Getting Started with Application Layer Protocol Inspection

This chapter describes how to configure application layer protocol inspection. Inspection engines are required for services that embed IP addressing information in the user data packet or that open secondary channels on dynamically assigned ports. These protocols require the ASA to do a deep packet inspection instead of passing the packet through the fast path (see the general operations configuration guide for more information about the fast path). As a result, inspection engines can affect overall throughput. Several common inspection engines are enabled on the ASA by default, but you might need to enable others depending on your network.

This chapter includes the following sections:

Information about Application Layer Protocol Inspection

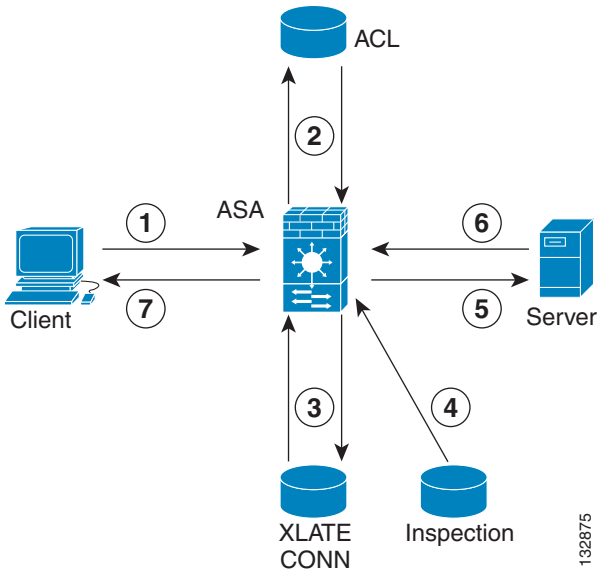
This section includes the following topics:

How Inspection Engines Work

As illustrated in Figure 8-1, the ASA uses three databases for its basic operation:

- ACLs—Used for authentication and authorization of connections based on specific networks, hosts, and services (TCP/UDP port numbers).
- Inspections—Contains a static, predefined set of application-level inspection functions.
- Connections (XLATE and CONN tables)—Maintains state and other information about each established connection. This information is used by the Adaptive Security Algorithm and cut-through proxy to efficiently forward traffic within established sessions.

Figure 8-1 How Inspection Engines Work



In Figure 8-1, operations are numbered in the order they occur, and are described as follows:

1. A TCP SYN packet arrives at the ASA to establish a new connection.
2. The ASA checks the ACL database to determine if the connection is permitted.
3. The ASA creates a new entry in the connection database (XLATE and CONN tables).
4. The ASA checks the Inspections database to determine if the connection requires application-level inspection.
5. After the application inspection engine completes any required operations for the packet, the ASA forwards the packet to the destination system.
6. The destination system responds to the initial request.
7. The ASA receives the reply packet, looks up the connection in the connection database, and forwards the packet because it belongs to an established session.

The default configuration of the ASA includes a set of application inspection entries that associate supported protocols with specific TCP or UDP port numbers and that identify any special handling required.

When to Use Application Protocol Inspection

When a user establishes a connection, the ASA checks the packet against ACLs, creates an address translation, and creates an entry for the session in the fast path, so that further packets can bypass time-consuming checks. However, the fast path relies on predictable port numbers and does not perform address translations inside a packet.

Many protocols open secondary TCP or UDP ports. The initial session on a well-known port is used to negotiate dynamically assigned port numbers.

Other applications embed an IP address in the packet that needs to match the source address that is normally translated when it goes through the ASA.

If you use applications like these, then you need to enable application inspection.

When you enable application inspection for a service that embeds IP addresses, the ASA translates embedded addresses and updates any checksum or other fields that are affected by the translation.

When you enable application inspection for a service that uses dynamically assigned ports, the ASA monitors sessions to identify the dynamic port assignments, and permits data exchange on these ports for the duration of the specific session.

Guidelines and Limitations

This section includes the guidelines and limitations for this feature.

Context Mode Guidelines

Supported in single and multiple context mode.

Firewall Mode Guidelines

Supported in routed and transparent firewall mode.

