Zebra WPA3

Integrator Guide

ZEBRA

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About WPA3

WPA3 is the next generation of Wi-Fi security, enabling robust authentication and increased cryptographic strength.

WPA3 offers the following features:

- Does not allow outdated protocols.
- Requires use of Protected Management Frames (PMF).
- Backwards compatible with WPA2.
- Supports the following authentication modes:
  - WPA3-Personal - Uses simultaneous authentication of equals (SAE)
  - WPA3-Enterprise
  - Enhanced Open - Based on opportunistic wireless encryption (OWE). Note that this is a separate Wi-Fi Alliance certification program and not WPA3.

WPA3-Personal (SAE)

WPA3-Personal uses the Simultaneous Authentication of Equals (SAE) protocol, replacing WPA2-Personal with Pre-shared Key (PSK). SAE is a variant of the Dragonfly protocol which uses a password authenticated key exchange based on zero knowledge proof. In SAE, passwords are used to determine a secret element in the negotiated group, called a password element (PWE). SAE is resistant to offline dictionary attacks.

WPA3-Personal (SAE) has the following modes:

- WPA3-SAE Mode – Devices can only use WPA3-SAE mode and PMF is always required. Information is secured using discrete logarithm cryptography.
- WPA3-SAE Transition Mode – Provides backward compatibility for devices using WPA2. The access point (AP) uses WPA3-SAE Transition Mode to enable both WPA2-PSK and WPA3-SAE at the same time on a single basic service set (BSS).

  WPA (version 1) cannot be used and is not supported on the same BSS as WPA3-SAE. WEP and TKIP cannot be used and are not supported by WPA2-PSK when used on the same BSS as WPA3-SAE.

WPA3-Enterprise

WPA3-Enterprise is based on WPA2-Enterprise but requires Protected Management Frames (PMF) and does not allow outdated WEP and TKIP protocols. WPA3-Enterprise 192-bit Mode requires support for GCMP-256 and SHA384 ciphers.

WPA3-Enterprise has following modes:

- WPA3-Enterprise only Mode - PMF is always required. WPA3-Enterprise devices negotiate PMF when connecting to an AP using WPA3-Enterprise only mode.
- WPA3-Enterprise Transition Mode - Provides backward combability for devices using WPA2-Enterprise. The access point uses WPA3-Enterprise Transition Mode to enable both WPA2-Enterprise and WPA3-Enterprise at the same time on a single basic service set (BSS). WPA3-Enterprise devices negotiate PMF when connecting to an AP using WPA3-Enterprise transition mode.
- WPA3-Enterprise 192-bit Mode - PMF is set to required when WPA3-Enterprise 192-bit Mode is used by a client station (STA). The only 802.1X Authentication allowed is EAP-TLS.

Enhanced Open (OWE)

Opportunistic Wireless Encryption (OWE) is defined in the IETF document RFC 8110.

OWE has the following modes:

- Enhanced Open OWE Mode - PMF is always required. To ensure interoperability, all STAs support group nineteen (19).
- Enhanced Open OWE Transition Mode - Allows both OWE STAs and non-OWE STAs to connect to the same distribution system at the same time.

Supported Devices, Features, and Infrastructure Combinations

WPA3 is supported on many Zebra devices and has been validated on several Aruba and Cisco infrastructure combinations.

Supported Products

WPA3-Personal and WPA3-Enterprise are supported on the following Zebra devices running Android 10 or later.

- PS20
- TC52/TC52HC
- TC57
- TC72
- TC77
- MC93
- TC8300
- VC8300
- EC30
- ET51
- ET56
- L10
- CC600/CC6000
- MC3300x
- MC330x
- TC52x
- TC57x
- EC50 (LAN)
- EC55 (WAN)
- WT6300
- TC21
- TC26
- MC22
- MC27
- TC21 -HC
- TC26 -HC

Supported WPA3 Capabilities

Zebra devices with WPA3 support many modes or suites.

Modes or Suites	Supported Capabilities
WPA3-Personal Modes	WPA3-Personal (SAE) WPA3-Personal Transition Mode WPA3-Personal Fast Transition
AKM Suites for Personal Modes	FT Authentication using SAE: 00-0F-AC:9 SAE Authentication: 00-0F-AC:8 FT Authentication using PSK: 00-0F-AC:4 PSK using SHA-256: 00-0F-AC:6 PSK: 00-0F-AC:2
WPA3-Enterprise Modes	WPA3-Enterprise WPA3-Enterprise Fast Transition WPA3-Enterprise 192-bit Mode WPA3-Enterprise 192-bit Mode Fast Transition
AKM Suites for Enterprise Modes	FT Authentication using IEEE Std 802.1X (SHA 256): 00-0F-AC:3 Authentication using IEEE Std 802.1X (SHA256): 00-0F-AC:5 Authentication using IEEE Std 802.1X: 00-0F-AC:1
AKM Suites for Enterprise 192-bit Modes	FT Authentication using IEEE Std 802.1X (SHA 384) 00-0F-AC:13 Authentication using IEEE Std 802.1X using a Suite B EAP method supporting SHA-384: 00-0F-AC:12
Cipher Suites	AES-CCMP 128: 00-0F-AC:4 GCMP-256: 00-0F-AC:9
Group Management Cipher Suites	BIP-CMAC-128: 00-0F-AC:6 BIP-GMAC-256: 00-0F-AC:12

WPA3 Features Validated on Aruba

The following features are validated on an Aruba infrastructure using a supported Zebra device.

- Enhanced open
- Enhanced open transition
- SAE-personal
- SAE-personal-transition
- Enterprise-128ccm-transition
- Enterprise-128ccm
- Enterprise-256gcm -transition

- Enterprise-256gcm
- WPA3-csna-192bit

Validation was performed using the following Aruba infrastructure:

- Controller Model - 7010
- AP Model - 324
- Software Version - ArubaOS_70xx_8.7.0.0_75915

WPA3 Features Validated on Cisco

The following features are validated on a Cisco infrastructure using a supported Zebra device.

