



Cisco Fabric Services

This chapter contains descriptions of, and instructions for using, the Cisco Fabric Services (CFS) with Fabric Manager and Device Manager. The Cisco MDS SAN-OS software uses CFS to enable efficient database distribution and to foster device flexibility. It simplifies SAN provisioning by automatically distributing configuration information to all switches in a fabric.

Several Cisco MDS SAN-OS features use the CFS infrastructure to maintain and distribute the contents of a particular feature's database.

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About CFS

Many features in the Cisco MDS 9000 Family of switches require configuration synchronization in all switches in the fabric. Maintaining configuration synchronization across a fabric is important to maintain fabric consistency. As of Cisco MDS SAN-OS Release 2.0, Cisco Fabric Services (CFS) provides a common infrastructure for automatic configuration synchronization in the fabric. It provides the transport function as well as a rich set of common services to the features. CFS can discover CFS capable switches in the fabric and discover feature capabilities in all CFS capable switches.

Cisco MDS SAN-OS Features Using CFS

The following Cisco MDS SAN-OS features use the CFS infrastructure:

- TACACS+
- RADIUS
- Role-based access
- Dynamic port VSAN membership

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- Distributed Device Alias Services
- iSNS
- Call Home
- VSANs
- IVR topology
- Port security
- NTP
- Syslog
- SCSI flow services
- fctimer
- Fabric Start Config Manager



Note

Most tabs in the Information pane for features using CFS are dimmed until you visit the CFS tab. The CFS tab shows which switches have CFS enabled and shows the master switch for this feature. Once the CFS tab is visited, the other tabs activated.

CFS Features

CFS has the following features:

- Two modes of distribution:
 - Uncoordinated distributions where multiple parallel distributions are allowed in the fabric.
 - Coordinated distributions where only one distribution is allowed in the fabric at any given time.
- Two scopes of distribution:
 - Logical scope where the distribution happens within the scope of a VSAN. An example feature is port security, where the configuration database is applicable only within a VSAN.
 - Physical scope where the distribution span the entire physical topology. Example features are NTP and DPVM (WWN based VSAN), which are independent of VSANs.
- A peer-to-peer protocol that does not have a client-server relationship at the CFS layer.
- A merge protocol that facilitates the merge of feature configuration during a fabric merge event (when two independent fabrics merge).

All switches in the fabric must be CFS capable. Non-CFS capable switches do not receive the distribution and may prevent part of the fabric from receiving the intended distribution.

CFS has the following attributes:

- Implicit CFS usage—The first time you issue a CFS task for a CFS-enabled feature, the configuration modification process begins and the feature locks the fabric.
- Temporary buffer—This term differs based on the feature:
 - Some feature saves the changes to the temporary buffer when you perform configuration modifications. The changes are not applied immediately to ensure that the database is synchronized with the database in the other switches in the fabric. When you commit the changes, the contents of the effective database are overwritten by the contents of the temporary buffer.

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- Other features make a copy of the configuration database (when you start making configuration changes) and use this as a working copy. When you commit the changes, the working copy becomes the new configuration database. In this case, this working copy is the temporary buffer.
- Explicit commit—Each feature requires an explicit **commit** action to commit the changes in the temporary buffer. The changes in the temporary buffer are not applied if you do not perform the commit. The **commit** action distributes the new database in the fabric and then releases the fabric lock.
- CFS distribution is enabled or disabled on a per-feature basis. The default (enable or disable) for each feature differs between features. If CFS distribution is disabled for a feature, then that feature does not distribute any configuration nor does it accept a distribution from other switches in the fabric.

Enabling CFS for a Feature

All CFS based features provide an option to enable or disable the distribution capabilities. Features that existed prior to Cisco MDS SAN-OS Release 2.x have the distribution capability disabled by default and must have their distribution capabilities enabled explicitly.

Features that are introduced in Cisco MDS SAN-OS Release 2.x have the distribution enabled by default but can be disabled as required.

The feature configuration is not distributed by CFS unless distribution is explicitly enabled for that feature.

