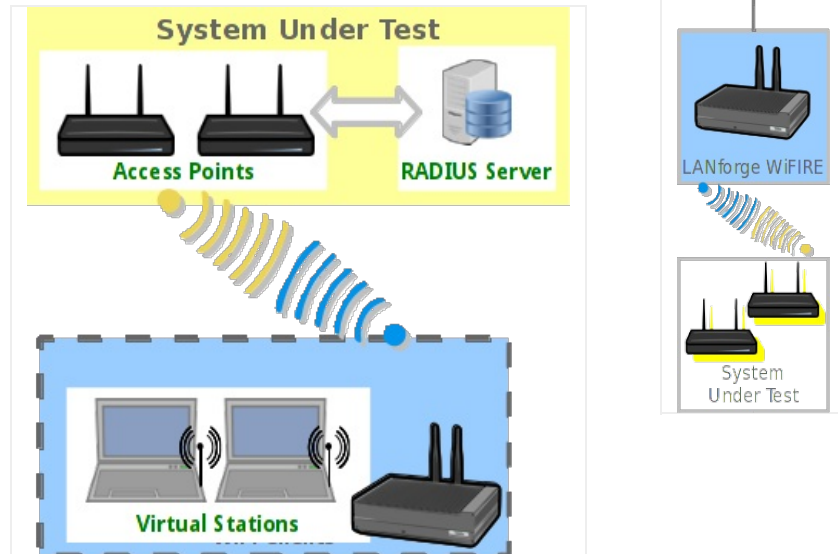


LANforge WiFi testing with HotSpot 2.0

Goal: Authenticate using HotSpot 2.0, 802.11u, and 802.1x EAP-TTLS and EAP-TLS.

Requires LANforge 5.2.10 or later. Create a Virtual AP configured for HotSpot 2.0 and RADIUS (802.1x) authentication. Create two Station interfaces, one connecting with EAP-TLS and one with EAP-TTLS. This example uses two LANforge CT520 systems but the procedure should work on all CT521, CT522, CT523, CT525 and similar systems.



1. Create a virtual AP on wiphy0 of Resource 1. (Skip this if you are using your own AP)
 - A. Go to the Port Manager tab, select wiphy0 on proper resource, click Create, fill out appropriate information and create basic Virtual AP interface.

- B. The new VAP should appear in the Port-Mgr table. Double-click to modify. Configure IP Address information, SSID and select WPA2:

The screenshot shows the 'vap1 (If0301-1n-f17-32) Configure Settings' window. The 'Port Status Information' section shows 'Current: LINK-UP GRO NONE' and 'Driver Info: Port Type: WIFI-AP Parent: wiphy0'. The 'Port Configurables' section has three tabs: 'Standard Configuration', 'Advanced Configuration', and 'Misc Configuration'. The 'Standard Configuration' tab is active, showing 'Enable' options (Set IF Down, Set MAC, Set TX Q Len, Set MTU, Set Offload, Set PROMISC), 'Services' (HTTP, FTP), and 'Low Level' options (PROMISC, TSO Enabled, UFO Enabled, GSO Enabled, LRO Enabled, GRO Enabled). The 'General Interface Settings' section includes 'DHCP-IPv6', 'DHCP-IPv4', 'Secondary-IPs', 'DNS Servers', 'IP Address', 'IP Mask', 'Gateway IP', 'Alias', 'MAC Addr', 'Rpt Timer', 'DHCP Release', 'Down', 'Aux-Mgt', 'DHCP Client ID', 'Peer IP', 'Global IPv6', 'Link IPv6', 'IPv6 GW', 'MTU', 'TX Q Len', and 'WiFi Bridge'. The 'WiFi Settings' section includes 'SSID', 'Key/Phrase', 'Freq/Channel', 'DTIM-Period', 'Beacon', 'AP', 'Mode', 'Rate', 'Max-STA', 'Use WPA', 'Use WPA2', 'Use WEP', 'Disable HT40', 'Disable SGI', and 'Verbose Debug'.