- Enhanced open
- Enhanced open transition
- SAE-personal
- SAE-personal-transition
- Enterprise-128ccm SHA-1

Validation was performed using the following Cisco infrastructure:

- Controller Model - 3504
- AP Model - 3802
- Software Version - 8.10.128.127

AKM and Suite Type Combinations

This section describes each security combination configured on the infrastructure and device and the corresponding AKM type or Suite type over the air.

Security Combination on the Device/ Infrastructure	**AKM Type/Suite Type over the Air**
Enhanced open	Group Cipher Suite type: AES (CCM) (4) Pairwise Cipher Suite type: AES (CCM) (4) Auth Key Management (AKM) type: Opportunistic Wireless Encryption (18) Group Management Cipher Suite type: BIP (128) (6)
Enhanced open-transition	Group Cipher Suite type: AES (CCM) (4) Pairwise Cipher Suite type: AES (CCM) (4) Auth Key Management (AKM) type: Opportunistic Wireless Encryption (18) Group Management Cipher Suite type: BIP (128) (6) Vendor Specific: Wi-Fi Alliance: OWE Transition Mode
SAE -personal	AKM Type : SAE (SHA256) (8) Group Cipher Suite type: AES (CCM) (4) Pairwise Cipher Suite type: AES (CCM) (4) Group Management Cipher Suite type: BIP (128) (6)

Security Combination on the Device/ Infrastructure	AKM Type/Suite Type over the Air
	FT CONNECTION: Auth Key Management (AKM) type: SAE (SHA256) (8) Auth Key Management (AKM) type: FT using SAE (SHA256) (9) Group Cipher Suite type: AES (CCM) (4) Pairwise Cipher Suite type: AES (CCM) (4) Group Management Cipher Suite type: BIP (128) (6)
SAE -personal-transition	AKM Type : PSK (2) AKM Type : SAE (SHA256) (8) Group Cipher Suite type: AES (CCM) (4) Pairwise Cipher Suite type: AES (CCM) (4) Group Management Cipher Suite type: BIP (128) (6)
Enterprise-128ccm	Auth Key Management (AKM) type: WPA (1) Group Cipher Suite type: AES (CCM) (4) Pairwise Cipher Suite type: AES (CCM) (4) Group Management Cipher Suite type: BIP (128) (6)
Enterprise-256gcm [Supported in Aruba Infrastructure only]	Group Cipher Suite type: GCMP (256) (9) Pairwise Cipher Suite type: GCMP (256) (9) Auth Key Management (AKM) type: WPA (SHA256) (5) Group Management Cipher Suite type: BIP (GMAC-256) (12) FT CONNECTION: Group Cipher Suite type: GCMP (256) (9) Pairwise Cipher Suite type: GCMP (256) (9) Auth Key Management (AKM) type: WPA (SHA256) (5) Auth Key Management (AKM) type: FT over IEEE 802.1X (3) Group Management Cipher Suite type: BIP (GMAC-256) (12)
WPA3-192bit	Group Cipher Suite type: GCMP (256) (9) Pairwise Cipher Suite type: GCMP (256) (9) Auth Key Management (AKM) type: WPA (SHA384-SuiteB) (12) Group Management Cipher Suite type: BIP (GMAC-256) (12)

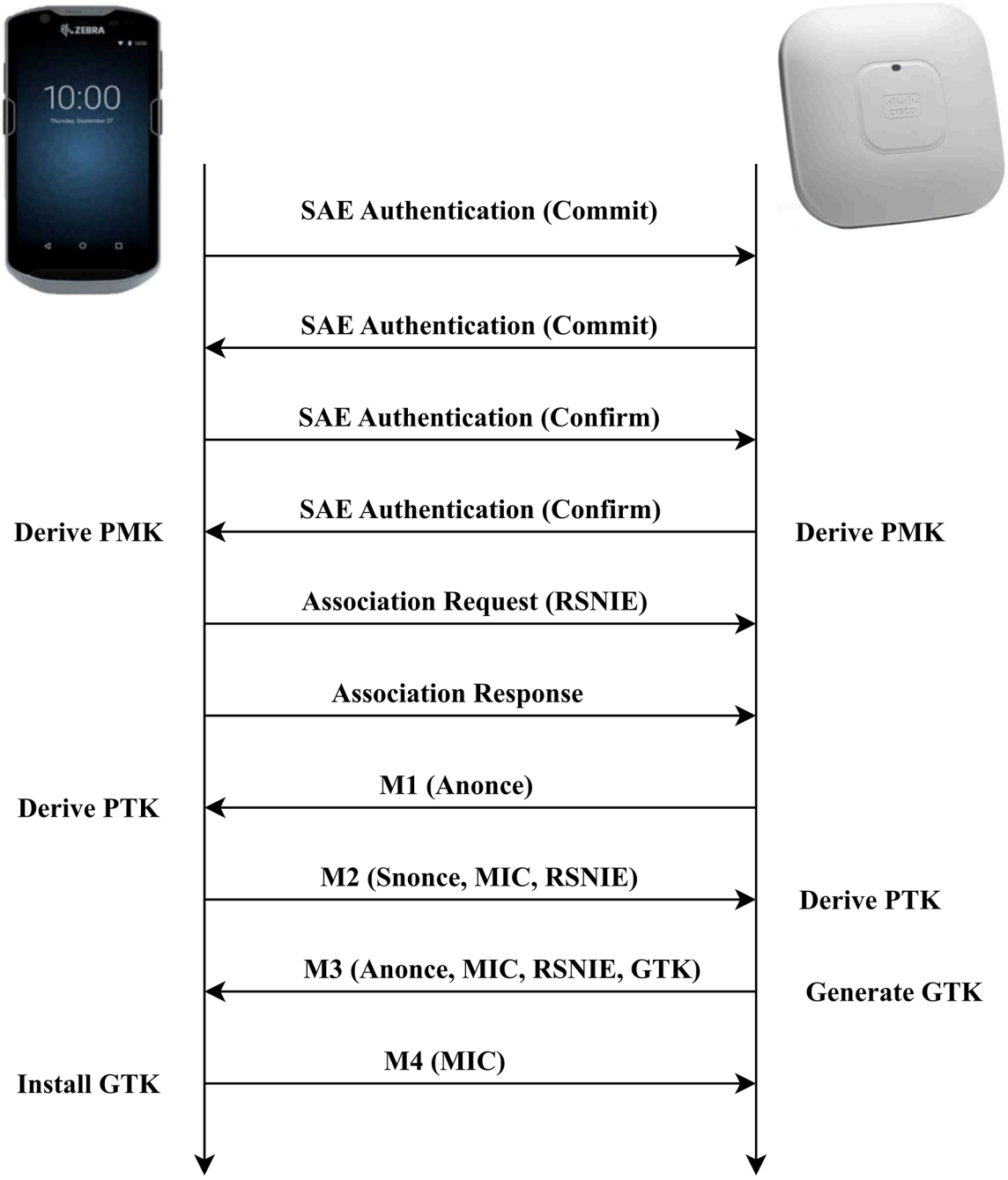
Flow Charts for WPA3 Authentication

This section contains flow charts describing WPA3 based authentication.

