Configuring FC-SP and DHCHAP

This chapter contains the following sections:

Configuring FC-SP and DHCHAP

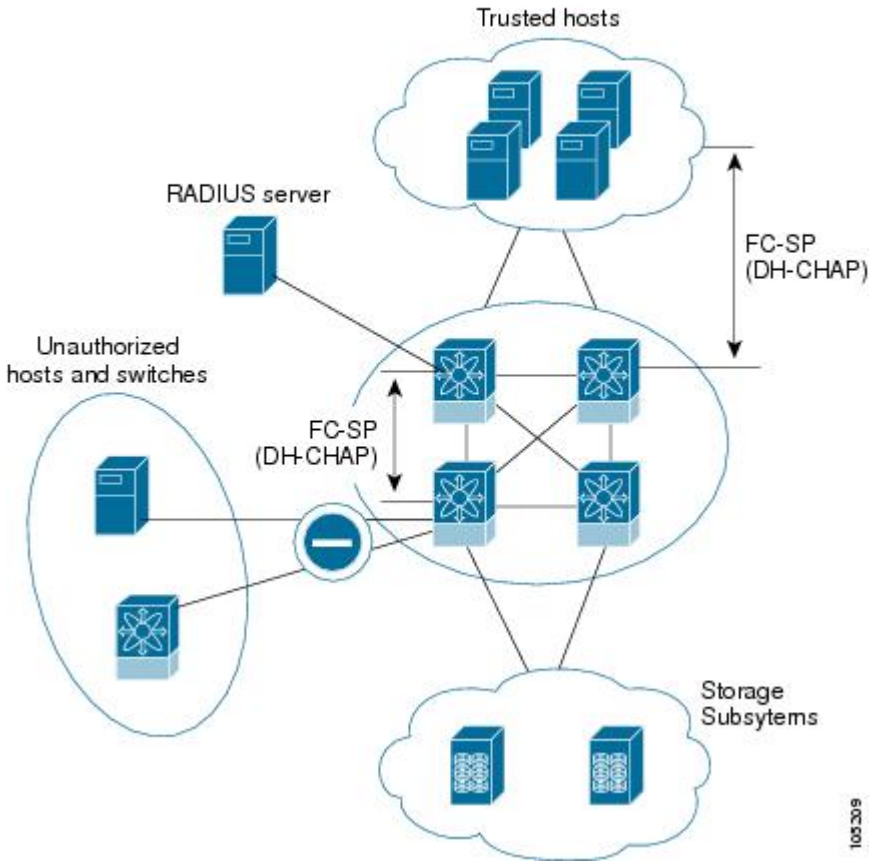
Fibre Channel Security Protocol (FC-SP) capabilities provide switch-to-switch and host-to-switch authentication to overcome security challenges for enterprise-wide fabrics. Diffie-Hellman Challenge Handshake Authentication Protocol (DHCHAP) is an FC-SP protocol that provides authentication between Cisco Nexus 5000 Series switches and other devices. DHCHAP consists of the CHAP protocol combined with the Diffie-Hellman exchange.

Information About Fabric Authentication

All Cisco Nexus 5000 Series switches enable fabric-wide authentication from one switch to another switch, or from a switch to a host. These switch and host authentications are performed locally or remotely in each fabric. As storage islands are consolidated and migrated to enterprise-wide fabrics, new security challenges arise. The approach of securing storage islands cannot always be guaranteed in enterprise-wide fabrics. For example, in a campus environment with geographically distributed switches, someone could maliciously interconnect incompatible switches or you could accidentally do so, resulting in Inter-Switch Link (ISL) isolation and link disruption.

Cisco Nexus 5000 Series switches support authentication features to address physical security (see the following figure).

Figure 1: Switch and Host Authentication



Note Fibre Channel Host Bus Adapters (HBAs) with appropriate firmware and drivers are required for host-switch authentication.

DHCHAP

DHCHAP is an authentication protocol that authenticates the devices connecting to a switch. Fibre Channel authentication allows only trusted devices to be added to a fabric, which prevents unauthorized devices from accessing the switch.

Note The terms FC-SP and DHCHAP are used interchangeably in this chapter.

DHCHAP is a mandatory password-based, key-exchange authentication protocol that supports both switch-to-switch and host-to-switch authentication. DHCHAP negotiates hash algorithms and DH groups before performing authentication. It supports MD5 and SHA-1 algorithm-based authentication.

