Configuring SDM Templates

- Restrictions for Switch Device Manager Template, on page 1
- Information About SDM Templates, on page 2
- How to Configure SDM Templates, on page 7
- Monitoring and Maintaining SDM Templates, on page 15
- Configuration Examples for SDM Templates, on page 15
- Additional References for SDM Templates, on page 23
- Feature History for SDM Templates, on page 23

Restrictions for Switch Device Manager Template

- If the device is operating with NAT template, Switch Device Manager (SDM) templates cannot be customized.
- In a customizable SDM template the combined limit for multicast entries for Layer 2 and Layer 3 is 48K (K = 1024 entries).
- It is mandatory to assign a priority value to each of the features when customizing an SDM template. The priority value decides the resource allocation for the features, when the total number of all the resources specified in the customizable SDM template exceeds the total number of system resources assigned to a customizable SDM Template.
- The priority value of each feature should be unique. You cannot assign the same priority value to different features.
- In case of RMA or Supervisor replacement, restoring the backup configuration does not restore the customized template. You have to reconfigure the customized template.
- You can enable the 4K VLAN feature only through a customizable SDM template for 4K VLAN. You cannot customize any other FIB or ACL related features in the custom VLAN template.

  In a customizable SDM template for 4K VLAN, you can only increase the scale of VLAN from 1K to 4K. You cannot have custom VLAN values between 1K and 4K. Scales of other features that are limited due to limitations of the 1K VLAN table will remain the same.

Information About SDM Templates

You can use SDM templates to configure the system resources to optimize support for specific features, depending on how your device is used in the network. You can select a template to provide maximum system usage for some functions.

The Cisco Catalyst C9400-SUP-1 supervisor engines support the following templates:

- Access
- Core
- NAT

The Cisco Catalyst C9400-SUP-2 supervisor engines support the following templates:

- Access

After you change the template and the system reboots, you can use the **show sdm prefer** privileged EXEC command to verify the new template configuration. If you enter the **show sdm prefer** command before you enter the **reload** privileged EXEC command, the **show sdm prefer** command shows the template currently in use and the template that will become active after a reload.

Table 1: Approximate Number of Feature Resources Allowed by Templates in Cisco Catalyst 9400 Series Supervisor 1

Resource	Access
LPM	64K
Host	48K
Layer 2 Multicast	16K
Layer 3 Multicast	16K
MAC Address	64K
SGT	8K
Flexible Netflow	128K/ASIC
Security ACL	18K
QoS ACL	18K
PBR/NAT	2K
Tunnel	1K
LISP	1K
MPLS L3VPN VRF	255
MPLS Label	12K

Resource	Access
MPLS L3VPN Routes VRF	32K
MPLS L3VPN Routes Prefix	4K
MVPN MDT Tunnels	1K
L2VPN EOMPLS Attachment	1K

Table 2: Approximate Number of Feature Resources Allowed by Templates in Cisco Catalyst 9400 Series Supervisor 1XL and Supervisor 1XL-Y Module

Template Name	Access	Core	SDA	NAT
LPM	64K	64K	64K	64K
Host	48K	32K	80K	48K
Layer2 Multicast	16K	16K	16K	16K
Layer3 Multicast	16K	32K	16K	32K
MAC Address	64K	16K	16K	16K
SGT	8K	8K	8K	8K
Flexible Netflow	128K/ASIC	128K/ASIC	128K/ASIC	128K/ASIC
Security ACL	18K	18K	18K	18K
QoS ACL	18K	18K	18K	18K
PBR/NAT	2K	2K	2K	16K
Tunnel	1K	1K	1K	1K
LISP	1K	1K	1K	1K
MPLS L3VPN VRF	255	255	N/A	255
MPLS Label	12K	16K		12K
MPLS L3VPN Routes VRF	32K	32K		32K
MPLS L3VPN Routes Prefix	4K	4K		4K
MVPN MDT Tunnels	1K	1K		1K
L2VPN EOMPLS Attachment	1K	1K	1K	1K

Customizable SDM Template

Overview of Customizable SDM Template

Switch Device Manager (SDM) templates can be used to configure system resources and optimize support for specific features. However standard SDM templates are defined based on how the device is deployed in the network.

A custom SDM template allows you to configure the features of the template based on your requirements and not the location of the device in the network.

You can configure custom SDM templates for Forwarding Information Base (FIB) features, Access Control List (ACL) features, and 4k VLAN features.

- You can configure a custom SDM template for Forwarding Information Base (FIB) features using the **sdm prefer custom fib** command.
- You can configure a custom SDM template for Access Control List (ACL) features using the **sdm prefer custom acl** command.
- You can configure a custom SDM template for 4k VLAN using the **sdm prefer custom vlan** command.

A Customizable SDM template supports the following FIB features:

- Unicast MAC addresses
- Layer 3 Unicast forwarding
- Layer 2 Multicast forwarding
- Layer 3 Multicast forwarding
- Ingress Netflow
- Egress Netflow
- SGT/DGT Index/MPLS VPN Label

A Customizable SDM template supports the following ACL features:

- Ingress Access Control List (ACL)
- Egress ACL
- Ingress Quality of Service (QoS)
- Egress QoS
- Netflow ACL
- Policy Based Routing (PBR)/Network Address Translation (NAT)
- Locator/ID Separation Protocol (LISP)
- Tunnels

A Customizable SDM template for 4K VLAN supports only the 4K VLAN feature. You can increase the scale of VLAN from 1k to 4k. A Customizable SDM template for 4K VLAN increases the number of supported Switch Virtual Interfaces (SVI) to 4000.

