# Configuring Security Group ACL Policies

Using security group access control lists (SGACLs), you can control the operations that users can perform based on the security group assignments of users and destination resources. Policy enforcement within the Cisco TrustSec domain is represented by a permissions matrix, with source security group numbers on one axis and destination security group numbers on the other axis. Each cell in the body of the matrix can contain an ordered list of SGACLs which specifies the permissions that should be applied to packets originating from the source security group and destined for the destination security group.


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# Restrictions for Configuring SGACL Policies

- Due to hardware limitations, Cisco TrustSec SGACLs cannot be enforced for punt (CPU bound) traffic in hardware. SGACL enforcement in software is bypassed wfor CPU bound traffic for SVI, layer 2 and layer 3 Location Identifier Separation Protocol (LISP), and loopback interfaces.
- When configuring SGACL policies, if you change the IP version dynamically from **IPv4** or **IPv6** to **Agnostic** (applies to both IPv4 and IPv6) and vice-versa, the corresponding SGACL policies for IPv4 and IPv6 are not downloaded completely via the management VRF interface.
- When configuring SGACL policies, if you change the existing IP version to any other version (**IPv4** or **IPv6** or **Agnostic**) and vice-versa, Change of Authorization (CoA) from Cisco Identity Services Engine (ISE) should not be performed using RADIUS. Instead, use SSH and run the **cts refresh policy** command to perform a manual policy refresh.
- When using an SGT allowed list model with default action as **deny all**, in some cases, Cisco TrustSec policies are partially downloaded from the ISE server after a device reload.

  To prevent this, define a static policy on the device. Even if the **deny all** option is applied, the static policy permits traffic which allows the device to download policies from the ISE server and overwrite the defined static policies. For device SGT, configure the following commands in global configuration mode:

  - **cts role-based permissions from** <*sgt_num*> **to unknown**
  - **cts role-based permissions from unknown to** <*sgt_num*>

# How to Configure SGACL Policies

The following sections provide information on various SGACL policy configurations.

## SGACL Policy Configuration Process

Follow these steps to configure and enable Cisco TrustSec Security Group ACL (SGACL) policies:

1. Configuration of SGACL policies should be done primarily through the Policy Management function of the Cisco Secure Access Control Server (ACS) or the Cisco Identity Services Engine (ISE).

   If you are not using AAA on a Cisco Secure ACS or a Cisco ISE to download the SGACL policy configuration, you can manually configure the SGACL mapping and policies.

**Note** An SGACL policy downloaded dynamically from the Cisco Secure ACS or a Cisco ISE will override any conflicting locally-defined policy.

2. To enable SGACL policy enforcement on egress traffic on routed ports, enable SGACL policy enforcement globally as described in the Enabling SGACL Policy Enforcement Globally section.
3. To enable SGACL policy enforcement on switched traffic within a VLAN, or on traffic that is forwarded to an SVI associated with a VLAN, enable SGACL policy enforcement for specific VLANs as described in the Enabling SGACL Policy Enforcement on VLANs section.

## Enabling SGACL Policy Enforcement Globally

You must enable SGACL policy enforcement globally for Cisco TrustSec-enabled routed interfaces.

To enable SGACL policy enforcement on routed interfaces, perform this task:

### Procedure

| | Command or Action | Purpose |
|---|---|---|
| **Step 1** | **enable**<br>**Example:**<br>`Device# enable` | Enables privileged EXEC mode.<br>Enter your password if prompted. |
| **Step 2** | **configure terminal**<br>**Example:**<br>`Device# configure terminal` | Enters global configuration mode. |
| **Step 3** | **cts role-based enforcement**<br>**Example:**<br>`Device(config)# cts role-based enforcement` | Enables Cisco TrustSec SGACL policy enforcement on routed interfaces. |

| | Command or Action | Purpose |
|---|---|---|
| **Step 4** | **end**<br>**Example:**<br>`Device(config)# end` | Exits global configuration mode and returns to privileged EXEC mode. |

# Enabling SGACL Policy Enforcement Per Interface

You must first enable SGACL policy enforcement globally for Cisco TrustSec-enabled routed interfaces. This feature is not supported on Port Channel interfaces.