To configure DHCHAP authentication using the local password database, perform this task:

SUMMARY STEPS

1. Enable DHCHAP.
2. Identify and configure the DHCHAP authentication modes.
3. Configure the hash algorithm and DH group.
4. Configure the DHCHAP password for the local switch and other switches in the fabric.
5. Configure the DHCHAP timeout value for reauthentication.
6. Verify the DHCHAP configuration.

DETAILED STEPS

Step 1 Enable DHCHAP.

Step 2 Identify and configure the DHCHAP authentication modes.

Step 3 Configure the hash algorithm and DH group.

Step 4 Configure the DHCHAP password for the local switch and other switches in the fabric.

Step 5 Configure the DHCHAP timeout value for reauthentication.

Step 6 Verify the DHCHAP configuration.

DHCHAP Compatibility with Fibre Channel Features

This section identifies the impact of configuring the DHCHAP feature along with existing Cisco NX-OS features:

- SAN port channel interfaces—If DHCHAP is enabled for ports belonging to a SAN port channel, DHCHAP authentication is performed at the physical interface level, not at the port channel level.
- Port security or fabric binding—Fabric-binding policies are enforced based on identities authenticated by DHCHAP.
- VSANs—DHCHAP authentication is not done on a per-VSAN basis.

About Enabling DHCHAP

By default, the DHCHAP feature is disabled in all Cisco Nexus 5000 Series switches.

You must explicitly enable the DHCHAP feature to access the configuration and verification commands for fabric authentication. When you disable this feature, all related configurations are automatically discarded.

Enabling DHCHAP

To enable DHCHAP for a Cisco Nexus 5000 Series switch, perform this task:

SUMMARY STEPS

1. switch# **configuration terminal**
2. switch(config)# **fcsp enable**
3. switch(config)# **no fcsp enable**

DETAILED STEPS

	Command or Action	Purpose
Step 1	switch# **configuration terminal**	Enters configuration mode.
Step 2	switch(config)# **fcsp enable**	Enables the DHCHAP in this switch.
Step 3	switch(config)# **no fcsp enable**	Disables (default) the DHCHAP in this switch.

About DHCHAP Authentication Modes

The DHCHAP authentication status for each interface depends on the configured DHCHAP port mode.

When the DHCHAP feature is enabled in a switch, each Fibre Channel interface or FCIP interface may be configured to be in one of four DHCHAP port modes:

- On—During switch initialization, if the connecting device supports DHCHAP authentication, the software performs the authentication sequence. If the connecting device does not support DHCHAP authentication, the link is placed in an isolated state.
- Auto-Active—During switch initialization, if the connecting device supports DHCHAP authentication, the software performs the authentication sequence. If the connecting device does not support DHCHAP authentication, the software continues with the rest of the initialization sequence.
- Auto-Passive (default)—The switch does not initiate DHCHAP authentication, but participates in DHCHAP authentication if the connecting device initiates DHCHAP authentication.
- Off—The switch does not support DHCHAP authentication. Authentication messages sent to ports in this mode return error messages to the initiating switch.

Note Whenever DHCHAP port mode is changed to a mode other than the Off mode, reauthentication is performed.

The following table identifies switch-to-switch authentication between two Cisco switches in various modes.

Table 1: DHCHAP Authentication Status Between Two MDS Switches

Switch N DHCHAP Modes	Switch 1 DHCHAP Modes			
	on	**auto-active**	**auto-passive**	**off**
on	FC-SP authentication is performed.	FC-SP authentication is performed.	FC-SP authentication is performed.	Link is brought down.
auto-Active				FC-SP authentication is *not* performed.
auto-Passive			FC-SP authentication is *not* performed.	
off	Link is brought down.	FC-SP authentication is *not* performed.		

Configuring the DHCHAP Mode

To configure the DHCHAP mode for a particular interface, perform this task:

SUMMARY STEPS

1. switch# **configuration terminal**
2. switch(config)# **interface fc** *slot*/*port* - *slot*/*port*
3. switch(config-if)# **fcsp on**
4. switch(config-if)# **no fcsp on**
5. switch(config-if)# **fcsp auto-active 0**
6. switch(config-if)# **fcsp auto-active** *timeout-period*
7. switch(config-if)# **fcsp auto-active**

DETAILED STEPS

	Command or Action	Purpose
Step 1	switch# **configuration terminal**	Enters configuration mode.
Step 2	switch(config)# **interface fc** *slot*/*port* - *slot*/*port*	Selects a range of interfaces and enters the interface configuration mode.
Step 3	switch(config-if)# **fcsp on**	Sets the DHCHAP mode for the selected interfaces to be in the on state.
Step 4	switch(config-if)# **no fcsp on**	Reverts to the factory default of auto-passive for these three interfaces.
Step 5	switch(config-if)# **fcsp auto-active 0**	Changes the DHCHAP authentication mode for the selected interfaces to auto-active. Zero (0) indicates that the port does not perform reauthentication. **Note** The reauthorization interval configuration is the same as the default behavior.