The following table shows the minimum and maximum scale values that can be configured for each of the FIB features, the step units and the default values that will be applied when no custom values are chosen for a feature.

Table 3: Scale values and Default values for FIB features

Feature name	Scale Values (Min-Max)	Step Units	Default Values
MAC addresses	32768 - 131072	16384	32768
Unicast routes	65536 - 262144	16384	65536
Layer 2 Multicast	0, 16384 - 32768	16384	16384
Layer 3 Multicast	0, 16384 - 32768	16384	16384
SG Hash/MPLS	0, 32768 - 65536	32768	32768
Ingress Netflow	0, 32768 - 65536	32768	32768
Egress NetFlow	0, 32768 - 65536	32768	0

The following table shows the minimum and maximum scale values that can be configured for each of the ACL features, the step units and the default values that will be applied when no custom values are chosen for a feature.

Table 4: Scale values and Default values for ACL features

Feature name	Scale Values (Min-Max)	Step Units	Default Values
Ingress ACL	4096 - 26624, 27648	2048	4096
Egress ACL	4096 - 26624, 27648	2048	4096
Ingress QoS	1024, 2048 - 16384	2048	1024
Egress QoS	1024, 2048 - 16384	2048	1024
Netflow ACL	1024 - 2048	1024	1024
PBR/ NAT	1024, 2048 - 16384	2048	1024
LISP	1024 - 2048	1024	1024
Tunnels	1024 - 3072	1024	1024

You can determine which features are allocated the resources first by assigning them a priority using the **priority** keyword. The lower the priority-value assigned to a feature the higher its priority in resource allocation. The resource allocation algorithm uses the priority-values to determine the number of resources assigned to each feature.

Once you have configured a customized template the device will have to be reloaded for the template to take effect.

Note

- NetFlow FIB entries consume twice as many hardware entries as configured, and SG Hash FIB entries consume half as many hardware entries as configured when NetFlow allocation is less than the allowed maximum value of 128K.
- For features where the scale value can be set to zero, you need to specify the scale value as zero. If not, the default value will be assigned as the scale value.

System resource allocation for Customizable SDM Template

The total number of system resources assigned to a Customizable SDM Template is 416K for FIB features and 52K for ACL features. If the total number of all the resources specified exceeds 416K for FIB features or 52K for ACL features, the system starts to lower the number of allotted resources starting with the feature assigned the highest number. A higher priority value or number assigned to a feature indicates a lower priority.

When the total number of resources assigned in the Customizable SDM Template is less than 416K for FIB features or less than 52K for ACL features:

- All the features specified in the template are allotted resources as customized in the template. Any features not specified in the template are allotted the default number of resources.
- If the total number of resources assigned to the FIB features multicast layer 2 and layer 3 exceeds 48K, then the scale of the multicast feature assigned the lower priority is reduced until the total number of resources assigned is equal to 48K.
- Resources that are not allotted will not be distributed.

When the total number of resources assigned in the Customizable SDM Template is more than 416K for FIB features and more than 52K for ACL features:

- All the features for which a custom scale is not specified are allotted the default values.
- If the total number of resources assigned to FIB features multicast layer 2 and layer 3 exceeds 48K, then the scale of the multicast feature that is assigned the lower priority is reduced until the total number of resources assigned is less than or equal to 48K.
- The number of resources allotted to the feature with the highest priority value are decreased by the step value.
- If the total number of resources still exceeds 416K for FIB features or 52K for ACL features, the resources allotted to the next feature with the highest priority value are decreased by the step value.
- While lowering the resources allotted to a feature, the scale is lowered only until the default value for that feature. If further adjustment is required, the resources allotted to the next feature on the priority list are reduced.

Note The custom value entered by you for any feature is rounded up to the next step value. For example, if you enter a value of 40K for SGT it's rounded up to 64K.

Customizable SDM Template and High Availability

On a device which supports High Availability, when a Customizable SDM Template is configured on the active Supervisor it also takes effect on the standby Supervisor.

If the standby Supervisor is configured with a different custom template than the active Supervisor, the Customizable SDM Template of the active Supervisor is configured on the standby Supervisor during initialization.

Customizable SDM Template and StackWise Virtual

On a device which supports StackWise Virtual, when an SDM Template is configured on the active Supervisor it also takes effect on the standby chassis.

If the standby chassis is configured with a different custom template than the active Supervisor, the SDM Template of the active Supervisor is configured on the standby chassis during initialization. The standby chassis undergoes an extra reload for the template to take effect.

Customizable SDM Template and ISSU

When a device undergoes an In-Service Software Upgrade (ISSU) to a higher release and there's a change in the resource allocation algorithm, this upgrade can result in a different scale for the same user input. The change in scale is detected and notified via a syslog message. The system continues to operate with the earlier scale.

You can view the change in scale by using the **show sdm prefer custom scale-change** command. You can apply this change in scale by using the **sdm prefer custom commit** command. The device has to be reloaded for the change to take effect.

When a device with a customizable SDM template for FIB features undergoes a downgrade to a release earlier than the Cisco IOS XE Amsterdam 17.3.1 release, you need to change the SDM template to a static SDM template before the downgrade. You can change the template using the **sdm prefer template name** command. Reload the system for the change to take effect before proceeding with the downgrade.

When a device with a customizable SDM template for ACL features undergoes a downgrade to a release earlier than the Cisco IOS XE Bengaluru 17.4.1 release, you need to change the SDM template to a static SDM template before the downgrade.