To enable SGACL policy enforcement on Layer 3 interfaces, perform this task:

### Procedure

| | Command or Action | Purpose |
|---|---|---|
| **Step 1** | **enable**<br>**Example:**<br>`Device# enable` | Enables privileged EXEC mode.<br>Enter your password if prompted. |
| **Step 2** | **configure terminal**<br>**Example:**<br>`Device# configure terminal` | Enters global configuration mode. |
| **Step 3** | **interface** *type slot/port*<br>**Example:**<br>`Device(config)# interface gigabitethernet 6/2` | Configures an interface and enters interface configuration mode. |
| **Step 4** | **cts role-based enforcement**<br>**Example:**<br>`Device(config-if)# cts role-based enforcement` | Enables Cisco TrustSec SGACL policy enforcement on routed interfaces. |
| **Step 5** | **end**<br>**Example:**<br>`Device(config-if)# end` | Exits interface configuration mode and returns to privileged EXEC mode. |
| **Step 6** | **show cts interface**<br>**Example:**<br>`Device# show cts interface` | (Optional) Displays Cisco TrustSec states and statistics per interface. |

# Enabling SGACL Policy Enforcement on VLANs

You must enable SGACL policy enforcement on specific VLANs to apply access control to switched traffic within a VLAN, or to traffic that is forwarded to an SVI associated with a VLAN.

To enable SGACL policy enforcement on a VLAN or a VLAN list, perform this task:

### Procedure

| | Command or Action | Purpose |
|---|---|---|
| **Step 1** | **enable**<br>**Example:**<br>`Device# enable` | Enables privileged EXEC mode.<br>Enter your password if prompted. |
| **Step 2** | **configure terminal**<br>**Example:**<br>`Device# configure terminal` | Enters global configuration mode. |
| **Step 3** | **cts role-based enforcement vlan-list** *vlan-list*<br>**Example:**<br>`Device(config)# cts role-based enforcement vlan-list 31-35,41` | Enables Cisco TrustSec SGACL policy enforcement on the VLAN or VLAN list. |
| **Step 4** | **end**<br>**Example:**<br>`Device(config)# end` | Exits global configuration mode and returns to privileged EXEC mode. |

# Configuring SGACL Monitor Mode

Before configuring SGACL monitor mode, ensure the following:

- Cisco TrustSec is enabled
- Counters are enabled

### Procedure

| | Command or Action | Purpose |
|---|---|---|
| **Step 1** | **enable**<br>**Example:**<br>`Device# enable` | Enables privileged EXEC mode.<br>Enter your password if prompted. |
| **Step 2** | **configure terminal**<br>**Example:**<br>`Device# configure terminal` | Enters global configuration mode. |

| | Command or Action | Purpose |
|---|---|---|
| **Step 3** | **cts role-based monitor all**<br>**Example:**<br>`Device(config)# cts role-based monitor all` | Enables the global monitor mode. |
| **Step 4** | **cts role-based monitor permissions from** {*sgt_num*} **to** {*dgt_num*} [**ipv4** \| **ipv6**]<br>**Example:**<br>`Device(config)# cts role-based permissions from 2 to 3 ipv4` | Enables monitor mode for IPv4/IPv6 Role Based Access Control List (RBACL) (Security Group Tag (SGT)- Destination Group Tag (DGT) pair). |
| **Step 5** | **end**<br>**Example:**<br>`Device(config)# end` | Exits global configuration mode and returns to privileged EXEC mode. |
| **Step 6** | **show cts role-based permissions from** {*sgt_num*} **to** {*dgt_num*} [**ipv4** \| **ipv6**] [**details**]<br>**Example:**<br>`Device# show cts role-based permissions from 2 to 3 ipv4 details` | (Optional) Displays the SGACL policies and details about the monitor mode feature for each pair. The command output displays monitored if per cell monitor mode is enabled for the <SGT-DGT> pair |
| **Step 7** | **show cts role-based counters** [**ipv4** \| **ipv6**]<br>**Example:**<br>`Device# show cts role-based counters ipv4` | (Optional) Displays all SGACL enforcement statistics for IPv4 and IPv6 events. |

# Manually Configuring SGACL Policies

A role-based access control list bound to a range of SGTs and DGTs forms an SGACL, a Cisco TrustSec policy enforced on egress traffic. Configuration of SGACL policies are best done through the policy management functions of the Cisco ISE or the Cisco Secure ACS. To manually (that is, locally) configure SGACL policies, configure a role-based ACL and bind the role-based ACL to a range of SGTs.

**Note** An SGACL policy downloaded dynamically from the Cisco ISE or Cisco ACS overrides any conflicting manually configured policy.

# Configuring and Applying IPv4 SGACL Policies

**Note** When configuring SGACLs and Role-Based access control lists (RBACLs), the named access control lists (ACLs) must start with an alphabet.

