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LANforge Scripted Attenuation of a WiFi Connection

Goal: Operate the CT703 WiFi Attenuator with a script to see the effect on a Layer-3 connection.

The LANforge GUI provides scripting support for the CT703 Attenuator. This cookbook provides a basic example of how to graph connection throughput and signal strength with a single station connection. Use this example as a basis for building more complex attenuation scripts. *Requires LANforge 5.2.11+ and CT703 Attenuator.*



1. Create a WiFi station

TECHNOLOGIES

A. In the **Ports** tab, select *wiphy0* and click **Create**

<u>ي</u>		_		_	LANfo	rge Ma	anager Ve	rsion(5.2.1	2)	_			+ _ 🗆 ×		
<u>C</u> ontrol	<u>R</u> epo	rting	<u>T</u> ear-Off <u>I</u> nfo <u>P</u> l	ugins											
							St	op All	Restart	Manager		Refresh	HELP		
Eile-IO	Lave	or-4	Test Mar Test	Group	Resourc	e Mar	Event Log	Alerts P	ort Mar	lessaries	7				
Status Layer-3 L3 Endps WanLinks Attenuators															
Disp: 102.169.100.27.0.0 Solff Packets Clear Counters Pacet Part															
	Disp: 192.158.100.27:0.0 Snitt Packets Clear Counters Reset Port Delete														
Rpt Timer: medium (8 s) 🔻 Apply View Details Create 🔪 Modify Batch Modify															
	All Ethernet Interfaces (Ports) for all Resources.														
						Poront				Create	a virtuar interi	ace of some	e type.		
Port	Pha.	Dowr	n IP	SEC	Alias	Dev	RX Bytes	RX Pkts	Pps RX	bps RX	TX Bytes	TX Pkts	Pps TX		
1.2.3			0.0.0.0	0	wiphy0		69,72	5 450	4	5,152	1,039	10	(🔺		
1.2.2			10.26.4.12	0	sta0	wiphy0	1,11	0 5	0	76	1,244	6	(
1.2.17		~	0.0.0.0	0	wlan2	wiphy2		0 0	0	0	0	0	(
1.2.16		~	0.0.0.0	0	wlan1	wiphy1		0 0	0	0	0	0			
1.2.15		~	0.0.0.0	0	wlan0	wiphy0		0 0	0	0	0	0			
1.2.14			0.0.0.0	0	wiphy2			0 0	0	0	0	0			
1.2.13			0.0.0.0	0	wiphyl			0 0	0	0	0	0			
1.2.1			10.26.1.3	0	eth1		2,76	8 8	0	191	0	0			
1.2.0			192.168.100.42	0	eth0		174,14	1 1,651	14	12,056	2,768,838	2,349	2(🖵		
		1											•		
Logge	d in to:	192.1	68.100.26:4002	as: Ac	dmin										

B. In the Create VLANS window, craft one wifi station:

<u></u>			Create VLANs o	on Port: 1.2.5		+ _ □ ×
0	○ MAC-VLAN● WIFI STA	○ 802.1Q-VLAN ○ Red) WiFi VAP ○ WiFi Monit	lirect 🔾 Bridge :or	○ GRE Tunnel		
2	Shelf:	1	Resource:	2 (kedtest)	Port: 3 (w	viphy0) 🔻
B	VLAN ID:		DHCP-IPv4			
	Parent MAC:	00:0e:8e:43:36:e9	DHCP Client ID:	-		
	MAC Addr:	XX:XX:XX:*:*:XX	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:	jedtest		•
	WiFi AP:		Key/Phrase:]
	Use WPA	Use WPA2	Use WEP			
4	Down					
	Apply	<u>C</u> ancel				

- A. Select WiFi STA
- B. For MAC address, choose xx:xx:*:*:xx
- C. Select DHCP-IPv4
- D. Enter Quantity 1
- E. Specify **0** for STA ID
- F. The example *SSID* for this cookbook is **jedtest**
- G. ...and then click Apply
- C. You will see a station created:

<u></u>				l	LANF	orge Mai	nager	Version(5.2	.12)			Ŷ	• ×		
<u>C</u> ontrol	<u>R</u> epor	ting]	<u>[</u> ear-Off <u>I</u> n	fo <u>P</u> lu	igins										
						Sto	IIA ac	Restar	t Manager		Refr	esh H	ELP		
Layer-4	Tes	t Mgr	Test Gro	up 🛛 R	lesour	ce Mgr 🌾	Event L	.og 🛛 Alerts 🎽	Port Mgr	Messages	5				
Status Layer-3 L3 Endps WanLinks Attenuators File-10															
Disp: 1	Disp: 192.168.100.27:0.0 Sniff Packets Clear Counters Reset Port Delete														
	Disp: 192.108.100.27:0.0 Silili Packets Clear Counters Reset Port Delete														
Rpt Time	Rpt Timer: medium (8 s) 🔻 Apply View Details Create Modify Batch Modify														
II	All Ethernet Interfaces (Ports) for all Resources.														
							Paran								
Port	Pha	Down	IP		SEC	Alias	Dev	RX Bytes	RX Pkts	Pps RX	bps RX	TX Bytes			
1.1.6			10.26.4.1		U	vap0	wiphy	23.841.611	15.748		4/	25.676.689.			
1.2.0			192.168.1	00.42	0	eth0		128,843,689	1,328,066		4,061	853,713,84	σĒ		
1.2.1			10.26.1.3		0	eth1		2,343,110, 1,565,91		C	89	2,909,008,			
1.2.2			0.0.0.0		0	wiphy0		27,080,193	17,883,	4	5,121	25,743,670.			
1.2.3			0.0.0.0		0	wiphy1		0	0	C	0		0		
1.2.4			0.0.0.0		0	wiphy2		0	0	0	0		0		
1.2.5		V	0.0.0.0		0	wlan0	wiphy0	0 0	0	0	0		0 =		
1.2.6		V	0.0.0.0		0	wlan1	wiphy1	. 0	0	0	0		0		
1.2.7		V	0.0.0.0		0	wlan2	wiphy2	2 0	0	0	0		0		
1.2.8			10.26.4.20)	0	sta0	wiphy	25,329,176	16,730,	0	28	24,160,586.			
										-			<u>۶</u>		
Logaed	in to:	192.10	58.100.26:4	4002 a	as: Ad	min									
33	_	_		_									_		

2. Create a connection to the Station

A. In the Layer-3 tab, click Create

差 LANforge Manager Version(5.2.12) 🔶 🗈	×
Control Reporting Tear-Off Info Plugins	
Stop All Restart Manager Refresh HEL	P
Layer-4 Test Mgr Test Group Resource Mgr Event Log Alerts Port Mgr Messages Status Layer-3 L3 Endps WanLinks Attenuators File-IO]
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	— I
Name Type State Pkt Tx A → B Pkt Tx A ← B Rate A → B Rate A ← B Rx Drop % A Rx Drop % B Drop Pkt	s A
Logged in to: 192.168.100.26:4002 as: Admin	

B. Create two-way station traffic

<u></u>	jbr - Create/M	۱od	lify Cross Connect	+ _ □ ×									
+ - All	Display	Sync	Batch-Create	Apply OK Cancel									
CX Name:	jbr												
CX Type:	LANforge / UDP												
	Endpoint A		Endpoint B										
Resource:	2 (kedtest)	•	1 (jedtest)	•									
Port:	8 (sta0)	•	6 (vap0)	▼									
Min Tx Rate:	100M (100 Mbps)	•	100M (100 Mbps)	▼									
Max Tx Rate:	Same	•	Same										
Min PDU Size:	UDP Pld (1,472 B)	•	UDP Pld (1,472 B)										
Max PDU Size:	Same	-	Same	The minimum write size.									
IP ToS:	Best Effort (0)	•	Best Effort (0)	For UDP, it is the UDP payload size									
Pkts To Send:	Infinite	-	Infinite	In all cases, the packets on the w									
				port's MTU + Ethernet-Header-Siz									