When a device has customizable SDM templates for both FIB and ACL features customized in the Cisco IOS XE Bengaluru 17.4.1 release and it downgrades to the Cisco IOS XE Amsterdam 17.3.1 release, the device will be restored with the customizations for the FIB features. The scale numbers for the ACL features will be alloted based on the scale values of the standard SDM template. The information about the customization of the ACL features will be preserved. The device will be restored with the customizations for the ACL features when it upgrades to the Cisco IOS XE Bengaluru 17.4.1 release.

How to Configure SDM Templates

Setting the SDM Template

Follow these steps to use the SDM template to maximize feature usage:

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	**sdm prefer** { **access** | **core** | | } **Example:** `Device(config)# sdm prefer access`	Specifies the SDM template to be used on the switch. The keywords have these meanings: • **access** —Sets the switch to the Access template. • **core** —Sets the Core template. **Note** The **no sdm prefer** command and a default template is not supported.
Step 4	**end** **Example:** `Device(config)# end`	Returns to privileged EXEC mode.
Step 5	**reload** **Example:** `Device# reload`	Reloads the operating system. After the system reboots, you can use the **show sdm prefer** privileged EXEC command to verify the new template configuration. If you enter the **show sdm prefer** command before you enter the reload privileged EXEC command, the **show sdm prefer** command shows the template currently in use and the template that will become active after a reload.

Configuring a Customizable SDM Template for FIB Features

To create a customizable SDM Template for FIB features, perform this procedure:

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	**sdm prefer custom fib** **Example:** `Device(config)#sdm prefer custom fib`	Creates a customizable SDM template for FIB features. Enters a sub-mode for customizing features.
Step 4	**mac-address** *number-of-entries* **priority** *priority-value* **Example:** `Device(config-sdm-fib)#mac-address 128 priority 1`	Specifies the number of entries allotted for MAC addresses. The value ranges from 32K to 128K. The value is rounded up to the next 16K unit. The priority values range 1–7.
Step 5	**ipv4_and_ipv6 unicast** *number-of-entries* **priority** *priority-value* **Example:** `Device(config-sdm-fib)#ipv4_and_ipv6 unicast 256 priority 2`	Specifies the number of entries allotted for IPv4 and IPv6 Unicast. The value ranges from 64K to 256K.The priority values range 1–7.
Step 6	**ipv4_and_ipv6 multicast l3** *number-of-entries* **priority** *priority-value* **Example:** `Device(config-sdm-fib)#ipv4_and_ipv6 multicast l3 32 priority 3`	Specifies the number of entries allotted for layer 3 IPv4 and IPv6 Multicast. The value ranges from 16 to 32, 0 (zero) can also be entered as the value. The priority values range 1–7.
Step 7	**ipv4_and_ipv6 multicast l2** *number-of-entries* **priority** *priority-value* **Example:** `Device(config-sdm-fib)#ipv4_and_ipv6 multicast l2 32 priority 4`	Specifies the number of entries allotted for layer 2 IPv4 and IPv6 Multicast. The value ranges from 16 to 32, 0 (zero) can also be entered as the value.The priority values range 1–7.
Step 8	**netflow_out** *number-of-entries* **priority** *priority-value* **Example:**	Specifies the number of entries allotted for Netflow egress. The value ranges from 32K to 64K, 0 (zero) can also be entered as the value.The priority values range 1–7.

	Command or Action	Purpose
	`Device(config-sdm-fib)#netflow_out 64 priority 5`	
Step 9	**netflow-in** *number-of-entries* **priority** *priority-value* **Example:** `Device(config-sdm-fib)# netflow_in 64 priority 6`	Specifies the number of entries allotted for Netflow ingress. The value ranges from 32K to 64K, 0 (zero) can also be entered as the value.The priority values range 1–7.
Step 10	**sgt_or_mpls_vpn** *number-of-entries* **priority** *priority-value* **Example:** `Device(config-sdm-fib)# sgt_or_mpls_vpn 64 priority 7`	Specifies the number of entries allotted for SGT or MPLS VPN. The value ranges from 32K to 64K, 0 (zero) can also be entered as the value.The priority values range 1–7.
Step 11	**end** **Example:** `Device(config-sdm-fib)# end`	Returns to privileged EXEC mode.
Step 12	**show sdm prefer custom** **Example:** `Device# show sdm prefer custom`	Displays the custom values that will be applied to the features in the customizable SDM template.
Step 13	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 14	**sdm prefer custom commit** **Example:** `Device(config)# sdm prefer custom commit`	Changes the running SDM preferences to the values in the customized template. The new template takes effect on the next reload.
Step 15	**end** **Example:** `Device(config)# end`	Returns to privileged EXEC mode.
Step 16	**reload** **Example:** `Device# reload`	Reloads the device and applies the customized SDM template.

What to do next

Once you view the custom values that will be applied to the features in the customizable SDM template using the **show sdm prefer custom** command, if required you can make changes to the values. To clear all the custom values that you have assigned to the features in the customized SDM template use the **sdm prefer custom fib clear** command.

If you want to change the custom value assigned to a feature without changing its priority value, you can simply overwrite the custom value assigned to the feature. For example, if you have assigned **mac-address 128 priority 1** you can overwrite this to **mac-address 32 priority 1**. If you want to change the priority value assigned to a feature, and if that priority value is already assigned to another feature you'll have to clear the custom value assigned to the other feature by using the **no** form of the command for that feature. You can then assign the priority value to the first feature. You'll have to reconfigure the other feature for it to have a non-default value.

The current customization context is valid only until **sdm prefer custom commit** command is issued. If you want to change any value after the commit CLI is issued, it will be considered as a new customization context. You will need to re-enter all the required feature values.

