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ADTRAN

Configuration Guide

Configuring Auto-Link in AOS for n-Command MSP

This configuration guide describes the auto-link feature and its use with ADTRAN Operating System (AOS) products and the n-Command® managed service provider (MSP) server. This guide provides all necessary information for step-by-step configuration of the AOS product through the command line interface (CLI) and the web-based graphical user interface (GUI).

This guide consists of the following sections:

n-Command MSP and Auto-Link Overview

ADTRAN's n-Command MSP is a suite of managed services software and network productivity tools for NetVanta and Total Access-based networks. The system provides the management tools necessary to quickly respond to networking changes and make better use of limited resources while monitoring network performance.

ADTRAN products can be linked to and managed by a single n-Command MSP server, or multiple MSP servers can be configured to provide service redundancy if managed products lose communication with the primary n-Command MSP server. ADTRAN products communicate with the n-Command server(s) using the AOS auto-link feature. This feature is configured using the CLI or the GUI, and is configured in the following basic steps:

- Specify the primary and secondary auto-link server(s)
- Specify the auto-link virtual routing and forwarding (VRF) instance (optional)
- Specify the recontact interval (optional)
- Specify the temporary recontact penalty (optional)
- Specify the communication method and service record (SRV) parameters (optional)
- Enable the auto-link feature

Auto-Link Redundancy

Auto-link redundancy is a feature introduced in AOS firmware release R10.7.0. This feature allows the configuration of multiple n-Command MSP servers that are available to ADTRAN products connected to MSP through auto-link. When multiple MSP servers are configured, ADTRAN units can roll over to the next MSP server for management if the current MSP server fails. On each attempt to contact the MSP server, the ADTRAN unit first attempts to contact the first host in the primary MSP server entry. If that host is unavailable, the unit attempts to connect to subsequent hosts in the primary MSP server entry. If all hosts in the primary MSP server entry cannot be contacted, auto-link fails over to the secondary MSP server list and attempts to contact the hosts in the first entry of the secondary server list. Failovers can be triggered by one of the following situations:

- Auto-link receives an Hypertext Transport Protocol (HTTP) error response (4xx or 5xx) from the MSP server
- The MSP server cannot be contacted (there is no route to the host)
- The MSP server can be contacted, but does not respond (the HTTP client times out after 20 to 30 seconds)

Each n-Command MSP server is specified in auto-link configuration by an IP address or a fully qualified domain name (FQDN). FQDNs can point to either A records or SRV records. The order of preference for each configured IP address or FQDN for a secondary MSP server entry is determined by the order in which they were configured. The order of preference for hosts contained in a resolved SRV record is based on the priority and weight of each record.

In addition, this feature allows other AOS management and monitoring services to communicate with the same n-Command MSP server used by auto-link. Voice quality monitoring (VQM) reports, Simple Network Management Protocol (SNMP) traps, and packet captures can be sent to the server currently selected by auto-link. If auto-link should fail over to another MSP server, these features will also fail over to the new server. Refer to *Additional Resources on page 12* for more information about these additional features.

Hardware and Software Requirements and Limitations

The AOS auto-link feature is supported in all AOS data platforms running AOS firmware 17.05.04 or later and in all AOS voice platforms running AOS firmware A2.04 or later.

The AOS auto-link redundancy feature is available in all AOS products running AOS firmware R10.7.0 or later. Auto-link redundancy is only supported on n-Command MSP servers running MSP software version 6.1 or later.

In AOS firmware release R11.12.0, the auto-link feature was enhanced to support CLI configuration on a non-default VRF instance. For more information about VRFs, refer to the configuration guide *Configuring Multi-VRF in AOS*, available online at https://supportforums.adtran.com.

Auto-link must be configured on the AOS product before the unit will be able to communicate with or be managed by the server. Without auto-link enabled and configured, the n-Command MSP server cannot automatically detect the AOS product for management.

When configuring auto-link for redundancy, keep in mind the following considerations:

- Only one entry is allowed for the primary n-Command MSP server. In addition, primary servers cannot be deleted if any secondary servers are configured.
- Multiple entries can be configured for secondary n-Command MSP servers. Duplicate entries are not allowed.
- The priority of secondary servers is determined by the order in which they were configured.
- If a configured FQDN has a resolvable SRV record, each server from the SRV record is contacted in the order defined by RFC 2782.
- If a failover event occurs, auto-link immediately fails over to the next MSP server address for the configured FQDN. It does not wait for the next recontact interval before failing over. In addition, the session is restarted and the AOS device sends a discovery to the new server.
- Hosts that cause repeated failures can be blacklisted. This capability is disabled by default, but can be configured following the steps in *Specifying the Recontact Interval Penalty (Optional) on page 6*. If the blacklist ever contains all configured MSP hosts, the list is emptied immediately.
- If auto-link fails to contact any MSP server, it stops attempting to do so and waits a random interval between one and two minutes before attempting connection again. When it does resume connection attempts, it begins with the configured primary MSP server entry.
- You can specify multiple sources for an MSP server's port number. If an SRV record is returned, the port number included for that MSP server's host is used. If an A record is returned, the configured port number is used. If no port is configured, then the default HTTP port (80) or HTTP over Secure Socket Layer (HTTPS) port (443) is used (depending on the HTTP/HTTPS configuration of auto-link).

Configuring Auto-Link Using the CLI

The auto-link feature can be configured using either the CLI or the GUI. The following sections describe how to configure auto-link using the CLI.

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.

   > *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.

   > *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. Enter your Enable mode password at the prompt.
6. Enter the unit's Global Configuration mode as follows:

   #configure terminal
   (config)#

Specifying the n-Command Auto-Link Server

The host name or the IP address of the server with which the AOS product will communicate must be specified for communication to take place. You must specify a primary server, and can optionally specify secondary servers to use in failover situations. Only one entry is allowed for the primary MSP server. To delete the primary MSP server, you must first remove all configured secondary servers.

To specify the primary server, enter the server's host name, IP address, or FQDN from the unit's Global Configuration mode using the **auto-link server primary** <*hostname* | *ip address*> **[port** <*port*>**]** command. IP addresses should be expressed in decimal dotted notation (for example, **10.10.10.1**). The optional **port** parameter specifies the port number used to communicate with the primary server. Valid port range is **1** to **65535**. By default, auto-link will use port **80** for HTTP, or port **443** for HTTPS, depending on the specified communication method (refer to *Specifying the Communication Method (Optional) on page 6*). Use the **no** form of this command to remove the primary server from the configuration.

Enter the command as follows:

(config)**#auto-link server primary 10.10.10.10**
(config)**#**

To specify a secondary server, enter the server's host name, IP address, or FQDN from the unit's Global Configuration mode using the **auto-link server secondary** <*hostname* | *ip address*> **[port** <*port*>**]** command. Secondary servers are used in auto-link failover situations where the primary server is unavailable. Multiple entries can be configured for the secondary server. The priority of secondary servers is determined by the order in which the servers are configured. IP addresses should be expressed in decimal dotted notation (for example, **10.10.10.1**). The optional **port** parameter specifies the port number used to communicate with the primary server. Valid port range is **1** to **65535**. By default, auto-link will use port **80** for HTTP, or port **443** for HTTPS, depending on the specified communication method (refer to *Specifying the Communication Method (Optional) on page 6*). Use the **no** form of this command to remove the secondary server from the configuration. To specify the secondary server IP address and the server port, enter the command as follows:

(config)**#auto-link server secondary 10.10.10.20 port 8080**
(config)**#**

The server is now specified and the unit and the server can communicate.

Specifying the Auto-link VRF (Optional)

By default, auto-link is configured on the default (unnamed) VRF. You can optionally configure auto-link to operate on a non-default, previously configured VRF by specifying the VRF in the auto-link feature's configuration. To specify that auto-link operate on a non-default VRF, enter the **auto-link vrf** <*name*> command from the Global Configuration mode. The <*name*> parameter is the name of the non-default VRF on which auto-link should operate. All auto-link messages are transmitted on the specified VRF. When a domain name is specified as the auto-link server, the DNS lookups also occur on the VRF. If a specified VRF does not exist, an error message is displayed. Using the **no** version of this command returns auto-link communication to the default VRF. To specify that auto-link communicates on a non-default VRF, enter the command as follows:

(config)**#auto-link vrf RED**
(config)**#**

Specifying the Recontact Interval (Optional)

Each AOS unit recontacts the n-Command auto-link server at specified intervals. By default, the AOS unit recontacts the server every **3600** seconds. You can specify a different recontact interval by specifying the number of seconds the unit will wait before recontacting the server. The valid recontact interval range is **300** to **604800** seconds. You can also set the recontact interval to **0** seconds, which disables the recontact feature. To specify a recontact interval different than the default, enter the **auto-link recontact-interval** <*value*> command from the Global Configuration mode prompt as follows:

(config)**#auto-link recontact-interval 7200**
(config)**#**

ADTRAN does not recommend specifying a recontact interval less than 3600 seconds.

The recontact interval is now specified.

