

LANforge WiFi testing HotSpot 2.0 Release 2

Goal: Setup HotSpot 2.0 Release 2 Example

Requires LANforge 5.3.2 or later on Fedora 20 or later.

- Run LANforge install script to begin setup of HotSpot 2.0 R2 related servers and certificates.
- Configure the OSU Server-only authenticated layer-2 Encryption Network (OSEN) AP and Passpoint AP.
- Initiate Online Sign-Up (OSU) procedure, select a provider and obtain an IP address from the Passpoint AP.
- Send traffic through the Service Provider Network.





For more information see:

WiFi Alliance Passpoint Release 2 Deployment Guidelines https://www.wi-fi.org/file/passpoint-release-2-deploymentguidelines

1. Run LANforge installation script to begin hostapd RADIUS, certificates and HotSpot 2.0 setup:

```
cd /home/lanforge
./lf kinstall.pl --lfver 5.3.2 --do_radius --do hs20
```

2. Make two copies of the ca.pem certificate to different directories:

```
cp /home/lanforge/hs20/ca/ca.pem /home/lanforge/ota-ca.pem
cp /home/lanforge/hs20/ca/ca.pem /home/lanforge/wifi/osu wlan2/osu-ca.pem
```

ota-ca.pem is used by the client for Over-The-Air authentication to the OSEN AP osu-ca.pem is used by the client for the Online-Sign-Up server authentication before connecting to the Passpoint AP

This is an all-in-one example on a single LANforge system, but if the authentication servers were setup on different systems, the proper certificates would need to be copied instead.

3. Create devinfo.xml and devdetail.xml files in /home/lanforge/wifi/osu_wlan2

A. /home/lanforge/wifi/osu_wlan2/devinfo.xml

```
<DevInfo xmlns="urn:oma:mo:oma-dm-devinfo:1.0">
	<DevId>urn:Example:HS20-station:123456</DevId>
	<Man>Manufacturer</Man>
	<Mod>HS20-station</Mod>
	<DmV>1.2</DmV>
	<Lang>en</Lang>
</DevInfo>
```

B. /home/lanforge/wifi/osu_wlan2/devdetail.xml

```
<DevDetail xmlns="urn:oma:mo:oma-dm-devdetail:1.0">
       <Ext>
               <org.wi-fi>
                       <Wi-Fi>
                                <EAPMethodList>
                                       <EAPMethod1>
                                                <EAPType>13</EAPType>
                                        </EAPMethod1>
                                        <EAPMethod2>
                                                <EAPType>21</EAPType>
                                                <InnerMethod>MS-CHAP-V2</InnerMethod>
                                        </EAPMethod2>
                                        <EAPMethod3>
                                                <EAPType>18</EAPType>
                                        </EAPMethod3>
                                        <EAPMethod4>
                                                <EAPType>23</EAPType>
                                        </EAPMethod4>
                                        <EAPMethod5>
                                               <EAPType>50</EAPType>
                                        </EAPMethod5>
                                </EAPMethodList>
                                <ManufacturingCertificate>false</ManufacturingCertificate>
                                <Wi-FiMACAddress>020102030405</Wi-FiMACAddress>
                                <IMSI>31002600000000</IMSI>
                                <IMEI_MEID>imei:490123456789012</IMEI_MEID>
                                <ClientTriggerRedirectURI>http://localhost:12345/</ClientTriggerRedirectURI>
                                <0ps>
                                        <launchBrowserToURI></launchBrowserToURI>
                                        <negotiateClientCertTLS></negotiateClientCertTLS>
                                        <getCertificate></getCertificate>
                                </0ps>
                        </Wi-Fi>
               </org.wi-fi>
       </Ext>
       <URI>
               <MaxDepth>0</MaxDepth>
               <MaxTotLen>0</MaxTotLen>
               <MaxSegLen>0</MaxSegLen>
       </URI>
       <DevType>MobilePhone</DevType>
       <OEM>Manufacturer</OEM>
       <FwV>1.0</FwV>
       <SwV>1.0</SwV>
       <HwV>1.0</HwV>
       <Lrg0bj>false</Lrg0bj>
</DevDetail>
```

4. Create two MAC-VLANs for two hostapd RADIUS server instances.

A. Go to the Port Manager tab, select eth1, select Create, select MAC-VLAN, quantity 2 then Apply.

0			Create VLANs on Port: 1.1.01		\odot \odot \otimes
0	MAC-VLAN WiFi STA	○ 802.1Q-VLAN ○ ○ WiFi VAP ○ WiFi I	Redirect O Bridge O GRE Tunnel Monitor O WiFi Virtual Radio		
0	Shelf:	1 🔻	Resource: 1 (ct523-3n-f20) 🔻	Port: 1 (e	th1) 🔻
Ø	VLAN ID:		DHCP-IPv4		
	MAC Addr:	xx:xx:xx:*:*:xx ▼	IP Address:	Global IPv6:	AUTO
	Quantity:	2	IP Mask or Bits:	Link IPv6:	AUTO
			Gateway IP:	IPv6 GW:	AUTO
	#1 Redir Name:		#2 Redir Name:		
	STA ID:		SSID:		
	WiFi AP:		Key/Phrase:		
	WPA	WPA2	WEP		
0	Down				
	Apply	<u>C</u> ancel			

B. Double-click each new MAC-VLAN interface in the Port-Mgr tab to modify. Select the RADIUS checkbox which will allow a hostapd based RADIUS server on the interfaces using the config files: /home/lanforge/wifi/hostapd_eth1#0.conf and /home/lanforge/wifi/hostapd_eth1#1.conf

Because this is an all-in-one example, the hostapd RADIUS servers will be referenced to localhost and each MAC-VLAN interface will not need an IP address assigned. If the hostapd RADIUS servers were on different systems or networks, the appropriate IP address would be assigned here.

