CHAPTER 1

Configuring the ASA to Integrate with Cisco TrustSec

This chapter includes the following sections:

Information About the ASA Integrated with Cisco TrustSec

This section includes the following topics:

Information about Cisco TrustSec

Traditionally, security features such as firewalls performed access control based on predefined IP addresses, subnets and protocols. However, with enterprises transitioning to borderless networks, both the technology used to connect people and organizations and the security requirements for protecting data and networks have evolved significantly. End points are becoming increasingly nomadic and users often utilize a variety of end points (for example, laptop versus desktop, smart phone, or tablet), which means that a combination of user attributes plus end-point attributes provide the key characteristics, in addition to existing 5-tuple based rules, that enforcement devices, such as switches and routers with firewall features or dedicated firewalls, can reliably use for making access control decisions.

As a result, the availability and propagation of end point attributes or client identity attributes have become increasingly important requirements to enable security solutions across the customers' networks, at the access, distribution, and core layers of the network and in the data center to name but a few examples.

Cisco TrustSec provides an access-control solution that builds upon an existing identity-aware infrastructure to ensure data confidentiality between network devices and integrate security access services on one platform. In the Cisco TrustSec solution, enforcement devices utilize a combination of user attributes and end-point attributes to make role-based and identity-based access control decisions. The availability and propagation of this information enables security solutions across networks at the access, distribution, and core layers of the network.

Implementing Cisco TrustSec into your environment has the following advantages:

- Provides a growing mobile and complex workforce with appropriate and more secure access from any device
- Lowers security risks by providing comprehensive visibility of who and what is connecting to the wired or wireless network
- Offers exceptional control over activity of network users accessing physical or cloud-based IT resources
- Reduces total cost of ownership through centralized, highly secure access policy management and scalable enforcement mechanisms

For information about Cisco TrustSec, see http://www.cisco.com/go/trustsec.

About SGT and SXP Support in Cisco TrustSec

In the Cisco TrustSec solution, security group access transforms a topology-aware network into a role-based network, thus enabling end-to-end policies enforced on the basis of role-based access-control (RBACL). Device and user credentials acquired during authentication are used to classify packets by security groups. Every packet entering the Cisco TrustSec cloud is tagged with an security group tag (SGT). The tagging helps trusted intermediaries identify the source identity of the packet and enforce security policies along the data path. An SGT can indicate a privilege level across the domain when the SGT is used to define a security group access list.

An SGT is assigned to a device through IEEE 802.1X authentication, web authentication, or MAC authentication bypass (MAB), which happens with a RADIUS vendor-specific attribute. An SGT can be assigned statically to a particular IP address or to a switch interface. An SGT is passed along dynamically to a switch or access point after successful authentication.

The Security-group eXchange Protocol (SXP) is a protocol developed for Cisco TrustSec to propagate the IP-to-SGT mapping database across network devices that do not have SGT-capable hardware support to hardware that supports SGTs and security group access lists. SXP, a control plane protocol, passes IP-SGT mappings from authentication points (such as legacy access layer switches) to upstream devices in the network.

The SXP connections are point-to-point and use TCP as the underlying transport protocol. SXP uses the well known TCP port number 64999 when initiating a connection. Additionally, an SXP connection is uniquely identified by the source and destination IP addresses.

Roles in the Cisco TrustSec Solution

To provide identity and policy-based access enforcement, the Cisco TrustSec solution includes the functionality:

- **Access Requestor (AR)**: Access requestors are end-point devices that request access to protected resources in the network. They are primary subjects of the architecture and their access privilege depends on their Identity credentials.

  Access requestors include end-point devices such PCs, laptops, mobile phones, printers, cameras, and MACsec-capable IP phones.
- **Policy Decision Point (PDP)**: A policy decision point is responsible for making access control decisions. The PDP provides features such as 802.1x, MAB, and Web authentication. The PDP supports authorization and enforcement through VLAN, DACL, and security group access (SGACL/SXP/SGT).

  In the Cisco TrustSec solution, the Cisco Identity Services Engine (ISE) acts as the PDP. The Cisco ISE provides identity and access control policy functionality.
- **Policy Information Point (PIP)**: A policy information point is a source that provides external information (for example, reputation, location, and LDAP attributes) to policy decision points.

  Policy information points include devices such as Session Directory, Sensors IPS, and Communication Manager.
- **Policy Administration Point (PAP)**: A policy administration point defines and inserts policies into authorization system. The PAP acts as an identity repository, by providing Cisco TrustSec tag to user identity mapping and Cisco Trustsec tag to server resource mapping.

  In the Cisco TrustSec solution, the Cisco Secure Access Control System (a policy server with integrated 802.1x and SGT support) acts as the PAP.
- **Policy Enforcement Point (PEP)**: A policy enforcement point is the entity that carries out the decisions (policy rules and actions) made by the PDP for each AR. PEP devices learn identity information through the primary communication path that exists across networks. PEP devices learn the identity attributes of each AR from many sources, such as end-point agents, authorization servers, peer-enforcement devices, and network flows. In turn, PEP devices use SXP to propagate IP-SGT mappings to mutually-trusted peer devices across the network.

  Policy enforcement points include network devices such as Catalyst switches, routers, firewalls (specifically the ASA), servers, VPN devices, and SAN devices.

The ASA serves the role of the PEP in the identity architecture. Using SXP, the ASA learns identity information directly from authentication points and uses that to enforce identity-based policies.

Security Group Policy Enforcement

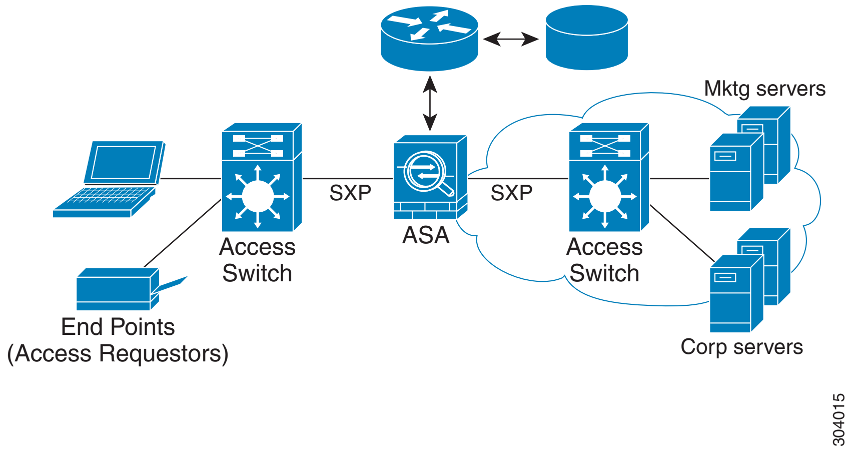
Security policy enforcement is based on security group name. An end-point device attempts to access a resource in the data center. Compared to traditional IP-based policies configured on firewalls, identity-based policies are configured based on user and device identities. For example, mktg-contractor is allowed to access mktg-servers; mktg-corp-users are allowed to access mktg-server and corp-servers.

The benefits of this type of deployment include:

- User group and Resource is defined and enforced using single object (SGT) – simplified policy management.

- User identity and resource identity are retained throughout the Cisco Trustsec capable switch infrastructure.

Figure 1-1 Security Group Name Based Policy Enforcement Deployment



Implementing Cisco TrustSec allows for configuration of security policies supporting server segmentation.