## Procedure

| | Command or Action | Purpose |
|---|---|---|
| **Step 1** | **enable**<br>**Example:**<br>`Device# enable` | Enables privileged EXEC mode.<br>Enter your password if prompted. |
| **Step 2** | **configure terminal**<br>**Example:**<br>`Device# configure terminal` | Enters global configuration mode. |
| **Step 3** | **ip access-list role-based** *rbacl-name*<br>**Example:**<br>`Device(config)# ip access-list role-based allow_webtraff` | Creates a Role-based ACL and enters Role-based ACL configuration mode. |
| **Step 4** | {[ *sequence-number*] \| **default** \| **permit** \| **deny** \| **remark**}<br>**Example:**<br>`Device(config-rb-acl)# 10 permit tcp dst eq 80 dst eq 20` | Specifies the access control entries (ACEs) for the RBACL.<br>You can use most of the commands and options allowed in extended named access list configuration mode, with the source and destination fields omitted.<br>Press Enter to complete an ACE and begin the next.<br>The following ACE commands or keywords are not supported:<br>• **reflect**<br>• **evaluate**<br>• **time-range** |
| **Step 5** | **exit**<br>**Example:**<br>`Device(config-rb-acl)# exit` | Exits role-based ACL configuration mode and returns to global configuration mode. |
| **Step 6** | **cts role-based permissions {default** \| [**from** {*sgt_num* \| **unknown**} **to** {*dgt_num* \| **unknown** }] {*rbacls* \| **ipv4** *rbacls*}<br>**Example:**<br>`Device(config)# cts role-based permissions from 55 to 66 allow_webtraff` | Binds SGTs and DGTs to the RBACL. The configuration is analogous to populating the permission matrix configured on the Cisco ISE or the Cisco Secure ACS.<br>• Default: Default permissions list<br>• *sgt_num*: 0 to 65,519. Source Group Tag.<br>• *dgt_num*: 0 to 65,519. Destination Group Tag |

| | Command or Action | Purpose |
|---|---|---|
| | | • unknown: SGACL applies to packets where the security group (source or destination) cannot be determined.<br>• ipv4: Indicates the following RBACL is IPv4.<br>• *rbacls*: Name of RBACLs |
| **Step 7** | **end**<br>**Example:**<br>`Device(config)# end` | Exits global configuration mode and returns to privileged EXEC mode. |
| **Step 8** | **show cts role-based permissions**<br>**Example:**<br>`Device# show cts role-based permissions` | (Optional) Displays permission to RBACL configurations. |
| **Step 9** | **show ip access-lists** {*rbacls* \| **ipv4** *rbacls*}<br>**Example:**<br>`Device# show ip access-lists allow_webtraff` | (Optional) Displays ACEs of all RBACLs or a specified RBACL. |

# Configuring IPv6 SGACL Policies

To manually configure IPv6 SGACL policies, perform this task:

### Procedure

| | Command or Action | Purpose |
|---|---|---|
| **Step 1** | **enable**<br>**Example:**<br>`Device# enable` | Enables privileged EXEC mode.<br>Enter your password if prompted. |
| **Step 2** | **configure terminal**<br>**Example:**<br>`Device# configure terminal` | Enters global configuration mode. |
| **Step 3** | **ipv6 access-list role-based** *sgacl-name*<br>**Example:**<br>`Device(config)# ipv6 access-list role-based sgaclname` | Creates a named IPv6 SGACL and enters IPv6 role-based ACL configuration mode. |
| **Step 4** | {**permit** \| **deny** } *protocol* [**dest-option** \| **dest-option-type** {*doh-number* \| *doh-type*}] [**dscp** *cp-value*] [**flow-label** *fl-value*] [**mobility** | Specifies the access control entries (ACEs) for the RBACL. |

| | Command or Action | Purpose |
|---|---|---|
| | \| **mobility-type** {*mh-number* \| *mh-type*}] [**routing** \| **routing-type** *routing-number*] [**fragments**] [**log** \| **log-input**] [**sequence** *seqno*]<br>**Example:**<br>`Device(config-ipv6rb-acl)# permit 33 dest-option dscp af11` | You can use most of the commands and options allowed in extended named access list configuration mode, with the source and destination fields omitted.<br>The following ACE commands or keywords are not supported:<br>• **reflect**<br>• **evaluate**<br>• **time-range** |
| **Step 5** | **end**<br>**Example:**<br>`Device(config-ipv6rb-acl)# end` | Exits IPv6 role-based ACL configuration mode and returns to privileged EXEC mode. |

# Manually Applying SGACL Policies

To manually apply SGACL policies, perform this task:

### Procedure

| | Command or Action | Purpose |
|---|---|---|
| **Step 1** | **enable**<br>**Example:**<br>`Device# enable` | Enables privileged EXEC mode.<br>Enter your password if prompted. |
| **Step 2** | **configure terminal**<br>**Example:**<br>`Device# configure terminal` | Enters global configuration mode. |
| **Step 3** | **cts role-based permissions default** [**ipv4** \| **ipv6**] *sgacl-name1* [*sgacl-name2* [*sgacl-name3* ...]]]<br>**Example:**<br>`Device(config)# cts role-based permissions default MYDEFAULTSGACL` | Specifies the default SGACLs. The default policies are applied when no explicit policy exists between the source and destination security groups. |
| **Step 4** | **cts role-based permissions from** {*source-sgt* \| **unknown**} **to** {*dest-sgt* \| **unknown**} [**ipv4** \| **ipv6**] *sgacl-name1* [*sgacl-name2* [*sgacl-name3* ...]]]<br>**Example:** | Specifies the SGACLs to be applied for a source security group (SGT) and destination security group (DGT). Values for source-sgt and dest-sgt range from 1 to 65533. By default, SGACLs are considered to be IPv4.<br>• **from**: Specifies the source SGT. |

| | Command or Action | Purpose |
|---|---|---|
| | `Device(config)# cts role-based permissions from 3 to 5 SRB3 SRB5` | • **to**: Specifies the destination security group.<br>• **unknown**: SGACL applies to packets where the security group (source or destination) cannot be determined.<br>**Note** An SGACL policy downloaded dynamically from the ACS will override any conflicting manual policy. |
| **Step 5** | **end**<br>**Example:**<br>`Device(config)# end` | Exits global configuration mode and returns to privileged EXEC mode. |

# Displaying SGACL Policies

After configuring the Cisco TrustSec device credentials and AAA, you can verify the Cisco TrustSec SGACL policies downloaded from the authentication server or configured manually. Cisco TrustSec downloads the SGACL policies when it learns of a new SGT through authentication and authorization on an interface, from SXP, or from manual IP address to SGT mapping.

Using the keywords, you can display all or part of the permissions matrix:

- If the **from** keyword is omitted, a column from the permissions matrix is displayed.
- If the **to** keyword is omitted, a row from the permissions matrix is displayed.
- If the **from** and **to** keywords are omitted, the entire permissions matrix is displayed.
- If the **from** and **to** keywords are specified, a single cell from the permissions matrix is displayed and the **details** keyword is available. When **details** is entered, the ACEs of the SGACL of the single cell are displayed.

To display the contents of the SGACL policies permissions matrix, perform this task:

### Procedure

| | Command or Action | Purpose |
|---|---|---|
| **Step 1** | **enable**<br>**Example:**<br>`Device> enable` | Enables privileged EXEC mode.<br>Enter your password if prompted. |
| **Step 2** | **show cts role-based permissions default** [**ipv4** \| **ipv6** \| **details**]<br>**Example:**<br>`Device# show cts role-based permissions default MYDEFAULTSGACL` | Displays the list of SGACL of the default policy. |

| | Command or Action | Purpose |
|---|---|---|
| **Step 3** | **show cts role-based permissions from** {*source-sgt* \| **unknown**} **to** {*dest-sgt* \| **unknown**}] [**ipv4** \| **ipv6** \| **details**]<br>**Example:**<br>`Device# show cts role-based permissions from 3` | Specifies the SGACLs to be applied for a source security group (SGT) and destination security group (DGT). Values for source-sgt and dest-sgt range from 1 to 65533. By default, SGACLs are considered to be IPv4.<br>• **from**: Specifies the source SGT.<br>• **to**: Specifies the destination security group.<br>• **unknown**: SGACL applies to packets where the security group (source or destination) cannot be determined.<br>**Note**<br>An SGACL policy downloaded dynamically from the ACS will override any conflicting manual policy. |
| **Step 4** | **exit**<br>**Example:**<br>`Device# exit` | Exits privileged EXEC mode. |

# Refreshing the Downloaded SGACL Policies

### Procedure

| | Command or Action | Purpose |
|---|---|---|
| **Step 1** | **enable**<br>**Example:**<br>`Device> enable` | Enables privileged EXEC mode.<br>Enter your password if prompted. |
| **Step 2** | **cts refresh policy** {**peer** [*peer-id*] \| **sgt** [*sgt_number* \| **default** \| **unknown**]}<br>**Example:**<br>`Device# cts refresh policy peer my_cisco_ise` | Performs an immediate refresh of the SGACL policies from the authentication server.<br>• If a *peer-id* is specified, only the policies related to the specified peer connection are refreshed. To refresh all peer policies, press Enter without specifying an ID.<br>• If an SGT number is specified, only the policies related to that SGT are refreshed. To refresh all security group tag policies, press Enter without specifying an SGT number. Select default to refresh the default policy. Select unknown to refresh unknown policy. |

| | Command or Action | Purpose |
|---|---|---|
| **Step 3** | **exit**<br>**Example:**<br>`Device# exit` | Exits privileged EXEC mode. |

# Configuration Examples for SGACL Policies

The following sections provide information on various SGACL policy configuration examples.

