Software-Defined Access Wireless

Information to Software-Defined Access Wireless

The Enterprise Fabric provides end-to-end enterprise-wide segmentation, flexible subnet addressing, and controller-based networking with uniform enterprise-wide policy and mobility. It moves the enterprise network from current VLAN-centric architecture to a user group-based enterprise architecture, with flexible Layer 2 extensions within and across sites.

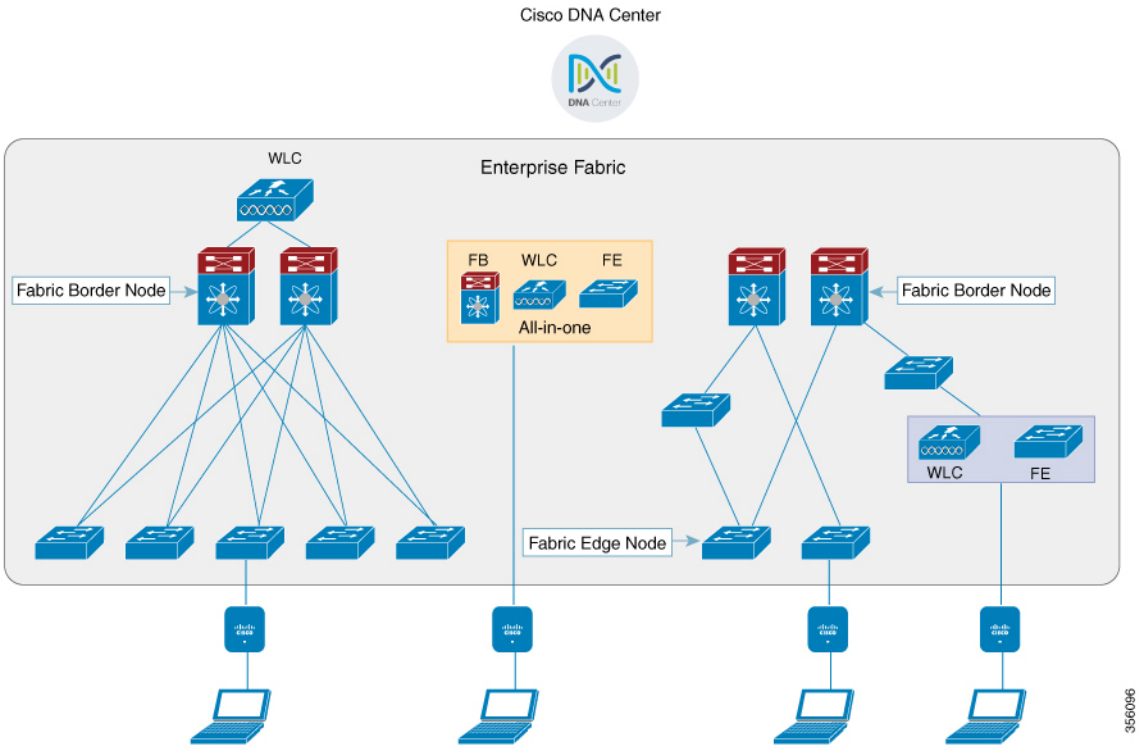
Enterprise fabric is a network topology where traffic is passed through inter-connected switches, while providing the abstraction of a single Layer 2 or Layer 3 device. This provides seamless connectivity, with policy application and enforcement at the edge of the fabric. Fabric uses IP overlay, which makes the network appear as a single virtual entity without using clustering technologies.

The following definitions are used for fabric nodes:

- **Enterprise Fabric**: A network topology where traffic is passed through inter-connected switches, while providing the abstraction of a single Layer 2 or Layer 3 device.
- **Fabric Domain**: An independent operation part of the network. It is administered independent of other fabric domains.
- **End Points**: Hosts or devices that connect to the fabric edge node are known as end points (EPs). They directly connect to the fabric edge node or through a Layer 2 network.

The following figure shows the components of a typical SD-Access Wireless. It consists of Fabric Border Nodes (BN), Fabric Edge Nodes (EN), Wireless Controller, Cisco Catalyst Center, and Host Tracking Database (HDB).

