Configuring 802.1X

This chapter describes how to configure IEEE 802.1X port-based authentication on Cisco NX-OS devices and includes the following sections:

About 802.1X

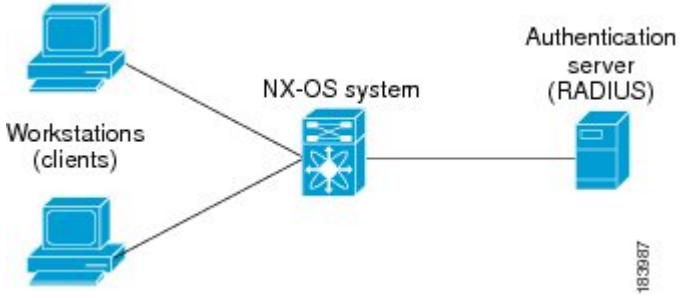
802.1X defines a client-server based access control and authentication protocol that restricts unauthorized clients from connecting to a LAN through publicly accessible ports. The authentication server authenticates each client connected to a Cisco NX-OS device port.

Until the client is authenticated, 802.1X access control allows only Extensible Authentication Protocol over LAN (EAPOL) traffic through the port to which the client is connected. After authentication is successful, normal traffic can pass through the port.

Device Roles

With 802.1X port-based authentication, the devices in the network have specific roles.

Figure 1: 802.1X Device Roles



The specific roles are as follows:

Supplicant

The client device that requests access to the LAN and Cisco NX-OS device services and responds to requests from the Cisco NX-OS device. The workstation must be running 802.1X-compliant client software such as that offered in the Microsoft Windows XP operating device.

Authentication server

The authentication server performs the actual authentication of the supplicant. The authentication server validates the identity of the supplicant and notifies the Cisco NX-OS device regarding whether the supplicant is authorized to access the LAN and Cisco NX-OS device services. Because the Cisco NX-OS device acts as the proxy, the authentication service is transparent to the supplicant. The Remote Authentication Dial-In User Service (RADIUS) security device with Extensible Authentication Protocol (EAP) extensions is the only supported authentication server; it is available in Cisco Secure Access Control Server, version 3.0. RADIUS uses a supplicant-server model in which secure authentication information is exchanged between the RADIUS server and one or more RADIUS clients.

Authenticator

The authenticator controls the physical access to the network based on the authentication status of the supplicant. The authenticator acts as an intermediary (proxy) between the supplicant and the authentication server, requesting identity information from the supplicant, verifying the requested identity information with the authentication server, and relaying a response to the supplicant. The authenticator includes the RADIUS client, which is responsible for encapsulating and decapsulating the EAP frames and interacting with the authentication server.

When the authenticator receives EAPOL frames and relays them to the authentication server, the authenticator strips off the Ethernet header and encapsulates the remaining EAP frame in the RADIUS format. This encapsulation process does not modify or examine the EAP frames, and the authentication server must support EAP within the native frame format. When the authenticator receives frames from the authentication server, the authenticator removes the server's frame header, leaving the EAP frame, which the authenticator then encapsulates for Ethernet and sends to the supplicant.

The Cisco NX-OS device can only be an 802.1X authenticator.

Authentication Initiation and Message Exchange

Either the authenticator (Cisco NX-OS device) or the supplicant (client) can initiate authentication. If you enable authentication on a port, the authenticator must initiate authentication when it determines that the port link state transitions from down to up. The authenticator then sends an EAP-request/identity frame to the supplicant to request its identity (typically, the authenticator sends an initial identity/request frame followed

by one or more requests for authentication information). When the supplicant receives the frame, it responds with an EAP-response/identity frame.

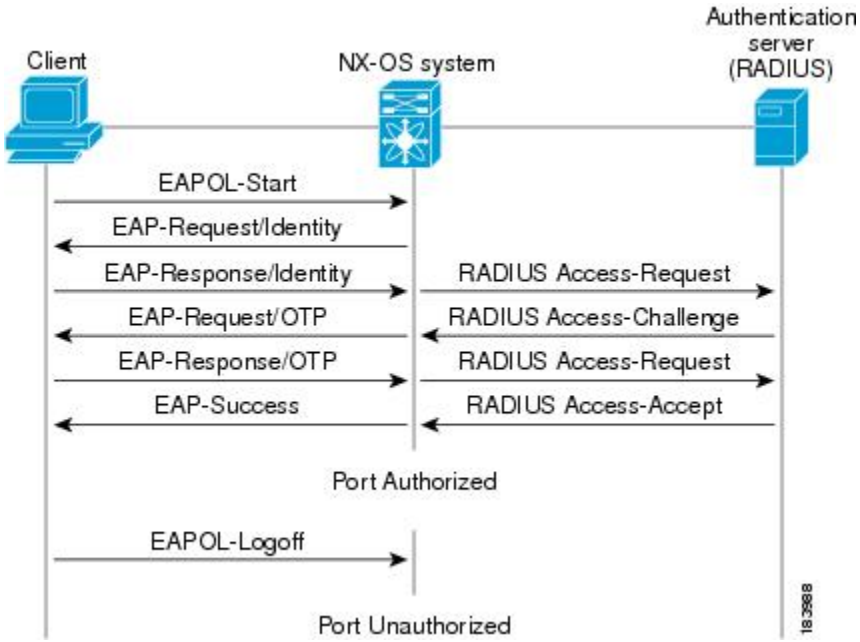
If the supplicant does not receive an EAP-request/identity frame from the authenticator during bootup, the supplicant can initiate authentication by sending an EAPOL-start frame, which prompts the authenticator to request the supplicant's identity.