- A. This example connection is named *jbr*
- B. Connection Type is LANforge / UDP
- C. This example *resource* is **kedtest**, where our stations live
- D. The Endpoint A *Port* will be the station **sta0**,
- E. and the Endpoint B *Port* will be upstream of the ap, eth1.
- F. We'll set the Min Tx Rate for both sides to 100 Mbps
- G. and set the PDU Size to UDP Pld (1,472 B).
- H. Use the + button to expand the window to panel 4 and add 2MB of buffers to the connection:

-			jbr - Create/M	odify	/ Cross Connect				+ _ □	×
+ - All					Display	Sync Batch-Create		Apply OK	Cancel	
CX Name:	Cross-Connect jbr			_	Report Timer:	Cross-Connect fast (1 s)			•	-
CX Tvbe:	LANforge / UDP			-		Endpoint A		Endpoint B		
	Endpoint A	Idpoint A Endpoint B				increasing	•	increasing	-	
Resource:	2 (kedtest)	•	1 (jedtest)	-	Min IP Port:	AUTO	•	AUTO	-	
Port:	8 (sta0)	•	6 (vap0)	-	Max IP Port:	Same	•	Same	-	
Min Tx Rate:	100M (100 Mbps)	•	100M (100 Mbps)	-	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		
						Thresholds		Thresholds		
0	Cross-Connect					Endpoint A		Endpoint B		
Test Manager	default_tm	_		-	Snd Buff Size:	2MB (2 MB)	-	2MB (2 MB)	-	
Ouiesce:	3			-	Rcv Buff Size:	2MB (2 MB)	•	2MB (2 MB)	-	
					Send Bad FCS:	zero (0%)	-	zero (0%)	-	
	Endpoint A		Endpoint B		Src MAC:					
IP Addr:	Addr: AUTO Replay File Loop		AUTO	-		Use-Proxy		Use-Proxy		
			Loop		Proxy Addr:	10.26.4.1		10.26.4.20		
	Dest Mac		Dest Mac		Proxy Port:			33014		
Filename:					Socket Priority	0		0		•

- I. ...then click OK
- C. You will see connection *jbr* in the *Layer-3* tab now:

<u>ا</u>		LANforge Manager V	ersion(5.2.12)	+ □ ×								
<u>Control</u> <u>Reporting</u> <u>Tear-Of</u>	ff Info <u>P</u> lugins											
			Stop All Restart Manager	Refresh HELP								
File-IO Layer-4 Test M	gr Test Group Resource	e Mgr Event Log Alerts	Port Mgr Messages									
Status	Layer-3	L3 Endps	WanLinks	Attenuators								
Rpt Timer: fast (1 s) Go Test Manager all Select All Star Stop Quiesce Clear View 0 - 200 Go Display Crgate Modify Delete												
	1	 Cross Connects for Sele 	cted Test Manager									
Name Type	State Pkt Tx A → B Pkt Tx A	A ← B Rate A → B	Rate A ← B Rx Drop % A Rx Drop % B	Drop Pkts A Drop Pkts B Avg RTT								
jbr LF/UDP Sto	opped 0	0 0	0 0 0	0 0 0								
		III										
Logged in to: 192.168.100).26:4002 as: Admin											