WPA3-SAE Authentication Flow Chart

Flow chart demonstrating the WPA3-SAE authentication workflow.

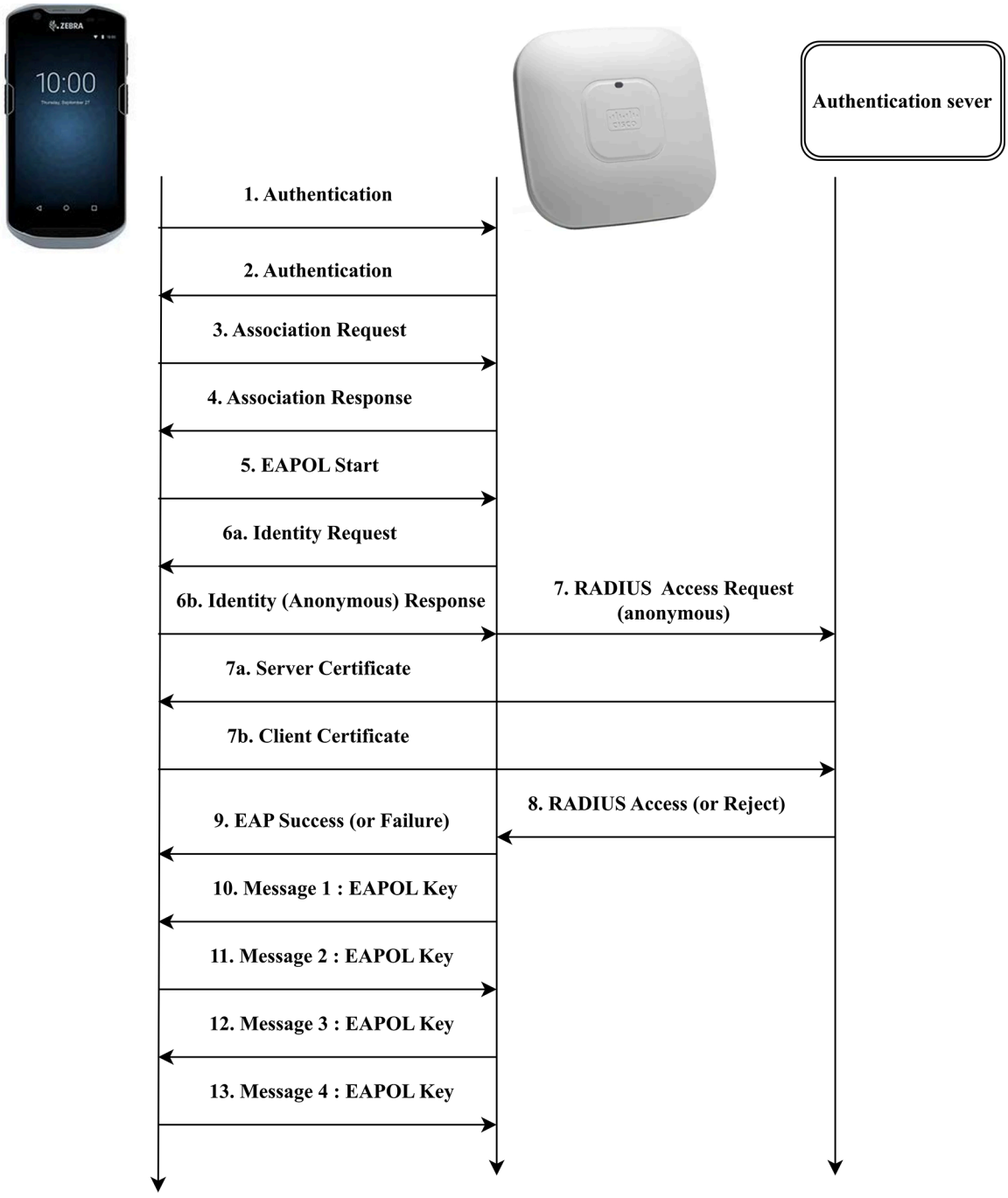
Figure 1: WPA3-SAE Authentication Flow Chart



WPA3-Enterprise EAP-TLS Flow Chart

Flow chart demonstrating the WPA3-Enterprise EAP-TLS authentication workflow.