If 802.1X is not enabled or supported on the network access device, the Cisco NX-OS device drops any EAPOL frames from the supplicant. If the supplicant does not receive an EAP-request/identity frame after three attempts to start authentication, the supplicant transmits data as if the port is in the authorized state. A port in the authorized state means that the supplicant has been successfully authenticated.

When the supplicant supplies its identity, the authenticator begins its role as the intermediary, passing EAP frames between the supplicant and the authentication server until authentication succeeds or fails. If the authentication succeeds, the authenticator port becomes authorized.

The specific exchange of EAP frames depends on the authentication method being used.

Figure 2: Message Exchange



The user's secret pass-phrase never crosses the network at any time such as during authentication or during pass-phrase changes.

Authenticator PAE Status for Interfaces

When you enable 802.1X on an interface, the Cisco NX-OS software creates an authenticator port access entity (PAE) instance. An authenticator PAE is a protocol entity that supports authentication on the interface. When you disable 802.1X on the interface, the Cisco NX-OS software does not automatically clear the authenticator PAE instances. You can explicitly remove the authenticator PAE from the interface and then reapply it, as needed.

Ports in Authorized and Unauthorized States

The authenticator port state determines if the supplicant is granted access to the network. The port starts in the unauthorized state. In this state, the port disallows all ingress and egress traffic except for 802.1X protocol packets. When a supplicant is successfully authenticated, the port transitions to the authorized state, allowing all traffic for the supplicant to flow normally.

If a client that does not support 802.1X is connected to an unauthorized 802.1X port, the authenticator requests the client's identity. In this situation, the client does not respond to the request, the port remains in the unauthorized state, and the client is not granted access to the network.

In contrast, when an 802.1X-enabled client connects to a port that is not running the 802.1X protocol, the client initiates the authentication process by sending the EAPOL-start frame. When no response is received, the client sends the request for a fixed number of times. Because no response is received, the client begins sending frames as if the port is in the authorized state.

Ports can have the following authorization states:

Force authorized
: Disables 802.1X port-based authentication and transitions to the authorized state without requiring any authentication exchange. The port transmits and receives normal traffic without 802.1X-based authentication of the client. This authorization state is the default.

Force unauthorized
: Causes the port to remain in the unauthorized state, ignoring all attempts by the client to authenticate. The authenticator cannot provide authentication services to the client through the interface.

Auto
: Enables 802.1X port-based authentication and causes the port to begin in the unauthorized state, allowing only EAPOL frames to be sent and received through the port. The authentication process begins when the link state of the port transitions from down to up or when an EAPOL-start frame is received from the supplicant. The authenticator requests the identity of the client and begins relaying authentication messages between the client and the authentication server. Each supplicant that attempts to access the network is uniquely identified by the authenticator by using the supplicant's MAC address.

If the supplicant is successfully authenticated (receives an Accept frame from the authentication server), the port state changes to authorized, and all frames from the authenticated supplicant are allowed through the port. If the authentication fails, the port remains in the unauthorized state, but authentication can be retried. If the authentication server cannot be reached, the authenticator can retransmit the request. If no response is received from the server after the specified number of attempts, authentication fails, and the supplicant is not granted network access.

When a supplicant logs off, it sends an EAPOL-logoff message, which causes the authenticator port to transition to the unauthorized state.

If the link state of a port transitions from up to down, or if an EAPOL-logoff frame is received, the port returns to the unauthorized state.

MAC Authentication Bypass

You can configure the Cisco NX-OS device to authorize a supplicant based on the supplicant MAC address by using the MAC authentication bypass feature. For example, you can enable this feature on interfaces configured for 802.1X that are connected to devices such as printers.

If 802.1X authentication times out while waiting for an EAPOL response from the supplicant, the Cisco NX-OS device tries to authorize the client by using MAC authentication bypass.

When you enable the MAC authentication bypass feature on an interface, the Cisco NX-OS device uses the MAC address as the supplicant identity. The authentication server has a database of supplicant MAC addresses that are allowed network access. After detecting a client on the interface, the Cisco NX-OS device waits for an Ethernet packet from the client. The Cisco NX-OS device sends the authentication server a RADIUS-access/request frame with a username and password based on the MAC address. If authorization succeeds, the Cisco NX-OS device grants the client access to the network.

If an EAPOL packet is detected on the interface during the lifetime of the link, the Cisco NX-OS device determines that the device connected to that interface is an 802.1X-capable supplicant and uses 802.1X authentication (not MAC authentication bypass) to authorize the interface. EAPOL history is cleared if the interface link status goes down.

If the Cisco NX-OS device already authorized an interface by using MAC authentication bypass and detects an 802.1X supplicant, the Cisco NX-OS device does not unauthorize the client connected to the interface. When reauthentication occurs, the Cisco NX-OS device uses 802.1X authentication as the preferred reauthentication process.

Clients that were authorized with MAC authentication bypass can be reauthenticated. The reauthentication process is the same as that for clients that were authenticated with 802.1X. During reauthentication, the port remains in the previously assigned VLAN. If reauthentication is successful, the switch keeps the port in the same VLAN.

