

LANforge-ICE Cookbook

The LANforge-ICE Cookbook provides a set of high-level examples of how to setup useful test scenarios in LANforge-ICE for WAN emulation. Each example intends to give the reader a brief introduction to the test scenario and a set of step-by-step instructions on how to use the LANforge-GUI to configure the test.

All of the following examples will work on Linux systems running the LANforge software with the LANforge kernel and a sufficient license. If you are running another Linux kernel, you will not be able to exactly duplicate some of the examples, but there are usually work-arounds available to assist you. Please contact us at support@candelatech.com if you have any questions.

If you are using the Windows version of LANforge, you will have to modify ports using the Windows utilities and you will not be able to duplicate the Routed Mode ICE examples. Everything else should work approximately the same, but the performance is limited to 10Mbps speeds.

LANforge-ICE WAN Emulation

Before attempting the examples below, ensure that you have successfully followed these software installation guides:

- LANforge-GUI Installation
- LANforge-Server Installation

It is also recommended that you back up your current running LANforge-Server database so that you may safely return to your current operating state.

LANforge-ICE Cookbook Examples

- 1. Bridged Mode (Non-routed) WanLink
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- 5. Routed Mode WanLinks with WanPaths
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- 7. Virtual Router with NAT
- 8. Multiple Layer-2 Switches
- 9. Multiple Virtual Routers
- 10. Multiple Physical Port Testing CT970-48
- 11. Bridging Three Wanlinks
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- 13. WanLink Queue Discipline
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Bridged Mode (Non-routed) WanLink

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.

								Stop	All	Restart	Manager		Refresh	HEL
Layer-4	Gene	eric	Test Mgr Test	Grou	p 🛛 Resou	rce Mgr	Event	Log	Alerts I	Port Mgr 🌾	vAP Static	ons Messag	es	
Status	L	ayer-	B L3 Endps		VoIP/RTP	Vo	IP/RTP E	ndps	Arma	ageddon	WanL	inks Att	enuators	File-IO
		_	58.100.239:0 edium (8 s) 💌		Apply		1 I	⊻iev	Counters w Details (s) for all Re	Reset		Delete Mo <u>d</u> ify	<u>B</u> atch Modif	7
Port F	Pha	Down	IP	SEC	Alias	Parent Dev	RX Byt		RX 🔓ts	Pps RX	bps RX	TX Bytes	TX Pkts	Pps TX
1.1.0			192.168.100.106	0	eth0		1,695	5,061	14, Tota	al number o	of packets	received by t	his Interface	
1.1.1			0.0.0.0	0	eth1			0	0	0	0	1,208	16	
1.1.2			0.0.0.0	0	eth2			0	0	0	0	1,208	16	(

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 Endps Armageddon WanUnks Attenuators File-I0
Rpt Timer: fast (1 s) V Go Test Manager all V Select All Start Switch Stop Clear
Hide Stopped Display Crgate 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 Time
- All WanLink Endpoints -
WPS Name Run Script Max Rate Tx 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

					Modify WanLink		\odot
+ - All			L	3	Apply	OK Display Wa	nLink & WanPaths Cance
WanLink information WanLink information Presets: CUSTOM VanLink information Presets: CUSTOM VanLink information Port: 1 (eth1) Value VanLink information Port: 1 (eth1) Value VanLink information Port: 1 (eth1) Value Value Port: 1 (eth1) Value Value Port: 1 (eth2) Value Value Port: 2 (eth2) Value Value Value Port: 2 (eth2) Value Value Value Value Port: 2 (eth2) Value Value Value Value <t< th=""><th>☐ HW Pass-Through ✔ Kernel-Mode</th></t<>	☐ HW Pass-Through ✔ Kernel-Mode						
Port:		-		-			•
Transfer Rate:	T1 (1.544 Mbps)	-	Tl (1.544 Mbps)	•			
Delay:	small (20 ms)	•	30 (30 ms)	-	Reorder-Freq:		▼ zero (0%) ▼
Drop-Freq:	zero (0%)	•	zero (O%)	-	Dup-Freq:	zero (O%)	▼ zero (0%) ▼
Jitter:	zero (0 us)	•	zero (O us)	-	Drop Burst:	min 1 max 1	min 1 max 1
Jitter-Freq:	zero (0%)	-	zero (0%)	-	Reorder Amt:	min 1 max 20	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 Entry Point
- D. Click \mathbf{OK} when done

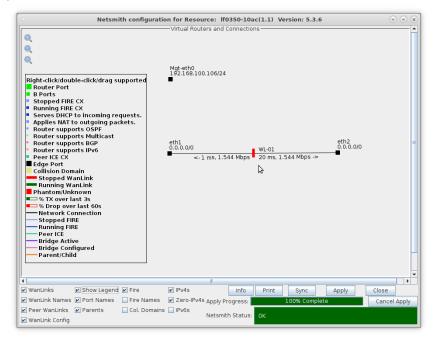
C. Verify the WanLink was created

ontrol	Reportin	g Te	ar-Off	f Info <u>P</u> lugii	าร								
							Sto	p All	start I			Refresh	HELF
							~		WARNIN	IG: This will		server proce	esses!
Layer-4	Gener		est N			source Mgr	Event Log			AP Stations			~
Status	s í La	yer-3	ſ	L3 Endps	VoIP/RT	P Vol	P/RTP Endps	Ar	mageddon	WanLink	s At	tenuators	File-IO
R	pt Timer:	fast	(1 s) 🔻	Go Test M	anager all	-		Select All	Start S	witch <u>S</u> t	op Clear	
					Hide Sto	opped		Di	splay Cr <u>e</u> at	e Mo <u>d</u> ify	Batch M	4odify De	lete
							s for Selecte	ed Test Ma	nager				
Na	ame	EID	K-M	State	Endpo	oints (A ↔ B)	Pkt Tx A	→B F	Pkt Tx A ← B	Bps Rx	B	Bps Rx A	Rpt Tim
VL-01		6.2	~	Stopped	WL-01-4	<=> WL		0	0	1,54	1,000	1,544,000	1,0
4													
•													
						/	All WanLink E	ndpoints-					
WPs	Name	R	un	Script N	lax Rate	Tx Pkts	Rx Pkts	Tx Rate	Tx Drop %	Dropped	Tx-Failed	Failed-Late	TX Byte
	/L-01-A				1,544,000	0	0		0 0	0	0		
+ N	(L-01-B		N	one	1,544,000	0	0	(0 0	0	0	0	
4													

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

-			
	LANforge Manager V	ersion(5.4.3)	\odot \otimes \otimes
Control Reporting Windows Info Test	s		
	Chamber ⊻iew Stop A	All Restart Manager <u>R</u> efi	resh HELP
Status Port Mgr Layer-3 L3 Endp	s Layer 4-7 WanLinks Resource	Mgr Alerts Messages Warnings Wifi-Mes	isages +
License Info	Current Users	Saved Test Configurations	
Licenses expire in: 656 days.	* Admin from:127.0.0.1 gnuserver from:127.0.0.1	Configuration: FACTORY_DFLT	Load
Support expires in: 656 days.		Download DB Show Progress	Delete
Status Vie <u>w</u> : Ports by Resource		Name:	Save
Realm 0			
	Manager/Resource	1	
	•• 💻		
	••		
	••		
	Netsmith		
Logged in to: localhost:4002 as: Admin		2	stations: 21 01 00

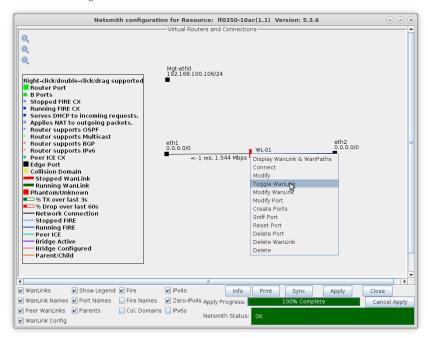
E. This is the general form of a Bridged Mode WanLink in Netsmith. It consists of two 0.0.0.0 IP addressed ports with a vertical bar between them.



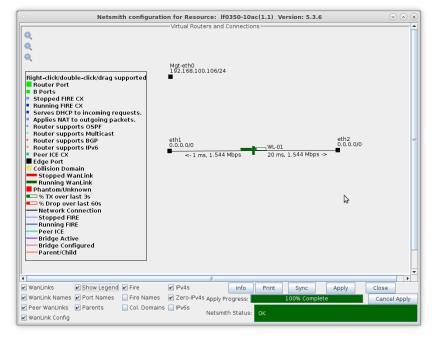
For more information see LANforge-GUI User Guide: WanLinks (ICE)

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.



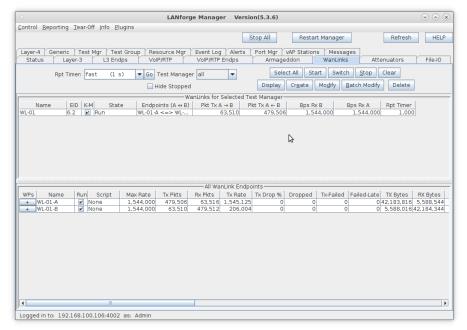
A. Right-click the WanLink and select Display WanLink

C. View the WanLink display

WanLink Display: WL-01 Mai	nager: 192.168.100.106	$\overline{\diamond \diamond \times}$
Endpoint: WL-01-A (1.1.1.1)	Endpoint: WL-01-B (1.1.2.2)	
08 08 WAN Speed: 1.544 Mbps TX Rate: 207.778 Kbps RX Rate: 207.778 Kbps TX Pkts: 250857 Dropped: 0 Duplicated: 0 Reordered: 0 TX Falled: 0	☐ 30-sec Averages WAN Speed: 1.544 Mbps TX Rate: 1.558 Mbps RX Rate: 1.558 Mbps TX Pkts: 33024 Dropped: 0 Duplicated: 0 Reordered: 0 TX Failed: 0	0 B
4 255 Steps - 16 777 Nbps - 255 Steps - 256 Sps - 2	4.35 Objs 16.777 Majs - 65.572 Kaps - 256 bps - 256 bps - 775 Kaps - 775 Kaps - 775 Kaps - 286 bps - 785 Kaps - 805 Kaps - 986 Kaps	75 KB Backlog
WanPaths for WanLi	nk Endpoint: WL-01-A	
Name Tx Rate Disabled ! !F Filter Pattern	Tx Pkts Rx Pkts TX Bytes RX Bytes Dropped Du	p Pkts OC
	k Endpoint: WL-01-B	
Name Tx Rate Disabled I IF Filter Pattern	Tx Pkts Rx Pkts TX Bytes RX Bytes Dropped Du	ip Pkts OC
Display Selected Paths Pause Display Print N	1odify Stop Refresh Clear	Close

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

4. View the **WanLinks** tab



- 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

Bridged Mode WanLink with Virtual Ports and Redirect Devices

Goal: Setup a Bridged Mode WanLink using RDDs (Redirect Devices).

In this test scenario, a LANforge-ICE WanLink is created in Bridged Mode using Redirect Devices to illustrate an example of how to send LANforge-FIRE traffic to yourself through LANforge-ICE. This is useful when physical ports are in short supply and a proof-of-concept test is needed. NOTE: THIS WILL NOT WORK PROPERLY WITHOUT THE INSTALLATION OF THE CANDELA KERNEL.

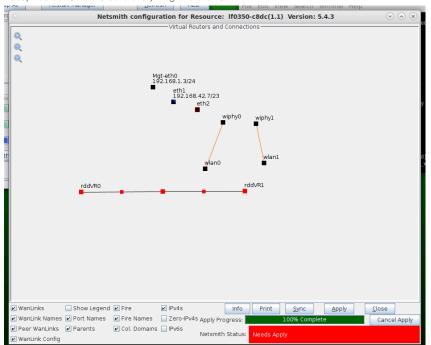
- 1. Setup a Netsmith Connection.
 - A. Go to the Status tab and click Netsmith

		.=						
	LANforge Mana	ager Versi	on(5.4.3)			\odot	\sim \times
<u>Control Reporting Windows Info Test</u>	ol Beporting Windgws info Tests Chamber Yiew Stop All Restart Manager Befresh HELP Jas Port Mgr Layer-3 L3 Endps Layer 4-7 WanLinks Resource Mgr Alerts Messages Warnings Wifi-Messages + License Info see expire in: 656 days. avtexpires in: 656 days. sview: Ports by Resource v n 0 Manager/Resource 1 Name: Save Manager Resource 1 Name: Save Name: Save Na							
	Chamber ⊻iew	Stop All	Re	estart Mana	ger	Refr	Load Delete Save	
Status Port Mgr Layer-3 L3 Endp	s Layer 4-7 WanLinks	Resource Mgr	Alerts	Messages	Warnings	Wifi-Mess	ages +	HELP +
License Info	Current Users			Save	d Test Config	urations		
Licenses expire in: 656 days.		Co	nfiguratio	n: FAC	TORY_DFLT	-	Load	i
Support expires in: 656 days.			Download	DB	Show Progr	ess	Befresh HELP Wifi-Messages + rations - Image: Signal Control - Image: Delete -	
Status Vie <u>w</u> : Ports by Resource		Na	me:			gs Wifi-Messages Y + figurations Load gress Delete		
Realm 0								
		•• 💻						
	1	Vetsmith						
ogged in to: localhost:4002 as: Admin						2.	tations.	
Jygeu III tu: Iucaiiiust.4002 as: Auriiiii						23	cations: 2	1 0 + 0%

B. Right-click inside the Netsmith window and select New Connection



C. Accept defaults, Auto Create everything and click \mathbf{OK}



A. NOTE: The new connection consists of two pairs of Redirect Devices, Port 1A, 1B and Port 2A, 2B and a WanLink. The new connection is not created until you click the Apply button in the Netsmith window.



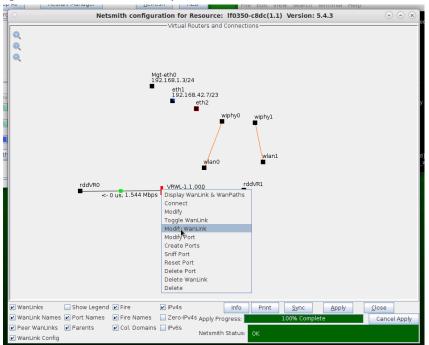


A. **NOTE:** The new connection is created and has a Bridged Mode WanLink between Redirect Device ports 1B and 2B which are shown as smaller, green squares (B-Ports) connected by a vertical bar (WanLink).

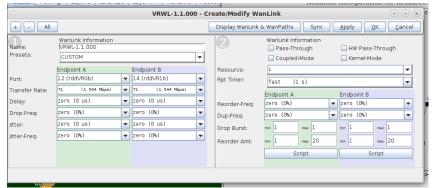
For more information see LANforge-GUI User Guide: Virtual Interfaces

2. Setup the WanLink.

A. Right-click the WanLink and select Modify WanLink

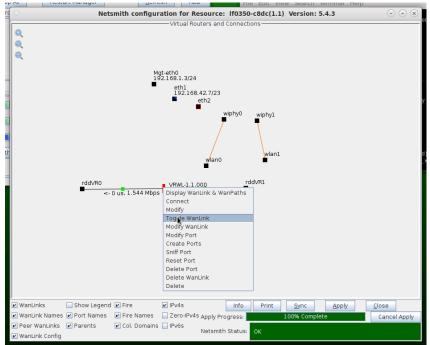


B. Verify that the B-side ports of the Redirect Device pairs (rddVR0b and rddVR1b) are configured



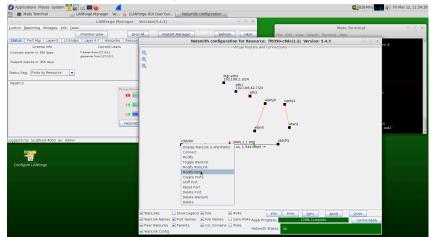
- A. NOTE: Be sure to set the impairment, if any, and transfer rate
- B. Click **OK** when done

C. Right-click on the WanLink and select Toggle WanLink to Running (green)



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

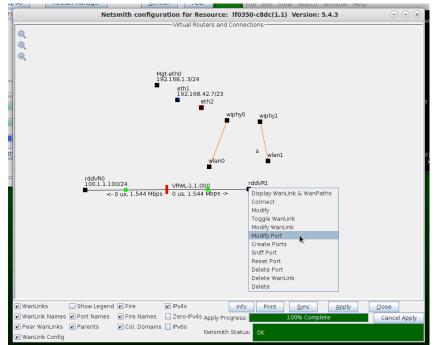
A. Right-click port rddVR0 and select Modify Port



B. Assign an IP address and Network Mask to rddVR0

\bigcirc			LANfo	rge Manager V	ersion(5.4.3)		(*) (*)
2c			rddVR0 (lf0350-c8dc) Cor	nfigure Settings		\odot \sim \times
				Port Status Informa	tion		
S				PROBE-ERROR TSO GSO (
			Driver Info: Port Typ	e: Redirect-Device Peer	rddVR0b rddVR0b		
L				Port Configurab	les		
	Enable		General Ir	terface Settings		Port Rates	Advert Rates
S	Set MAC			, i i i i i i i i i i i i i i i i i i i		A 10bt-HD	10bt-HD
	Set TX Q Len	Down	🔲 Aux-Mgt	DHCP Hostname:	None	O 100bt-HD	10bt-FD
St	Set MTU	DHCP-IPv <u>6</u>	🗹 DHCP Release	DHCP Vendor ID:	None 💌	8 100bt-FD 1000-FD	100bt-HD
B	Set Offload	DHCP-IPv4	Secondary-IPs	DHCP Client ID:	None	8 2.5G-FD 5G-FD	100bt-FD
	Set PROMISC	DNS Servers:	BLANK	Peer IP:	NA	10G-FD 40G-FD	1000-FD
	Set Rx-All/FCS	IP Address:	100.1.1.100	Global IPv6:	AUTO	O Autonegotiate	2.5G-FD
	Set Bridge Info	IP Mask:	255,255,255,0	Link IPv6:	AUTO	Renegotiate	5G-FD
		Gateway IP:	0.0.0.0	IPv6 GW:	AUTO	Restart Xcvr	40G-FD
	Services	Alias:		I MTU:	1500		Flow-Control
	FTP	MAC Addr:	fe:1d:d6:79:aa:aa	TX Q Len	1000	RX-ALL	
	DNS	Br Cost:	Ignore		Ignore 🗸	RX-FCS	Offload
	RADIUS	Br Cost:		1		Bypass NOW!	✓ TSO Enabled UFO Enabled
	IPSEC-Client	Rpt Timer:	medium (8 s) 🔻	WiFi Bridge:	NONE	Bypass Power-UP	GS0 Enabled
þç	IPsec-Upstream	IPSec GW:		IPSec Password:		Bypass Power-DOWN	LRO Enabled
		IPSec Local ID.		IPSec Remote ID.:		Bypass Disconnect	GRO Enabled
		Print	Display	be Sync	Apply OK	Cancel	
		Tune r		<u>ayric</u>		cancer	

C. Right-click port rddVR1 and select Modify Port



D. Assign an IP address and Network Mask to rddVR1

		Current: LINK-UP	Port Status Informate PROBE-ERROR TSO GSO (
			pe: Redirect-Device Peer			
		Driver into: Forcily	pe: Redirect-Device Feer	rodvkib rodvkib		
			Port Configurab	les		
Enable		General Ir	nterface Settings		Port Rates	Advert Rates
Set MAC			-	None	A 10bt-HD 10bt-ED	10bt-HD
Set TX Q Len	Down	Aux-Mgt	DHCP Hostname:	None	100bt-HD 100bt-FD	10bt-FD
Set MTU	DHCP-IPv <u>6</u>	DHCP Release	DHCP Vendor ID:	None 💌	Ö 1000-FD	100bt-HD
Set Offload	DHCP-IPv4	Secondary-IPs	DHCP Client ID:	None	8 2.5G-FD 5G-FD	100bt-FD
Set PROMISC	DNS Servers:	BLANK	Peer IP:	NA	10G-FD 40G-FD	1000-FD
Set Rx-All/FCS	IP Address:	100.1.1.101	Global IPv6:	AUTO	O Autonegotiate	2.5G-FD
Set Bridge Info	IP Mask:	255.255.255.0	Link IPv6:	AUTO		5G-FD
	Gateway IP:	0.0.0.0	IPv6 GW:	AUTO	Renegotiate	10G-FD
Services	Alias:	0.0.0.0	MTU:	1500	Restart Xcvr	Flow-Contro
HTTP	MAC Addr:	4e:24:c9:61:34:8b	TX 0 Len	1000	PROMISC	- Flow-contro
DNS					RX-ALL	Offload
RADIUS	Br Cost:	Ignore	Priority:	Ignore 🔻	RX-FCS	✓ TSO Enable
IPSEC-Client	Rp <u>t</u> Timer:	nedium (8 s) 🔻	WiFi Bridge:	NONE 👻	Bypass NOW!	UFO Enable
IPsec-Upstream	IPSec GW:		IPSec Password:		Bypass Power-UP Bypass Power-DOWN	GSO Enable
a see opsideant	IPSec Local ID.		IPSec Remote ID.:			LRO Enabled
					Bypass Disconnect	GRO Enable