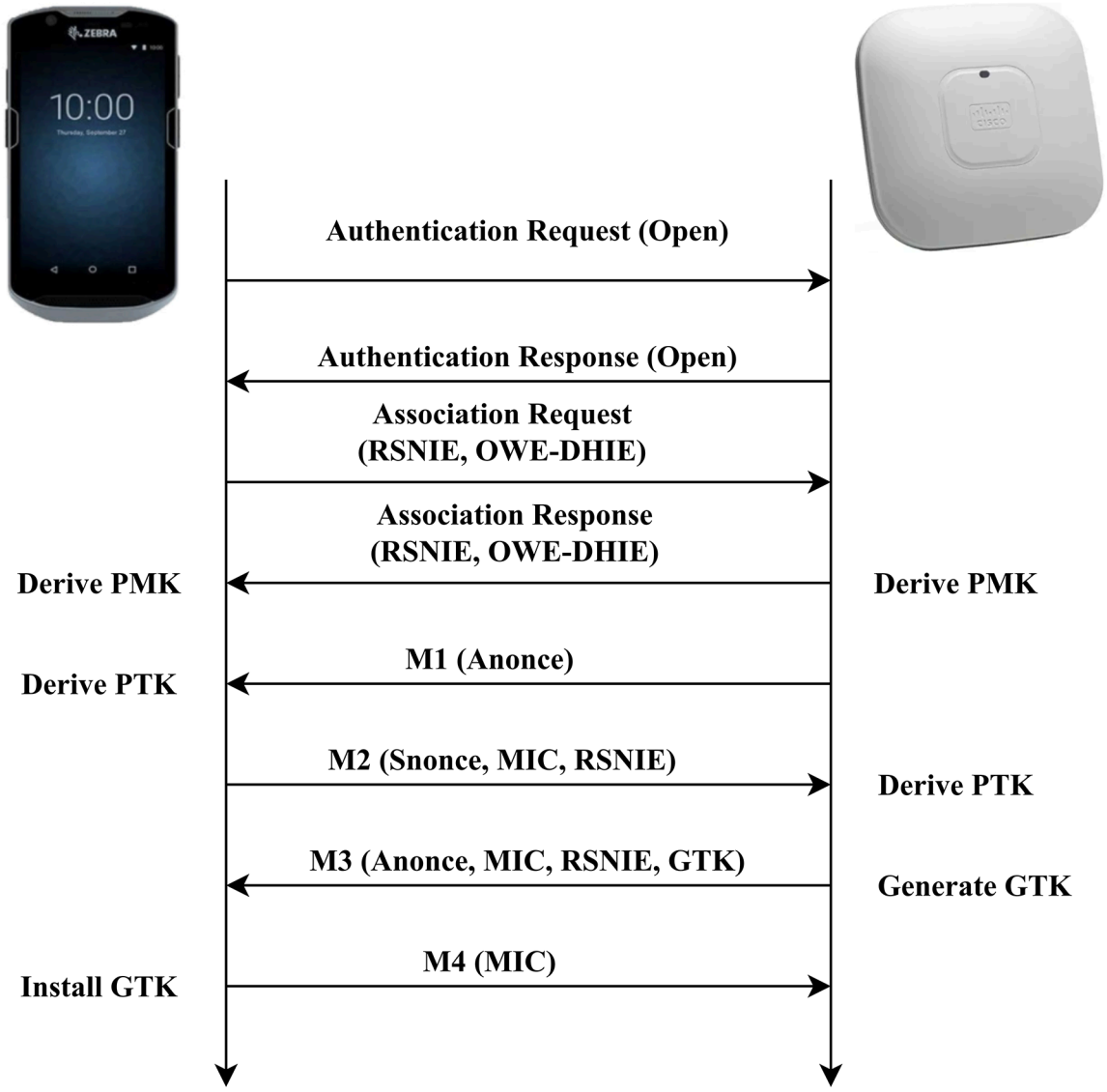
Figure 2: WPA3-Enterprise EAP-TLS Flow Chart



Enhanced Open OWE Flow Chart

Flow chart demonstrating the Enhanced Open OWE authentication workflow.

Figure 3: Enhanced Open OWE Flow Chart



WPA3 Profiles for Aruba Deployment

Create WPA3 profiles on an Aruba infrastructure.

- WPA3-SAE
- WPA3-SAE Transition
- WPA3-Enterprise 128 Bit CCM
- WPA3-Enterprise 256 Bit GCM
- WPA3-Enterprise 192 Bit
- WPA3-Enterprise-FT 192 Bit
- Enhanced Open
- Enhanced Open Transition.

Create a WPA3-SAE Profile for Aruba Deployment

Create a WPA3-SAE WLAN profile in Aruba and configure the network on the device.

Creating a WPA3-SAE Profile in Aruba

Procedure

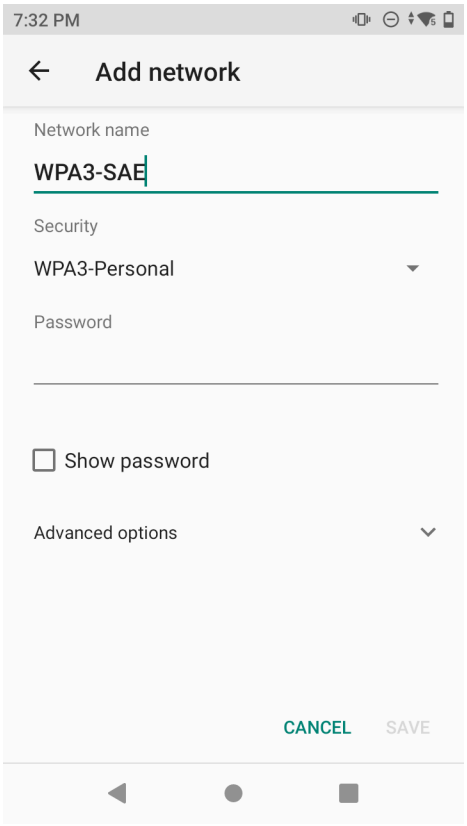
1. In Aruba, create a WLAN profile.
2. Set Key Management to **WPA3-Personal**.
3. Ensure that Enable backward Compatibility is unchecked.

Configuring a WPA3-SAE Network on the Device

Procedure

1. On the device, enter the SSID Name in the Network name field.
2. In the Security field, select **WPA3-Personal**.
3. In the Password field, enter the password.

Example



Create a WPA3-SAE Transition Profile for Aruba Deployment

Create a WPA3-SAE Transition WLAN profile in Aruba and configure the network on the device.