If reauthentication is based on the Session-Timeout RADIUS attribute (Attribute[27]) and the Termination-Action RADIUS attribute (Attribute [29]) and if the Termination-Action RADIUS attribute (Attribute [29]) action is Initialize (the attribute value is DEFAULT), the MAC authentication bypass session ends, and connectivity is lost during reauthentication. If MAC authentication bypass is enabled and the 802.1X authentication times out, the switch uses the MAC authentication bypass feature to initiate reauthorization. For more information about these AV pairs, see RFC 3580, IEEE 802.1X Remote Authentication Dial In User Service (RADIUS) Usage Guidelines.

MAC authentication bypass interacts with the following features:

802.1X authentication—You can enable MAC authentication bypass only if 802.1X authentication is enabled on the port.

Port security—This feature is not supported on the Nexus 3548 platform switches.

Network admission control (NAC) Layer 2 IP validation—This feature takes effect after an 802.1X port is authenticated with MAC authentication bypass, including hosts in the exception list.

Dynamic VLAN Assignment based on MAC-Based Authentication (MAB)

The Cisco Nexus 3548 Series switches supports dynamic VLAN assignment. After the 802.1x authentication or MAB is completed, before bringing up the port, you may want to (as part of authorization) allow the peer/host to be placed into a particular VLAN based as a result of the authentication. The RADIUS server typically indicates the desired VLAN by including tunnel attributes within the Access-Accept message. This procedure of getting the VLAN an binding it to the port constitutes to Dynamic VLAN assignment.

VLAN Assignment from RADIUS

After authentication is completed either through dot1x or MAB, the response from the RADIUS server can have dynamic VLAN information, which can be assigned to a port. This information is present in response from RADIUS server in Accept-Access message in the form of tunnel attributes. For use in VLAN assignment, the following tunnel attributes are sent:

Tunnel-type=VLAN(13)

Tunnel-Medium-Type=802

Tunnel-Private-Group-ID=VLANID

All the three parameters must be received for configuring access VLAN.

Single Host and Multiple Host Support

The 802.1X feature can restrict traffic on a port to only one endpoint device (single-host mode) or allow traffic from multiple endpoint devices on a port (multi-host mode).

Single-host mode allows traffic from only one endpoint device on the 802.1X port. Once the endpoint device is authenticated, the Cisco NX-OS device puts the port in the authorized state. When the endpoint device leaves the port, the Cisco NX-OS device put the port back into the unauthorized state. A security violation in 802.1X is defined as a detection of frames sourced from any MAC address other than the single MAC address authorized as a result of successful authentication. In this case, the interface on which this security association violation is detected (EAPOL frame from the other MAC address) will be disabled. Single host mode is applicable only for host-to-switch topology and when a single host is connected to the Layer 2 (Ethernet access port) or Layer 3 port (routed port) of the Cisco NX-OS device.

Only the first host has to be authenticated on the 802.1X port configured with multiple host mode. The port is moved to the authorized state after the successful authorization of the first host. Subsequent hosts are not required to be authorized to gain network access once the port is in the authorized state. If the port becomes unauthorized when reauthentication fails or an EAPOL logoff message is received, all attached hosts are denied access to the network. The capability of the interface to shut down upon security association violation is disabled in multiple host mode. This mode is applicable for both switch-to-switch and host-to-switch topologies.

Supported Topology

The 802.1X port-based authentication supports point-to-point topology.

In this configuration, only one supplicant (client) can connect to the 802.1X-enabled authenticator (Cisco NX-OS device) port. The authenticator detects the supplicant when the port link state changes to the up state. If a supplicant leaves or is replaced with another supplicant, the authenticator changes the port link state to down, and the port returns to the unauthorized state.

Licensing Requirements for 802.1x

The following table shows the licensing requirements for this feature:

Table 1: Licensing Requirements

Product	License Requirement
Cisco NX-OS	802.1X requires no license. Any feature not included in a license package is bundled with the Cisco NX-OS system images and is provided at no extra charge to you.

Guidelines and Limitations for 802.1x

802.1X port-based authentication has the following configuration guidelines and limitations:

- Multi-authentication mode is enabled on an 802.1X port. VLAN assignment occurs successfully for the first authenticated host. Subsequent authorized (based on user credentials) data hosts are considered successfully authenticated, provided either they have no VLAN assignment or have a VLAN assignment matching the first successfully authenticated host on the port. This ensures that all successfully authenticated hosts on a port are members of the same VLAN. Flexibility of VLAN assignment is only provided to the first authenticated host.
- Cisco Nexus Series switches do not support 802.1X on the following:
  - 40G interfaces
  - Transit topology set ups
  - VPC ports
  - PVLAN ports
  - L3 (routed) ports
  - Port security
  - Ports that are enabled with CTS and MACsec
  - Dot1x with LACP port-channels
  - Disable 802.1X on VPC ports and all unsupported features
- The Cisco NX-OS software supports 802.1X authentication only on physical ports.
- The Cisco NX-OS software does not support 802.1X authentication on port channels or subinterfaces.
- The Cisco NX-OS software supports 802.1X authentication on member ports of a port channel but not on the port channel itself.
- When the members are configured for 802.1X, Cisco NX-OS software does not support configuring single-host mode on port channel members. Only multi-host mode is supported on the member ports.
- Member ports with and without a 802.1X configuration can coexist in a port channel. However, you must ensure the identical 802.1X configuration on all the member ports in order for channeling to operate with 802.1X.
- When you enable 802.1X authentication, supplicants are authenticated before any other Layer 2 or Layer 3 features are enabled on an Ethernet interface.
- On a 802.1X enabled port, the STP BPDUs are permitted only after a successful authentication. We recommend that you enable the 802.1X functionality only on the STP edge ports to avoid STP disputes.
- The Cisco NX-OS software supports 802.1X authentication only on Ethernet interfaces that are in a port channel, a trunk, or an access port.
- The Cisco NX-OS software does not work with the CTS or the MACsec features. Global "mac-learn disable" and dot1x feature are mutually exclusive and cannot be configured together.

