Configuring FlexConnect Groups

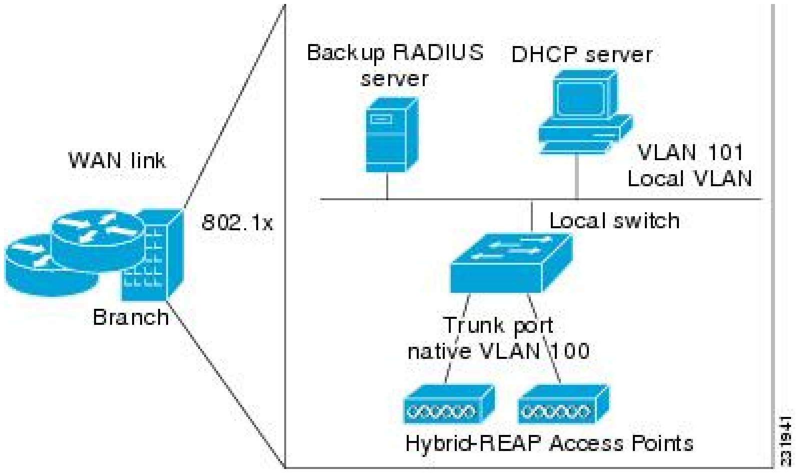
Information About FlexConnect Groups

To organize and manage your FlexConnect access points, you can create FlexConnect Groups and assign specific access points to them.

All of the FlexConnect access points in a group share the same backup RADIUS server, CCKM, and local authentication configuration information. This feature is helpful if you have multiple FlexConnect access points in a remote office or on the floor of a building and you want to configure them all at once. For example, you can configure a backup RADIUS server for a FlexConnect rather than having to configure the same server on each access point.

Figure 1: FlexConnect Group Deployment

The following figure shows a typical FlexConnect deployment with a backup RADIUS server in the branch office.



FlexConnect Groups and Backup RADIUS Servers

You can configure the controller to allow a FlexConnect access point in standalone mode to perform full 802.1X authentication to a backup RADIUS server. You can configure a primary backup RADIUS server or both a primary and secondary backup RADIUS server. These servers can be used when the FlexConnect access point is in of these two modes: standalone or connected.

FlexConnect Groups and CCKM

FlexConnect Groups are required for CCKM fast roaming to work with FlexConnect access points. CCKM fast roaming is achieved by caching a derivative of the master key from a full EAP authentication so that a simple and secure key exchange can occur when a wireless client roams to a different access point. This feature prevents the need to perform a full RADIUS EAP authentication as the client roams from one access point to another. The FlexConnect access points need to obtain the CCKM cache information for all the clients that might associate so they can process it quickly instead of sending it back to the controller. If, for example, you have a controller with 300 access points and 100 clients that might associate, sending the CCKM cache for all 100 clients is not practical. If you create a FlexConnect that includes a limited number of access points (for example, you create a group for four access points in a remote office), the clients roam only among those four access points, and the CCKM cache is distributed among those four access points only when the clients associate to one of them.

Note CCKM fast roaming among FlexConnect and non-FlexConnect access points is not supported.

Note FlexConnect Groups is needed for CCKM to work. Flex group needs to be created for CCKM, 11r , and OKC , only then the caching can happen on an AP. The group name must be same between APS for a fast roaming to happen for 11r/CCKM. The group can be different for OKC as final check is done at Cisco WLC.

FlexConnect Groups and Opportunistic Key Caching

Starting with the Cisco Wireless LAN Controller Release 7.0.116.0, FlexConnect groups accelerate Opportunistic Key Caching (OKC) to enable fast roaming of clients. OKC facilitates fast roaming by using PMK caching in access points that are in the same FlexConnect group.

OKC prevents the need to perform a full authentication as the client roams from one access point to another. FlexConnect groups store the cached key on the APs of the same group, accelerating the process. However, they are not required, as OKC will still happen between access points belonging to different FlexConnect groups and will use the cached key present on the Cisco WLC, provided that Cisco WLC is reachable and APs are in connected mode.