To enable CFS for a feature using Fabric Manager, follow these steps:

Step 1 Choose the feature that you want to enable CFS for. For example, choose **Switches > Events > CallHome** from the Physical Attributes pane. The Information pane shows that feature, with a CFS tab. Click the **CFS** tab to display the CFS state for each switch in the fabric for that feature.

Step 2 Decide which switch(es) to enable CFS for. Set the Admin state column to either **enable** to enable CFS, or **disable** to disable CFS.




Note You should enable CFS for all switches in the fabric or VSAN for the feature that uses CFS.

Step 3 Right-click anywhere on the row to get the pop-up menu. Select **Apply Changes** to apply the CFS configuration change. The CFS tab updates as the CFS changes take affect. Fabric Manager retrieves the status of the CFS change and updates the Last > Result column.

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To enable CFS for a feature using Device Manager, follow these steps:

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- Step 1** Select **Admin > CFS** from the main menu. You see the CFS dialog box with the CFS status for all features on that switch.
- Step 2** Decide which feature(s) to enable CFS for. Set the Command column to either **enable** to enable CFS, or **disable** to disable CFS.
-  **Note** You should enable CFS for all switches in the fabric or VSAN for the feature that uses CFS.
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- Step 3** Select the **Pending Differences** button to check the configuration of this feature on this switch as compared to other switches in the fabric or VSAN that have CFS enabled for this feature.
- Step 4** Select **Apply** to apply the CFS configuration change or **Close** to close the dialog box without making changes. Device Manager retrieves the status of the CFS change and updates the Last > Result column.
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Locking the Fabric

When you configure (first time configuration) a CFS-enabled feature, that feature starts a CFS session and locks the fabric. When a fabric is locked, the Cisco MDS SAN-OS software does not allow any configuration changes from a switch (other than the switch holding the lock) to this Cisco MDS SAN-OS feature, and issues a message to inform you about the locked status. The configuration changes are held in a pending database by that feature.

If you start a CFS session that requires a fabric lock but forget to end the session, an administrator can clear the session. If you lock a fabric at any time, your user name is remembered across restarts and switchovers. If another user (on the same machine) tries to perform configuration tasks, that user's attempts are rejected.

Committing Changes

A commit causes the pending database to be saved by all feature peers. It also causes locks to be released at all switches.

In general, the commit function does not start a session; only a lock function starts a session. However, an empty commit is allowed if configuration changes were not previously made. In this case, a commit results in a session whereby locks are acquired and the current database distributed.

When you commit configuration changes to a feature using the CFS infrastructure, you receive a notification about one of the following responses:

- One or more external switches report a successful status—The feature applies the changes locally and releases the fabric lock.
- None of the external switches report a successful state—The feature considers this state a failure and does not apply the changes to any switch in the fabric. The fabric lock is not released.

Fabric locks are released even if all peers failed to commit the configuration.

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To commit changes using Fabric Manager for CFS-enabled features, follow these steps:

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- Step 1** Choose the feature you want to enable CFS for. For example, choose **Switches > Events > CallHome** from the Physical Attributes pane. The Information pane shows that feature, with a CFS tab. Click the **CFS** tab to display the CFS state for each switch in the fabric for that feature.
 - Step 2** Select **Config Changes** for any switch. Set the Action column to **commit**.
 - Step 3** Click the **Apply Changes** to commit the configuration changes for that feature and distribute the changes through CFS, or click **Undo Changes** to discard the changes for that feature. Fabric Manager retrieves the status of the CFS change and updates the Last > Result column on a per feature or per VSAN basis, depending on the feature.
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To commit changes using Device Manager for CFS-enabled features, follow these steps:

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- Step 1** Select **Admin > CFS** from the main menu. You see the CFS dialog box with the CFS status for all features on that switch.
 - Step 2** For each applicable feature, set the Command column to **commit** to commit the configuration changes for that feature and distribute the changes through CFS, or set it to **abort** to discard the changes for that feature and release the fabric lock for CFS for that feature.
 - Step 3** Optionally, select **none** or **VsanID** as the basis for the CFS distribution for CFS features that require this.
 - Step 4** Select the **Pending Differences** button to check the configuration of this feature on this switch as compared to other switches in the fabric or VSAN that have CFS enabled for this feature.
 - Step 5** Select **Apply** to apply the CFS configuration change or **Close** to close the dialog box without making changes. Device Manager retrieves the status of the CFS change and updates the Last > Result column.
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**Caution**

If you do not commit the changes, they are not saved to the running configuration.