		eth1#0 (c	t523-3n-f20) Con	figure Settings		\odot
		Currenti III	Port Status Info	rmation	CRO	
		Driver Info: Po		Parent: eth1	dito	
			it typer inte ven			
			Port Configur	ables	121223	
Enable		General Int	erface Settings		0 10bt-HD	Advert Rates -
Set MAC					O 10bt-FD	10bt ED
	Down	Aux-Mgt			0 100bt-FD	V 100t-FD
Set IX Q Len	DHCP-IPv6	DHCP Release	DHCP Vendor ID:	None	0 1000-FD	V 100bt-HD
Set Offload	DHCP-IPv4	Secondary-IPs	DHCP Client ID:	None	0 40G-FD	1000C-PD
	DNS Servers:	BLANK	Peer IP:	NA	Autonegotiate	1000-FD
	IP Address:	0.0.0.0	Global IPv6:	AUTO	Renegotiate	
Set Rridge Infe	IP Mask:	0.0.0.0	Link IPv6:	AUTO	Restart Xcvr	Elow Control
_ Set bridge into	Gateway IP:	0.0.0.0	IPv6 GW:	AUTO		How-control
	Alias:		MTU:	1500	RX-ALL	Offload
-Services-	MAC Addr:	00:1e:a6:be:c8:6c	TX Q Len	0	RX-FCS	TSO Enabled
	Br Cost:	Ignore	Priority:	Ignore	Bypass NOW!	UFO Enabled
FTP	Det Timer	radius (0 a)	wirt p-id	NONE	Bypass Power-UP	GSO Enabled
RADIUS	Rpt Timer:	medium (8 s)	WIFI Bridge:	NONE	Bypass Power-DOWN	LRO Enabled
					Bypass Disconnect	GRO Enabled
	Print V	iew Details	Probe Sync	Apply	OK Cancel	
	Print Vi	eth1#1 (c	Probe Sync	Apply	OK Cancel	\odot
	Print Vi	eth1#1 (c	Probe Syno t523-3n-f20) Con Port Status Info	Apply figure Settings	OK Cancel	\odot
	Print Vi	eth1#1 (c Current: LIN	Probe Sync t523-3n-f20) Con Port Status Info IK-DOWN PROBE-E	Apply figure Settings rmation RROR TSO UFO GSO	OK Cancel	\odot
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Enable —— Set IF Down Set MAC	Print Vi	ew Details eth1#1 (c Current: LIP Driver Info: Po General Int	Probe Sync t523-3n-f20) Con Port Status Info IK-DOWN PROBE-E rt Type: MAC-VLAI Port Configur erface Settings	Apply figure Settings rmation RROR TSO UFO GSO 4 Parent: eth1 ables	OK Cancel	 ✓ Advert Rates- ✓ 10bt-HD ✓ 10bt-FD
Enable Set IF Down Set MAC Set TX Q Len	Print V	eth1#1 (c Current: LIN Driver Info: Po General Int Aux-Mgt V DHCP Release	Probe Sync t523-3n-f20) Con Port Status Info IK-DOWN PROBE-E tr Type: MAC-VLAI Port Configur erface Settings DHCP Vendor ID:	Apply figure Settings rmation RROR TSO UFO GSO 4 Parent: eth1 ables	ОК Cancel GRO 	 ✓ Advert Rates ✓ 10bt-HD ✓ 10bt-FD ✓ 10bt-HD
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Enable Set IF Down Set MAC Set TX Q Len Set MTU Set Offload	Print V	eth1#1 (c Current: LIM Driver Info: Po General Info Aux-Mgt Ø DHCP Release Secondary-IPS	Probe Sync t523-3n-f20) Con Port Status Info IK-DOWN PROBE-E rt Type: MAC-VLAI Port Configur erface Settings DHCP Vendor ID: DHCP Client ID: Dece ID:	Apply figure Settings rmation RROR TSO UFO GSO 4 Parent: eth1 ables None	GRO	Advert Rates- V 10bt-HD V 10bt-FD V 100bt-FD V 100bt-FD V 100bt-FD V 1000-FD
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Enable Set IF Down Set MAC Set TX Q Len Set MTU Set Offload Set PROMISC Set Rx-All/FCS	Print V Down DHCP-IPv6 DHCP-IPv4 DNS Servers: IP Address: IP Mack-	eth1#1 (c Current: LIN Driver Info: Po General Int Aux-Mgt Ø HCP Release Secondary-IPs BLANK 0.0.0.0	Probe Sync ts23-3n-f20) Con Port Status Info IK-DOWN PROBE-E rt Type: MAC-VLAI Port Configur erface Settings DHCP Vendor ID: DHCP Client ID: Peer IP: Global IPv6:	Apply figure Settings rmation RROR TSO UFO GSO J Parent: eth1 ables None None AUTO AUTO AUTO	OK Cancel GRO	Advert Rates- V 10bt-HD V 10bt-FD V 100bt-FD V 100bt-FD V 1000-FD 100G-FD 40G-FD
Enable Set IF Down Set MAC Set TX Q Len Set MTU Set Offload Set PROMISC Set Rx-All/FCS Set Bridge Info	Print V Down DHCP-IPv6 DHCP-IPv4 DNS Servers: IP Address: IP Mask: Gateway IP	eth1#1 (c Current: LIN Driver Info: Po General Int Aux-Mgt Ø DHCP Release Secondary-IPs BLANK 0.0.0 0.0.0	Probe Sync ts23-3n-f20) Con Port Status Info IK-DOWN PROBE-E rt Type: MAC-VLAI Port Configur erface Settings DHCP Vendor ID: DHCP Client ID: Peer IP: Global IPv6: Link IPv6: Link IPv6:	Apply figure Settings rmation RROR TSO UFO GSO J Parent: eth1 ables None None NA AUTO AUTO AUTO AUTO	OK Cancel GRO	Advert Rates- 2 10bt-HD 2 10bt-FD 2 100bt-FD 2 100bt-FD 2 1000-FD 100G-FD 10G-FD 40G-FD Flow-Control