	Command or Action	Purpose
Step 6	switch(config-if)# **fcsp auto-active** *timeout-period*	Changes the DHCHAP authentication mode to auto-active for the selected interfaces. The timeout period value (in minutes) sets how often reauthentication occurs after the initial authentication.
Step 7	switch(config-if)# **fcsp auto-active**	Changes the DHCHAP authentication mode to auto-active for the selected interfaces. Reauthentication is disabled (default). **Note** The reauthorization interval configuration is the same as setting it to zero (0).

About the DHCHAP Hash Algorithm

Cisco SAN switches support a default hash algorithm priority list of MD5 followed by SHA-1 for DHCHAP authentication.

If you change the hash algorithm configuration, then change it globally for all switches in the fabric.

Caution RADIUS and TACACS+ protocols always use MD5 for CHAP authentication. Using SHA-1 as the hash algorithm may prevent RADIUS and TACACS+ usage, even if these AAA protocols are enabled for DHCHAP authentication.

Configuring the DHCHAP Hash Algorithm

To configure the hash algorithm, perform this task:

SUMMARY STEPS

1. switch# **configuration terminal**
2. switch(config)# **fcsp dhchap hash** [**md5**] [**sha1**]
3. switch(config)# **no fcsp dhchap hash sha1**

DETAILED STEPS

	Command or Action	Purpose
Step 1	switch# **configuration terminal**	Enters configuration mode.
Step 2	switch(config)# **fcsp dhchap hash** [**md5**] [**sha1**]	Configures the use of the the MD5 or SHA-1 hash algorithm.
Step 3	switch(config)# **no fcsp dhchap hash sha1**	Reverts to the factory default priority list of the MD5 hash algorithm followed by the SHA-1 hash algorithm.

About the DHCHAP Group Settings

All Cisco Nexus 5000 Series switches support all DHCHAP groups specified in the standard: 0 (null DH group, which does not perform the Diffie-Hellman exchange), 1, 2, 3, or 4.

If you change the DH group configuration, change it globally for all switches in the fabric.

Configuring the DHCHAP Group Settings

To change the DH group settings, perform this task:

SUMMARY STEPS

1. switch# **configuration terminal**
2. switch(config)# **fcsp dhchap dhgroup** [**0** | **1** | **2** | **3** | **4**]
3. switch(config)# **no fcsp dhchap dhgroup** [**0** | **1** | **2**| **3** | **4**]

DETAILED STEPS

	Command or Action	Purpose
Step 1	switch# **configuration terminal**	Enters configuration mode.
Step 2	switch(config)# **fcsp dhchap dhgroup** [**0** | **1** | **2** | **3** | **4**]	Prioritizes the use of DH groups in the configured order.
Step 3	switch(config)# **no fcsp dhchap dhgroup** [**0** | **1** | **2**| **3** | **4**]	Reverts to the DHCHAP factory default order of 0, 4, 1, 2, and 3.

About the DHCHAP Password

DHCHAP authentication in each direction requires a shared secret password between the connected devices. To do this, you can use one of three configurations to manage passwords for all switches in the fabric that participate in DHCHAP:

- Configuration 1—Use the same password for all switches in the fabric. This is the simplest configuration. When you add a new switch, you use the same password to authenticate that switch in this fabric. It is also the most vulnerable configuration if someone from the outside maliciously attempts to access any one switch in the fabric.
- Configuration 2—Use a different password for each switch and maintain that password list in each switch in the fabric. When you add a new switch, you create a new password list and update all switches with the new list. Accessing one switch yields the password list for all switches in that fabric.
- Configuration 3—Use different passwords for different switches in the fabric. When you add a new switch, multiple new passwords corresponding to each switch in the fabric must be generated and configured in each switch. Even if one switch is compromised, the password of other switches are still protected. This configuration requires considerable password maintenance by the user.

