mode, enter the command as follows:

   (config)**#voice trunk T02 type isdn**
   (config-T02)#

   To enter an RBS trunk configuration mode, enter the command as follows:

   (config)**#voice trunk T03 type t1-rbs supervision wink role network**
   (config-T03)#

2. After entering the configuration mode on the appropriate trunk, enable busy-out monitoring by entering the **busy-out monitor track** <*name* > command from the trunk's configuration mode. For example, to enable busy-out monitoring, and associate the monitor with the track **TESTTRACK**, enter the command as follows:

   (config-T02)**#busy-out monitor track TESTTRACK**
   (config-T02)#

Repeat these steps for any trunks configured on your network that will be using busy-out monitoring.

Configuring FXS Busy-Out Monitoring for Voice Users

The following steps are used to configure busy-out monitoring on voice users for FXS ports.

1. Enter the configuration mode for an existing voice user by entering the command **voice user** <*extension*> command from the Global Configuration mode. The <*extension*> parameter specifies the user's extension. Enter the command as follows:

   (config)**#voice user 2004**
   (config-2004)#

2. Configure the busy-out monitoring alert mode using the **busy-out alert-mode [fast-busy | no-battery | no-dialtone]** command. This command specifies the alert type received by the user when attempting to make a call when the user is busied out. The **fast-busy** parameter specifies that a fast busy tone is heard on the port, the **no-battery** parameter specifies that the battery is removed from the port, and the **no-dialtone** parameter specifies there is no dialtone on the port. Enter the command from the user's configuration mode as follows:

   (config-2004)**#busy-out alert-mode fast-busy**
   (config-2004)#

3. Enable the busy-out monitor on the user by entering the **busy-out monitor track** <*name*> command from the user's configuration mode. For example, to enable busy-out monitoring, and associate the monitor with the track **TESTTRACK**, enter the command as follows:

   (config-2004)**#busy-out monitor track TESTTRACK**
   (config-2004)#

Repeat this configuration for each voice user account on which busy-out monitoring is to be enabled.

Busy-Out Monitoring Configuration Examples

The example scenarios contained within this section are designed to enhance understanding of busy-out monitor configurations on AOS products. The examples describe some of the common real-world applications of busy-out monitoring. All configurations provided in this section use the command line interface (CLI).

> *The configuration parameters entered in these examples are sample configurations only. These applications should be configured in a manner consistent with the needs of your particular network. CLI prompts have been removed from the configuration examples to provide a method of copying and pasting configurations directly from this configuration guide into the CLI. These configurations should not be copied without first making the necessary adjustments to ensure they will function properly in your network.*

Example 1: Busy-Out Monitoring on a PRI Trunk

The following example enables busy-out monitoring on a PRI trunk. The probe **DROPTRUNK** is created, the track **TESTTRACK** is created and associated with the probe, and the PRI trunk is configured with busy-out monitoring enabled. The probe is configured so that it sends an ICMP echo request to IPv4 address 192.168.1.1 every 30 seconds with a 300 ms timeout. If the probe fails to receive 3 consecutive responses, the probe enters a FAIL state. Two consecutive responses puts the probe back into a PASS state. The track, TESTTRACK, monitors the probe and determines if it is in a PASS or FAIL state, and changes its state accordingly. When the track is in a FAIL state, the PRI trunk (T02) is put in busied out mode.

```
!
probe DROPTRUNK icmp-echo
  destination 192.168.1.1
  period 30
  timeout 300
  tolerance consecutive fail 3 pass 2
  no shutdown
!
track TESTTRACK
  test if probe drop-trunk
!
voice trunk T02 type isdn
  busy-out monitor track TESTTRACK
!
```


Example 2: Busy-Out Monitoring on an FXS Port

The following example enables busy-out monitoring on voice user 2004 for FXS port 0/1. The probe **BUSYOUT** is created, the track **BUSYOUT** is created and associated with the probe, and the voice user account is configured with busy-out monitoring enabled. The probe is configured so that it sends an ICMP echo request to IPv4 address 192.168.5.5 every 30 seconds. If the probe fails to receive 4 consecutive responses, the probe enters a FAIL state. Three consecutive responses puts the probe in a PASS state. The track, BUSYOUT, monitors the probe, and when it is in a FAIL state, the FXS port is put in busied out mode with a fast busy alert tone.

```
!
probe BUSYOUT icmp-echo
   destination 192.168.5.5
   period 30
   timeout 300
   tolerance consecutive fail 4 pass 3
   no shutdown
!
track BUSYOUT
   test if probe BUSYOUT
!
voice user 2004
   busy-out alert-mode fast-busy
   busy-out monitor track BUSYOUT
!
```

Busy-Out Monitoring Configuration Command Summary

The following table summarizes the configuration commands used to configure busy-out monitoring.

Table 1. Busy-Out Monitoring Command Summary

Prompt	Command	Description
(config)#	**probe** <*name*> **icmp-echo**	Creates and names an ICMP echo probe, and enters the probe's configuration mode.
(config-probe-PROBE)#	**destination** <*ipv4 address* | *hostname*>	Specifies the probe's destination. IPv4 addresses should be expressed in dotted decimal notation (for example, **10.10.10.1**) and host names should be fully qualified (for example, **www.company.com**).
(config-probe-PROBE)#	**period** <*value*>	Specifies the time (in seconds) between the sending of probe packets. Valid range is **1** to **65535** seconds, with a default value of **60** seconds.

