



Creating Dynamic VSANs

Port VSAN membership on the switch is assigned on a port-by-port basis. By default each port belongs to the default VSAN.

You can dynamically assign VSAN membership to ports by assigning VSANs based on the device WWN. This method is referred to as Dynamic Port VSAN Membership (DPVM). DPVM offers flexibility and eliminates the need to reconfigure the port VSAN membership to maintain fabric topology when a host or storage device connection is moved between two Cisco MDS switches or two ports within a switch. It retains the configured VSAN regardless of where a device is connected or moved. To assign VSANs statically, see [Chapter 20, “Configuring and Managing VSANs.”](#)

This chapter includes the following sections:

- [DPVM, page 21-1](#)
- [DPVM Database Distribution, page 21-5](#)
- [Database Merge Guidelines, page 21-8](#)
- [Displaying DPVM Configurations, page 21-10](#)
- [Sample DPVM Configuration, page 21-11](#)
- [Default Settings, page 21-13](#)

DPVM

DPVM configurations are based on port world wide name (pWWN) and node world wide name (nWWN) assignments. A DPVM database contains mapping information for each device pWWN/nWWN assignment and the corresponding VSAN. The Cisco SAN-OS software checks the database during a device FLOGI and obtains the required VSAN details.

The pWWN identifies the host or device and the nWWN identifies a node consisting of multiple devices. You can assign any one of these identifiers or any combination of these identifiers to configure DPVM mapping. If you assign a combination, then preference is given to the pWWN.

DPVM uses the Cisco Fabric Services (CFS) infrastructure to allow efficient database management and distribution. DPVM uses the application driven, coordinated distribution mode and the fabric-wide distribution scope (see [Chapter 6, “Using the CFS Infrastructure”](#)).

Send documentation comments to mdsfeedback-doc@cisco.com

**Note**

DPVM does not cause any changes to device addressing. DPVM only pertains to the VSAN membership of the device, ensuring that the host gets same VSAN membership on any port on the switch. For example, if a port on the switch has a hardware failure, you can move the host connection to another port on the switch and not need to update the VSAN membership manually.

**Note**

DPVM is not supported on FL ports. DPVM is supported only on F ports.

This section describes DPVM and includes the following topics:

- [About DPVM Configuration, page 21-2](#)
- [Enabling DPVM, page 21-2](#)
- [About DPVM Databases, page 21-3](#)
- [Configuring DPVM Config and Pending Databases, page 21-3](#)
- [Activating DPVM Config Databases, page 21-4](#)
- [About Autolearned Entries, page 21-4](#)
- [Enabling Autolearning, page 21-5](#)
- [Clearing Learned Entries, page 21-5](#)

About DPVM Configuration

To use the DPVM feature as designed, be sure to verify the following requirements:

- The interface through which the dynamic device connects to the Cisco MDS 9000 Family switch must be configured as an F port.
- The static port VSAN of the F port should be valid (not isolated, not suspended, and in existence).
- The dynamic VSAN configured for the device in the DPVM database should be valid (not isolated, not suspended, and in existence).

**Note**

The DPVM feature overrides any existing static port VSAN membership configuration. If the VSAN corresponding to the dynamic port is deleted or suspended, the port is shut down.

Enabling DPVM

To begin configuring DPVM, you must explicitly enable DPVM on the required switches in the fabric. By default, this feature is disabled in all switches in the Cisco MDS 9000 Family.

The configuration and verification commands for DPVM are only available when DPVM is enabled on a switch. When you disable this feature, all related configurations are automatically discarded.

Send documentation comments to mdsfeedback-doc@cisco.com

To enable DPVM on any participating switch, follow these steps:

	Command	Purpose
Step 1	switch# config t switch(config)#	Enters configuration mode.
Step 2	switch(config)# dpvm enable	Enables DPVM on that switch.
	switch(config)# no dpvm enable	Disables (default) DPVM on that switch.

About DPVM Databases

The DPVM database consists of a series of device mapping entries. Each entry consists of a device pWWN/nWWN assignment along with the dynamic VSAN to be assigned. You can configure a maximum of 16,000 DPVM entries in the DPVM database. This database is global to the whole switch (and fabric) and is not maintained for each VSAN.