Creating a WPA3-SAE Transition Profile in Aruba

Procedure

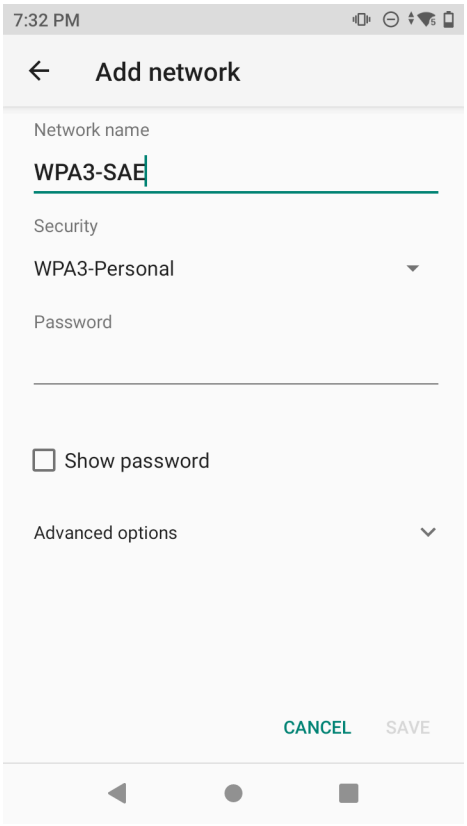
1. In Aruba, create a WLAN profile.
2. Set Key Management to **WPA3-Personal**.
3. Ensure that Enable backward Compatibility is checked.

Configuring a WPA3-SAE Transition Network on the Device

Procedure

1. On the device, enter the SSID Name in the Network name field.
2. In the Security field, select **WPA3-Personal**.
3. In the Password field, enter password.

Example



Create a WPA3-Enterprise 128 Bit CCM Profile for Aruba Deployment

Create WPA3-Enterprise 128 Bit CCM profile in Aruba and configure the network on the device.

Creating a WPA3-Enterprise 128 Bit CCM Profile in Aruba

Procedure

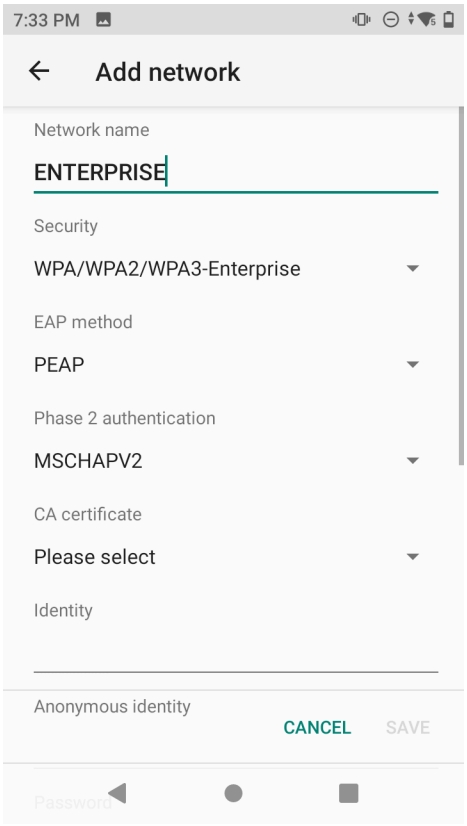
1. In Aruba, create a WLAN profile.
2. Set Key Management to **WPA3-Enterprise**.
3. Set Key Size to 128 Bits.

Configuring a WPA3-Enterprise 128 Bit CCM Network on the Device

Procedure

1. On the device, enter the SSID Name in the Network name field.
2. In the Security field, select **WPA/WPA2/WPA3-Enterprise**.
3. Select the desired EAP method.
4. Set the remaining fields as required.

Example



Create a WPA3-Enterprise 256 Bit GCM Profile for Aruba Deployment

Create WPA3-Enterprise 256 Bit GCM profile in Aruba and configure the network on the device.

Creating a WPA3-Enterprise 256-Bit GCM Profile in Aruba

Procedure

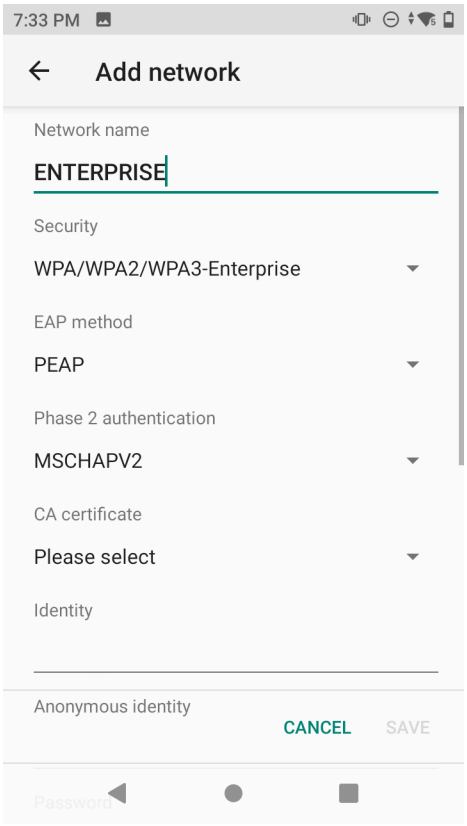
1. In Aruba, create a WLAN profile.
2. Set Key Management to **WPA3-Enterprise**.
3. Set Key Size to 256 Bits.

Configuring a WPA3 Enterprise 256-Bit Network on the Device

Procedure

1. On the device, enter the SSID Name in the Network name field.
2. In the Security field, select **WPA/WPA2/WPA3-Enterprise**.
3. Select the desired EAP method.
4. Set the remaining fields as required.

Example



Create a WPA3-Enterprise 192 Bit Profile for Aruba Development

Create WPA3-Enterprise 192 Bit profile in Aruba and configure the network on the device.

Creating a WPA3-Enterprise 192 Bit Profile in Aruba

Procedure

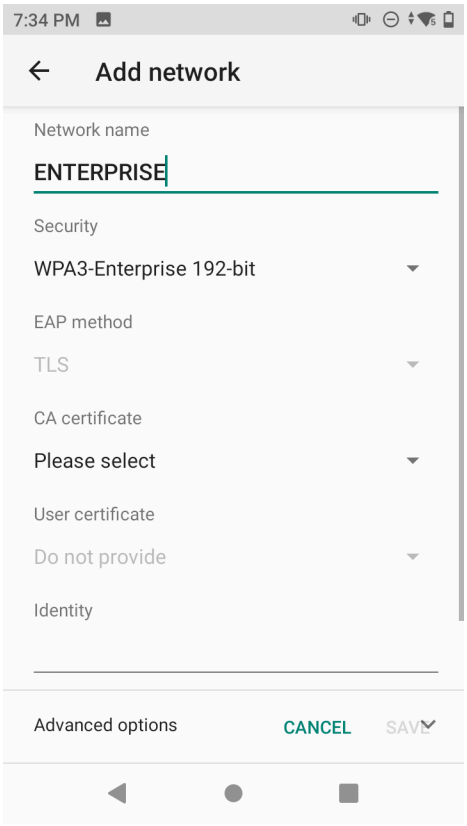
1. In Aruba, create a WLAN profile.
2. Set Key Management to **WPA3-Enterprise**.
3. Ensure that Use CNSA Suite is checked.

