

Network Testing and Emulation Solutions

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Ethernet Cable

LANforge WiFi Rate v. Range Test

Goal: Compare WiFi performance for 'upload' traffic (client to AP) using a WiFi access point, a LANforge Attenuator and a LAN Virtual Station. Traffic is generated by a RFC-2544 script on a Layer-3 UDP connection.

This demo consists of one WiFi access point and one CT523

LANforge WiFIRE machine connected to the LANforge Attenuator with coax SMA cables. (This is **not** over the air testing). This requires LANforge release 5.2.7 or higher.



1. Create Virtual Station

	LANfor	ge Manage	er Versio	n(5.2.11)					↑ _ □ X
<u>Control Reporting Tear-Off</u> Info Plugin	ıs								
			Stop	All	Restart M	lanager		Refresh	HELP
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 Armageddon WanLinks Attenuators Collision-Domains									
Disp: 10.1.0.10:0.0	Sniff Packe	ets	Clear Co	unters	Reset Por	t Del	ete	1	I
Rpt Timer: medium (8 s) 🔻	Apply		View D	etails	Create	Mo	dify Ba	atch Modify	
	All Eth	ernet Interfa	aces (Ports) for all Res	sources. —				
Port Pha Down IP S	SEC Alias	RX Bytes	RX Pkts	Pps RX	bps RX	TX Bytes	TX Pkts	Pps TX	bps TX
1.1.15 10.26.10.1 0	ppp5	0	0	0	0	0	0	0	0
1.42.00 192.168.100.42 0	eth0	10,086	98	6	5,519	85,866	68	4	46,985
1.42.01 0.0.0.0 0	ethl	5,702	80	5	3,099	832	13	0	452
1.42.02 0.0.0.0 0	wiphy0	0	0	0	0	0	0	0	0
1.42.03 0.0.0.0 0	wiphy1	0	0	0	0	0	0	0	0 =
1.42.04 0.0.0.0 0	wiphy2	V 0	0	0	0	0	0	0	0
1.42.05 0.0.0.0 0	wlan0	0	0	0	0	0	0	0	0
1.42.06 0 0.0.0.0	wlan1	0	0	0	0	0	0	0	0 -
									•
Logged in to: 192.168.100.26:4002 as:	Admin								

A. Select radio wiphy1 and click Modify

B. Set the frequency of the radio to Auto

📓 wiphy(0 (kedtest.car	ndelatech.com) Co	nfigure Setting	js + _ □ X
		Port Status Informat	ion	
	Current: LINI	C-DOWN NONE		
	Driver Info: Por	t Type: WIFI-Radio D	river: ath9k() Bu	JS:
		Port Configurable	s	1
Enable		General Inte	rface Settings	1
🗹 Set IP Info	DHCP-IPv6	☑ DHCP Release	🗌 Down	Aux-Mgt
Set IP6 Info	DHCP-IPv4	Secondary-IPs	DHCP Client ID:	None 🔽
Set IF Down	DNS Servers:	BLANK	Peer IP:	NA
Set TX O Lon	IP Address:	0.0.0.0	Global IPv6:	AUTO
Set IX Q Len	IP Mask:	0.0.0.0	Link IPv6:	AUTO
Set Offload	Gateway IP:	0.0.0.0	IPv6 GW:	AUTO
Set DROMICC	Alias:		MTU:	0
	MAC Addr:	00:0e:8e:43:36:e9	TX Q Len	0
	Rpt Timer:	medium (8 s) 🔻	WiFi Bridge:	NONE
		WiFi S	ettings	
	Max-VIFs: 0 N	lax-Stations: 0 Max-	APs: 0 Supports	: 802.11g
	Country:	840 United	States 🔻	
	Channel/Freq	uency: AUTO (-1 Mh	z) 🔻	
	Antenna:	All WiFi c	hannel/frequenc means let the st	y. ations roam to all available char
	RTS:	DEFAU Some	channels are no	ot available in all locations.
	🗌 Verbose 🛙	ebug		
Print View Details	Logs	Probe Syn	с Арр	ly OK Cancel
A. Click OK				