The DPVM feature uses three databases to accept and implement configurations.

- Configuration (config) database—All configuration changes are stored in the configuration database when distribution is disabled.
- Active database—The database currently enforced by the fabric.
- Pending database—All configuration changes are stored in the DPVM pending database when distribution is enabled (see the “[DPVM Database Distribution](#)” section on page 21-5).

Changes to the DPVM config database are not reflected in the active DPVM database until you activate the DPVM config database. Changes to the DPVM pending database are not reflected in the config/active DPVM database until you commit the DPVM pending database. This database structure allows you to create multiple entries, review changes, and let the DPVM config and pending databases take effect.

Configuring DPVM Config and Pending Databases

To create and populate the DPVM config and pending databases, follow these steps:

	Command	Purpose
Step 1	switch# config t switch(config)#	Enters configuration mode.
Step 2	switch(config)# dpvm database switch(config-dpvm-db)#	Creates the DPVM config database.
	switch(config)# no dpvm database	Deletes the DPVM config database.
Step 3	switch(config-dpvm-db)# pwwn 12:33:56:78:90:12:34:56 vsan 100	Maps the specified device pWWN to VSAN 100.
	switch(config-dpvm-db)# no pwwn 12:33:56:78:90:12:34:56 vsan 101	Removes the specified device pWWN mapping from the DPVM config database.
Step 4	switch(config-dpvm-db)# nwwn 14:21:30:12:63:39:72:81 vsan 101	Maps the specified device nWWN to VSAN 101.
	switch(config-dpvm-db)# no nwwn 14:21:30:12:63:39:72:80 vsan 101	Removes the specified device nWWN mapping from the DPVM config database.

[Send documentation comments to mdsfeedback-doc@cisco.com](mailto:mdsfeedback-doc@cisco.com)

Activating DPVM Config Databases

When you explicitly activate the DPVM config database, the DPVM config database becomes the active DPVM database. Activation may fail if conflicting entries are found between the DPVM config database and the currently active DPVM database. However, you can force activation to override conflicting entries.

To disable DPVM, you must explicitly deactivate the currently active DPVM database by issuing the **no dpvm activate** command.

To activate the DPVM config database, follow these steps:

	Command	Purpose
Step 1	switch# config t switch(config)#	Enters configuration mode.
Step 2	switch(config)# dpvm activate	Activates the DPVM config database.
	switch(config)# no dpvm activate	Deactivates the currently active DPVM database.
	switch(config)# dpvm activate force	Forcefully activates the DPVM config database to override conflicting entries.

About Autolearned Entries

The DPVM database can be configured to automatically learn (autolearn) about new devices within each VSAN. The autolearn feature can be enabled or disabled at any time. Learned entries are created by populating device pWWNs and VSANs in the active DPVM database. The active DPVM database should already be available to enable autolearn.

You can delete any learned entry from the active DPVM database when you enable autolearn. These entries only become permanent in the active DPVM database when you disable autolearn.



Note

Autolearning is only supported for devices connected to F ports. Devices connected to FL ports are not entered into the DPVM database because DPVM is not supported on FL ports.

The following conditions apply to learned entries:

- If a device logs out while autolearn is enabled, that entry is automatically deleted from the active DPVM database.
- If the same device logs multiple times into the switch through different ports, then the VSAN corresponding to last login is remembered.
- Learned entries do not override previously configured and activated entries.
- Learning is a two-part process—enabling autolearning followed by disabling autolearning. When the **auto-learn** option is enabled, the following applies:
 - Learning currently logged-in devices—occurs from the time learning is enabled.
 - Learning new device logins—occurs as and when new devices log in to the switch.

Send documentation comments to mdsfeedback-doc@cisco.com

Enabling Autolearning

To enable autolearning, follow these steps:

	Command	Purpose
Step 1	switch# config t switch(config)#	Enters configuration mode.
Step 2	switch(config)# dpvm auto-learn	Enables learning on this switch.
	switch(config)# no dpvm auto-learn	Disables (default) learning on this switch.