- Dot1x is mutually exclusive with the IP Source Guard and URPF features and cannot be configured together. When you upgrade the Cisco Nexus Series switch to Cisco NX-OS Release 9.3(3), you must disable one of these features.
- The Cisco NX-OS software does not support single host mode on trunk interfaces or member interfaces in a port channel.
- The Cisco NX-OS software does not support MAC address authentication bypass on a port channel. The multi-host mode is the only supported mode on the port-channels.
- The Cisco NX-OS software does not support Dot1x on vPC ports and MCT.
- During a switch reload, Dot1x does not generate RADIUS accounting stops.
- The Cisco NX-OS software does not support the following 802.1X protocol enhancements:
  - One-to-many logical VLAN name to ID mapping
  - Web authorization
  - Dynamic domain bridge assignment
  - IP telephony
- In order to prevent reauthentication of inactive sessions, use the authentication timer inactivity command to set the inactivity timer to an interval shorter than the reauthentication interval set with the authentication timer reauthenticate command.
- A security violation occurs when the same MAC is learned on a different VLAN with dot1x enabled on the interface.
- Configuring mac learn disable with dot1x enabled on a DME enabled platform does not display the error messages.
- Tagged EAPOL frames are processed although the VLAN is not configured on the interface and the authentication is successful on the interface for the client.
- Secure MAC learned on the orphan port is not synced on the vPC peer.
- The Cisco Nexus 3500 series switches do not support MAC address authentication bypass on a port channel and trunk interfaces.
- Beginning with Cisco NX-OS Release 10.4(3)F, EAP-TLS supports Transport Layer Security version 1.3 and 1.2 on Cisco Nexus switches.

Note If the RADIUS server is not capable of TLS v1.3, then TLS v1.2 is used, as it is the minimum supported version.

Default Settings for 802.1x

Table 2: Default 802.1x Parameters

Parameters	Default
802.1X feature	Disabled
AAA 802.1X authentication method	Not configured
Per-interface 802.1X protocol enable state	Disabled (force-authorized) The port transmits and receives normal traffic without 802.1X-based authentication of the supplicant.
Periodic reauthentication	Disabled
Number of seconds between reauthentication attempts	3,600 seconds
Quiet timeout period	60 seconds (number of seconds the Cisco NX-OS device remains in the quiet state following a failed authentication exchange with the supplicant)
Retransmission timeout period	30 seconds (number of seconds the Cisco NX-OS device waits for a response to an EAP request/identity frame from the supplicant before retransmitting the request)
Maximum retransmission number	Two times (number of times the Cisco NX-OS device sends an EAP-request/identity frame before restarting the authentication process)
Host mode	Single host
Supplicant timeout period	30 seconds (time that the Cisco NX-OS device waits for a response before retransmitting the request to the supplicant when relaying a request from the authentication server to the supplicant)
Authentication server timeout period	30 seconds (time that the Cisco NX-OS device waits for a reply before retransmitting the response to the server when relaying a response from the supplicant to the authentication server)

Configuring 802.1X

Process for Configuring 802.1X

This section describes the process for configuring 802.1X.

SUMMARY STEPS

1. Enable the 802.1X feature.
2. Configure the connection to the remote RADIUS server.
3. Enable 802.1X feature on the Ethernet interfaces.

DETAILED STEPS

Step 1 Enable the 802.1X feature.

Step 2 Configure the connection to the remote RADIUS server.

Step 3 Enable 802.1X feature on the Ethernet interfaces.

Enabling 802.1X

You must enable the 802.1X feature on the Cisco NX-OS device before authenticating any supplicant devices.

SUMMARY STEPS

1. **configure terminal**
2. **feature dot1x**
3. **exit**
4. **show dot1x**
5. **copy running-config startup-config**

DETAILED STEPS

	Command or Action	Purpose

Step 1	**configure terminal**
	Example:
	`switch# configure terminal`
	`switch(config)#`
		Enters global configuration mode.

Step 2	**feature dot1x** **Example:** `switch(config)# feature dot1x`	Enables the 802.1X feature. The default is disabled.

Step 3	**exit**
	Example:
	`switch(config)# exit`
	`switch#`
		Exits configuration mode.

Step 4	**show dot1x** **Example:** `switch# show dot1x`	Displays the 802.1X feature status.

	Command or Action	Purpose
Step 5	**copy running-config startup-config** **Example:** `switch# copy running-config startup-config`	Copies the running configuration to the startup configuration.

Configuring AAA Authentication Methods for 802.1X

You can use remote RADIUS servers for 802.1X authentication. You must configure RADIUS servers and RADIUS server groups and specify the default AAA authentication method before the Cisco NX-OS device can perform 802.1X authentication.

Before you begin

Obtain the names or addresses for the remote RADIUS server groups.

SUMMARY STEPS

1. **configure terminal**
2. **aaa authentication dot1x default group**
3. **exit**
4. **show radius-server**
5. **show radius-server group**
6. **copy running-config startup-config**

DETAILED STEPS

	Command or Action	Purpose

Step 1	**configure terminal**
	Example:
	`switch# configure terminal`
	`switch(config)#`
		Enters global configuration mode.