- C. Select the **Advanced Configuration** tab in the Port-Modify window and configure the 802.1x, 802.11u, HotSpot 2.0, RADIUS and other information. The RADIUS server can be the LANforge machine when freeradius is installed via `If_kinstall.pl --do_radius ...` then just copy the `client.p12` and `ca.pem` from the `/home/lanforge/` directory on the RADIUS LANforge machine to the Station machine(s) and configure the stations to use those key files. Or, use your own RADIUS server and copy key files as appropriate:

The screenshot shows the 'vap1 (If0301-1n-f17-32) Configure Settings' window, 'Advanced Configuration' tab. The 'Port Status Information' section shows 'Current: LINK-UP GRO NONE' and 'Driver Info: Port Type: WIFI-AP Parent: wiphy0'. The 'Port Configurables' section has three tabs: 'Standard Configuration', 'Advanced Configuration', and 'Misc Configuration'. The 'Advanced Configuration' tab is active, showing 'Advanced WiFi Settings'. The 'Advanced WiFi Settings' section includes 'Ignore Probes', 'Ignore Auth-Assoc', 'Ignore Assoc', 'Ignore Re-Assoc', 'Corrupt GTK', 'HS20 Capabilities', 'HS20 Oper Class', 'HS20 WAN Metrics', 'IEEE80211w', 'Venue Group', 'Network Type', 'Network Auth', 'HESSID', 'Realm', 'IMSI', 'Milenage', 'Domain', 'Consortium', 'RADIUS IP', 'RADIUS Port', 'RADIUS Secret', 'Venue Type', 'Address Types', '3GPP Cell Net', 'Use 80211d', 'Use 80211h', 'Short-Preamble', 'Advanced/802.1x', 'HotSpot 2.0', 'Disable DGAF', 'Enable 802.11u', '802.11u Internet', '802.11u ASRA', '802.11u ESR', and '802.11u UESA'.

- D. Use NetSmith to create Virtual-Router. Add the vapX interface to the Virtual router, configure the Virtual Router port object to serve DHCP. Optionally, add external Ethernet interface to virtual router so that it can route to upstream networks. You could also set up the VAP in bridge mode and use external DHCP server if preferred.

For more information see [LANforge User's Guide: Ports \(Interfaces\)](#) , [VAP Bridge Mode Cookbook](#) , [Virtual Router with DHCP Cookbook \(Skip the WanLink portion\)](#)

2. Create EAP-TLS (key certificate authentication) Station on wiphy0 of the second LANforge Resource.
- A. Go to the Port Manager tab, select wiphy0 on proper resource, click Create, fill out appropriate information and create a basic Virtual Station interface.
- B. The new Station should appear in the Port-Mgr table. Double-click to modify. Select WPA2. The SSID and Key/Password do not need to be configured when using HotSpot 2.0:

wlan0 (ct523-3n-f20) Configure Settings

Port Status Information
Current: LINK-UP GRO Authorized
Driver Info: Port Type: WIFI-STA Parent: wiphy0

Port Configurables

Standard Configuration | Advanced Configuration | Misc Configuration

Enable

- ☐ Set IF Down
- ☐ Set MAC
- ☐ Set TX Q Len
- ☐ Set MTU
- ☐ Set Offload
- ☐ Set PROMISC

Services

- ☐ HTTP
- ☐ FTP

Low Level

- ☐ PROMISC
- ☐ TSO Enabled
- ☐ UFO Enabled
- ☐ GSO Enabled
- ☐ LRO Enabled
- ☒ GRO Enabled

General Interface Settings

☐ DHCP-IPv6 ☒ DHCP Release ☐ Down ☐ Aux-Mgt

☒ DHCP-IPv4 **Secondary-IPs** DHCP Client ID: None

DNS Servers: BLANK Peer IP: NA

IP Address: 0.0.0.0 Global IPv6: AUTO

IP Mask: 0.0.0.0 Link IPv6: AUTO

Gateway IP: 0.0.0.0 IPv6 GW: AUTO

Alias: MTU: 1500

MAC Addr: 00:0e:8e:30:9d:69 TX Q Len: 1000

Rpt Timer: medium (8 s) WiFi Bridge: NONE

WiFi Settings

SSID: [BLANK] AP: DEFAULT

Key/Phrase: Mode: 802.11abgn

Freq/Channel: 5745/149 Rate: OS Default

☐ Use WPA ☒ Use WPA2 ☐ Use WEP ☐ Disable HT40 ☐ Disable SGI

Print View Details Probe Display Scan Sync Apply OK Cancel

- C. Select the **Advanced Configuration** tab in the Port-Modify window and configure the 802.1x, 802.11u, HotSpot 2.0 and other information. The **EAP Identity** is required, but it may not matter what value you enter unless your RADIUS server has specific requirements. The LANforge RADIUS server does not care. The **Private Key** and **CA Cert File** should come from the /home/lanforge directory on the RADIUS machine if using LANforge for the RADIUS server, or from your own RADIUS server's machine if using your own RADIUS.

wlan0 (ct523-3n-f20) Configure Settings

Port Status Information
Current: LINK-UP GRO Authorized
Driver Info: Port Type: WIFI-STA Parent: wiphy0

Port Configurables

Standard Configuration **Advanced Configuration** **Misc Configuration**

Advanced WiFi Settings

Select 'WPA2' on the Standard Configuration screen to enable Advanced/802.1x and enable Advanced/802.1x to enable most of these. Enabling 802.11u enables others.