- C. On the Port Modify tab, click **Create**
- D. Create virtual station with these paramters:

4			Create VLANs on	Port: 1.42.02				◆ _ □ ×
a	O MAC-VLAN	○ 802.1Q-VLAN ○ Re	direct 🔾 Bridge	GRE Tunnel				
	WiFi STA (🔾 WiFi VAP 🛛 🔾 WiFi Mon	itor					
2	Shelf:	1	Resource:	42 (kedtest)	-	Port: 2	(wiphy0)	-
â	VLAN ID:		DHCP-IPv4					
	Parent MAC:	00:0e:8e:43:36:e9	DHCP Client ID:		-			
	MAC Addr:	00:26:*:*:*:*	IP Address:			Global IPv6:	AUTO	
	Quantity:	1	IP Mask or Bits:			Link IPv6:	AUTO	
			Gateway IP:			IPv6 GW:	AUTO	
	#1 Redir Name:		#2 Redir Name:					
	STA ID:	0	SSID:	udptest			-	
	WiFi AP:		Key/Phrase:					
	Use WPA	Use WPA2	Use WEP					
4	Down	<u>C</u> ancel						
A	. Select Wifi STA	A Contraction of the second seco						
В	8. Choose DHCP	P-IPv4						
С	2. Quantity 1							
D	. Station ID 0							
E	. SSID 'udptest	.'						
F	. Click Apply							

- 2. Create upstream port wired to AP
 - A. Wire the eth1 port into the upstream connection of the AP under test.

C. Configure eth1 port with an upstream IP, like 10.26.2.3

Current: LINK-UP 1000bt-FD AUTO-NEGOTIATE Flow-Control TSO GSO GRO									
	Drive	er Info: Port Type: Et	thernet Driver: e	1000e(2.3.2-k) E	Bus: 0	000:04:00.0			
			Port Configu	rables					
		General Inte	erface Settings		1	Port Rates			
Set IP Info						○ 10bt-HD ○ 10bt-FD ○ 100bt-HD	Advertise Ra		
Set IF Down	DHCP-IPV6	DHCP Release		Aux-Mgt		O 100bt-FD	🖌 10bt-FD		
Set TX O Lop	DHCP-IPv4	Secondary-IPs	DHCP Client ID:	None	-	O 1000-FD	✓ 100bt-HE		
Set IX Q Leff	DNS Servers:	BLANK	Peer IP:	NA		Autonegotiate	✓ 100bt-FD		
Set Offload	IP Address:	10.26.2.3	Global IPv6:	AUTO			▶ 1000-FD		
Set Bate Info	IP Mask:	255.255.255.0	Link IPv6:	AUTO		Renegotiate	10G-FD		
	Gateway IP:	10.26.2.1	IPv6 GW:	AUTO		Restart Xcvr	Flow-Con		
Set Ry-All/ECS	Alias:		MTU:	1500		PROMISC	Offload		
Set Bypass	MAC Addr:	00:90:0b:2f:0a:0f	TX Q Len	1000		RX-ALL	TSO Enat		
Set Bridge Info	Br Cost:	Ignore 🗸	Priority:	lgnore	-	RX-FCS	UFO Enal		
Set CPU Mask	Rpt Timer:	medium (8 s) 🔻	Watchdog:	0	-	Bypass NOW!	GS0 Ena		
- Services -	CPU Mask:	NO-SET	WiFi Bridge:	NONE	-	Bypass Power-UP	LRO Enab		
HTTP						Bypass Power-DOWN	GRO Ena		
FTP						Bypass Disconnect	,		

- D. Set the Gateway to the AP wired interface IP.
- E. Click **OK**
- 3. Create and Test Cross Connect