Clearing Learned Entries

You can clear DPVM entries from the active DPVM database (if autolearn is still enabled) using one of two methods.

- To clear a single autolearn entry, use the **clear dpvm auto-learn pwwn** command.

```
switch# clear dpvm auto-learn pwwn 55:22:33:44:55:66:77:88
```

- To clear all autolearn entries, use the **clear dpvm auto-learn** command.

```
switch# clear dpvm auto-learn
```



Note

These two commands do not start a session and can only be issued in the local switch.

DPVM Database Distribution

If the DPVM database is available on all switches in the fabric, devices can be moved anywhere and offer the greatest flexibility. To enable database distribution to the neighboring switches, the database should be consistently administered and distributed across all switches in the fabric. The Cisco SAN-OS software uses the Cisco Fabric Services (CFS) infrastructure to achieve this requirement (see [Chapter 6](#), “Using the CFS Infrastructure”).

This section describes how to distribute the DPVM database and includes the following topics:

- [About DPVM Database Distribution, page 21-5](#)
- [Disabling DPVM Database Distribution, page 21-6](#)
- [About Locking the Fabric, page 21-6](#)
- [Locking the Fabric, page 21-6](#)
- [Committing Changes, page 21-7](#)
- [Discarding Changes, page 21-8](#)
- [Clearing a Locked Session, page 21-8](#)

About DPVM Database Distribution

Using the CFS infrastructure, each DPVM server learns the DPVM database from each of its neighboring switches during the ISL bring-up process. If you change the database locally, the DPVM server notifies its neighboring switches, and that database is updated by all switches in the fabric.

Send documentation comments to mdsfeedback-doc@cisco.com

If fabric distribution is enabled, all changes to the configuration database are stored in the DPVM pending database. These changes include the following tasks:

- Adding, deleting, or modifying database entries.
- Activating, deactivating, or deleting the configuration database.
- Enabling or disabling autolearning.

These changes are distributed to all switches in a fabric when you commit the changes. You can also discard (abort) the changes at this point.



Tip

You can view the contents of the DPVM pending database by issuing the **show dpvm pending** command.

Disabling DPVM Database Distribution

To disable DPVM database distribution to the neighboring switches, follow these steps:

	Command	Purpose
Step 1	switch# config t switch(config)#	Enters configuration mode.
Step 2	switch(config)# no dpvm distribute	Disables DPVM distribution to the neighboring switches.
	switch(config)# dpvm distribute	Enables (default) DPVM distribution to the neighboring switches.

About Locking the Fabric

The first action that modifies the existing configuration creates the DPVM pending database and locks the feature in the fabric. Once you lock the fabric, the following conditions apply:

- No other user can make any configuration changes to this feature.
- A copy of the configuration database becomes the DPVM pending database. Modifications from this point on are made to the DPVM pending database. The DPVM pending database remains in effect until you commit the modifications to the DPVM pending database or discard (abort) the changes to the DPVM pending database.

Locking the Fabric

To lock the fabric and apply changes to the DPVM pending database, follow these steps:

	Command	Purpose
Step 1	switch# config t switch(config)#	Enters configuration mode.
Step 2	switch(config)# dpvm database switch(config-dpvm-db)#	Accesses the DPVM config database.
Step 3	switch(config-dpvm-db)# pwwn 11:22:33:44:55:66:77:88 vsan 11	Adds one entry to the DPVM config database.

Send documentation comments to mdsfeedback-doc@cisco.com

	Command	Purpose
Step 4	switch(config-dpvm-db)# exit switch(config)#	Exits to configuration mode.
Step 5	switch(config)# dpvm activate	Activates the DPVM config database.

Committing Changes

If you commit the changes made to the configuration, the configuration in the DPVM pending database are distributed to other switches. On a successful commit, the configuration change is applied throughout the fabric and the lock is released.

To commit the DPVM pending database, follow these steps:

	Command	Purpose
Step 1	switch# config t switch(config)#	Enters configuration mode.
Step 2	switch(config)# dpvm commit	Commits the database entries that are currently in the DPVM pending database.