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Enable Set IF Down Set MAC Set TX Q Len Set MTU Set Offload Set PROMISC Set R-All/FCS Set R-All/FCS Set Bridge Info	Print V Down DHCP-IPv6 DHCP-IPv6 DHS Servers: IP Address: IP Mask: Gateway IP: Alias: MAC Addr: BF Cost:	eth1#1 (c Current: LIN Driver Info: Po General Int Aux-Mgt Ø DHCP Release Secondary-IPs BLANK 0.0.0 0.0.0 0.0.0 0.0.0	Probe Sync 523-3n-f20) Con Port Status Info IK-DOWN PROBE-E tr Type: MAC-VLAI Port Configur erface Settings – DHCP Vendor ID: DHCP Client ID: Peer IP: Global IPv6: Link IPv6: IPv6 GW: MTU: TX Q Len Priority-	Apply figure Settings rmation RROR TSO UFO GSO A Parent: eth1 ables None None None NA AUTO AUTO AUTO 1500 0 moore	OK Cancel GRO Port Rates O 10bt-HD O 10bt-HD O 10bt-FD O 100bt-FD O 100c-FD O 100c-FD O 100c-FD O 100c-FD O 406-FD O 406-FD O 406-FD O 406-FD O Restart Xcvr PROMISC RX-ALL RX-FCS Bypass NOW!	Advert Rates- Iobt-HD Iobt-FD Iobt-FD Ioobt-HD Ioobt-FD Ioobt-FD Ioo-FD Ioo-FD Ioo-FD Ioo-FD Flow-Control Offload Y UFO Enabled
Enable Set IF Down Set MAC Set TX Q Len Set MTU Set Offload Set PROMISC Set Rx-All/FCS Set Bridge Info Set Prices FTP	Print V Down DHCP-IPv6 DHCP-IPv6 DHCP-IPv4 DNS Servers: IP Address: IP Mask: Gateway IP: Alias: MAC Addr: Br Cost:	ethi#1 (c current: LIN Driver Info: Po General Int Aux-Mgt V DHCP Release Secondary-IPS BLANK 0.0.0.0 0.0.0.0 0.0.0.0 0.0.0.0 0.0.0 0.0.0 0.0.0 0.0.0 0.0.0 0.0.0 0.0.0 0.0.0 0.0.0 0.0.0 0.0.0 0.0.0 0.0	Probe Sync 523-3n-f20) Con Port Status Info IK-DOWN PROBE-E rt Type: MAC-VLAI Port Configur erface Settings - DHCP Vendor ID: DHCP Vendor ID: DHCP Client ID: Peer IP: Global IPv6: Link IPv6: IPv6 GW: MTU: TX Q Len Priority:	Apply	GRO Port Rates Dott-HD Dott	Advert Rates- Iobt-HD Iobt-FD Iobt-FD Ioobt-FD Ioobt-FD Ioobt-FD Ioo-FD Ioo-FD Ioo-FD Ioo-FD Gfload VFO Enabled V UFO Enabled Y GSO Enabled
Enable Set IF Down Set MAC Set TX Q Len Set Offload Set PROMISC Set Rx-All/FCS Set Bridge Info -Services- HTTP FTP Z RADIUS	Print V Down DHCP-IPV6 DHCP-IPV6 DHCP-IPV4 DNS Servers: IP Address: IP Mask: Gateway IP: Alias: MAC Addr: Br Cost: Rpt Timer:	eth J#1 (c current: LIM Driver Info: Po General Int Aux-Mgt V DHCP Release Secondary-IPs BLANK 0.0.0.0 0.0.0.0 0.0.0.0 0.0.0.0 0.0.0.0 0.0.0 0.0.0 0.0.0 0.0.0 0.0.0 0.0.0 0 0.0	Probe Sync 523-3n-f20) Con Port Status Info IK-DOWN PROBE-E rt Type: MAC-VLAI Port Configur erface Settings DHCP Vendor ID: DHCP Client ID: Peer IP: Global IPv6: Link IPv6: IPv6 GW: MTU: TX Q Len Priority: WiFi Bridge:	Apply figure Settings rmation RROR TSO UFO GSO A Parent: eth1 ables None None None NA AUTO AUTO AUTO ISO0 C Ignore NONE	OK Cancel GRO Port Rates O 10bt-HD O 10bt-HD O 10bt-HD O 100t-FD O 100-FD O 106-FD O 406-FD Ø Autonegotiate Renegotiate Renegotiate Restart Xcvr PROMISC RX-ALL RX-FCS Bypass NOW! Bypass Power-UP Bypass Power-UP Bypass Power-DOWN	Advert Rates- 2 10bt-HD 2 10bt-FD 2 10bt-FD 2 100bt-FD 2 1000-FD 3 100-FD 4 00-FD 4 00-FD 5 Flow-Control 0 Ffload 2 UFO Enabled 2 UFO Enabled 2 LRO Enabled
Enable Set IF Down Set MAC Set TX Q Len Set Offload Set PROMISC Set Rx-All/FCS Set Bridge Info -Services HTTP FTP Z RADIUS	Print V Down DHCP-IPv6 DHCP-IPv6 DHCP-IPv4 DNS Servers: IP Address: IP Mask: Gateway IP: Alias: MAC Addr: Br Cost: Rpt Timer:	eth Details eth 1#1 (c Current: LIM Driver Info: Po General Inf Aux-Mgt DHCP Release Secondary-IPs BLANK 0.0.0.0 0.0.0.0 0.0.0.0 0.0.0.0 0.0.0 0.0.0 0.0.0 0.0.0 0 0.1e:a6:67:96:6c Ignore medium (8 s)	Probe Sync 523-3n-f20) Con Port Status Info IK-DOWN PROBE-E rt Type: MAC-VLAI Port Configur erface Settings DHCP Vendor ID: DHCP Client ID: Peer IP: Global IPv6: Link IPv6: IPv6 GW: MTU: TX Q Len Priority: WiFi Bridge:	Apply figure Settings rmation RROR TSO UFO GSO A Parent: eth1 ables None None None NA AUTO AUTO AUTO ISO0 0 Ignore NONE	OK Cancel GRO	Advert Rates- V 10bt-HD V 10bt-FD V 100bt-FD V 100bt-FD V 1000-FD 100-FD 0 40G-FD Flow-Control Offload V TSO Enabled V GSO Enabled V GRO Enabled