Table 1. Busy-Out Monitoring Command Summary *(Continued)*

Prompt	Command	Description
(config-probe-PROBE)#	**tolerance consecutive pass** <*number*> **fail** <*number*>	Specifies that the probe must either pass or fail a certain number of times in a row to change states. Valid range for consecutive passes and failures is **1** to **255**; with a default value of **1**.
(config-probe-PROBE)#	**no shutdown**	Activates the probe.
(config)#	**track** <*name*>	Creates and names a track, and enters the track's configuration mode.
(config-track-TRACK)#	**test if probe** <*name*>	Associates the track with a probe. The track will mirror the state of the associated probe.
(config)#	**voice trunk** <*trunk id*> **type isdn**	Creates an ISDN (PRI) trunk, specifies the trunk's two-digit identifier, and enters the trunk's configuration mode.
(config)#	**voice trunk** <*trunk id*> **type t1-rbs supervision [fgd role network | fgd role user | ground-start role user | immediate role network | immediate role user | loop-start role user | wink role network | wink role user]**	Creates a T1 (RBS) trunk, specifies the trunk's two-digit identifier, supervision, and role, and enters the trunk's configuration mode.
(config-T01)#	**busy-out monitor track** <*name*>	Enables busy-out monitor on the trunk and associates the monitor with a track.
(config)#	**voice user** <*extension*>	Creates a voice user account, specifies the user's extension, and enters the voice user configuration mode.
(config-2004)#	**busy-out alert-mode [fast-busy | no-battery | no-dialtone]**	Specifies the busy-out monitoring alert method on the FXS port for the voice user.
(config-2004)#	**busy-out monitor track** <*name*>	Enables busy-out monitor on the voice user for the connected FXS port and associates the monitor with a track.

Troubleshooting

The following **show** and **debug** commands can be used to view busy-out monitoring statistics, configured probes and tracks, or to enable debug messages associated with busy-out monitoring behavior. These commands are all entered from the Enable mode prompt.

Show Commands

Use the following **show** commands to view statistics associated with busy-out monitoring and its components, and to verify proper configuration.

1. Use the **show busy-out monitor** command to display busy-out monitoring information, including trunk and track associations. Enter the command as follows:

```
>enable
#show busy-out monitor
Account         Track                          Track
Name            Name                           State
-------------------------------------------------------------------------
T02             TESTTRACK                      Fail
```

2. Use the **show probe** command to display the current status for all configured probes. Enter the command as follows:

```
>enable
#show probe
Probe DROPTRUNK:
    Current State: PASS Admin. Status: UP
    Type: ICMP Echo Period: 60 sec Timeout: 1500 msec
    Source: 0:0:0:0 Destination: 192.168.5.5
    Data size: 0
    Tracked by: TESTTRACK
    Test Run: 98 Failed: 0
    Tolerance: 3
    Time in current state: 0 days, 1 hours, 38 minutes, 16 seconds
```


3. Use the **show track** command to display the current status for all configured tracks. Enter the command as follows:

```
>enable
#show track
Track: TESTTRACK
    Current State: PASS
    Test Value: probe BUSYOUT (PASS)
    Track Changes: 0
    Time in current state: 0 days, 1 hours, 38 minutes, 16 seconds
```

4. Use the **show interface fxs** <*slot/port*> command to display the two-wire and busy-out status for the FXS port. Enter the command as follows:

```
>enable
#show interface fxs 2/1
Two-wire Status is: No Battery
Busyout Status is: Busyout
Test Status is INACTIVE
    No Tests
Impedance is: 600 ohms +2.16uF
Transmit Gain is: -6.0dB
Receive Gain is: -3.0dB
Ring frequency is: 20 Hz
Ring voltage is: 50 Vrms
Ring voltage DC Offset is: -20 V
Signal Mode: Loop-Start
Last clearing of the “show interface” counters: never
Caller ID Format is: Multiple Data Message Format
Caller ID Time is: Mar 12 10:34 AM
Caller ID TimeZone is: -6-Central-Time
Battery Mode: Auto
    Currently using: High
```

Debug Commands

The following **debug** commands enable debug messaging for busy-out monitoring. The configured probes and tracks are used to gather debug information so that you can see the changes in the trunk or voice user’s status.

Turning on a large amount of debug information can adversely affect the performance of your unit.

1. Use the **debug probe** command to display any debug messages for all configured probes. Enter the command as follows:

```
>enable
#debug probe
NETMON. PROBE BUSYOUT: value changed to fail
NETMON. PROBE BUSYOUT: Request timed out. (failed)
```


2. Use the **debug track** command to display any debug messages for all configured tracks. Enter the command as follows:

```
>enable
#debug track
NETMON. TRACK TESTTRACK: Controlling account T02 New State: FAIL
NETMON. TRACK TESTTRACK changed from pass to fail
```

