Candela Network Testing and Emulation Solutions



Goal: Allow LANforge-ICE to sit transparently on a network segment by using a Bridged Mode WanLink to simulate a WAN.

In this test scenario, a LANforge-ICE WanLink is created in Bridged Mode to simulate a WAN consisting of a DS1 speed (1.544Mbps) link with 20ms of delay in one direction and 30ms of delay in the other direction.

- 1. Setup the LANforge Ports so that they have 0.0.0.0 IP addresses. (Bridged Mode WanLinks use ports that have no IP address because the ports are transparent to the traffic flowing through them.)
 - A. A: Go to the Port Manager to see what ports are available. In this example, we will use eth1 and eth2. eth0 is the management port and cannot be used for WanLinks.

0					LANF	orge M	anager Ve	rsion(5.3.6	5)				\odot \times \times
<u>C</u> ontrol	Repor	ting]	<u>[</u> ear-Off <u>I</u> nfo <u>P</u> lu	gins									
							Stop	All	Restart	Manager		Refresh	HELP
Layer-4	Ger	neric	Test Mgr Test	Grou	p Resou	rce Mgr	Event Log	Alerts F	Port Mgr	vAP Statio	ons Messag	jes	
Statu	s	Layer-	3 L3 Endps	1	VoIP/RTP	Vo	P/RTP Endps	Arma	geddon	WanL	inks Att	tenuators	File-IO
	Disp:	192.1	68.100.239:0	S	niff Packe	ts	1 Clear	Counters	Reset	Port	Delete		
	Rpt Tir	mer: 🖿	edium (8 s) 🔻		Apply		Į <u>V</u> ie	w Details	Cr <u>e</u> a	ate	Mo <u>d</u> ify	Batch Modif	У
					All Et	hernet I	nterfaces (Por	ts) for all Re	sources				
Port	Pha	Down	IP	SEC	Alias	Parent Dev	RX Bytes	RX 🔓ts	Pps RX	bps RX	TX Bytes	TX Pkts	Pps TX
1.1.0			192.168.100.106	0	eth0		1,695,061	14, Tota	al number o	of packets	received by t	his Interface	. 1
1.1.1			0.0.0.0	0	ethl		0	0	0	0	1,208		0
1.1.2			0.0.0.0	0	eth2		0	0	0	0	1,208	16	0
													•
Logged	in to:	192.16	58.100.106:4002	as: A	dmin								

For more information see LANforge-GUI User Guide: Ports (Interfaces)

2. Create a WanLink.

A. Go to the **WanLinks** tab

LANforge Manager Version(5.3.6)
Control Reporting Tear-Off Info Plugins
Stop All Restart Manager Refresh HELP
Layer-4 Generic Test Mgr Test Group Resource Mgr Event Log Alerts Port Mgr VAP Stations Messages Status Layer-3 L3 Endps VolP/RTP VolP/RTP Armageddon WanLinks Attenuators File-IO
Rpt Timer: fast (1 s) Go Test Manager all Select All Start Switch Stop Clear Hide Stopped Display Create Modify Batch Modify Delete
WanLinks for Selected Test Manager
Name EID K-M State Endpoints (A \leftrightarrow B) Pkt Tx A \rightarrow B Pkt Tx A \leftarrow B Bps Rx B Bps Rx A Rpt Timer
WPS Name Run Script Max Rate Tx Pkts Rx Pkts Tx Rate Tx Drop % Dropped Tx-Failed Failed-Late TX Bytes
Logged in to: 192.168.100.106:4002 as: Admin

B. Create a WanLink

			N		odify WanLink			\sim \sim \times
+ - All			13	7	Apply	OK Display Wa	nLink & WanPaths	Cancel
Name: Presets:	WanLink Information WL-01 CUSTOM			-	2	WanLink Information Pass-Through Coupled-Mode	HW Pass-Through	
Port: Transfer Rate:	Endpoint A 1 (eth1) T1 (1.544 Mbps)	•	Endpoint B 2 (eth2) T1 (1.544 Mbps)	•	Resource: Rpt Timer:	1 (lf0350-10ac) fast (l s) Endpoint A	Endpoint B	•
Delay: Drop-Freq:	small (20 ms) zero (0%)		30 (30 ms) zero (0%)	•	Reorder-Freq: Dup-Freq:	zero (0%)	 ✓ zero (0%) ✓ zero (0%) 	•
Jitter: Jitter-Freq:	zero (O us) zero (O%)		zero (O us) zero (O%)	•	Drop Burst: Reorder Amt:	min 1 max 1 min 1 max 20	min 1 max 1 min 1 max 20	
						Script	Script	

- A. To simulate a WAN, enter a specific amount of delay or other impairment
- B. For this example, enter 20ms of delay for Entry Point A and 30ms of delay for Entry Point B
- c. Be sure to set the correct ports and transfer rate for each $\ensuremath{\mathsf{Entry}}$ Point
- D. Click $\boldsymbol{O}\boldsymbol{K}$ when done

