



Configuring Switching Database Manager

This chapter describes the switching database manager (SDM) features built into the Catalyst 2948G-L3 and 4908G-L3 switch routers. This section contains the following sections:

- Understanding Switching Database Manager, page 10-1
- Configuring SDM, page 10-2

Understanding Switching Database Manager

The Gigabit Ethernet interfaces use the forwarding engine and ternary content addressable memory (TCAM) to implement Layer 3 switching. The Layer 3 switching information is maintained in TCAM. The SDM is the Layer 3 software subsystem that manages the Layer 3 switching information maintained in TCAM.

SDM in Layer 3 organizes the switching information in TCAM into protocol-specific regions and configures the size of these protocol regions. SDM enables exact-match and longest-match address searches, which result in high-speed forwarding. SDM manages TCAM space by partitioning protocol-specific switching information into multiple regions.

The forwarding engine on the Gigabit Ethernet interfaces performs packet processing on multiple channels simultaneously and extracts the packet header information. It uses this packet header information to issue exact-match or longest-match address searches in the switching information stored in TCAM.

TCAM identifies the location index of the Layer 2 or Layer 3 address and conveys it to the forwarding engine. The forwarding engine uses this location index to derive information associated with each Layer 2 and Layer 3 address.

The key benefits of SDM in Layer 3 switching are its ability to organize the switching information in TCAM into protocol-specific regions and its ability to configure the size of these protocol regions. SDM enables exact-match and longest-match address searches, which result in high-speed forwarding.

SDM Regions

SDM partitions TCAM space into multiple protocol-specific regions and interacts with the individual protocol control layers to store Layer 3 switching information. SDM consists of the following types of regions:

- Exact-match region—The exact-match region consists of Layer 3 entries for multiple protocol regions such as IP adjacencies and IPX node.

- Longest-match region—Each longest-match region consists of multiple *buckets* or groups of Layer 3 address entries organized in decreasing order by mask length. All entries within a bucket share the same mask value and key size. The buckets can change their size dynamically by borrowing address entries from neighboring buckets. Although the size of the whole protocol region is fixed, you can reconfigure it.

TCAM space consists of 32,000 entries, each entry being 32 bits wide. Because SDM is responsible for managing TCAM space, SDM partitions the entire TCAM space for each protocol region based on user configuration. Although the maximum size of all protocol regions is fixed, you can reconfigure the size of each protocol region. A change in the partition configuration takes effect only during the next system reboot.

Table 10-1 lists default partitioning for each protocol region in TCAM.

Table 10-1 Default Partitioning by Protocol Region in TCAM

Protocol Region	Lookup Type	Key Size	Default Size	No. of TCAM Entries
ipx-bvi-network	Exact-match	32 bits	32	32
ip-adjacency	Exact-match	32 bits	2048	2048
ipx-node	Exact-match	64 bits	2048	4096
ip-prefix	Longest-match	32 bits	8192	8192
ipx-network	Exact-match	32 bits	6144	6144
ip-mcast	Longest-match	64 bits	3072	6144
l2-switching	Exact-match	64 bits	1024	2048
access-list	First-match	128 bits	512	8192



Note

The enhanced Gigabit Ethernet interface is available with 32K TCAM space.

Configuring SDM

This section describes the commands necessary to configure the SDM. It includes commands to configure the autolearn feature in SDM and commands to configure the size of the SDM regions. The commands described in this section are unique to Layer 3 switching software.

Configuring SDM autolearn

SDM groups entries based on their mask lengths into *buckets*. The size of each bucket in the protocol region varies. The autolearn feature automatically saves the mask length distribution (bucket size distribution) for the longest-match region in the switching database. SDM uses this information to set up the partitions, which are effective during the next system reboot.

Layer 3 switching enables the autolearn feature by default. The **no** form of the **sdm autolearn** command disables the autolearn feature. You can reenabling autolearn by entering the **sdm autolearn** command from global configuration mode.

```
Router# configure terminal
Router (config)# sdm autolearn
Router (config)# end
```

Configuring SDM Regions

TCAM space consists of 32,000 entries, each entry being 32 bits wide. Since SDM is responsible for managing TCAM space, SDM partitions the entire TCAM space for each protocol region based on user configuration. A change in the partition configuration takes effect the next time you reboot the system.