A. NOTE: As an alternate method to set Network Mask, enter a / followed by the number of mask bits after the IP address. In this case, /24 is equivalent to 255.255.255.0

E. Select the IPv4s checkbox at the bottom of the Netsmith window to verify port configuration



F. Go to the Port Mgr tab to verify port configuration

control	Rep	orti	ing Wind <u>o</u> ws <u>I</u> r	nto <u>T</u> e	sts									
					Chamb	er ⊻iew		Stop All	R	estart Mar	nager	<u>R</u> e	fresh	HELF
Status	P	ort I	Mar Laver-3	L3 End	lps Lave	er 4-7	WanLinks R	esource Ma	r Alerts	Messag	es Warning	s Wifi-Me	ssages +	-
Dier										1	1			
Disp	» 118	92.1	.08.1.3:1		Shiir Packe	ets	Down	I Clear	Counters	Rese	t Port De	elete		
<u> </u>						- All Ethe	rnet Interface	s (Ports) for	all Resource					
				1		1	ince incentace.		annesoan				1	
Port	Ø	î	IP	SEC	Alias		RX Bytes	RX Pkts	Pps RX	bps RX	TX Bytes	TX Pkts	Pps TX	bp
L.1.00		_	192.168.1.3	0	eth0		12,587,573	143,206	39	22,947	48,826,836	162,993	44	20
1.1.01			192.168.42.7	0	ethl		405,312	6,727	1	489	10,392	112	0	
1.1.02			0.0.0.0	0	eth2		0			0	0		0	
							145,811				7,360			
				0			0	3,948	0		0	0		
							v							
1.1.14			0.0.0.0	0	rddVR1b	rddV	2,252	28	0	0	1,546	19	0	

A. NOTE: The Bridged Mode WanLink is connected between rddVR0b and rddVR1b which both have 0.0.0.0 IP addresses

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

A. Go to the Layer-3 tab and click Create

LANforge Manager Version(5.4.3)	
Control Beporting Windows Info Iests	
Chamber View Stop All Restart Manager Refresh	HELP
Status Port Mgr Layer-3 L3 Endps Layer 4-7 WanLinks Resource Mgr Alerts Messages Warnings Wifi-Messages +	
Rpt Timer: fast (1 s) 🔻 Go Test Manager all 💌 Select All Start + Stop - Quiesce Clear	
View 0 - 500 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
	Þ
, Logged in to: localhost:4002 as: Admin 2 stations: 21	0100

B. The RDD-FIRE connection will use the A-side ports of the Redirect Device pairs

0		_	RDD-FIRE - Cr		Modify Cross (Connect	_	(v) (n) (x) (v)) (~)
+ - All					Display	<u>Sync</u> <u>B</u> atch-Create		Apply OK	<u>C</u> ano	cel
CX Name: CX Type:	Cross-Connect RDD-FIRE LANforge / UDP			•	Report Timer:	Cross-Connect fast (1 s) Endpoint A	_	Endpoint B]
	Endpoint A		Endpoint B		Pld Pattern	increasing	-	increasing	-	7
Resource:	1 (lf0350-c8dc)	-	1 (lf0350-c8dc)	-	Min IP Port:	AUTO	-	AUTO	-	1
Port:	11 (rddVR0)	-	13 (rddVR1)	•	Max IP Port:	Sane	-	Sane	-	1
Min Tx Rate:	1G (1 Gbps)	•	1G (1 Gbps)	-	Min Duration:	Forever	-	Forever	-	1
Max Tx Rate:	Same	-	Same	-	Max Duration:	Same	-	Sane	-	1
Min PDU Size:	UDP Pld (1,472 B)	•	UDP Pld (1,472 B)	-	Min Reconn:	0 (0 ms)	- -	0 (0 ms)		
Max PDU Size:	Sane	-	Same	-	Max Reconn:	Same	-	Sane	-	1
IP ToS:	Best Effort (0)	-	Best Effort (0)	-	Multi-Conn:	Normal (0)	-	Normal (0)		1
Pkts To Send:	Infinite	-	Infinite	-	Maid-Conn.	Auto-Helper		Auto-Helper		1
						Script		Script		٦
						Ihresholds		Ihresholds		ī
										1

A. NOTE: These are the ports rddVR0 and rddVR1 that were assigned IP addresses in step 2

C. Verify the Layer-3 connection was created

				LANforge N	lanager Versi	on(5.4.3)			\sim \sim \times
<u>Control</u> <u>R</u> epo	orting Wir	nd <u>o</u> ws <u>I</u> nfo	Tests						
			Cham	ber <u>V</u> iew	Stop All	Restart Manag	ler	<u>R</u> efresh	HELP
Status Po	rt Mgr 🛛 L	ayer-3 L3	Endps Lay	er 4-7 WanLink	s Resource Mgr	Alerts Messages	Warnings V	Vifi-Messages	+
Rpt	Timer: fa	st (1s)	▼ Go 1	est Manager all	-	Select All Start +	<u>S</u> top - <u>Q</u> ui	iesce Clear]
Viev	N 0 -	500		▼ Go		Display Cre	ate Mo <u>d</u> ify	Delete	
				Cross Connec	ts for Selected Tes	t Manager			
Name	Туре	State	Pkt Rx A	Pkt Rx B	Bps Rx A	Bps Rx B Rx Drop	% A Rx Drop % I	B Drop Pkts A	Drop Pkts
RDD-FIRE	LF/UDP	Stopped	0	0	0	0	0 (0 0	
٩									•

For more information see LANforge-GUI User Guide: Layer-3 Cross Connects (FIRE)

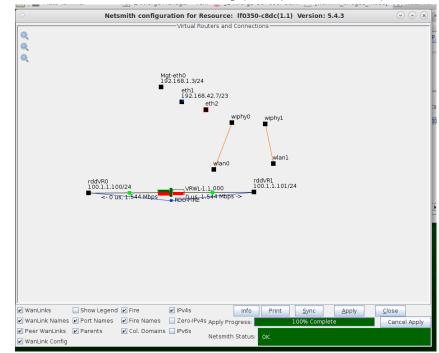
- 5. Run LANforge-FIRE to yourself through LANforge-ICE!
 - A. Select the Layer-3 Cross Connect and click Start

				LANforg	e Manager 🛛 Vei	rsion(5.4.3)				\sim \sim \times
<u>Control</u> <u>R</u> eport	ing Win	id <u>o</u> ws <u>I</u> nfo	Tests							
Chamber View Stop All Restart Manager Befresh HELP										
Status Port Mgr Layer-3 L3 Endps Layer 4-7 WanLinks Resource Mgr Alerts Messages Warnings Wifi-Messages +										
Rpt Ti	mer: fas	st (1s)	▼ Go 1	est Manager	all 🔻	Select All	Start + St	op - Quie	esce Clear	
View	0 -	500		🔻 Go		Displa	y Cr <u>e</u> ate	Mo <u>d</u> ify	Delete	
					nects for Selected	Test Manager—				
Name	Туре	State	Pkt Rx A	Pkt Rx B	Bps Rx A	Bps Rx B	Rx Drop % A	Rx Drop % E	Drop Pkts A	Drop Pkts
RDD-FIRE	LF/UDP	Run	0	0	0	0	100	100	171,050	191,51
4										•
gged in to: loo										

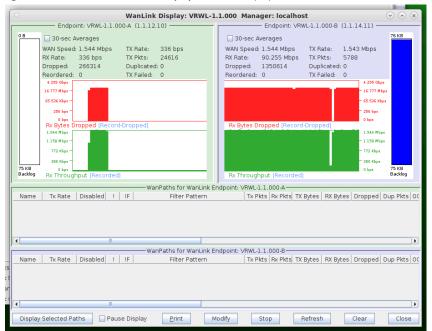
B. Click **Display** to show the Layer-3 Cross Connect details



C. Go to the Status tab and click Netsmith to view the graphical representation of the setup



D. Right-click on the WanLink and select **Display WanLink** to display the WanLink details



Routed Mode WanLinks with Virtual Routers

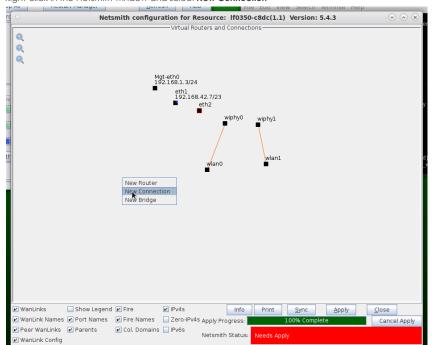
Goal: Setup a Routed Mode WanLink between two Virtual Routers.

In this test scenario, LANforge-ICE is used to simulate a routed network where incoming traffic on one port is sent through one Virtual Router then through a WanLink, then through a second Virtual Router and then finally out to a port on a different network.

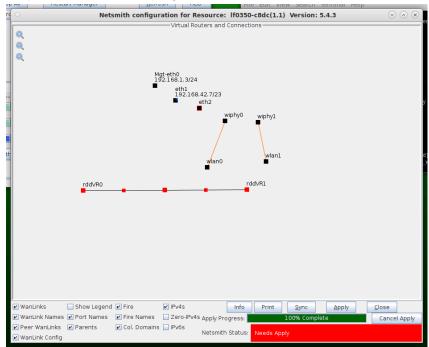
- 1. Setup a Netsmith Connection.
 - A. Go to the Status tab and click Netsmith

	LANforge Manager	Version(5.4.3)		\odot \otimes \otimes
<u>Control Reporting Windows Info Test</u>	IS			
	Chamber ⊻iew Sto	p All Restart	Manager <u>R</u>	efresh HELP
Status Port Mgr Layer-3 L3 Endp	s Layer 4-7 WanLinks Resou	ce Mgr Alerts Mes	sages Warnings Wifi-M	essages +
License Info	Current Users		Saved Test Configurations	
Licenses expire in: 656 days.	* Admin from:127.0.0.1 gnuserver from:127.0.0.1	Configuration:	FACTORY_DFLT	Load
Support expires in: 656 days.		Download DB	Show Progress	Delete
Status Vie <u>w</u> : Ports by Resource 💌		Name:		Save
Realm 0	Manager/Reso	urce 1		
	Netsmit			

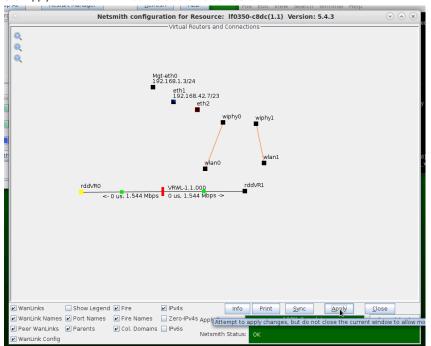
B. Right-click in the Netsmith window and select New Connection



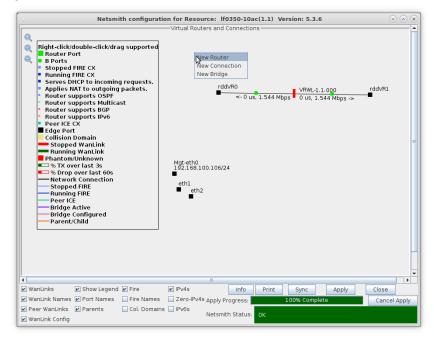
C. Accept defaults, Auto Create everything then click \mathbf{OK}



D. Click Apply in the Netsmith window to create the connection



- 2. Setup two Virtual Routers.
 - A. Right-click in the Netsmith window and select New Router

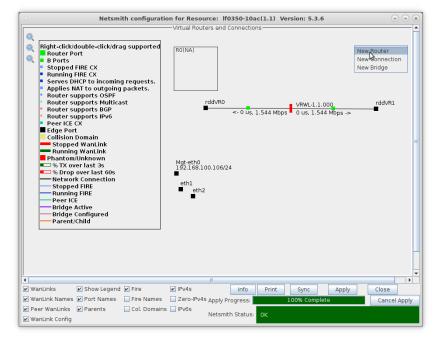


B. Accept defaults, or change the name, graphical size and notes about the Virtual Router.

Right-click/double-cli	ick/drag support	ed						
B Ports		Cre	eate/Modify	Virtual Roo	uter			(
Jame: <pre></pre> Auto Create Nev	v Name>		Width:			Height:	100	
Use OSPF 🔲 Multicas				P Dflt Route	-		iter 📃 IPv6	RADV
Use Existing Cfg 🛛 🗎 B	IGP Router BG		BGP Reflect BGP Reflect			BGP Dar	mping	
		INC	ites about thi	s virtual Roul	.er			
		B	GP Configurat	ion Informatio	n			
Router	ID 0.0.0.0	Local		0	Cluster ID			
Confed	eration ID 0	Dampi	ng Half Life		Damping Ma	x Suppress 3		
Dampir	ng Reuse 3	Dampi	ng Suppress					
BGP Peer Flags		Peer AS	Peer ID	Local Iface	Nexthop	Nexthop6	Hold Time	Delay Oper
Active Client	Confed 🗹 Ucast							
Active Client	Confed 🖌 Ucast							
Active Client C	Confed 🗹 Ucast							
Active Client	Confed 🖌 Ucast							
Active Client	Confed 🕑 Ucast							
Active Client	Confed 🖌 Ucast							
Active Client	Confed 🗹 Ucast							
Active Client	Confed 🗹 Ucast							
			ок	Cancel	л		n	
			OK	cancer	_			
/anLinks 🔽 Show L	.egend 🔽 Fire	P IPv		Info	Print	Svnc	Apply	Close

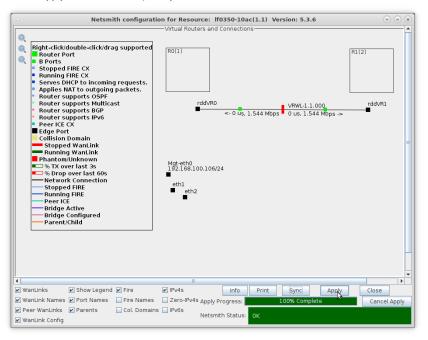
A. Click OK when done

C. Click the Apply button and repeat for the second Virtual Router



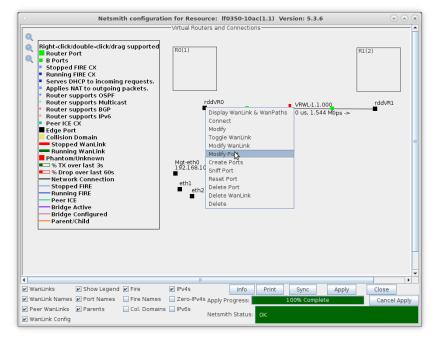
A. **NOTE:** After making any changes to the Netsmith window, you must click **Apply** or your changes will NOT be implemented and could be lost.

D. Click the Apply button followed by the Sync button



- A. NOTE: Clicking Sync makes sure any changes are synchronized with the current database.
- B. Also, note the Netsmith Apply Progress bar displayed at the bottom of the Netsmith window.

- 3. Configure the ports on the ends of the WanLink.
 - A. Right-click port rddVR0 and select Modify Port

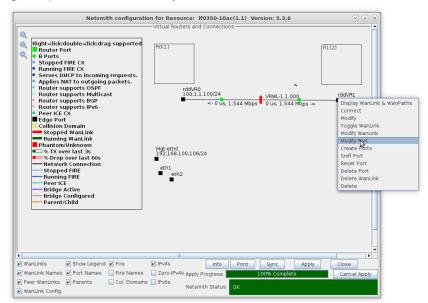


B. Assign an IP address and Network Mask.

			LANfo	orge Manager V	ersion(5.4.3)		(*) (*)
0			rddVR0	(lf0350-c8dc) Cor	nfigure Settings		\odot \otimes \otimes
				Port Status Informa			
9				JP PROBE-ERROR TSO GSO (
			Driver Info: Port T	ype: Redirect-Device Peer	r: rddVR0b rddVR0b		
				Port Configurab	les		
Enal	ble		General	Interface Settings		Port Rates	Advert Rates
Set M/	AC			-	None	S 10bt-HD 10bt-FD	10bt-HD
Set TX	Q Len	Down 🗌	Aux-Mgt	DHCP Hostname:	None	O 100bt-HD	10bt-FD
Set M1	ru	DHCP-IPv <u>6</u>	DHCP Release	DHCP Vendor ID:	None 💌	8 100bt-FD 1000-FD	100bt-HD
Set Of		DHCP-IPv4	Secondary-IPs	DHCP Client ID:	None	8 2.5G-FD 5G-FD	100bt-FD
Set PR		DNS Servers:	BLANK	Peer IP:	NA	10G-FD 40G-FD	1000-FD
Set Rx		IP Address:	100.1.1.100	Global IPv6:	AUTO	Autonegotiate	2.5G-FD
Set Br	idge Info	IP Mask:	255.255.255.0	Link IPv6:	AUTO	Renegotiate	5G-FD
Serv	icar	Gateway IP:	0.0.0.0	IPv6 GW:	AUTO	Restart Xcvr	40G-FD
HTTP	ices	Alias:		MTU:	1500	PROMISC	Flow-Control
FTP		MAC Addr:	fe:1d:d6:79:aa:aa	TX Q Len	1000	RX-ALL	Offload
DNS		Br Cost:	Ignore	 Priority: 	Ignore 💌	RX-FCS	▼ TSO Enabled
RADIU		Rot Timer:	medium (8 s)	 WiFi Bridge: 	NONE	Bypass NOW!	UFO Enabled
IPSEC		IPSec GW:	0.0.0.0	IPSec Password:		Bypass Power-UP	🖌 GSO Enabled
IPsec-I	Upstream					Bypass Power-DOWN	LRO Enabled
		IPSec Local ID.:		IPSec Remote ID.:		Bypass Disconnect	🖌 GRO Enabled
		Print D	isplay <u>P</u>	robe <u>S</u> ync	Apply OK	<u>C</u> ancel	