Configuring WPA3 Enterprise 192 Bit Network On the Device

Procedure

1. On the device, enter the SSID Name in the Network name field.
2. In the Security field, select **WPA3-Enterprise 192-bit**.
3. Set the remaining fields as required.

Example



Create a WPA3-Enterprise-FT 192 Bit Profile for Aruba Deployment

Create WPA3-Enterprise-FT 192 Bit profile in Aruba and configure the network on the device.

Creating a WPA3-Enterprise-FT 192 Bit Profile in Aruba

Procedure

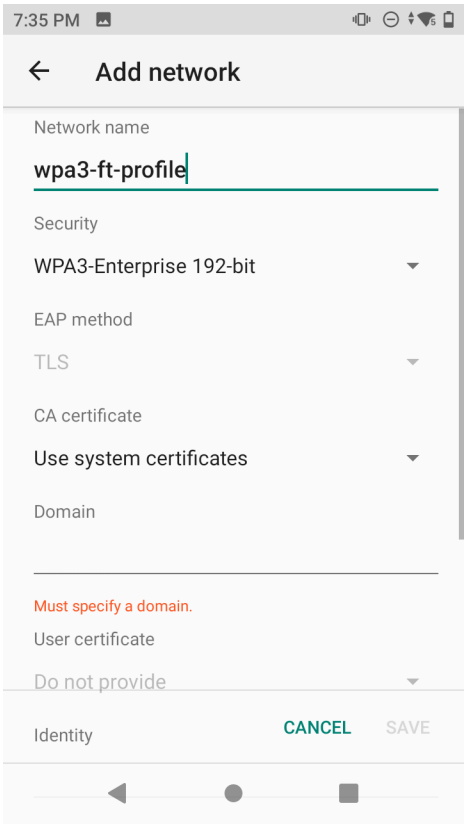
1. In Aruba, create a WLAN profile.
2. Set Key Management to **WPA3-Enterprise**.
3. Ensure that Advertise 802.11r Capability is enabled.

Configuring a WPA3-Enterprise-FT 192 Bit Network on the Device

Procedure

1. On the device, enter the SSID Name in the Network name field.
2. In the Security field, select **WPA3-Enterprise 192-bit**.
3. Set the remaining fields as required.

Example



Create an Enhanced Open Profile for Aruba Deployment

Create an Enhanced Open profile in Aruba and configure the network on the device.

Creating an Enhanced Open Profile on Aruba

Procedure

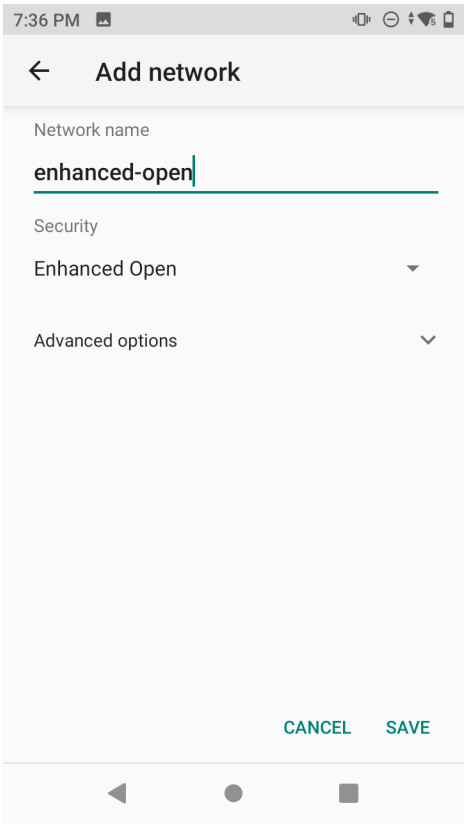
1. In Aruba, create a WLAN profile.
2. Set Security to **Open**.
3. Ensure that Enable Backward Compatibility is unchecked.

Configuring an Enhanced Open Network on the Device.

Procedure

1. On the device, enter the SSID Name in the Network name field.
2. In the Security field, select **Enhanced Open**.

Example



Create an Enhanced Open Transition Profile for Aruba Deployment

Create an Enhanced Open Transition profile in Aruba and configure the network on the device.

Creating an Enhanced Open Transition Profile on Aruba

Procedure

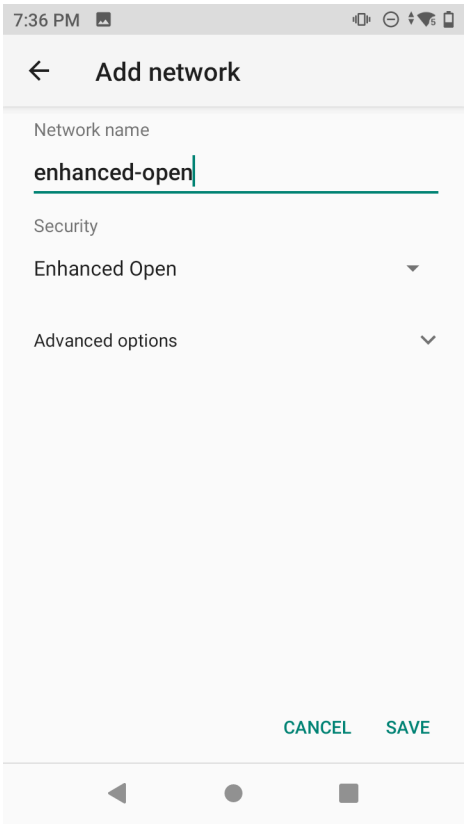
1. In Aruba, create a WLAN profile.
2. Set Security to **Open**.
3. Ensure that Enable Backward Compatibility is checked.