Note All passwords are restricted to 64 alphanumeric characters and can be changed, but not deleted.

We recommend using RADIUS or TACACS+ for fabrics with more than five switches. If you need to use a local password database, you can continue to do so using Configuration 3 and using the Cisco MDS 9000 Family Fabric Manager to manage the password database.

Configuring DHCHAP Passwords for the Local Switch

To configure the DHCHAP password for the local switch, perform this task:

SUMMARY STEPS

1. switch# **configuration terminal**
2. switch(config)# **fcsp dhchap password** [**0** | **7**] *password* [**wwn** *wwn-id*]

DETAILED STEPS

	Command or Action	Purpose
Step 1	switch# **configuration terminal**	Enters configuration mode.
Step 2	switch(config)# **fcsp dhchap password** [**0** | **7**] *password* [**wwn** *wwn-id*]	Configures a clear text password for the local switch.

About Password Configuration for Remote Devices

You can configure passwords in the local authentication database for other devices in a fabric. The other devices are identified by their device name, which is also known as the switch WWN or device WWN. The password is restricted to 64 characters and can be specified in clear text (0) or in encrypted text (7).

Note The switch WWN identifies the physical switch. This WWN is used to authenticate the switch and is different from the VSAN node WWN.

Configuring DHCHAP Passwords for Remote Devices

To locally configure the remote DHCHAP password for another switch in the fabric, perform this task:

SUMMARY STEPS

1. switch# **configuration terminal**
2. switch(config)# **fcsp dhchap devicename** *switch-wwn* **password** *password*
3. switch(config)# **no fcsp dhchap devicename** *switch-wwn* **password** *password*

DETAILED STEPS

	Command or Action	Purpose
Step 1	switch# **configuration terminal**	Enters configuration mode.
Step 2	switch(config)# **fcsp dhchap devicename** *switch-wwn* **password** *password*	Configures a password for another switch in the fabric that is identified by the switch WWN device name.
Step 3	switch(config)# **no fcsp dhchap devicename** *switch-wwn* **password** *password*	Removes the password entry for this switch from the local authentication database.

About the DHCHAP Timeout Value

During the DHCHAP protocol exchange, if the Cisco Nexus 5000 Series switch does not receive the expected DHCHAP message within a specified time interval, authentication failure is assumed. The time ranges from 20 (no authentication is performed) to 1000 seconds. The default is 30 seconds.

When changing the timeout value, consider the following factors:

- The existing RADIUS and TACACS+ timeout values.
- The same value must also be configured on all switches in the fabric.

Configuring the DHCHAP Timeout Value

To configure the DHCHAP timeout value, perform this task:

SUMMARY STEPS

1. switch# **configuration terminal**
2. switch(config)# **fcsp timeout** *timeout*
3. switch(config)# **no fcsp timeout** *timeout*

DETAILED STEPS

	Command or Action	Purpose
Step 1	switch# **configuration terminal**	Enters configuration mode.
Step 2	switch(config)# **fcsp timeout** *timeout*	Configures the reauthentication timeout to the specified value. The unit is seconds.
Step 3	switch(config)# **no fcsp timeout** *timeout*	Reverts to the factory default of 30 seconds.

Configuring DHCHAP AAA Authentication

You can configure AAA authentication to use a RADIUS or TACACS+ server group. If AAA authentication is not configured, local authentication is used by default.

Displaying Protocol Security Information

Use the **show fcsp** commands to display configurations for the local database.

The following example shows how to display the DHCHAP configuration for the specified interface:

```
switch# show fcsp interface fc2/4
fc2/4:
        fcsp authentication mode:SEC_MODE_ON
        Status: Successfully authenticated
```

The following example shows how to display DHCHAP statistics for the specified interface:

```
switch# show fcsp interface fc2/4 statistics
```

The following example shows how to display the FC-SP WWN of the device connected to the specified interface:

```
switch# show fcsp interface fc2/1 wwn
```

The following example shows how to display the hash algorithm and DHCHAP groups configured in the switch:

```
switch# show fcsp dhchap
```

The following example shows how to display the DHCHAP local password database:

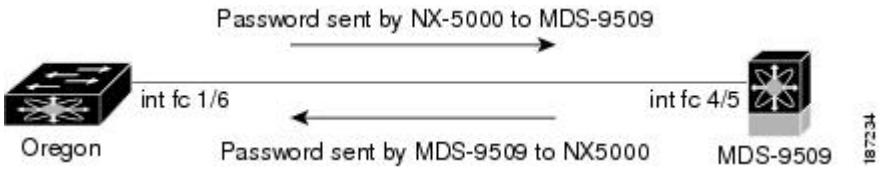
```
switch# show fcsp dhchap database
```

Use the ASCII representation of the device WWN to configure the switch information on RADIUS and TACACS+ servers.

