

# **NEWS FROM THE HOSTAPD LAND**

**BATTLEMESH 2020**

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# WHAT WHAT WHAT?

- **hostapd** and **wpa\_supplicant** are userspace daemons managing wifi interfaces
- Project created in 2001 by Jouni Malinen
- Originally for Prism2 IEEE 802.11b PCI hardware
- Became the default to manage your `cfg80211` wireless interfaces in most Linux-based OS

# HOW?

- OpenWrt today only supports cfg80211 drivers
- That obsoleted legacy driver-specific management and authentication daemons
- We use **hostapd** for Access Point interfaces
- **wpa\_supplicant** for (encrypted) Station, Mesh and Ad-Hoc interfaces
- As both daemons have some overlap, we also build a combined multical binary named **wpad**

# ***FOR EACH INTERFACE***

- generate configuration file using shell scripts
- start daemon

# SOUNDS TOO SIMPLE?

- We build 24 variants

wpad-basic, wpad-basic-openssl, wpad-basic-wolfssl, wpad-mesh-openssl, wpad-mesh-wolfssl, wpad-mini, wpad-openssl, wpad-wolfssl, hostapd-basic, hostapd-basic-openssl, hostapd-basic-wolfssl, hostapd-mini, hostapd-openssl, hostapd-wolfssl, wpa-supPLICANT-basic, wpa-supPLICANT-mesh-openssl, wpa-supPLICANT-mesh-wolfssl, wpa-supPLICANT-mini, wpa-supPLICANT-openssl, wpa-supPLICANT-p2p, wpa-supPLICANT-wolfssl

# STILL SOUNDS TOO SIMPLE?

- 280kB of patches on top of upstream project
- OpenWrt-specific ubus interfaces added
- ~2.5k lines of Shell code
- spread around hostapd, mac80211 and netifd packages

# WELL...

- IEEE 802.11 is constantly being amended
- and so are the Shell scripts
- We want cool ubus interfaces

# SO WHAT'S NEW

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- WPA3
  - wolfSSL variants
  - single instance, dynamic reload
  - improved WPS and Multi-AP
  - Hotspot 2.0
  - Opportunistic Wireless Encryption
  - DFS support for IEEE 802.11s mesh
  - IEEE 802.11ax rates
  - IEEE 802.11k Radio Resource Management
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# WPA3

- Simultaneous Authentication of Equals (SAE) brings us forward secrecy
- Comes with mandatory IEEE 802.11w management frame protection
- Support for EAP192 (aka. WPA-Enterprise Suite-B)
- WPA2/WPA3 transition mode

# WOLFSSL VARIANTS

- SAE requires elliptic curve crypto primitives which are not built-in
- OpenSSL is really big
- Sean Parkinson @wolfssl.com is contributing support to hostapd since 2017
- OpenWrt 20.xx will ship with wolfSSL by default

# SINGLE INSTANCE

```
for each radio
  if (access point)
    netifd -> scripts -> hostapd
  for each non-access point each interface
    netifd -> scripts -> wpa_supplicant
```

# SINGLE INSTANCE

```
procd -> wpa (listening on ubus)
```

```
for each radio
```

```
  for each interface
```

```
    netifd -> scripts -> ubus
```

# SINGLE INSTANCE

(well, actually it's still one global hostapd and one global wpa\_supplicant process)

volunteers needed

# BUT BUT BUT

Now someone needs to translate 2.5k loc of Shell code to utpl. Anyone?

[GITHUB.COM/JOW-/UTPL](https://github.com/jow-/utpl)

# DYNAMIC RELOAD

- add, edit and remove interfaces on the fly using ubus calls
- much faster, no processes need to be restarted
- no longer loose all connections on all radios when changing wifi settings

# MULTI-AP

= (WDS) repeaters on steroids

- required WPS support also for Station mode
- basic UCI configuration for Access Point and Station interfaces added



# HOTSPOT 2.0

- Extension to IEEE 802.11u (interworking)
- tons of options added for Access point interfaces
- `hs20-server` package providing *example* PKI and radius server for onboarding and showtime (from `hostapd.git`, written in PHP)

# OPPORTUNISTIC WIRELESS ENCRYPTION

- unauthenticated (open) but encrypted
- mandatory IEEE 802.11w management frame protection
- transition mode

# DFS SUPPORT FOR IEEE 802.11S MESH

- updated patches from Markus Theil
- actually works as expected in case of radar events occurring

# IEEE 802.11AX

Quote Felix Fietkau: "No advanced features are configurable yet, just basic enabling of HE modes"

# RADIO RESOURCE MANAGEMENT

(IEEE 802.11k)

- Lets clients do scans
- Expose beacon reports through ubus

future

**AND THEN USE THAT FOR  
DECENTRALIZED BAND-  
STEERING**

**[GITHUB.COM/BLOGIC/USTEER](https://github.com/BLOGIC/USTEER)**

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# LEARN MORE

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OpenWrt <https://openwrt.org/>

hostapd <https://w1.fi/>

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