- A pool of servers can be assigned an SGT for simplified policy management.
- The SGT information is retained within the infrastructure of Cisco Trustsec capable switches.
- The ASA can leverage the IP-SGT mapping for policy enforcement across the Cisco TrustSec domain.
- Deployment simplification is possible because 802.1x authorization for servers is mandatory.

How the ASA Enforces Security Group Based Policies

Note User-based security policies and security-group based policies, can coexist on the ASA. Any combination of network, user-based and security-group based attributes can be configured in an security policy. See Chapter 1, "Configuring the Identity Firewall" for information about configuring user-based security policies.

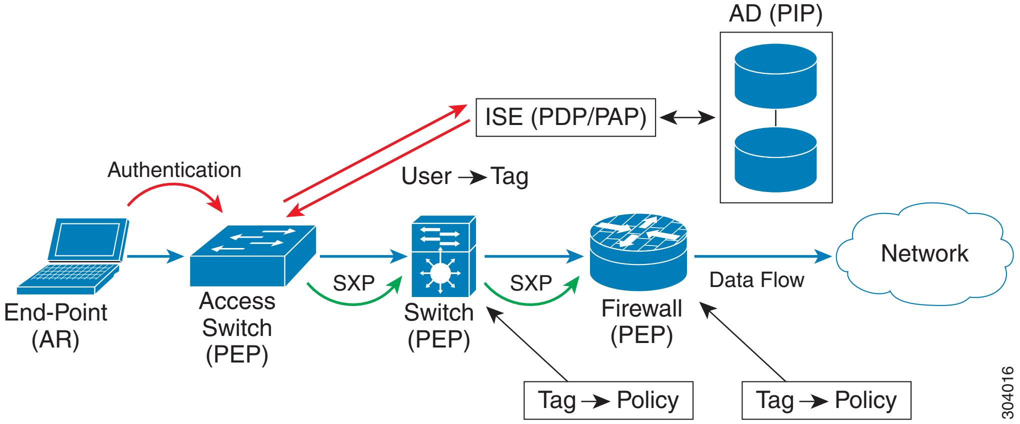
As part of configuring the ASA to function with Cisco TrustSec, you must import a Protected Access Credential (PAC) file from the ISE. Importing a Protected Access Credential (PAC) File, page 1-13.

Importing the PAC file to the ASA establishes a secure communication channel with the ISE. After the channel is established, the ASA initiates a PAC secure RADIUS transaction with the ISE and downloads Cisco TrustSec environment data; specifically, the ASA downloads the security group table. The security group table maps SGTs to security group names. Security group names are created on the ISE and provide user-friendly names for security groups.

The first time the ASA downloads the security group table, it walks through all entries in the table and resolves all the security group names contained in security policies configured on the ASA; then, the ASA activates those security policies locally. If the ASA is unable to resolve a security group name, it generates a system log message for the unknown security group name.

The following figure shows how a security policy is enforced in Cisco TrustSec.

Figure 1-2 Security Policy Enforcement



1. An end-point device connects to an access layer device directly or via remote access and authenticates with Cisco TrustSec.
2. The access layer device authenticates the end-point device with the ISE by using authentication methods such as 802.1X or web authentication. The end-point device passes role and group membership to classify the device into the appropriate security group.
3. The access layer device uses SXP to propagate the IP-SGT mapping to the upstream devices.
4. The ASA receives the packet. Using the IP-SGT mapping passed by SXP, the ASA looks up the SGTs for the source and destination IP addresses.

   If the mapping is new, the ASA records it in its local IP-SGT Manager database. The IP-SGT Manager database, which runs in the control plan, tracks IP-SGT mappings for each IPv4 or IPv6 address. The database records the source from which the mapping was learned. The peer IP address of the SXP connection is used as the source of the mapping. Multiple sources can exist for each IP-SGT mapping.

   If the ASA is configured as a Speaker, the ASA transmits all IP-SGT mappings to its SXP peers. See About Speaker and Listener Roles on the ASA, page 1-5.
5. If a security policy is configured on the ASA with that SGT or security group name, the ASA enforces the policy. (You can create security policies on the ASAthat contain SGTs or security group names. To enforce policies based on security group names, the ASA needs the security group table to map security group names to SGTs.)

   If the ASA cannot find a security group name in the security group table and it is included in a security policy, the ASA considers the security group name unknown and generates a system log message. When it becomes know after the ASA refreshes the security group table from the ISE, the ASA generates a system log message indicating that the security group name is known.

About Speaker and Listener Roles on the ASA

The ASA supports SXP to send and receive IP-SGT mappings to and from other network devices. Employing SXP allows security devices and firewalls to learn identity information from access switches without the need for hardware upgrades or changes. SXP can also be used to pass IP-SGT mappings from upstream devices (such as datacenter devices) back to the downstream devices. The ASA can receive information from both upstream and downstream directions.

When configuring an SXP connection on the ASA to an SXP peer, you must designate the ASA as a Speaker or a Listener for that connection so that it can exchange identity information:

- **Speaker mode**—configures the ASA so that it can forward all active IP-SGT mappings collected on the ASA to upstream devices for policy enforcement.
- **Listener mode**—configures the ASA so that it can receive IP-SGT mappings from downstream devices (SGT-capable switches) and use that information in creating policy definitions.

If one end of an SXP connection is configured as Speaker, then the other end must be configured as a Listener, and vice versa. If both devices on each end of an SXP connection are configured with the same role (either both as Speakers or both as Listeners), the SXP connection will fail and the ASA will generate a system log message.

Configuring the ASA to be both a Speaker and a Listener for an SXP connection can cause SXP looping, meanings that SXP data can be received by an SXP peer that originally transmitted it.

As part of configuring SXP on the ASA, you configure an SXP reconcile timer. After an SXP peer terminates its SXP connection, the ASA starts a hold down timer. Only SXP peers designated as Listener devices can terminate a connection. If an SXP peer connects while the hold down timer is running, the ASA starts the reconcile timer; then, the ASA updates the IP-SGT mapping database to learn the latest mappings.

Features of the ASA-Cisco TrustSec Integration

The ASA leverages Cisco TrustSec as part of its identity-based firewall feature. The integrating the ASA with Cisco TrustSec provides the following key features.

Flexibility

- The ASA can be configured as an SXP Speaker or Listener, or both.

  See About Speaker and Listener Roles on the ASA, page 1-5.
- The ASA supports SXP for IPv6 and IPv6 capable network devices.
- The ASA negotiates SXP versions with different SXP-capable network devices. SXP version negotiation eliminates the need for static configuration of versions.
- You can configure the ASA to refresh the security group table when the SXP reconcile timer expires and you can download the security group table on demand. When the security group table on the ASA is updated from the ISE, changes are reflected in the appropriate security policies.
- The ASA supports security policies based on security group names in the source or destination fields, or both. You can configure security policies on the ASA based on combinations of security groups, IP address, Active Directory group/user name, and FQDN.

Availability

- You can configure security group based policies on the ASA in Active/Active and Active/Standby configuration.
- The ASA can communicate with the ISE configured for high availability (HA).
- If the PAC file downloaded from the ISE expires on the ASA and the ASA cannot download an updated security group table, the ASA continues to enforce security policies based on the last downloaded security group table until the ASA downloads an updated table.