C. Create config file:

/home/lanforge/wifi/hostapd_eth1#0.conf for the hostapd RADIUS server on eth1#0. NOTE: The eap_user_file, eap_sim_db and radius_server_auth_port are unique for each RADIUS server.

interface=eth1#0 driver=wired logger syslog=-1 logger_syslog_level=2 logger_stdout=-1 logger stdout level=2 dump file=/home/lanforge/wifi/hostapd eth1#0.dump ctrl_interface=/var/run/hostapd ctrl_interface_group=0 ieee8021x=1 eapol_key_index_workaround=0 eap_server=1 eap_user_file=/home/lanforge/hs20/AS/hostapd-osen.eap_user server_id=ct523-3n-f20 eap sim_db=unix:/tmp/hlr_auc_gw.sock radius server auth port=1820 radius_server_clients=/home/lanforge/hs20/AS/hostap.radius_clients

ca_cert=/home/lanforge/hs20/ca/ca.pem
server_cert=/home/lanforge/hs20/ca/server.pem
private_key=/home/lanforge/hs20/ca/server.key
private_key_passwd=lanforge

ocsp_stapling_response=/home/lanforge/hs20/ca/ocsp-server-cache.der

D. Create config file:

/home/lanforge/wifi/hostapd_eth1#1.conf for the hostapd RADIUS server on eth1#1. NOTE: The eap_user_file, eap_sim_db and radius_server_auth_port are unique for each RADIUS server.

interface=eth1#1 driver=wired logger syslog=-1 logger_syslog_level=2 logger_stdout=-1 logger stdout level=2 dump file=/home/lanforge/wifi/hostapd eth1#1.dump ctrl_interface=/var/run/hostapd ctrl_interface_group=0 ieee8021x=1 eapol_key_index_workaround=0 eap server=1 eap_user_file=sqlite:/home/lanforge/hs20/AS/DB/eap_user.db server_id=ct523-3n-f20 eap_sim_db=unix:/tmp/hlr_auc_gw.sock db=/home/lanforge/hs20/AS/DB/eap_sim.db radius server auth port=1821 radius_server_clients=/home/lanforge/hs20/AS/hostap.radius_clients

ca_cert=/home/lanforge/hs20/ca/ca.pem
server_cert=/home/lanforge/hs20/ca/server.pem
private_key=/home/lanforge/hs20/ca/server.key
private_key_passwd=lanforge

ocsp_stapling_response=/home/lanforge/hs20/ca/ocsp-server-cache.der

E. Start the hlr_auc_gw tool:

cd /home/lanforge
. lanforge.profile
hlr_auc_gw -m /etc/hlr_auc_gw.milenage_db > /tmp/hlr_auc_gw.log &

NOTE: If the hlr_auc_gw does not start, you may have to remove the file /tmp/hlr_auc_gw.sock first.

F. Reset the MAC-VLAN interfaces on the Port Mgr tab so that the new hostapd RADIUS servers are started. Check that they are running with the command:

ps auxwww |grep hostapd_eth

If they are not running, check the log files for problems:

cat /home/lanforge/wifi/hostapd_log_ethl#0.txt
cat /home/lanforge/wifi/hostapd_log_ethl#1.txt

- 5. Create two VAPs for the HotSpot 2.0 Release 2 Network.
 - A. Go to the Port Mgr tab and create one VAP on wiphy0 and one VAP on wiphy1.
 - B. Modify the first VAP on wiphy0 to be the $\ensuremath{\textbf{OSEN}}$ AP. Configure IP Address and SSID.

0	vap1 (ct5)	23-3n-f20) Configur	e Settings		\sim \times		
Port Status Information							
	Current: LINK-UP GRO NONE						
Driver Info: Port Type: WIFI-AP Parent: wiphy0							
		Port Configurabl	es				
Standard Configur	ation Advanced Co	onfiguration Misc	Configuration C	ustom WiFi			
Enable —		General Int	erface Settings		1		
Set IF Down	Down	Aux-Mgt					
Set MAC	DHCP-IPv6	DHCP Release	DHCP Vendor ID:	None			
Set TX Q Len	DHCP-IPv4	Secondary-IPs	DHCP Client ID:	None			
Set MIU	DNS Servers:	BLANK	Peer IP:	NA			
	IP Address:	10.88.1.1	Global IPv6:	AUTO			
Set PROMISC	IP Mask:	255.255.255.0	Link IPv6:	AUTO			
	Gateway IP:	0.0.0.0	IPv6 GW:	AUTO			
Services	Alias:		MTU:	1500			
🔲 НТТР	MAC Addr:	00:0e:8e:5d:5a:71	TX Q Len	1000			
FTP	Rpt Timer:	faster (1 s) 🔻	WiFi Bridge:	NONE			
		WiFi	Settings				
l ow Level	SSID: ABCD-	1234	▼ AP:	DEFAULT			
	Key/Phrase:		Mode:	802.11abqn			
TSO Enabled	Freq/Channel: 518	0/36	Rate:	OS Default	•		
UFO Enabled	DTIM-Period: 2		Max-STA:	2007			
GSO Enabled	Beacon: 240						
LRO Enabled	WPA WPA2		isable HT40 🗌 Die	sable HT80 🗌 Disable !	SGI		
GRO Enabled	Verbose Debug						
Print View Details	Logs Pro	be Display Sca	n Sync	Apply OK	Cancel		

C. Select the **Advanced Configuration** tab in the Port-Modify window to configure 802.1x and RADIUS server information.