Sample Configuration

This section provides the steps to configure the example illustrated in the following figure.

Figure 2: Sample DHCHAP Authentication



To configure the authentication setup shown in the above figure, perform this task:

SUMMARY STEPS

1. Obtain the device name of the Cisco Nexus 5000 Series switch in the fabric. The Cisco Nexus 5000 Series switch in the fabric is identified by the switch WWN.
2. Explicitly enable DHCHAP in this switch.
3. Configure a clear text password for this switch. This password will be used by the connecting device.
4. Configure a password for another switch in the fabric that is identified by the switch WWN device name.
5. Enable the DHCHAP mode for the required Fibre Channel interface.
6. Verify the protocol security information configured in this switch by displaying the DHCHAP local password database.
7. Display the DHCHAP configuration in the Fibre Channel interface.
8. Repeat these steps on the connecting MDS 9509 switch.

DETAILED STEPS

Step 1 Obtain the device name of the Cisco Nexus 5000 Series switch in the fabric. The Cisco Nexus 5000 Series switch in the fabric is identified by the switch WWN.

Example:
```
switch# show wwn switch
Switch WWN is 20:00:00:05:30:00:54:de
```

Step 2 Explicitly enable DHCHAP in this switch.

Note When you disable DHCHAP, all related configurations are automatically discarded.

Example:
```
switch(config)# fcsp enable
```

Step 3 Configure a clear text password for this switch. This password will be used by the connecting device.

Example:
```
switch(config)# fcsp dhchap password rtp9216
```

Step 4 Configure a password for another switch in the fabric that is identified by the switch WWN device name.

Example:
```
switch(config)# fcsp dhchap devicename 20:00:00:05:30:00:38:5e password rtp9509
```

Step 5 Enable the DHCHAP mode for the required Fibre Channel interface.

Note Whenever DHCHAP port mode is changed to a mode other than the Off mode, reauthentication is performed.

Example:
```
switch(config)# interface fc2/4
switch(config-if)# fcsp on
```

Step 6 Verify the protocol security information configured in this switch by displaying the DHCHAP local password database.

Example:
```
switch# show fcsp dhchap database
DHCHAP Local Password:
        Non-device specific password:*******
Other Devices' Passwords:
        Password for device with WWN:20:00:00:05:30:00:38:5e is *******
```

Step 7 Display the DHCHAP configuration in the Fibre Channel interface.

Example:
```
switch# show fcsp interface fc2/4
fc2/4
        fcsp authentication mode:SEC_MODE_ON
        Status:Successfully authenticated
```

Step 8 Repeat these steps on the connecting MDS 9509 switch.

Example:

```
MDS-9509# show wwn switch
Switch WWN is 20:00:00:05:30:00:38:5e
MDS-9509(config)# fcsp enable
MDS-9509(config)# fcsp dhchap password rtp9509
MDS-9509(config)# fcsp dhchap devicename 20:00:00:05:30:00:54:de password rtp9216
MDS-9509(config)# interface fc 4/5
MDS-9509(config-if)# fcsp on
MDS-9509# show fcsp dhchap database
DHCHAP Local Password:
        Non-device specific password:*******
Other Devices' Passwords:
        Password for device with WWN:20:00:00:05:30:00:54:de is *******
MDS-9509# show fcsp interface fc2/4
Fc2/4
        fcsp authentication mode:SEC_MODE_ON
        Status:Successfully authenticated
```

You have now enabled and configured DHCHAP authentication for the sample setup in shown in the figure above.

Default Fabric Security Settings

The following table lists the default settings for all fabric security features in any switch.

Table 2: Default Fabric Security Settings

Parameters	Default
DHCHAP feature	Disabled
DHCHAP hash algorithm	A priority list of MD5 followed by SHA-1 for DHCHAP authentication
DHCHAP authentication mode	Auto-passive
DHCHAP group default priority exchange order	0, 4, 1, 2, and 3, respectively
DHCHAP timeout value	30 seconds