Troubleshooting Connections and Resources

This chapter describes how to troubleshoot the ASA.

Testing Your Configuration

This section describes how to test connectivity for the single mode ASA or for each security context, how to ping the ASA interfaces, and how to allow hosts on one interface to ping through to hosts on another interface.

Test Basic Connectivity: Pinging Addresses

Ping is a simple command that let's you determine if a particular address is alive and responsive. The following topics explain more about the command and what types of testing you can accomplish with it.

What You Can Test Using Ping

When you ping a device, a packet is sent to the device and the device returns a reply. This process enables network devices to discover, identify, and test each other.

You can using ping to do the following tests:

- Loopback testing of two interfaces—You can initiate a ping from one interface to another on the same ASA, as an external loopback test to verify basic "up" status and operation of each interface.
- Pinging to an ASA—You can ping an interface on another ASA to verify that it is up and responding.
- Pinging through an ASA—You can ping through an intermediate ASA by pinging a device on the other side of the ASA. The packets will pass through two of the intermediate ASA's interfaces as they go in each direction. This action performs a basic test of the interfaces, operation, and response time of the intermediate unit.
- Pinging to test questionable operation of a network device—You can ping from an ASA interface to a network device that you suspect is functioning incorrectly. If the interface is configured correctly and an echo is not received, there might be problems with the device.
- Pinging to test intermediate communications—You can ping from an ASA interface to a network device that is known to be functioning correctly. If the echo is received, the correct operation of any intermediate devices and physical connectivity is confirmed.

Choosing Between ICMP and TCP Ping

The ASA includes the traditional ping, which sends ICMP Echo Request packets and gets Echo Reply packets in return. This is the standard tool and works well if all intervening network devices allow ICMP traffic. With ICMP ping, you can ping IPv4 or IPv6 addresses, or host names.

However, some networks prohibit ICMP. If this is true of your network, you can instead use TCP ping to test network connectivity. With TCP ping, the ping sends TCP SYN packets, and considers the ping a success if it receives a SYN-ACK in response. With TCP ping, you can ping IPv4 addresses or host names, but you cannot ping IPv6 addresses.

Keep in mind that a successful ICMP or TCP ping simply means that the address you are using is alive and responding to that specific type of traffic. This means that basic connectivity is working. Other policies running on a device could prevent specific types of traffic from successfully getting through a device.

Enable ICMP

By default, you can ping from a high security interface to a low security interface. You just need to enable ICMP inspection to allow returning traffic through. If you want to ping from low to high, then you need to apply an ACL to allow traffic.

When pinging an ASA interface, any ICMP rules applied to the interface must allow Echo Request and Echo Response packets. ICMP rules are optional: if you do not configure them, all ICMP traffic to an interface is allowed.

This procedure explains all of ICMP configuration you might need to complete to enable ICMP pinging of ASA interfaces, or for pinging through an ASA.

Procedure

Step 1 Ensure ICMP rules allow Echo Request/Echo Response.

ICMP rules are optional and apply to ICMP packets sent directly to an interface. If you do not apply ICMP rules, all ICMP access is allowed. In this case, no action is required.

However, if you do implement ICMP rules, ensure that you include rules that permit any address for the Echo and Echo-Reply messages on each interface. Configure ICMP rules on the **Configuration > Device Management > Management Access > ICMP** page.

Step 2 Ensure access rules allow ICMP.

When pinging a host through an ASA, access rules must allow ICMP traffic to leave and return. The access rule must at least allow Echo Request/Echo Reply ICMP packets. You can add these rules as global rules.

If you do not have access rules, you will need to also allow the other type of traffic you want, because applying any access rules to an interface adds an implicit deny, so all other traffic will be dropped.

Configure access rules on the **Configuration > Firewall > Access Rules** page. If you are simply adding the rules for testing purposes, you can delete them after completing the tests.

Step 3 Enable ICMP inspection.

ICMP inspection is needed when pinging through the ASA, as opposed to pinging an interface. Inspection allows returning traffic (that is, the Echo Reply packet) to return to the host that initiated the ping, and also ensures there is one response per packet, which prevents certain types of attack.