Scalability

The ASA supports the following number of IP-SGT mapped entries:

Table 1-1 Capacity Numbers for IP-SGT Mappings

ASA Platform	Number of IP-SGT Mapped Entries
5505	250
5510	1000
5520	2500
5540	5000
5550	7500
5580-20	10,000
5580-40	20,000
5585-X with SSP-10	18,750
5585-X with SSP-20	25,000
5585-X with SSP-40	50,000
5585-X with SSP-60	100,000

The ASA supports the following number of SXP connections:

Table 1-2 SXP Connections

ASA Platform	Number of SXP TCP Connections
5505	10
5510	25
5520	50
5540	100
5550	150
5580-20	250
5580-40	500
5585-X with SSP-10	150
5585-X with SSP-20	250
5585-X with SSP-40	500
5585-X with SSP-60	1000

Licensing Requirements when Integrating the ASA with Cisco TrustSec

Model	License Requirement
All models	Base License.

Prerequisites for Integrating the ASA with Cisco TrustSec

Before configuring the ASA to integrate with Cisco TrustSec, you must perform the following prerequisites:

- Register the ASA with the ISE.
- Create a security group for the ASA on the ISE.
- Generate the PAC file on the ISE to import into the ASA.

Registering the ASA with the ISE

The ASA must be configured as a recognized Cisco TrustSec network device in the ISE before the ASA can successfully import a PAC file.

1. Log into the ISE.
2. Choose **Administration** > **Network Devices** > **Network Devices**.
3. Click **Add**.
4. Enter the IP address of the ASA.
5. When the ISE is being used for user authentication in the Cisco TrustSec solution, enter a shared secret in the Authentication Settings area.

   When you configure the AAA sever on the ASA, provide the shared secret you create here on the ISE. The AAA server on the ASA uses this shared secret to communicate with the ISE.
6. Specify a device name, device ID, password, and a download interval for the ASA. See the ISE documentation for the details to perform these tasks.

Creating a Security Group on the ISE

When configuring the ASA to communicate with the ISE, you specify a AAA server. When configuring the AAA server on the ASA, you must specify a server group.

The security group must be configured to use the RADIUS protocol.

1. Log into the ISE.
2. Choose **Policy** > **Policy Elements** > **Results** > **Security Group Access** > **Security Group**.
3. Add a security group for the ASA. (Security groups are global and not ASA specific.)

   The ISE creates an entry under Security Groups with a tag.
4. Under the Security Group Access section, configure a device ID credentials and password for the ASA.

Generating the PAC File

For information about the PAC file, see Importing a Protected Access Credential (PAC) File, page 1-13.

Before generating the PAC file, you must have registered the ASA with the ISE.

1. Log into the ISE.
2. Choose **Administration** > **Network Resources** > **Network Devices**.
3. From the list of devices, select the ASA device.
4. Under the Security Group Access (SGA), click **Generate PAC**.
5. To encrypt the PAC file, enter a password.

The password (or encryption key) you enter to encrypt the PAC file is independent of the password that was configured on the ISE as part of the device credentials.

The ISE generates the PAC file. The ASA can import the PAC from flash or from a remote server via TFTP, FTP, HTTP, HTTPS, or SMB. (The PAC does not have to reside on the ASA flash before you can import it.)

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.

IPv6 Guidelines

Supports IPv6

Clustering Guideline

Supported only on the master device in a clustering setting.

High Availability Guideline

Supports a list of servers via configuration. If the first server is unreachable, the ASA will try to contact the second server in the list, and so on. However, the server list downloaded as part of the Cisco TrustSec environment data is ignored.

Limitations

- The ASA can only be configured to interoperate in a single Cisco TrustSec domain.
- The ASA does not support static configuration of SGT-name mappings on the device.
- NAT is not supported in SXP messages.
- SXP conveys IP-SGT mappings to enforcement points in the network. If an access layer switch belongs to a different NAT domain than the enforcing point, the IP-SGT map it uploads is invalid and an IP-SGT mappings database lookup on the enforcement device will not yield valid results; therefore, the ASA cannot apply security group aware security policy on the enforcement device.
- You can configure a default password for the ASA to use for SXP connections, or you can choose not to use a password; however, connection-specific passwords are not supported for SXP peers. The configured default SXP password should be consistent across the deployment network. If you configure a connection-specific password, connections may fail and a warning message will appear. If you configure the connection with the default password, but the default password is not configured, the result is the same as when you have configured the connection with no password.
- SXP connection loops can form when a device has bidirectional connections to a peer, or is part of a unidirectionally connected chain of devices. (The ASA can learn IP-DGT mappings for resources from the access layer in the data center. The ASA might need to propagate these tags to downstream devices.) SXP connection loops can cause unexpected behavior of SXP message transport. In cases where the ASA is configured to be a Speaker and Listener, an SXP connection loop can occur causing SXP data to be received by the peer that originally transmitted it.

- When changing the ASA local IP address, you must ensure that all SXP peers have updated their peer list. Likewise, if an SXP peers changes its IP addresses, you must ensure those changes are reflected on the ASA.
- Automatic PAC file provisioning is not supported. The ASA administrator must request the PAC file from the ISE administrative interface and import it to the ASA. For information about the PAC file, see Generating the PAC File, page 1-8 and Importing a Protected Access Credential (PAC) File, page 1-13.
- PAC files have expiration dates. You must import the updated PAC file before the current PAC file expires; otherwise, the ASA will not be able to retrieve environment data updates.
- When a security group changes on the ISE (for example, it is renamed or deleted), the ASA does not change the status of any ASA security policies that contain an SGT or security group name associated with the changed security group; however, the ASA generates a system log message to indicate that those security policies changed.

  See Refreshing Environment Data, page 1-19 for information about manually updating the security group table on the ASA to pick up changes from the ISE.
- The multicast types are not supported in ISE 1.0.
- An SXP connection stays in the initializing state among two SXP peers interconnected by the ASA; as shown in the following example:

  (SXP peer A) - - - - (ASA) - - - (SXP peer B)

  Therefore, when configuring the ASA to integrate with Cisco TrustSec, you must enable the no-NAT, no-SEQ-RAND, and MD5-AUTHENTICATION TCP options on the ASA to configure SXP connections. Create a TCP-state-bypass policy for traffic destined to SXP port TCP 64999 among the SXP peers. Apply the policy on the appropriate interfaces.

  For example, configure the ASA as shown in this sample configuration for a TCP-state-bypass policy:

```
access-list SXP-MD5-ACL extended permit tcp host peerA host peerB eq 64999
access-list SXP-MD5-ACL extended permit tcp host peerB host peerA eq 64999

tcp-map SXP-MD5-OPTION-ALLOW
 tcp-options range 19 19 allow

class-map SXP-MD5-CLASSMAP
 match access-list SXP-MD5-ACL

policy-map type inspect dns preset_dns_map
 parameters
  message-length maximum 512
policy-map global_policy
class SXP-MD5-CLASSMAP
  set connection random-sequence-number disable
  set connection advanced-options SXP-MD5-OPTION-ALLOW
  set connection advanced-options tcp-state-bypass
service-policy global_policy global
```

Configuring the ASA for Cisco TrustSec Integration

This section contains the following topics:

- Task Flow for Configuring the ASA to Integrate with Cisco TrustSec, page 1-11

- Configuring the AAA Server for Cisco TrustSec Integration, page 1-11
- Importing a Protected Access Credential (PAC) File, page 1-13
- Configuring the Security Exchange Protocol (SXP), page 1-14
- Adding an SXP Connection Peer, page 1-17
- Refreshing Environment Data, page 1-19
- Configuring the Security Policy, page 1-20
- Collecting User Statistics, page 1-21

Task Flow for Configuring the ASA to Integrate with Cisco TrustSec

Prerequisite

Before configuring the ASA to integrate with Cisco TrustSec, you must meet the following prerequisites:

- Register the ASA with the ISE.
- Generate the PAC file on the ISE to import into the ASA.