Configuring a Customizable SDM Template for ACL Features

To create a customizable SDM Template for ACL features, perform this procedure:

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	**sdm prefer custom acl** **Example:** `Device(config)#sdm prefer custom acl`	Creates a customizable SDM template for ACL features. Enters a sub-mode for customizing features.
Step 4	**acl-ingress** *number-of-entries* **priority** *priority-value* **Example:** `Device(config-sdm-acl)#acl-ingress 26 priority 1`	Specifies the number of entries allotted for Ingress ACL. The value ranges from 4K to 27K. The value is rounded up to the next 2K unit. The priority values range 1–8.
Step 5	**acl-egress** *number-of-entries* **priority** *priority-value*	Specifies the number of entries allotted for Engress ACL. The value ranges from 4K to

	Command or Action	Purpose
	Example: `Device(config-sdm-acl)#acl-engress 20 priority 2`	27K. The value is rounded up to the next 2K unit. The priority values range 1–8.
Step 6	**qos-ingress** *number-of-entries* **priority** *priority-value* **Example:** `Device(config-sdm-acl)#qos-ingress 2 priority 3`	Specifies the number of entries allotted for Ingress QoS. The value ranges from 2K to 16K. The value is rounded up to the next 2K unit. The priority values range 1–8.
Step 7	**qos-egress** *number-of-entries* **priority** *priority-value* **Example:** `Device(config-sdm-acl)#qos-egress 2 priority 4`	Specifies the number of entries allotted for Egress QoS. The value ranges from 2K to 16K. The value is rounded up to the next 2K unit. The priority values range 1–8.
Step 8	**nfl** *number-of-entries* **priority** *priority-value* **Example:** `Device(config-sdm-acl)#nfl 2 priority 5`	Specifies the number of entries allotted for Netflow ACL. The value ranges from 1K to 2K. The priority values range 1–8. The entries alloted for Netflow ACL are divided equally between ingress and egress entries.
Step 9	**pbr** *number-of-entries* **priority** *priority-value* **Example:** `Device(config-sdm-acl)#pbr 2 priority 6`	Specifies the number of entries allotted for PBR/NAT. The value ranges from 2K to 16K. The value is rounded up to the next 2K unit. The priority values range 1–8.
Step 10	**lisp** *number-of-entries* **priority** *priority-value* **Example:** `Device(config-sdm-acl)#lisp 2 priority 7`	Specifies the number of entries allotted for LISP. The value ranges from 1K to 2K. The priority values range 1–8.
Step 11	**tunnels** *number-of-entries* **priority** *priority-value* **Example:** `Device(config-sdm-acl)#tunnels 1 priority 8`	Specifies the number of entries allotted for Tunnel Termination Entries. The value ranges from 1K to 3K. The specified value will be lowered by 256 entries. 1K, 2K, 3K tunnel scale will be mapped to 0.75K, 1.75K, 2.75K respectively.The priority values range 1–8.
Step 12	**end** **Example:** `Device(config-sdm-acl)# end`	Returns to privileged EXEC mode.
Step 13	**show sdm prefer custom** **Example:** `Device# show sdm prefer custom`	Displays the custom values that will be applied to the features in the customizable SDM template.

	Command or Action	Purpose
Step 14	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 15	**sdm prefer custom commit** **Example:** `Device(config)# sdm prefer custom commit`	Changes the running SDM preferences to the values in the customized template. The new template takes effect on the next reload.
Step 16	**end** **Example:** `Device(config)# end`	Returns to privileged EXEC mode.
Step 17	**reload** **Example:** `Device# reload`	Reloads the device and applies the customized SDM template.

What to do next

Once you view the custom values that will be applied to the features in the customizable SDM template using the **show sdm prefer custom** command, if required you can make changes to the values. To clear all the custom values that you have assigned to the features in the customized SDM template use the **sdm prefer custom acl clear** command.

If you want to change the custom value assigned to a feature without changing its priority value, you can simply overwrite the custom value assigned to the feature. For example, if you have assigned **`acl-ingress 26 priority 1`** you can overwrite this to **`acl-ingress 24 priority 1`**. If you want to change the priority value assigned to a feature, and if that priority value is already assigned to another feature you'll have to clear the custom value assigned to the other feature by using the **no** form of the command for that feature. You can then assign the priority value to the first feature. You'll have to reconfigure the other feature for it to have a non-default value.

The current customization context is valid only until **sdm prefer custom commit** command is issued. If you want to change any value after the commit CLI is issued, it will be considered as a new customization context. You will need to re-enter all the required feature values.

Configuring a Customizable SDM Template for 4k VLAN

To create a customizable SDM Template for 4k VLAN, perform this procedure:

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	**sdm prefer custom vlan** **Example:** `Device(config)#sdm prefer custom vlan`	Creates a customizable SDM template for 4k VLAN.
Step 4	**end** **Example:** `Device(config-sdm-vlan)# end`	Returns to privileged EXEC mode.
Step 5	**show sdm prefer custom** **Example:** `Device# show sdm prefer custom`	Displays the custom values that will be applied to the features in the customizable SDM template.
Step 6	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 7	**sdm prefer custom commit** **Example:** `Device(config)# sdm prefer custom commit`	Changes the running SDM preferences to the values in the customized template. The new template takes effect on the next reload.
Step 8	**end** **Example:** `Device(config)# end`	Returns to privileged EXEC mode.
Step 9	**reload** **Example:** `Device# reload`	Reloads the device and applies the customized SDM template.

Clearing the customized values of the SDM Template

To clear the custom values that have been assigned to the features in the customized SDM template use the **sdm prefer custom fib clear** command or the **sdm prefer custom acl clear** command.