Configuring an Enhanced Open Transition Network on the Device

Procedure

1. On the device, enter the SSID Name in the Network name field.
2. In the Security field, select **Enhanced Open**

Example


7:36 PM
Add network
Network name
enhanced-open
Security
Enhanced Open
Advanced options
CANCEL
SAVE

WPA3 Profiles for Cisco Deployment

Create WPA3 profiles on a Cisco infrastructure.

- WPA3-SAE
- WPA3-SAE Transition
- WPA3-Enterprise 128 Bit CCMP
- WPA3-Enterprise 192 Bit
- Enhanced Open
- Enhanced Open Transition.

Create a WPA3-SAE or WPA3-SAE Transition Profile for Cisco Deployment

Create a WPA3-SAE or WPA3-SAE Transition profile in Cisco and configure the network on the device.

Creating a WPA3-SAE or WPA3-SAE Transition Profile in Cisco

Procedure

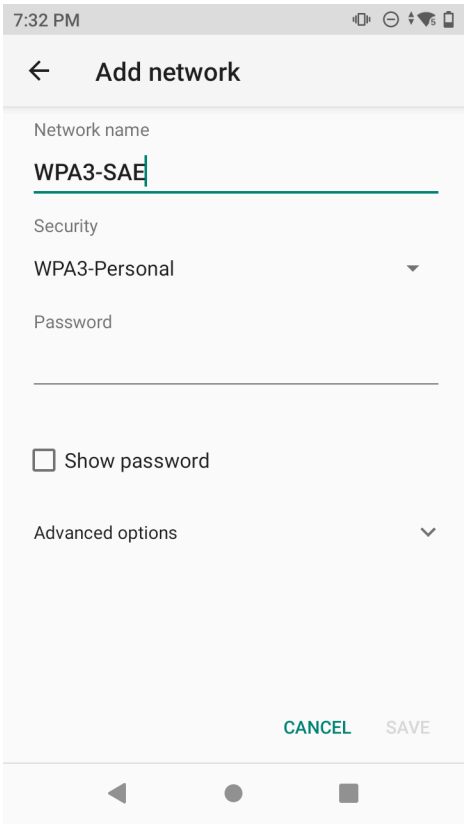
1. In Cisco, create a WLAN profile.
2. Set Layer 2 Security to **WPA2+WPA3**.
3. Set Security Type to **Personal**.
4. If configuring a WPA3-SAE profile, set Policy to **WPA3**.
5. If configuring a WPA-3 SAE Transition profile, set Policy to **WPA2 and WPA3**.

Configuring the WPA3-SAE or WPA3-SAE Network on the Device

Procedure

1. On the device, enter the SSID Name in the Network name field.
2. In the Security field, select **WPA3-Personal**.
3. In the Password field, enter the password.

Example



Create a WPA3-Enterprise 128 Bit CCMP Profile for Cisco Deployment

Create a WPA3-Enterprise 128 Bit CCMP WLAN profile in Cisco and configure the network on the device.

Creating a WPA3-Enterprise 128 Bit CCMP Profile in Cisco

Procedure

1. In Cisco, create a WLAN profile.
2. Set Layer 2 Security to **WPA2+WPA3**.
3. Set Security Type to **Enterprise**.
4. Set Policy to **WPA3**.
5. Set Encryption Cipher to **CCMP128**.

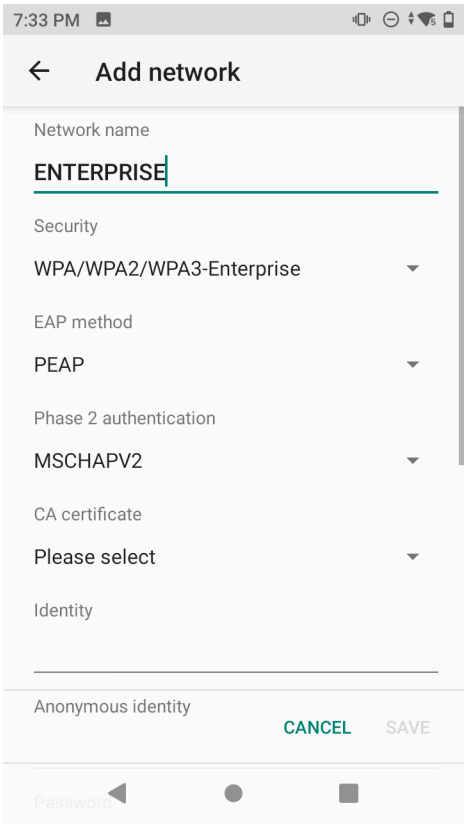
Configuring the WPA3-Enterprise 128 Bit CCMP Network on the Device

Procedure

1. On the device, enter the SSID Name in the Network name field.
2. In the Security field, select **WPA/WPA2/WPA3-Enterprise**.
3. Select the desired EAP method.

4. Set the remaining fields as required.

Example



Create a WPA3-Enterprise 192 Bit Profile for Cisco Deployment

Create a WPA3-Enterprise 192 Bit WLAN profile in Cisco and configure the network on the device.

Creating a WPA3-Enterprise 192 Bit Profile in Cisco

Procedure

1. In Cisco, create a WLAN profile.
2. Set Layer 2 Security to **WPA2+WPA3**.
3. Set Security Type to **Enterprise**.
4. Set Policy to **WPA3**.
5. Set Encryption Cipher to **GCMP256**.

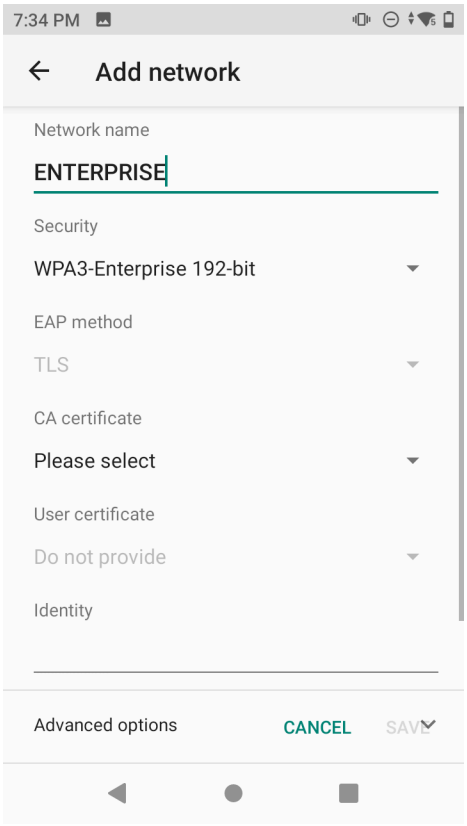
Configuring a WPA3-Enterprise 192 Bit Network on the Device

Procedure

1. On the device, enter the SSID Name in the Network name field.
2. In the Security field, select **WPA3-Enterprise 192-bit**.