See the "Prerequisites for Integrating the ASA with Cisco TrustSec" section on page 1-8 for information.

Task Flow in the ASA

To configure the ASA to integrate with Cisco TrustSec, perform the following tasks:

Step 1 Configure the AAA server.

See Configuring the AAA Server for Cisco TrustSec Integration, page 1-11.

Step 2 Import the PAC file from the ISE.

See Importing a Protected Access Credential (PAC) File, page 1-13.

Step 3 Enable and set the default values for SXP.

See Configuring the Security Exchange Protocol (SXP), page 1-14.

Step 4 Add SXP connection peers for the Cisco TrustSec architecture.

See Adding an SXP Connection Peer, page 1-17.

Step 5 As necessary, refresh environment data for the ASA integrated with Cisco TrustSec.

See Refreshing Environment Data, page 1-19.

Step 6 Configure the Security Policy.

See Configuring the Security Policy, page 1-20.

Configuring the AAA Server for Cisco TrustSec Integration

As part of configuring the ASA to integrate with Cisco TrustSec, you must configure the ASA so that it can communicate with the ISE.

See also the "Configuring AAA Server Groups" section on page 1-11 for more information.

Prerequisites

- The referenced server group must be configured to use the RADIUS protocol. If you add a non-RADIUS server group to the ASA, the feature configuration will fail.
- If the ISE is also used for user authentication, obtain the shared secret that was entered on the ISE when you registered the ASA with the ISE. Contact your ISE administrator if you do not have this information.

To configure the AAA server group for the ISE on the ASA, perform the following steps:

	Command	Purpose

Step 1	`hostname(config)# ` **`aaa-server`** *`server-tag`* **`protocol radius`**
	`Example:`
	`hostname(config)# aaa-server ISEserver protocol radius`
		Creates the AAA server group and configures the AAA server parameters for the ASA to communicate with the ISE server.
		Where *server-tag* specifies the server group name.
		See Creating a Security Group on the ISE, page 1-8 for information.

Step 1	`hostname(config-aaa-server-group)# ` **`exit`**	Exits from the AAA server group configuration mode.

Step 1	`hostname(config)# ` **`aaa-server`** *`server-tag`* `(`*`interface-name`*`)` **`host`** *`server-ip`*
	`Example:`
	`hostname(config)# aaa-server ISEserver (inside) host 192.0.2.1`
		Configures a AAA server as part of a AAA server group and sets host-specific connection data.
		Where (*interface-name*) specifies the network interface where the ISE server resides. The parentheses are required in this parameter.
		Where *server-tag* is the name of the AAA server group that you specified in step 1 in the *server-tag* argument.
		Where *server-ip* specifies the IP address of the ISE server.

Step 1	`hostname(config-aaa-server-host)# ` **`key`** *`key`*
	`Example:`
	`hostname(config-aaa-server-host)# key myexclusivemumblekey`
		Specifies the server secret value used to authenticate the ASA with the ISE server.
		Where *key* is an alphanumeric keyword up to 127 characters long.
		If the ISE is also used for user authentication, enter the shared secret that was entered on the ISE when you registered the ASA with the ISE.
		See Registering the ASA with the ISE, page 1-8 for information.

Step 1	`hostname(config-aaa-server-host)# ` **`exit`**	Exits from the AAA server host configuration mode.

Step 2	`hostname(config)# ` **`cts server-group`** *`AAA-server-group-name`*
	`Example:`
	`hostname(config)# cts server-group ISEserver`
		Identifies the AAA server group that is used by Cisco TrustSec for environment data retrieval.
		Where *AAA-server-group-name* is the name of the AAA server group that you specified in step 1 in the *server-tag* argument.
		Only one instance of the server group can be configured on the ASA for Cisco TrustSec.

Examples

The following example shows how to configure the ASA to communicate with the ISE server for Cisco TrustSec integration:

```
hostname(config)# aaa-server ISEserver protocol radius
hostname(config-aaa-server-group)# exit
hostname(config)# aaa-server ISEserver (inside) host 192.0.2.1
hostname(config-aaa-server-host)# key myexclusivemumblekey
hostname(config-aaa-server-host)# exit
hostname(config)# cts server-group ISEserver
```

Importing a Protected Access Credential (PAC) File

Importing the PAC file to the ASA establishes the connection with the ISE. After the channel is established, the ASA initiates a secure RADIUS transaction with the ISE and downloads Cisco TrustSec environment data; specifically, the ASA downloads the security group table. The security group table maps SGTs to security group names. Security group names are created on the ISE and provide user-friendly names for security groups.

More specifically, no channel is established prior to the radius transaction. The ASA simply initiates a radius transaction with the ISE using the PAC for authentication

Tip The PAC file contains a shared key that allows the ASA and ISE to secure the RADIUS transactions that occur between them. Given the sensitive nature of this key, it must be stored securely on the ASA.

After successfully importing the file, the ASA download Cisco TrustSec environment data from the ISE without requiring the device password configured in the ISE.

Prerequisites

- The ASA must be configured as a recognized Cisco TrustSec network device in the ISE before the ASA can generate a PAC file. The ASA can import any PAC file but it will only work on the ASA when the file was generated by a properly configured ISE. See Registering the ASA with the ISE, page 1-8.
- Obtain the password used to encrypt the PAC file when generating it on the ISE.

  The ASA requires this password to import and decrypt the PAC file.
- Access to the PAC file generated by the ISE. The ASA can import the PAC from flash or from a remote server via TFTP, FTP, HTTP, HTTPS, or SMB. (The PAC does not have to reside on the ASA flash before you can import it.)
- The server group has been configured for the ASA.

Restrictions

- When the ASA is part of an HA configuration, you must import the PAC file to the primary ASA device.
- When the ASA is part of a clustering configuration, you must import the PAC to the master device.

To import a PAC file, perform the following steps:

	Command	Purpose

Step 1	`hostname(config)#` **`cts import-pac`** *`filepath`* **`password`** *`value`*
	`Example:`
	`hostname(config)# cts import-pac disk0:/xyz.pac password IDFW-pac99`
		Imports a Cisco TrustSec PAC file.
		Where *filepath* is entered as one of the following **exec** mode commands and options:.
		Single Mode
		• **disk0**: Path and filename on disk0
		• **disk1**: Path and filename on disk1
		• **flash**: Path and filename on flash
		• **ftp**: Path and filename on FTP
		• **http**: Path and filename on HTTP
		• **https**: Path and filename on HTTPS
		• **smb**: Path and filename on SMB
		• **tftp**: Path and filename on TFTP
		Multi-mode
		• **http**: Path and filename on HTTP
		• **https**: Path and filename on HTTPS
		• **smb**: Path and filename on SMB
		• **tftp**: Path and filename on TFTP
		Where *value* specifies the password used to encrypt the PAC file. The password is independent of the password that was configured on the ISE as part of the device credentials.