This command will clear the customization configuration that is not committed yet.

Once you issue this command, all the custom values for the features have to be reconfigured.

Monitoring and Maintaining SDM Templates

Verifying SDM Templates

Use the following commands to monitor and maintain SDM templates.

Command	Purpose
show sdm prefer	Displays the SDM template in use.

Note The SDM templates contain only those commands that are defined as part of the templates. If a template enables another related command that is not defined in the template, then this other command will be visible when the **show running config** command is entered. For example, if the SDM template enables the **switchport voice vlan** command, then the **spanning-tree portfast edge** command may also be enabled (although it is not defined on the SDM template).

If the SDM template is removed, then other such related commands are also removed and have to be reconfigured explicitly.

Configuration Examples for SDM Templates

Examples: Displaying SDM Templates

This is an example output showing the advanced template information on Cisco Catalyst 9400 Series Supervisor 1 Module

```
Device# show sdm prefer

Showing SDM Template Info

This is the Access template.
  Number of VLANs:                                4094
  Unicast MAC addresses:                          65536
  Overflow Unicast MAC addresses:                 1024
  L2 Multicast entries:                           16384
  Overflow L2 Multicast entries:                  1024
  L3 Multicast entries:                           16384
  Overflow L3 Multicast entries:                  1024
  Directly connected routes:                      49152
  Indirect routes:                                65536
  Security Access Control Entries:                18432
  QoS Access Control Entries:                     18432
  Policy Based Routing ACEs / NAT ACEs:           2048
  Netflow Input ACEs:                             1024
  Netflow Output ACEs:                            2048
  Flow SPAN ACEs:                                 1024
  Tunnels:                                        1024
  LISP Instance Mapping Entries:                  2048
```

```
  Control Plane Entries:                              512
  Input Netflow flows:                                65536
  Output Netflow flows:                               65536
  SGT/DGT (or) MPLS VPN entries:                      8192
  SGT/DGT (or) MPLS VPN Overflow entries:             512
  Wired clients:                                      2048
  MACSec SPD Entries:                                 1024
  VRF:                                                256
  MPLS Labels:                                        12288
  MPLS L3 VPN Routes VRF Mode:                        32768
  MPLS L3 VPN Routes Prefix Mode:                     8192
  MVPN MDT Tunnels:                                   1024
  L2 VPN EOMPLS Attachment Circuit:                   1024
  MAX VPLS Bridge Domains :                           128
  MAX VPLS Peers Per Bridge Domain:                   32
  MAX VPLS/VPWS Pseudowires :                         4096

These numbers are typical for L2 and IPv4 features.
Some features such as IPv6, use up double the entry size;
so only half as many entries can be created.
```