A. This example uses 10.1.1.100 and 255.255.255.0.

C. Right-click port rddVR1 and select Modify Port



D. Assign an IP address and Network Mask.

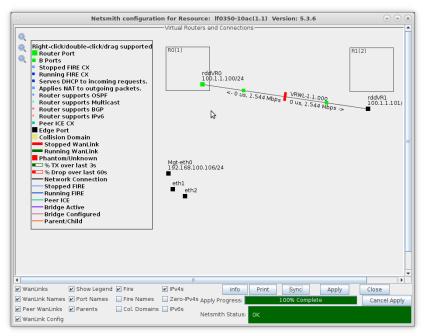
Fort Status Information Current: LINK-UP PROBE ERROR TSO 650 670 Driver Infe: Port Type: Rediract Device Peer ridWILb Port Configurables Fort Retex Advent Retex Set MAC Port Configurables Set NAC Port Retex Advent Retex Set KAC Port Retex Advent Retex Set KAC Down Advent Retex Set KAC Down Advent Retex Set KAC Port Retex Advent Retex Set Koulance Discretion Discretion Discretion Set Koulance Port Retex Advent Retex Set Koulance Discretion Set Koulance Discretion Set Koulance Port Retex Advent Retex Set Koulance Port Retex Set Koulance Port Retex					rge Manager V			(*) (*)
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Bit Wer Infe: Port Type: Reference Werk Inference								
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Set NU DHCP HPV3 VDHCP Keleass DHCP Vendor ID: None 0 0.06+D 0.06+D Set NU DHCP HPV4 Secondary-PS DHCP Client ID: None 0 0.06+D		TX Q Len	Down	Aux-Mgt	DHCP Hostname:	None	O 100bt-HD	10bt-FD
Bet Phone	Set Set	: MTU	DHCP-IPv <u>6</u>	DHCP Release	DHCP Vendor ID:	None 🔻	O 1000-FD	100bt-HD
Set Re-AlliPCS DNS Servers: BLANK Peer IP: NA Set Bridge Infe IP Address: 100.1.1.101 Global IPv6: AUTO 55-50 Set Bridge Infe IP Mask: 250-70 Infe IPv6: AUTO 55-70 Setvices Gateway IP: 0.0.0.0 IPv6 GW: AUTO Resequiate 106-70 Services Gateway IP: 0.0.0.0 IPv6 GW: AUTO Resequiate 106-70 FTP MACA Addr: 4e:24:(5):61:34:8b TX Q Len 1000 RKALL Officad DNS Br Cost: 1000e Priority: gnore TS0 Enabled Bypass Nowi Ur to Enabled IPSec Client IPSec Cost: 19-50 WFI Bridge: NONE Bypass Power-UP Bypass Power-UP IPSec Cost ID.: IPSec Remote ID.: IPSec Remote ID.: V GRO Enabled Bypass Disconcect V GRO Enabled	R		DHCP-IPv4	Secondary-IPs	DHCP Client ID:	None 💌	Ö 5G-FD	-
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Services Ajlas: MTU: 1500 PRONISC Flow Control FTP MAC Addr: 4e:24:c9:61:34:8b TX Q Len 1000 RX.ALL Officad DNS Br Cost: gnore Priority: gnore Priority: Bpass Novi UF 0 Enabled IPSec.Clean IPSec.Clean IPSec.Clean 0.0.0 IPSec Password: Bypass Power-UP G 050 Enabled IPSec.Local ID.: IPSec Remote ID.: IPSec Remote ID.: Bypass Disconnect V 060 Enabled		. onege nite	IP Mask:	255.255.255.0	Link IPv6:	AUTO	Renegotiate	
wttp: Alias: MTU: 1500 P RoHISC Flow Control FTP MAC Addr: 4ei:24:c9:61:34:8b TX Q Len 1000 P KALL Official DNS Br Cost: Ignore Priority: Ignore IKK.KE Y TSO Enabled IPSec.Client IPSec.Client IPSec.Client IPSec.Client IPSec.Client Ur So Enabled IPSec.Client IPSec.Client IPSec.Client IPSec.Client IPSec.Alient IPSec.Alient IPSec.Client IPSec.Client IPSec.Client IPSec.Alient IPSec.Alient IPSec.Alient IPSec.Client IPSec.Client IPSec.Client IPSec.Alient IPSec.Alient IPSec.Alient IPSec.Client IPSec.Client IPSec.Alient IPSec.Alient IPSec.Alient IPSec.Alient </td <th></th> <td>envices</td> <td>Gateway IP:</td> <td>0.0.0.0</td> <td>IPv6 GW:</td> <td>AUTO</td> <td>Restart Xcvr</td> <td>40 G-FD</td>		envices	Gateway IP:	0.0.0.0	IPv6 GW:	AUTO	Restart Xcvr	40 G-FD
DNS Br Cost: gnore Priority: gnore RCFCS FOS brakeled RADIUS Rpt Timer: medium (8 s) WiFi Bridge: NONE Bypass Nowi U/O Enabled IPSec.Client IPSec GW: 0.0.0.0 IPSec Password: Bypass PowerUP Bypass PowerUP IPSec Local ID.: IPSec Remote ID.: IPSec Subscence: V GRO Enabled			Alias:		MTU:	1500	PROMISC	Flow-Control
DNS Br Cost: gnore Priority: gnore RxFCS Y TS0 Enabled Bpsc.client IPSec.Client IPSec GW: 0.0.0.0 IPSec Password: Bppass Pomer-UP Ø CS0 Enabled IPSec Local ID.: IPSec Remote ID.: IPSec Sec W: 0.60.0 Enabled Bypass Disconnect Ø G80 Enabled	FTP		MAC Addr:	4e:24:c9:61:34:8b	TX Q Len	1000	RX-ALL	Offload
IPSEC-Client Rpt Timer: ledium (8 s) WiFi Bridge: NONE Bypass Description 00 c masks IPSec-Upstream IPSec GW: 0.0.0 IPSec Password: Bypass Power-DB V C NO Enabled IPSec Local ID.: IPSec Remote ID.: IPSec Remote ID.: IPSec Remote ID.: IPSpass Disconnect V GR0 Enabled	DN:	S	Br Cost:	Ignore 💌	Priority:	Ignore 💌	RX-FCS	
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IPSec Local ID.: IPSec Remote							Bypass Power-UP	🖌 GSO Enabled
Bypass Disconnect ⊻ GRO Enabled	IP se	ec-Upstream					Bypass Power-DOWN	LRO Enabled
			in Sec Local ID.:		Jan Sec Relificte ID.:		Bypass Disconnect	🖌 GRO Enabled
Print Display Probe Sync Apply QK Cancel			Print D	Display Pro	obe <u>S</u> ync	Apply <u>O</u> K	<u>C</u> ancel	

A. This example uses 10.1.1.101 and 255.255.255.0.

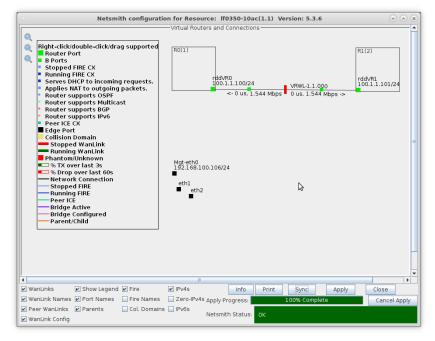
For more information see LANforge-GUI User Guide: Netsmith

4. Drag the ends of the WanLink into the Virtual Routers.

A. Left-click and drag rddVR0 into Router R0(1)



B. Left-click and drag rddVR1 into Router R1(2)

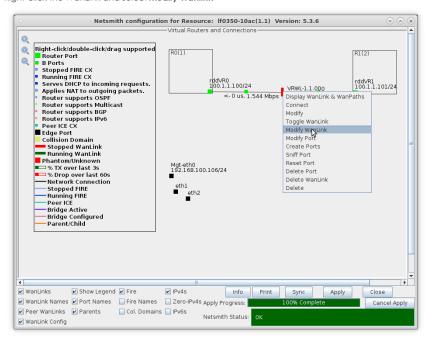


C. Click the $\ensuremath{\textbf{Apply}}$ button at the bottom of the Netsmith window

Netsmith configuration for Resource: lf0350-10ac(1.1) Version: 5.3.6 📀 📀	×
Virtual Routers and Connections	
Right-click/double-click/drag supported Router Port B Ports Stopped FIRE CX Router supports DICP to incoming requests. Applies NAT to outgoing packets. Router supports SOFF Router supports SOFF Router supports BGP Router Supper	
WanLinks Show Legend Fire Prv4s Info Print Sync Apply Close	-
WanLink Names Port Names Fire Names Zero-IPv4s Apply Progress: 1% Complete Cancel Appl	y
Peer WanLinks Parents Col. Domains IPv6s Netsmith Status: 0K	

5. Setup the Routed Mode WanLink characteristics.

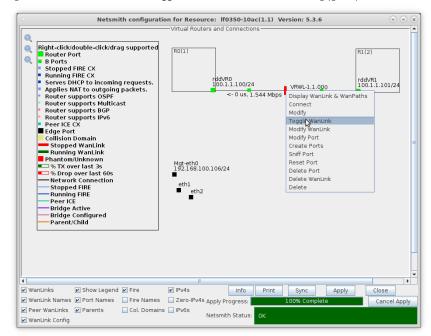
A. Right-click the WanLink and select Modify Wanlink



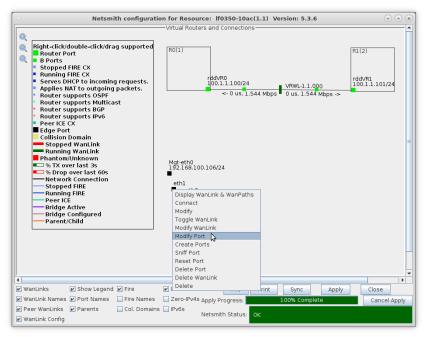
B. Verify that the B-side ports, rddVR0b and rddVR1b are filled in.

			VRWL-1.1.000) - C	reate/Modify Wa	nLink		\odot	\bigcirc	×
+ - All					Display WanLink 8	x WanPaths Sync		Apply QK C	ance	əl
Name: Presets:	WanLink Information VRWL-1.1.000 CUSTOM			•	2	WanLink Information Pass-Through Coupled-Mode		HW Pass-Through		
Port:	Endpoint A 12 (rddVR0b)	¥	Endpoint B 14 (rddVR1b)	•	Resource: Rpt Timer:	1 fast (1 s)	_		▼	
Transfer Rate: Delay:	Tl (1.544 Mbps) zero (O us)	• •	Tl (1.544 Mbps) zero (O us)	• •	Reorder-Freq:	Endpoint A zero (0%)	•	Endpoint B zero (0%)	-	
Drop-Freq: Jitter:	zero (0%) zero (0 us)	•	zero (0%) zero (0 us)	• •	Dup-Freq:	zero (0%)	-	zero (0%)	-	1
Jitter-Freq:	zero (O%)	-	zero (O%)	-	Drop Burst: Reorder Amt:	min 1 max 1 min 1 max 20		min 1 max 1 min 1 max 20	_	
						Script		Script]
CONTR					. т.					

- A. NOTE: Be sure to set the impairment, if any, and transfer rate.
- B. Click **OK** when done
- C. Right-click the WanLink and select Toggle Wanlink to set its status to Running (green).



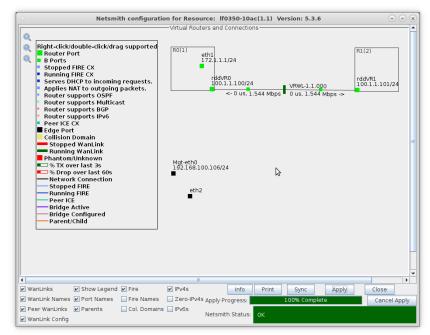
A. Right-click port eth1 and select Modify Port



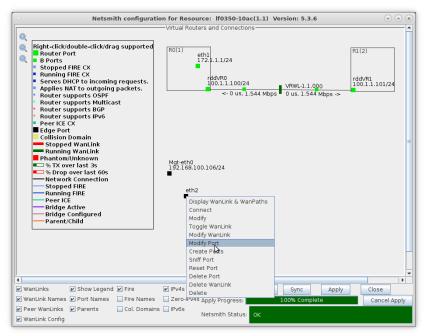
B. Assign port eth1 an IP address and Network Mask

			Port Status Info	ormation					
	Current: LINK-	UP 1000bt-FD AUTO-	NEGOTIATE Flow-Co	ontrol PROMISC		\triangleright			
Driver Info: Port Type: Ethernet Driver: igb(5.4.0-k) Bus: 0000:02:00.0 Cur: 2.5GT/s x1 Max: 2.5GT/s									
	Port Configurables								
Enable		Constantin	terface Settings	ables	Port Bates	-Advert Bates			
Set IF Down		General In	iterrace settings		O 10bt-HD	I 10bt-HD			
Set MAC	Down	Aux-Mat			O 10bt-FD	10bt-FD			
Set TX 0 Len	_		DHCP Vendor ID:	News	O 100bt-HD O 100bt-FD	100bt-HD			
Set MTU	DHCP-IPv6	DHCP Release			0 1000-FD 0 10G-FD	100bt-FD			
Set Offload	DHCP-IPv4	Secondary-IPs	DHCP Client ID:	None	0 40G-FD	1000-FD			
Set Bate Info	DNS Servers:	BLANK	Peer IP:	NA	Autonegotiate	1000-FD			
Set PROMISC	IP Address:	172.1.1.1/24	Global IPv6:	DELETED	Renegotiate	40G-FD			
Set PROMISC	IP Mask:	255.255.255.0	Link IPv6:	DELETED	Restart Xcvr	Flow-Contr			
	Gateway IP:	0.0.0.0	IPv6 GW:	DELETED		Piow-contr			
Set Bypass	Alias:		MTU:	1500	RX-ALL	Offload -			
Set CPU Mask	MAC Addr:	00:0d:b9:47:10:ad	TX Q Len	1000	RX-FCS	TS0 Enable			
	Br Cost:	Ignore 💌	Priority:	Ignore		UFO Enable			
Services — HTTP	Rpt Timer:	slover (30 s) 🔻	Watchdog:	0	Bypass NOW!	GSO Enabl			
FTP		NO-SET	1		Bypass Power-UP	LR0 Enable			
RADIUS	CPU Mask:	NU-SET	WiFi Bridge:	NONE		GRO Enabl			
RADIUS					Bypass Disconnect	,			
	Print V	ew Details	Probe Sync	Apply	<u>O</u> K <u>C</u> ancel				

- A. NOTE: This example uses 172.1.1.1 and 255.255.255.0
- C. Drag port eth1 into Router R0(1)



D. Right-click port eth2 and select Modify Port



E. Assign port eth2 an IP address and Network Mask.

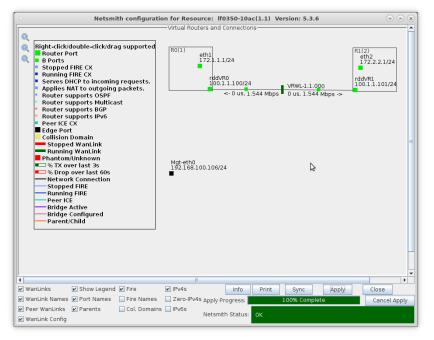
		eth2 (lf0	350-10ac) Confi	igure Settings			\odot
		UP 1000bt-FD AUTO-		ontrol PROMISC	n 2.5G	T/s x1 Max: 2.5GT/s x1	
		.,,,	Port Configu				
Enable		General In	terface Settings	rables	11	Port Rates	-Advert Rates
Set IF Down	Down	Aux-Mgt	-			O 10bt-HD O 10bt-FD O 100bt-HD	✓ 10bt-HD ✓ 10bt-FD
🗌 Set TX Q Len	DHCP-IPv6	DHCP Release	DHCP Vendor ID:	None		0 100bt-FD 0 1000-FD	☑ 100bt-HD
Set MTU Set Offload	DHCP-IPv4	Secondary-IPs	DHCP Client ID:	None		 10G-FD 40G-FD Autonegotiate 	✓ 100bt-FD ✓ 1000-FD
Set Rate Info	DNS Servers: IP Address:	BLANK 172.2.2.1	Peer IP: Global IPv6:	NA DELETED	= '	Renegotiate	10G-FD
Set Rx-All/FCS	IP Mask: Gateway IP:	255.255.255.0	Link IPv6:	DELETED		Restart Xcvr	Flow-Contro
Set Bypass Set Bridge Info	Alias:		MTU:	1500		RX-ALL	Offload
Set CPU Mask	MAC Addr: Br Cost:	00:0d:b9:47:10:ae	TX Q Len Priority:	1000 Ignore	- II '	RX-FCS	UFO Enable
Services	Rpt Timer:	nedium (8 s) 🔻	Watchdog:	0		Bypass NOW! Bypass Power-UP	GSO Enable
RADIUS	CPU Mask:	NO-SET	WiFi Bridge:	NONE		Bypass Power-DOWN	GR0 Enable
						Bypass Disconnect	
	Print V	ew Details	Probe Sync	Apply	<u>0</u> K	Cancel	

- A. NOTE: This example uses 172.2.2.1 and 255.255.255.0
- F. If either physical port connects to a larger routed network, right-click the port and select **Modify** and enter values for Next Hop and Subnets as follows:

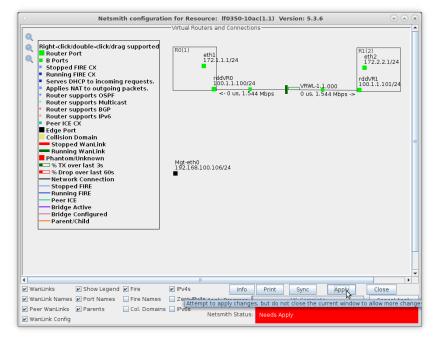
<u>ی</u>	Create/M	od	ify Connection	×
Port 1-A:	1 (eth0)	•	Interface-Cost:	1
Port 1-B: 🗹 Skip	<auto create="" new="" port=""></auto>	•	RIP-Metric	1
WanLink: 🗹 Skip	<auto create="" new="" wanlink=""></auto>	•	OSPF Area:	0.0.0.0
Port 2-B: 🗹 Skip	<auto create="" new="" port=""></auto>	•	Next-Hop:	0.0.0.0
Port 2-A: 🗹 Skip	<auto create="" new="" port=""></auto>	•	Subnets (a.b.c.d/xx):	
DHCP Lease Time:	43200			
DHCP DNS:				
DHCP Range Min:				
DHCP Range Max:				
DHCP Domain:			·	
DHCPd Config File:				
🗌 NAT 🛛 DHCP	🗌 Custom DHCP 📃 Cand-R	Р		
	ок		Cancel	

- A. NOTE: Next Hop is the default gateway of your next network hop
- B. Up to 8 different subnets can be configured or 0.0.0.0/0 for any subnet
- C. Click OK when done, then click Apply in Netsmith to apply your changes

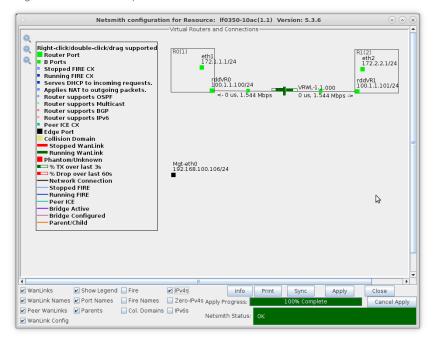
G. Drag port eth2 into Router R1(0)



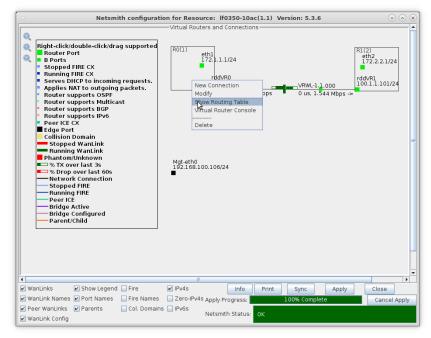
H. Click the Apply button at the bottom of the Netsmith window



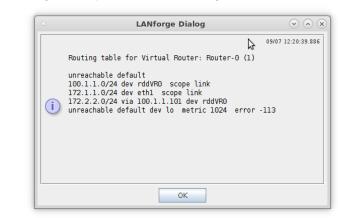
- 7. Run traffic and verify results. (Refer to LANforge FIRE Cookbook to run traffic)
 - A. Verify that the traffic on eth1 is being sent to Default Gateway 172.1.1.1 and that traffic on eth2 is being sent to Default Gateway 172.2.2.1



- A. NOTE: In this example, traffic to eth1 is from a port configured with IP address 172.1.1.105 Network Mask 255.255.255.0 and Default Gateway 172.1.1.1
- B. Traffic to eth2 is from a port configured with IP address 172.2.2.106 Network Mask 255.255.255.0 and Default Gateway 172.2.2.1
- C. To generate routed network traffic refer to the LANforge FIRE Cookbook Routed Network Testing section.
- D. If your physical configuration is complete, Netsmith should appear as shown here:
- B. Right-click one of the Virtual Routers and select **Show Routing Table** to view the internal routing table for the Virtual Router



C. LANforge Virtual Routers by default use simple subnet routing, but can also use OSPF or BGP routing protocols. LANforge can also perform IPv4 multicast routing.



For more information see LANforge-GUI User Guide: Netsmith

For more information see LANforge FIRE Cookbook

Routed Mode WanLinks with a Single Physical Port

Goal: Setup a Routed Mode WanLink between two Virtual Routers that only use one physical port.

In this test scenario, LANforge-ICE is used to simulate a routed network where a single physical port is used for incoming and outgoing traffic. The traffic will enter the physical port and will then be sent through two Virtual Routers connected by a WanLink and then back out the same physical port.