Examples

The following example shows how to import a PAC file into the ASA:

```
hostname(config)#cts import pac disk0:/pac123.pac password hideme
PAC file successfully imported
```

Configuring the Security Exchange Protocol (SXP)

Configuring the Security Exchange Protocol (SXP) involves enabling the protocol in the ASA and setting the following default values for SXP:

- The source IP address of SXP connections
- The authentication password between SXP peers
- The retry interval for SXP connections
- The Cisco TrustSec SXP reconcile period

To configure SXP, perform the following steps:

	Command	Purpose
Step 1	hostname(config)# **cts sxp enable**	If necessary, enables SXP on the ASA. By default, SXP is disabled. In multi-context mode, enabling SXP is done in the user context.
Step 2	hostname(config)# **cts sxp default source-ip** *ipaddress* **Example:** hostname(config)# cts sxp default source-ip 192.168.1.100	Configures the default source IP address for SXP connections. Where *ipaddress* is an IPv4 or IPv6 address. When you configure a default source IP address for SXP connections, you must specify the same address as the ASA outbound interface. If the source IP address does not match the address of the outbound interface, SXP connections will fail. When a source IP address for an SXP connection is not configured, the ASA performs a route/ARP lookup to determine the outbound interface for the SXP connection. See Adding an SXP Connection Peer, page 1-17 for information about configuring a default source IP address for all SXP connections.
Step 3	hostname(config)# **cts sxp default password** [0 | 8] *password* **Example:** hostname(config)# cts sxp default password 8 IDFW-TrustSec-99	Configures the default password for TCP MD5 authentication with SXP peers. By default, SXP connections do not have a password set. Configuring an encryption level for the password is optional. If you configure an encryption level, you can only set one level: • Level 0—unencrypted cleartext • Level 8—encrypted text Where *password* specifies an encrypted string up to 162 characters or an ASCII key string up to 80 characters.

	Command	Purpose

Step 4	`hostname(config)#` **`cts sxp retry period`** *`timervalue`*
	`Example:`
	`hostname(config)# cts sxp retry period 60`
		Specifies the default time interval between ASA attempts to set up new SXP connections between SXP peers. The ASA continues to make connection attempts until a successful connection is made.
		The retry timer is triggered as long as there is one SXP connection on the ASA that is not up.
		Where *timervalue* is the number of seconds in the range of 0 to 64000 seconds.
		If you specify 0 seconds, the timer never expires and the ASA will not attempt to connect to SXP peers.
		By default, the *timervalue* is 120 seconds.
		When the retry timer expires, the ASA goes through the connection database and if the database contains any connections that are off or in a “pending on” state, the ASA restarts the retry timer.
		We recommend you configure the retry timer to a different value from its SXP peer devices.

Step 5	`hostname(config)#` **`cts sxp reconciliation period`** *`timervalue`*
	`Example:`
	`hostname(config)# cts sxp reconciliation period 60`
		Specifies the value of the default reconcile timer. After an SXP peer terminates its SXP connection, the ASAstarts a hold down timer.
		If an SXP peer connects while the hold down timer is running, the ASA starts the reconcile timer; then, the ASA updates the SXP mapping database to learn the latest mappings.
		When the reconcile timer expires, the ASA scans the SXP mapping database to identify stale mapping entries (entries that were learned in a previous connection session). The ASA marks these connections as obsolete. When the reconcile timer expires, the ASA removes the obsolete entries from the SXP mapping database.
		Where *timervalue* is the number of seconds in the range of 1 to 64000 seconds.
		By default, the *timervalue* is 120 seconds.
		You cannot specify 0 for the timer because specifying 0 would prevent the reconcile timer from starting. Not allowing the reconcile timer to run would keep stale entries for an undefined time and cause unexpected results from the policy enforcement.

Examples

The following example shows how to set default values for SXP:

```
hostname(config)# cts sxp enable
hostname(config)# cts sxp default source-ip 192.168.1.100
hostname(config)# cts sxp default password 8 ********
hostname(config)# cts sxp retry period 60
hostname(config)# cts sxp reconcile period 60
```

Adding an SXP Connection Peer

SXP connections between peers are point-to-point and use TCP as the underlying transport protocol.

To add an SXP connection peer, perform the following steps:

	Command	Purpose
Step 1	`hostname(config)#` **`cts sxp enable`**	If necessary, enables SXP on the ASA. By default, SXP is disabled.

Step 2	`hostname(config)#` **`cts sxp connection peer`** *`peer_ip_address`* `[`**`source`** *`source_ip_address`*`]` **`password`** `{`**`default`**`|`**`none`**`}` `[`**`mode`** `{`**`local`**`|`**`peer`**`}]` `{`**`speaker`**`|`**`listener`**`}`
	`Example:`
	`hostname(config)# cts sxp connection peer 192.168.1.100 password default mode peer speaker`
		Sets up an SXP connection to an SXP peer. SXP connections are set per IP address; a single device pair can service multiple SXP connections.
		Peer IP Address (Required)
		Where *peer_ip_address* is the IPv4 or IPv6 address of the SXP peer. The peer IP address must be reachable from the ASA outgoing interface.
		Source IP Address (Optional)
		Where *source_ip_address* is the local IPv4 or IPv6 address of the SXP connection. The source IP address must be the same as the ASA outbound interface or the connection will fail.
		We recommend that you do not configure a source IP address for an SXP connection and allow the ASA to perform a route/ARP lookup to determine the source IP address for the SXP connection.
		Password (Required)
		Specifies whether to use the authentication key for the SXP connection:
		• **default**—Use the default password configured for SXP connections. See Configuring the Security Exchange Protocol (SXP), page 1-14.
		• **none**—Do not use a password for the SXP connection.
		Mode (Optional)
		Specifies the mode of the SXP connection:
		• **local**—Use the local SXP device.
		• **peer**—Use the peer SXP device.
		Role (Required)
		Specifies whether the ASA functions as a Speaker or Listener for the SXP connection. See About Speaker and Listener Roles on the ASA, page 1-5.
		• **speaker**—ASA can forward IP-SGT mappings to upstream devices.
		• **listener**—ASA can receive IP-SGT mappings from downstream devices.

Examples

The following example shows how to configure SXP peers in the ASA:

```
hostname(config)# cts sxp enable
hostname(config)# cts sxp connection peer 192.168.1.100 password default mode peer speaker
hostname(config)# cts sxp connection peer 192.168.1.101 password default mode peer
hostname(config)# no cts sxp connection peer 192.168.1.100
hostname(config)# cts sxp connection peer 192.168.1.100 source 192.168.1.1 password default mode peer speaker
hostname(config)# no cts sxp connection peer 192.168.1.100 source 192.168.1.1 password default mode peer
speaker
```

Refreshing Environment Data

The ASA downloads environment data from the ISE, which includes the Security Group Tag (SGT) name table. The ASA automatically refreshes its environment data obtained from the ISE when you complete the following tasks on the ASA:

- Configure a AAA server to communicate with the ISE.
- Import a PAC file from the ISE.
- Identify the AAA server group that the ASA will use for retrieval of Cisco TrustSec environment data.

Normally, you will not need to manually refresh the environment data from the ISE; however, security groups can change on the ISE. These changes are not reflected on the ASA until you refresh the data in the ASA security group table. Refresh the data on the ASA to make sure any security group made on the ISE are reflected on the ASA.

Tip We recommend that you schedule policy configuration changes on the ISE and the manual data refresh on the ASA during a maintenance window. Handling policy configuration changes in this way maximizes the chances of security group names getting resolved and security policies becoming active immediately on the ASA.

Prerequisites

The ASA must be configured as a recognized Cisco TrustSec network device in the ISE and the ASA must have successfully imported a PAC file, so that the changes made for Cisco TrustSec are applied to the ASA.

Restrictions

- When the ASA is part of an HA configuration, you must refresh the environment data on the primary ASA device.
- When the ASA is part of a clustering configuration, you must refresh the environment data on the master device.