Figure 1: Software-Defined Access Wireless



The figure covers the following deployment topologies:

- All-in-one Fabric—When we have all Fabric Edge, Fabric Border, Control-Plane and controller functionality enabled on a Cat 9K switch.

  This topology is depicted in the mid part of the figure.

- Split topology—When we have Fabric Border, or Control Plane, or controller on a Cat 9K switch with separate Fabric Edge. This topology is depicted in the left-most part of the figure.

- Co-located Fabric Edge and Controller—When we have Fabric Edge and controller on a Cat 9K switch. This topology is depicted in the right-most part of the figure.

Cisco Catalyst Center: Is an open, software-driven architecture built on a set of design principles with the objective of configuring and managing Cisco Catalyst 9800 Series Wireless Controllers.

Control Plane: This database allows the network to determine the location of a device or user. When the EP ID of a host is learnt, other end points can query the database about the location of the host. The flexibility of tracking subnets helps in summarization across domains and improves the scalability of the database.

Fabric Border Node (Proxy Egress Tunnel Router [PxTR or PITR/PETR] in LISP): These nodes connect traditional Layer 3 networks or different fabric domains to the enterprise fabric domain. If there are multiple fabric domains, these nodes connect a fabric domain to one or more fabric domains, which could be of the same or different type. These nodes are responsible for translation of context from one fabric domain to another. When the encapsulation is the same across different fabric domains, the translation of fabric context is generally 1:1. The fabric control planes of two domains exchange reachability and policy information through this device.

Fabric Edge Nodes (Egress Tunnel Router [ETR] or Ingress Tunnel Router [ITR] in LISP): These nodes are responsible for admitting, encapsulating or decapsulating, and forwarding of traffic from the EPs. They lie at the perimeter of the fabric and are the first points of attachment of the policy. EPs could be directly or indirectly attached to a fabric edge node using an intermediate Layer 2 network that lies outside the fabric domain. Traditional Layer 2 networks, wireless access points, or end hosts are connected to fabric edge nodes.

Wireless Controller: The controller provides AP image and configuration management, client session management and mobility. Additionally, it registers the mac address of wireless clients in the host tracking database at the time of client join, as well as updates the location at the time of client roam.

Access Points: AP applies all the wireless media specific features. For example, radio and SSID policies, webauth punt, peer-to-peer blocking, and so on. It establishes CAPWAP control and data tunnel to controller. It converts 802.11 data traffic from wireless clients to 802.3 and sends it to the access switch with VXLAN encapsulation.

The SDA allows to simplify:

- Addressing in wireless networks
- Mobility in wireless networks
- Guest access and move towards multi-tenancy
- Leverage Sub-net extension (stretched subnet) in wireless network
- Provide consistent wireless policies

Note Role co-location between wireless controller and fabric edge is supported.

Platform Support

Table 1: Supported Platforms for Software-Defined Access Wireless

Platforms	Support
Catalyst 9300	Yes
Catalyst 9400	Yes
Catalyst 9500H	Yes
Cisco Catalyst 9800 Series Wireless Controller for Cloud	Yes
Cisco Catalyst 9800-40 Series Wireless Controller	Yes
Cisco Catalyst 9800-80 Series Wireless Controller	Yes

Table 2: Multi-Instance Support

Multi-instance	Support
Multiple LISP sessions	Yes

Multi-instance	Support
Emulated database support	Yes
Client roaming between WNCd instances	Yes

Table 3: Feature Support

Feature	Support
Inter-WLC roam for IRCM	Only L2 mobility is supported as VLAN is stretched across the fabric.
DNS-IPv4-ACL	• ACLs are enforced at AP. • Controller needs to push the DNS-ACL information to AP.
IPv6 ACL for clients	Yes. Open, 802.11x, WebAuth, PSK WLANs, IPv6 address visibility are also supported.
Location tracking/Hyperlocation	Yes
Multicast Video-Stream (IPv4)	Yes
Smart Licensing	Yes

Table 4: Outdoor Access Points Support

AP	Support
1542	Yes
1560	Yes

Information About SD-Access Wireless Mesh Inter Fabric Edge Switch Roaming Protection

When a Mesh AP (MAP) finds a Root AP (RAP) or other MAP with better adjacency, it roams to that RAP or MAP. However, a MAP cannot roam to another MAP or RAP connected to a different fabric edge switch due to wireless client connectivity loss. The reason being the VXLAN tunnels of the wireless client cannot be moved to another fabric edge switch.

