Configuring SGT Exchange Protocol

You can use the SGT Exchange Protocol (SXP) to propagate the Security Group Tags (SGTs) across network devices that do not have hardware support for Cisco TrustSec. This module describes how to configure Cisco TrustSec SXP on switches in your network.

Cisco TrustSec builds secure networks by establishing domains of trusted network devices. Each device in the domain is authenticated by its peers. Communication on the links between devices in the domain is secured with a combination of encryption, message integrity check, and data-path replay protection mechanisms.

The Security Group Tag (SGT) Exchange Protocol (SXP) is one of several protocols that supports CTS and is referred to in this document as Cisco TrustSec-SXP. Cisco TrustSec-SXP is a control protocol for propagating IP-to-SGT binding information across network devices that do not have the capability to tag packets. Cisco TrustSec-SXP passes IP to SGT bindings from authentication points to upstream devices in the network. This process allows security services on switches, routers, or firewalls to learn identity information from access devices.

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Prerequisites for SGT Exchange Protocol

The Cisco TrustSec-SGT Over Exchange Protocol (SXP) network needs to be established before implementing SXP. This network has the following prerequisites:

- To use the Cisco TrustSec functionality on your existing router, ensure that you have purchased a Cisco TrustSec security license. If the router is being ordered and needs the Cisco TrustSec functionality, ensure that this license is pre-installed on your router before it is shipped to you
- Cisco TrustSec SXP software must run on all network devices.
- Connectivity should exist between all network devices.
- The Cisco Identity Services Engine 1.0 is required for authentication. The Secure Access Control Server (ACS) Express Appliance server can also be used for authentication, however not all ACS features are supported by Cisco TrustSec. ACS 5.1 operates with a Cisco TrustSec-SXP license

- Configure the **retry open timer** command to a different value on different routers

Restrictions for SGT Exchange Protocol

- Cisco TrustSec Exchange Protocol is not supported on logical interfaces; supported only on physical interfaces.
- In Cisco IOS XE Everest 16.6.4 and later releases, when the Dynamic Host Control Protocol (DHCP) snooping is enabled, Cisco TrustSec enforcement for DHCP packets are bypassed by enforcement polices.

Information About SGT Exchange Protocol

This section provides information about SGT Exchange Protocol.

SGT Exchange Protocol Overview

Cisco TrustSec builds secure networks by establishing domains of trusted network devices. Each device in the domain is authenticated by its peers. Communication on the links between devices in the domain is secured with a combination of encryption, message integrity check, and data-path replay protection mechanisms.

The Security Group Tag (SGT) Exchange Protocol (SXP) is one of several protocols that supports Cisco TrustSec. SXP is a control protocol for propagating IP-to-SGT binding information across network devices that do not have the capability to tag packets. Cisco TrustSec filters packets at the egress interface. During endpoint authentication, a host accessing the Cisco TrustSec domain (the endpoint IP address) is associated with an SGT at the access device through Dynamic Host Control Protocol (DHCP) snooping and IP device tracking. The access device transmits that association or binding through SXP to Cisco TrustSec hardware-capable egress devices. These devices maintain a table of source IP-to-SGT bindings. Packets are filtered on the egress interface by Cisco TrustSec hardware-capable devices by applying security group access control lists (SGACLs). SXP passes IP-to-SGT bindings from authentication points to upstream devices in the network. This process allows security services on switches, routers, or firewalls to learn identity information from access devices.

SGTs can be assigned through any of the following Endpoint Admission Control (EAC) access methods:

- 802.1X port-based authentication
- MAC Authentication Bypass (MAB)
- Web Authentication

SXP uses TCP as the transport protocol, and the TCP port 64999 for connection initiation. SXP uses Message Digest 5 (MD5) for authentication and integrity check. It has two defined roles—speaker (initiator) and listener (receiver).

Security Group Tagging

Security Group Tag is a unique 16 bit tag that is assigned to a unique role. It represents the privilege of the source user, device, or entity and is tagged at the ingress of the Cisco TrustSec domain. SXP uses the device and user credentials acquired during authentication for classifying packets by security groups (SGs) as they

enter a network. This packet classification is maintained by tagging packets on the ingress to the Cisco TrustSec network so that they can be identified for the purpose of applying security and other policy criteria along the data path. The Security Group Tag (SGT) allows the network to enforce the access control policy by enabling the endpoint device to act upon the SGT to filter traffic. Static port Identification is used to lookup the SGT value for a particular endpoint connected to a port.

SGT Assignment

The Security Group Tag (SGT) of a packet can be assigned at the port level when the packet comes tagged on a Cisco TrustSec link, or when a single endpoint authenticates on a port. SGT of an incoming packet is determined in the following ways:

- When a packet that is tagged with an SGT comes on a trust port, the tag of the packet is considered as the SGT of the packet.
- When a packet is tagged with an SGT, but comes on an untrusted port, the SGT of the packet is ignored and the peer SGT is configured for the port.
- When a packet does not have an SGT, the peer SGT is configured for a port.