This is an example output showing the advanced template information on Cisco Catalyst 9400 Series Supervisor 1XL Module

```
Device
This is the Access template.
Number of VLANs: 4094
Unicast MAC addresses: 65536
Overflow Unicast MAC addresses: 1024
L2 Multicast entries: 16384
Overflow L2 Multicast entries: 1024
L3 Multicast entries: 16384
Overflow L3 Multicast entries: 1024
Directly connected routes: 49152
Indirect routes: 65536
Security Access Control Entries: 18432
QoS Access Control Entries: 18432
Policy Based Routing ACEs / NAT ACEs: 2048
Netflow Input ACEs: 1024
Netflow Output ACEs: 2048
Ingress Netflow ACEs: 1024
Egress Netflow ACEs: 2048
Flow SPAN ACEs: 1024
Tunnels: 1024
LISP Instance Mapping Entries: 1024
Control Plane Entries: 1024
Input Netflow flows: 65536
Output Netflow flows: 65536
SGT/DGT (or) MPLS VPN entries: 8192
SGT/DGT (or) MPLS VPN Overflow entries: 512
Wired clients: 2048
MACSec SPD Entries: 1024
MPLS L3 VPN VRF: 255
MPLS Labels: 12288
MPLS L3 VPN Routes VRF Mode: 32768
MPLS L3 VPN Routes Prefix Mode: 4096
MVPN MDT Tunnels: 1024
L2 VPN EOMPLS Attachment Circuit: 1024
MAX VPLS Bridge Domains : 128
MAX VPLS Peers Per Bridge Domain: 32
MAX VPLS/VPWS Pseudowires : 4096
These numbers are typical for L2 and IPv4 features.
Some features such as IPv6, use up double the entry size;
so only half as many entries can be created.
* values can be modified by sdm cli.
```

```
Device
This is the Core template.
Number of VLANs: 4094
Unicast MAC addresses: 16384
Overflow Unicast MAC addresses: 1024
L2 Multicast entries: 16384
Overflow L2 Multicast entries: 1024
L3 Multicast entries: 32768
Overflow L3 Multicast entries: 1024
Directly connected routes: 32768
Indirect routes: 65536
Security Access Control Entries: 18432
QoS Access Control Entries: 18432
Policy Based Routing ACEs / NAT ACEs: 2048
Netflow Input ACEs: 1024
Netflow Output ACEs: 2048
Ingress Netflow ACEs: 1024
Egress Netflow ACEs: 2048
Flow SPAN ACEs: 1024
Tunnels: 1024
LISP Instance Mapping Entries: 1024
Control Plane Entries: 1024
Input Netflow flows: 65536
Output Netflow flows: 65536
SGT/DGT (or) MPLS VPN entries: 8192
SGT/DGT (or) MPLS VPN Overflow entries: 512
Wired clients: 2048
MACSec SPD Entries: 256
MPLS L3 VPN VRF: 255
MPLS Labels: 16384
MPLS L3 VPN Routes VRF Mode: 32768
MPLS L3 VPN Routes Prefix Mode: 4096
MVPN MDT Tunnels: 1024
L2 VPN EOMPLS Attachment Circuit: 1024
MAX VPLS Bridge Domains : 128
MAX VPLS Peers Per Bridge Domain: 32
MAX VPLS/VPWS Pseudowires : 4096
These numbers are typical for L2 and IPv4 features.
Some features such as IPv6, use up double the entry size;
so only half as many entries can be created.
* values can be modified by sdm cli.

Device
This is the NAT template.
Number of VLANs: 4094
Unicast MAC addresses: 16384
Overflow Unicast MAC addresses: 1024
L2 Multicast entries: 16384
Overflow L2 Multicast entries: 1024
L3 Multicast entries: 32768
Overflow L3 Multicast entries: 1024
Directly connected routes: 49152
Indirect routes: 65536
Security Access Control Entries: 18432
QoS Access Control Entries: 3072
Policy Based Routing ACEs / NAT ACEs: 16384
Netflow Input ACEs: 1024
Netflow Output ACEs: 2048
Ingress Netflow ACEs: 1024
Egress Netflow ACEs: 2048
Flow SPAN ACEs: 1024
Tunnels: 1024
LISP Instance Mapping Entries: 1024
Control Plane Entries: 1024
Input Netflow flows: 65536
```

```
Output Netflow flows: 65536
SGT/DGT (or) MPLS VPN entries: 8192
SGT/DGT (or) MPLS VPN Overflow entries: 512
Wired clients: 2048
MACSec SPD Entries: 256
MPLS L3 VPN VRF: 255
MPLS Labels: 12288
MPLS L3 VPN Routes VRF Mode: 32768
MPLS L3 VPN Routes Prefix Mode: 4096
MVPN MDT Tunnels: 1024
L2 VPN EOMPLS Attachment Circuit: 1024
MAX VPLS Bridge Domains : 128
MAX VPLS Peers Per Bridge Domain: 32
MAX VPLS/VPWS Pseudowires : 4096
These numbers are typical for L2 and IPv4 features.
Some features such as IPv6, use up double the entry size;
so only half as many entries can be created.
* values can be modified by sdm cli.

Device
This is the SDA template.
Number of VLANs: 4094
Unicast MAC addresses: 16384
Overflow Unicast MAC addresses: 1024
L2 Multicast entries: 16384
Overflow L2 Multicast entries: 1024
L3 Multicast entries: 16384
Overflow L3 Multicast entries: 1024
Directly connected routes: 81920
Indirect routes: 65536
Security Access Control Entries: 18432
QoS Access Control Entries: 18432
Policy Based Routing ACEs / NAT ACEs: 2048
Netflow Input ACEs: 1024
Netflow Output ACEs: 2048
Ingress Netflow ACEs: 1024
Egress Netflow ACEs: 2048
Flow SPAN ACEs: 1024
Tunnels: 1024
LISP Instance Mapping Entries: 1024
Control Plane Entries: 1024
Input Netflow flows: 65536
Output Netflow flows: 65536
SGT/DGT (or) MPLS VPN entries: 8192
SGT/DGT (or) MPLS VPN Overflow entries: 512
Wired clients: 2048
MACSec SPD Entries: 256
These numbers are typical for L2 and IPv4 features.
Some features such as IPv6, use up double the entry size;
so only half as many entries can be created.
* values can be modified by sdm cli.
```

Example: Configuring a customized SDM template

The following example output shows how to configure a customized SDM template for FIB features. In this example, as the SG Hash/MPLS and Ingress Netflow features haven't been assigned any resources in the customized template they are allotted resources according to their default values.

```
Device(config)# sdm prefer custom fib
Device(config-sdm-fib)# mac-address 128 priority 1
Device(config-sdm-fib)# ipv4_and_ipv6 unicast 256 priority 2
Device(config-sdm-fib)# ipv4_and_ipv6 multicast l3 32 priority 3
Device(config-sdm-fib)# ipv4_and_ipv6 multicast l2 32 priority 4
```

```
Device(config-sdm-fib)# netflow_out 64 priority 5
Device(config-sdm-fib)# end
```

In the following examples as the SGT/ MPLS VPN features are assigned zero resources, no resources will be allotted to these features.

```
Device(config)# sdm prefer custom fib
Device(config-sdm-fib)# ipv4_and_ipv6 unicast 164 priority 1
Device(config-sdm-fib)# mac-address 80 priority 2
Device(config-sdm-fib)# ipv4_and_ipv6 multicast l2 16 priority 4
Device(config-sdm-fib)# ipv4_and_ipv6 multicast l3 16 priority 3
Device(config-sdm-fib)# sgt_or_mpls_vpn 0
Device(config-sdm-fib)# netflow_in 32 priority 5
Device(config-sdm-fib)# netflow_out 32 priority 6
Device(config-sdm-fib)# end
```

The following example output shows how to configure a customized SDM template for ACL features. In this example, as the Tunnels feature hasn't been assigned any resources in the customized template it is allotted resources according to the default values.

```
Device(config)# sdm prefer custom acl
Device(config-sdm-acl)# acl-ingress 26 priority 1
Device(config-sdm-acl)# acl-engress 20 priority 2
Device(config-sdm-acl)# lisp 2 priority 3
Device(config-sdm-acl)# nfl 2 priority 4
Device(config-sdm-acl)# pbr 2 priority 5
Device(config-sdm-acl)# qos-ingress 2 priority 6
Device(config-sdm-acl)# qos-egress 2 priority 7
Device(config-sdm-acl)# end
```