However, if the current MAP link is much worse than the link to RAP or MAP connected to a different fabric edge switch, then the MAP roams and restart its CAPWAP tunnel.

Thus, all the MAPs connected to the MAP restarts the CAPWAP tunnels as well. This allows the wireless clients to connect again and creates wireless client VXLAN tunnels in the fabric edge.

Note The criteria for a MAP roaming to a RAP or MAP connected to a different fabric edge switch are the same as the mesh preferred parent. They are:

- If the current link SNR is worse than 12 dB and there is another better link. (Or)
- If the current link SNR is worse than 20 dB and there is another link with 20% or better SNR.

The mesh daisy chain roaming is not supported in RAP or MAP connected to different fabric edge switches.

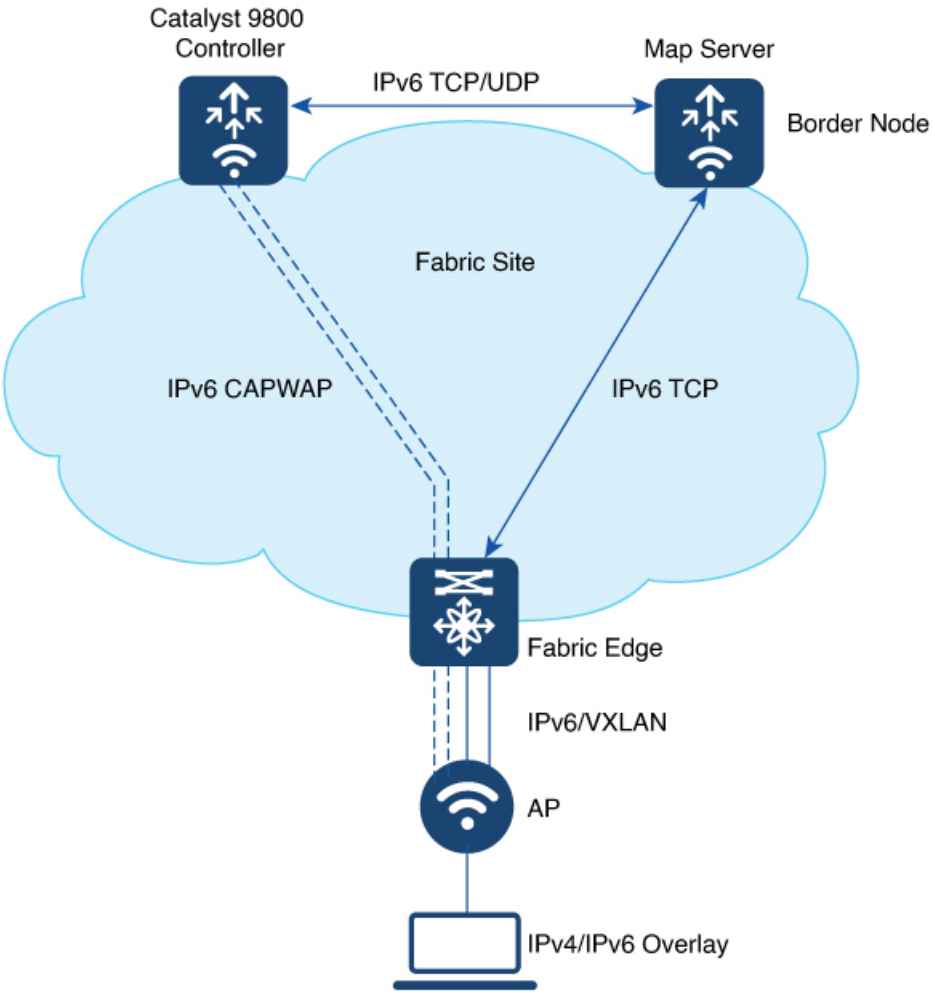
SDA IPv6 Underlay Support

This feature provides a wireless SDA IPv6 underlay support to enable IPv6-based communications in a fabric site. IPv6 is used to establish LISP connections between the controller and map server as well as between the map server and Fabric Edge. IPv6 underlay is also used to construct a VXLAN tunnel between the Fabric Edge and the AP.