To see the PMK cache entries at the FlexConnect access point, use the **show capwap reap pmk** command. This feature is supported on Cisco FlexConnect access points only. The PMK cache entries cannot be viewed on Non-FlexConnect access points.

Note The FlexConnect access point must be in connected mode when the PMK is derived during WPA2/802.1x authentication.

When using FlexConnect groups for OKC or CCKM, the PMK-cache is shared only across the access points that are part of the same FlexConnect group and are associated to the same controller. If the access points are in the same FlexConnect group but are associated to different controllers that are part of the same mobility group, the PMK cache is not updated and CCKM roaming will fail but OKC roaming will still work.

Note Fast roaming works only if the APs are in the same FlexConnect group for APs in FlexConnect mode, 802.11r .

FlexConnect Groups and Local Authentication

You can configure the controller to allow a FlexConnect access point in standalone mode to perform LEAP, EAP-FAST, PEAP, or EAP-TLS authentication for up to 100 statically configured users. The controller sends the static list of usernames and passwords to each FlexConnect access point when it joins the controller. Each access point in the group authenticates only its own associated clients.

This feature is ideal for customers who are migrating from an autonomous access point network to a lightweight FlexConnect access point network and are not interested in maintaining a large user database or adding another hardware device to replace the RADIUS server functionality available in the autonomous access point.

Note

- You can configure LEAP, EAP-FAST, PEAP, or EAP-TLS authentication only if AP local authentication is enabled.

You have to provision a certificate to the AP because the AP has to send the certificate to the client. You must download the Vendor Device Certificate and the Vendor Certification Authority Certificate to the controller. The controller then pushes these certificates to the AP. If you do not configure a Vendor Device Certificate and the Vendor CA Certificate on the controller, the APs associating with the FlexConnect group download the self-signed certificate of the controller, which may not be recognized by many wireless clients.

With EAP-TLS, AP does not recognize and accept client certificate if the client root CA is different from the AP root CA. When you use Enterprise public key infrastructures (PKI), you must download a Vendor Device Certificate and Vendor CA Certificate to the controller so that the controller can push the certificates to the AP in the FlexConnect group. Without a common client and AP root CA, EAP-TLS fails on the local AP. The AP cannot check an external CA and relies on its own CA chain for client certificate validation.

The space on the AP for the local certificate and the CA certificate is around 7 Kb, which means that only short chains are adapted. Longer chains or multiple chains are not supported.

Note This feature can be used with the FlexConnect backup RADIUS server feature. If a FlexConnect is configured with both a backup RADIUS server and local authentication, the FlexConnect access point always attempts to authenticate clients using the primary backup RADIUS server first, followed by the secondary backup RADIUS server (if the primary is not reachable), and finally the FlexConnect access point itself (if the primary and secondary are not reachable).

For information about the number of FlexConnect groups and access point support for a Cisco WLC model, see the data sheet of the respective Cisco WLC model.

Configuring FlexConnect Groups

Configuring FlexConnect Groups (GUI)

Note If the same IPv4 ACLs is mapped to a FlexConnect group and to an AP, then the controller uses the Flex group ACL. However, if the controller is downgraded to an older version, the AP reboots to the older version and pushes the AP specific ACL. This time the controller uses the AP specific ACL ignoring the FlexConnect Group ACL.

Step 1 Choose **Wireless** > **FlexConnect Groups** to open the **FlexConnect Groups** page.

This page lists any FlexConnect groups that have already been created.

Note If you want to delete an existing group, hover your cursor over the blue drop-down arrow for that group and choose **Remove**.

Step 2 Click **New** to create a new FlexConnect Group.

Step 3 On the **FlexConnect Groups** > **New** page, enter the name of the new group in the **Group Name** text box. You can enter up to 32 alphanumeric characters.

Step 4 Click **Apply**. The new group appears on the **FlexConnect Groups** page.

Step 5 To edit the properties of a group, click the name of the desired group. The **FlexConnect Groups** > **Edit** page appears.

Step 6 If you want to configure a primary RADIUS server for this group (for example, the access points are using 802.1X authentication), choose the desired server from the Primary RADIUS Server drop-down list. Otherwise, leave the text box set to the default value of None.