D. Begin traffic on this station by selecting it and clicking Start

<u>ن</u>	LANforge Ma	anager Versio	on(5.2.12)			+ □ ×
<u>Control Reporting Tear-</u>	-Off <u>I</u> nfo <u>P</u> lugins					
	Stop	All Res	start Manager	R	efresh	HELP
Layer-4 Test Mgr Te Status Laye	est Group Resource Mo er-3 L3 Endps	gr Event Log Wanl	Alerts Port M Links	gr Messages Attenuators] File	e-10
er: fast (1 s) 💌	Go Test Manager all	-	Select All	Start	p Quies	sce
0 - 200	▼ Go		Display	Cr <u>e</u> ate	<u>M</u> odify	Delete
	Cross Conn	ects for Selected	Test Manager-			
Name Type	State Pkt Tx A → B P	kt Tx A ← B Ra	ate A → B	Rate A ← B	Rx Drop % A	Rx Drop
jbr LF/UDP R	un 15,950,708 1	5,374,748	90,950,023	87,683,679	0	9
	Ш					•
Logged in to: 192.168.10	00.26:4002 as: Admin					

- 3. Create an Attenuator Script
 - A. In the Attenuators tab, select your attenuator and click Modify

LANforge Manager Version(5.2.12) 🔶	□ ×
Control Reporting Tear-Off Info Plugins	
Stop All Restart Manager Refresh	IELP
File-IO Layer-4 Test Mgr Test Group Resource Mgr Event Log Alerts Port Mgr Messages	
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 → B Pkt Tx A ← B Rate A → B Rate A ← B Rx Drop % A Rx Drop % B Drop Pkts A Drop	p Pkt:
Logged in to: 192.168.100.26:4002 as: Admin	

B. You will see the *Modify Attenuator* window. Click on the **Script** button.

<u>ی</u>	Modify Attenuator	+ _ = ×
Name:	1.1.14	
Module 1:	30.0 (300 ddBm) 💌 🗌 Synchronized	Script
Module 2:	30.0 (300 ddBm) 🔻 Adjustment Value 50 (50 ddBm) 💌	Adjust
Module 3:	30.0 (300 ddBm) 🔻	
	Sync Apply OK Can	cel

C. The *Add/Modify Script* window opens. In the picture below you see a huge list of numbers (the attenuation levels). These numbers are not pre-populated. You can copy and paste them out of this document or create a series with other commands listed below.

<u></u>		Add/Modify 9	Script		+ _ □ ×							
Attenuator Name	1.1.14	Script Type:	ScriptAtten	-								
Script Name:	attnr	Group Action:	All	-								
🖌 Enable Script	🗹 Show Reports 🕑 Symm	netric 🗌 Loop 📃	Hide Iteration Details	🗌 Hide Legend	Hide CSV							
Loop Count	Forever	Script Iterations:	192 (192)	Estimated	Duration: 16 m (16 m)							
	Script Configuration											
Run Duration:		5s (5s)										
		Attenuation	ns (ddBm)									
185, 195, 205, 2 345, 355, 365, 3 505, 515, 525, 5 665, 675, 685, 6 825, 835, 845, 8 935, 925, 915, 9 775, 765, 755, 7 615, 605, 595, 5 455, 445, 435, 4 295, 285, 275, 2 135, 125, 115, 1	115, 225, 235, 245, 255, 26 175, 385, 395, 405, 415, 42 135, 545, 555, 565, 575, 58 195, 705, 715, 725, 735, 74 155, 865, 875, 885, 875, 885, 895, 90 105, 895, 885, 875, 885, 875, 865, 85 45, 735, 725, 715, 705, 65 125, 415, 405, 395, 385, 37 165, 255, 245, 235, 225, 21 05, 95, 85, 75, 65, 55, 45,	 i5, 275, 285, 295, 3 i5, 435, 445, 455, 4 i5, 595, 605, 615, 6 i5, 755, 765, 775, 7 i5, 915, 925, 935, 9 i5, 845, 835, 825, 8 i5, 685, 675, 665, 6 i5, 525, 515, 505, 4 i5, 205, 195, 185, 1 35, 25, 15, 5 	05, 315, 325, 335, 65, 475, 485, 495, 25, 635, 645, 655, 85, 795, 805, 815, 45, 955, 955, 945, 15, 805, 795, 785, 55, 645, 635, 625, 95, 485, 475, 465, 35, 325, 315, 305, 75, 165, 155, 145,									
	Show Previous Report	Sync	Apply	OK Car	icel							