1. Setup a Netsmith Connection.

A. Go to the **Status** tab and click **Netsmith**

	LANforge Manager V	ersion(5.4.3)	\odot \otimes \otimes					
Control Reporting Windows Info Tests	3							
	Chamber ⊻iew Stop A	II Restart Manager	<u>R</u> efresh HELP					
Status Port Mgr Layer-3 L3 Endps	S Layer 4-7 WanLinks Resource	Mgr Alerts Messages Warnings	Wifi-Messages +					
License Info	Current Users	Saved Test Config	gurations					
Licenses expire in: 656 days.	* Admin from:127.0.0.1 gnuserver from:127.0.0.1	Configuration: FACTORY_DFLT	Load					
Support expires in: 656 days.		Download DB Show Progr	ress Delete					
Status Vie <u>w</u> : Ports by Resource 💌		Name:	Save					
Realm 0								
ogged in to: localhost:4002 as: Admin			2 stations: 21 01 00					

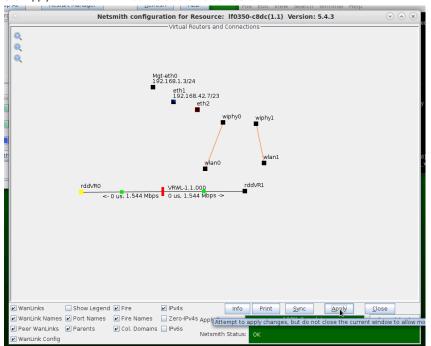
B. Right-click in the Netsmith window and select New Connection



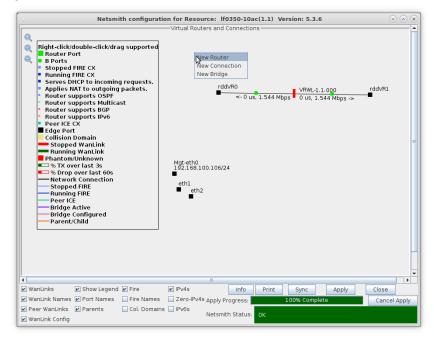
C. Accept defaults, Auto Create everything and click \mathbf{OK}



D. Click Apply in the Netsmith window to create the connection



- 2. Setup two Virtual Routers.
 - A. Right-click in the Netsmith window and select New Router

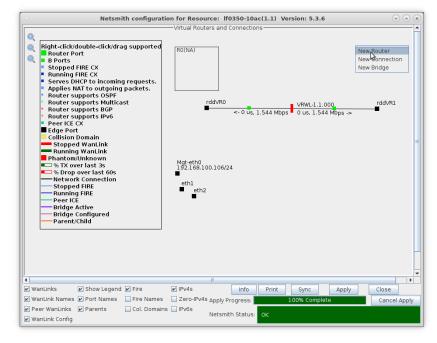


B. Accept defaults, or change the name, graphical size and notes about the Virtual Router

Right-click/double-click/drag Router Port	supported	1						
B Ports		Crea	te/Modify	Virtual Ro	uter	N		
Jame: <pre> Auto Create New Name></pre>			Width:	100		Height:	100	
Use OSPF Multicast Routing	-				Xorp SHA	IPv6 Rou		RADV
Use Existing Cfg 🛛 BGP Route	er 🗌 BGP			or 🔲 BGP (s Virtual Bout	Confederation	BGP Dar	nping	
		NOLE	s about this	s virtual Rou	Lei			
		BGF	. Configurat	ion Informatio	on			
Router ID		Local AS	-		Cluster ID			
Confederation II		Damping	g Half Life		Damping Max	Suppress 3		
Damping Reuse			g Suppress					
BGP Peer Flags			Peer ID	Local Iface	Nexthop	Nexthop6	Hold Time	Delay Oper
Active Client Confed [Ucast 0							
Active Client Confed [Ucast 0							
Active Client Confed [Ucast 0							
Active Client Confed [Ucast 0							
Active Client Confed [Ucast 0							
Active Client Confed [✔ Ucast 0							
Active Client Confed [Ucast 0							
Active Client Confed [Ucast 0							
			ОК	Cancel				
				cancer				

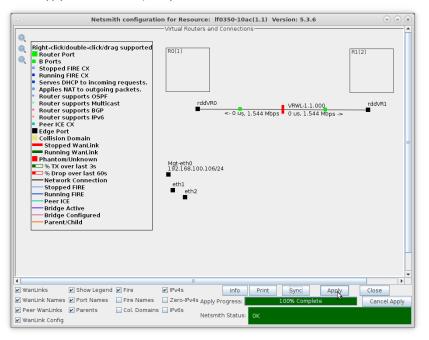
A. Click OK when done

C. Click the Apply button and repeat for the second Virtual Router



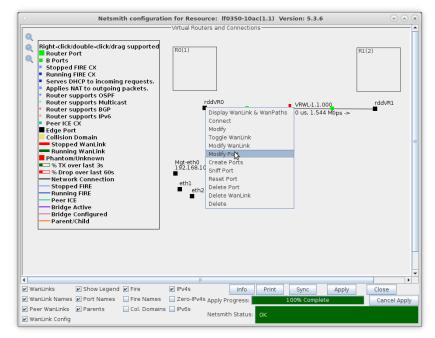
A. **NOTE:** After making any changes to the Netsmith window, you must click **Apply** or your changes will NOT be implemented and could be lost

D. Click the Apply button followed by the Sync button



- A. NOTE: Clicking Sync makes sure any changes are synchronized with the current database
- B. Also, note the Netsmith Apply Progress bar displayed at the bottom of the Netsmith window

- 3. Configure the ports on the ends of the WanLink.
 - A. Right-click port rddVR0 and select Modify Port

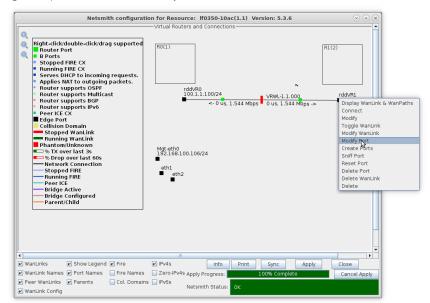


B. Assign an IP address and Network Mask

			Port Status Informat			
		Current: LINK-U	P PROBE-ERROR TSO GSO (
			vpe: Redirect-Device Peer			
		Since mile. Foreig	per neurocourice i reer			
			Port Configurab	les		
Enable		General I	interface Settings		Port Rates	Advert Rates
Set MAC	Down		DHCP Hostname:	None	O 10bt-HD 10bt-ED	10bt-HD
Set TX Q Len	Down	🔲 Aux-Mgt	DHCP Hostname:	Notie	100bt-HD 100bt-FD	10bt-FD
Set MTU	DHCP-IPv <u>6</u>	DHCP Release	DHCP Vendor ID:	None 🗸	O 1000-FD	100bt-HD
Set Offload	DHCP-IPv4	Secondary-IPs	DHCP Client ID:	None	8 2.5G-FD 5G-FD	100bt-FD
Set PROMISC	DNS Servers:	BLANK	Peer IP:	NA	10G-FD 40G-FD	1000-FD
Set Rx-All/FCS	IP Address:	100.1.1.100	Global IPv6:	AUTO	O Autonegotiate	2.5G-FD
Set Bridge Info	IP Mask:	255.255.255.0	Link IPv6:	AUTO	Renegotiate	5G-FD
Services	Gateway IP:	0.0.0.0	IPv6 GW:	AUTO	Restart Xcvr	40G-FD
HTTP	Alias:		MTU:	1500	PROMISC	Flow-Contro
FTP	MAC Addr:	fe:1d:d6:79:aa:aa	TX Q Len	1000	RX-ALL	Offload
DNS	Br Cost:	Ignore 🗖	Priority:	Ignore 💌	RX-FCS	TS0 Enabled
RADIUS	Rpt Timer:	medium (8 s)	WiFi Bridge:	NONE	Bypass NOW!	UFO Enabled
IPSEC-Client		0.0.0.0	IPSec Password:	TOTAL T	Bypass Power-UP	🖌 GSO Enable
IPsec-Upstream	IPSec GW:				Bypass Power-DOWN	LRO Enabled
	IPSec Local ID.:		IPSec Remote ID.:		Bypass Disconnect	🖌 GRO Enabled

A. This example uses 10.1.1.100 and 255.255.255.0

C. Right-click port rddVR1 and select Modify Port



D. Assign an IP address and Network Mask

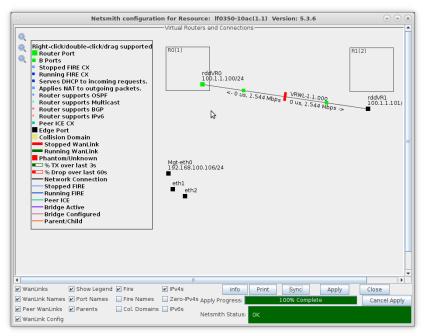
°_				rge Manager			(*) (*)
20			rddVR1 (lf0350-c8dc) Co	nfigure Settings		\sim \times
			Current: LINK-UP	Port Status Informa PROBE-ERROR TSO GSO			
3			Driver Info: Port Typ	pe: Redirect-Device Pee	rddVR1b rddVR1b		
L				Port Configurat	les		
L.	Enable		General Ir	nterface Settings		Port Rates	Advert Rates
s	Set MAC	Down	Aux-Mat	DHCP Hostname:	None	A 10bt-HD 10bt-FD	10bt-HD
St	Set TX Q Len	DHCP-IPv6	DHCP Release	DHCP Vendor ID:	None 👻	O 100bt-HD 100bt-FD	10bt-FD
B	Set Offload	DHCP-IPv4	Secondary-IPs	DHCP Client ID:	None 👻	2.5G-FD 5G-FD	100bt-FD
1	Set PROMISC	DNS Servers:	BLANK	Peer IP:	NA	10G-FD 40G-FD Autonegotiate	2.5G-FD
L.	Set Bridge Info	I <u>P</u> Address:	100.1.1.101	Global IPv6:	AUTO	() Autonegotiate	5G-FD
L		IP Mask:	255.255.255.0	Link IPv6:	AUTO	Renegotiate	10G-FD
L.	Services	Gateway IP:	0.0.0.0	IPv6 GW:	AUTO	Restart Xcvr	40 G-FD
L.	HTTP	Alias:		MTU:	1500	PROMISC	Flow-Control
L.	FTP	MAC Addr:	4e:24:c9:61:34:8b	TX Q Len	1000	RX-ALL	Offload
L.	DNS	Br Cost:	Ignore 👻	Priority:	Ignore 💌	RX-FCS	TSO Enabled
L.	RADIUS	Rot Timer:	medium (8 s) 👻	WiFi Bridge:	NONE	Bypass NOW!	UFO Enabled
	IPSEC-Client	IPSec GW:	0.0.0.0	IPSec Password:		Bypass Power-UP	🖌 GSO Enabled
Jų.	IPsec-Upstream	IPSec Local ID.		IPSec Remote ID.:		Bypass Power-DOWN	LRO Enabled
		in See Local ID.		In occi itemote ib		Bypass Disconnect	🖌 GRO Enabled
		Print [Display Pro	obe <u>S</u> ync	<u>A</u> pply <u>O</u> K	<u>C</u> ancel	

A. This example uses 10.1.1.101 and 255.255.255.0

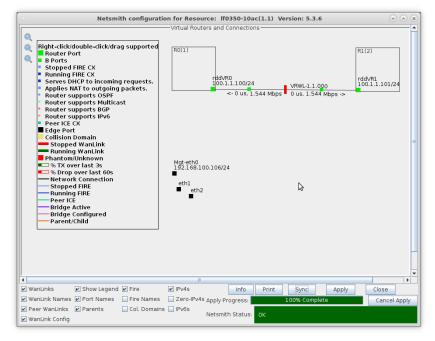
For more information see LANforge-GUI User Guide: Netsmith

4. Drag the ends of the WanLink into the Virtual Routers.

A. Left-click and drag rddVR0 into Router R0(1)



B. Left-click and drag rddVR1 into Router R1(2)

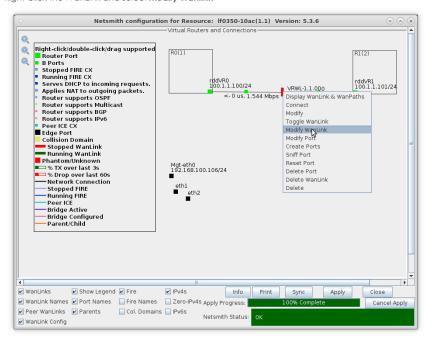


C. Click the $\ensuremath{\textbf{Apply}}$ button at the bottom of the Netsmith window

Netsmith configuration for Resource: lf0350-10ac(1.1) Version: 5.3.6 📀 📀	×
Virtual Routers and Connections	
Right-click/double-click/drag supported Router Port B Ports Stopped FIRE CX Router supports DICP to incoming requests. Applies NAT to outgoing packets. Router supports SOFF Router supports SOFF Router supports BGP Router Supper	
V WanLinks V Show Legend V Fire V IPv4s Info Print Sync Apply Close	
WanLink Names Port Names Fire Names Zero-IPv4s Apply Progress: 1% Complete Cancel Appl	y
Peer WanLinks Parents Col. Domains IPv6s Netsmith Status: 0K	

5. Setup the Routed Mode WanLink characteristics.

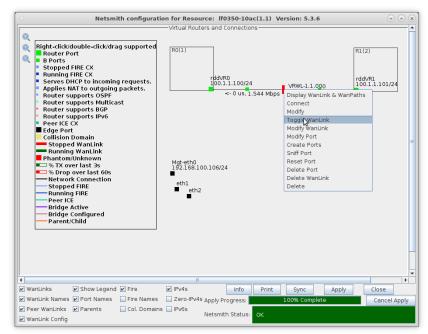
A. Right-click the WanLink and select Modify Wanlink



B. Verify that the B-side ports, rddVR0b and rddVR1b, are filled in

			VRWL-1.1.000	- C	reate/Modify Wa	nLink			•	×
+ - All					Display WanLink &	& WanPaths Sync		Apply QK	<u>C</u> anc	el
Name: Presets:	WanLink Information VRWL-1.1.000 CUSTOM			•	2	WanLink Information Pass-Through Coupled-Mode		HW Pass-Throug	h	_
Port:	Endpoint A 12 (rddVR0b)	-	Endpoint B 14 (rddVR1b)	•	Resource: Rpt Timer:	1 fast (1 s)	_		•	1.
Transfer Rate: Delay:	Tl (1.544 Mbps) zero (0 us)	•	Tl (1.544 Mbps) zero (0 us)	• •	Reorder-Freq:	Endpoint A zero (0%)	-	Endpoint B zero (0%)		
Drop-Freq: Jitter:	zero (0%) zero (0 us)	•	zero (O%) zero (O us)	• •	Dup-Freq: Drop Burst:	zero (0%)	•	zero (0%) min 1 max 1	•	-
Jitter-Freq:	zero (0%)	•	zero (0%)	•	Reorder Amt:	min 1 max 20		min 1 max 20)	
										-

- A. NOTE: Be sure to set the impairment, if any, and transfer rate
- B. Click **OK** when done
- C. Right-click the WanLink and select Toggle Wanlink to set its status to Running (green)



A. Go to the Port Mgr tab, select eth1 and click Create

Layer-4 Status	_	leric		Grou	Resou	rce Mgr	Event Log		Port Mgr	vAP Stati Want		es enuators	File-IO
	_		58.100.239:0	s	niff Packet			Counters	Reset	Port	Delete		
Rpt Timer: medium (8 s) 🔻 Apply I View Details Create Modify Batch Modify													
					All Et	hernet I	nterfaces (Por	ts) for all Re	sources				
Port	Pha	Down	IP	SEC	Alias	Parent Dev	RX Bytes	RX Pkts	Pps RX	bps RX	TX Bytes	TX Pkts	Pps TX
.1.0			192.168.100.106	0	eth0		269,824,726	690,830	9	8,408	315,968,149	444,352	12
.1.1			0.0.0.0	0	ethl		528	6	0	38	528	6	C
.1.2			0.0.0.0	0	eth2		528	6	0	39	528	6	(
.1.3			100.1.1.101	0	rddVR1	rddV	1,448	18	0	0	2,436	28	(
.1.4	_		0.0.0.0	0	rddVR1b	rddV	2,436	28	0	0	1,448	18	0
.1.5 .1.6		-	100.1.1.100	0	rddVR0 rddVR0b	rddV rddV	1,358 2,386	17	0	0	2,456	28 17	C
.1.0			0.0.0.0	U	raavkub	raav	2,380	27	0	0	1,358	17	U

B. Select the MAC-VLAN button

0			Create VLANs	on Port: 1.1.1	\$	\odot \otimes \otimes
0	MAC-VLAN WIFI STA	○ 802.1Q-VLAN ○ Rec Ə WiFi VAP ○ WiFi Monit		○ Bond ○ GRE Tu al Radio	nnel 😡	
2	Shelf:	1	Resource:	1 (lf0350-10ac) 💌	Port: 1 (ethl) 💌
B	VLAN ID:		DHCP-IPv4			
ľ	Parent MAC:	00:0d:b9:47:10:ad	DHCP Client ID:	None 💌		
	MAC Addr:	xxxxxxxxxxxx 💌	IP Address:	172.1.1.1/24	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:			r
	WiFi AP:		Key/Phrase:			
	WPA	WPA2	WEP			
4	Down					
	Apply	<u>C</u> ancel		C)one	

- A. Set a MAC address that begins with 00 (Ex: 00:11:33:55:77:01)
- B. Set the Quantity to 2
- C. Set the IP Address to 172.1.1.1 and IP Mask to 255.255.255.0
- D. Leave the Gateway IP field blank
- E. Click **OK** when done
- C. Select the MAC VLAN eth1#1 and click Modify

							5	top All	Restart	Manager		Refresh	HELF
Layer-4		neric		Grou		irce Mgr			Port Mgr	vAP Stati			
Status	s (Layer-	3 🕴 L3 Endps	ľ	VoIP/RTP	V	PIP/RTP End	os Arm	ageddon	Want	.inks 🏾 Att	enuators	File-IO
	Disp:	192.1	68.100.239:0	9	niff Packet	ts	1 CI	ear Counters	Reset	Port	Delete		
		_				_							
	Rpt Tir	mer: m	edium (8 s) 🖪		Apply		I	/iew Details	Cre	ate	Mo <u>d</u> ify	<u>B</u> atch Modif	У
					All Et	hernet I	nterfaces (F	Ports) for all R	esources				
Port	Pha	Down	IP	SEC	Alias	Parent Dev	RX Bytes	RX Pkts	Pps RX	bps RX	TX Bytes	TX Pkts	Pps TX
.1.0			192.168.100.10	6 0	eth0		270,124,3	82 693,526	9	8,827	319,635,849	447,964	13
1.1.1			0.0.0.0	0	eth1			28 6	0	0	6,166	75	C
1.1.2			0.0.0.0	0	eth2		6,1		0	36	528	6	(
.1.3			100.1.1.101	0	rddVR1	rddV	1,5			0			(
1.1.4			0.0.0.0	0	rddVR1b	rddV	2,5			0	1,518	19	C
1.5			100.1.1.100	0	rddVR0	rddV	1,4			0	2,456	28	C
1.1.6			0.0.0.0	0	rddVR0b	rddV	2,4		0	0		18	C
1.1.7			172.1.1.1	0	eth1#0	ethl		0 0		0			C
L.1.8			172.1.1.2	0	eth1#1	ethl		0 0	0	0	1,128	14	C
											3		

D. Set eth1#1 IP address to 172.2.2.1 and IP Mask to 255.255.255.0

			Port Status Info	ormation	\$	
		Current:	LINK-UP PROBE-	ERROR TSO UFO		
		Driver Inf	o: Port Type: MAC	-VLAN Parent: eth1		
			Port Configu	ables		
		General In	terface Settings		Port Rates	-Advert Rate
Set IF Down					O 10bt-HD O 10bt-ED	☑ 10bt-HD
Set MAC	Down	Aux-Mgt			O 100bt-HD	🖌 10bt-FD
🔲 Set TX Q Len	DHCP-IPv6	DHCP Release	DHCP Vendor ID:	None	0 100bt-FD 0 1000-FD	☑ 100bt-HD
Set MTU	_		-		O 10G-FD O 40G-FD	🗹 100bt-FD
Set Offload	DHCP-IPv4	Secondary-IPs	DHCP Client ID:	None	Autonegotiate	🗹 1000-FD
Set PROMISC	DNS Servers:	BLANK	Peer IP:	NA	Renegotiate	🔲 10G-FD
Set Rx-All/FCS	IP Address:	172.2.2.1	Global IPv6:	AUTO	Restart Xcvr	40G-FD
🔲 Set Bridge Info	IP Mask:	255.255.255.0	Link IPv6:	AUTO		Flow-Cont
	Gateway IP:	0.0.0.0	IPv6 GW:	AUTO	RX-ALL	, Offload -
	Alias:		MTU:	1500	RX-ALL	TSO Enab
HTTP	MAC Addr:	00:0d:b9:e3:cd:ad	TX Q Len	1000		UFO Enab
FTP	Br Cost:	Ignore 🗸	Priority:	Ignore 🗸	Bypass NOW!	GSO Enab
RADIUS	Rpt Timer:	nediun (8 s) 🔻	WiFi Bridge:	NONE	Bypass Power-DOWN	LRO Enabl
					Bypass Disconnect	GR0 Enab
]
	Print	ew Details	Probe Sync	Apply	0K Cancel	

E. Select eth2 and click **Create**

						LAN	orge M	anager	Ve	rsion(5.3.6	5)				
<u>C</u> ontrol	Repor	ting]	[ear-Of	f Info <u>P</u> lu	igins										
									Stop	All	Restart	Manager		Refresh	HELP
								L							
Layer-4	Ger	neric	Test M	Mgr Test	Grou	p Resou	rce Mgr	Event	: Log	Alerts F	Port Mgr	vAP Stati	ons Messag	jes	
Statu	s	Layer-	3	L3 Endps	- T	VoIP/RTP	V	IP/RTP E	ndps	Arma	ageddon	Want	inks Att	enuators	File-IO
	Disp: 192.168.100.239:0 Sniff Packets 1 Clear Counters Reset Port Delete														
	Rpt Timer: medium (8 s) V Apply I View Details Create Modify Batch Modify														
	All Ethernet Interfaces (Ports) for all Resources.														
	Parent														
Port	Pha	Down		IP	SEC	Alias	Dev	RX By	tes	RX Pkts	Pps RX	bps RX	TX Bytes	TX Pkts	Pps TX
	_	_	100.1		-			070.00		005.070		0.000		453 03 7	
1.1.0		-	0.0.0.0	68.100.106	0	eth0 eth1		270,38	5,983	695,978	10		322,640,242		13
1.1.1 1.1.2		-	0.0.0.0		0	eth1			528	6 85	0		6,954		0
1.1.3		12	100.1.		0	rddVR1	rddV		1.518	19	0	0			0
1.1.4		-	0.0.0.0		0	rddVR1b	rddV		2,506	29	0				0
1.1.5			100.1.		0	rddVR0	rddV		1.428	18	0		2,456		0
1.1.6			0.0.0.0	0	0	rddVR0b	rddV		2,456	28	0	0	1,428	18	0
1.1.7			172.1.		0	eth1#0	eth1		0		0				0
1.1.8			172.2.	2.1	0	eth1#1	ethl		0	0	0	0	1,846	23	0
•		11													•
Logged	in to:	1921	58 1 0 0	106:4002	as: A	dmin									