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Clearing a Locked Session

You can clear locks held by a feature from any switch in the fabric. This option is provided to rescue you from situations where locks are acquired and not released. This function requires administrative permissions.



Caution

Exercise caution when using this function to clear locks in the fabric. Any pending configurations in any switch in the fabric is flushed and lost.

Disabling or Enabling CFS Distribution on a Switch

By default, CFS distribution is enabled. Applications can distribute data and configuration information to all CFS-capable switches in the fabric where the applications exist. This is the normal mode of operation.

As of Cisco MDS SAN-OS Release 2.1(1a), you can globally disable CFS on a switch to isolate the applications using CFS from fabric-wide distributions while maintaining physical connectivity. When CFS is globally disabled on a switch, CFS operations are restricted to the switch and all CFS commands continue to function as if the switch were physically isolated.

To globally disable or enable CFS distribution on a switch using Fabric Manager, follow these steps:

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- Step 1** Choose any CFS feature. For example, choose **Switches > Events > CallHome** from the Physical Attributes pane. The Information pane shows that feature, with a CFS tab.
 - Step 2** Click the **CFS** tab to display the CFS state for each switch in the fabric for that feature.
 - Step 3** Set the **Enable > Global** drop-down menu to **disable** or **enable** for all switches that you want to disable or enable CFS on.
 - Step 4** Set the **Config Changes > Action** column to **commit**.
 - Step 5** Click the **Apply Changes** to commit the configuration changes for that feature and distribute the changes through CFS, or click **Undo Changes** to discard the changes for that feature.
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To globally disable or enable CFS distribution on a switch using Device Manager, follow these steps:

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- Step 1** Select **Admin > CFS** from the main menu. You see the CFS dialog box with the CFS status for all features on that switch.
 - Step 2** Uncheck or check the **Globally Enabled** check box to disable or enable CFS distribution on this switch.
 - Step 3** Select **Apply** to disable CFS on this switch or **Close** to close the dialog box without making changes.
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CFS Merge Support

A feature keeps the configuration synchronized in a fabric through CFS. Two such fabrics might merge as a result of an ISL coming up between them. These two fabrics could have two different sets of configuration information that need to be reconciled in the event of a merge. CFS provides notification each time a feature peer comes online. If two fabrics with M and N feature peers merge and if a feature triggers a merge action on every such notification, a link up event results in M*N merges in the fabric.

CFS supports a protocol that reduces the number of merges required to one by handling the complexity of the merge at the CFS layer. This protocol runs per feature per scope. The protocol involves selecting one switch in a fabric as the merge master for that fabric. The other switches do not play any role in the merge process.

During a merge, the merge master in the two fabrics exchange their configuration databases with each other. The feature on one of the databases merges the information, decides if the merge is successful or not, and informs all switches in the combined fabric of the status of the merge.

In case of a successful merge, the merged database is distributed to all switches in the combined fabric and the entire new fabric remains in a consistent state. You can recover from a merge failure by starting a distribution from any of the switches in the new fabric. This distribution restores all peers in the fabric to the same configuration database. The merge master in a fabric is the master or seed switch that is used for distributing each CFS-enabled feature.

A CFS Example Using Fabric Manager

This procedure is an example of what you see when you use Fabric Manager to configure a feature that uses CFS. For specific procedures for features that use CFS, refer to that feature's documentation.

To configure a feature that uses CFS using Fabric Manager, follow these steps:

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- Step 1** Select the CFS-capable feature you want to configure. For example, Choose **Switches > Clock > NTP** from the Physical Attributes pane. You see the feature configuration in the Information pane, including a CFS tab.
 - Step 2** Click the **CFS** tab. You see the CFS configuration and status for each switch.
 - Step 3** Choose **enable** from the Enable > Admin drop-down box for all switches in the fabric



Note A warning displays if you do not enable CFS for all switches in the fabric for this feature.

