Quick Start Guide for WPA3

Contents

Introduction

The next generation of Wi-Fi® security, bringing new capabilities to enhance Wi-Fi protections in personal and enterprise networks.:

- **WPA3-Personal (WPA3-SAE):**
  more resilient, password-based authentication even when users choose passwords that fall short of typical complexity recommendations. WPA3 leverages Simultaneous Authentication of Equals (SAE), a secure key establishment protocol between devices, to provide stronger protections for users against password guessing attempts by third parties.
- **WPA3-Enterprise (192-bit Mode/Suite B):**
  offers the equivalent of 192-bit cryptographic strength, providing additional protections for networks transmitting sensitive data, such as government or finance. The 192-bit security suite ensures a consistent combination of cryptographic tools are deployed across WPA3 networks.

1. WPA3-Peresonal Required for RTK driver

You can use official wpa_supplicant version must be greater than v2.8 or use wpa_supplicant that we provided in our software release packages.

A. Linux Kernel Version and wpa_supplicant
   a. Available for WPA3-Personal Station above kernel v4.17. If kernel version below v4.17, you shall merge patch[1] to kernel.
   b. Available for WPA3-Personal SoftAP above kernel v5.1. If kernel version below v5.1, you shall merge patch[2] to kernel.

[1] Support offloading wireless authentication to userspace via NL80211_CMD_EXTERNAL_AUTH
https://git.kernel.org/pub/scm/linux/kernel/git/torvalds/linux.git/commit/?id=40cbfa90218bc570a7959b436b9d48a18c361041
https://git.kernel.org/pub/scm/linux/kernel/git/torvalds/linux.git/commit/?id=10773a7c09b327d02144c7d181e6544b7015ffc7
https://git.kernel.org/pub/scm/linux/kernel/git/torvalds/linux.git/commit/?id=db8d93a7a355121d49777c059afbca23c53c8628
[2] Authentication offload to user space in AP mode

c. You need to add patch[3] to fix bug if you use wpa_supplicant v2.9. Also, you need to define **CONFIG_KERNEL_PATCH_EXTERNAL_AUTH** flag in driver.
d. You shall use wpa_supplicant that we provided in our software release packages if you are not able to patch your system kernel.
e. If your system kernel version is newer than v3.8, the WPA3-Personal functionality can work fine by using RTK version of hostapd/wpa_supplicant.

B. Realtek Linux Driver Version
a. Available for WPA3-Personal Station/SoftAP above driver v5.8.

C. RTK maintain's hostapd/wpa_supplicant Version
a. For Pure Linux, you have to use version wpa_supplicant_8_O_8x_rtw[4] above the patch 6.
b. For Android system, please contact the FAE.

2. WPA3-Enterpris Required for RTK driver

A. Linux Kernel Version
a. The mandatory as WPA-3-Personal Required.
b. The optional Suite-B/192-Bit as WPA-3-Personal Required.

B. Realtek Linux Driver Version
a. The mandatory, Station/SoftAP above driver v5.8.
b. The optional Suite-B/192-Bit, Station/SoftAP above driver v5.10.
i. Hardware have to supported crypto cipher GCMP_256 and BIP_GMAC_256

3. Start the WPA3-Personal

A. For further information about wpa_cli and wpa_supplicant, please refer to: document/wpa_cli_with_wpa_supplicant.pdf.

You have to enable below settings when build wpa_supplicant.

```
CONFIG_TLS=openssl
CONFIG_IEEE80211W=y
CONFIG_SAE=y
```

You can scan two kind of WPA3 Access Points.

a. **WPA3-SAE mode:**

Only WPA3-SAE station can connect.

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https://git.kernel.org/pub/scm/linux/kernel/git/torvalds/linux.git/commit/?id=fe4943702c850fa07f963eaa6f1530d9d4c2da78

[3] Fix send_mlme for SAE external auth
http://w1.fi/cgit/hostap/commit/?id=aad414e956fdb463d3b45eb61c42792bf0c9f558

[4] wpa_supplicant_8_O_8.x_rtw-6-g8c4af17fe.20200221.tar.gz.

```
bssid / frequency / signal level / flags / ssid
00:11:22:33:44:21   2432   -37      [WPA2-SAE-CCMP][WPS][ESS]  WPA3-
AP
```

b. **WPA3-SAE Transition Mode:**

WPA2-PSK and WPA3-SAE station can connect.

```
bssid / frequency / signal level / flags / ssid
00:11:22:33:44:21   2432   -37  [WPA2-PSK+SAE-CCMP][WPS][ESS]  WPA3-
AP
```

You can use the same configuration to connect both Access Point.