Send documentation comments to mdsfeedback-doc@cisco.com

Discarding Changes

If you discard (abort) the changes made to the DPVM pending database, the configurations remain unaffected and the lock is released.

To discard the DPVM pending database, follow these steps:

	Command	Purpose
Step 1	switch# config t switch(config)#	Enters configuration mode.
Step 2	switch(config)# dpvm abort	Discards the database entries that are currently in the DPVM pending database.

Clearing a Locked Session

If you have performed a DPVM task and have forgotten to release the lock by either committing or discarding the changes, an administrator can release the lock from any switch in the fabric. If the administrator performs this task, your changes to the DPVM pending database are discarded and the fabric lock is released.



Tip

The DPVM pending database is only available in the volatile directory and are subject to being discarded if the switch is restarted.

To use administrative privileges and release a locked DPVM session, use the **clear dpvm session** command in EXEC mode.

```
switch# clear dpvm session
```

Database Merge Guidelines

A database merge refers to a union of the configuration database and static (unlearned) entries in the active DPVM database. See the [“CFS Merge Support” section on page 6-8](#) for detailed concepts.

When merging the DPVM database between two fabric, follow these guidelines:

- Verify that the activation status and the auto-learn status is the same in both fabrics.
- Verify that the combined number of device entries in each database does not exceed 16K.



Caution

If you do not follow these two conditions, the merge will fail. The next distribution will forcefully synchronize the databases and the activation states in the fabric.

This section describes how to merge DPVM databases and includes the following topics:

- [About Copying DPVM Databases, page 21-9](#)
- [Copying DPVM Databases, page 21-9](#)
- [Comparing Database Differences, page 21-9](#)

Send documentation comments to mdsfeedback-doc@cisco.com

About Copying DPVM Databases

The following circumstances may require the active DPVM database to be copied to the DPVM config database:

- If the learned entries are only added to the active DPVM database.
- If the DPVM config database or entries in the DPVM config database are accidentally deleted.



Note

If you copy the DPVM database and fabric distribution is enabled, you must commit the changes.

Copying DPVM Databases

To copy the currently active DPVM database to the DPVM config database, use the **dpvm database copy** command.

```
switch# dpvm database copy active
Legend: "+" New Entry, "-" Missing Entry, "*" Possible Conflict Entry
-----
- pwn 12:33:56:78:90:12:34:56 vsan 100
- nwn 14:21:30:12:63:39:72:81 vsan 101
```

Comparing Database Differences

You can compare the DPVM databases as follows:

- Use the **dpvm database diff active** command to compare the active DPVM database with the DPVM config database.

```
switch# dpvm database diff active
Legend: "+" New Entry, "-" Missing Entry, "*" Possible Conflict Entry
-----
- pwn 44:22:33:44:55:66:77:88 vsan 44
* pwn 11:22:33:44:55:66:77:88 vsan 11
```

- Use the **dpvm database diff config** command to compare the DPVM config database with the active DPVM database.

```
switch# dpvm database diff config
Legend: "+" New Entry, "-" Missing Entry, "*" Possible Conflict Entry
-----
+ pwn 44:22:33:44:55:66:77:88 vsan 44
* pwn 11:22:33:44:55:66:77:88 vsan 22
```

- Use the **show dpvm pending-diff** command (when CFS distribution is enabled) to compare the DPVM pending database with the DPVM config database.

To add pending database entries to the DPVM config database, follow these steps:

	Command	Purpose
Step 1	switch# config t switch(config)#	Enters configuration mode.
Step 2	switch(config)# dpvm distribute	Enables CFS distribution.

Send documentation comments to mdsfeedback-doc@cisco.com

	Command	Purpose
Step 3	switch(config)# dpvm database	Accesses the DPVM config database.
Step 4	switch(config-dpvm-db) # pwwn 44:22:33:44:55:66:77:88 vsan 55 switch(config-dpvm-db) # pwwn 55:22:33:44:55:66:77:88 vsan 55	Adds two entries to the DPVM config database.

Displaying DPVM Configurations

Use the **show dpvm** command to display information about WWNs configured on a per VSAN basis (see Examples 21-1 to 21-6).

