

LANforge WiFi Many vAP Testing

Goal: Create 7 vAP on a single a/b/g/n/AC radio to emulate a busy environment and test that station devices associate to the proper AP.

Requires LANforge 5.3.3 or later. Configure 7 vAP, add the vAP to a bridge and set up DHCP. The Device Under Test (DUT) in this case is a mobile handset or other wifi station device. Verify that station can handle many APs and select an appropriate AP from the available scan results. This example uses a LANforge CT523 system but the procedure should work on all CT521, CT522, CT523 and CT525 systems.

1. In the **Ports** tab, select the radio **wiphy2** and click **Create**. Configure the values appropriately and click create.

0			Create VLANs o	n Port: 1.2.04		\odot
0	○ MAC-VLAN ○ WiFi STA	○ 802.1Q-VLAN ○ F ® WiFi VAP ○ WiFi M	Redirect 🔾 Bri Ionitor 🔾 WiFi	dge		
0	Shelf:	1 💌	Resource:	2 (ben-ota2) 🔻	Port: 4 (w	riphy2) 💌
B	VLAN ID:		DHCP-IPv4			
	Parent MAC:	04:f0:21:11:e7:3b	DHCP Client ID:	None 🗸		
	MAC Addr:	XX:XX:XX:*:*:XX 💌	IP Address:		Global IPv6:	AUTO
	Quantity:	7	IP Mask or Bits:		Link IPv6:	AUTO
			Gateway IP:		IPv6 GW:	AUTO
	#1 Redir Name:		#2 Redir Name:			
	STA ID:	200	SSID:	ben-ota-w2-1		
	WiFi AP:		Key/Phrase:]
	WPA	WPA2	WEP			
0	Down					
	Apply	<u>C</u> ancel		Creating	port 7 of 7	

2. In the **Ports** tab you will see the new WiFi vAP:

LANforge Manager Version(5.3.3) ben-title										
<u>C</u> ontrol <u>R</u> eporting <u>T</u> ear-Off <u>I</u> nfo <u>P</u> lugins										
Stop All Restart Manager Refresh HELP										
File-IO [Layer-4 Generic Test Mgr Test Group Resource Mgr Event Log Alerts Port Mgr Messages										
Status Layer-3 L3 Endps	VOIP/RTP	VOIP/RTP	'Endps Al	mageddor	n wani	INKS	Attenuators	Collisio	n-Domains	
Disp: 192.168.100.149:0.0	Disp: 192.168.100.149:0.0 Sniff Packets Clear Counters Reset Port Delete									
Rpt Timer: medium (8 s) 💌	App	oly	<u>V</u> iew	Details	Cre	ate	<u>M</u> odify	Batch Me	odify	
	All	Ethernet I	nterfaces (Po	rts) for all	Resource	s. —				
Port Pha Down IP	SEC Alia	as Parent Dev	RX Bytes	RX Pkts	Pps RX	bps RX	TX Bytes	TX Pkts	Pps TX	
1.2.10 0.0.0.0	0 vap20	0 wiphy2	0	0	0	0	1,116	11	0	
1.2.11 0.0.0.0	0 vap20)1 wiphy2	0	0	0	0	792	8	0	
1.2.12 0.0.0.0	0 vap20)2 wiphy2	0	0	0	0	1,008	10	0	
1.2.13 0.0.0.0	0 vap20)3 wiphy2	0	0	0	0	792	8	0	
1.2.14 0.0.0.0	0 vap20	04 wiphy2	0	0	0	0	792	8	0	
1.2.15 0.0.0.0	0 vap20	05 wiphy2	0	0	0	0	792	8	0 =	
1.2.16 0.0.0.0	0 vap20	06 wiphy2	0	0	0	0	792	8	0 🚽	
Logged in to: ben-ota-1:4002 as:	Admin									

3. Select the Status panel in the LANforge GUI, and click the Netsmith button for the appropriate resource. Right-

click and select the 'New Bridge' option. In this example, I selected 'br2' as the bridge name. After creating the bridge, click Sync to show the new bridge device. Right-click on it and select Modify Port. Add each of the vAP you just created to the bridge and then apply:

•	br2 (ben-ota2) Configure Settings										
Port Status Information Current: LINK-UP PROBE-ERROR TSO UFO GSO GRO Driver Info: Port Type: Bridge Driver: bridge(2.3) Bus: N/A											
Port Configurables											
Enable ——											
Set IF Down	Down	Aux-Mgt				300					
Set MAC	DHCP-IPv6	DHCP Release	DHCP Vendor ID:	None	Bridge Priority	32768					
Set TX Q Len		Secondary-IPs	DHCP Client ID:	None	Max Age:	20					
Set MTU			Door ID:	NA	Hello Time:	2	-				
Set Offload	ID Address	88 1 1 1	Global IPv6		Forwarding Delay	- 15	-				
Set Bridge Info	IP Mask:	255.255.255.0	Link IPv6:	AUTO	r or marang benay						
	Gateway IP:	0.0.0.0	IPv6 GW:	AUTO							
	Alias:		MTU:	1500							
	MAC Addr:	04:f0:21:3c:07:3b	TX Q Len	0							
	Rpt Timer:	medium (8 s) 🔻	WiFi Bridge:	NONE							
	Bridg	je Information ——	Remov	e Ports	I						
Services —	Configured Po	rts Current Ports									
🔲 НТТР	vap200 vap201	vap200 vap201	Add Po	orts							
FTP	vap202	vap202	/ap202 vap200 vap201 vap202 vap203 vap204								
RADIUS	vap203	vap203	vap205 vap206								
1	vap204	vap204									
	vap206	vap200									
			·								
	Print View	Details P	robe Sync	Apply Ok	Cancel]					

4. Create a virtual router in Netsmith and add br2, and optionally a wired port (eth1) to the router. Double-click the br2 port and configure DHCP to match its IP address. When complete, Netsmith should look something like this:



5. Now, we should have 7 vAP able to accept stations and give out DHCP addresses. Depending on the DUT, the user may wish to run iperf on LANforge, or on an upstream device connected to the LANforge eth1 port. For an initial test, make sure the DUT can connect to one of the vAP and get an IP address. The DUT should also see each of the vAP in its listing of available APs. This example will use LANforge WiFi Station on a different radio as the DUT. Here is a listing of the scan results:

o wiphy0 Scan Results										 ×
SSID	Channel	Info	Auth	BSS	Signal	Frequency	Beacon	Age		
ben-ota-w2-1	149+	3x3 MCS 0-9 AC	Open	04:f0:21:7b:11:3b	-18.0	5745	240	2.83 m		-
ben-ota-w2-1	149+	3x3 MCS 0-9 AC	Open	04:f0:21:d4:c5:3b	-20.0	5745	240	2.83 m		
ben-ota-w2-1	149+	3x3 MCS 0-9 AC	Open	04:f0:21:af:2c:3b	-18.0	5745	240	2.83 m		
ben-ota-w2-1	149+	3x3 MCS 0-9 AC	Open	04:f0:21:ff:98:3b	-19.0	5745	240	2.83 m		=
ben-ota-w2-1	149+	3x3 MCS 0-9 AC	Open	04:f0:21:f7:61:3b	-21.0	5745	240	2.83 m		
ben-ota-w2-1	149+	3x3 MCS 0-9 AC	Open	04:f0:21:3c:07:3b	-18.0	5745	240	2.83 m		
ben-ota-w2-1	149+	3x3 MCS 0-9 AC	Open	04:f0:21:f3:0b:3b	-21.0	5745	240	2.83 m		-
		· · ·		Pause		Scan	S	ync	Close	

6. To make it a bit more interesting, we will now set the operating modes for one AP to be 802.11a, a second to be 802.11n, and the rest will remain 802.11AC. These APs are running on channel 149, so b and g mode are not available on this radio. To set the mode, double-click the vap200 row and set the Mode to be 802.11a and click OK to apply. Use similar procedure to set vap201's mode to 802.11an:

	vap200 (k	oen-ota2) Configure	Settings		\odot \land \times						
Port Status Information											
Current: LINK-UP GRO NONE											
Driver Info: Port Type: WIFI-AP Parent: wiphy2											
Port Configurables											
Standard Configuration Advanced Configuration Misc Configuration Custom WiFi											
Enable —	Enable General Interface Settings										
Set IF Down	Down	Aux-Mgt	<u>,</u>								
Set MAC		DHCP Release	DHCP Vendor ID:	None							
🔲 Set TX Q Len		Secondary-IPs	DHCP Client ID:	None							
Set MTU		DIANK	Door ID:	NA							
Set Offload	ID Address:		Global IDv6:								
Set PROMISC	IP Mask		Link IPv6								
	Gateway IP:	0.0.0.0	IPv6 GW:	AUTO							
- Services -	Alias:		MTU:	1500							
П НТТР	MAC Addr:	04:f0:21:7b:11:3b	TX Q Len	1000							
FTP	Rpt Timer:	medium (8 s) 👻	WiFi Bridge:	NONE							
		WiFi	Settings								
Low Level	SSID: ben-o	ta-w2-l	▼ AP:	DEFAULT							
	Key/Phrase:		Mode:	802.11a 💌							
TSO Enabled	Freq/Channel: 5745	5/149	Rate:	OS Default 💌							
UFO Enabled	DTIM-Period: 2 Max-STA: 2007										
GSO Enabled	GSO Enabled Beacon: 240										
LRO Enabled	WPA WPA2	OSEN WEP D	isable HT40 🔲 Dis	sable HT80 🗌 Disable SGI							
GRO Enabled	Verbose Debug										
Print View Details	Logs Pro	be Display Sca	Sync	Apply OK	Cancel						

7. Now, request the DUT to re-scan and re-associate to the network. There should now be one 802.11a, one 802.11n, and 5 802.11AC vAP in the scan results. A well behaved DUT should attempt to connect to the AP with the higest rate that the DUT supports. In this case, the LANforge Station properly selected the 802.11AC vAP:

o wiphy0 Scan Results 📀										\diamond ×
SSID	Channel	Info	Auth	BSS	Signal	Frequency	Beacon	Age		
pen-ota-w2-1	149	802.11a	open	04:T0:21:9T:77:3D	-25.0	5745	240	1.83 n		
ben-ota-w2-1	149	802.11a	Open	04:f0:21:7b:11:3b	-24.0	5745	240	3.42 m		
ben-ota-w2-1	149+	3x3 MIMO	Open	04:f0:21:d4:c5:3b	-23.0	5745	240	3.42 m		
ben-ota-w2-1	149+	3x3 MCS 0-9 AC	Open	04:f0:21:af:2c:3b	-22.0	5745	240	3.42 m		
ben-ota-w2-1	149+	3x3 MCS 0-9 AC	Open	04:f0:21:ff:98:3b	-23.0	5745	240	3.42 m		
ben-ota-w2-1	149+	3x3 MCS 0-9 AC	Open	04:f0:21:f7:61:3b	-22.0	5745	240	3.42 m		
ben-ota-w2-1	149+	3x3 MCS 0-9 AC	Open	04:f0:21:3c:07:3b	-24.0	5745	240	3.42 m		
ben-ota-w2-1	149+	3x3 MCS 0-9 AC	Open	04:f0:21:f3:0b:3b	-23.0	5745	240	3.42 m		
ben-ota-w2-4	149+	3x3 MCS 0-9 AC	Open	04:f0:21:95:03:3b	-25.0	5745	240	1.83 h		-
				Pause		Scan	5	Sync	Close	

8. For additional testing, you may wish to use additional LANforge radios to create more vAP, change the SSID and configure DUT to connect to a particular SSID, admin down vAP to make sure DUT will properly connect to a new AP, and much more. You may also run traffic on the different APs to ensure that if a DUT connects to a 802.11a AP, then it does not try to send any 802.11n (HT) encoded traffic. A LANforge radio configured for monitor mode could verify this, as could third-party sniffers.:

0	Ca	oturing from moni5a [Wi	reshark 1.10.14 (Git Rev U	Jnknown fr	rom unknown)] (on ben-ota-1)	\odot \land \times
File Edit	View Go Capture Analyze Statis	stics Telephony Tools Inter	mals Help			
•	🖊 🗖 🙇 🖻 🗎 🗙 G	Q 🔄 🖓 😓 👼	× . • •	1	🅁 🗹 🎦 🚥 🙄	
Filter:	wlan.addr == 04:f0:21:11:e7:3a	🛔 Exp	ression Clear Apply	Save	bss-cross ibss-10k sta1000 vap50 wlan2-o1	
No.	Time	Source	Destination	Protocol	Length Info	4
23130	2015-10-12 09:33:04.560572000	88.1.1.1	88.1.1.10	TCP	100 33002 > 12439 [RST] Seq=1 Win=0 Len=0	
23132	2015-10-12 09:33:04.560919000	88.1.1.10	88.1.1.1	TCP	1560 10853 > 33002 [ACK] Seq=932513 Ack=1 Win=29696 Len	=1448 TS
23133	2015-10-12 09:33:04.560971000		CompexPt_11:e7:3a (RA)	802.11	36 Acknowledgement, Flags=	
23134	2015-10-12 09:33:04.561092000	88.1.1.10	88.1.1.1	TCP	112 34187 > 33002 [ACK] Seq=942649 Ack=2 Win=29696 Len	=0 TSval
23135	2015-10-12 09:33:04.561150000		CompexPt_11:e7:3a (RA)	802.11	36 Acknowledgement, Flags=	
23136	2015-10-12 09:33:04.561215000	88.1.1.1	88.1.1.10	тср	100 33002 > 16029 [RST] Seq=1 Win=0 Len=0	
23138	2015-10-12 09:33:04.561536000	CompexPt_11:e7:3a (TA)	CompexPt_9f:77:3b (RA)	802.11	34 Request-to-send, Flags=	
23139	2015-10-12 09:33:04.561553000	CompexPt_11:e7:3a (TA)	CompexPt_9f:77:3b (RA)	802.11	42 Request-to-send, Flags=	
23140	2015-10-12 09:33:04.561621000		CompexPt_11:e7:3a (RA)	802.11	36 Clear-to-send, Flags=	
23141	2015-10-12 09:33:04.561638000	88.1.1.10	88.1.1.1	TCP	112 21314 > 33002 [ACK] Seq=936857 Ack=2 Win=29696 Len	=0 TSval
23142	2015-10-12 09:33:04.561694000		CompexPt_11:e7:3a (RA)	802.11	36 Acknowledgement, Flags=	
23143	2015-10-12 09:33:04.561818000	88.1.1.10	88.1.1.1	тср	112 11352 > 33002 [ACK] Seq=939753 Ack=2 Win=29696 Len	=0 TSval
23144	2015-10-12 09:33:04.5618/5000		CompexPt_11:e7:3a (RA)	802.11	36 Acknowledgement, Flags=	
23145	2015-10-12 09:33:04.562019000	CompexPt_9f:77:3b (TA)	CompexPt_11:e7:3a (RA)	802.11	34 Request-to-send, Flags=	
23140	2015-10-12 09:33:04.562036000	CompexPt_9T:77:3b (TA)	CompexPt_II:e7:3a (RA)	802.11	42 Request-to-send, Flags=	
23140	2013-10-12 09.33.04.302121000	00.1.1.1	88.1.1.10	TCP	100 33002 > 34187 [K31] Seq=1 Willed Lelled	• • •
▶ Frame 2 ▼ Radiota	3143: 112 bytes on wire (896 b p Header v0, Length 26	its), 112 bytes captured	(896 bits) on interface	θ		
Header	revision: 0					
Header	pad: 0					
Header	length: 26					
▶ Presen	t flags					
MAC ti	mestamp: 15435269					
▶ Flags:	0×00					
Data R	ate: 54.0 MD/s					
Channe	L Trequency: 5745 [A 149]					
P Channe	apple 12 dBm					
551 51	gilat: -15 ubili					
► BY fla						
P NA TLA	gs. 0x0000					T
0010 00	6c 71 16 40 01 f3 00 00 00 88	3 01 2c 00 04 f0 .lq.@				A
0020 21	9T // 3b 04 t0 21 11 e7 3a 04	+ TU 21 6C 45 3b !.w;.	.!:!LE;			0
0040 19	7f 40 00 40 06 6f 38 58 01 01	l 0a 58 01 01 01	.08 XX			
0050 2c	58 80 ea b1 fe 03 43 16 f9 do	94 80 10 00 1d ,X	c			
0060 ad	81 00 00 01 01 08 0a 0e 08 c8	3 37 00 46 ea 79	7.F.y			
	d this frame was sent/received Pa	ackets: 252694 · Displaye	Profile: Default			V

Candela Technologies, Inc., 2417 Main Street, Suite 201, Ferndale, WA 98248, USA www.candelatech.com | sales@candelatech.com | +1.360.380.1618