	Por Current: LIN	t Stati IK-UP (IS Information		
	Driver Info: Po	rt Type	: WIFI-AP Paren	nt: wiphy0	
	F	Port Co	nfigurables		
Standard Configuration	Advanced Config	guratio	n Misc Configu	uration Custom WiFi	
Select 'WPA2' on th and enable Advance	Adv e Standard Configu ed/802.1x to enable	ration most (WiFi Settings screen to enable of these. Enablin	e Advanced/802.1x g 802.11u enables others.	
Ignore Probes:	zero (0%)	-	HESSID:		
Ignore Auth-Assoc:	zero (0%)	-	Realm:		
Ignore Assoc:	zero (O%)	-	IMSI:		
Ignore Re-Assoc:	zero (0%)	-	Milenage:		
Corrupt GTK:	zero (0%)	-	Domain:		
HS20 Capabilities			Consortium:		
HS20 Oper Class			RADIUS IP	127.0.0.1	
HS20 WAN Metrics			RADIUS Port	1820	
leee80211w:	Disabled (0)	-	RADIUS Secret	lanforge	
Venue Group:	Unspecified (0)	-	Venue Type:	Unspecified (0)	-
Network Type:	Private (0)	-	Address Types:	Not Available (0)	-
Network Auth:			3GPP Cell Net:		
Use 80211d	Use 80211h 🛛 Sho	ort-Pre	amble		
✓ Advanced/802.1x					
Enable 802.11u	802.11u Internet	t 🗌 8	802.11u ASRA] 802.11u ESR 🗌 802.11u	UESA

D. Select the ${\bf Custom}~{\bf WiFi}$ tab to add the following lines for HotSpot 2.0 Release 2.

ocsp_stapling	_response=/home/	lanforge/hs20/ca	a/ocsp-server-cache.der
---------------	------------------	------------------	-------------------------

vap1 (ct523-3n-f20) Configure Settings	\odot \otimes \otimes
Port Status Information	
Current: LINK-UP GRO NONE	
Driver Info: Port Type: WIFI-AP Parent: wiphy0	
Port Configurables	
Standard Configuration Advanced Configuration Misc Configuration Custom WiFi	
Custom WiFi	1
User-Specified supplicant/hostapd configuration text:	
ocsp_stapling_response=/home/lanforge/hs20/ca/ocsp-server-cache.der	
•	
	Cancel

E. Modify the second VAP on wiphy1 to be the **Passpoint** AP. Configure IP Address and SSID.

	vap2 (ct5	23-3n-f20) Configu	re Settings		\odot
		Port Status Inform	ation		
	Current:	LINK-UP GRO NON	E		
	Driver Info:	Port Type: WIFI-AP	Parent: wiphy1		
		Port Configurab	les		
Standard Configurat	ion Advanced Con	figuration Misc C	onfiguration Cu	stom WiFi	
Enable		General In	terface Settings		1
Set IF Down	Down	Aux-Mgt			
Set MAC	DHCP-IPv6	DHCP Release	DHCP Vendor ID:	None	
Set TX Q Len		Secondary-IRs	DHCP Client ID:	None	
Set MTU		BLANK	Drice client ib.		
Set Offload	UNS Servers:	BLANK	Clobal IDuc		
Set PROMISC	IP Address:				
	Gatoway ID:	233.233.233.0	LINK IPVO.		
Continue	Galeway IP:	0.0.0.0	MTU:	1600	
HTTP	MAC Addr	00.00.90.22.17.49	TV O Lon	1000	
	MAC AUDI.	00:00:00:23:17:48	IX Q Lell		
Jun	Rpt Timer:	medium (8 s)	WIFI Bridge:	NONE	
		WiF	i Settings		
Low Level	SSID: ABCD	-5678	▼ AP:	DEFAULT	
	Key/Phrase:		Mode:	802.11abqn 💌	
TSO Enabled	Freq/Channel: 518	0/36	Rate:	OS Default 💌	
UFO Enabled	DTIM-Period: 2		Max-STA:	2007	
GSO Enabled	Beacon: 240				
LRO Enabled	WPA WPA2	OSEN WEP	Disable HT40 🔲 Dis	sable HT80 🗌 Disable SGI	
GRO Enabled	Verbose Debug				
,					
int View Details	Logs Pro	be Display Sca	n Sync	Apply OK	Cance

F. Select the **Advanced Configuration** tab in the Port-Modify window to configure 802.1x, 802.1u, HotSpot 2.0, RADIUS server and other information.

		Por	t Status Informat	ion	1
	Current	LIN			
	Driver Inf	o Dor	t Type: WIELAD	Parent: winby]	
	Driver in	0. FUI	c type. Witt-AP		_
		Р	ort Configurable	6	
Standard Configura	tion Advanced C	onfigur	ation Misc Con	figuration Custom WiFi	
		Adv	anced WiFi Settir	igs	
Select 'WPA2' on th	e Standard Configu ed/802.1x to enable	ration most o	screen to enable	Advanced/802.1x 1802.11u enables others.	
Ignore Probes:	zero (0%)	-	HESSID:	00:00:00:00:00	
Ignore Auth-Assoc:	zero (0%)	-	Realm:	0,ct523-3n-f20.lanforge.local,12[5:6],21[2:4][5:7]	
Ignore Assoc:	zero (0%)	-	IMSI:		
Ignore Re-Assoc:	zero (0%)	-	Milenage:		
Corrupt GTK:	zero (0%)	-	Domain:	ct523-3n-f20.lanforge.local	
HS20 Capabilities			Consortium:		
HS20 Oper Class			RADIUS IP	127.0.0.1	
HS20 WAN Metrics			RADIUS Port	1821	
leee80211w:	Disabled (0)	-	RADIUS Secret	lanforge	
Venue Group:	Unspecified (0)	-	Venue Type:	Unspecified (0)	
Network Type:	Private (O)	-	Address Types:	Not Available (O) 🗨	
Network Auth:			3GPP Cell Net:		
Use 80211d	Use 80211h 🛛 🔲 She	ort-Pre	amble		
Advanced/802.1x	▶ HotSpot 2.0	🗌 Disa	ble DGAF		
✓ Enable 802.11u	802.11u Interne	t 🗌 8	302.11u ASRA	802.11u ESR 🔤 802.11u UESA	

G. Select the ${\bf Custom}~{\bf WiFi}$ tab to add the following lines for HotSpot 2.0 Release 2.

hs20_icon=64:64:eng:image/png:logo-64x64.png:/home/lanforge/hs20/www/logo-64x64.png
osu_ssid="ABCD-1234"
osu_server_uri=https://osu-server.ct523-3n-f20.lanforge.local/hs20/spp.php/signup?realm=ct523-3n-f20.lanforge.local
osu_friendly_name=eng:LANforge HS20 Operator
osu_nai=osen@lanforge.com
osu_method_list=1 0
osu_icon=logo-64x64.png
osu_service_desc=eng:LANforge Example services