Example 21-1 Displays the DPVM Configuration Status

```
switch# show dpvm status
DB is activated successfully, auto-learn is on
```

Example 21-2 Displays the DPVM Current Dynamic Ports for the Specified VSAN

```
switch# show dpvm ports vsan 10
-----
Interface Vsan Device pWWN                Device nWWN
-----
fc1/2      10    29:a0:00:05:30:00:6b:a0 fe:65:00:05:30:00:2b:a0
```

Example 21-3 Displays the DPVM Config Database

```
switch# show dpvm database
pwwn 11:22:33:44:55:66:77:88 vsan 11
pwwn 22:22:33:44:55:66:77:88 vsan 22
pwwn 33:22:33:44:55:66:77:88 vsan 33
pwwn 44:22:33:44:55:66:77:88 vsan 44
[Total 4 entries]
```

Example 21-4 Displays the DPVM Database

```
switch# show dpvm database active
pwwn 11:22:33:44:55:66:77:88 vsan 22
pwwn 22:22:33:44:55:66:77:88 vsan 22
pwwn 33:22:33:44:55:66:77:88 vsan 33
[Total 3 entries]
* is auto-learnt entry
```

Example 21-5 Displays DPVM Config Database

```
switch# show dpvm database
pwwn 11:22:33:44:55:66:77:88 vsan 11
pwwn 22:22:33:44:55:66:77:88 vsan 22
pwwn 33:22:33:44:55:66:77:88 vsan 33
pwwn 44:22:33:44:55:66:77:88 vsan 44
[Total 4 entries]
```

Example 21-6 Compares Pending Database with the DPVM Config Database

```
switch# show dpvm pending-diff
```

Send documentation comments to mdsfeedback-doc@cisco.com

Legend: "+" New Entry, "-" Missing Entry, "*" Possible Conflict Entry

```
-----
+ pwwn 55:22:33:44:55:66:77:88 vsan 55
- pwwn 11:22:33:44:55:66:77:88 vsan 11
* pwwn 44:22:33:44:55:66:77:88 vsan 44
```

Sample DPVM Configuration

To configure a basic DPVM scenario, follow these steps:

Step 1 Enable DPVM and enable DPVM distribution.

```
switch1# config
Enter configuration commands, one per line. End with CNTL/Z.
switch1(config)# dpvm enable
switch1(config)# end
switch1# show dpvm database
switch1# show dpvm database active
switch1# show dpvm status
```

At this stage, the configuration does not have an active DPVM database and the **auto-learn** option is disabled.

Step 2 Activate a null (empty) database so it can be populated with autolearned entries.

```
switch1# config
Enter configuration commands, one per line. End with CNTL/Z.
switch1(config)# dpvm activate
switch1(config)# dpvm commit
switch1(config)# end
switch1# show dpvm database
switch1# show dpvm database active
switch1# show dpvm status
```

At this stage, the database is successfully activated and the **auto-learn** option continues to be disabled.

Step 3 Enable the auto-learn option and commit the configuration changes.

```
switch1# config
Enter configuration commands, one per line. End with CNTL/Z.
switch1(config)# dpvm auto-learn
switch1(config)# dpvm commit
switch1(config)# end
switch1# show dpvm database active
pwwn 21:00:00:e0:8b:0e:74:8a vsan 4(*)
pwwn 21:01:00:e0:8b:2e:87:8a vsan 5(*)
[Total 2 entries]
* is auto-learnt entry
switch1# show dpvm ports
```

```
-----
Interface  Vsan      Device pWWN      Device nWWN
-----
fc1/24      4    21:00:00:e0:8b:0e:74:8a  20:00:00:e0:8b:0e:74:8a
fc1/27      5    21:01:00:e0:8b:2e:87:8a  20:01:00:e0:8b:2e:87:8a
switch1# show flogi database
```

```
-----
INTERFACE  VSAN    FCID           PORT NAME           NODE NAME
-----
fc1/24     4       0xe70100    21:00:00:e0:8b:0e:74:8a  20:00:00:e0:8b:0e:74:8a
fc1/27     5       0xe80100    21:01:00:e0:8b:2e:87:8a  20:01:00:e0:8b:2e:87:8a
```

Total number of flogi = 2.