Note IPv6 RADIUS Server is not configurable. Only IPv4 configuration is supported.

Step 7 If you want to configure a secondary RADIUS server for this group, choose the server from the Secondary RADIUS Server drop-down list. Otherwise, leave the field set to the default value of None.

Step 8 Configure the RADIUS server for the FlexConnect group by doing the following:

a) Enter the RADIUS server IP address.
b) Choose the server type as either Primary or Secondary.
c) Enter a shared secret to log on to the RADIUS server and confirm it.

The maximum number of characters allowed for the shared secret is 63.

d) Enter the port number.
e) Click **Add**.

Step 9 To add an access point to the group, click **Add AP**. Additional fields appear on the page under **Add AP**.

Step 10 Perform one of the following tasks:

- To choose an access point that is connected to this controller, select the **Select APs from Current Controller** check box and choose the name of the access point from the AP Name drop-down list.

  Note If you choose an access point on this controller, the MAC address of the access point is automatically entered in the Ethernet MAC text box to prevent any mismatches from occurring.

- To choose an access point that is connected to a different controller, leave the **Select APs from Current Controller** check box unselected and enter its MAC address in the Ethernet MAC text box.

  Note If the FlexConnect access points within a group are connected to different controllers, all of the controllers must belong to the same mobility group.

Step 11 Click **Add** to add the access point to this FlexConnect group. The access point's MAC address, name, and status appear at the bottom of the page.

Note If you want to delete an access point, hover your cursor over the blue drop-down arrow for that access point and choose **Remove**.

Step 12 Click **Apply**.

Step 13 Enable local authentication for a FlexConnect Group as follows:

a) Ensure that the Primary RADIUS Server and Secondary RADIUS Server parameters are set to **None**.
b) Select the **Enable AP Local Authentication** check box to enable local authentication for this FlexConnect Group. The default value is unselected.
c) Click **Apply**.
d) Choose the **Local Authentication** tab to open the **FlexConnect > Edit (Local Authentication > Local Users)** page.
e) To add clients that you want to be able to authenticate using LEAP, EAP-FAST, PEAP, or EAP-TLS, perform one of the following:
f) Upload a comma-separated values (CSV) file by selecting the **Upload CSV File** check box, clicking the **Browse** button to browse to an CSV file that contains usernames and passwords (each line of the file needs to be in the following format: username, password), and clicking **Add** to upload the CSV file. The clients' names appear on the left side of the page under the "User Name" heading.
g) Add clients individually by entering the client's username in the User Name text box and a password for the client in the Password and Confirm Password text boxes, and clicking **Add** to add this client to the list of supported local users. The client name appears on the left side of the page under the "User Name" heading.

   Note You can add up to 100 clients.

h) Click **Apply**.
i) Choose the **Protocols** tab to open the **FlexConnect > Edit (Local Authentication > Protocols)** page.
j) To allow a FlexConnect access point to authenticate clients using LEAP, select the **Enable LEAP Authentication** check box.
k) To allow a FlexConnect access point to authenticate clients using EAP-FAST, select the **Enable EAP-FAST Authentication** check box. The default value is unselected.

l) To allow a FlexConnect access point to authenticate clients using PEAP Authentication, select the **Enable PEAP Authentication** check box.

   You can configure PEAP authentication only when AP local authentication is configured.

m) To allow a FlexConnect access point to authenticate clients using EAP-TLS, select the **Enable EAP TLS Authentication** check box.

   You can configure EAP-TLS authentication only when AP local authentication is configured.