The sample configuration as:

```
ctrl_interface=/var/run/wpa_supplicant
network={
     ssid="WPA3-AP"
     key_mgmt=SAE
     psk="87654321"
     ieee80211w=2
}
```

B. For further information about hostapd_cli and hostapd, please refer to: document/Quick_Start_Guide_for_SoftAP.pdf.

You have to enable below settings when build hostapd.

```
CONFIG_TLS=openssl
CONFIG_IEEE80211W=y
CONFIG_SAE=y
```

You can setup the WPA3 SoftAP as:

a. **WPA3-SAE mode:**

There are three setting you have to configure as:

```
auth_algs=3
ieee80211w=2
wpa_key_mgmt=SAE
```

b. WPA3-SAE Transition Mode:

There are four setting you have to configure as:

```
auth_algs=3
ieee80211w=1
sae_require_mfp=1
wpa_key_mgmt=SAE WPA-PSK
```

The sample configuration:

```
ctrl_interface=/var/run/hostapd
interface=wlan0
driver=nl80211
ssid=WPA3-SAE
channel=1
beacon_int=100
hw_mode=g
ieee80211w=1
auth_algs=3
ignore_broadcast_ssid=0
wpa=2
wpa_passphrase=87654321
wpa_key_mgmt=SAE WPA-PSK
sae_require_mfp=1
wpa_pairwise=CCMP
rsn_pairwise=CCMP
max_num_sta=16
wmm_enabled=1
```

4. Start the WPA3-Enterprise

A. For further information about wpa_cli and wpa_supplicant, please refer to: document/wpa_cli_with_wpa_supplicant.pdf.

You have to enable below settings when build wpa_supplicant.

```
CONFIG_TLS=openssl
CONFIG_IEEE80211W=y
CONFIG_SAE=y
CONFIG_SUITEB192=y
```

You can use the configuration to connect Access Point.

The sample configuration as:

```
network={
 ssid="WPA3ENTERPRISE"
 key_mgmt=WPA-EAP-SUITE-B-192
 pairwise=GCMP-256
 group=GCMP-256
 eap=TLS
 identity="Client Certificate IDL"
 ca_cert="./ec2-ca.pem"
 client_cert="./ec2-user.pem"
 private_key="./ec2-user.pem"
 private_key_passwd="wifi"
 openssl_ciphers="ECDHE-ECDSA-AES256-GCM-SHA384:ECDHE-ECDSA-AES128-GCM-
SHA256"
 ieee80211w=2
}
```

B. For further information about hostapd_cli and hostapd, please refer to: document/Quick_Start_Guide_for_SoftAP.pdf.

You have to enable below settings when build hostapd.

```
CONFIG_TLS=openssl
CONFIG_IEEE80211W=y
CONFIG_SAE=y
CONFIG_SUITEB192=y
```

You can setup the WPA3 SoftAP as:

The sample configuration as:

```
interface=wlan0
driver=nl80211
ssid=WPA3ENTERPRISE
wpa=2
wpa_key_mgmt=WPA-EAP-SUITE-B-192
wpa_pairwise=GCMP-256
group_cipher=GCMP-256
group_mgmt_cipher=BIP-GMAC-256
ieee80211w=2
sae_anti_clogging_threshold=0
ieee8021x=1
eapol_version=2

# RADIUS authentication server
auth_server_addr=192.168.10.10
auth_server_port=1812
auth_server_shared_secret=12345678
```

5. Document revision history

Version	Date YYYY-MM-DD	Remarks
1.0	2018-05-28	Initial release
1.1	2020-02-20	1. Add Enterprise parts. 2. Update last support rtw_wpa_supplicant version. 8_O_8.x_rtw-6-g8c4af17fe
1.2	2021-12-15	1. Update the instructions for wpa_wupplicant in WPA3.