F. Select the **MAC-VLAN** button

0			Create VLANs	on Port: 1.1.2		\$	
a	MAC-VLAN	○ 802.1Q-VLAN ○ Red	direct 🛛 🔾 Bridge	🔾 Bond 🛛 🔾 GRE Tu	nnel	N	
_	O WIFI STA	🔾 WIFI VAP 🛛 🔾 WIFI Moni	tor 🔾 WiFi Virtu	al Radio			
2	Shelf:	1	Resource:	1 (lf0350-10ac) 🔻	Port: 2 (eth2)	-
	VLAN ID:		DHCP-IPv4				
	Parent MAC:	00:0d:b9:47:10:ae	DHCP Client ID:	None 💌			
	MAC Addr:	xxx:xxx:xxx:xxx	IP Address:	172.1.1.100	Global IPv6:	AUTO	
	Quantity:	2	IP Mask or Bits:	255.255.255.0	Link IPv6:	AUTO	
			Gateway IP:	172.1.1.1	IPv6 GW:	AUTO	
	#1 Redir Name:		#2 Redir Name:				
	STA ID:		SSID:			-	
	WiFi AP:		Key/Phrase:				
	WPA	WPA2	WEP				
4	Down						
	Apply	<u>C</u> ancel					

- A. Set a MAC address that begins with 00 (Ex: 00:22:44:66:88:01)
- B. Set the Quantity to 2
- C. Set the IP Address to 172.1.1.100 and IP Mask to 255.255.255.0
- D. Set the Gateway IP to 172.1.1.1
- E. Click OK when done

G. Select the MAC VLAN eth2#1 and click Modify

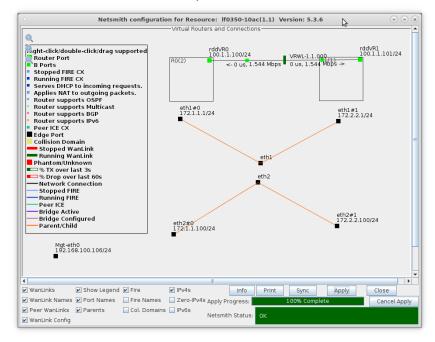
							Stop	All	Restart	Manager		Refresh	HEL
ayer-4.		neric		Grou		irce Mgr				vAP Stati			
Statu	S	Layer-	3 L3 Endps	1	/oIP/RTP	/ Vo	IP/RTP Endps	Arma	igeddon	Want	.inks 🏾 At	tenuators	File-IC
	Disp	1921	68.100.239:0		niff Packe	te	1 Clea	Counters	Reset	Port	Delete		
	Biopi				rini i deke			counters		TOIL	Delete		
	Rpt T	mer: n	edium (8 s) 🔽		Apply		I <u>V</u> ie	w Details	Crea	ate	Mo <u>d</u> ify	Batch Modif	y
					All Et	hernet I	nterfaces (Por	ts) for all Re	sources				
	1	1										L	
Port	Pha.	. Down	IP	SEC	Alias	Parent	RX Bytes	RX Pkts	Pps RX	bps RX	TX Bytes	TX Pkts	Pps TX
						Dev	-			1.1			
.1.00			192.168.100.106	0	eth0		270,635,535	698,242	9	8,893	325,639,014	453,975	1
1.01			0.0.0.0	0	eth1		2,644	32	0		7,234		
1.02			0.0.0.0	0	eth2		7,234	89	0		2,644		
1.03			100.1.1.101	0	rddVR1	rddV	1,588	20	0	0	2,576	30	
1.04			0.0.0.0	0	rddVR1b	rddV	2,576	30	0	4	1,588	20	
1.05			100.1.1.100	0	rddVR0	rddV	1,498	19	0	4	2,526	29	
1.06			0.0.0.0	0	rddVR0b	rddV	2,526	29	0	0	1,498	19	
.1.07			172.1.1.1	0	eth1#0	eth1	0	0	0	0	1,178	15	
1.08			172.2.2.1	0	eth1#1	ethl	0	0	0	0	2,056	26	
1.09			172.1.1.100	0	eth2#0	eth2	0	0	0	0	1,058	13	
1.10			172.1.1.101	0	eth2#1	eth2	0	0	0	0	1,058	13	
											3		

H. Set eth2#1 IP address to 172.2.2.100, IP Mask to 255.255.255.0 and Gateway IP to 172.2.2.1

		eth2#1 (lf	0350-10ac) Con	figure Settings	2	\odot
			Port Status Info		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	
		Current:		ERROR TSO UFO		
		Driver Inf	o: Port Type: MAC	-VLAN Parent: eth2		
			Port Configu	rables		
Enable		General In	terface Settings		Port Rates	-Advert Rates-
Set IF Down					O 10bt-HD O 10bt-FD	🖬 10bt-HD
Set MAC	Down	Aux-Mgt			0 100bt-HD	🖌 10bt-FD
🔲 Set TX Q Len	DHCP-IPv6	DHCP Release	DHCP Vendor ID:	None	0 100bt-FD 0 1000-FD	🖬 100bt-HD
Set MTU	_		1		0 10G-FD	🖌 100bt-FD
Set Offload	DHCP-IPv4	Secondary-IPs	DHCP Client ID:	None	Autonegotiate	₽ 1000-FD
Set PROMISC	DNS Servers:	BLANK	Peer IP:	NA	Renegotiate	🔲 10G-FD
Set Rx-All/FCS	IP Address:	172.2.2.100	Global IPv6:	AUTO	Restart Xcvr	40G-FD
🔲 Set Bridge Info	IP Mask:	255.255.255.0	Link IPv6:	AUTO		Flow-Contro
	Gateway IP:	172.2.2.1	IPv6 GW:	AUTO		, Offload —
	Alias:		MTU:	1500	RX-ALL	TSO Enable
HTTP	MAC Addr:	00:0d:b9:6b:a3:ae	TX Q Len	1000	Bypass NOW!	UFO Enable
FTP	Br Cost:	Ignore 💌	Priority:	Ignore 💌	Bypass Now:	GSO Enable
RADIUS	Rpt Timer:	medium (8 s) 🔻	WiFi Bridge:	NONE	Bypass Power-DOWN	LRO Enabled
		·	-		Bypass Disconnect	GRO Enable
	Print ⊻i	ew Details	Probe Sync	Apply	<u>O</u> K <u>C</u> ancel	

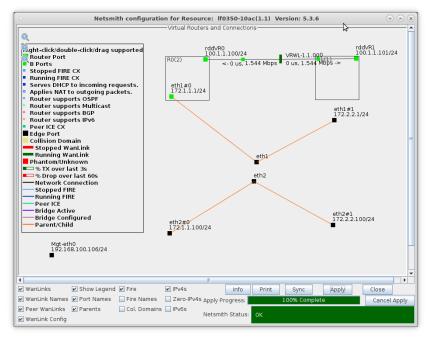
For more information see LANforge-GUI User Guide: Virtual Interfaces

- 7. Configure Netsmith.
 - A. After clicking on the sync button, move the ports on the Netsmith window to be more clearly visible.**Eth1 and eth2 are connected via a loopback cabel**

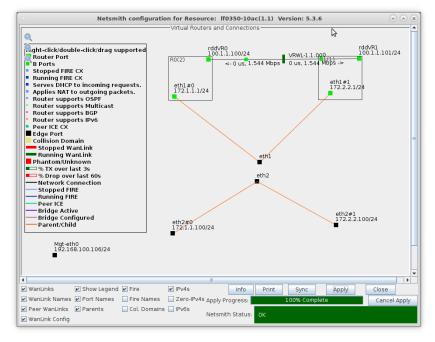


A. **NOTE**: Be sure to click **Apply** after moving objects so that their new positions are saved to the database

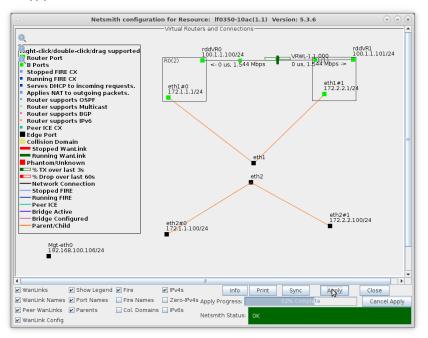
B. Drag eth1#0 into Router R0(1)



C. Drag eth1#1 into Router R1(2)



D. Click Apply in the Netsmith window



- A. LANforge is now ready to accept incoming traffic on eth0, the single physical port that is connected to a Routed Mode WanLink
- B. Ports eth0 and eth1 are physically connected via a loopback cable in this example. MAC VLANs on eth1 are configured to generate test traffic to the Routed Mode WanLink

For more information see LANforge-GUI User Guide: Netsmith

- 8. Setup a Layer-3 UDP connection between MAC VLANs eth2#0 and eth2#1.
 - A. Go to the Layer-3 tab and click Create

					o					
0			LANfor	ge Manager Ve	ersion(5.4.3)				\odot	×
Control Reporting	Wind <u>o</u> ws <u>I</u> nfo	Tests					_			
		Chamb	er <u>V</u> iew	<u>S</u> top A	dl Resta	art Manager		<u>R</u> efresh	HEL	P
Status Port Mg	r Layer-3 L3	BEndps Lay	er 4-7 Wai	nLinks Resource	Mgr Alerts M	lessages 🛛 🛛	Varnings W	/ifi-Messages	+	
Rpt Time) 🔻 Go T	est Manager		Select All			esce Clear		
View	0 - 500		▼ Go		Displa	ay Cr <u>e</u> ate	Mo <u>d</u> ify	Delete		
			-Cross Co	onnects for Selected	d Test Manager —		1			_
Name -	Type State	Pkt Rx A	Pkt Rx B	Bps Rx A	Bps Rx B	Rx Drop % A	A Rx Drop % E	Drop Pkts A	Drop Pkt	s
						_				
						J				•
Logged in to: local	host:4002 as: A	dmin						2 station	s: 21 01	00

B. Set Endpoint A to be eth2#0 and Endpoint B to be eth2#1

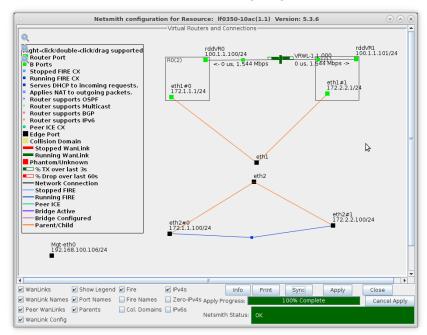
+ - All			\$		Display	Sync Batch-Create		Apply OK	Canc
CX Name: CX Type:	Cross-Connect Judp-cxJ LANforge / UDP			•	Report Timer:	Cross-Connect fast (1 s) Endpoint A		Endpoint B	•
	Endpoint A		Endpoint B		Pld Pattern	increasing	-	increasing	-
Resource:	1 (lf0350-10ac)		1 (lf0350-10ac)	-	Min IP Port:	AUTO	-	AUTO	-
Port:	9 (eth2#0)	-	10 (eth2#1)	-	Max IP Port:	Same	-	Sane	
Min Tx Rate:	1024000 (1.024 Mbps)	-	1024000 (1.024 Mbps)	-	Min Duration:	Forever	-	Forever	
Max Tx Rate:	Same	-	Sane	-	Max Duration:	Same	-	Sane	
Min PDU Size:	UDP Pld (1,472 B)	-	UDP Pld (1,472 B)	-	Min Reconn:	0 (0 ms)		0 (0 ms)	
Max PDU Size:	Sane	-	Same	-	Max Reconn:	Same		Same	
IP ToS:	Best Effort (0)		Best Effort (0)	-	Multi-Conn:	Normal (0)		Normal (0)	
Pkts To Send:	Infinite	-	Infinite	-	Multi-Corin:	Script	H	Script	
						Thresholds		Thresholds	

- A. Enter the CX name then set the CX Type to LANforge UDP and the Report Timer to 1000
- B. Set the Min/Max Tx Rate to 1024000 and the Min/Max Pkt Size to 1472

C. Select the new connection and click Start

			LANforge I	Manager Versio	n(5.3.6)			\odot \otimes \otimes
Control Repor	ting <u>T</u> ear-Off Info	Plugins						
				Stop All	Restart	Manager	Refres	sh HELP
	neric Test Mgr Layer-3 L3 En		Resource Mg /RTP	r Event Log Al /oIP/RTP Endps	erts Port Mgr Armageddon	vAP Stations WanLinks	Messages Attenuator	s File-IO
Rpt	Timer: fast (1	s) 🔻 Go	Test Manage	er all 🔻	Select All	Start Stop	Quiesce Cl	lear
View	0 - 500		▼ G	>	Display	Cr <u>e</u> ate M	o <u>d</u> ify Delete	
			-Cross Co	nnects 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 F	Pkts A Drop Pkt
udp-cx	LF/UDP Run	3,616	3,625	1,022,598	1,022,614	0	0	0
•			11					Þ
	192.168.100.106:4	002 as: Admir	n					

D. Netsmith now shows the new connection and traffic flowing through the Routed Mode WanLink



For more information see LANforge-GUI User Guide

Routed Mode WanLink with WanPaths

Goal: Setup a Routed Mode WanLink with WanPaths.

In this test scenario, LANforge-ICE is used to filter traffic by IP address on a WanLink with the use of WanPaths.

- 1. Setup a Netsmith connection.
 - A. Go to the Status tab and click Netsmith

Control <u>Beporting Windows</u> Info <u>Iests</u> Cha	LANforge Manager Ve amber ⊻iew Stop A	rsion(5.4.3)		$\odot \odot \otimes$
	amber <u>V</u> iew <u>S</u> top A			
Cha	amber ⊻iewStop A			
		Restart N	lanager <u>R</u> e	efresh HELP
Status Port Mgr Layer-3 L3 Endps L	Layer 4-7 WanLinks Resource 1	Igr Alerts Mess	ages Warnings Wifi-Me	essages +
License Info	Current Users		Saved Test Configurations	
	dmin from:127.0.0.1 iserver from:127.0.0.1	Configuration:	FACTORY_DFLT	Load
Support expires in: 656 days.		Download DB	Show Progress	Delete
Status Vie <u>w</u> : Ports by Resource 💌		Name:		Save
Realm 0	Manager/Resource			
Logged in to: localhost:4002 as: Admin				2 stations: 21 01 0Ø

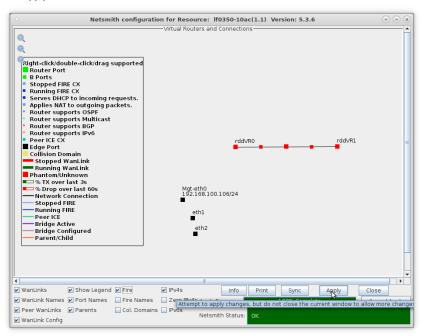
B. Right-click in the Netsmith window and select New Connection



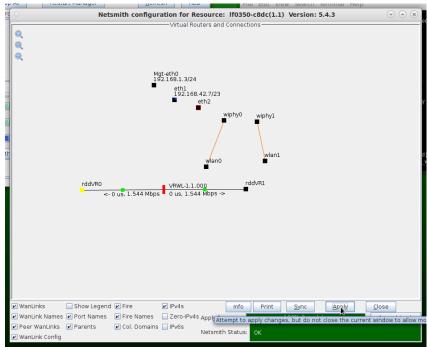
C. Accept defaults, $\ensuremath{\text{Auto Create}}$ everything and click $\ensuremath{\text{OK}}$



D. Click **Apply** in the Netsmith window to create the connection



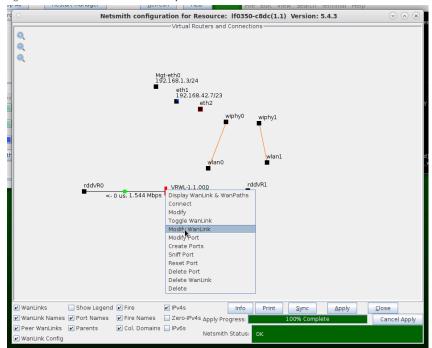
E. The Netsmith window after applying changes



For more information see LANforge-GUI User Guide: Netsmith

2. Setup the WanLink.

A. Right-click the WanLink and select Modify WanLink



B. Setup the WanLink with values larger than what each of the WanPaths will use

			VRWL-1.1.00) - Creat	e/Modify WanLi	nk			\sim
+ - All					App	oly OK Display	WanLink &	WanPaths	Cancel
Name: Presets:	WanLink Information VRWL-1.1.000 CUSTOM			-	2	WanLink Information Pass-Through Coupled-Mode		Pass-Through nel-Mode	
Port:	Endpoint A 4 (rddVR0b)	Endpo		•	Resource: Rpt Timer:	1 (lf0350-10ac)			-
Transfer Rate:	T1 (1.544 Mbps) Zero (0 us)	▼ T1 ▼ Zero	(1.544 Mbps)	•		Endpoint A	Endpoir		-
Delay: Drop-Freq:	zero (0%)	v zero		-	Reorder-Freq: Dup-Freq:	zero (0%) zero (0%)	✓ zero (•
Jitter: Jitter-Freg:	zero (O us) zero (O%)	▼ zero▼ zero		▼ ▼	Drop Burst:	min 1 max 1	min 1	max 1	
					Reorder Amt:	min 1 max 20 Script	min 1	script	
8		t A WAN Patl				Endpoint B			
	ate-WP M Tx Rate Disabled !	odify-WP	Delet Pattern	e-WP Delay	Create Name Tx	-WP Modif Rate Disabled !	y-WP Filter P	Delete	-WP Delav
ivallie	TATIONE USADIEU :	Filt		Jelay			, nicer P	accom	Delay

- A. WanPaths are subordinate to WanLinks. WanLinks, therefore, should be configured with sufficient bandwidth and buffering required by all of its WanPaths
- B. Click Apply and leave the Create/Modify WanLink window open

For more information see LANforge-GUI User Guide: WanLinks

- 3. Setup the WanPaths.
 - A. Click Create-WP on Entry Point A to create a new WanPath on this WanLink

	Create/Modif	fy WanPath for	Endpoint: VRWL-1	.1.000-A	N 000
Name:	ep-1		Backlog Buffer:	AUTO	~ 4
PCAP Filter:					
Source IP/MAC:	172.1.1.100		Source Mask:	32	
Dest IP/MAC:	172.2.2.100		Dest Mask:	32	
Transfer Rate:	64 Kbps (64 Kbp	s) 🔻	Delay	zero (O us)	
Jitter	zero (O us)	-	Drop-Freq:	zero (O%)	•
Min Drop Burst:	1		Max Drop Burst:	1	
Min Reorder Amour	nt: 1		Max Reorder Amou	nt: 20	
Reorder-Freq:	zero (0%)	-	Dup-Freq:	zero (0%)	
Jitter-Freq:	zero (0%)	-	Test Manager:		
ICEcap Replay	Replay File:				- Dir
	nverse Match	Drop-Xth	Duplicate-Xth	Reorder-Xth	ntion #2
Corrur	tion #0		ption #1	Corru	ption #2
Rate:	0	Rate:	0	Rate:	0
Corruption:	Random Write 💌	Corruption:	Random Write 👻	Corruption:	Random Write 👻
Byte-to-Write:	0	Byte-to-Write:	0	Byte-to-Write:	0
Min Offset:	0	Min Offset:	0	Min Offset:	0
Max Offset:	0	Max Offset:	0	Max Offset:	0
Chain-to-Next	🗌 Do Checksum	Chain-to-Nex	Do Checksum	Chain-to-Next	Do Checksum
Corrup	tion #3	Corru	ption #4	Corru	ption #5
Rate:	0	Rate:	0	Rate:	0
Corruption:	Random Write 💌	Corruption:	Random Write 👻	Corruption:	Random Write 🔫
Byte-to-Write:	0	Byte-to-Write:		Byte-to-Write:	0
Min Offset:	0	Min Offset:	0	Min Offset:	0
Max Offset:	0	Max Offset:	0	Max Offset:	0
Chain-to-Next	Do Checksum	Chain-to-Nex	🗌 Do Checksum	Chain-to-Next	Do Checksum
4		-			

- A. NOTE: In order to filter by specific IP address, use a Source and Dest Mask of 32 to exactly match the IP coming in on the Entry Point
- B. Click **OK** to create the WanPath
- B. Click **Create-WP** on Entry Point B to create a new WanPath on this WanLink