You can simply enable ICMP inspection in the default global inspection policy.

a. Choose **Configuration > Firewall > Service Policy Rules**.

b. Edit the **inspection_default** global rule.

c. On the **Rule Actions > Protocol Inspection** tab, select ICMP.

d. Click **OK**, then **Apply**.

Ping Hosts

To ping any device, you simply choose **Tools > Ping**, enter the IP address or host name of the destination you are pinging, and click **Ping**. For TCP ping, you select **TCP** and also include the destination port. That is usually the extent of any test you need to run.

Example output for a successful ping:

```
Sending 5, 100-byte ICMP Echos to out-pc, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms
```

If the ping fails, the output indicates ? for each failed attempt, and the success rate is less than 100 percent (complete failure is 0 percent):

```
Sending 5, 100-byte ICMP Echos to 10.132.80.101, timeout is 2 seconds:
?????
Success rate is 0 percent (0/5)
```

However, you can also add parameters to control some aspects of the ping. Following are your basic options:

- ICMP ping—You can select the interface through which the destination host is connected. If you do not select an interface, the routing table is used to determine the correct interface. You can ping IPv4 or IPv6 addresses or host names.
- TCP ping—You must also select the TCP port for the destination you are pinging. For example, **www.example.com 80** to ping the HTTP port. You can ping IPv4 addresses or host names, but not IPv6 addresses.

You also have the option to specify the source address and port that is sending the ping. In this case, optionally select the interface through which the source sends the ping (the routing table is used when you do not select an interface).

Finally, you can specify how often to repeat the ping (the default is 5 times) or the timeout for each attempt (the default is 2 seconds).

Test ASA Connectivity Systematically

If you want to do a more systematic test of ASA connectivity, you can use the following general procedure.