A. Go to the Layer 3 tab	Α.	Go	to	the	Layer	3	tab	
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📓 LANforge Manager Version(5.2.11) 🔶 -	ο×
Control Reporting Tear-Off Info Plugins	
Stop All Restart Manager Refresh H	ELP
File-IO Layer-4 Generic Test Group Resource Mgr Event Log Alerts Port Mgr Mgrsages Status Laver-3 L3 Endps VolP/RTP VolP/RTP Armageddon WanLinks Attenuators Collision-Domain	ıs
Rpt Timer: fast (1 s) 🔻 Go Test Manager all 💌 Select All Start Stop Quiesce Clear	
View 0 - 200 🔽 Go Display Create Modify Delete	
Cross Connects for Selected Test Manager	
Name Type State Pkt Tx A \rightarrow B Pkt Tx A \leftarrow B Rate A \rightarrow B Rate A \leftarrow B Rx Drop % B Drop Pkts A Drop Pkts A	Rpt
	•
Logged in to: 192.168.100.26:4002 as: Admin	

A. Click Create

B. Create a cross connect with these qualities:

<u></u>	udptest - Create	/M	lodify Cross Connect				↑ _ □ ×
+ - All	Display S	Sync	Batch-Create	Арр	oly	ОK	Cancel
CX Name: CX Tvpe:	Cross-Connect udptest LANforge / UDP			•			
Resource:	Endpoint A 42 (kedtest)	-	Endpoint B 42 (kedtest)	•			
Port:	1 (eth1)	•	8 (sta0)	-			
Min Tx Rate:	New Modem (56 Kbps)	-	New Modem (56 Kbps)	-			
Max Tx Rate:	Same	-	Same	-			
Min PDU Size:	UDP Pld (1,472 B)	-	UDP Pld (1,472 B)	-			
Max PDU Size:	Same	-	Same	-			
IP ToS:	Best Effort (0)	-	Best Effort (0)	-			
Pkts To Send:	Infinite	-	Infinite	-			

- A. Make sure Endpoint A is eth1
- B. Make sure Endpoint B is **sta0**
- C. Min PDU Size for both should be 1472
- D. NOTE: These rate and PDU size settings will be manipulated by the script we setup later.
- C. Next, expand the screen to Level 4 using the [+] button.
- D. Configure the send buffer on $\ensuremath{\text{Endpoint B}}$ to $\ensuremath{\texttt{1}}\xspace$ MB

\$		udptest - Create/	Mod	ify Cross Conne	ct			↑ _ □ X
+ - All				Display S	ync Batch-Create		Apply OK	Cancel
CX Name: CX Tvpe:	Cross-Connect udptest			Report Timer:	Cross-Connect fast (1 s)			•
Resource: Port: Min Tx Rate: Max Tx Rate: Min PDU Size: Max PDU Size: IP ToS:	Endpoint A 42 (kedtest) 1 (eth1) New Wodem (56 Kbps) Same UDP Pld (1,472 B) Same Best Effort (0)	Endpoint B 42 (kedtest) 8 (sta0) Hew Wodem (56 Kbps 5ame UDP Pld (1,472 B) 5ame Best Effort (0)		Pld Pattern Min IP Port: Max IP Port: Min Duration: Max Duration: Min Reconn: Max Reconn: Max Internation:	Endpoint A increasing AUTO Same Forever Same 0 (0 ms) Same Normal (0)		Endpoint B increasing AUTO Same Forever Same 0 (0 ms) Same Normal (0)	
Pkts To Send:	Infinite	 Infinite 	-		Script		Script	
3 Test Manager Ouiesce:	Cross-Connect default_tm 3		•	Snd Buff Size: Rcv Buff Size:	Endpoint A 1 MB (1 MB) 1 MB (1 MB)	•	Endpoint B 1MB (1 MB) 1MB (1 MB)	•
IP Addr:	Endpoint A AUTO Replay File	AUTO	•	Src MAC: Proxy Addr:	00:90:0b:2f:0a:0f Use-Proxy 10.26.1.10		00:26:fc:32:cc:58 Use-Proxy 10.26.2.3	
Filename: Dest MAC:	00 26 fc 32 cc 58	Dest Mac	-	Proxy Port: Socket Priority:	33003 0 Payload		33002 0 Payload	