	Create/Modif	y WanPath for	Endpoint: VRWL-1	1.1.0	00-В	\odot		6
Name:	ep-2		Backlog Buffer:	2	AUTO		-	ľ
PCAP Filter:								1
Source IP/MAC:	172.2.2.100		Source Mask:		32			1
Dest IP/MAC:	172.1.1.100		Dest Mask:		32			
Transfer Rate:	64 Kbps (64 Kbps	5) 🗸	Delay		zero (O us)			•
litter	zero (O us)	-	Drop-Freq:		zero (O%)			-
Min Drop Burst:	1		Max Drop Burst:		1			1
Min Reorder Amoun	t: 1		Max Reorder Amou	unt:	20			
Reorder-Freq:	zero (G%)	-	Dup-Freq:		zero (O%)			•
litter-Freq:	zero (O%)	-	Test Manager:					•
🗌 ICEcap Replay	Replay File:		-			-	D	ir
0.0	isabled i	Loop Replay	Replay Latency	v P	Replay Loss			
		Replay Dup	Replay Bandwi			er		1
	verse Match	Drop-Xth	Duplicate-Xth		Reorder-Xth			1
Corrupt	tion #0	Corr	 uption #1		Corrup	tion #2		
Rate:	0	Rate:	0	Rat		0		1
Corruption:	Random Write 👻	Corruption:	Random Write 💌		rruption:	Random Wri	ite 🖣	-
Byte-to-Write:	0	Byte-to-Write:	0	- 1	e-to-Write:	0		1
Min Offset:	0	Min Offset:	0	Min	Offset:	0		1
Max Offset:	0	Max Offset:	0	Ma	x Offset:	0		=
Chain-to-Next	Do Checksum	Chain-to-Nex	t Do Checksum		Chain-to-Next	Do Check	ksum	1
Corrupt		Corri	uption #4		Corrur	tion #5		
Rate:	0	Rate:	0	Rat		0		1
Corruption:	Random Write 💌	Corruption:	Random Write 💌	Cor	rruption:	Random Wri	ite 🖣	-
Byte-to-Write:	0	Byte-to-Write:	0	Byt	e-to-Write:	0		1
Min Offset:	0	Min Offset:	0	Min	n Offset:	0		-
Max Offset:	0	Max Offset:	0	Ma	x Offset:	0		-
Chain-to-Next	Do Checksum	Chain-to-Nex	t Do Checksum	10	Chain-to-Next	Do Check	ksum	1
4								,

- A. NOTE: The Source and Destination IPs for this WanPath are the reverse of those for Entry Point A
- B. Click \mathbf{OK} to create the WanPath

C. Create a second WanPath for this WanLink using the next set of IP addresses

	Create/Modif	fy WanPath for	Endpoint: VRWL-1	.1.000-A	\odot
Name:	ep-3		Backlog Buffer:	AUTO	•
PCAP Filter:					
Source IP/MAC:	172.1.1.101		Source Mask:	255.255.255.0)
Dest IP/MAC:	172.2.2.101		Dest Mask:	255.255.255.0)
Transfer Rate:	64 Kbps	-	Delay	zero (O us)	
Jitter	zero (O us)	-	Drop-Freq:	zero (0%)	
Min Drop Burst:	1		Max Drop Burst:	1	
Min Reorder Amour	nt: 1		Max Reorder Amour	nt: 20	
Reorder-Freq:	zero (O%)	-	Dup-Freq:	zero (O%)	
Jitter-Freq:	zero (O%)	•	Test Manager:		
🔲 ICEcap Replay	Replay File:				- Dir
0 [Disabled	Loop Replay	Replay Latency	Replay Loss	
	ame As WanLink	Replay Dup	Replay Bandwid	th 🔲 Use Pcap Filt	er
🔲 I	nverse Match	Drop-Xth	Duplicate-Xth	Reorder-Xth	
Corrup	tion #0	Corru	ption #1	Corrup	otion #2
Rate:	0	Rate:	0	Rate:	0
Corruption:	Random Write 👻	Corruption:	Random Write 👻	Corruption:	Random Write 👻
Byte-to-Write:	0	Byte-to-Write:	0	Byte-to-Write:	0
Min Offset:	0	Min Offset:	0	Min Offset:	0
Max Offset:	0	Max Offset:	0	Max Offset:	0
Chain-to-Next	Do Checksum	Chain-to-Next	Do Checksum	Chain-to-Next	Do Checksum
Corrup	tion #3	Corru	ption #4	Corrup	otion #5
Rate:	0	Rate:	0	Rate:	0
Corruption:	Random Write 💌	Corruption:	Random Write 🔻	Corruption:	Random Write 👻
Byte-to-Write:		Byte-to-Write:		Byte-to-Write:	0
Min Offset:	0	Min Offset:	0	Min Offset:	0
Max Offset:	0	Max Offset:	0	Max Offset:	0
Chain-to-Next	Do Checksum	Chain-to-Next	Do Checksum	Chain-to-Next	Do Checksum

D. Reverse the Source and Destination IPs for this corresponding WanPath

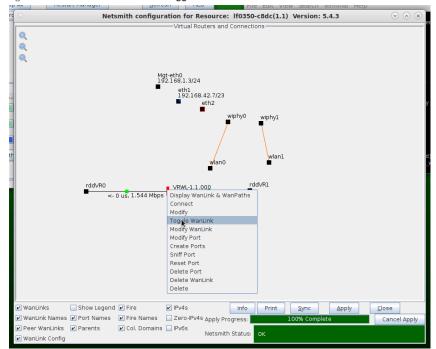
	Create/Modif	fy WanPath for I	Endpoint: VRWL-1	.1.000-В	\odot
Name:	ep-4		Backlog Buffer:	AUTO	•
PCAP Filter:					
Source IP/MAC:	172.2.2.101		Source Mask:	255.255.255.2	255
Dest IP/MAC:	172.1.1.101		Dest Mask:	255.255.255.2	255
Transfer Rate:	64 Kbps	-	Delay	zero (O us)	
Jitter	zero (O us)	-	Drop-Freq:	zero (0%)	
Min Drop Burst:	1		Max Drop Burst:	1	
Min Reorder Amour	nt: 1		Max Reorder Amour	nt: 20	
Reorder-Freq:	zero (O%)	-	Dup-Freq:	zero (0%)	
Jitter-Freq:	zero (O%)	-	Test Manager:		•
🗌 ICEcap Replay	Replay File:				- Dir
0.1	Disabled	Loop Replay	Replay Latency	Replay Loss	
		Replay Dup		ith 🗌 Use Pcap Filt	er
	nverse Match	Drop-Xth	Duplicate-Xth	Reorder-Xth	-
Corrup	tion #0	Corru	ption #1	Corrur	tion #2
Rate:	0	Rate:	0	Rate:	0
Corruption:	Random Write 👻	Corruption:	Random Write 👻	Corruption:	Random Write 👻
Byte-to-Write:	0	Byte-to-Write:	0	Byte-to-Write:	0
Min Offset:	0	Min Offset:	0	Min Offset:	0
Max Offset:	0	Max Offset:	0	Max Offset:	0
Chain-to-Next	Do Checksum		Do Checksum		Do Checksum
	tion #3]-	ption #4]-	tion #5
Rate:	0	Rate:	0	Rate:	0
Corruption:	Random Write 👻	Corruption:	Random Write 👻	Corruption:	Random Write 👻
Byte-to-Write:	0	Byte-to-Write:	0	Byte-to-Write:	0
Min Offset:	0	Min Offset:	0	Min Offset:	0
Max Offset:	0	Max Offset:	0	Max Offset:	0
Chain-to-Next	Do Checksum	Chain-to-Next	Do Checksum	Chain-to-Next	Do Checksum
A	bo encercaum		_ bo encertaum		Do checksum

E. Verify that the WanPaths on this WanLink are setup correctly, then click **OK** on the *Create/Modify WanLink* window shown here

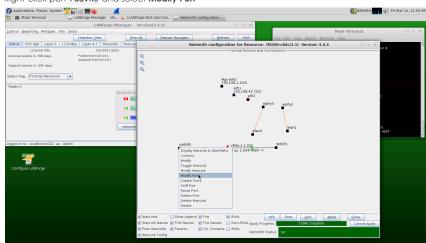
		VRWL-1.1.00	0 - Creat	e/Modify WanLii	nk		\odot
+ - All		k	3	Арр	ly OK Display	WanLink & WanPaths	Cancel
Name:	WanLink Information			2	WanLink Information	HW Pass-Through	
Presets:	CUSTOM		-		Coupled-Mode	Kernel-Mode	
	Endpoint A	Endpoint B		Resource:	1 (lf0350-10ac)		-
Port:	4 (rddVR0b)	 6 (rddVR1b) 	-	Rpt Timer:	fast (1 s)		-
Fransfer Rate:	T1 (1.544 Mbps)	▼ T1 (1.544 Mbps)	-		Endpoint A	Endpoint B	
Delay:	zero (O us)	▼ zero (0 us)	-	Reorder-Freg:	zero (0%)	✓ zero (0%)	-
Drop-Freq:	zero (O%)	▼ zero (0%)	-	Dup-Freq:	zero (O%)	✓ zero (0%)	-
itter:	zero (0 us)	▼ zero (0 us)	-		min 1 max 1	min 1 max 1	
itter-Freq:	zero (0%)	▼ zero (0%)	-	Drop Burst:			
				Reorder Amt:	min 1 max 20	min 1 max 20	
					Script	Script	
2	Endpoint	A WAN Paths			Endpoint B \	WAN Paths	
Crea	ate-WP Mo	dify-WP Delet	e-WP	Create	-WP Modify	/-WP Delete	e-WP
	Tx Rate Disabled !	Filter Pattern	Delay		Rate Disabled !	Filter Pattern	Delay
		Src: 172.1.1.100/32 Dest: 1 Src: 172.1.1.101/24 Dest: 1				: 172.2.2.100/32 Dest: 1. : 172.2.2.101/32 Dest: 1.	
cp o jo				-			

For more information see LANforge-GUI User Guide: WanLinks

- 4. Setup the ports with IP addresses.
 - A. Right-click on the WanLink and select Toggle Wanlink



B. Right-click port rddVR0 and select Modify Port



C. Setup an IP address that is on a different network than the WanPath entry points

			0350-10ac) Con			
			Port Status Info	rmation		
		Current: L	INK-UP PROBE-ERF	OR TSO UFO GSO GRO		
		Driver Info: F	Port Type: Redirect	-Device Peer: rddVR0b	> N	
			Port Configur	ables		
Enable		General In	terface Settings		Port Rates	Advert Rates
Set IF Down					O 10bt-HD O 10bt-ED	10bt-HD
Set MAC	Down	Aux-Mgt			O 100bt-HD	10bt-FD
Set TX Q Len				None	0 100bt-FD 0 1000-FD	100bt-HD
Set MTU	DHCP-IPv6	DHCP Release	DHCP Vendor ID:	None	10G-FD	100bt-FD
Set Offload	DHCP-IPv4	Secondary-IPs	DHCP Client ID:	None 💌	O 40G-FD O Autonegotiate	1000-FD
Set PROMISC	DNS Servers:	BLANK	Peer IP:	NA		10G-FD
Set Rx-All/FCS	IP Address:	10.1.1.10/24	Global IPv6:	AUTO	Renegotiate	40G-FD
Set Bridge Info	IP Mask:	0.0.0.0	Link IPv6:	AUTO	Restart Xcvr	Flow-Contro
	Gateway IP:	0.0.0.0	IPv6 GW:	AUTO	PROMISC	1-
	Alias:		MTU:	1500	RX-ALL	Offload-
— Services — HTTP	MAC Addr:	da:bf:f9:94:a6:4f	TX Q Len	1000	RX-FCS	TS0 Enable
FTP	Br Cost:	Ignore 💌	Priority:	Ignore 💌	Bypass NOW!	UFO Enable
RADIUS	Rot Timer:	medium (8 s) 🔻	WiFi Bridge:	NONE	Bypass Power-UP	GSO Enable
- NADIUS	Npt nitter:		wiri bildge:		Bypass Power-DOWN	LR0 Enable
					Bypass Disconnect	GRO Enable

D. Setup an IP address on port rddVR1 that is on the same network as rddVR0

S N		ration for Resou		62-7A		_ = ×
	Vi	rtual Routers and C	onnections —			^
Right-click/double-click/drag sup Router Port Router Port Router uses OSPF Rouped FIRE CX Running FIRE CX Serves DHCP to incoming reque Applies NAT to outgoing packet Peer ICE CX Edge Port Collision Domain Stopped WanLink Phantom/Unknown % TX over last 3s Norp over last 60s Network Connection Stopped FIRE Running FIRE Running FIRE Running FIRE Running FIRE Running FIRE Running FIRE	sts. s. 19 19	rddVR0 10.1.1.3 2.166.100.224/24 th0 eth1 ■ eth2 ■	0/24	VRWL-1.1.00	rddVR1 0 10.1.1.11	L/24 =
Parent/Child						
J Show Legend Zero-IPv4s	∠ IPv4s	IPv 6 s	Help	Print Sy	nc Apply	Close
🗹 Port Names 🛛 🗹 WanLinks	🖌 Peer WanLinks	🖌 WanLink Names	Netsmith Apply	Progress: 🗾 1	.00% Complete	Cancel Apply
🗹 Col. Domains 🕑 Parents	✓ Fire	🗹 Fire Names	Netsmith Status	OK.		

For more information see LANforge-GUI User Guide: WanLinks

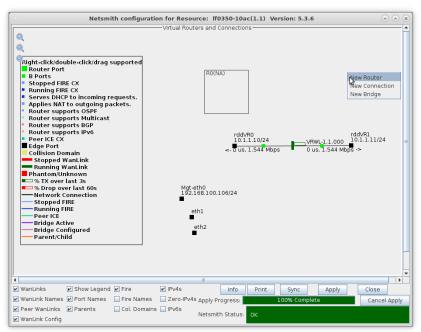
- 5. Add the Virtual Routers.
 - A. Right-click in the Netsmith window and select New Router

Virtual Routers and Connections Withight-click/drag supported Router Port B Ports Stopped FIRE CX Router supports ODFF Router supports Nutricast Router supports BP6 Stopped WanLink Phantom/Unknown Stopped FIRE Parent/Child Mdt-eth0 192.168.100.106/24 eth1 eth2	Netsmith configura	tion for Resource: lf0350-10ac(1.1) Version: 5.3.6	\odot \land (2
	Rught-click/double-click/drag supported Router Port B Ports Stopped FIRE CX Running FIRE CX Serves DHCP to incoming requests. Applies NAT to outgoing packets. Router supports SOSPF Router supports Multicast Router supports Multicast Router supports NPv6 Router supports IPv6 Router Support Support Router Support Support Supped WanLink Running WanLink Round Stopped FIRE Round FIRE Round FIRE Rege FIRE Bridge Configured	Virtual Routers and Connections New Router New Connection New Bridge rddVR0 10.1.1.10/24 VRWL-1.1.000 10.1.1.11/2 VRWL-1.1.000 10.1.1.11/2 0 us. 1.544 Mbps > Mgl-eth0 192.168.100.106/24 eth1 eth2	
	2 WanLink Names ₽ Port Names ☐ Fire Name 2 Peer WanLinks ₽ Parents ☐ Col. Doma 2 WanLink Config	Apply Hogress.	el Apply

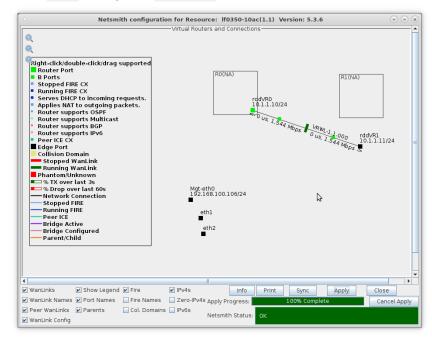
B. Accept the defaults or change the Virtual Router name and graphical size

			Cr	eate/Modify	Virtual Rou	iter	Ν		
Name: <a>Auto Cr	eate New Name:	>		Width:	100		Height:	100	
Use OSPF					P Dflt Route	-		iter 🔲 IPv6	RADV
Use Existing C	g 📃 BGP Rou	ter 🗌 B			or 🔲 BGP (BGP Da	mping	
			No	nes about th	is virtuai Rout	.er			
			B	GP Configurat	ion Informatio	n			
	Router ID					Cluster ID			
	Confederation	ID 0	Damp	ing Half Life		Damping Ma	Suppress 3		
	Damping Reus			ing Suppress					
BGP Peer Flags	_		Peer AS	Peer ID	Local Iface		Nexthop6	Hold Time	Delay Oper
Active Cli									
Active Cli	ent 🗌 Confed	Ucast							
Active Cli	ent 🗌 Confed	🖌 Ucast							
Active Cli	ent 🗌 Confed	🖌 Ucast							
Active Cli	ent 🗌 Confed	🖌 Ucast							
Active Cli	ent 🗌 Confed	🖌 Ucast							
Active Cli	ent 🗌 Confed	Ucast							
Active Cli	ent 🗌 Confed	🖌 Ucast							
				οκ	Cancel				

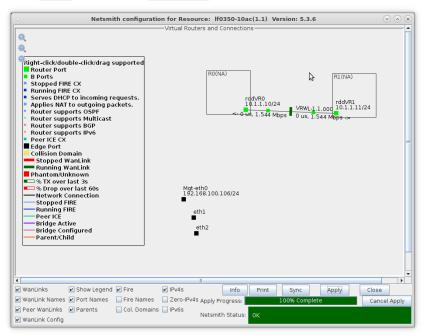
C. Click the Apply button and repeat for the second Virtual Router



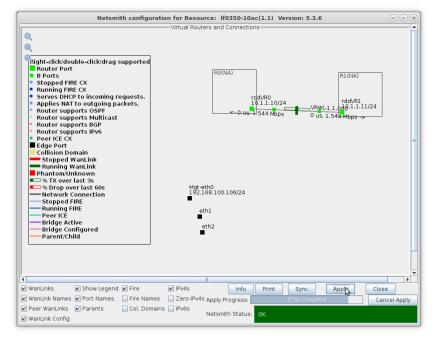
- A. **NOTE:** After making any changes to the Netsmith window, you must click **Apply** or your changes will NOT be implemented and could be lost
- B. NOTE: Clicking Sync makes sure any changes are synchronized with the current database
- D. Left-click rddVR0 and drag it inside Router R0(1)



E. Left-click rddVR1 and drag it inside Router R1(2)

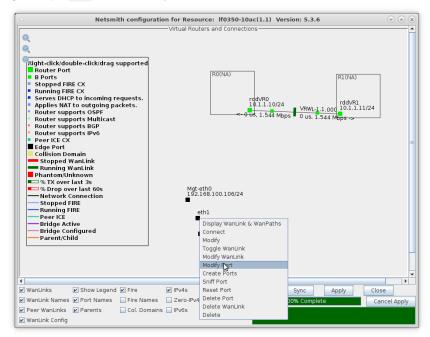


F. Apply your changes in Netsmith



For more information see LANforge-GUI User Guide: WanLinks

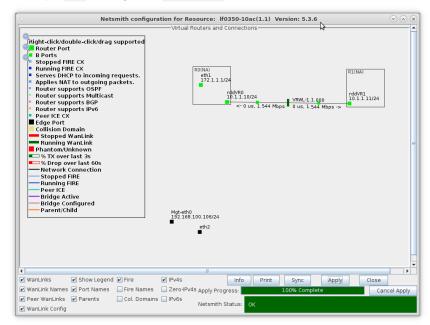
- 6. Setup the external interfaces.
 - A. Right-click port eth1 and select Modify Port



B. Setup eth1 with a valid IP address and IP mask that is on the same network as the WanPath entry points ep-1 and ep-3

		UP 1000bt-FD AUTO-N		ntrol PROMISC			\$
	Driver Inio: Port	Type: Ethernet Drive	Port Configur		2.56	iT/s x1 Max: 2.5GT/s x1	
Enable Enable	Down	General Inf	terface Settings			Port Rates 0 10bt-HD 0 10bt-FD	Advert Rates
Get MAC Get TX Q Len Set TX Q Len Set MTU Set RTG Set Rate Info Set RAMISC Set RX-AI/FCS Set Bypass Set Bridge Info Set CPU Mask	DHCP-IPv6 DHCP-IPv4 DNS Servers: IP Address: IP Mask: Gateway IP: Alias: MAC Addr:	□ AUX-MgL ▷ DHCP Release Secondary-IPs BLANK 172.1.1.1/24 255.255.255.0 0.0.0.0 00:0d:b9:47:10:ad	DHCP Vendor ID: DHCP Client ID: Peer IP: Global IPv6: Link IPv6: IPv6 GW: MTU: TX Q Len			© 100bt-HD ○ 100bt-FD ○ 1000-FD ○ 1006-FD ● Autonegotiate ■ Renegotiate ■ Restart Xcvr ₽ PROMISC ■ RX-ALL ■ RX-FCS	V 10bt-FD V 100bt-HD V 100bt-FD V 1000-FD 10G-FD 40G-FD V Flow-Contro
Services	Br Cost: Rpt Timer: CPU Mask:	Ignore v slover (30 s) v NO-SET v	Priority: Watchdog: WiFi Bridge:	0	- - -	Bypass NOW! Bypass Power-UP Bypass Power-DOWN Bypass Disconnect	UFO Enable