3. Set the remaining fields as required.

Example



Create an Enhanced Open Profile for Cisco Deployment

Create an Enhanced Open profile in Cisco and configure the network on the device.

Creating an Enhanced Open Profile in Cisco

Procedure

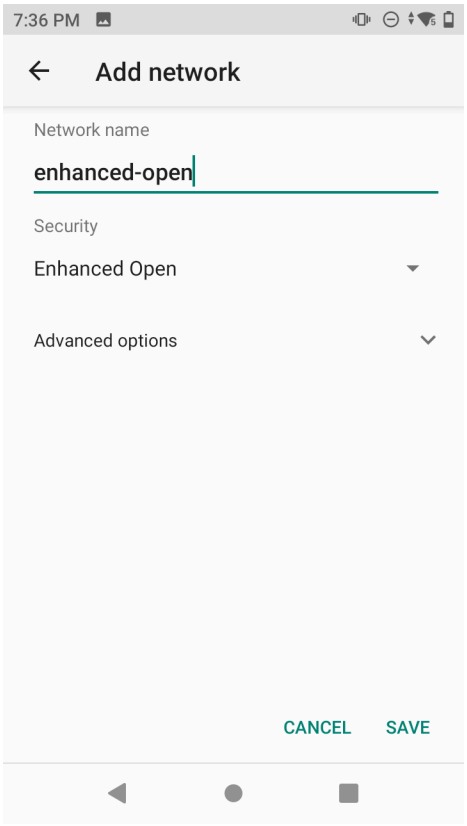
1. In Cisco, create a WLAN profile.
2. Set Layer 2 Security to **Enhanced Open**.

Configuring an Enhanced Open Network on the Device

Procedure

1. On the device, enter the SSID Name in the Network name field.
2. In the Security field, select **Enhanced Open**.

Example



Create an Enhanced Open Transition Profile for Cisco Deployment

Create an Enhanced Open Transition profile in Cisco and configure the network on the device.

Creating an Enhanced Open Transition Profile in Cisco

Before You Begin

Create an Enhanced Open profile. See Creating an Enhanced Open Profile on Cisco.

Procedure

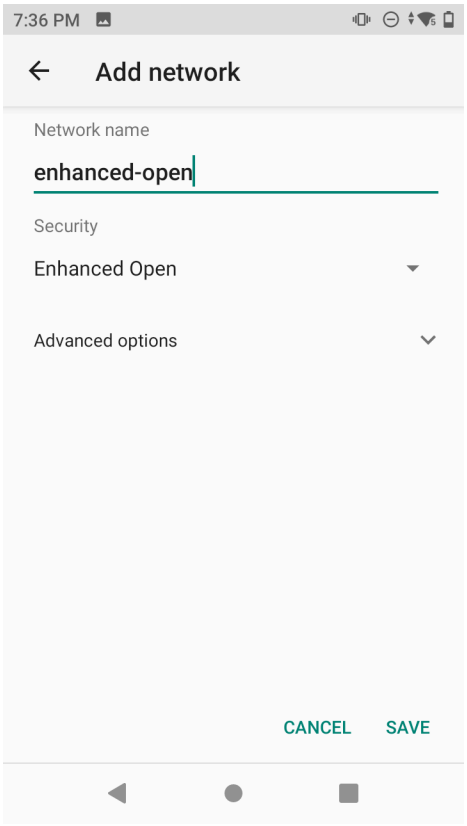
1. In Cisco, create a WLAN profile.
2. Set Layer 2 Security to **None**.
3. In the Enhanced Open SSID drop down menu, select a previously created Enhanced Open profile.

Configuring an Enhanced Open Transition Network on the Device

Procedure

1. On the device, in the Network name field enter the Enhanced Open profile name.
   Make sure to enter the same Enhanced Open profile name selected in the Cisco profile.
2. In the Security field, select **Enhanced Open**.

Example


7:36 PM
Add network
Network name
enhanced-open
Security
Enhanced Open
Advanced options
CANCEL
SAVE

Client Certificate Requirements for WPA3 Profiles

Make sure to follow the client certificate requirements for WPA3 profiles and use the correct digital signature algorithm.

WPA3-Enterprise 192-bit uses EAP-TLS authentication with the following TLS ciphers:

- TLS_ECDHE_ECDSA_WITH_AES_256_GCM_SHA384
  - ECDHE and ECDSA using the 384-bit prime modulus curve P-384
- TLS_ECDHE_RSA_WITH_AES_256_GCM_SHA384
  - ECDHE using the 384-bit prime modulus curve P-384
  - RSA ≥ 3072-bit modulus

To comply with the above requirements, the client certificate should use one of the following digital signature algorithms:

- ECDSA: Elliptic curve digital signature algorithm
- RSA encryption with a minimum key size of 3072 bits

WPA3 Abbreviations

The following abbreviations are used in this guide.

AES	Advanced Encryption Standard
AKM	Authentication and Key Management
AP	Access Point
BIP	Broadcast Integrity Protocol
BSS	Basic Service Set
CCMP	Counter Mode Cipher Block Chaining Message Authentication Code Protocol
FT	Fast Transition
GMAC	Galois Message Authentication Code
OWE	Opportunistic Wireless Encryption
PMF	Protected Management Frames
PWE	Password Element
PSK	Pre-Shared Key
SAE	Simultaneous Authentication of Equals
SHA	Secure Hash Algorithms
STA	Client Station
WPA	Wi-Fi Protected Access