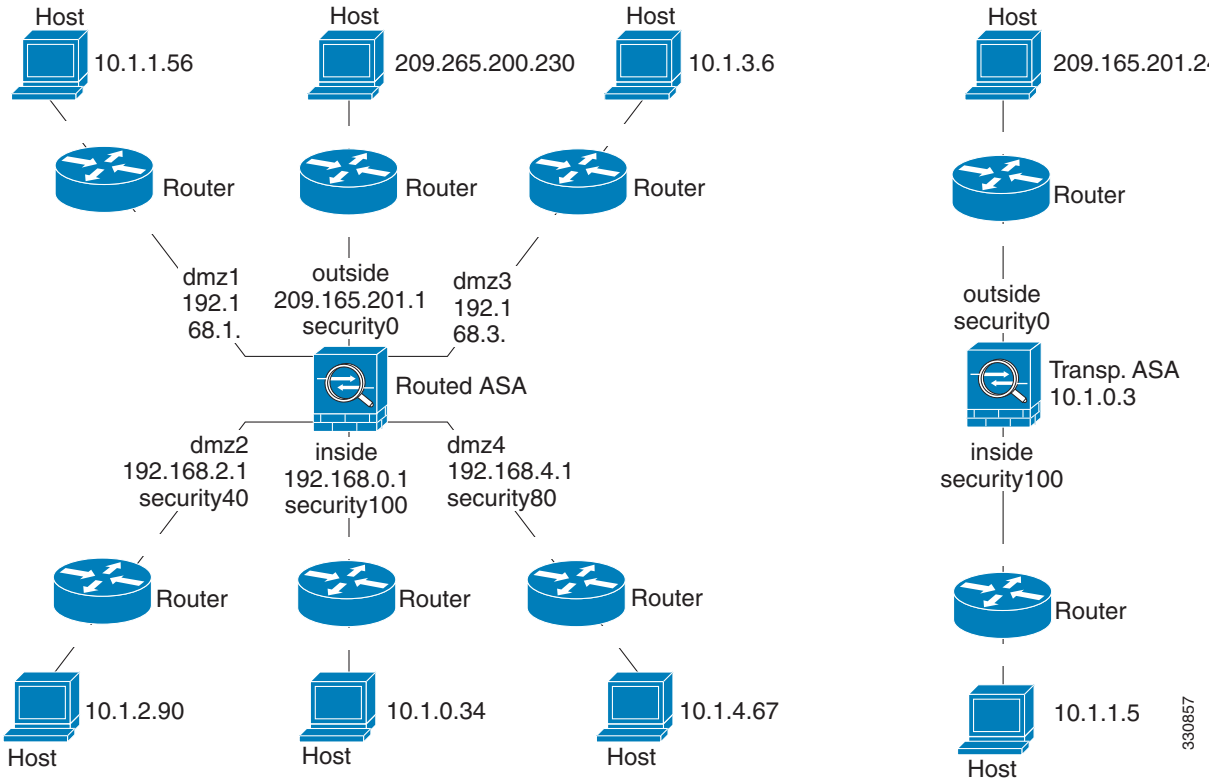
Before You Begin

If you want to see the syslog messages mentioned in the procedure, enable logging (the **logging enable** command, or **Configuration > Device Management > Logging > Logging Setup** in ASDM).

Procedure

Step 1 Draw a diagram of your single-mode ASA or security context that shows the interface names, security levels, and IP addresses. The diagram should also include any directly connected routers and a host on the other side of the router from which you will ping the ASA.

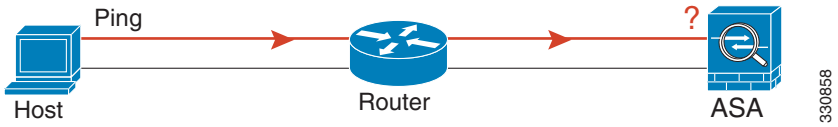
Figure 14-1 Network Diagram with Interfaces, Routers, and Hosts



Step 2 Ping each ASA interface from the directly connected routers. For transparent mode, ping the management IP address. This test ensures that the ASA interfaces are active and that the interface configuration is correct.

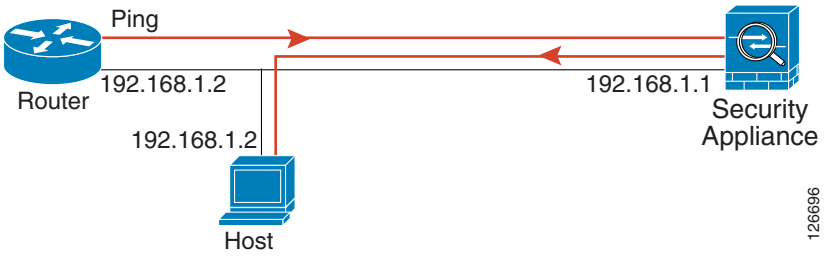
A ping might fail if the ASA interface is not active, the interface configuration is incorrect, or if a switch between the ASA and a router is down (see the following figure). In this case, no debugging messages or syslog messages appear, because the packet never reaches the ASA.

Figure 14-2 Ping Failure at the ASA Interface



If the ping reply does not return to the router, then a switch loop or redundant IP addresses might exist (see the following figure).

Figure 14-3 Ping Failure Because of IP Addressing Problems



Step 3 Ping each ASA interface from a remote host. For transparent mode, ping the management IP address. This test checks whether the directly connected router can route the packet between the host and the ASA, and whether the ASA can correctly route the packet back to the host.

A ping might fail if the ASA does not have a return route to the host through the intermediate router (see the following figure). In this case, the debugging messages show that the ping was successful, but syslog message 110001 appears, indicating a routing failure has occurred.

Figure 14-4 Ping Failure Because the ASA Has No Return Route

Step 4 Ping from an ASA interface to a network device that you know is functioning correctly.

- If the ping is not received, a problem with the transmitting hardware or interface configuration may exist.
- If the ASA interface is configured correctly and it does not receive an echo reply from the “known good” device, problems with the interface hardware receiving function may exist. If a different interface with “known good” receiving capability can receive an echo after pinging the same “known good” device, the hardware receiving problem of the first interface is confirmed.

Step 5 Ping from the host or router through the source interface to another host or router on another interface. Repeat this step for as many interface pairs as you want to check. If you use NAT, this test shows that NAT is operating correctly.

If the ping succeeds, a syslog message appears to confirm the address translation for routed mode (305009 or 305011) and that an ICMP connection was established (302020). You can also enter either the **show xlate** or **show conns** command to view this information.

The ping might fail because NAT is not configured correctly. In this case, a syslog message appears, showing that the NAT failed (305005 or 305006). If the ping is from an outside host to an inside host, and you do not have a static translation, you get message 106010.