A. Click OK

E. On the Layer 3 tab, click Start to verify the AP and Station can connect

F. Click the **Display** button to monitor throughput

<u>ف</u>			Cro	ss Conne	ect: udptes	st Manager	: 192.168.1	00.26						
	Endpoint: udpt	est-A					[En	dpoint: udpte	est-B			
Port Resource: kedtest.can Port: eth1 IP: 10.26.2.3 bp5 TX: 8.419 kbps PP5 TX: 0 bp5 RX: 11.618 Mbps Pp5 RX: 1099 Errors: 0 6.556 kpp 6.55 kpp 6	Endpoint dopint EID: 1.42.1.5 Min TX: 52 kbps Max TX: 52 kbps RX Rate: 84.951 Mbps RX Fkts: 14374 TX Pkts: 62 TX Pkts: 62 Type: LF/UDP	631 14 4 2 5 0 7 0 11 4 5 0 7 0 13 2 5 0 5 2 5 2 5 2 5 2 5 2 5 2 5 2 5 2	RT-Lat Avg:67 3.216 -2^15 -1024 -32 0 Drops Avg:32 7.72 2^200 -2^15 -1024	4 2 5 0 111 4 125 23 67 4025 123: 942 225: 0 1027:	1W-Lat Avg:57 383 2^20 -2^15 -022 -32 0	Packets: 59 Dropped: 3 Packets: 14374 Dropped:	Resource Port: IP: bps TX: PPS TX: pps RX: Prors:	Port kedtest.can sta0 10.26.1.10 10.177 Mbps 948 6.835 Kbps 0 0	EID: 1 EID: 1 Min TX: 40 Max TX: 40 RX Rate: 51 RX Pkts: 59 RX Drop: 3 TX Pkts: 14 Type: LF	00000000000000000000000000000000000000	5.10 6.2 6.2 1.2 7.5 9.1 1.2 1.2 1.2 1.2 1.2 1.2 1.2 1	RT-Lat Avg:88 59198 -2^15 -1024 -32 0 Drops Avg:1 11 2^200 -215 -1024	2.4 4:0 6:2 10:1 13:6 2:5 6:1 120:1 120:1 120:0 10:5 0 20:5 0 20:5 0	1W-Lat Avg:28 2142 2^20 -2^15 -1024 -32 0
RX-Error-Pkts RX-Dropped	I-Pkts Rx Throughput		-32 0			98	RX-Error-F	kts RX-Droppe	d-Pkts Rx Th	o bps roughput		-32 0		
N-	Pause Display	Print		Stop	Sync	Dyr	amic Report	Modif	y C	lear	Close]		

- G. Only a short confirmation is necessary, click **Stop** on the Layer 3 tab
- 4. Configure Scripting for Cross Connect
 - A. On the ${\it Layer-3}$ tab, click ${\it Modify}$
 - B. In the Level 2 box, click Endpoint A Script button

<u></u>	🛓 udptest - Create/Modify Cross Connect + 🗕 🗆 🗙										
+ - All					Display	Sync Batch-Create		Apply OK C	ancel		
1	Cross-Connect				2	Cross-Connect				T	
CX Name:	udptest				Report Timer:	fast (1 s)			-		
CX Type:	LANforge / UDP			-							
						Endpoint A		Endpoint B			
	Endpoint A		Endpoint B		Pld Pattern	increasing	•	increasing	-		
Resource:	42 (kedtest)	•	42 (kedtest)	-	Min IP Port:	AUT0	•	AUT0	-		
Port:	1 (eth1)	•	8 (sta0)	-	Max IP Port:	Same	-	Same	-		
Min Tx Rate:	New Modem (56 Kbps)	•	New Modem (56 Kbps)	-	Min Duration:	Forever	•	Forever	-		
Max Tx Rate:	Same	•	Same	-	Max Duration:	Same	-	Same	-		
Min PDU Size:	UDP Pld (1,472 B)	•	UDP Pld (1,472 B)	-	Min Reconn:	0 (0 ms)	-	0 (0 ms)	-		
Max PDU Size:	Same	•	Same	-	Max Reconn:	Same	-	Same	-		
IP ToS:	Best Effort (0)	•	Best Effort (0)	-	Multi-Conn:	Normal (0)	-	Normal (0)	-		
Pkts To Send:	Infinite	•	Infinite	-		Script		Script			
						Add an automated so	rip	t to this endpoint. Script	sizes	a	