The following example output shows how to configure a customized SDM template for 4K VLAN.

```
Device(config)# sdm prefer custom VLAN
Device(config-sdm-vlan)# end
```

Example: Displaying the customized SDM template

The following example output shows the proposed values in the customized SDM template for FIB and ACL features.

```
Device# show sdm prefer custom

Showing SDM Template Info

This is the Custom template
<SNIP>
  Number of VLANs:                                  4094
  Unicast MAC addresses*:                          32768  (current) - 131072 (proposed)

  Overflow Unicast MAC addresses*:                 768    (current) - 1536   (proposed)

  L2 Multicast entries*:                           0      (current) - 16384  (proposed)

  Overflow L2 Multicast entries*:                  2304   (current) - 768    (proposed)

  L3 Multicast entries*:                           32768  (current) - 16384  (proposed)

  Overflow L3 Multicast entries*:                  768    (current) - 768    (proposed)

  Ipv4/Ipv6 shared unicast routes*:                212992 (current) - 180224 (proposed)

  Overflow shared unicast routes*:                 1536   (current) - 2304   (proposed)
```

```
  Ingress Security Access Control Entries*:           24576  (current) - 26624  (proposed)

  Egress Security Access Control Entries*:            3072   (current) - 20480  (proposed)

  Ingress QoS Access Control Entries*:                8192   (current) - 1024   (proposed)

  Egress QoS Access Control Entries*:                 8192   (current) - 1024   (proposed)

  Policy Based Routing ACEs / NAT ACEs*:              3072   (current) - 1024   (proposed)

  Netflow Input ACEs*:                                256    (current) - 512    (proposed)

  Netflow Output ACEs*:                               768    (current) - 512    (proposed)

  Flow SPAN ACEs*:                                    256    (current) - 512    (proposed)

  Output Flow SPAN ACEs*:                             256    (current) - 512    (proposed)

  Tunnels*:                                           2816   (current) - 768    (proposed)

  LISP Instance Mapping Entries*:                     2048   (current) - 1024   (proposed)

  Control Plane Entries*:                             512    (current) - 512    (proposed)

  Input Netflow flows*:                               32768  (current) - 32768  (proposed)

  Output Netflow flows*:                              32768  (current) - 0      (proposed)

  SGT/DGT (or) MPLS VPN entries*:                     32768  (current) - 32768  (proposed)

  SGT/DGT (or) MPLS VPN Overflow entries*:            768    (current) - 768    (proposed)

  Wired clients:                                      2048
  MACSec SPD Entries*:                                256    (current) - 256    (proposed)

  VRF:                                                1024
  MPLS Labels:                                        45056
  MPLS L3 VPN Routes VRF Mode*:                       209920 (current) - 180224 (proposed)

  MPLS L3 VPN Routes Prefix Mode*:                    32768  (current) - 32768  (proposed)

  MVPN MDT Tunnels:                                   1024
  L2 VPN EOMPLS Attachment Circuit:                   1024
  MAX VPLS Bridge Domains :                           1000
  MAX VPLS Peers Per Bridge Domain:                   128
  MAX VPLS/VPWS Pseudowires :                         16384

Ipv4/Ipv6 Direct and Indirect unicast routes share same space
(*) values can be modified by sdm cli
The proposed values will take effect post reload.
```

The following example output shows the values and priorities specified by the user in the custom template. As the SG Hash/MPLS, Ingress Netflow and Tunnels features haven't been assigned any resources in the customized template, they will be allotted resources according to their default values.

```
Device# show sdm prefer custom user-input

FIB FEATURE USER INPUT
User Input values
==========================

  FEATURE NAME                                          PRIORITY   SCALE
-------------------------------------------------------------------------
  Unicast MAC addresses:                                 1          128*1024
```

```
  L2 Multicast entries:                                4          32*1024
  L3 Multicast entries:                                3          32*1024
  Ipv4/Ipv6 shared unicast routes:                     2          256*1024
  Output Netflow flows:                                5          64*1024


System Default values
=========================

  FEATURE NAME                                                    PRIORITY   SCALE
-------------------------------------------------------------------------------
  Input Netflow flows:                                           NA         32768
  SGT/DGT (or) MPLS VPN entries:                                 NA         32768

ACL FEATURE USER INPUT
User Input values
=========================

  FEATURE NAME                                                    PRIORITY   SCALE
-------------------------------------------------------------------------------
  Security Access Control Entries:                               1          26*1024
  Egress Security Access Control Entries:                        2          20*1024
  QoS Access Control Entries:                                    3          2*1024
  Egress QoS Access Control Entries:                             4          2*1024
  Policy Based Routing ACEs / NAT ACEs:                          5          2*1024
  Netflow ACEs:                                                  6          2*1024
  LISP Instance Mapping Entries:                                 7          2*1024


System Default values
=========================

  FEATURE NAME                                                    PRIORITY   SCALE
-------------------------------------------------------------------------------
  Tunnels:                                                        NA         1024
```