To Refresh Environment Data

On the ASA, enter the following command:

```
hostname(config)# cts refresh environment-data
```

The ASA refreshes the Cisco TrustSec environment data from the ISE and resets the reconcile timer to the configured default value.

Configuring the Security Policy

You can incorporate TrustSec policy in many ASA features. Any feature that uses extended ACLs (unless listed in this chapter as unsupported) can take advantage of TrustSec. You can now add security group arguments to extended ACLs, as well as traditional network-based parameters.

- To configure an extended ACL, see Chapter 1, "Adding an Extended Access Control List."
- To configure security group object groups, which can be used in the ACL, see the "Configuring Local User Groups" section on page 1-11.

For example, an access rule permits or denies traffic on an interface using network information. With TrustSec, you can now control access based on security group. See Chapter 1, "Configuring Access Rules." For example, you could create an access rule for sample_securitygroup1 10.0.0.0 255.0.0.0, meaning the security group could have any IP address on subnet 10.0.0.0/8.

You can configure security policies based on combinations of security group names (servers, users, unmanaged devices, etc.), user-based attributes, and traditional IP-address-based objects (IP address, Active Directory object, and FQDN). Security-group membership can extend beyond roles to include device and location attributes and is independent of user-group membership.

Examples

The following example shows how to create an access list that uses a locally defined security object group:

```
object-group security objgrp-it-admin
   security-group name it-admin-sg-name
   security-group tag 1
object-group security objgrp-hr-admin
   security-group name hr-admin-sg-name  // single sg_name
   group-object it-admin     // locally defined object-group as nested object
object-group security objgrp-hr-servers
    security-group name hr-servers-sg-name
object-group security objgrp-hr-network
    security-group tag 2
access-list hr-acl permit ip object-group-security objgrp-hr-admin any
object-group-security objgrp-hr-servers
```

The access list configured above can be activated by configuring an access group or configuring MPF.

Other examples:

```
!match src hr-admin-sg-name from any network to dst host 172.23.59.53
    access-list idw-acl permit ip security-group name hr-admin-sg-name any host 172.23.59.53
!match src hr-admin-sg-name from host 10.1.1.1 to dst any
    access-list idfw-acl permit ip security-group name hr-admin-sg-name host 10.1.1.1 any
!match src tag 22 from any network to dst hr-servers-sg-name any network
    access-list idfw-acl permit ip security-group tag 22 any security-group name hr-servers-sg-name any
!match src user mary from any host to dst hr-servers-sg-name any network
    access-list idfw-acl permit ip user CSCO\mary any security-group name hr-servers-sg-name any
!match src objgrp-hr-admin from any network to dst objgrp-hr-servers any network
    access-list idfw-acl permit ip object-group-security objgrp-hr-admin any object-group-security
    objgrp-hr-servers any
!match src user Jack from objgrp-hr-network and ip subnet 10.1.1.0/24 to dst objgrp-hr-servers any network
    access-list idfw-acl permit ip user CSCO\Jack object-group-security objgrp-hr-network 10.1.1.0
    255.255.255.0 object-group-security objgrp-hr-servers any
!match src user Tom from security-group mktg any google.com
object network net-google
    fqdn google.com
    access-list sgacl permit ip sec name mktg any object net-google
```

```
! If user Tom or object_group security objgrp-hr-admin needs to be matched, multiple ACEs can be defined as
follows:
    access-list idfw-acl2 permit ip user CSCO\Tom 10.1.1.0 255.255.255.0 object-group-security
    objgrp-hr-servers any
    access-list idfw-acl2 permit ip object-group-security objgrp-hr-admin 10.1.1.0 255.255.255.0
    object-group-security objgrp-hr-servers any
```

Collecting User Statistics

To activate the collection of user statistics by the Modular Policy Framework and match lookup actions for the Identify Firewall, enter the following command:

Command	Purpose

user-statistics [**accounting** | **scanning**]
Example:
`hostname(config)# class-map c-identity-example-1`
`hostname(config-cmap)# match access-list identity-example-1`
`hostname(config-cmap)# exit`
`hostname(config)# policy-map p-identity-example-1`
`hostname(config-pmap)# class c-identity-example-1`
`hostname(config-pmap)# user-statistics accounting`
`hostname(config-pmap)# exit`
`hostname(config)# service-policy p-identity-example-1 interface outside`
	Activates the collection of user statistics by the Modular Policy Framework and matches lookup actions for the Identify Firewall.
	The **accounting** keyword specifies that the ASA collect the sent packet count, sent drop count, and received packet count. The **scanning** keyword specifies that the ASA collect only the sent drop count.
	When you configure a policy map to collect user statistics, the ASA collects detailed statistics for selected users. When you specify the **user-statistics** command without the **accounting** or **scanning** keywords, the ASA collects both accounting and scanning statistics.

Configuration Example

The following configuration example shows how to perform a complete configuration to integrate the ASA with Cisco TrustSec:

```
// Import an encrypted CTS PAC file
    cts import-pac asa.pac password Cisco
// Configure ISE for environment data download
    aaa-server cts-server-list protocol radius
    aaa-server cts-server-list host 10.1.1.100 cisco123
    cts server-group cts-server-list
// Configure SXP peers
    cts sxp enable
    cts sxp connection peer 192.168.1.100 password default mode peer speaker
//Configure security-group based policies
    object-group security objgrp-it-admin
          security-group name it-admin-sg-name
          security-group tag 1
    object-group security objgrp-hr-admin
        security-group name hr-admin-sg-name
        group-object it-admin
    object-group security objgrp-hr-servers
        security-group name hr-servers-sg-name
    access-list hr-acl permit ip object-group-security objgrp-hr-admin any
    object-group-security objgrp-hr-servers
```

Monitoring the ASA Integrated with Cisco TrustSec

This section contains the following topics:

Displaying the Cisco TrustSec Configuration for the ASA

Syntax:

```
show running-config cts
```

Description:

Specify the **show running-config cts** command to display the configured default values for the Cisco TrustSec infrastructure and the SXP commands.

Output:

This example displays the basic Cisco TrustSec configuration settings:

```
hostname# show running-config cts
!
cts server-group ctsgroup
!
cts sxp enable
cts sxp connection peer 192.16.1.1 password none mode speaker
```

This example displays the Cisco TrustSec configuration settings, including the default settings:

```
hostname# show running-config all cts
!
cts server-group ctsgroup
!
no cts sxp enable
no cts sxp default password
cts sxp retry period 120
cts sxp reconcile period 120
```

Monitoring SXP Connections

Syntax:

```
show cts sxp connections [peer peer_addr] [local local_addr] [ipv4|ipv6] [status
{on|off|delete-hold-down|pending-on}] [mode {speaker|listener}] [brief]
```

Description:

Use this command to verify which SXP connections are up and running. This command displays the SXP connections on the ASA for a particular user context when multi-context mode is used.

peer *peer_addr*	Displays only connections with the matched peer IP address.
local *local_addr*	Displays only connections with the matched local IP address.
ipv4	Displays only IPv4 connections.
ipv6	Displays only IPv6 connections.
status	Displays only connections with the matched status.
mode	Displays only connections with the matched mode.
brief	Displays only the connection summary.

Alternatively you can use the **show connection** command with the **security-group** keyword to display SXP connection information:

```
show connection [security-group [tag <sgt#> | name <sg_name>]...]
```

This **show connection** command displays data for SXP connections when you include the **security-group** keyword. To display information for a specific connection, include the **security-group** keyword specify an SGT value or security group name for both the source and destination of the connection. The ASA displays the connection matching the specific SGT values or security group names.