The protocol region size in SDM is represented by the number of 32-bit or 64-bit entries. The combined size of all the application regions should be calculated in terms of 32-bit TCAM entries and should not exceed 32K, which is the total TCAM size.



Note Although the size of the whole protocol region is configured by default, you can reconfigure it. The reconfigured size of the protocol region is effective only at the next system reboot.

To configure SDM size for each protocol region, perform the following task beginning in global configuration mode:

	Command	Purpose
Step 1	Router(config)# sdm size <i>region-name</i> {k-entries} num-of-entries	Set the name of the protocol region for which you want to configure the size. You can enter the size either as multiples of 1K (that is, 1024) entries or in absolute number of entries.
Step 2	Router(config)# end Router#	Return to privileged EXEC mode.

The following output is an example of configuring 2K entries for the ip-prefix region:

```
Router # configure terminal
Router (config)# sdm size ip-prefix k-entries 2
Router (config)# end
```

The combined size entered for all the protocol regions should not exceed 32K, which is the total TCAM size. To display the supported size of SDM, enter the **show sdm size** command from global configuration mode:

```
Router # show sdm size
Switching Database Region Sizes :
IPX Direct Network   :256      32-bit entries
IP Adjacency         :2048     32-bit entries
IPX Node             :1024     64-bit entries
IP Prefix            :2048     32-bit entries
IPX Network          :2048     32-bit entries
IP Multicast         :1024     64-bit entries
MAC Addr             :2048     64-bit entries
Access List          :512      128-bit entries
```

The following output is an example of borrowing 1 K, 32-bit entries from the IPX-Network region and adding it to the ACL region, as a 256 128-bit entry:

```
Router # configure terminal
Router (config)# sdm size ipx-network k-entries 1
Router (config)# sdm size access-list 256
Router (config)# end
```

```
Router # show sdm size
Switching Database Region Sizes :
IPX Direct Network :256      32-bit entries
IP Adjacency       :2048     32-bit entries
IPX Node           :1024     64-bit entries
IP Prefix          :2048     32-bit entries
IPX Network        :1024     32-bit entries
IP Multicast       :1024     64-bit entries
MAC Addr          :2048     64-bit entries
Access List        :768     128-bit entries
```

The following example shows the IP adjacency and IP prefix protocol regions configured to the maximum size possible, as the other regions are configured to the minimum size possible in the 32K TCAM. The combined size for all the protocol regions should not exceed the 32K TCAM size.

```
Router# show sdm size
Switching Database Region Sizes :
IPX BVI Network    :32       32-bit entries
→ IP Adjacency     :16240    32-bit entries
IPX Node           :32       64-bit entries
→ IP Prefix        :16240    32-bit entries
IPX Network        :32       32-bit entries
IP Multicast       :32       64-bit entries
MAC Addr          :32       64-bit entries
Access List        :512     128-bit entries
```

Configuring Access Control List Size in TCAM

The enhanced Gigabit Ethernet interface module supports TCAM sizes of 32K. The combined size of the protocol regions and access lists should not exceed your TCAM space. The default size of the access control lists (ACLs) in a 32K TCAM is 512. You can enter the **sdm access-list** command to partition the TCAM space for ACLs.

To partition the TCAM space for access lists, perform the following task:

Command	Purpose
sdm access-list <i>num-entries</i>	Set the name of the protocol region for which you want to configure the size. You can enter the size as an absolute number of entries.

Before you configure the access-list region in TCAM, make sure that TCAM has enough space to accommodate the ACL region. If there is not enough space available in the TCAM, you can borrow space from other less used regions. Enter the **show internal all-regions** command to verify how much space is available in TCAM.

The following output is an example of configuring 8192 entries for the ACL region in TCAM:

```
Router# configure terminal
Router(config)# sdm access-list 8192
Router(config)# end
```