The following example output shows the proposed values in the customized SDM template. As the SGT/MPLS VPN features are assigned zero resources, no resources will be allotted to these features.

```
Device# show sdm prefer custom

Showing SDM Template Info

This is the Custom template
<SNIP>
  Unicast MAC addresses*:                          32768  (current) - 81920  (proposed)
  Overflow Unicast MAC addresses*:                 768    (current) - 1536   (proposed)
  L2 Multicast entries*:                           0      (current) - 16384  (proposed)
  Overflow L2 Multicast entries*:                  2304   (current) - 768    (proposed)
  L3 Multicast entries*:                           32768  (current) - 16384  (proposed)
  Overflow L3 Multicast entries*:                  768    (current) - 768    (proposed)
  Ipv4/Ipv6 shared unicast routes*:                212992 (current) - 180224 (proposed)
  Overflow shared unicast routes*:                 1536   (current) - 2304   (proposed)
  Ingress Security Access Control Entries*:        24576  (current) - 26624  (proposed)
  Egress Security Access Control Entries*:         3072   (current) - 20480  (proposed)
  Ingress QoS Access Control Entries*:             8192   (current) - 1024   (proposed)
  Egress QoS Access Control Entries*:              8192   (current) - 1024   (proposed)
  Policy Based Routing ACEs / NAT ACEs*:           3072   (current) - 1024   (proposed)
  Netflow Input ACEs*:                             256    (current) - 512    (proposed)
  Netflow Output ACEs*:                            768    (current) - 512    (proposed)
  Flow SPAN ACEs*:                                 256    (current) - 512    (proposed)
  Output Flow SPAN ACEs*:                          256    (current) - 512    (proposed)
  Tunnels*:                                        2816   (current) - 768    (proposed)
  LISP Instance Mapping Entries*:                  2048   (current) - 1024
  Input Netflow flows*:                            32768  (current) - 32768  (proposed)
```

```
  Output Netflow flows*:                          32768  (current) - 32768  (proposed)
  SGT/DGT (or) MPLS VPN entries*:                 32768  (current) - 0      (proposed)
  SGT/DGT (or) MPLS VPN Overflow entries*:        768    (current) - 768    (proposed)
  Wired clients:                                  2048
  MACSec SPD Entries*:                            256    (current) - 256    (proposed)
  VRF:                                            1024
  MPLS Labels:                                    45056
  MPLS L3 VPN Routes VRF Mode*:                   209920 (current) - 180224 (proposed)
  MPLS L3 VPN Routes Prefix Mode*:                32768  (current) - 32768  (proposed)
  MVPN MDT Tunnels:                               1024
  L2 VPN EOMPLS Attachment Circuit:               1024
  MAX VPLS Bridge Domains :                       1000
  MAX VPLS Peers Per Bridge Domain:               128
  MAX VPLS/VPWS Pseudowires :                     16384
```

The following example output shows the values and priorities specified by the user in the custom template. No resources have been alloted to SGT/MPLS VPN features.

```
Device# show sdm prefer custom user-input

FIB FEATURE USER INPUT
User Input values
==========================
  FEATURE NAME                                                PRIORITY       SCALE
-------------------------------------------------------------------------------
Unicast MAC addresses:                                           2          80*1024
L2 Multicast entries:                                            4          16*1024
L3 Multicast entries:                                            3          16*1024
Ipv4/Ipv6 shared unicast routes:                                 1          164*1024
Input Netflow flows:                                             5          32*1024
Output Netflow flows:                                            6          32*1024
SGT/DGT (or) MPLS VPN entries:                                   NA         0

ACL FEATURE USER INPUT
User Input values
==========================
  FEATURE NAME                                                PRIORITY   SCALE
-------------------------------------------------------------------------------
  Security Access Control Entries:                           1          26*1024
  Egress Security Access Control Entries:                    2          20*1024
  QoS Access Control Entries:                                3          2*1024
  Egress QoS Access Control Entries:                         4          2*1024
  Policy Based Routing ACEs / NAT ACEs:                      5          2*1024
  Netflow ACEs:                                              6          2*1024
  LISP Instance Mapping Entries:                             7          2*1024


System Default values
==========================

  FEATURE NAME                                                PRIORITY   SCALE
-------------------------------------------------------------------------------
  Tunnels:                                                    NA         1024
```

Example: Applying the customized SDM template

The following example output shows how to apply a customized SDM template:

```
Device(config)# sdm prefer custom commit
Changes to the running SDM preferences have been stored and will take effect on the next
reload.
Device(config)# exit
Device# reload
```

Example: Clearing the customized values of the SDM template

The following example output shows how to clear a customized SDM template for FIB features after which the template can be recustomized:

```
Device(config)# sdm prefer custom fib clear
FIB customization changes, not yet committed will be cleared
Device(config-sdm-fib)# end
```

The following example output shows how to clear a customized SDM template for ACL features after which the template can be recustomized:

```
Device(config)# sdm prefer custom acl clear
ACL customization changes, not yet committed will be cleared
Device(config-sdm-fib)# end
```

Additional References for SDM Templates

Related Documents

Related Topic	Document Title
For complete syntax and usage information for the commands used in this chapter.	*Command Reference (Catalyst 9400 Series Switches)*

Feature History for SDM Templates

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 16.6.1	SDM Template	Standard SDM templates can be used to configure system resources to optimize support for specific features.
Cisco IOS XE Cupertino 17.7.1	SDM Template	This feature was implemented on supervisor modules C9400X-SUP-2 and C9400X-SUP-2XL, which were introduced in this release. Only Access template is supported on these supervisor modules.

Release	Feature	Feature Information
Cisco IOS XE Dublin 17.11.1	Customizable SDM Template for FIB and ACL Features	Support for customizable SDM Templates for FIB and ACL features was introduced. Customizable SDM templates can be used to configure the features of the template as per the user's requirements. Support for this feature was introduced only on the Cisco Catalyst 9400X Series Switches.

Use Cisco Feature Navigator to find information about platform and software image support. To access Cisco Feature Navigator, go to Cisco Feature Navigator.