When you specify the **security-group** keyword without specifying a source and destination SGT value or a source and destination security group name, the ASA displays data for all SXP connections.

The ASA displays the connection data in the format *security_group_name* (*SGT_value*) or just as the *SGT_value* when the security group name is unknown.

Note Security group data is not available for stub connections because stub connection do not go through the slow path. Stub connections maintain only the information necessary to forward packets to the owner of the connection.

You can specify a single security group name to display all connections in a cluster; for example, the following example displays connections matching security-group mktg in all units of the cluster:

```
hostname# show cluster conn security-group name mktg
...
```

Output

This example displays a summary of the SXP connections enabled on the ASA:

```
hostname# show cts sxp connection brief
SXP               : Enabled
Highest version   : 2
Default password  : Set
Default local IP  : Not Set
Reconcile period  : 120 secs
Retry open period : 10 secs
Retry open timer  : Not Running
Total number of SXP connections : 2
-----------------------------------------------------------------------------
```

```
Peer IP          Local IP         Conn Status       Duration (dd:hr:mm:sec)
-----------------------------------------------------------------------------
2.2.2.1          2.2.2.2          On                0:00:02:14
3.3.3.1          3.3.3.2          On                0:00:02:14
------------------------------------------------------------------------------------------
Peer IP                    Local IP                   Conn Status       Duration
(dd:hr:mm:sec)
------------------------------------------------------------------------------------------
1234::A8BB:CCFF:FE00:1101  1234::A8BB:CCFF:FE00:2202  On 0:00:02:14
```

This example displays a detailed information about each SXP connections enabled on the ASA:

```
hostname# show cts sxp connections
SXP               : Enabled
Highest version   : 2
Default password  : Set
Default local IP  : Not Set
Reconcile period  : 120 secs
Retry open period : 10 secs
Retry open timer  : Not Running
Total number of SXP connections : 2
----------------------------------------------
Peer IP           : 2.2.2.1
Local IP          : 2.2.2.2
Conn status       : Delete Hold Down
Local mode        : Listener
Ins number        : 3
TCP conn password : Set
Delete hold down timer : Running
Reconciliation timer   : Not Running
Duration since last state change: 0:00:00:16 (dd:hr:mm:sec)
----------------------------------------------
Peer IP           : 3.3.3.1
Local IP          : 3.3.3.2
Conn status       : On
Local mode        : Listener
Ins number        : 2
TCP conn password : Default
Delete hold down timer : Not Running
Reconciliation timer   : Not Running
Duration since last state change: 0:00:05:49 (dd:hr:mm:sec)
```

This example displays data for all SXP connections:

```
hostname# show connection security-group
100 in use, 90 most used
TCP inside (security-group mktg(3)) 10.1.1.1:2000 outside (security-group 111)
172.23.59.53:21, idle 0:00:00, bytes 10, flags ...
TCP inside (security-group mktg(3)) 10.1.1.1:2010 outside (security-group 222)
172.23.59.53:21, idle 0:00:00, bytes 10, flags ...
...
```

This example displays the SXP connection matching specific SGT values for source and destination:

```
hostname# show connection security-group tag 3 security-group tag 111
1 in use
TCP inside (security-group mktg(3)) 10.1.1.1:2000 outside (security-group 111)
172.23.59.53:21, idle 0:00:00, bytes 10, flags ...
```

Monitoring Environment Data

Syntax:

`show cts sxp connections` **security-group-table** [**sgt** *value* | **name** *name-value*]

Description:

This command displays the Cisco TrustSec environment information contained in security group table on the ASA. This information includes the expiry timeout and security group name table. The security group table is populated with data from the ISE when you import the PAC file.

You can select a specific table entry to display by specifying either a SGT or security group name. A security group has a single name assigned to it. The same name can only be associated with a single SGT.

sgt *value*	Displays environment data for the security group name that matches the specified SGT value; where *value* is a number from 1 to 65533.
name *name-value*	Display environment data for the security group name that you specify; where name-*value* is a 32-byte case-sensitive string.

If you do not specify either an SGT or a name, the ASA displays all the environment data contained in the security group table.

When an entry includes "reserved," the SGT was assigned from a reserved range.

Output:

This example displays the environment data that appears when the ASA is unable to import the PAC file:

```
hostname# show cts environment-data
CTS Environment Data
====================
Status:                    Expired
Last download attempt:     Failed
Retry_timer (60 secs) is running
```

This example displays the environment data that appears when the ASA has successfully imported the PAC file:

```
hostname# show cts environment-data
CTS Environment Data
====================
Status:                    Active
Last download attempt:     Successful
Environment Data Lifetime: 1036800 secs
Last update time:          16:43:39 EDT May 5 2011
Env-data expires in        11:01:18:27 (dd:hr:mm:sec)
Env-data refreshes in      11:01:08:27 (dd:hr:mm:sec)
```

This example displays the environment data that is contained in the security group table:

```
hostname# show cts environment-data sg-table
Valid until: 04:16:29 EST Feb 16 2012
Total number of entries: 4
Number of entries shown: 4

SG Name     SG Tag  Type
-------     ------- ------------
```

```
Marketing  1       unicast
Engineering123     unicast (reserved)
Finance    44      multicast
Payroll    54321   multicast (reserved)
```

Monitoring Cisco TrustSec IP-SGT Mappings

This section contains the following topics about monitoring Cisco TrustSec IP-SGT mappings:

- To display IP-SGT Manager entries in the control plane, page 1-26
- To display IP-SGT mappings learned via SXP, page 1-27
- To display the IP-SGT mappings database in the datapath, page 1-29

To display IP-SGT Manager entries in the control plane

Syntax:

```
show cts sgt-map [address ip_address|[ipv4|ipv6]] [sgt value] [name sg_name]
[brief|detail]
```

Description:
This command displays the active IP-SGT mappings consolidated from SXP. Include the **detail** keyword to display more information, such as the security group names with the SGT values (included brackets). If a security group name is not available, only the SGT value is displayed without the bracket.

address *ip_address*	Displays IP-SGT mappings that match the specified IPv4 or IPv6 address.
ipv4 | ipv6	Displays IPv4 or IPv6 mappings. By default, only IPv4 mappings are displayed.
sgt *value*	Displays IP-SGT mappings that match the specified SGT.
name *sg_name*	Displays IP-SGT mappings that match the specified security group name.
brief	Displays the summary.
detail	Displays details, such as the security group name.