Key Management:	WPA-EAP	HESSID:	00:00:00:00:00:00
Pairwise Ciphers:	CCMP TKIP	Realm:	lanforge.com
Group Ciphers:	All	Client Cert:	
WPA PSK:		IMSI:	
EAP Methods:	EAP-TLS	Milenage:	
EAP Identity:	lanforge	Domain:	lanforge.com
EAP Anon Identity:		Consortium:	
EAP Password:		Phase-1:	
EAP Pin:		Phase-2:	
Private Key:	/home/lanforge/client.p12	PK Password:	lanforge
CA Cert File:	/home/lanforge/ca.pem	PAC File:	
Network Auth:		IEEE80211w:	Disabled (0)

☒ Advanced/802.1x ☒ Enable 802.11u ☒ HotSpot 2.0 ☐ Enable PKC

Print **View Details** **Probe** **Display Scan** **Sync** **Apply** **OK** **Cancel**

- D. Verify Station connects and obtains DHCP IP Address configuration.

For more information see [WiFi Station Cookbook](#)

3. Create EAP-TTLS (802.1x username + password authentication) Station on wiphy0 of the second LANforge Resource.
- A. Go to the Port Manager tab, select wiphy0 on proper resource, click Create, fill out appropriate information and create another basic Virtual Station interface.

- B. The new Station should appear in the Port-Mgr table. Double-click to modify. Select WPA2. The SSID and Key/Password do not need to be configured when using HotSpot 2.0:

The screenshot shows the 'wlan1 (ct523-3n-f20) Configure Settings' window. The 'Port Status Information' section shows 'Current: LINK-UP GRO Authorized' and 'Driver Info: Port Type: WIFI-STA Parent: wiphy1'. The 'Port Configurables' section has three tabs: 'Standard Configuration', 'Advanced Configuration', and 'Misc Configuration'. The 'Standard Configuration' tab is active, showing a list of checkboxes for 'Enable' (Set IF Down, Set MAC, Set TX Q Len, Set MTU, Set Offload, Set PROMISC), 'Services' (HTTP, FTP), and 'Low Level' (PROMISC, TSO Enabled, UFO Enabled, GSO Enabled, LRO Enabled, GRO Enabled). The 'General Interface Settings' section includes checkboxes for DHCP-IPv6, DHCP Release, Down, and Aux-Mgt. It also has fields for DNS Servers, IP Address, IP Mask, Gateway IP, Alias, MAC Addr, Rpt Timer, DHCP Client ID, Peer IP, Global IPv6, Link IPv6, IPv6 GW, MTU, TX Q Len, and WiFi Bridge. The 'WiFi Settings' section includes fields for SSID, Key/Phrase, Freq/Channel, AP, Mode, Rate, and checkboxes for Use WPA, Use WPA2, Use WEP, Disable HT40, and Disable SGI.

- C. Select the **Advanced Configuration** tab in the Port-Modify window and configure the 802.1x, 802.11u, HotSpot 2.0 and other information. The **EAP Identity** and **EAP Password** must match the configuration on your RADIUS server. LANforge RADIUS defaults to: testuser, testpasswd when freeradius is installed via lf_install.pl --do_radius. Phase-2 must be configured as shown for EAP-TTLS with MSCHAPV2.

The screenshot shows the 'wlan1 (ct523-3n-f20) Configure Settings' window, now with the 'Advanced Configuration' tab selected. The 'Advanced WiFi Settings' section contains a message: 'Select 'WPA2' on the Standard Configuration screen to enable Advanced/802.1x and enable Advanced/802.1x to enable most of these. Enabling 802.11u enables others.' Below this are fields for Key Management, Pairwise Ciphers, Group Ciphers, WPA PSK, EAP Methods, EAP Identity, EAP Anon Identity, EAP Password, EAP Pin, Private Key, CA Cert File, Network Auth, HESSID, Realm, Client Cert, IMSI, Milenage, Domain, Consortium, Phase-1, Phase-2, PK Password, PAC File, and IEEE80211w. At the bottom, there are checkboxes for 'Advanced/802.1x', 'Enable 802.11u', 'HotSpot 2.0', and 'Enable PKC'.

- D. Verify Station connects and obtains DHCP IP Address configuration.

For more information see [WiFi Station Cookbook](#)

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