- A. In the Script Type pulldown, select ScriptAtten
- B. Type in the name for the script, this example is called attnr
- C. Select Symmetric
- D. Choose 5 s for Run Duration. This will run the Attenuator at each ddB value for this period of time.
- E. Enter the following attenuation values for a 16 minute long test. This will send the attenuator from 5 to 955ddB and back:

F.	5, 15	5, 25,	35,	45, 5	55, 6	5, 75,	85,	95,	105,	115,	125,	135,	145,	155,	165,	175,
	185,	195,	205,	215,	225,	235,	245,	255,	265,	275,	285,	295,	305,	315,	325,	335,
	345,	355,	365,	375,	385,	395,	405,	415,	425,	435,	445,	455,	465,	475,	485,	495,
	505,	515,	525,	535,	545,	555,	565,	575,	585,	595,	605,	615,	625,	635,	645,	655 ,
	665,	675,	685,	695,	705,	715,	725,	735,	745,	755,	765,	775,	785,	795,	805,	815,
	825,	835,	845,	855,	865,	875,	885,	895,	905,	915,	925,	935,	945,	955,	955,	945,
	935,	925,	915,	905,	895,	885,	875,	865,	855,	845,	835,	825,	815,	805,	795,	785,
	775,	765,	755,	745,	735,	725,	715,	705,	695,	685,	675,	665,	655,	645,	635,	625,
	615,	605,	595,	585,	575,	565,	555,	545,	535,	525,	515,	505,	495,	485,	475,	465,
	455,	445,	435,	425,	415,	405,	395,	385,	375,	365,	355,	345,	335,	325,	315,	305,
	295,	285,	275,	265,	255,	245,	235,	225,	215,	205,	195,	185,	175,	165,	155,	145,
	135,	125,	115,	105,	95,	85, 75	5, 65,	, 55,	45,	35, 2	25, 15	, 5				

- G. ...click OK
- D. In the Attenuators tab, you will notice that your attenuator now reads **Enabled** in the *Script* column. Select the attenuator and click the **Start** button.

<u></u>		Add/Modify S	cript		+ _ □ ×
Attenuator Name	1.1.14 💌 S	cript Type:	ScriptAtten	-	
Script Name:	attnr	Froup Action:	All	-	
🖌 Enable Script	🗹 Show Reports 🛛 🗹 Symmet	ric 🗌 Loop 🔲 I	Hide Iteration Details	🗌 Hide Legend 📃	Hide CSV
Loop Count	Forever 💌 S	cript Iterations:	192 (192)	Estimated Dura	ation: 16 m (16 m)
-		Script Con	figuration		
Run Duration:	5	s (5s)		-	
			ns (ddBm)		
185, 195, 205, 2 345, 355, 365, 3 505, 515, 525, 5 665, 675, 685, 6 825, 835, 845, 8 935, 925, 915, 6 775, 765, 755, 7 615, 605, 595, 5 455, 445, 435, 4 295, 285, 275, 2 135, 125, 115, 1	 (3), (3), (3), (3), (3), (3), (13), (15), (25	, 125, 135, 145, 45, 45, 45, 45, 45, 45, 45, 45, 45,	 135, 115, 125, 335, 135, 315, 325, 335, 145, 475, 485, 495, 15, 635, 645, 655, 15, 805, 815, 15, 805, 795, 945, 15, 805, 795, 785, 55, 645, 635, 625, 95, 485, 475, 465, 35, 325, 315, 305, 75, 165, 155, 145, 		
	Show Previous Report	Sync	Apply	OK Cancel	