Step 2	**aaa authentication dot1x default group** **Example:** `switch(config)# aaa authentication dot1x default group rad2`	Specifies the RADIUS server groups to use for 802.1X authentication. The group-list argument consists of a space-delimited list of group names. The group names are the following: • radius—Uses the global pool of RADIUS servers for authentication. • named group—Uses the global pool of RADIUS servers for authentication.

Step 3	**exit**
	Example:
	`switch(config)# exit`
	`switch#`
		Exits configuration mode.

	Command or Action	Purpose
Step 4	**show radius-server** **Example:** `switch# show radius-server`	Displays the RADIUS server configuration.
Step 5	**show radius-server group** **Example:** `switch# show radius-server group rad2`	Displays the RADIUS server group configuration.
Step 6	**copy running-config startup-config** **Example:** `switch# copy running-config startup-config`	Copies the running configuration to the startup configuration.

Controlling 802.1x Authentication on an Interface

You can control the 802.1X authentication performed on an interface. An interface can have the following 802.1X authentication states:

Auto
Enables 802.1X authentication on the interface.

Force-authorized
Disables 802.1X authentication on the interface and allows all traffic on the interface without authentication. This state is the default.

Force-unauthorized
Disallows all traffic on the interface.

Before you begin

Enable the 802.1X feature on the Cisco NX-OS device.

SUMMARY STEPS

1. **configure terminal**
2. **interface ethernet** *slot* | *port*
3. **dot1x port-control** {**auto** | **force-authorized** | **force-unauthorised**}
4. **exit**
5. **show dot1x all**
6. **copy running-config startup-config**

DETAILED STEPS

	Command or Action	Purpose

Step 1	**configure terminal**
	Example:
	`switch# configure terminal`
	`switch(config)#`
		Enters global configuration mode.

	Command or Action	Purpose

Step 2	**interface ethernet** *slot* | *port*
	Example:
	`switch(config)# interface ethernet 2/1`
	`switch(config-if)#`
		Selects the interface to configure and enters interface configuration mode.

Step 3	**dot1x port-control** {**auto** | **force-authorized** | **force-unauthorised**} **Example:** `switch(config-if)# dot1x port-control auto`	Changes the 802.1X authentication state on the interface. The default is force-authorized.

Step 4	**exit**
	Example:
	`switch(config)# exit`
	`switch#`
		Exits configuration mode.

Step 5	**show dot1x all** **Example:** `switch# show dot1x all`	Displays all 802.1X feature status and configuration information.
Step 6	**copy running-config startup-config** **Example:** `switch# copy running-config startup-config`	Copies the running configuration to the startup configuration.

Creating or Removing an Authenticator PAE on an Interface

You can create or remove the 802.1X authenticator port access entity (PAE) instance on an interface.

Note By default, the Cisco NX-OS software creates the authenticator PAE instance on the interface when you enable 802.1X on an interface.

Before you begin

Enable the 802.1X feature.

SUMMARY STEPS

1. **configure terminal**
2. **show dot1x interface ethernet** *slot* | *port*
3. **interface ethernet** *slot* | *port*
4. [**no**] **dot1x pae authenticator**
5. **copy running-config startup-config**

DETAILED STEPS

	Command or Action	Purpose

Step 1	**configure terminal**
	Example:
	`switch# configure terminal`
	`switch(config)#`
		Enters global configuration mode.

Step 2	**show dot1x interface ethernet** *slot* | *port* **Example:** `switch# show dot1x interface ethernet 2/1`	Displays the 802.1X configuration on the interface.

Step 3	**interface ethernet** *slot* | *port*
	Example:
	`switch(config)# interface ethernet 2/1`
	`switch(config-if)#`
		Selects the interface to configure and enters interface configuration mode.

Step 4	[**no**] **dot1x pae authenticator** **Example:** `switch(config-if)# dot1x pae authenticator`	Creates an authenticator PAE instance on the interface. Use the **no** form to remove the PAE instance from the interface. **Note** Creates an authenticator PAE instance on the interface. Use the **no** form to remove the PAE instance from the interface.
Step 5	**copy running-config startup-config** **Example:** `switch# copy running-config startup-config`	Copies the running configuration to the startup configuration.

Enabling Periodic Reauthentication for an Interface

You can enable periodic 802.1X reauthentication on an interface and specify how often it occurs. If you do not specify a time period before enabling reauthentication, the number of seconds between reauthentication defaults to the global value.

Note During the reauthentication process, the status of an already authenticated supplicant is not disrupted.

Before you begin

Enable the 802.1X feature on the Cisco NX-OS device.

SUMMARY STEPS

1. **configure terminal**
2. **interface ethernet** *slot* / port
3. dot1x re-authentication
4. **dot1x timeout re-authperiod**

5. **exit**
6. **show dot1x all**
7. **copy running-config startup-config**

DETAILED STEPS

	Command or Action	Purpose

Step 1	**configure terminal**
	Example:
	`switch# configure terminal`
	`switch(config)#`
		Enters global configuration mode.

Step 2	**interface ethernet** *slot* / port
	Example:
	`switch(config)# interface ethernet 2/1`
	`switch(config-if)#`
		Selects the interface to configure and enters interface configuration mode.