   Enabling the EAP-TLS authentication results in enabling the downloading of EAP root and device certificate to the access point. You can unselect the **EAP TLS Certificate download** check box if you do not want to download the certificate.

n) Perform one of the following, depending on how you want protected access credentials (PACs) to be provisioned:

   - To use manual PAC provisioning, enter the server key used to encrypt and decrypt PACs in the Server Key and Confirm Server Key text boxes. The key must be 32 hexadecimal characters.
   - To allow PACs to be sent automatically to clients that do not have one during PAC provisioning, select the **Enable Auto Key Generation** check box

o) In the Authority ID text box, enter the authority identifier of the EAP-FAST server. The identifier must be 32 hexadecimal characters.

p) In the Authority Info text box, enter the authority identifier of the EAP-FAST server in text format. You can enter up to 32 hexadecimal characters.

q) To specify a PAC timeout value, select the **PAC Timeout** check box and enter the number of seconds for the PAC to remain viable in the text box. The default value is unselected, and the valid range is 2 to 4095 seconds when enabled.

r) Click **Apply**.

Step 14 In the **WLAN-ACL Mapping** tab, you can do the following:

a) Under **Web Auth ACL Mapping**, enter the **WLAN ID**, choose the **WebAuth ACL**, and click **Add** to map the web authentication ACL and the WLAN.

b) Under **Local Split ACL Mapping**, enter the **WLAN ID**, and choose the **Local Split ACL**, and click **Add** to map the Local Split ACL to the WLAN.

   Note You can configure up to 16 WLAN-ACL combinations for local split tunneling. Local split tunneling does not work for clients with static IP address.

Step 15 In the Central DHCP tab, you can do the following:

a) In the WLAN Id box, enter the WLAN ID with which you want to map Central DHCP.

b) Select or unselect the **Central DHCP** check box to enable or disable Central DHCP for the mapping.

c) Select or unselect the **Override DNS** check box to enable or disable overriding of DNS for the mapping.

d) Select or unselect the **NAT-PAT** check box to enable or disable network address translation and port address translation for the mapping.

e) Click **Add** to add the Central DHCP - WLAN mapping.

Note When the overridden interface is enabled for the FlexConnect Group DHCP, the DHCP broadcast to unicast is optional for locally switched clients.

Step 16 Click **Save Configuration**.

Step 17 Repeat this procedure if you want to add more FlexConnects.

Note To see if an individual access point belongs to a FlexConnect Group, you can choose **Wireless** > **Access Points** > **All APs >** the name of the desired access point in the FlexConnect tab. If the access point belongs to a FlexConnect, the name of the group appears in the FlexConnect Name text box.

Configuring FlexConnect Groups (CLI)

Note If the same IPv4 ACLs is mapped to a FlexConnect group and to an AP, then the controller uses the Flex group ACL. However, if the controller is downgraded to an older version, the AP reboots to the older version and pushes the AP specific ACL. This time the controller uses the AP specific ACL ignoring the FlexConnect Group ACL.

Step 1 Add add or delete a FlexConnect Group by entering this command:

config flexconnect group *group_name* {**add** | **delete**}

Step 2 Configure a primary or secondary RADIUS server for the FlexConnect group by entering this command:

config flexconect group *group-name* **radius server auth** {{**add** {**primary** | **secondary**} *ip-addr auth-port secret*} | {**delete** {**primary** | **secondary**}}}

The maximum number of characters allowed for the shared secret is 63.

Step 3 Add an access point to the FlexConnect Group by entering this command:

config flexconnect *group_name* **ap** {**add** | **delete**} *ap_mac*

Step 4 Configure local authentication for a FlexConnect as follows:

a) Make sure that a primary and secondary RADIUS server are not configured for the FlexConnect Group.

b) To enable or disable local authentication for this FlexConnect group, enter this command:

config flexconnect group *group_name* **radius ap** {**enable** | **disable**}

c) Enter the username and password of a client that you want to be able to authenticate using LEAP, EAP-FAST, PEAP, or EAP-TLS by entering this command:

config flexconnect group *group_name* **radius ap user add** *username* **password** *password*

Note You can add up to 100 clients.