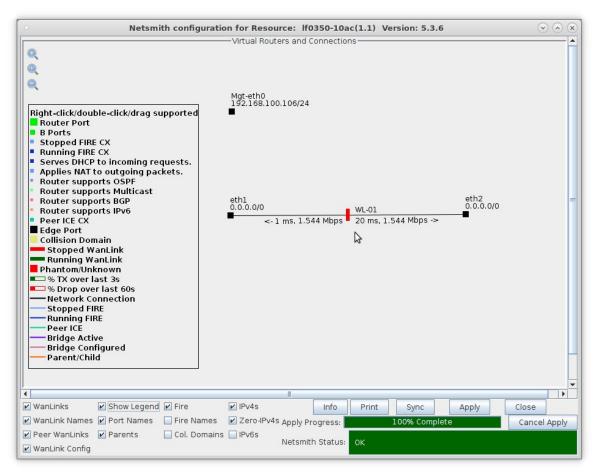
C. Verify the WanLink was created

LANforge Manager Version(5.3.6)
Control Reporting Tear-Off Info Plugins
Stop All Stop All Refresh HELP WARNING: This will restart the server processes! WARNING: This will restart the server processes! WARNING: This will restart the server processes!
Layer-4 Generic Test Mgr Test Group Resource Mgr Event Log Alerts Port Mgr VAP Stations Messages Status Layer-3 L3 Endps VolP/RTP VolP/RTP Endps Armageddon WanLinks Attenuators File-IO
Rpt Timer: fast (1 s) ▼ Go Test Manager all ▼ Select All Start Switch Stop Clear
Hide Stopped Display Create Modify Batch Modify Delete
WanLinks for Selected Test Manager
Name EID K-M State Endpoints (A ↔ B) Pkt Tx A → B Pkt Tx A ← B Bps Rx B Bps Rx A Rpt Timer
WL-01 6.2 Image: WL-01-A <=> WL 0 0 1,544,000 1,544,000 1,00(
All WanLink Endpoints
WPs Name Run Script Max Rate Tx Pkts Tx Rate Tx Drop % Dropped Tx-Failed Failed-Late TX Bytes + WL-01-A None 1.544,000 0 <t< td=""></t<>
+ WL-01-A None 1,544,000 0
Logged in to: 192.168.100.106:4002 as: Admin

D. Go to the **Status** tab and click **Netsmith** to view the graphical representation of the WanLink

	LANforge Manager Vers	sion(5.3.6)		\odot \sim \times						
Control Reporting Tear-Off Info Pl	ugins	}								
	Stop /	All Resta	art Manager R	efresh HELP						
Layer-4 Generic Test Mgr Tes Status Layer-3 L3 Endps		Alerts Port Mgr Armageddon		ators File-10						
License Info	Current Users		Test Configuration Databas	e						
Licenses expire in: 343 days.	* Admin from:192.168.100.239 gnuserver from:127.0.0.1	List:	BLANK	Load						
		Name:		Delete						
Support expires in: 343 days.		Load Behavior:	Choose One	Save						
Support expires in, 545 days,			Download DB	Show Progress						
•				Þ						
	Virtual Shelf 1									
	Resource 1	L ,								
Netsmith										
Logged in to: 192.168.100.106:4002	as: Admin									

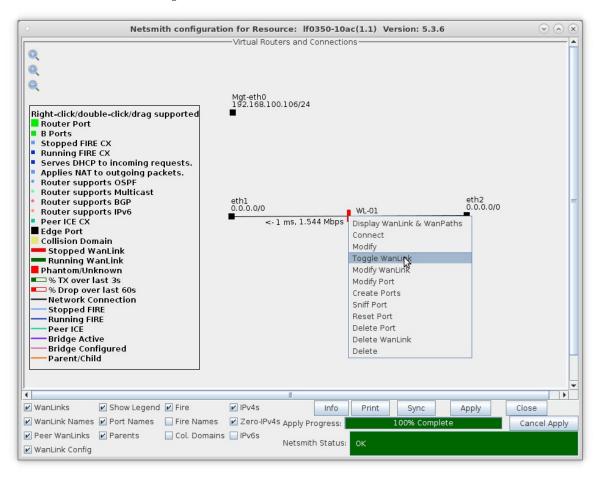
E. This is the general form of a Bridged Mode WanLink in Netsmith. It consists of two 0.0.0.0 IP addressed ports with a vertical bar between them.



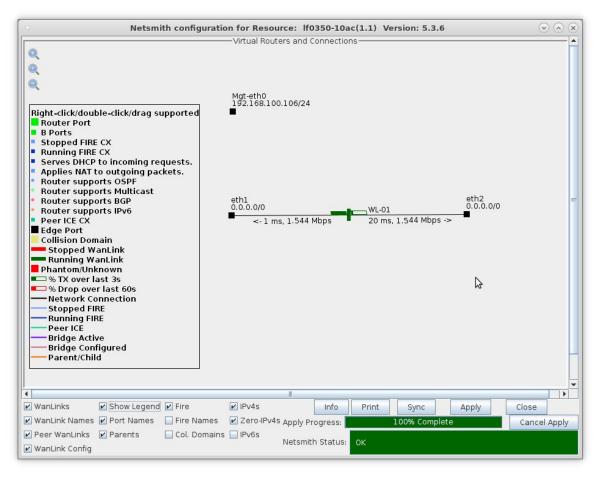
For more information see LANforge-GUI User Guide: WanLinks (ICE)

3. Run traffic and verify results.

A. Right-click on the WanLink and select **Toggle WanLink** to allow traffic to flow from a transmitting device to a receiving device



B. The transmitting/receiving devices can be just about anything that generates and receives traffic such as a web server and client or a pair of LANforge-FIRE ports.