Step 3	dot1x re-authentication **Example:** `switch(config-if)# dot1x re-authentication`	Enables periodic reauthentication of the supplicants connected to the interface. By default, periodic authentication is disabled.
Step 4	**dot1x timeout re-authperiod** **Example:** `switch(config-if)# dot1x timeout re-authperiod 3300`	Sets the number of seconds between reauthentication attempts. The default is 3600 seconds. The range is from 1 to 65535. **Note** This command affects the behavior of the Cisco NX-OS device only if you enable periodic reauthentication on the interface.

Step 5	**exit**
	Example:
	`switch(config)# exit`
	`switch#`
		Exits configuration mode.

Step 6	**show dot1x all** **Example:** `switch# show dot1x all`	Displays all 802.1X feature status and configuration information.
Step 7	**copy running-config startup-config** **Example:** `switch# copy running-config startup-config`	Copies the running configuration to the startup configuration.

Manually Reauthenticating Supplicants

You can manually reauthenticate the supplicants for the entire Cisco NX-OS device or for an interface.

Note During the reauthentication process, the status of an already authenticated supplicant isn't disrupted.

Before you begin

Enable the 802.1X feature on the Cisco NX-OS device.

SUMMARY STEPS

1. **dot1x re-authenticate** [**interface** *slot* | **port**]

DETAILED STEPS

	Command or Action	Purpose
Step 1	**dot1x re-authenticate** [**interface** *slot* | **port**] **Example:** `switch# dot1x re-authenticate interface 2/1`	Reauthenticates the supplicants on the Cisco NX-OS device or on an interface.

Changing 802.1X Authentication Timers for an Interface

You can change the following 802.1X authentication timers on the Cisco NX-OS device interfaces:

Quiet-period timer
When the Cisco NX-OS device can't authenticate the supplicant, the switch remains idle for a set period and then tries again. The quiet-period timer value determines the idle period. An authentication failure might occur because the supplicant provided an invalid password. You can provide a faster response time to the user by entering a smaller number than the default. The default is the value of the global quiet period timer. The range is from 1 to 65535 seconds.

Rate-limit timer
The rate-limit period throttles EAPOL-Start packets from supplicants that are sending too many EAPOL-Start packets. The authenticator ignores EAPOL-Start packets from supplicants that have successfully authenticated for the rate-limit period duration. The default value is 0 seconds and the authenticator processes all EAPOL-Start packets. The range is from 1 to 65535 seconds.

Switch-to-authentication-server retransmission timer for Layer 4 packets
The authentication server notifies the switch each time that it receives a Layer 4 packet. If the switch does not receive a notification after sending a packet, the Cisco NX-OS device waits a set period and then retransmits the packet. The default is 30 seconds. The range is from 1 to 65535 seconds.

Switch-to-supplicant retransmission timer for EAP response frames
The supplicant responds to the EAP-request/identity frame from the Cisco NX-OS device with an EAP-response/identity frame. If the Cisco NX-OS device does not receive this response, it waits a set period (known as the retransmission time) and then retransmits the frame. The default is 30 seconds. The range is from 1 to 65535 seconds.
Switch-to-supplicant retransmission timer for EAP request frames

Note Change the default values only to adjust for unusual circumstances such as unreliable links or specific behavioral problems with certain supplicants and authentication servers.

Before you begin

Enable the 802.1X feature on the Cisco NX-OS device.

SUMMARY STEPS

1. **configure terminal**
2. **configure interface ethernet 2/1**
3. **dot1x timeout quiet-period** *seconds*
4. **dot1x timeout ratelimit-period** *seconds*
5. **dot1x timeout server-timeout** *seconds*
6. **dot1x timeout supp-timeout** *seconds*
7. **dot1x timeout tx-period** *seconds*
8. **dot1x timeout inactivity-period** *seconds*
9. **exit**
10. **show dot1x all**
11. **copy running-config startup-config**

DETAILED STEPS

	Command or Action	Purpose

Step 1	**configure terminal**
	Example:
	`switch# configure terminal`
	`switch(config)#`
		Enters global configuration mode.

Step 2	**configure interface ethernet 2/1**
	Example:
	`switch# interface ethernet 2/1`
	`switch(config-if)#`
		Selects the interface to configure and enters interface configuration mode.

Step 3	**dot1x timeout quiet-period** *seconds* **Example:** `switch(config-if)# dot1x timeout quiet-period 25`	Sets the number of seconds that the authenticator waits for a response to an EAP-request/identity frame from the supplicant before retransmitting the request. The default is the global number of seconds set for all interfaces. The range is from 1 to 65535 seconds.
Step 4	**dot1x timeout ratelimit-period** *seconds* **Example:** `switch(config-if)# dot1x timeout ratelimit-period 10`	Sets the number of seconds that the authenticator ignores EAPOL-Start packets from supplicants that have successfully authenticated. The default value is 0 seconds. The range is from 1 to 65535 seconds.
Step 5	**dot1x timeout server-timeout** *seconds* **Example:** `switch(config-if)# dot1x timeout server-timeout 60`	Sets the number of seconds that the Cisco NX-OS device waits before retransmitting a packet to the authentication server. The default is 30 seconds. The range is from 1 to 65535 seconds.
Step 6	**dot1x timeout supp-timeout** *seconds* **Example:**	Sets the number of seconds that the Cisco NX-OS device waits for the supplicant to respond to an EAP request frame

	Command or Action	Purpose
	`switch(config-if)# dot1x timeout supp-timeout 20`	before the Cisco NX-OS device retransmits the frame. The default is 30 seconds. The range is from 1 to 65535 seconds.
Step 7	**dot1x timeout tx-period** *seconds* **Example:** `switch(config-if)# dot1x timeout tx-period 40`	Sets the number of seconds between the retransmission of EAP request frames when the supplicant does not send notification that it received the request. The default is the global number of seconds set for all interfaces. The range is from 1 to 65535 seconds.
Step 8	**dot1x timeout inactivity-period** *seconds* **Example:** `switch(config-if)# dot1x timeout inactivity-period 1800`	Sets the number of seconds the switch can remain inactive. The recommended minimum value is 1800 seconds.