d) Allow a FlexConnect access point group to authenticate clients using LEAP or to disable this behavior by entering this command:

config flexconnect group *group_name* **radius ap leap** {**enable** | **disable**}

e) Allow a FlexConnect access point group to authenticate clients using EAP-FAST or to disable this behavior by entering this command:

config flexconnect group *group_name* **radius ap eap-fast** {**enable** | **disable**}

f) To download EAP Root and Device certificate to AP, enter this command:

config flexconnect group *group_name* **radius ap eap-cert download**

g) Allow a FlexConnect access point group to authenticate clients using EAP-TLS or to disable this behavior by entering this command:

config flexconnect group *group_name* **radius ap eap-tls** {**enable** | **disable**}

h) Allow a FlexConnect access point group to authenticate clients using PEAP or to disable this behavior by entering this command:

config flexconnect group *group_name* **radius ap peap** {**enable** | **disable**}

i) Allow a FlexConnect access point group to authenticate clients using PEAP or to disable this behavior by entering this command:

config flexconnect group *group_name* **radius ap peap** {**enable** | **disable**}

j) Allow a FlexConnect access point group to authenticate clients using EAP-TLS or to disable this behavior by entering this command:

config flexconnect group *group_name* **radius ap eap-tls** {**enable** | **disable**}

k) Download the EAP root and device certificate by entering this command:

config flexconnect group *group_name* **radius ap eap-cert download**

l) Enter one of the following commands, depending on how you want PACs to be provisioned:

- **config flexconnect group** *group_name* **radius ap server-key** *key*—Specifies the server key used to encrypt and decrypt PACs. The key must be 32 hexadecimal characters.
- **config flexconnect group** *group_name* **radius ap server-key auto**—Allows PACs to be sent automatically to clients that do not have one during PAC provisioning.

m) To specify the authority identifier of the EAP-FAST server, enter this command:

config flexconnect group *group_name* **radius ap authority id** *id*

where *id* is 32 hexadecimal characters.

n) To specify the authority identifier of the EAP-FAST server in text format, enter this command:

config flexconnect group *group_name* **radius ap authority info** *info*

where *info* is up to 32 hexadecimal characters.

o) To specify the number of seconds for the PAC to remain viable, enter this command:

config flexconnect group *group_name* **radius ap pac-timeout** *timeout*

where *timeout is a value between 2 and* 4095 seconds (inclusive) or 0. A value of 0, which is the default value, disables the PAC timeout.

Step 5 Configure a Web Policy ACL on a FlexConnect group by entering this command:

config flexconnect group *group-name* **web-policy policy acl** {**add** | **delete**} *acl-name*

Step 6 Configure local split tunneling on a per-FlexConnect group basis by entering this command:

config flexconnect group *group_name* **local-split wlan** *wlan-id* **acl** *acl-name flexconnect-group-name* {**enable** | **disable**}

Step 7 To set multicast/broadcast across L2 broadcast domain on overridden interface for locally switched clients, enter this command:

config flexconnect group *group_name* **multicast overridden-interface** {**enable** | **disable**}

Step 8 Configure central DHCP per WLAN by entering this command:

config flexconnect group *group-name* **central-dhcp** *wlan-id* {**enable override dns** | **disable** | **delete**}

Step 9 Configure the DHCP overridden interface for FlexConnect group, use the **config flexconnect group flexgroup dhcp overridden-interface enable**command.

Step 10 Configure policy acl on FlexConnect group by entering this command:

config flexconnect group *group_name* **policy acl** {**add** | **delete**} *acl-name*

Step 11 Configure web-auth acl on flexconnect group by entering this command:

config flexconnect group *group_name* **web-auth wlan** *wlan-id* **acl** *acl-name* {**enable** | **disable**}

Step 12 Configure wlan-vlan mapping on flexconnect group by entering this command:

config flexconnect group *group_name* **wlan-vlan wlan** *wlan-id*{**add** | **delete**}**vlan** *vlan-id*

Step 13 To set efficient upgrade for group, enter this command:

config flexconnect group *group_name* **predownload** {**enable** | **disable** | **master** | **slave**} *ap-name* **retry-count** *maximum retry count* **ap-name** *ap-name*

Step 14 Save your changes by entering this command:

save config

Step 15 See the current list of flexconnect groups by entering this command:

show flexconnect group summary

Step 16 See the details for a specific FlexConnect Groups by entering this command:

show flexconnect group detail *group_name*

Configuring VLAN-ACL Mapping on FlexConnect Groups

Configuring VLAN-ACL Mapping on FlexConnect Groups (GUI)

Step 1 Choose **Wireless** > **FlexConnect Groups**.