C. The Cross Connect Script window displays with no parameters

<u></u>		Add/Modify Scr	ipt	↑ _ □ >
Endpoint Name:	udptest-A	Script Type:	NONE	-
Script Name:	my-script	Group Action:	All	-
🗷 Enable Script	Show Reports	Symmetric Loop	Hide Iteration Details	Hide Legend Hide CSV
Loop Count	Forever	Script Iterations:	NA	Estimated Duration: NA
		Script Configu	iration	
S	how Previous Repo	rt Sync	Apply OK	Cancel

D. Select Script Type: RFC-2544. Set the following parameters:

<u></u>	Add/N	1odify Script	↑ _ □ ×
Endpoint Name: udptest-	A Script Type:	RFC-2544 💌	
Script Name: my-script	Group Actio	n: All 💌]
🗷 Enable Script 🕑 Show	v Reports 🕑 Symmetric 📃	Loop 🔲 Hide Iteration Details	🗌 Hide Legend 📄 Hide CSV
Loop Count Forever	Script Iterat	ions: 192 (192)	Estimated Duration: 38.4 m (38.4 m)
	Sc	ript Configuration	1
Show Dups 🗌 Show	v 000 🗌 Show Attenuation	Hide Latency Distributions	Hide Constraints
Run Duration:	10 s (10 s)	 Pause Duration: 	2s 💌
Max Drop Percent:	10%	Max-Tx-Underrun:	10% (10%)
Max Jitter:	200ms	Max RT Latency:	200ms 💌
Max Failed OK:	0	•	
Rates A	Rates B bps 400Mbps	Payload Sizes A Payload	Attenuations (ddBm) 1.1.2 0+5955 1
Show	Previous Report Syn	c Apply (OK Cancel

- A. Select Symmetric. This will increment both the A and B rates and payload sizes. (Instead of just side A).
- B. Select **Show Attenuation**. This displays attenuation levels in the report.
- C. Run Duration: 10 sec. This is how long each rate setting will be held.
- D. Pause Duration: 2 sec. We give it some time to transition.
- E. Max Drop Percent 10%
- F. Max Jitter 200ms
- G. Max RT Latency 200ms
- H. Rates A: 56kbps. This sets the client upload target rate.
- I. Rates B: 400Mbs. This sets the client download target rate.
- J. Pld A: 1472 This sets the client (sta0) MTU. This is a 1500 byte wire packet.
- K. Pld B: 9000 This sets the upstream (eth1) MTU.
- L. Attenuator Resource: 1.1.2. You can find your attenuator resources in the Attenuator tab.
- M. Attenuation: 0..+5..955. This is shorthand for: Begin at zero dB attenuation, increase in 0.5dB steps, until 955 dB of attenuation. Individual dB steps could also be specified.
- N. Click **OK**
- E. On the Create/Modify Cross Connect window, click OK
- 5. Run the Cross Connect and Generate a Report

A. On the Layer-3 tab, click Start



B. The Scripting Report window will appear

٤	Script Report for: udptest-A + - 🗆										
107	0	0	0	40	10	0	0	0	0		
188	0	0	0	25	33	0	0	0	0		
189	0	0	0	82	0	0	0	0	0		
190	0	0	43	60	0	0	0	0	0		
191	234	26	60	22	0	0	0	0	0		
System L	oad at end of to	est: 0.05									
End of Report, date: Mon Dec 9 18:30:09 2013											
·	Pause Close Save File Fraphical Display										

A. When the script completes, you can view the graphed results.

- B. Click on Graphical Display and a window with the graphical report will display
- C. Scroll to the top of the window to view the graphs. Highlights are shown below.
- D. Attenuation v. RX signal, endpoint A











G. RX rate including frame headers (UDP payload with frame headers) v. RX signal, endpoint B



H. RX rate v. TX link speed. You see a sawtooth pattern becuase all attenuations are included.



I. Click on Save File and your browser will appear the the HTML copy of the report.



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