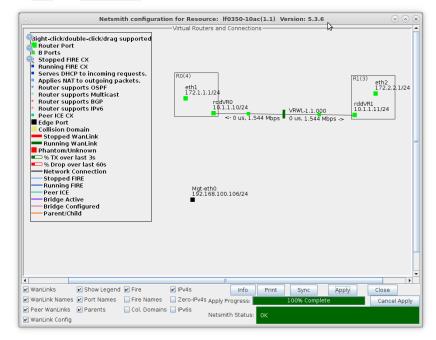
C. Left-click port eth1 and drag it inside Router R0(1)



D. Setup eth2 with a valid IP address and IP mask that is on the same network as the WanPath entry points ep-2 and ep-4

			Port Status Info	rmation		6	
	Current: LINK-	UP 1000bt-ED AUTO-				N2	
	Driver Info: Port	Type: Ethernet Driv	er: iab(5.4.0-k) Bu	IS: 0000:03:00.0 CI	in: 2.5	iGT/s x1 Max: 2.5GT/s x1	
		.,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,					
			Port Configur	rables			
Enable		General In	terface Settings		1	Port Rates	Advert Rates
🔄 Set IF Down						O 10bt-HD O 10bt-ED	🖌 10bt-HD
Set MAC	Down	Aux-Mgt				O 100bt-HD	≥ 10bt-FD
🗌 Set TX Q Len	DHCP-IPv6	DHCP Release	DHCP Vendor ID:	None	-	O 100bt-FD O 1000-FD	🗹 100bt-HD
Set MTU	DHCP-IPv4	Secondary-IPs	DHCP Client ID:	None	Ţ	O 10G-FD	🖬 100bt-FD
Set Offload	DNS Servers:	BLANK	Peer IP:	NA		 40G-FD Autonegotiate 	🖬 1000-FD
Set Rate Info	IP Address:	172.2.2.1	Global IPv6:	DELETED		1	🔲 10G-FD
Set PROMISC	IP Address: IP Mask:	255.255.255.0		DELETED		🗌 Renegotiate	40G-FD
Set Rx-All/FCS			Link IPv6:			Restart Xcvr	Flow-Contro
Set Bypass	Gateway IP:	0.0.0.0	IPv6 GW:	DELETED	_	PROMISC	
🗌 Set Bridge Info	Alias:		MTU:	1500	_	RX-ALL	Offload -
Set CPU Mask	MAC Addr:	00:0d:b9:47:10:ae	TX Q Len	1000	_	RX-FCS	
— Services —	Br Cost:	Ignore 💌	Priority:	Ignore	-	Bypass NOW!	UFO Enable
HTTP	Rpt Timer:	nediun (8 s) 🔻	Watchdog:	0	-	Bypass Power-UP	GSO Enable
FTP	CPU Mask:	NO-SET 🗸	WiFi Bridge:	NONE	-	Bypass Power-DOWN	GRO Enable
RADIUS						Bypass Disconnect	LIGRO Enable

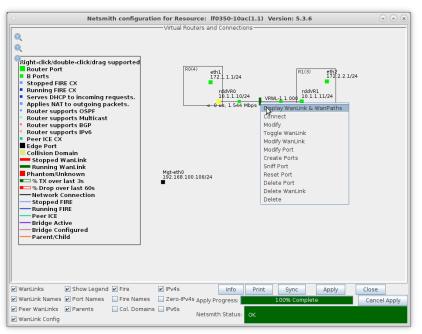
E. Drag eth2 inside Router R1(2) and Apply changes in Netsmith



For more information see LANforge-GUI User Guide: WanLinks

7. Run traffic to LANforge-ICE ports eth1 and eth2, then display results. Refer to the LANforge FIRE Cookbook to run traffic.

A. Right-click the WanLink and select Display Wanlink & WanPaths



B. The lower half of the WanLink display shows traffic passing on WanPath entry points ep-3 and ep-4 and other IP address are excluded from passing on the WanLink

<u>ی</u>		Cross C	onnect: VF	WL-1.1	.000 Ma	anager: 19	2.168.100.2	24		– 🗆 🗙
	— Endpoir	nt: VRWL-1.1.0	00-A (1.1.5	.1) ——			- Endpoint: VR	WL-1.1.000-	B (1.1.7.2) —	
0.8	WAN Speed	1544000	bps TX:	16202		WAN Speed	1544000	bps TX:	16213	0.8
	bps RX:	12160	TX Pkts:	51		bps RX:	12152	TX Pkts:	51	
	Dropped:	0	Duplicated	0		Dropped:	0	Duplicated	0	
	Reordered:	0	TX Failed:	0		Reordered:	0	TX Failed:	0	
	4 G8				- 11				4 G8	
	16 MB -								- 16 MB	
	64 KB -								- 64 KB	
	256 B -								- 256 B	
	08 D	ropped [Record	Droppedl		- 11	Ry Putor P	ropped [Recor	d Drappedl	0.8	
	Fix Bytes Di	ropped (Record	i-Diobbeal			rix Bytes L	uohhen (Kecol	a-propped]		
	1.544 Mbps				- 11				1.544 Mb	
	1.158 Mbps -								- 1.158 Mb	ps
	772 Kbps								- 772 Kbps 386 Kbps	
10 KB	0 bps								0 bps	10 KB
Backlog	Rx Through	nput [Recorded]			Rx Throug	hput [Recorded	1]		Backlog
,				s for Wa	nLink End	lpoint: VRWL	-1.1.000-A—			
Name	Tx Rate	Stop ! !!	Source	-Addr	Des	t-Addr	Tx Pkts Rx Pk	ts TX Bytes	RX Bytes Dr	opped Du
ep-1	6400		172.1.1.1	.00/32	172.2.2	.100/32	0	0 0	0	0
ep-3	6400		172.1.1.1	.01/32	172.2.2	.101/32	48 4	7 72672	71158	0
										•
				ns for Wa	nLink En	dpoint: VRWL				
Name	Tx Rate	Stop ! !!					Tx Pkts Rx Pk			opped Du
ep-2	6400		172.2.2.1			100/32	0	0 0	0	0
ep-4	6400] 172.2.2.1	.01/32	172.1.1	.101/32	48 4	7 72672	71158	0
•				_						•
,					Г	_				
Dis	play Selected	l Paths				Modify	Refresh	CI	ear	Close

C. Select a WanPath and click **Display Selected Paths** in the lower left corner of the WanLink display window

🛃 Wan	Path: ep-3	WanLink:	VRWL-1.1.00	0-A –	
		—Endpoin	t: ep-3		
0 B	WAN Speed:	64000	bps TX:	12170	
	bps RX:	12170	TX Pkts:	107	
	Dropped:	0	Duplicated:	0	
	Reordered:	0	TX Failed:	0	
1 KB Backlog	4 GB 16 MB 64 KB 256 B 0 B RX Bytes Dr 64 Kbps 32 Kbps 0 bps RX Through		հաետոետովու	11.01.1	
		Clo	se		

Virtual Router with DHCP Service

Goal: Setup a Virtual Router with one interface serving DHCP.

In this test scenario, a LANforge Virtual Router is created with one interface setup to serve DHCP to two remote redirect interfaces that are setup to be DHCP clients.

- 1. Setup a Virtual Router and two Netsmith Connections.
 - A. Go to the Status tab and click the Netsmith button

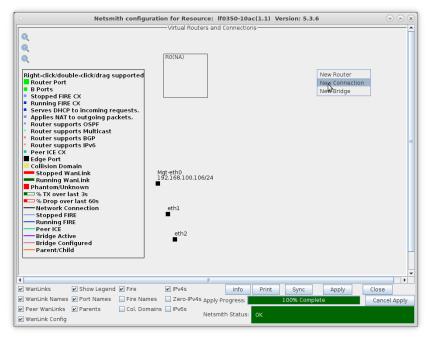
		9		
	LANforge Manager V	ersion(5.4.3)		\odot \otimes \otimes
Control Reporting Windows Info Test	5			
	Chamber ⊻iew Stop A	All Restart	: Manager <u>B</u>	efresh HELP
Status Port Mgr Layer-3 L3 Endp	s Layer 4-7 WanLinks Resource	Mgr Alerts Me	ssages Warnings Wifi-M	essages +
License Info	Current Users		Saved Test Configurations	
Licenses expire in: 656 days.	* Admin from:127.0.0.1 gnuserver from:127.0.0.1	Configuration:	FACTORY_DFLT	Load
Support expires in: 656 days.		Download DB	Show Progress	Delete
Status Vie <u>w</u> : Ports by Resource		Name:		Save
Realm 0	[**			
	Manager/Resource	e 1		
	••	_		
	Netsmith			
ogged in to: localhost:4002 as: Admin				2 stations: 21 01 00

B. Right-click in the Netsmith window and select New Router

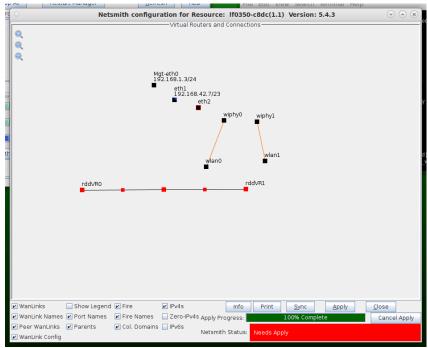
• Netsmith config	uration for Resource: If0350-10ac(1.1) Version: 5.3.6	\odot \land \times
Netsmith configu Right-click/double-click/drag supported Router Port B Ports Stopped FIRE CX Running FIRE CX Running FIRE CX Router supports OSPF Router supports OSPF Router supports BGP Router supports BFP Router supports NUtlicast Router supports BFP Edge Port Collision Domain Stopped VanLink Phantom/Unknown % TX over last 3s % Werkork Connection Stopped FIRE Running FIRE Pene ICE	Interior for Resource: If0350-10ac(1.1) Version: 5.3.6 Virtual Routers and Connections New Pruter New Connection New Bridge Mgt-eth0 192.168.100.106/24 eth1	
Bridge Active Bridge Configured Parent/Child	eth2	_
• • • • • • • • • • • • • • • • • • •		
✓ WanLinks ✓ Show Legend ✓ Fire	Print Sync Apply	Close
WanLink Names Port Names Fire Na	Apply rogress.	Cancel Apply
 ✓ Peer WanLinks ✓ Parents Col. Doi ✓ WanLink Config 	mains 🗌 IPv6s Netsmith Status: OK	

A. Follow steps discussed above for configuring the router

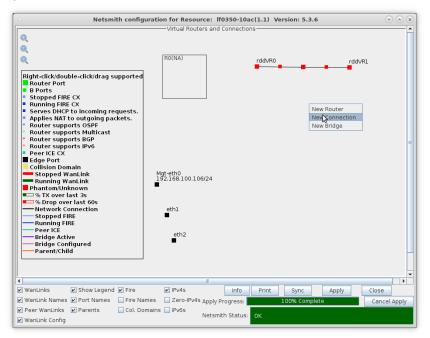
C. Right-click in the Netsmith window and select New Connection



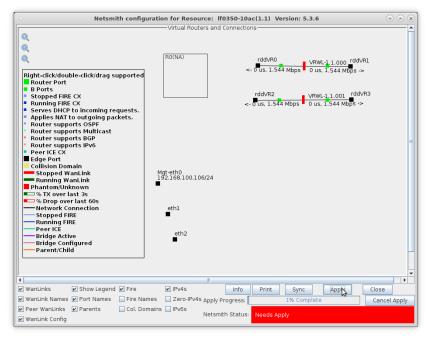
D. Accept defaults, Auto Create everything and click \mathbf{OK}



E. Repeat and create a second connection.



F. Click the Apply button to commit the changes in Netsmith to the LANforge Server.

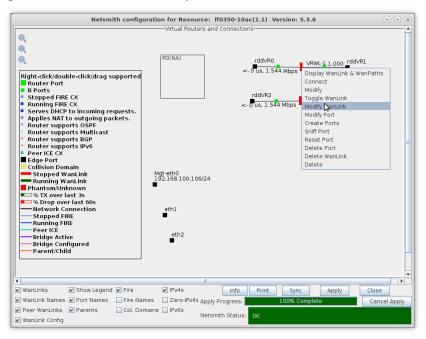


A. NOTE: Modifications in Netsmith are only sent to the LANforge-Server after Applying them

For more information see LANforge-GUI User Guide: Virtual Interfaces

2. Setup the WanLinks.

A. Right-click the first WanLink and select Modify WanLink



B. Enter values specific to your test and click OK

			VRWL-1.1.000	0 - Crea	te/Modify WanL	ink					\bigcirc	
+ - All				N	Ар	ply OK	Display	VanLi	nk & Wa	nPaths	Ca	ncel
Name: Presets:	WanLink Information VRWL-1.1.000 CUSTOM				2	WanLink Inf Pass-Th	rough		HW Pass Kernel-M		n	
Port: Transfer Rate:	Endpoint A 4 (rddVROb) New Modem (56 Kbps)		Endpoint B 6 (rddVR1b) New Modem (56 Kbps)	•	Resource: Rpt Timer:	1 fast (1 Endpoint A	Ls)	En	dpoint B		v	
Delay: Drop-Freq:	zero (0 us) zero (0%)	-	zero (O us) zero (O%)	•	Reorder-Freq: Dup-Freq:	zero (0%) zero (0%)		ze	ro (0%) ro (0%)		•	
Jitter: Jitter-Freq:	zero (0 us) v zero (0 us) v zero (0%) v zero (0%) v		Drop Burst: Reorder Amt:	min 1 min 1	max 1 max 20	min min		max 1 max 20				
						S	cript		S	cript		
8	Endpoint .						ndpoint B WA		:hs			
	ate-WP Mod	lify-\			Create		Modify-V			Delete		
Name	Tx Rate Disabled !		Filter Pattern	Delay	Name Tx F	Rate Disabl		Fill	er Patter	<u>n</u>	Dela	1y •

- A. **NOTE:** Kernel-Mode allows for much higher emulation speeds and supports all features of the normal WAN emulation mode
- B. Kernel-Mode is available for the WAN emulation if you are using a pre-compiled Linux kernel from the Candela downloads page
- C. Right-click to toggle the WanLink status to Running (green).

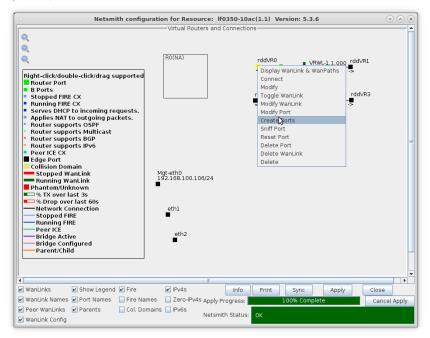
Running WanLink I92-186-100-106/24 Phantom/luknown Shoppe over last 60s Hotwork Connection eth1 Stopped FIRE Peer ICE Bridge Active Bridge Configured Parent/Child	Right-click/double-click/drag supported Router Port B Ports Stopped FIRE CX Stopped FIRE CX Running FIRE CX Serves DFCP to incoming requests. Applies NAT to outgoing packets. Router supports Supports SPF Router supports Multicast Router supports Multicast Router supports BCP Router supports BCP B Collision Domain Collision Domain Stopped WanLink	Mgt-eth0 192.168.100.106/24	rddVR0 V <-0 us, 56 kbps D rddVR2 TR 0 us, 1.544 Mbps M K R D D D	RWL11000 rddvR isplay WanLink & Wa onnect Iddify ddify YanLink ddify YanLink ddify YanLink ddify Yort reate Ports niff Port seate Ports elete Yant elete WanLink elete	
	Phantom/Unknown % TX over last 35 % TX over last 35 % Drop over last 605 Network Connection Stopped FIRE Running FIRE Peer ICE Bridge Active Bridge Configured				

D. Repeat for the second WanLink and set it to Running (green).

Netsmith config	uration for Resource:	lf0350-10ac(1.1) Versio	n: 5.3.6	
Right-click/double-click/drag supported Router Port Borts Stopped FIRE CX Sunning FIRE CX Serves DHCP to incoming requests. Applies NAT to outgoing packets. Router supports OSPF Router supports Multicast Router supports IPv6 PeriCE CX Edge Port Collision Domain Stopped WanLink Phantom/Unknown % DT over last 3s % DT op over last 60s Network Connection Stopped FIRE	Mgt-eth0 Mgt-eth1	d Connections	VRWL-1.1.000 rddvR1 os 0 us. 56 kbps 5	
Running FIRE Peer ICE Bridge Active Bridge Configured Parent/Child	eth2 ■			_
I ✓ WanLinks ♥ Show Legend ♥ Fire ♥ WanLink Names ♥ Port Names □ Fire Na	₩ IPv4s mes Zero-IPv4s Apply		7.12 T T T T T T T T T T T T T T T T T T T	ose ancel Apply
 ✓ Peer WanLinks ✓ Parents ✓ Col. Do ✓ WanLink Config 	mains 🔲 IPv6s	nith Status: OK		

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

- 3. Setup the ports.
 - A. Right-click port rddVR0 and select Create Ports



B. Select the Bridge button from the available connection types, name it, and click OK

0			Create VLANs	on Port: 1.1.3		\odot \otimes \otimes
0	○ MAC-VLAN ○ WIFI STA	○ 802.1Q-VLAN ○ Re ○ WiFi VAP ○ WiFi Moni			nnel	
0	Shelf:	1	Resource:	1 (lf0350-10ac) 💌	Port: 3 ((rddvR0)
B	VLAN ID:		DHCP-IPv4			
	Parent MAC: MAC Addr:	8e:45:69:ee:6b:14	DHCP Client ID: IP Address:	None	Global IPv6:	AUTO
	Quantity:	1	IP Mask or Bits:		Link IPv6:	AUTO
			Gateway IP:		IPv6 GW:	AUTO
	Bridge Name:	br0	#2 Redir Name:			
	STA ID:		SSID:			-
	WiFi AP:		Key/Phrase:			
	WPA	WPA2	WEP			
4	Down					
	Apply	<u>C</u> ancel		R	eady	

C. Right-click the bridge port and select Modify Port

Netsmith configu			.3.6	\odot
ght-click/double-click/drag supported Router Port B Ports Stopped FIRE CX Stopped FIRE CX Serves DHCP to incoming requests. Applies NAT to outgoing packets. Router supports Multicast Router supports BGP Router supports BGP Router supports IPv6 Peer ICE CX Edge Port Collision Domain Stopped WanLink Phatom/Unknown % TX over last 3s % Drop over last 60s Network Connection Stopped FIRE Running FIRE Peer ICE Bridge Active	Mgt.eth0 192.168.100.106/24 eth1		VRWL-1.1.000 rddVR1 0 us, 56 Kbps ->	
Bridge Configured Parent/Child	eth2			
 WanLinks	III IPv4s	Info Print Sync		ose
	nes 🔲 Zero-IPv4s Apply F nains 🔲 IPv6s	Progress: 100% Cor		ancel Appl
	Netsmi	th Status: OK		

A. NOTE: You will have to click the Sync button for your newly created bridge port to appear in the Netsmith window. D. Assign an IP address and IP mask, then click $\ensuremath{\textbf{Apply}}$

			0-10ac) Configur			\odot
			Port Status Inform			
			JP PROBE-ERROR TS	N		
		Driver Info: Port	Type: Bridge Drive	r: bridge(2.3) Bus N/A		
			Port Configurab	les		
Enable ——		General Ir	nterface Settings		Spanning-Tree	
Set IF Down	Down	Aux-Mgt			Aging Time: 30	0
Set MAC	DHCP-IPv6	☑ DHCP Release	DHCP Vendor ID:	None		768
Set TX Q Len	DHCP-IPv4	Secondary-IPs	DHCP Client ID:	None	Max Age: 20	•
Set MTU Set Offload	DNS Servers:	BLANK	Peer IP:	NA	Hello Time: 2	•
Set Bridge Info	IP Address:	1.1.1.1	Global IPv6:	AUTO	Forwarding Delay: 15	
Set bridge into	IP Mask:	255.255.255.0	Link IPv6:	AUTO		
	Gateway IP:	0.0.0.0	IPv6 GW:	AUTO		
	Alias:		MTU:	1500		
	MAC Addr:	de:09:d6:1c:f2:1e	TX Q Len	1000		
	Rpt Timer:	medium (8 s) 🔻	WiFi Bridge:	NONE		
	Brid	dge Information	Bem	ove Ports	1	
— Services —	Configured P	orts Current Port	ts			
HTTP			Add	Ports		
FTP]	
RADIUS						
	1					
	Print View	Dotaile P	supe	Apply OK	Concol	