0	vap2 (ct523-3n-f20) Configure Settings	\odot \land \times
	Port Status Information Current: LINK-UP GRO NONE Driver Info: Port Type: WIFI-AP Parent: wiphy1	
	Port Configurables	
Standard Configuration	Advanced Configuration Misc Configuration Custo	om WiFi
User-Specified s hs20_icon=64.64.eng:ir osu_said="ABCD-1234" osu_server_uri=https:// osu_naieosten@lanforg osu_naieosten@lanforg osu_method_list=1 0	upplicant/hostapd configuration text: nage/png:logo-64x64.png:/home/lanforge/hs20/www/logo-64x64.png susserver.ct523-3n-f20.lanforge_local/hs20/spp.php/signup?realm=ct523-3n-f20.lan LANforge H520 Operator .com	nforge.local
osu_service_desc=eng:	ng JANforge Example services	
Print View Details Lo	ygs Probe Display Scan Sync	Apply OK Cancel

 $\ensuremath{\text{H}}.$ Modify wiphy0 and wiphy1 to be on the same channel and select OK.

•	wiphy0 (ct523-3n-f20) Configure Settings 💿 🔿 😒					
Port Status Information Current: LINK-DOWN NONE Driver Info: Port Type: WIFI-Radio Driver: ath9k() Bus:						
Enable	Down	Port Configurabl General Int	es erface Settings			
Set MAC Set TX Q Len	DHCP-IPv6	DHCP Release	DHCP Vendor ID: DHCP Client ID:	None		
Set MID Set Offload	DNS Servers: IP Address: IP Mask:	BLANK 0.0.0.0 0.0.0.0	Peer IP: Global IPv6:			
	Gateway IP: Alias:	0.0.0.0	IPv6 GW: MTU:	AUTO		
	MAC Addr: Rpt Timer:	00:00:80:43:33:71 medium (8 s)	WiFi Bridge:	NONE		
	Max-VIFs: 204 Country:	B Max-Stations: 20 United States (84	48 Max-APs: 8 Su	pports: 802.11abgn		
	Channel/Freq Antenna:	: 36 (5180 Mhz)	Tx-Powe	er: DEFAULT		
RTS: DEFAULT Frag: 2346 Verbose Debug						
Print View Details	Logs	Probe Sy	nc Apply	OK Cancel		

0	wiphy1 (ct5	23-3n-f20) Configu	ire Settings	\sim \sim		
	Current: LINI Driver Info: Por	Port Status Informa K-DOWN NONE t Type: WIFI-Radio	ation Driver: ath9k() Bu	ıs:		
		Port Configurabl	es			
Enable —		General Int	terface Settings	1		
Set IF Down	Down	Aux-Mgt				
Set MAC	DHCP-IPv6	DHCP Release	DHCP Vendor ID:	None		
Set TX Q Len	DHCP-IPv4	Secondary-IPs	DHCP Client ID:	None		
Set Offload	DNS Servers:	BLANK	Peer IP:	NA		
Set PROMISC	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:43:37:48	TX Q Len	0		
	Rpt Timer:	medium (8 s) 🔻	WiFi Bridge:	NONE		
	Max-VIFs: 204	WiFi 18 Max-Stations: 20	Settings 48 Max-APs: 8 Su	pports: 802.11abgn		
	Country:	United States (84	•0) 🔻			
	Channel/Fred	: 36 (5180 Mhz)	-			
	Antenna:	All	Tx-Pow	er: DEFAULT		
	RTS:	DEFAULT	Frag:	2346		
Verbose Debug						
Print View Details	Print View Details Logs Probe Sync Apply OK Cancel					

I. In Netsmith, setup each VAP with DHCP Service on different IP networks.

•	Create/Mo	ify Connection	×
		Interface-Co	st: 1
Port 1-A:	10 (vap1)	RIP-Metric:	1
Port 1-B: 🗹 Skip	<auto create="" new="" port=""></auto>	VRRP IP:	0.0.0.0
WanLink: 🗹 Skip	<auto create="" new="" wanlink=""></auto>	VRRP ID:	
Port 2-B: 🗹 Skip	<auto create="" new="" port=""></auto>	VRRP Priority	100
Port 2-A: 🗹 Skip	<auto create="" new="" port=""></auto>	Next-Hop:	0.0.0.0
DHCP Lease Time:	43200	Subnets (a.b	.c.d/xx):
DHCP DNS:	10.88.1.1		
DHCP Range Min:	10.88.1.101		
DHCP Range Max:	10.88.1.250		
DHCP Domain:			-
DHCPv6 DNS:		Next-Hop-IPv	
DHCPv6 Range Min:		IPv6 Subnets	; (aaa::0/xx):
DHCPv6 Range Max:			
DHCPd Config File:			
]
🗌 NAT 🕑 DHCP	DHCPv6 Custom DHC	Cancel	Cand-RP

•	Create/Mo	lify Connection	×
		Interface-Cost:	1
Port 1-A:	11 (vap2)	RIP-Metric:	1
Port L.B. ZSkin	<auto create="" new="" ports<="" td=""><td>OSPF Area:</td><td>0.0.0.0</td></auto>	OSPF Area:	0.0.0.0
Ропст-в. С экр	sate create new roles	VRRP IP:	0.0.0/24
WanLink: 🗹 Skip	<auto create="" new="" wanlink=""></auto>	VRRP ID:	
Port 2-B: Skip	<auto create="" new="" port=""></auto>	VRRP Priority:	
		VRRP Interval:	
Port 2-A: V Skip	<auto create="" new="" port=""></auto>	Next-Hop:	0.0.0.0
DHCP Lease Time:	43200	Subnets (a.b.c.d/xx):	
DHCP DNS:	10.1.1.1		
DHCP Range Min:	10.1.1.11		
DHCP Range Max:	10.1.1.100		
DHCP Domain:			
DHCPv6 DNS:		Next-Hop-IPv6:	
DHCPv6 Range Min:		IPv6 Subnets (aaa::0/xx)	:
DHCPv6 Range Max:			
DHCPd Config File:			
	DHCPv6 Custom DHC	VRRP Cand-RP	
		Cancel	
	UK	Cancer	