Output:

This example shows IP-SGT mappings that have IPv6 addresses:

```
hostname# show cts sgt-map ipv6
Active IP-SGT Bindings Information

IP Address                              SGT     Source
============================================================
3330::1                                 17      SXP
FE80::A8BB:CCFF:FE00:110                17      SXP

IP-SGT Active Bindings Summary
============================================
Total number of SXP    bindings = 2
Total number of active   bindings = 2
```

This example shows detailed information, including the security group names, about IP-SGT mappings that have IPv6 addresses:

```
hostname# show cts sgt-map ipv6 detail
Active IP-SGT Bindings Information

IP Address                 Security Group                          Source
=========================================================================
3330::1                     2345                                    SXP
1280::A8BB:CCFF:FE00:110    Security Tech Business Unit(12345)      SXP

IP-SGT Active Bindings Summary
===================================
Total number of SXP bindings    = 2
Total number of active bindings = 2
```

This example shows a summary of the IP-SGT mappings that have IPv6 addresses:

```
hostname# show cts sgt-map ipv6 brief
Active IP-SGT Bindings Information

IP-SGT Active Bindings Summary
====================================
Total number of SXP bindings    = 2
Total number of active bindings = 2
```

This example shows how to display IP-SGT mappings that fall within a specific subnet:

```
hostname# show cts sgt-map address 10.10.10.5 mask 255.255.255.255

Active IP-SGT Bindings Information

IP Address              SGT     Source
============================================================
10.10.10.5              1234    SXP

IP-SGT Active Bindings Summary
============================================
Total number of SXP    bindings = 1
Total number of active   bindings = 1
```

To display IP-SGT mappings learned via SXP

Syntax:

show cts sxp sgt-map [**peer** *peer_addr*] [**sgt** *value*] [**address** *ipv4_addr* [**netmask** *mask*]|**address** *ipv6_addr*[/*prefix*]|**ipv4**|**ipv6**] [**brief**|**detail**]

Description:
This command displays the current IP-SGT mapping database in the SXP module for a particular user context.

Include the **detail** keyword to display more information, such as the security group names with the SGT values (included brackets). If a security group name is not available, only the SGT value is displayed without the bracket.

Note The **show cts sgt-map** command displays the IP-SGT Manager entries in control path; while the **show cts sxp sgt-map** command displays more detailed information like instance number and peer IP address.

peer *peer_addr*	Displays only IP-SGT mappings *ipv4_addr* peer IP address.
sgt *value*	Displays only IP-SGT mappings *ipv4_addr* the SGT.
address *ipv4_addr* [**netmask** *mask*]	Displays only IP-SGT mappings included in the specified IPv4 address or subnet.
address *ipv6_addr*[*/prefix*]	Displays only IP-SGT mappings included in the specified IPv6 address or subnet.
brief	Displays only the summary.
detail	Displays details, such as the security group name.

Output:

This example shows detailed information about the each IP-SGT mapped entry in the IP-SGT mapping database, including whether the entry is activated. Entries are activated when they are used in a security policy or a security group object.

```
hostname# show cts sxp sgt-map detail
Total number of IP-SGT mappings : 3

SGT        : STBU(7)
IPv4       : 2.2.2.1
Peer IP    : 2.2.2.1
Ins Num    : 1
Status     : Active

SGT        : STBU(7)
IPv4       : 2.2.2.0
Peer IP    : 3.3.3.1
Ins Num    : 1
Status     : Inactive

SGT        : 6
IPv6       : 1234::A8BB:CCFF:FE00:110
Peer IP    : 2.2.2.1
Ins Num    : 1
Status     : Active
```

This example summarizes of the mapping information from IP-SGT mapping database:

```
hostname# show cts sxp sgt-map brief
Total number of IP-SGT mappings : 3
SGT, IPv4: 7, 2.2.2.1
SGT, IPv4: 7, 3.3.3.0
SGT, IPv6: 7, FE80::A8BB:CCFF:FE00:110
```

To display the IP-SGT mappings database in the datapath

Syntax:

show asp table cts sgt-map [**address** *ipv4_addr*|**address** *ipv6_addr*|**ipv4**|**ipv6**|**sgt** *value*]

Description:

This command displays the IP-SGT mappings from the IP-SGT mappings database maintained in the datapath. When an IP address is not specified, all the entries in the IP-SGT mappings database in the datapath are displayed. The IP address could be an exact address or a subnet based IP address.

address *ipv4_addr*	Displays IP-SGT mapping for the specified IPv4 address.
address *ipv6_addr*	Displays IP-SGT mapping for the specified IPv6 address.
ipv4	Displays all IP-SGT mappings with IPv4 addresses.
ipv6	Displays all IP-SGT mappings with IPv6 addresses.
sgt *value*	Displays IP-SGT mapping for the specified SGT value.
default	Displays IP-SGT mappings with IPv4 addresses.

Output:

This example shows all IP-SGT mapped entries in the ASP table:

```
hostname# show asp table cts sgt-map
IP Address                         SGT
========================================
10.10.10.5                         1234
55.67.89.12                        05
56.34.0.0                          338
192.4.4.4                          345
```

This example shows the IP-SGT map information in the ASP table for a specific IP address:

```
hostname# show asp table cts sgt-map address 10.10.10.5
IP Address                         SGT
========================================
10.10.10.5                         1234
```

This example shows the IP-SGT map information in the ASP table for all IPv6 address:

```
hostname# show asp table cts sgt-map ipv6
IP Address                         SGT
========================================
FE80::A8BB:CCFF:FE00:110           17
FE80::A8BB:CCFF:FE00:120           18
```

This example shows the IP-SGT map information in the ASP table for a specific SGT value:

```
hostname# show asp table cts sgt-map sgt 17
IP Address                         SGT
========================================
FE80::A8BB:CCFF:FE00:110           17
```

Monitoring the PAC File

Syntax:

```
show cts pac
```

Description:

This command displays information about the PAC file imported into the ASA from the ISE.

The ASA displays a warning message at the end of the display when the PAC file has expired or is within the 30 days of expiring:

```
WARNING: The pac will expire in less than 10 days
WARNING: The pac expired at Apr 30 2011 21:03:49 and needs to be refreshed
```

Output:

```
hostname# show cts pacs
  AID: CAFECAFECAFECAFECAFECAFECAFECAFE
  PAC-Info:
    Valid until: Apr 06 2002 01:00:31 UTC
    AID: CAFECAFECAFECAFECAFECAFECAFECAFE
    I-ID: someASA
    A-ID-Info: "Cisco Policy Manager"
    PAC-type = Cisco trustsec
PAC-Opaque:
000200820001000400010DEADBEEFDEADBEEF11111111111111110006005400000000158EDE58522C8698794F2F2
4F2623F8D26D78414DE33B102E6E93EDE53B8EFF0061FC14C1E1CCF14A04F69DAC79FE9F1BCD514893AC87B0AD
B476D2CB9CBF75788C5B8C3AE89E5322E4A124D4CB6A616B306E1DDD38CCE3E634E64E17BBD31957B0579DBC
```

Feature History for the ASA-Cisco TrustSec Integration

Table 1-3 lists each feature change and the platform release in which it was implemented.

Table 1-3 Feature History for the ASA-Cisco TrustSec Integration

Feature Name	Platform Releases	Feature Information
Cisco TrustSec Integration	9.0(1)	Cisco TrustSec provides an access-control solution that builds upon an existing identity-aware infrastructure to ensure data confidentiality between network devices and integrate security access services on one platform. In the Cisco TrustSec solution, enforcement devices utilize a combination of user attributes and end-point attributes to make role-based and identity-based access control decisions. In this release, the ASA integrates with Cisco TrustSec to provide security group based policy enforcement. Access policies within the Cisco TrustSec domain are topology-independent, based on the roles of source and destination devices rather than on network IP addresses. The ASA can utilize the Cisco TrustSec solution for other types of security group based policies, such as application inspection; for example, you can configure a class map containing an access policy based on a security group. We introduced or modified the following commands: **access-list extended**, **cts sxp enable**, **cts server-group**, **cts sxp default**, **cts sxp retry period**, **cts sxp reconciliation period**, **cts sxp connection peer**, **cts import-pac**, **cts refresh environment-data**, **object-group security**, **security-group**, **show running-config cts**, **show running-config object-group**, **clear configure cts**, **clear configure object-group**, **show cts**, **show object-group**, **show conn security-group**, **clear cts**, **debug cts.**