Step 9	**exit**
	Example:
	`switch(config)# exit`
	`switch#`
		Exits configuration mode.

Step 10	**show dot1x all** **Example:** `switch# show dot1x all`	Displays the 802.1X configuration.
Step 11	**copy running-config startup-config** **Example:** `switch# copy running-config startup-config`	Copies the running configuration to the startup configuration.

Enabling MAC Authentication Bypass

You can enable MAC authentication bypass on an interface that has no supplicant connected.

Before you begin

Enable the 802.1X feature on the Cisco NX-OS device.

SUMMARY STEPS

1. **configure terminal**
2. **interface ethernet** *slot* | *port*
3. **dot1x mac-auth-bypass** [**eap**]
4. **exit**
5. **show dot1x all**
6. **copy running-config startup-config**

DETAILED STEPS

	Command or Action	Purpose

Step 1	**configure terminal**
	Example:
	`switch# configure terminal`
	`switch(config)#`
		Enters global configuration mode.

Step 2	**interface ethernet** *slot* | *port*
	Example:
	`switch(config)# interface ethernet 2/1`
	`switch(config-if)`
		Selects the interface to configure and enters interface configuration mode.

Step 3	**dot1x mac-auth-bypass** [**eap**] **Example:** `switch(config-if)# dot1x mac-auth-bypass`	Enables MAC authentication bypass. The default is bypass disabled. Use the **eap** keyword to configure the Cisco NX-OS device to use EAP for authorization.

Step 4	**exit**
	Example:
	`switch(config)# exit`
	`switch#`
		Exits configuration mode.

Step 5	**show dot1x all** **Example:** `switch# show dot1x all`	Displays all 802.1X feature status and configuration information.
Step 6	**copy running-config startup-config** **Example:** `switch# copy running-config startup-config`	Copies the running configuration to the startup configuration.

Enabling Single Host or Multiple Hosts Mode

You can enable single host or multiple hosts mode on an interface.

Before you begin

Enable the 802.1X feature on the Cisco NX-OS device.

SUMMARY STEPS

1. **configure terminal**
2. **interface ethernet** *slot* | *port*
3. **dot1x host-mode** { **multi-host** | **single-host**}
4. **dot1x host-mode multi-auth**
5. **exit**
6. **copy running-config startup-config**

DETAILED STEPS

	Command or Action	Purpose

Step 1	**configure terminal**
	Example:
	`switch# configure terminal`
	`switch(config)#`
		Enters global configuraiton mode.

Step 2	**interface ethernet** *slot* | *port*
	Example:
	`switch(config)# interface ethernet 2/1`
	`switch(config-if)`
		Selects the interface to configure and enters interface configuration mode.

Step 3	**dot1x host-mode** { **multi-host** | **single-host**} **Example:** `switch(config-if)# dot1x host-mode multi-host`	Configures the host mode. The default is single-host. **Note** Make sure that the dot1x port-control interface configuration command is set to auto for the specified interface.
Step 4	**dot1x host-mode multi-auth** **Example:** `switch(config-if)# dot1x host-mode multi-auth`	Configures the multiple authentication mode. The port is authorized only on a successful authentication of either EAP or MAB or a combination of both. Failure to authenticate will restrict network access.

Step 5	**exit**
	Example:
	`switch(config)# exit`
	`switch#`
		Exits configuration mode.

Step 6	**copy running-config startup-config** **Example:** `switch# copy running-config startup-config`	Copies the running configuration to the startup configuration.

Disabling the 802.1X feature

You can disable the 802.1X feature on the Cisco NX-OS device.

When you disable 802.1X, all related configurations are automatically discarded. The Cisco NX-OS software creates an automatic checkpoint that you can use if you reenable 802.1X and want to recover the configuration. For more information, see the *Cisco NX-OS System Management Configuration Guide* for your platform.

Before you begin

Enable the 802.1X feature on the Cisco NX-OS device.

SUMMARY STEPS

1. **configure terminal**
2. **no feature dot1x**
3. **exit**

4. **copy running-config startup-config**

DETAILED STEPS

	Command or Action	Purpose

Step 1	**configure terminal**
	Example:
	`switch# configure terminal`
	`switch(config)#`
		Enters global configuration mode.

Step 2	**no feature dot1x** **Example:** `no feature dot1x`	Disables 802.1X. **Note** Disabling the 802.1X feature removes all 802.1X configuration.

Step 3	**exit**
	Example:
	`switch(config)# exit`
	`switch#`
		Exits configuration mode.

Step 4	**copy running-config startup-config** **Example:** `switch# copy running-config startup-config`	Copies the running configuration to the startup configuration.

Resetting the 802.1X Interface Configuration to the Default Values

You can reset the 802.1X configuration for an interface to the default values.

Before you begin

Enable the 802.1X feature on the Cisco NX-OS device.