J. Check that the VAP hostapd processes are running with the command:

ps auxwww |grep hostapd_vap

If they are not running, check the log files for problems:

tail -f /home/lanforge/wifi/hostapd_log_vap1.txt
tail -f /home/lanforge/wifi/hostapd_log_vap2.txt

For more information see WiFi Testing: Configuring a Virtual AP with Limited Stations

6. Start the Online Certificate Status Protocol (OCSP) script which will restart the OCSP Responder and update the cache once per minute. It is only required on the VAP or server side of a HotSpot 2.0 R2 network.

cd /home/lanforge ./ocsp.bash > /dev/null 2>&1 & 7. In Netsmith, we can label the two Virtual Routers containing each VAP. We also setup a single TCP connection named 'test1' between the client (wlan2) and a virtual interface connected to the Passpoint AP. In this way, we can verify that the client is only allowed to pass traffic once it has met the authentication requirements for the HotSpot and Service Provider Networks.



For more information see

- , Virtual Router with NAT Cookbook , Virtual Router with DHCP Cookbook
- 8. Setup wlan2 as the HotSpot 2.0 R2 client.

A. Modify wlan2 on the Port Mgr tab and set the SSID to the OSEN AP's SSID 'ABCD-1234' in this example and set the authentication to OSEN.

0	wlan2 (ct5	23-3n-f20) Configu	re Settings		\odot \otimes \times						
	Port Status Information Current: DOWN LINK-DOWN GRO NONE Driver Info: Port Type: WIFI-STA Parent: wiphy2										
(Port Configurables										
Standard Configura	Standard Configuration Advanced Configuration Misc Configuration Custom WiFi Enable General Interface Settings Custom WiFi										
Set IF Down	Set IF Down Aux-Mgt										
Set TX Q Len	DHCP-IPv6	☑ DHCP Release	DHCP Vendor ID:	None							
Set MTU	DHCP-IPv4	Secondary-IPs	DHCP Client ID:	None							
Set PROMISC	IP Address:	0.0.0.0	Global IPv6:	AUTO							
Services —	IP Mask: Gateway IP:	0.0.0.0	Link IPv6: IPv6 GW:	AUTO AUTO							
	Alias: MAC Addr:	00:03:7f:00:00:00	MTU: TX O Len	1500							
Low Level	Rpt Timer:	faster (1 s) 🔻	WiFi Bridge:	NONE							
D PROMISC	WiFi Settings										
GSO Enabled	SSID: // Key/Phrase: Freq/Channel: WPA WF	5180/36 •A2 OSEN WEI	▼ AP: DEFA Mode: 802. Rate: 05 D Disable HT40	ULT 11abqn-AC fault Disable SGI							
Print View Details	Probe	Display Scan	Sync	ррly OK	Cancel						

B. In wlan2 Advanced WiFi Settings, select Advanced/802.1x, set Key Management, EAP Identity and CA Cert File.

	office and the start type				
	Port Co	onf	igurables		
Standard Configurati	on Advanced Configu	ла	tion Misc Cor	nfiguration	Custom WiFi
Select 'WPA2' on the and enable Advance	he Standard Configurat ced/802.1x to enable mo	tio	n screen to ena of these. Enab	able Advance ling 802.11u	ed/802.1x enables others.
Key Management:	OSEN	-	HESSID:		
Pairwise Ciphers:	DEFAULT	-	Realm:		
Group Ciphers:	DEFAULT	-	Client Cert:		
WPA PSK:			IMSI:		
EAP Methods:	DEFAULT	-	Milenage:		
EAP Identity:	osen@lanforge.com		Domain:		
EAP Anon Identity:			Consortium:		
EAP Password:			Phase-1:		
EAP Pin:			Phase-2:		
Private Key:			PK Password:		
CA Cert File:	/home/lanforge/ota-ca.pe	em	PAC File:		
Network Auth:			leee80211w:	Disabled (0))
Advanced/802.1	x 🗌 Enable 802.11u		HotSpot 2.0	Enable PK	C

C. In wlan2 Misc Configuration, set OCSP to Required.

c	Port Stat	IIS I	· · · ·		
(nformation		
E CONTRACTOR OF CO	viver lafe: Down Li	· M	ELSTA Darant: w	inby2	
L	niver into: Port Type		FI-STA Parent, w	ipiiyz	
	Port C	onfi	gurables		
Standard Configuration	Advanced Config	urat	ion Misc Configu	uration Custom WiFi	
	More V	ViFi	Settings		
OCSP:	Required (2)	-			
Freq-2.4:	0xfffffff		Freq-5:	0xfffffff	
AMPDU-Factor:	OS Default	-	AMPDU-Density:	OS Default 💌	
Max-AMSDU:	OS Default	-	Bridge-IP:	0.0.0.0	
X-Coordinate:	0		Y-Coordinate:	0	
Z-Coordinate:	0]		
Post IF-UP Script:				•	
Custom WPA Cfe	WPA Cfg:				
🗌 Scan Hidden 🗌	Allow Migration 🔲 I	BSS	Mode		
Restart DHCP o	n Connect 🔤 🤋	kip	Portal on Roam		
				,pp.,	

D. Admin up wlan2 and it will associate with the OSEN AP and obtain an IP address on the OSEN AP IP network.



9. Initiate Online Sign-Up

A. In a terminal window type the following:

cd /home/lanforge/wifi/osu_wlan2				
~lanforge/local/hs20/client/hs20-osu-client	<pre>-x /home/lanforge/local/hs20/spp/spp.xsd</pre>	-dd -S	wlan2	signup

B. Select 'LANforge HS20 Operator' from the Service Provider List.



C. Select 'Sign up for free access' from the Online Sign-Up page.

Hotspot 2.0 signup (as superuser)	\odot \otimes \otimes
Sign up for a subscription - ct523-3n-f20.lanforge.local	
Sign up for free access	
Select a username and password. Leave password empty to get automatically generated ar machine managed password. Username: Password: Complete subscription registration Enroll a client certificate	nd



10. Client wlan2 will obtain an IP address on the Passpoint AP IP network and TCP connection 'test1' can now pass traffic.