The following methods of assigning SGTs are supported:

- IPM (dot1x, MAB, and Web Authentication)
- VLAN-to-SGT mapping Established when an authentication method provides an SGT for an authenticated entry already has an assigned IP address. A device process monitors endpoint sessions and detects changes or removal of IP-to-SGT binding.
- SXP (SGT Exchange Protocol) Listener

How to Configure SGT Exchange Protocol

This section describes how to configure SGT Exchange Protocol.

Configuring a Device SGT Manually

In normal Cisco TrustSec operation, the authentication server assigns an SGT to the device for packets originating from the device. You can manually configure an SGT to be used if the authentication server is not accessible, but an authentication server-assigned SGT will take precedence over a manually-assigned SGT.

To manually configure an SGT on the device, perform this task:

Procedure

	Command or Action	Purpose
Step 1	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.

	Command or Action	Purpose
Step 2	**cts sgt** *tag* **Example:** `Device(config)# cts sgt tag`	Configures the SGT for packets sent from the device. The tag argument is in decimal format. The range is 1 to 65533.
Step 3	**exit** **Example:** `Device(config)# exit`	Exits configuration mode.

Configuring an SXP Peer Connection

You must configure the SXP peer connection on both of the devices. One device is the speaker and the other is the listener. When using password protection, make sure to use the same password on both ends.

Note If a default SXP source IP address is not configured and you do not configure an SXP source address in the connection, the Cisco TrustSec software derives the SXP source IP address from existing local IP addresses. The SXP source address might be different for each TCP connection initiated from the device.

To configure an SXP peer connection, perform this task:

Procedure

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device# enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 3	**cts sxp connection peer** *peer-ipv4-addr*[**source** *src-ipv4-addr*] **password** {**default | none**} **mode** {**local | peer**} {**speaker | listener**} {**vrf** *vrf-name*} **Example:** `Device(config)# cts sxp connection peer 10.10.1.1 password default mode local listener`	Configures the SXP address connection. The optional **source** keyword specifies the IPv4 address of the source device. If no address is specified, the connection will use the default source address, if configured, or the address of the port. The **password** keyword specifies the password that SXP will use for the connection using the following options: • **default**—Use the default SXP password you configured using the **cts sxp default password** command.

	Command or Action	Purpose
		• **none**—Do not use a password. The mode keyword specifies the role of the remote peer device: • **local**—The specified mode refers to the local device. • **peer**—The specified mode refers to the peer device. • **speaker**—Default. Specifies that the device is the speaker in the connection. • **listener**—Specifies that the device is the listener in the connection. The optional **vrf** keyword specifies the VRF to the peer. The default is the default VRF.
Step 4	**exit** **Example:** `Device(config)# exit`	Exits global configuration mode and returns to privileged EXEC mode
Step 5	**show cts sxp connections** **Example:** `Device# show cts sxp connections`	(Optional) Displays the SXP connection information.

Configuring the Default SXP Password

By default, SXP uses no password when setting up connections.

To configure a default SXP password, perform this task:

Procedure

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device# enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 3	**cts sxp default password** [**0** | **6** | **7**] *password* **Example:**	Configures the SXP default password. You can enter either a clear text password (using the **0** or no option) or an encrypted password (using

	Command or Action	Purpose
	`Device(config)# cts sxp default password 0 hello`	the **6** or **7** option). The maximum password length is 32 characters.
Step 4	**exit** **Example:** `Device(config)# exit`	Exits global configuration mode and returns to privileged EXEC mode

Configuring the Default SXP Source IP Address

SXP uses the default source IP address for all new TCP connections where a source IP address is not specified. There is no effect on existing TCP connections when you configure the default SXP source IP address.

To configure a default SXP source IP address, perform this task:

Procedure

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device# enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 3	**cts sxp default source-ip** *src-ip-addr* **Example:** `Device(config)# cts sxp default source-ip 10.0.1.2`	Configures the SXP default source IP address.
Step 4	**exit** **Example:** `Device(config)# exit`	Exits global configuration mode and returns to privileged EXEC mode.

Changing the SXP Reconciliation Period

After a peer terminates an SXP connection, an internal hold-down timer starts. If the peer reconnects before the internal hold-down timer expires, the SXP reconciliation period timer starts. While the SXP reconciliation period timer is active, the Cisco TrustSec software retains the SGT mapping entries learned from the previous connection and removes invalid entries. The default value is 120 seconds (2 minutes). Setting the SXP reconciliation period to 0 seconds disables the timer and causes all entries from the previous connection to be removed.