The **FlexConnect Groups** page appears. This page lists the access points associated with the controller.

Step 2 Click the **Group Name** link of the FlexConnect Group for which you want to configure VLAN-ACL mapping.

Step 3 Click the **VLAN-ACL Mapping** tab.

The VLAN-ACL Mapping page for that FlexConnect group appears.

Step 4 Enter the **Native VLAN ID** in the **VLAN ID** text box.

Step 5 From the **Ingress ACL** drop-down list, choose the **Ingress ACL**.

Step 6 From the **Egress ACL** drop-down list, choose the **Egress ACL**.

Step 7 Click **Add** to add this mapping to the **FlexConnect Group**.

The **VLAN ID** is mapped with the required ACLs. To remove the mapping, hover your mouse over the blue drop-down arrow and choose **Remove**.

Note The Access Points inherit the VLAN-ACL mapping on the FlexConnect groups if the WLAN VLAN mapping is also configured on the groups.

Configuring VLAN-ACL Mapping on FlexConnect Groups (CLI)

Procedure

- **config flexconnect group** *group-name* **vlan add** *vlan-id* **acl** *ingress-acl egress acl*

  Add a VLAN to a FlexConnect group and map the ingress and egress ACLs by entering this command:

Viewing VLAN-ACL Mappings (CLI)

Procedure

- **show flexconnect group detail** *group-name*

  View FlexConnect group details.

- **show ap config general** *ap-name*

  View VLAN-ACL mappings on the AP.

Configuring WLAN-VLAN Mappings on FlexConnect Groups

Configuring WLAN-VLAN Mapping on FlexConnect Groups (GUI)

Following are a few guidelines:

- The individual AP settings have precedence over FlexConnect group and global WLAN settings. The FlexConnect group settings have precedence over global WLAN settings.

- The AP level configuration is stored in flash; WLAN and FlexConnect group configuration is stored in RAM.

- When an AP moves from one controller to another, the AP can keep its individual VLAN mappings. However, the FlexConnect group and global mappings will be from the new controller. If the WLAN SSID differs between the two controllers, then the WLAN-VLAN mapping is not applied.

- In a downstream traffic, VLAN ACL is applied first and then the client ACL is applied. In an upstream traffic, the client ACL is applied first and then the VLAN ACL is applied.

- The ACL must be present on the AP at the time of 802.1X authentication. If the ACL is not present on the AP, a client might be denied authentication by the AP even if the client successfully passes 802.1X authentication.

ACL Present on AP	ACL Name sent from AAA	Result of 802.1X Authentication
No	No	Authenticated, no ACL applied
No	Yes	Authentication Denied
Yes	No	Authenticated, no ACL applied
Yes	Yes	Authenticated, client ACL applied

- After client authentication, if the ACL name is changed in the RADIUS server, the client must go through a full authentication again to get the correct client ACL.
- The WLAN-VLAN mapping on FlexConnect groups is not supported on Cisco APs 1131 and 1242.

Before you begin

Ensure that the WLAN is locally switched. The configuration is applied to the AP only if the WLAN is broadcast on the AP.

Step 1 Choose **Wireless** > **FlexConnect Groups**.

Step 2 Click the group name.

The **FlexConnect Groups > Edit** page is displayed.

Step 3 Click the **WLAN VLAN Mapping** tab.

Step 4 Enter the WLAN ID and the VLAN ID and click **Add**.

The mapping is displayed in the same tab.

Step 5 Click **Apply**.

Step 6 Click **Save Configuration**.

Configuring WLAN-VLAN Mapping on FlexConnect Groups (CLI)

Before you begin

Ensure that the WLAN is locally switched. The configuration is applied to the AP only if the WLAN is broadcast on the AP.

Procedure

- **config flexconnect group** *group-name* **wlan-vlan wlan** *wlan-id* {**add** | **delete**} **vlan** *vlan-id*

  Configure WLAN-VLAN mapping on a FlexConnect group by entering this command.