Control Reporting Tear-Off Info Plugins Stop All Restart Manager Refresh HELP File-IO Layer-4 Generic Test Group Resource Mgr Event Log Alerts Port Mgr Messages Status Layer-3 L3 Endps VoIP/RTP VoIP/RTP Armageddon WanLinks Attenuators Collision-Domains Rpt Timer: default (5 s) Go Test Manager all Select All Start Stop Quiesce Clear View 0 - 200 V Go Display Create Modify Delete Cross Connects for Selected Test Manager Name Type State Pkt Rx A Pkt Rx B Bps Rx A Bps Rx B Rx Drop % A Rx Drop % B Drop Pkts A Drop Pkts A test1 LF/TCP Run 201 203 1,539,146 1,541,123 0 0 0	•				ANforge M	anager Versior	n(5.3.2.2)				\odot \times \times
Stop All Restart Manager Refresh HELP File-IO Layer-4 Generic Test Group Resource Mgr Event Log Alerts Port Mgr Messages Status Layer-3 L3 Endps VoIP/RTP VoIP/RTP Event Log Alerts Port Mgr Messages Rpt Timer: default (5 s) Image Go Test Manager all Select All Start Stop Quiesce Clear View 0 - 200 Image Go Imaged Display Create Modify Delete Cross Connects for Selected Test Manager Name Type State Pkt Rx A Pkt Rx B Bps Rx A Bps Rx B Rx Drop % A Rx Drop % B Drop Pkts A Drop Pkts test1 LF/TCP Run 201 203 1,539,146 1,541,123 0 0 0 0 4 Image: Intra transport Image: Intra	<u>Control</u> <u>Report</u>	ting <u>T</u> ea	r-Off <u>I</u> nfo	Plugins							
File-IO Layer-4 Generic Test Mgr Test Group Resource Mgr Event Log Alerts Port Mgr Messages Status Layer-3 L3 Endps VolP/RTP VolP/RTP Endps Armageddon WanLinks Attenuators Collision-Domains Rept Timer: default (5 s) Go Test Manager all Go Select All Statt Status Status Create Modify Delete Cross Connects for Selected Test Manager Name Type State Pkt Rx A Pkt Rx B Bps Rx A Bps Rx B Rx Drop % A Rx Drop % B Drop Pkts A Drop Pk						Stop All	Restart N	lanager		Refresh	HELP
Image: Status Layer-3 L3 Endps VolP/RTP VolP/RTP Endps Armageddon WanLinks Attenuators Collision-Domains Rpt Timer: default (5 s) Go Test Manager all Imageddon Select All Status Status Collision-Domains View 0 - 200 Imageddon Go Imageddon Display Create Modify Delete Cross Connects for Selected Test Manager Name Type State Pkt Rx A Pkt Rx B Bps Rx A Bps Rx B Rx Drop % A Rx Drop % B Drop Pkts A Drop Pkts test1 LF/TCP Run 201 203 1,539,146 1,541,123 0 0 0 4 Imaged in te: Inscalbact 4002 ac: Admin Adm	File-10 / Laver-4 / Generic / Test Mar / Test Group / Resource Mar / Event Log / Alerts / Port Mar / Messages										
Rpt Timer: default (5 s) Go Test Manager all Select All Start Stop Quiesce Clear Display Create Modify Delete Cross Connects for Selected Test Manager Name Type State Pkt Rx A Pkt Rx B Bps Rx A Bps Rx B Rx Drop % A Rx Drop % B Drop Pkts A Drop Pkts test1 LF/TCP Run 201 203 1,539,146 1,541,123 0 0 0 I sealbact: 4002. ac: Admin	Status Layer-3 L3 Endps VolP/RTP Endps Armageddon WanLinks Attenuators Collision-Domains										
View 0 - 200 Image: Go Display Create Modify Delete Cross Connects for Selected Test Manager Name Type State Pkt Rx A Pkt Rx B Bps Rx A Bps Rx B Rx Drop % A Rx Drop % B Drop Pkts A Drop Pkts test1 LF/TCP Run 201 203 1,539,146 1,541,123 0 0 0 1 Image: State in the image in the imag	Rpt Tim	Rpt Timer: default (5 s) 🗸 Go Test Manager all 🗸 Select All Start Stop Quiesce Clear									
Cross Connects for Selected Test Manager Name Type State Pkt Rx A Pkt Rx B Bps Rx A Bps Rx B Rx Drop % A Rx Drop % B Drop Pkts A Drop Pkts test1 LF/TCP Run 201 203 1,539,146 1,541,123 0 0 0	View	0 - 2	00		🔻 Go		Displ	ay Cr <u>e</u> ate	e <u>M</u> odify	Delete]
Name Type State Pkt Rx A Pkt Rx B Bps Rx A Bps Rx B Rx Drop % A Rx Drop % B Drop Pkts A Drop Pkts test1 LF/TCP Run 201 203 1,539,146 1,541,123 0 0 0 0 1 Image: State I					-Cross Con	nects for Selecte	d Test Manager				
test1 LF/TCP Run 201 203 1,539,146 1,541,123 0 0 0 Image: Image in the local bact 4002, act Admin Image in	Name	Туре	State	Pkt Rx A	Pkt Rx B	Bps Rx A	Bps Rx B	Rx Drop % A	Rx Drop % B	Drop Pkts A	Drop Pkts
▲ ►	testl	LF/TCP	Run	201	203	1,539,146	1,541,123	0	0	0	
Logged in to: localbest: 4002 as: Admin					III			1			
	Logged in to	localbo	st:/1002 a	e: Admin							

11. If wlan2 is reset or reassociates with the OSEN AP, you will have to remove the Service Provider (SP) directory before attempting the Online Sign-Up again.

cd /home/lanforge/wifi/osu_wlan2 rm -rf SP

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