Figure 14-5 Ping Failure Because the ASA is Not Translating Addresses

Trace Routes to Hosts

If you are having problems sending traffic to an IP address, you can trace the route to the host to determine if there is a problem on the network path.

Procedure

Step 1 Make the ASA Visible on Trace Routes, page 14-6.

Step 2 Determine Packet Routes, page 14-7.

Make the ASA Visible on Trace Routes

By default, the ASA does not appear on traceroutes as a hop. To make it appear, you need to decrement the time-to-live on packets that pass through the ASA, and increase the rate limit on ICMP unreachable messages.

Procedure

Step 1 Decrement the TTL using a service policy.

a. Choose **Configuration > Firewall > Service Policy Rules**.

b. Add or edit a rule. For example, if you already have a rule to which you can add the option to decrement TTL, you do not need to create a new one.

c. Progress through the wizard to the Rule Actions page, applying the rule globally or to an interface, and specifying the traffic match. For example, you could create a global match any rule.

d. On the Rule Actions page, click the **Connection Settings** tab, and select **Decrement time to live for a connection**.

e. Click **OK** or **Finish**, then **Apply**.

Step 2 Increase the ICMP unreachable rate limit.

a. Choose **Configuration > Device Management > Management Access > ICMP**.

b. Increase the **IPv4 ICMP Unreachable Message Limits > Rate Limit** value at the bottom of the page. For example, increase it to 50.

c. Click **Apply**.

Determine Packet Routes

Use Traceroute to help you to determine the route that packets will take to their destination. A traceroute works by sending UDP packets to a destination on an invalid port. Because the port is not valid, the routers along the way to the destination respond with an ICMP Time Exceeded Message, and report that error to the ASA.

The traceroute shows the result of each probe sent. Every line of output corresponds to a TTL value in increasing order. The following table explains the output symbols.

Output Symbol	Description
*	No response was received for the probe within the timeout period.
nn msec	For each node, the round-trip time (in milliseconds) for the specified number of probes.
!N.	ICMP network unreachable.
!H	ICMP host unreachable.
!P	ICMP unreachable.
!A	ICMP administratively prohibited.
?	Unknown ICMP error.

Procedure

Step 1 Choose **Tools > Traceroute**.

Step 2 Enter the destination hostname or IP address to which you are tracing the route. Configure a DNS server to use a host name.

Step 3 (Optional) Configure the characteristics of the trace. The defaults are appropriate in most cases.

- **Timeout**—How long to wait for a response before timing out. The default is 3 seconds.
- **Port**—The UDP port to use. The default is 33434.
- **Probe**—How many probes to send at each TTL level. The default is 3.
- **TTL**—The minimum and maximum time-to-live values for the probes. The minimum default is one, but you can set it to a higher value to suppress the display of known hops. The maximum default is 30. The traceroute terminates when the packet reaches the destination or when the maximum value is reached.
- **Specify source interface or IP address**—The interface to use as the source of the trace. You can specify the interface by name or by IP address. In transparent mode, you must use the management address.
- **Reverse Resolve**—Whether to have the output display the names of hops encountered if DNS name resolution is configured. Deselect the option to show IP addresses only.
- **Use ICMP**—Whether to send ICMP probe packets instead of UDP probe packets.

Step 4 Click **Trace Route** to start the traceroute.

The Traceroute Output area displays detailed messages about the traceroute results.

Tracing Packets to Test Policy Configuration

You can test your policy configuration by modeling a packet based on source and destination addressing and protocol characteristics. The trace does policy lookup to test access rules, NAT, routing, and so forth, to see if the packet would be permitted or denied.

By testing packets this way, you can see the results of your policies and test whether the types of traffic you want to allow or deny are handled as desired. Besides verifying your configuration, you can use the tracer to debug unexpected behavior, such as packets being denied when they should be allowed.

Procedure

Step 1 Choose **Tools > Packet Tracer**.

Step 2 Choose the source interface for the packet trace.

Step 3 Specify the protocol type for the packet trace. Available protocol types include ICMP, IP, TCP, and UDP.

Step 4 (Optional.) If you want to trace a packet where the security group tag value is embedded in the Layer 2 CMD header (Trustsec), check **SGT number** and enter the security group tag number, 0-65533.

Step 5 Specify the source and destination for the packets.