## Example: Enabling SGACL Policy Enforcement Globally

The following example shows how to enable SGACL policy enforcement globally:

```
Device> enable
Device# configure terminal
Device(config)# cts role-based enforcement
```

## Example: Enabling SGACL Policy Enforcement Per Interface

The following example shows how to enable SGACL policy enforcement per interface:

```
Device> enable
Device# configure terminal
Device(config)# interface gigabitethernet 1/0/2
Device(config-if)# cts role-based enforcement
Device(config-if)# end
```

## Example: Enabling SGACL Policy Enforcement on VLANs

The following example shows how to enable SGACL policy enforcement on VLANs:

```
Device> enable
Device# configure terminal
Device(config)# cts role-based enforcement vlan-list 31-35,41
Device(config)# exit
```

## Example: Configuring SGACL Monitor Mode

The following example shows how to configure SGACL monitor mode:

```
Device> enable
Device# configure terminal
Device(config)# cts role-based monitor enable
Device(config)# cts role-based permissions from 2 to 3 ipv4
Device# show cts role-based permissions from 2 to 3 ipv4

IPv4 Role-based permissions from group 2:sgt2 to group 3:sgt3 (monitored):
```

```
        denytcpudpicmp-10
        Deny IP-00

Device# show cts role-based permissions from 2 to 3 ipv4 details

IPv4 Role-based permissions from group 2:sgt2 to group 3:sgt3 (monitored):
        denytcpudpicmp-10
        Deny IP-00
Details:
Role-based IP access list denytcpudpicmp-10 (downloaded)
        10 deny tcp
        20 deny udp
        30 deny icmp
Role-based IP access list Permit IP-00 (downloaded)
        10 permit ip

Device# show cts role-based counters ipv4

Role-based IPv4 counters
From     To     SW-Denied  HW-Denied  SW-Permitt  HW_Permitt  SW-Monitor  HW-Monitor
*         *     0          0          8           18962       0           0
2         3     0          0          0           0           0           341057
```

# Example: Manually Configuring SGACL Policies

The following example shows how to manually configure SGACL policies:

```
Device> enable
Device# configure terminal
Device(config)# ip access role allow_webtraff
Device(config-rb-acl)# 10 permit tcp dst eq 80
Device(config-rb-acl)# 20 permit tcp dst eq 443
Device(config-rb-acl)# 30 permit icmp
Device(config-rb-acl)# 40 deny ip
Device(config-rb-acl)# exit
Device(config)# cts role-based permissions from 55 to 66 allow_webtraff

Device# show ip access allow_webtraff

Role-based IP access list allow_webtraff
    10 permit tcp dst eq www
    20 permit tcp dst eq 443
    30 permit icmp
    40 deny ip

Device# show cts role-based permissions from 2 to 5

Role-based permissions from group 2 to group 5:
srb2
srb5
```

# Example: Manually Applying SGACLs

The following example shows how to manually apply SGACL policies:

```
Device> enable
Device# configure terminal
```

```
Device(config)# cts role-based permissions default MYDEFAULTSGACL
Device(config)# cts role-based permissions from 3 to 5 SRB3 SRB5
Device(config)# exit
```

# Example: Displaying SGACL Policies

This example shows how to display the content of the SGACL policies permissions matrix for traffic sourced from security group 3:

```
Device> enable
Device# show cts role-based permissions from 3

Role-based permissions from group 3 to group 5:
        SRB3
        SRB5
Role-based permissions from group 3 to group 7:
        SRB4
```

# Feature History for Security Group ACL Policies

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 | Security Group ACL Policies | Using SGACLs you can control the operations that users can perform based on the security group assignments of users and destination resources.<br><br>Support for this feature was introduced only on the C9500-12Q, C9500-16X, C9500-24Q, C9500-40X models of the Cisco Catalyst 9500 Series Switches. |
| Cisco IOS XE Fuji 16.8.1a | Security Group ACL Policies | Support for this feature was introduced on the C9500-32C, C9500-32QC, C9500-48Y4C, and C9500-24Y4C models of the Cisco Catalyst 9500 Series Switches. |

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.