Send documentation comments to mdsfeedback-doc@cisco.com

```
switch195# show dpvm status
DB is activated successfully, auto-learn is on
```

At this stage, the currently logged in devices (and their current VSAN assignment) populate the active DPVM database. However the entries are not yet permanent in the active DPVM database.

The output of the **show dpvm ports** and the **show flogi database** commands displays two other devices that have logged in (referred to as switch9 and switch3 in this sample configuration).

Step 4 Access switch9 and issue the following commands.

```
switch9# show dpvm database active
pwwn 21:00:00:e0:8b:0e:87:8a vsan 1(*)
pwwn 21:01:00:e0:8b:2e:74:8a vsan 1(*)
[Total 2 entries]
* is auto-learnt entry
switch9# show dpvm status
DB is activated successfully, auto-learn is on
```

Step 5 Access switch3 and issue the following commands.

```
switch3# show dpvm database active
pwwn 21:00:00:e0:8b:0e:76:8a vsan 1(*)
pwwn 21:01:00:e0:8b:2e:76:8a vsan 1(*)
[Total 2 entries]
* is auto-learnt entry
switch3# show dpvm status
DB is activated successfully, auto-learn is on
```

Step 6 Disable autolearning in switch1 and commit the configuration changes.

```
switch1# config
Enter configuration commands, one per line. End with CNTL/Z.
switch1(config)# no dpvm auto-learn
switch1(config)# dpvm commit
switch1(config)# end
switch1# show dpvm status
DB is activated successfully, auto-learn is off
switch1# show dpvm database active
pwwn 21:00:00:e0:8b:0e:74:8a vsan 4
pwwn 21:01:00:e0:8b:2e:87:8a vsan 5
pwwn 21:00:00:e0:8b:0e:87:8a vsan 1
pwwn 21:01:00:e0:8b:2e:74:8a vsan 1
pwwn 21:00:00:e0:8b:0e:76:8a vsan 1
pwwn 21:01:00:e0:8b:2e:76:8a vsan 1
[Total 6 entries]
* is auto-learnt entry
switch1# show dpvm status
DB is activated successfully, auto-learn is off
```

At this stage, the autolearned entries are made permanent in the active DPVM database.

Step 7 Access switch9 and issue the following commands.

```
switch9# show dpvm database active
pwwn 21:00:00:e0:8b:0e:87:8a vsan 1
pwwn 21:01:00:e0:8b:2e:74:8a vsan 1
pwwn 21:00:00:e0:8b:0e:76:8a vsan 1
pwwn 21:01:00:e0:8b:2e:76:8a vsan 1
pwwn 21:00:00:e0:8b:0e:74:8a vsan 4
pwwn 21:01:00:e0:8b:2e:87:8a vsan 5
[Total 6 entries]
* is auto-learnt entry
switch9# show dpvm status
```

Send documentation comments to mdsfeedback-doc@cisco.com

DB is activated successfully, auto-learn is off

Step 8 Access switch3 and issue the following commands.

```
switch3# show dpvm database active
pwwn 21:00:00:e0:8b:0e:76:8a vsan 1
pwwn 21:01:00:e0:8b:2e:76:8a vsan 1
pwwn 21:00:00:e0:8b:0e:87:8a vsan 1
pwwn 21:01:00:e0:8b:2e:74:8a vsan 1
pwwn 21:00:00:e0:8b:0e:74:8a vsan 4
pwwn 21:01:00:e0:8b:2e:87:8a vsan 5
[Total 6 entries]
* is auto-learnt entry
switch3# show dpvm status
DB is activated successfully, auto-learn is off
```



Note

These basic steps help you ascertain that the information is identical in all the switches in the fabric.

You have now configured a basic DPVM scenario in a Cisco MDS 9000 Family switch.

Default Settings

Table 21-1 lists the default settings for DPVM parameters.

Table 21-1 Default DPVM Parameters

Parameters	Default
DPVM	Disabled.
DPVM distribution	Enabled.
Autolearning	Disabled.

Send documentation comments to mdsfeedback-doc@cisco.com