You can specify IPv4 or IPv6 addresses, fully-qualified domain names (FQDN), or security group names or tags, if you use Cisco Trustsec. For the source address, you can also specify a username in the format Domain\username.

Step 6 Specify the protocol characteristics:

- ICMP—Enter the ICMP type, ICMP code (0-255), and optionally, the ICMP identifier.
- TCP/UDP—Enter the source and destination port numbers.
- Raw IP—Enter the protocol number, 0-255.

Step 7 Click **Start** to trace the packet.

The Information Display Area shows detailed messages about the results of the packet trace.

Monitoring Performance and System Resources

You can monitor a variety of system resources to identify performance or other potential problems.

Monitoring Performance

You can view ASA performance information in a graphical or tabular format.

Procedure

Step 1 Choose **Monitoring > Properties > Connection Graphs > Perfmon**.

Step 2 You can give the graph window a title by entering it in **Graph Window Title**, or you can choose an existing title.

Step 3 Select up to four entries from the Available Graphs list, then click **Add** to move them to the Selected Graphs list. The available options are the following:

- AAA Perfmon—Requests per second for authentication, authorization, and accounting requests.
- Inspection Perfmon—Packets per second for HTTP, FTP, and TCP inspection.
- Web Perfmon—Requests per second for URL access and URL server requests.
- Connections Perfmon—Connections per second for all connections, UDP connections, TCP connections, and TCP Intercept.
- Xlate Perfmon—NAT xlates per second.

Step 4 Click **Show Graphs**.

You can toggle each graph between graph and table views. You can also change how often the data refreshes, and export or print the data.

Monitoring Memory Blocks

You can view free and used memory blocks information in a graphical or tabular format.

Procedure

Step 1 Choose **Monitoring > Properties > System Resources Graphs > Blocks**.

Step 2 You can give the graph window a title by entering it in **Graph Window Title**, or you can choose an existing title.

Step 3 Select entries from the Available Graphs list, then click **Add** to move them to the Selected Graphs list. The available options are the following:

- Blocks Used—Displays the ASA used memory blocks.
- Blocks Free—Displays the ASA free memory blocks.

Step 4 Click **Show Graphs**.

You can toggle each graph between graph and table views. You can also change how often the data refreshes, and export or print the data.

Monitoring CPU

You can view CPU utilization.

Procedure

Step 1 Choose **Monitoring > Properties > System Resources Graphs > CPU**.

Step 2 You can give the graph window a title by entering it in **Graph Window Title**, or you can choose an existing title.

Step 3 Add CPU Utilization to the Selected Graphs list.

Step 4 Click **Show Graphs**.

You can toggle the graph between graph and table views. You can also change how often the data refreshes, and export or print the data.

Monitoring Memory

You can view memory utilization information in a graphical or tabular format.

Procedure

Step 1 Choose **Monitoring > Properties > System Resources Graphs > Memory**.

Step 2 You can give the graph window a title by entering it in **Graph Window Title**, or you can choose an existing title.

Step 3 Select entries from the Available Graphs list, then click **Add** to move them to the Selected Graphs list. The available options are the following:

- Free Memory—Displays the ASA free memory.
- Used Memory—Displays the ASA used memory.

Step 4 Click **Show Graphs**.

You can toggle each graph between graph and table views. You can also change how often the data refreshes, and export or print the data.

Monitoring Per-Process CPU Usage

You can monitor the processes that run on the CPU. You can obtain information about the percentage of CPU that is used by a certain process. CPU usage statistics are sorted in descending order to display the highest consumer at the top. Also included is information about the load on the CPU per process, at 5 seconds, 1 minute, and 5 minutes before the log time. This information is updated automatically every 5 seconds to provide real-time statistics. In ASDM, it is updated every 30 seconds.

To view CPU usage on a per-process basis, choose **Monitoring > Properties > Per-Process CPU Usage**.

You can stop the auto refresh, manually refresh the information, or save it to a file. You can also click the **Configure CPU Usage Colors** button to chose background and foreground colors based on usage percentages, to make it easier to scan for high-usage processes.

Monitoring Connections

To view current connections in a tabular format, in the ASDM main window, choose **Monitoring > Properties > Connections**. Information for each connection includes the protocol, source and destination address characteristics, idle time since the last packet was sent or received, and the amount of traffic in the connection.