Specifying the Recontact Interval Penalty (Optional)

Hosts that cause repeated communication failures can optionally be blacklisted in the auto-link configuration. This penalty list is temporary and is disabled by default. If a server or configured IP address causes a failover event three consecutive times, it is added to the penalty list. Once added to the list, auto-link will not contact the server for a configured number of recontact intervals.

To enable and configure the penalty list, enter the **auto-link penalty** <*value*> command from the Global Configuration mode. The <*value*> parameter specifies the number of recontact intervals that the server will stay in the penalty list. Valid range is **0** to **65535**; using a value of **0** disables the penalty feature. Penalty lists can be based on IP addresses and port numbers. Host IP addresses and port numbers returned from DNS requests, as well as configured IP addresses and port numbers, can be penalized.

To enable recontact interval penalties, and specify that penalized servers remain on the list for **30** recontact intervals, enter the command as follows:

```
(config)#auto-link penalty 30
(config)#
```

The recontact interval penalty is now enabled and specified.

Specifying the Communication Method (Optional)

The AOS unit can communicate with the server using either HTTP or HTTPS. By default, the unit communicates with the server using HTTPS. If you want to change the communication method to HTTP, you can do so by entering the **auto-link http** command from the unit's Global Configuration mode prompt. To change the communication method to HTTP, enter the command as follows:

```
(config)#auto-link http
(config)#
```

If you want to change the communication method back to HTTPS, enter the **auto-link https** command from the unit's Global Configuration mode prompt. To change the communication method to HTTPS, enter the command as follows:

```
(config)#auto-link https
(config)#
```

The communication method is now specified.

Specifying the SRV Service Name Prefixes (Optional)

You can optionally choose to specify the service name prefix of SRV requests when configuring auto-link. The service name prefix, such as **_http**, can be any arbitrary string, but the protocol prefix is **_tcp** for auto-link. Service name prefixes are configured using the **auto-link [http | https] srv** <*prefix*> command from the Global Configuration mode prompt. The **http** and **https** parameters refer to the communication method used by the AOS unit (as described in *Specifying the Communication Method (Optional) on page*

6). You can configure both the communication method and service name prefix using this command. If no service name prefix is configured, and auto-link is communicating using HTTP, the default prefix of **_http** is used. If no service name prefix is configured, and auto-link is communicating using HTTPS, the default prefix of **_https** is used. To specify a service name prefix, enter the command as follows:

(config)**#auto-link http srv auto-link**
(config)#

Do not include the leading underscore for service name prefixes. The underscore is added automatically.

Enabling Auto-Link

By default, auto-link is disabled on AOS products. To enable auto-link, enter the **auto-link** command from the unit's Global Configuration mode as follows:

(config)**#auto-link**
(config)#

Auto-link is now enabled. To disable auto-link, use the **no** form of this command.

Saving the Configuration

After you have completed enabling and configuring auto-link in your AOS product, you should save the configuration. To do so, exit the Global Configuration mode with the **end** command and enter the **write** command from the Enable mode prompt. Enter the command as follows:

(config)**#end**
#write
Building Configuration...
Success!

The auto-link feature is now enabled and configured, and your AOS unit can now communicate with the n-Command MSP server(s). n-Command MSP will now be able to automatically detect the AOS unit, and all AOS management can be performed using n-Command MSP.

Configuring the Auto-Link Client Using the GUI

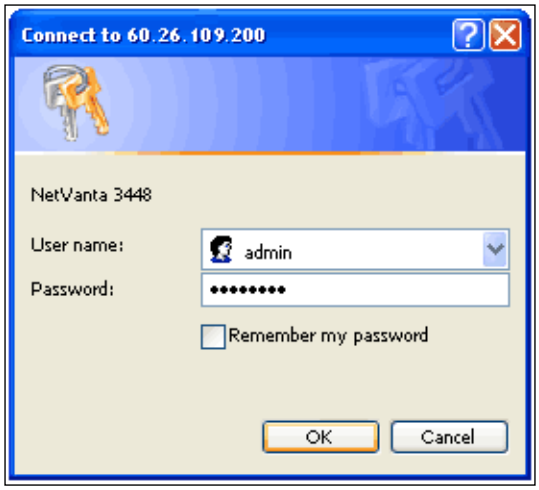
The auto-link feature can also be configured using the GUI. To configure auto-link using the GUI, follow these steps:

1. Open a new web page in your Internet browser.
2. Enter your AOS product's IP address in the Internet browser's address field in the form **http://***<ip address>*, for example:

   http://10.10.10.1

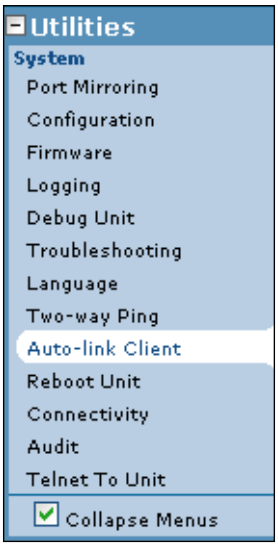
> *If during the unit's setup process you have changed the default IP address (**10.10.10.1**), use the configured IP address.*

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



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

4. Navigate to **Utilities** > **Auto-link Client** using the menu on the left of the GUI.



5. In the **Auto-link Client Configuration** menu, select the check box next to **Enabled** to enable auto-link on the AOS product.

   Enter the recontact interval in the **Re-contact Interval** field. By default, the AOS unit recontacts the n-Command auto-link server every **3600** seconds. The valid recontact interval range is **300** to **604800** seconds. Setting the recontact interval to **0** disables the recontact feature.

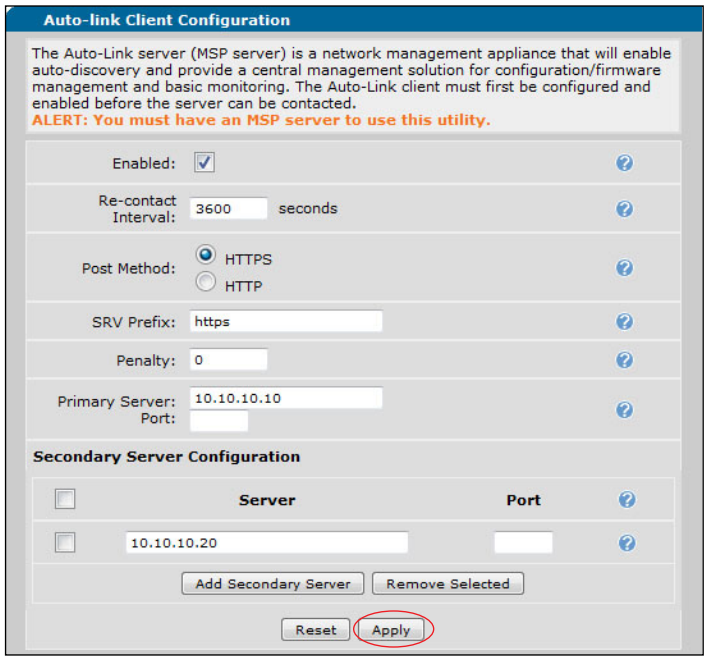
   Specify the communication method used by the auto-link server by selecting either **HTTPS** or **HTTP**. Auto-link uses HTTPS by default. Then optionally specify the SRV service name prefix in the **SRV Prefix** field. If no prefix is specified, auto-link uses **_http** if the post method is HTTP, or **_https** if the post method is HTTPS. Do not include the underscore when specifying an SRV service name prefix, as it is automatically added.

   Use the **Penalty** field to specify the number of recontact intervals that a blacklisted server remains on the penalty list. Valid range is **1** to **65535**. Entering a value of **0** disables the penalty feature. IP addresses or servers are blacklisted if they cause repeated communication failures, and they will not be contacted for the specified number of recontact intervals. This option is disabled by default.

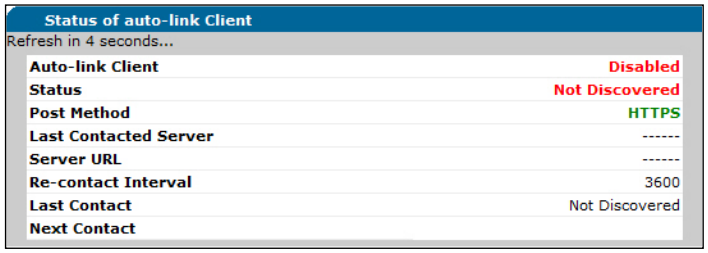
   Specify the primary n-Command server by entering the server's host name or IP address in the **Primary Server** field. Optionally specify the primary server's port number. Valid range is **1** to **65535**. If you do not specify a port number, port **80** is used if the post method is HTTP, and port **443** is used if the post method is HTTPS.

   Optionally specify secondary servers by selecting **Add Secondary Server** and entering the server's host name or IP address in the field. Optionally specify the secondary server's port number. Valid range is **1** to **65535**. If you do not specify a port number, port **80** is used if the post method is HTTP, and port **443** is used if the post method is HTTPS. Secondary servers are used in auto-link failover situations where the primary server is unavailable. Multiple entries can be configured for the secondary server. The priority of secondary servers is determined by the order in which the servers are configured. Secondary servers are removed by selecting the check box next to the server and selecting **Remove Selected**.