Failover Guidelines

State information for multimedia sessions that require inspection are not passed over the state link for stateful failover. The exception is GTP, which is replicated over the state link.

IPv6 Guidelines

Supports IPv6 for the following inspections:

- DNS
- FTP
- HTTP
- ICMP
- SIP
- SMTP
- IPsec pass-through
- IPv6

Supports NAT64 for the following inspections:

- DNS
- FTP
- HTTP
- ICMP

Additional Guidelines and Limitations

Some inspection engines do not support PAT, NAT, outside NAT, or NAT between same security interfaces. See Default Settings and NAT Limitations, page 8-4 for more information about NAT support.

For all the application inspections, the ASA limits the number of simultaneous, active data connections to 200 connections. For example, if an FTP client opens multiple secondary connections, the FTP inspection engine allows only 200 active connections and the 201 connection is dropped and the adaptive security appliance generates a system error message.

Inspected protocols are subject to advanced TCP-state tracking, and the TCP state of these connections is not automatically replicated. While these connections are replicated to the standby unit, there is a best-effort attempt to re-establish a TCP state.

Default Settings and NAT Limitations

By default, the configuration includes a policy that matches all default application inspection traffic and applies inspection to the traffic on all interfaces (a global policy). Default application inspection traffic includes traffic to the default ports for each protocol. You can only apply one global policy, so if you want to alter the global policy, for example, to apply inspection to non-standard ports, or to add inspections that are not enabled by default, you need to either edit the default policy or disable it and apply a new one.

Table 8-1 lists all inspections supported, the default ports used in the default class map, and the inspection engines that are on by default, shown in bold. This table also notes any NAT limitations.

Table 8-1 Supported Application Inspection Engines

Application[1]	Default Port	NAT Limitations	Standards[2]	Comments
CTIQBE	TCP/2748	No extended PAT. No NAT64. (Clustering) No static PAT.	—	—
DCERPC	TCP/135	No NAT64.	—	—
DNS over UDP	UDP/53	No NAT support is available for name resolution through WINS.	RFC 1123	—
FTP	TCP/21	(Clustering) No static PAT.	RFC 959	—
GTP	UDP/3386 UDP/2123	No extended PAT. No NAT64.	—	Requires a special license.
H.323 H.225 and **RAS**	TCP/1720 UDP/1718 UDP (RAS) 1718-1719	No dynamic NAT or PAT. Static PAT may not work. (Clustering) No static PAT. No extended PAT. No per-session PAT. No NAT on same security interfaces. No outside NAT. No NAT64.	ITU-T H.323, H.245, H225.0, Q.931, Q.932	—
HTTP	TCP/80	—	RFC 2616	Beware of MTU limitations stripping ActiveX and Java. If the MTU is too small to allow the Java or ActiveX tag to be included in one packet, stripping may not occur.
ICMP	—	—	—	—

Table 8-1 Supported Application Inspection Engines (continued)

Application[1]	Default Port	NAT Limitations	Standards[2]	Comments
ICMP ERROR	—	—	—	—
ILS (LDAP)	TCP/389	No extended PAT. No NAT64.	—	—
Instant Messaging (IM)	Varies by client	No extended PAT. No NAT64.	RFC 3860	—
IP Options	—	No NAT64.	RFC 791, RFC 2113	—
IPsec Pass Through	UDP/500	No PAT. No NAT64.	—	—
IPv6	—	No NAT64.	RFC 2460	—
MGCP	UDP/2427, 2727	No extended PAT. No NAT64. (Clustering) No static PAT.	RFC 2705bis-05	—
MMP	TCP 5443	No extended PAT. No NAT64.	—	—
NetBIOS Name Server over IP	UDP/137, 138 (Source ports)	No extended PAT. No NAT64.	—	NetBIOS is supported by performing NAT of the packets for NBNS UDP port 137 and NBDS UDP port 138.
PPTP	TCP/1723	No NAT64. (Clustering) No static PAT.	RFC 2637	—
RADIUS Accounting	1646	No NAT64.	RFC 2865	—
RSH	TCP/514	No PAT. No NAT64. (Clustering) No static PAT.	Berkeley UNIX	—
RTSP	TCP/554	No extended PAT. No outside NAT. No NAT64. (Clustering) No static PAT.	RFC 2326, 2327, 1889	No handling for HTTP cloaking.
ScanSafe (Cloud Web Security)	TCP/80 TCP/413	—	—	These ports are not included in the default-inspection-traffic class for the ScanSafe inspection.