The feature implementation is as follows:

- **Catalyst 9800 Controller**:
  - The controller manages IPv6-based LISP sessions to the map server
  - Encodes, decodes, and processes LISP messages through IPv6 TCP/UDP sockets.)
  - Communicates RLOC IPv6 address to the AP for VXLAN creation and client tunnel mapping
- **Fabric Edge**:
  - Processes map notification from map server
  - Creates IPv6 VXLAN tunnel
  - Maps client to IPv6 VXLAN tunnel
  - Encapsulates and decapsulates client traffic into and out of VXLAN tunnel
- **Access Points**:
  - Processes fabric TLV from the controller
  - Creates IPv6 VXLAN tunnel
  - Encapsulates and decapsulates client traffic into and out of VXLAN tunnel

The following figure shows the feature architecture:



Note For AP to join controller using IPv6 address, ensure that you configure the preferred mode in AP profile as IPv6.

Restrictions

Embedded wireless controller (EWC) on Catalyst 9k switches is not supported.

Configuring SD-Access Wireless

- To enable SD-Access wireless globally, you need to run the **wireless fabric** configuration command.
- During SD-Access Wireless provisioning, ensure that L2-VNID value is unique.

Configuring Default Map Server (GUI)

Procedure

Step 1 Click **Configuration** > **Wireless Plus** > **Fabric** > **Fabric Configuration**.

Step 2 In the **Map Server** section, specify the IP address and preshared key details for Server 1.

Step 3 Optionally, you can specify the IP address and preshared key details for Server 2.

Step 4 Click **Apply**.

Configuring Default Map Server (CLI)

Follow the procedure given below to configure default map server:

Procedure

	Command or Action	Purpose
Step 1	**configure terminal** **Example:** `Device# configure terminal`	Enters the global configuration mode.
Step 2	**wireless fabric control-plane** *map-server-name* **Example:** `Device(config)# wireless fabric control-plane map-server-name`	Configures the default map server. Here, *map-server-name* defines a pair of map servers.
Step 3	**ip address** *ip-address* **key** *user_password reenter_password* **Example:** `Device(config-wireless-cp)# ip address 200.0.0.0 key user-password user-password`	Configures IP address for the default map server.
Step 4	**end** **Example:** `Device(config-wireless-cp)# end`	Returns to privileged EXEC mode. Alternatively, you can also press **Ctrl-Z** to exit global configuration mode.

Configuring SD-Access Wireless Profile (GUI)

Procedure

Step 1 Choose **Configuration** > **Wireless** > **Fabric**.

Step 2 On the **Fabric** page, click the **Profiles** tab and click **Add**.

Step 3 In the **Add New Profile** window that is displayed, specify the following parameters:

- Profile name
- Description
- L2 VNID; valid range is between 0 and 16777215
- SGT tag; valid range is between 2 and 65519

Step 4 Click **Save & Apply to Device**.

Configuring SD-Access Wireless Profile (CLI)

Follow the procedure given below to configure SD-Access wireless profile:

Procedure

	Command or Action	Purpose
Step 1	**configure terminal** **Example:** `Device# configure terminal`	Enters the global configuration mode.
Step 2	**wireless profile fabric** *fabric-profile-name* **Example:** `Device(config)# wireless profile fabric fabric-profile-name`	Configures the SD-Access wireless profile parameters.
Step 3	**sgt-tag** *sgt* **Example:** `Device(config-wireless-fabric)# sgt-tag 2`	Configures SGT tag. Here, *sgt* refers to the sgt tag value. The valid range is from 2-65519. The default value is 0.
Step 4	**client-l2-vnid** *client-l2-vnid* **Example:** `Device(config-wireless-fabric)# client-l2-vnid client-l2-vnid`	Configures client L2-VNID. Here, *client-l2-vnid* refers to the client L2-VNID value. The valid range is from 0-16777215.
Step 5	**end** **Example:** `Device(config-wireless-fabric)# end`	Returns to privileged EXEC mode. Alternatively, you can also press **Ctrl-Z** to exit global configuration mode.