E. The window Script Report will appear. This monitors the script behavior of the attenuator script.

<u></u>				Script Rep	ort for	: 1.1.14		+ _ □ ×
Hostname:	iedtest							^
OS Version:	Linux/x86-64							
CPU:	Intel(R) Core	(TM) i7-26	55LE CPU	@ 2.20GHz				
Mhz:	1018							
Memory:	7956 MB							
CPU Cores (incl. HT):	4						T	
LANforge SW Version:	5.2.12 64bit						-	
Starting System Load:	0.11							
Started test at: Wed Ju Iteration Duration: 500 ## attenuation (ddBm)	n 11 16:03:13 Oms	2014						
System Load at end of th	est: 0.20							
End of Report, date: We	d Jun 11 16:16	38 2014						■
	Pause	Close		Save File		Graphical Display	Invert RX-Signal X Axis	

F. To monitor the progress of traffic and signal as it progresses, you will go to the *Ports* tab. Click on **sta0**, right click and select *Dynamic Display*. The *Dynamic Reports* window will open. Choose the following selections to refine the display:



- A. Unselect Tx-Bps
- B. Select Rx-Bps
- C. Select Rx-Signal
- D. Drag the label sta0-signal to the left side of the X axis
- E. Click Adjust and set Maximum Time to 30 min, click OK
- F. Click Auto Adjust
- G. At the end of the attenuator script run, the *Layer-3* connection will still be running, but the *Script Report* window will say **End of Report**. At this time, click on **Graphical Display**. You will see a graph of the attenuation level over time.



- 4. Creating attenuation sequences
- 5. It is relatively simple to generate a sequence of numbers right from a Terminal window (on Linux). Below are some examples:

Terminal - jrevnolds@cholla:~ 🔹 🔹 🗖 🛨
jreynolds@cholla ~
> for d in `seq 5 +10 955` `seq 955 -10 5` ; do echo -n "\$d, " ; done fold -sw80
5, 15, 25, 35, 45, 55, 65, 75, 85, 95, 105, 115, 125, 135, 145, 155, 165, 175,
185, 195, 205, 215, 225, 235, 245, 255, 265, 275, 285, 295, 305, 315, 325, 335,
345, 355, 365, 375, 385, 395, 405, 415, 425, 435, 445, 455, 465, 475, 485, 495,
505, 515, 525, 535, 545, 555, 565, 575, 585, 595, 605, 615, 625, 635, 645, 655,
665, 675, 685, 695, 705, 715, 725, 735, 745, 755, 765, 775, 785, 795, 805, 815,
825, 835, 845, 855, 865, 875, 885, 895, 905, 915, 925, 935, 945, 955, 955, 945,
935, 925, 915, 905, 895, 885, 875, 865, 855, 845, 835, 825, 815, 805, 795, 785,
775, 765, 755, 745, 735, 725, 715, 705, 695, 685, 675, 665, 655, 645, 635, 625,
615, 605, 595, 585, 575, 565, 555, 545, 535, 525, 515, 505, 495, 485, 475, 465,
455, 445, 435, 425, 415, 405, 395, 385, 375, 365, 355, 345, 335, 325, 315, 305,
295, 285, 275, 265, 255, 245, 235, 225, 215, 205, 195, 185, 175, 165, 155, 145,
135, 125, 115, 105, 95, 85, 75, 65, 55, 45, 35, 25, 15, 5,
jreynolds@cholla ~

- A. The 10 ddB step series we used in this example: for d in `seq 5 +10 955` `seq 955 -10 5` ; do echo -n "\$d, " ; done | fold -sw80
- B. A 5 ddB step series, as precise as the CT703 can run: for d in `seq 0 +5 955` `seq 955 -5 0` ; do echo -n "\$d, " ; done | fold -sw80
- C. A 15 ddB step series from full attenuation to 25 ddB: for d in `seq 955 -15 25` ; do echo -n "\$d, " ; done | fold -sw80
- D. A sawtooth ranging from 950 to 0 ddB: i=0; while [\$i -lt 100]; do echo -n \$((\$i%11 * 95))", "; i=\$[\$i+1]; done | fold -sw80

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