SUMMARY STEPS

1. **configure terminal**
2. **interface ethernet** *slots port*
3. **dot1x default**
4. **exit**

DETAILED STEPS

	Command or Action	Purpose

Step 1	**configure terminal**
	Example:
	`switch# configure terminal`
	`switch(config)#`
		Enters global configuration mode.

	Command or Action	Purpose

Step 2	**interface ethernet** *slots port*
	Example:
	`switch(config)# interface ethernet 2/1`
	`switch(config-if)`
		Selects the interface to configure and enters interface configuration mode.

Step 3	**dot1x default** **Example:** `switch(config-if)# dot1x default`	Reverts to the 802.1X configuration default values for the interface.

Step 4	**exit**
	Example:
	`switch(config)# exit`
	`switch#`
		Exits configuration mode.

Setting the Maximum Authenticator-to-Supplicant Frame for an Interface

You can set the maximum number of times that the Cisco NX-OS device retransmits authentication requests to the supplicant on an interface before the session times out. The default is 2 times and the range is from 1 to 10.

Before you begin

Enable the 802.1X feature on the Cisco NX-OS device.

SUMMARY STEPS

1. **configure terminal**
2. **interface ethernet** *slots* | *port*
3. **dot1x max-req** *count*
4. **exit**
5. **copy running-config startup-config**

DETAILED STEPS

	Command or Action	Purpose

Step 1	**configure terminal**
	Example:
	`switch# configure terminal`
	`switch(config)#`
		Enters global configuration mode.

Step 2	**interface ethernet** *slots*	*port*
		Example:
		`switch(config)# interface ethernet 2/1`
		`switch(config-if)#`
			Selects the interface to configure and enters interface configuration mode.

	Command or Action	Purpose
Step 3	**dot1x max-req** *count* **Example:** `switch(config-if)# dot1x max-req 3`	Changes the maximum authorization request retry count. The default is 2 times and the range is from 1 to 10. **Note** Make sure that the dot1x port-control interface configuration command is set to auto for the specified interface.

Step 4	**exit**
	Example:
	`switch(config)# exit`
	`switch#`
		Exits configuration mode.

Step 5	**copy running-config startup-config** **Example:** `switch# copy running-config startup-config`	Copies the running configuration to the startup configuration.

Setting the Maximum Reauthentication Retry Count on an Interface

You can set the maximum number of times that the Cisco NX-OS device retransmits reauthentication requests to the supplicant on an interface before the session times out. The default is 2 times and the range is from 1 to 10.

Before you begin

Enable the 802.1X feature on the Cisco NX-OS device.

SUMMARY STEPS

1. **configure terminal**
2. **interface ethernet** *slots* | *port*
3. **dot1x max-reauth-req** *retry-count*
4. **exit**
5. **copy running-config startup-config**

DETAILED STEPS

	Command or Action	Purpose

Step 1	**configure terminal**
	Example:
	`switch# configure terminal`
	`switch(config)#`
		Enters global configuration mode.

Step 2	**interface ethernet** *slots*	*port*
		Example:
		`switch(config)# interface ethernet 2/1`
		`switch(config-if)#`
			Selects the interface to configure and enters interface configuration mode.

	Command or Action	Purpose
Step 3	**dot1x max-reauth-req** *retry-count* **Example:** `switch(config-if)# dot1x max-reauth-req 3`	Changes the maximum reauthentication request retry count. The default is 2 times and the range is from 1 to 10.

Step 4	**exit**
	Example:
	`switch(config)# exit`
	`switch#`
		Exits configuration mode.

Step 5	**copy running-config startup-config** **Example:** `switch# copy running-config startup-config`	Copies the running configuration to the startup configuration.

Verifying the 802.1X configuration

To display 802.1X information, perform one of the following tasks:

Command	Purpose
show dot1x	Displays the 802.1X feature status.
show dot1x all [**details** | **statistics** | **summary**]	Displays all 802.1X feature status and configuration information.
show dot1x interface ethernet *slot*/*port* [**details** | **statistics** | **summary**]	Displays the 802.1X feature status and configuration information for an Ethernet interface.
show running-config dot1x [**all**]	Displays the 802.1X feature configuration in the running configuration.
show startup-config dot1x	Displays the 802.1X feature configuration in the startup configuration.

For detailed information about the fields in the output from these commands, see the *Cisco NX-OS Security Command Reference* for your platform.

Monitoring 802.1X

You can display the statistics that the Cisco NX-OS device maintains for the 802.1X activity.

Before you begin

Enable the 802.1X feature on the Cisco NX-OS device.

SUMMARY STEPS

1. **show dot1x** {**all** | **interface ethernet** *slot* | *port*} **statistics**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**show dot1x** {**all**	**interface ethernet** *slot*	*port*} **statistics** **Example:** `switch# show dot1x all statistics`	Displays the 802.1X statistics.

Configuration Example for 802.1X

The following example shows how to configure 802.1X for an access port:

```
feature dot1x
aaa authentication dot1x default group rad2
interface Ethernet2/1
dot1x pae-authenticator
dot1x port-control auto
```

The following example shows how to configure 802.1X for a trunk port:

```
feature dot1x
aaa authentication dot1x default group rad2
interface Ethernet2/1
dot1x pae-authenticator
dot1x port-control auto
dot1x host-mode multi-host
```

Note Repeat the **dot1x pae authenticator** and **dot1x port-control auto** commands for all interfaces that require 802.1X authentication.