Once these settings have been configured, select **Apply**.



6. Save the configuration by selecting **Save** from the upper right corner of the GUI.
7. To view auto-link statistics, navigate to **Utilities** > **Auto-link Client** and scroll to the **Status of auto-link Client** menu.



Troubleshooting Auto-link Configuration

The following section describes **show** and **debug** commands that can be used to troubleshoot auto-link configuration. Troubleshooting commands are issued from the Enable mode on the AOS device.

Use the **show auto-link** command to show the configured primary MSP server entry and the list of secondary MSP servers. In addition, any penalized servers are displayed, as well as the VRF on which auto-link is configured (if it is the default VRF, the VRF information is not displayed). To view the auto-link configuration, enter the command as follows:

```
>enable
#show auto-link
Auto-Link: Enabled
    Use Http: Enabled
    Server URL: primary.mspserver.com/al/DiscoveryProcessor?action=devinfo
    SRV Prefix: _http._tcp.
    Primary Server: primary.mspserver.com:80
    Secondary Servers:
```



```
    secondary1.mspserver.com:80
    secondary2.mspserver.com:8080
    secondary3.mspserver.com:8080
  Temporarily Blacklisted IP Addresses:
    10.10.10.30:80              -18 of 20 recontact intervals remaining
    10.10.20.20:8080            -2 of 20 recontact intervals remaining
  Recontact Interval: 3600 seconds
  Last Contact: Not Discovered
  Next Contact:
  Status: Discovered
  Last Contacted Server: 10.10.10.20:80
```

Use the **show running-config auto-link [verbose]** command to view auto-link in the unit's running configuration. This command displays all commands used to configure auto-link. Using the optional **verbose** parameter additionally displays the auto-link commands that are using the default setting. To view the auto-link configuration in the unit's running configuration, enter the command as follows:

```
>enable
#show running-config auto-link
Building configuration...
auto-link
auto-link http
auto-link server primary primary.mspserver.com port 80
auto-link server secondary secondary1.mspserver.com port 80
auto-link server secondary secondary2.mspserver.com port 8080
auto-link server secondary 10.10.10.20
```

Use the **debug auto-link** command to enable the debug messaging for auto-link. These messages contain information pertaining to the servers that auto-link is attempting to contact. The command output describes which n-Command MSP server auto-link is currently attempting to contact, which attempts have failed, and the reason an attempt has failed. To enable debug messaging for auto-link, enter the command as follows:

```
>enable
#debug auto-link
12:17:47 AUTOLINK HeartbeatTimerEvent::attemptExecution scheduledExecution ==false.
12:17:47 AUTOLINK HeartbeatTimerEvent::createDefaultPeriodicTimer.
12:17:47 AUTOLINK HeartbeatTimerEvent::getRetryTimer() == 3600.
12:17:47 AUTOLINK OnSendDiscovery
12:17:47 AUTOLINK resetHttpClientStreams ().
12:17:47 AUTOLINK closeHttpConnection ().
12:17:47 AUTOLINK deleteHttpClientStreams ().
12:17:47 AUTOLINK getSystemUpTime - Success.
12:17:47 AUTOLINK Sending initial discovery message to
    172.20.20.11/al/DiscoveryProcessor?action=devinfo
12:17:48 AUTOLINK OnWaitForReply
12:17:48 AUTOLINK OnDiscoveryFailed: Discovery failed.
12:17:48 AUTOLINK Failed to contact 172.20.20.10:80 (Primary Server - _http._tcp.server1.abc.com)
12:17:48 AUTOLINK Failure reason: HTTP error 403 - Forbidden.
12:17:48 AUTOLINK Failover to 172.20.20.11:80 (Primary Server - _http._tcp.server1.abc.com)
```


Additional Resources

Auto-link is used with n-Command MSP and a number of other AOS features. These features include VQM Reporting, SNMP management, and packet capture. These features also use the auto-link failover feature. For more information about these features, refer to the configuration guides included in *Table 1*. All documents are available online at https://supportforums.adtran.com.

Table 1. Additional Auto-Link Feature Documentation

Feature	Document Title
VQM Reporting	*Configuring VQM Reporter in AOS for n-Command MSP*
SNMP	*Configuring SNMP in AOS*
Packet Capture	*Configuring Packet Capture in AOS*
VRF Configuration	*Configuring Multi-VRF in AOS*