- Step 4** Check the **Master** check box for the switch that you want to act as the merge master for this feature.
- Step 5** Choose **commit** from the Config Changes > Action drop-down box for each switch that you enabled CFS on.
- Step 6** Choose a configuration tab. For example, choose **Servers** from the Information pane for NTP. You see the configuration for this feature based on the master switch.
- Step 7** Modify the feature configuration. For example, click on **Create Row** to create a new server for NTP.
 - a. Set the **ID**, and the **Name or IP Address** for the NTP server.
 - b. Set the **Mode** radio button and click **Add** to add the server.
Fabric Manager sends the request to the master switch and updates the CFS > Last > Results column with the "pending" status.

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- Step 8** Choose the **CFS** tab for this feature.
- Step 9** Set the Config Changes > Action column to **commit** to distribute the feature change through the fabric. Fabric Manager only changes the status to “running” when **commit**, **clear**, or **abort** is selected and applied.



Note Fabric Manager will not change the status to “pending” if **enable** is selected, because the “pending” status does not apply until the first actual change is made.

- Step 10** Click the **Apply Changes** to commit the configuration changes for that feature and distribute the changes through CFS, or click **Undo Changes** to discard the changes for that feature.
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Note When using CFS with features like DPVM and device alias, you must select **commit** at the end of each configuration. If the session is locked, you must exit the feature by selecting **abort**.

To configure the master or seed switch for distribution for each feature using Fabric Manager, follow these steps:

- Step 1** Choose the feature that you want to select the merge master for CFS. For example, choose **Switches > Events > CallHome** from the Physical Attributes pane. The Information pane shows that feature, with a CFS tab. Click the **CFS** tab to display the CFS state for each switch in the fabric for that feature.
- Step 2** Check the Master column checkbox for the switch that you want to act as the merge master for this feature.
- Step 3** Click the **Apply Changes** to select this switch as master for future CFS distributions, or click **Undo changes** to discard your unsaved changes.
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A CFS Example Using Device Manager

This procedure is an example of what you see when you use Device Manager to configure a feature that uses CFS. For specific procedures for features that use CFS, refer to that feature's documentation.

To configure feature using Device Manager that uses CFS, follow these steps:

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- Step 1** Open the dialog box for any CFS-capable feature. Device Manager checks to see whether CFS is enabled. It also checks to see if there is a lock on the feature by checking for at least one entry in the Owner table.
 - Step 2** If CFS is enabled and there is a lock, Device Manager sets the status to “pending” for that feature. You see a dialog box displaying the lock information and you are prompted to continue or cancel the procedure. If you continue, Device Manager remembers the CFS status.
 - Step 3** Select **Admin > CFS (Cisco Fabric Services)** to view the username of the CFS lock holder. Click the locked feature and click **Details**.
 - Step 4** Click the **Owners** tab and look in the **UserName** column.



Note Device Manager does not monitor the status of the feature across the fabric until the user clicks **Refresh**. If a user on another CFS-enabled switch attempts to configure the same feature, they will not see the “pending” status. However, their configuration changes will be rejected by your switch.

- Step 5** If CFS is enabled and there is no lock, Device Manager sets the status to “running” for that feature. You then see a dialog box for the feature. As soon as you perform a creation, deletion, or modification, Device Manager changes the status to “pending” and displays the updated information from the pending database.
 - Step 6** View the CFS table for a feature. Device Manager only changes the status to “running” when **commit**, **clear**, or **abort** is selected and applied. Device Manager will not change the status to “pending” if **enable** is selected, because the “pending” status does not apply until the first actual change is made.
- The Last Command and Result fields are blank if the last command is noOp.
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Note When using CFS with features like DPVM and device alias, you must select **commit** at the end of each configuration. If the session is locked, you must exit the feature by selecting **abort**.

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