A. Right-click the WanLink and select **Display WanLink**

C. View the WanLink display

0	WanLink Display: WL-01 Ma	anager: 192.168.100.106	\odot \otimes \otimes
	Endpoint: WL-01-A (1.1.1.1)	Endpoint: WL-01-B (1.1.2.2)	
0 B	🗌 30-sec Averages	30-sec Averages	ов
	WAN Speed: 1.544 Mbps TX Rate: 207.778 Kbps	WAN Speed: 1.544 Mbps TX Rate: 1.558 Mbps	
	RX Rate: 207.778 Kbps TX Pkts: 250857	RX Rate: 1.558 Mbps TX Pkts: 33024	
	Dropped: 0 Duplicated: 0 Reordered: 0 TX Failed: 0	Dropped: 0 Duplicated: 0 Reordered: 0 TX Failed: 0	
	Reordered: U IX Failed: U	A.295 Gbps	
	16.777 Mbps -	- 16.777 Mbps	
	65.536 Kbps -	— 65.536 Кbps	
	256 bps -	- 256 bps	
	0 bps	0 bps	
	Rx Bytes Dropped [Record-Dropped]	Rx Bytes Dropped [Record-Dropped]	
	1.544 Mbps	1.544 Mbps	
	1.158 Mbps -	- 1.158 Mbps	
	772 Kbps -	— 772 Kbps	
79 KB	386 Kbps -	— 386 Кыря	75 KB
Backlog	Rx Throughput [Recorded]		75 KB Backlog
ľ		Link Endpoint: WL-01-A	
Name	Tx Rate Disabled ! !F Filter Pattern	Tx Pkts Rx Pkts TX Bytes RX Bytes Dropped Du	p Pkts OC
		at a second s	
•		N.	•
		Link Endpoint: WL-01-B	
Name	Tx Rate Disabled ! !F Filter Pattern	Tx Pkts Rx Pkts TX Bytes RX Bytes Dropped Du	p Pkts OC
•	II		•
Display	y Selected Paths Pause Display Print	Modify Stop Refresh Clear	Close

For more information see Refer to the LANforge FIRE Cookbook to run traffic.

4. View the **WanLinks** tab

Layer-4 Generic Status Laye	Tear-Off Info Plugins	5					
Status Laye							
Status Laye				Stop All	Restart Manager	Refresh	HELP
Status Laye		vv					
	Test Mgr Test Gro er-3 L3 Endps	VoIP/RTP	Event Log Alerts VoIP/RTP Endps	Port Mgr VAP Armageddol	Stations Message N WanLinks	Attenuators	File-I0
	si-o Eo Entapa	Voir /itil	Voir /itir Enups				1110-10
Rpt Tim	ier: fast (1 s)	Go Test Manager	all 🔽	Select Al	I Start Switch	<u>S</u> top Clear	
		Hide Stopped		Display Cr	<u>e</u> ate Mo <u>d</u> ify <u>B</u> a	atch Modify Delete	
		Wa	nLinks for Selected Te	est Manager			
Name E		Endpoints (A ↔ B)	Pkt Tx A → B F	kt Tx A ← B		os Rx A Rpt Timer	
VL-01 6.2	2 🖌 Run	WL-01-A <=> WL	63,510	479,506	1,544,000	1,544,000 1,00	ס
WPs Name		ax Rate Tx Pkts	Rx Pkts Tx Rate			ailed-Late TX Bytes	RX Bytes
+ WL-01-A + WL-01-B		544,000 479,506 544,000 63,510	63,516 1,545,125 479,512 206,004		0 0	0 42,183,816	
+ WL-01-B	None 1,	544,000 05,510	479,512 200,004		0 0	0 5,566,010	42,104,344

- A. Selecting a WanLink automatically selects the WanLink Endpoints on the bottom panel
- B. Scroll to the right on the bottom panel to note the Serialization Delay (delay injected by LANforge to account for packet size and transfer rate). Also, the WanLink must have a high enough transfer rate to pass all the traffic. In other words, if a layer-3 connection is sending 100Mbps of traffic, the WanLink must allow at least 100Mbps transfer rate
- C. In this case, SD = (1514 bytes * 8 bits/byte) / 1.544Mbps = 7.8ms
- D. The total delay as experienced by the transmitting/receiving device is the sum of the WanLink configured delay and the serialization delay which in this case would be about 28ms in one direction and 38ms in the other.

For more information see LANforge FAQ: Serialization Delay Candela Technologies, Inc., 2417 Main Street, Suite 201, Ferndale, WA 98248, USA www.candelatech.com | sales@candelatech.com | +1.360.380.1618