Table 8-1 Supported Application Inspection Engines (continued)

Application[1]	Default Port	NAT Limitations	Standards[2]	Comments
SIP	TCP/5060 UDP/5060	No outside NAT. No NAT on same security interfaces. No extended PAT. No per-session PAT. No NAT64. (Clustering) No static PAT.	RFC 2543	—
SKINNY (SCCP)	TCP/2000	No outside NAT. No NAT on same security interfaces. No extended PAT. No per-session PAT. No NAT64. (Clustering) No static PAT.	—	Does not handle TFTP uploaded Cisco IP Phone configurations under certain circumstances.
SMTP and **ESMTP**	TCP/25	No NAT64.	RFC 821, 1123	—
SNMP	UDP/161, 162	No NAT or PAT.	RFC 1155, 1157, 1212, 1213, 1215	v.2 RFC 1902-1908; v.3 RFC 2570-2580.
SQL*Net	TCP/1521	No extended PAT. No NAT64. (Clustering) No static PAT.	—	v.1 and v.2.
Sun RPC over UDP and TCP	UDP/111	No extended PAT. No NAT64.	—	The default rule includes UDP port 111; if you want to enable Sun RPC inspection for TCP port 111, you need to create a new rule that matches TCP port 111 and performs Sun RPC inspection.
TFTP	UDP/69	No NAT64. (Clustering) No static PAT.	RFC 1350	Payload IP addresses are not translated.
WAAS	—	No extended PAT. No NAT64.	—	—
XDCMP	UDP/177	No extended PAT. No NAT64. (Clustering) No static PAT.	—	—

1. Inspection engines that are enabled by default for the default port are in bold.
2. The ASA is in compliance with these standards, but it does not enforce compliance on packets being inspected. For example, FTP commands are supposed to be in a particular order, but the ASA does not enforce the order.

Configuring Application Layer Protocol Inspection

This feature uses Security Policy Rules to create a service policy. Service policies provide a consistent and flexible way to configure ASA features. For example, you can use a service policy to create a timeout configuration that is specific to a particular TCP application, as opposed to one that applies to all TCP applications. See Chapter 1, "Service Policy," for more information.

Inspection is enabled by default for some applications. See Default Settings and NAT Limitations, page 8-4 section for more information. Use this section to modify your inspection policy.

Detailed Steps

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Step 1 Choose **Configuration > Firewall > Service Policy Rules**.

Step 2 Add or edit a service policy rule according to the Adding a Service Policy Rule for Through Traffic, page 1-8.

If you want to match non-standard ports, then create a new rule for the non-standard ports. See Default Settings and NAT Limitations, page 8-4 for the standard ports for each inspection engine. You can combine multiple rules in the same service policy if desired, so you can create one rule to match certain traffic, and another to match different traffic. However, if traffic matches a rule that contains an inspection action, and then matches another rule that also has an inspection action, only the first matching rule is used.

Step 3 In the Edit Service Policy Rule > Rule Actions dialog box, click the **Protocol Inspection** tab.

For a new rule, the dialog box is called Add Service Policy Rule Wizard - Rule Actions.

Step 4 Select each inspection type that you want to apply.

Step 5 (Optional) Some inspection engines let you control additional parameters when you apply the inspection to the traffic. Click **Configure** for each inspection type to configure an inspect map.

You can either choose an existing map, or create a new one. You can predefine inspect maps in the Configuration > Firewall > Objects > Inspect Maps pane.

Step 6 You can configure other features for this rule if desired using the other Rule Actions tabs.

Step 7 Click **OK** (or **Finish** from the wizard).