To change the SXP reconciliation period, perform this task:

Procedure

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device# enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 3	**cts sxp reconciliation period** *seconds* **Example:** `Device(config)# cts sxp reconciliation period 360`	Changes the SXP reconciliation timer. The default value is 120 seconds (2 minutes). The range is from 0 to 64000.
Step 4	**exit** **Example:** `Device(config)# exit`	Exits global configuration mode and returns to privileged EXEC mode.

Changing the SXP Retry Period

The SXP retry period determines how often the Cisco TrustSec software retries an SXP connection. When an SXP connection is not successfully set up, the Cisco TrustSec software makes a new attempt to set up the connection after the SXP retry period timer expires. The default value is 120 seconds. Setting the SXP retry period to 0 seconds disables the timer and retries are not attempted.

To change the SXP retry period, perform this task:

Procedure

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device# enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 3	**cts sxp retry period** *seconds* **Example:** `Device(config)# cts sxp retry period 360`	Changes the SXP retry timer. The default value is 120 seconds (2 minutes). The range is from 0 to 64000.

	Command or Action	Purpose
Step 4	**exit** **Example:** `Device(config)# exit`	Exits global configuration mode and returns to privileged EXEC mode.

Creating Syslogs to Capture Changes of IP Address-to-SGT Mapping Learned Through SXP

When the **cts sxp log binding-changes** command is configured in global configuration mode, SXP syslogs (sev 5 syslog) are generated whenever a change to IP address to SGT binding occurs (add, delete, change). These changes are learned and propagated on the SXP connection. The default is **no cts sxp log binding-changes**.

To enable logging of binding changes, perform the following task:

Procedure

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device# enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 3	**cts sxp log binding-changes** **Example:** `Device(config)# cts sxp log binding-changes`	Enables logging for IP to SGT binding changes.
Step 4	**exit** **Example:** `Device(config)# exit`	Exits global configuration mode and returns to privileged EXEC mode.

Configuration Examples for SGT Exchange Protocol

The following sections show configuration examples of SGT Exchange Protocol:

Example: Enabling Cisco TrustSec SXP and an SXP Peer Connection

The following example shows how to enable SXP and configure an SXP peer connection between device A, the speaker, and device B, the listener:

```
Device# configure terminal
Device(config)# cts sxp enable
Device(config)# cts sxp default password Cisco123
Device(config)# cts sxp default source-ip 10.10.1.1
Device(config)# cts sxp connection peer 10.20.2.2 password default mode local speaker
```

The following example shows how to configure the SXP peer connection between device B, the listener, and device A, the speaker:

```
Device# configure terminal
Device(config)# cts sxp enable
Device(config)# cts sxp default password Cisco123
Device(config)# cts sxp default source-ip 10.20.2.2
Device(config)# cts sxp connection peer 10.10.1.1 password default mode local listener
```

Example: Configuring the Default SXP Password and Source IP Address

The following example shows how to configure a default SXP password and source IP address:

```
Device# configure terminal
Device(config)# cts sxp default password Cisco123
Device(config)# cts sxp default source-ip 10.20.2.2
Device(config)# end
```

Verifying SGT Exchange Protocol Connections

To view SXP connections, perform this task:

Command	Purpose
show cts sxp connections	Displays detailed information about the SXP status and connections.
show cts sxp connections [brief]	Displays brief information about the SXP status and connections.

The following is sample output from the **show cts sxp connections** command:

```
Device# show cts sxp connections

SXP                    : Enabled
Default Password       : Set
Default Source IP      : 10.10.1.1
Connection retry open period: 10 secs
Reconcile period       : 120 secs
Retry open timer is not running
----------------------------------------------
```

```
Peer IP                 : 10.20.2.2
Source IP               : 10.10.1.1
Conn status             : On
Conn Version            : 2
Connection mode         : SXP Listener
Connection inst#        : 1
TCP conn fd             : 1
TCP conn password       : default SXP password
Duration since last state change: 0:00:21:25 (dd:hr:mm:sec)
Total num of SXP Connections = 1
```

The following is sample output from the **show cts sxp connections brief** command:

```
Device# show cts sxp connections brief

SXP                     : Enabled
Default Password        : Set
Default Source IP       : Not Set
Connection retry open period: 120 secs
Reconcile period        : 120 secs
Retry open timer is not running
------------------------------------------------------------------------------
Peer_IP          Source_IP          Conn Status    Duration
------------------------------------------------------------------------------
10.1.3.1         10.1.3.2           On             6:00:09:13 (dd:hr:mm:sec)
Total num of SXP Connections = 1
```

Feature History for SGT Exchange Protocol

This table provides release and related information for features explained in this module.

These features are available on all releases subsequent to the one they were introduced in, unless noted otherwise.

Release	Feature	Feature Information
Cisco IOS XE Everest 16.5.1a	SGT Exchange Protocol	The SXP propagates the SGTs across network devices that do not have hardware support for Cisco TrustSec.

Use Cisco Feature Navigator to find information about platform and software image support. To access Cisco Feature Navigator, go to http://www.cisco.com/go/cfn.