Configuring Map Server in Site Tag (GUI)

Before you begin

Ensure that you have configured a control plane at the time of configuring Wireless Fabric.

Procedure

Step 1 Choose **Configuration** > **Tags & Profiles** > **Tags**.

Step 2 On the **Manage Tags** page, click the **Site** tab.

Step 3 Click the name of the site tag.

Step 4 In the **Edit Site Tag** window, choose the Fabric control plane name from the **Control Plane Name** drop-down list.

Step 5 Save the configuration.

Configuring Map Server in Site Tag (CLI)

Follow the procedure given below to configure map server in site tag:

Procedure

	Command or Action	Purpose
Step 1	**configure terminal** **Example:** `Device# configure terminal`	Enters the global configuration mode.
Step 2	**wireless tag site** *site-tag* **Example:** `Device(config)# wireless tag site default-site-tag`	Configures site tag. Here, *site-tag* refers to the site tag name.
Step 3	**fabric control-plane** *map-server-name* **Example:** `Device(config-site-tag)# fabric control-plane map-server-name`	Configures fabric control plane details. Here, *map-server-name* refers to the fabric control plane name associated with the site tag.
Step 4	**end** **Example:** `Device(config-site-tag)# end`	Returns to privileged EXEC mode. Alternatively, you can also press **Ctrl-Z** to exit global configuration mode.

Configuring Map Server per L2-VNID (GUI)

Procedure

Step 1 Choose **Configuration** > **Wireless** > **Fabric**.

Step 2 On the **Fabric Configuration** page in the **Fabric VNID Mapping** section, click **Add**.

Step 3 In the **Add Client and AP VNID** window, specify a name for the Fabric, L2 VNID value (valid range is from 0 to 4294967295), control plane name.

Step 4 Save the configuration.

Configuring Map Server per L2-VNID (CLI)

Follow the procedure given below to configure map server in site tag:

Procedure

	Command or Action	Purpose
Step 1	**configure terminal** **Example:** `Device# configure terminal`	Enters the global configuration mode.
Step 2	**wireless fabric name** *name* **l2-vnid** *l2-vnid-value* **l3-vnid** *l3-vnid-value* **ip** *network-ip subnet-mask* **control-plane-name** *control-plane-name* **Example:** `Device(config)# wireless fabric name fabric_name l2-vnid 2 l3-vnid 2 ip 122.220.234.0 255.255.0.0 control-plane-name sample-control-plane`	Configures the map server to the VNID map table. • *name* refers to the fabric name. • *l2-vnid-value* refers to the L2 VNID value. The valid range is from 0 to 16777215. • *L3-vnid-value* refers to the L3 VNID value. The valid range is from 0 to 16777215. • *control-plane-name* refers to the control plane name.
Step 3	**end** **Example:** `Device(config)# end`	Returns to privileged EXEC mode.

Verifying SD-Access Wireless

You can verify the SD-Access wireless configurations using the following commands:

Table 5: Commands for Verifying SD-Access Wireless

Commands	Description
show wireless fabric summary	Displays the fabric status.
show wireless fabric vnid mapping	Displays all the VNID mapping details.
show wireless profile fabric detailed *fabric_profile_name*	Displays the details of a given fabric profile name.
show ap name *AP_name* **config general**	Displays the general details of the Cisco AP.

Commands	Description
show wireless client mac *MAC_addr* **detail**	Displays the detailed information for a client by MAC address.
show wireless tag site detailed *site_tag*	Displays the detailed parameters for a site tag.