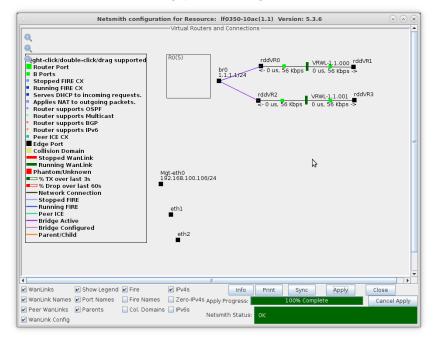
E. Enter interface names rddVR0 and rddVR2 in the whitespace located below the **Add Ports** button so that you can add them as bridge members

			-10ac) Configui			\odot) (
			Port Status Inform				
			IP PROBE-ERROR T				
		Driver Info: Port T	ype: Bridge Drive	r: bridge(2.3) Bus: N/A			_
			Port Configurab	les			
Enable ——		General In	terface Settings		Spanning-Tree		
Set IF Down	Down	Aux-Mgt			Aging Time:		•
Set MAC	DHCP-IPv6	DHCP Release	DHCP Vendor ID:	None	Bridge Priority:	32768	•
🔲 Set TX Q Len	DHCP-IPv4	Secondary-IPs	DHCP Client ID:	None	Max Age:		•
Set MTU	DNS Servers:	BLANK	Peer IP:	NA	Hello Time:	2	•
Set Offload	IP Address:	1.1.1.1	Global IPv6:	AUTO	Forwarding Delay:	15	•
📃 Set Bridge Info	IP Mask:	255.255.255.0	Link IPv6:	AUTO		·	Ĩ
	Gateway IP:	0.0.0.0	IPv6 GW:	AUTO			
	Alias:		MTU:	1500			
	MAC Addr:	de:09:d6:1c:f2:1e	TX Q Len	1000			
	Rpt Timer:	medium (8 s) 🔻	WiFi Bridge:	NONE			
	Brid	ge Information	Bem	ove Ports			
	Configured P	orts Current Port		0101010			
HTTP			Add	Ports			
FTP			rddVR0				
RADIUS			rddVR2				
]						
							Î
	Print View	Dotaile P	raha Sunc	Apply OF	Concol	1	
							i

F. Click ${\bf Add} \ {\bf Ports}$ to add the interfaces as bridge members, then click ${\bf OK}$

0			-10ac) Configur				\odot \land \times
		Current: LINK-U	IP PROBE-ERROR T	SO UFO GSO GRO			Ê
		Driver Info: Port T	ype: Bridge Drive	r: bridge(2.3) Bus: N/A			
			Port Configurab	les	2		
Enable			terface Settings		Spanning-Tree		
Set MAC	Down	Aux-Mgt			Aging Time:	300	-
Set TX 0 Len	DHCP-IPv6	DHCP Release	DHCP Vendor ID:	None 🔻	Bridge Priority:	32768	-
Set MTU	DHCP-IPv4	Secondary-IPs	DHCP Client ID:	None 💌	Max Age:	20	-
Set Offload	DNS Servers:	BLANK	Peer IP:	NA	Hello Time:	2	-
Set Bridge Info	IP Address:	1.1.1.1	Global IPv6:	AUTO	Forwarding Delay:	15	-
	IP Mask:	255.255.255.0	Link IPv6:	AUTO			
	Gateway IP:	0.0.0.0	IPv6 GW:	AUTO			
	Alias:		MTU:	1500			
	MAC Addr:	2a:6a:10:a5:8a:52	TX Q Len	1000			
	Rpt Timer:	nedium (8 s) 🔻	WiFi Bridge:	NONE			
Services	Configured P rddVR0 rddVR2	lge Information orts Current Port rddVR0 rddVR2	s	ove Ports Ports			
RADIUS							
	Print <u>V</u> iew	Details P	robe Sync	Apply QK	<u>C</u> ancel		

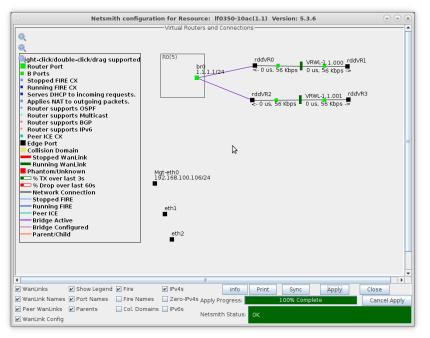
G. The Netsmith window now shows a bridge port with two bridge members



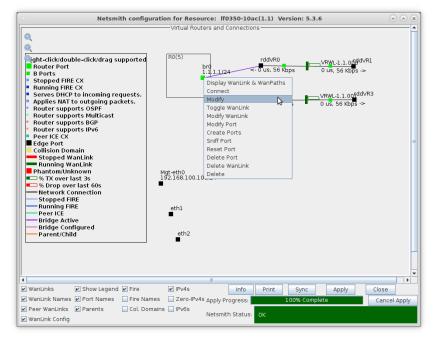
For more information see LANforge-GUI User Guide: Ports (Interfaces)

4. Setup DHCP Server and Clients.

A. Drag the bridge port into the virtual router.



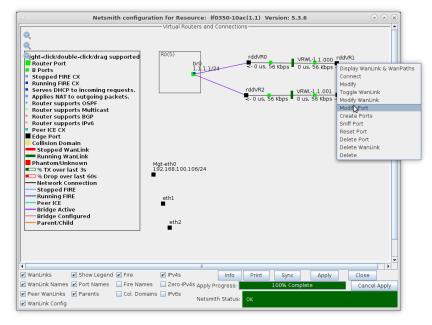
B. Right-click the bridge port and select Modify



C. Select the 'DHCP' checkbox at the bottom of the window and enter in your desired DHCP Server configuration, then click **OK**

		7		
k/double-click/drag su P	upported R0(5)	rddVR0	VRWL-1.1.000 rddVR1	
0	Create/I	lodify Connection	×	
d		Interface-Cost:	1	
Port 1-A:	11 (br0)	RIP-Metric:	1	
Port 1-B: 🗹 Skip	<auto create="" new="" port=""></auto>	OSPF Area: VRRP IP:	0.0.0.0	
WanLink: 🖌 Skip	<auto create="" new="" wanlink=""></auto>	VRRP ID:	1	
		VRRP Priority:	100	
Port 2-B: 🗹 Skip	<auto create="" new="" port=""></auto>	VRRP Interval:	1	
Port 2-A: 🗹 Skip	<auto create="" new="" port=""></auto>	Next-Hop:	0.0.0.0	
DHCP Lease Time:	300	Subnets (a.b.c.d/xx):		
DHCP DNS:	10.10.10.10			
DHCP Range Min:	1.1.1.100			
DHCP Range Max:	1.1.1.110	□		
DHCP Domain:	domain1.com			
DHCPv6 DNS:		Next-Hop-IPv6: IPv6 Subnets (aaa::0/xx):		
DHCPv6 Range Min:		IPv6 Subnets (aaa::U/xx):		
DHCPv6 Range Max:				
DHCPd Config File:				
-				
	DHCPv6 Custom D	ICP VRRP Cand-R	P	
	OK	3		
Show Legend	Fire Piv4s	Info Print	Sync Apply Clos	
nes 🖌 Port Names				ince
nks 🖌 Parents	Col. Domains IPv6s	Apply Hogiess:	ca ca	nce
onfig		Netsmith Status: OK		

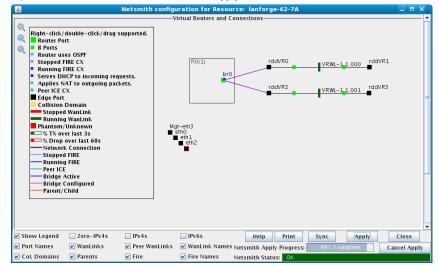
D. Right-click interface rddVR1 and select Modify Port



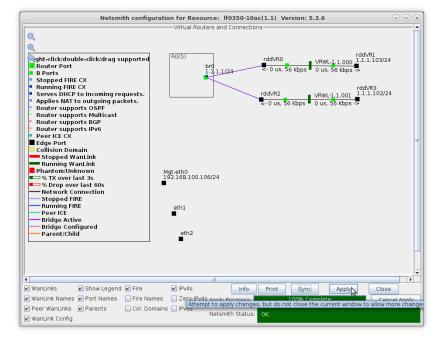
E. Select the 'DHCP' checkbox to make this interface a DHCP client, then click **OK**

			Port Status Info	ormation		
		Current: I	INK-UP PROBE-ERP	OR TSO UFO GSO GRO		
		Driver Info: I	Port Type: Redirect	-Device Peer: rddVR1	0	
			Port Configu	rables		
Enable		General In	terface Settings		Port Rates	Advert Rate
Set IF Down					O 10bt-HD O 10bt-FD	10bt-HD
Set MAC	Down	Aux-Mgt			0 100bt-HD	10bt-FD
🗌 Set TX Q Len	DHCP-IPv6	DHCP Release	DHCP Vendor ID:	None	0 100bt-FD 0 1000-FD	100bt-HD
Set MTU					10G-FD 0 40G-FD	100bt-FD
Set Offload	DHCP-IPv4	Secondary-IPs	DHCP Client ID:	None	O Autonegotiate	1000-FD
Set PROMISC	DNS Servers:	BLANK	Peer IP:	NA	Renegotiate	🗌 10G-FD
Set Rx-All/FCS	IP Address:	0.0.0.0	Global IPv6:	AUTO	Restart Xcvr	40G-FD
📃 Set Bridge Info	IP Mask:	0.0.0.0	Link IPv6:	AUTO		Flow-Contr
	Gateway IP:	0.0.0.0	IPv6 GW:	AUTO	RX-ALL	, Offload -
	Alias:		MTU:	1500	RX-FCS	TSO Enable
HTTP	MAC Addr:	6a:6f:f1:e7:e6:23	TX Q Len	1000	Bypass NOW!	UFO Enabl
FTP	Br Cost:	Ignore	Priority:	Ignore 💌	Bypass Power-UP	GSO Enabl
RADIUS	Rpt Timer:	medium (8 s) 🔻	WiFi Bridge:	NONE	Bypass Power-DOWN	LRO Enabl
					Bypass Disconnect	GRO Enabl
						1

F. Repeat for interface rddVR3, then click Netsmith Apply



G. After the Netsmith apply, DHCP clients will acquire IP addresses from the DHCP server



A. Select the 'IPv4s' checkbox at the bottom of the Netsmith window to see the IP addresses of the DHCP clients

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

- 5. Create a Layer-3 Connection.
 - A. Go to the Layer-3 tab and click Create

······································
C LANforge Manager Version(5.4.3) · · · · · · · · · · · · · · · · · · ·
Control Beporting Windows Info Iests
Chamber View Stop All Restart Manager Refresh HELP
Status Port Mgr Layer-3 L3 Endps Layer 4-7 WanLinks Resource Mgr Alerts Messages Warnings Wifi-Messages +
Rpt Timer: fast (1 s) 🔻 Go Test Manager all 💌 Select All Start + Stop - Quiesce Clear
View 0 - 500 To Go Display Create Mogify 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
ogqed in to: localhost:4002 as: Admin 2 stations: 21 03 02

B. The RDD-FIRE connection for this example will use interfaces rddVR1 and rddVR3.

			RDD-FIRE - Crea	ate/M	odify Cross Con	nect			0) (
+ - All			\searrow		Display	Sync Batch-Crea	ite	Apply OK	Cance	el
CX Name:	Cross-Connect RDD-FIRE			_	Report Timer:	Cross-Connect			v	
CX Type:	LANforge / UDP			-		Endpoint A		Endpoint B		
	Endpoint A		Endpoint B		Pld Pattern	increasing	-	1	-	
Resource:	1 (lf0350-10ac)	•	1 (lf0350-10ac)	-	Min IP Port:	AUTO	-	AUTO	-	
Port:	5 (rddVR1)	-	9 (rddVR3)	-	Max IP Port:	Sane		Same	-	
Min Tx Rate:	28 Kbps	-	28 Kbps	-	Min Duration:	Forever	-	Forever	-	
Max Tx Rate:	Sane	-	Sane	-	Max Duration:	Sane		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:	Sane	-	Same	-			-			
IP ToS:	Best Effort (0)	-	Best Effort (0)	-	Max Reconn:	Sane	-	Same	-	
Pkts To Send:	Infinite	-	Infinite	-	Multi-Conn:	Normal (0)	-	Normal (0)	-	
PRES TO Serio:						Script		Script		
						Thresholds		Thresholds		
6	Cross-Connect				A	Endpoint A		Endpoint B		
Test Manager	default_tm			-	Snd Buff Size:	OS Default	-	OS Default	-	
Quiesce:	3 (3 sec)			-	Rcv Buff Size:	OS Default	-	OS Default	-	
	Endpoint A		Endpoint B		Send Bad FCS:	zero (0%)	-	zero (G%)	-	
IP Addr:	AUTO	-	AUTO	-	Src MAC:	00:00:00:00:00:00	-	00:00:00:00:00:00	-	
	Replay File		Replay File			Use-Proxy		Use-Proxy		
	Loop		🗌 Loop		Proxy Addr:					
	Dest Mac		Dest Mac		Proxy Port:	0		0	_	
Filename:					Socket Priority:	0		0		
		-		-	o o calcer i noney.					

C. Verify the Layer-3 connection was created

				LANforge	Manager Versi	on(5.3.6)				\odot \land \times
<u>Control</u> <u>Repor</u>	ting <u>T</u> ea	ar-Off Info	Plugins			ß				
					Stop Al	Restart	Manager		Refresh	HELP
	neric T Layer-3	est Mgr T L3 End		Resource Mo	gr Event Log A VoIP/RTP Endps	lerts Port Mgr Armageddon	vAP Stations WanLink		nuators	File-IO
Rpt	Timer: fa	ast (1s) 🔻 Go	Test Manage	er all 💌	Select All	Start Start	op Quieso	e Clear	
View	0	- 500		▼ G	D	Display	/ Cr <u>e</u> ate	Mo <u>d</u> ify	Delete	
				-Cross Co	nnects for Selected	i Test Manager —			1	
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 Pkt:
RDD-FIRE	LF/UDP	Stopped	0	0	0	0	0	0	0	
•										,
Logged in to:	192.168.	100.106:40	02 as: Admi	n						

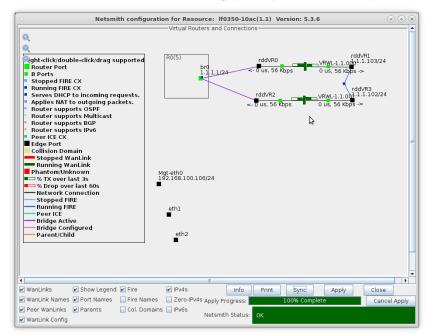
For more information see LANforge-GUI User Guide: Layer-3 Cross Connects (FIRE)

6. Run LANforge-FIRE to yourself through LANforge-ICE!

A. Select the Layer-3 Cross Connect and click Start

		LANforge N	lanager Versio	on(5.3.6)				\odot
ing <u>T</u> ear-0)ff Info <u>P</u> lugins							
			Stop All	Restart	Manager		Refresh	HELF
								File-IO
	ES Endp3 Von	,						111010
imer: fast	(1 s) 🔻 Go	Test Manage	r all 🔻	Select All	Start Start	op Quieso	clear	
0 - 50	00	▼ Go	•	Display	Cr <u>e</u> ate	Mo <u>d</u> ify	Delete	
	1	Cross Cor	nnects for Selected	i Test Manager —				
Туре	State Pkt Rx A	Pkt Rx B	Bps Rx A	Bps Rx B	Rx Drop % A	Rx Drop % B	Drop Pkts A	Drop F
LF/UDP Ru	n 184	184	27,750	27,822	0.541	0	1	
			\$					
	eric Test .ayer-3 Timer: fast 0 - 5 Type	eric Test Mgr Test Group) ayer-3 L3 Endps Voll Imer: fast (1 s) Vol 0 - 500 Type State Pkt Rx A	ing Tear-Off Info Plugins eric Test Mgr Test Group Resource Mg L3 Endps VolP/RTP V imer: fast (1 s) ▼ Go Test Manage 0 - 500 ▼ Go Cross Cor Type State Pkt Rx A Pkt Rx B	ing Tear-Off Info Plugins stop Al eric Test Mgr Test Group Resource Mgr Event Log A Layer-3 L3 Endps VolP/RTP VolP/RTP Endps Timer: fast (1 s) ▼ Go Test Manager all ▼ 0 - 500 ▼ Go Cross Connects for Selecter Type State Pkt Rx A Pkt Rx B Bps Rx A LF/UDP Run 184 184 27,750	ing Tear-Off Info Plugins eric Test Mgr Test Group Resource Mgr Event Log Alerts Fort Mgr .ayer-3 L3 Endps VoIP/RTP VoIP/RTP Endps Armageddon imer: fast (1 s) ▼ Go Test Manager all ▼ Select All 0 - 500 ▼ Go Display Cross Connects for Selected Test Manager Type State Pkt Rx A Pkt Rx B Bps Rx A Bps Rx B LF/UDP Run 184 184 27.750 27.822	ing Tear-Off Info Plugins stop All Restart Manager eric Test Mgr Test Group Resource Mgr Event Log Alerts Port Mgr vAP Stations .ayer-3 L3 Endps VoIP/RTP VoIP/RTP Endps Armageddon WanLink imer: fast (1 s) ♥ Go Test Manager all ♥ Select All Start Start 0 - 500 ♥ Go Display Crgate -Cross Connects for Selected Test Manager Type State Pkt Rx A Pkt Rx B Bps Rx A Bps Rx B Rx Drop % A LF/UDP Run 184 184 27,750 27,822 0.541	ing Tear-Off Info Plugins stop All Restart Manager eric Test Mgr Test Group Resource Mgr Event Log Alerts Port Mgr vAP Stations Messagg .ayer-3 L3 Endps VoIP/RTP VoIP/RTP Endps Armageddon WanLinks Atte imer: fast (1 s) ▼ Go Test Manager all ▼ Select All Start Stop Quiese 0 - 500 ▼ Go Display Create Modify Cross Connects for Selected Test Manager Type State Pkt Rx A Pkt Rx B Bps Rx A Bps Rx B Rx Drop % A	ing Tear-Off Info Plugins stop All Restart Manager Refresh eric Test Mgr Test Group Resource Mgr Event Log Alerts Port Mgr vAP Stations Messages .ayer-3 L3 Endps VoIP/RTP VoIP/RTP Endps Armageddon WanLinks Attenuators imer: fast (1 s) ♥ Go Test Manager all ♥ Select All Start: Stop Quiesce Clear 0 - 500 ♥ Go Display Crgate Modify Delete -Cross Connects for Selected Test Manager Type State Pkt Rx A Pkt Rx B Bps Rx A Bps Rx B Rx Drop % A Rx Drop % B Drop Pkts A LF/UDP Run 184 184 27,750 27,822 0.541 0 1

B. Go to the Status tab and click Netsmith to view the graphical representation of the setup



For more information see LANforge-GUI User Guide

Virtual Router with NAT

Goal: Setup a Virtual Router with one interface performing NAT on outgoing traffic.

In this test scenario, a pair of Virtual Routers are connected with a Redirected Interface connection with one side of the connection performing NAT on outgoing traffic. Two additional Redirected Interface connections are configured to pass traffic and demonstrate NAT.

^{1.} Setup two Virtual Routers and three Netsmith Connections.

A. Right-click inside the Netsmith window and select $\ensuremath{\mathsf{New Router}}$

	Netsm	ith configuratio		urce: lf0350-10a		ersion: 5.3.	7		
			-Virtual Rout	ters and Connection	ns				
0									
Q									
0									
~									
	í								
		New Connection							
		New Bridge							
	l								
Mgt-eth	0								
-									
ethl									
eth2									
WanLinks	Show Legend		IPv4s	Info	Print	Sync	Apply	Close	
	Port Names			s Apply Progress:		100% Compl	ete	Cance	el Apply
Peer WanLinks	 Parents 	🗹 Col. Domains	IPv6s	Netsmith Status:	ок				_
WanLink Config				wecomich ordrus:					

B. Repeat to create another virtual router

	nith configuration for Resource: If0350-10ac(1.1) Version: 5.3.7	\odot \diamond
	-Virtual Routers and Connections	
Mgt-eth0 eth1 eth2	R0(NA) R0(NA) R0w Router New Bridge	
WanLinks 📃 Show Leger	d 🗹 Fire 🗌 IPv4s Info Print Sync Apply	Close
	Fire Names Zero-IPv4s Apply Progress: 100% Complete	Cancel Apply
WanLink Names 🖌 Port Names		

C. Right-click inside the Netsmith window and select $\ensuremath{\textbf{New Connection}}$

	Netsm	ith configuratio	on for Resou	rce: lf0350-10a	c(1.1) Ve	rsion: 5.3.	7	(
		-		ers and Connectio					
Q									
0									
~									
e(
		R0(NA)							
					New R				
					New C	Sinection			
					New B	nuge			
Mgt-eth0									
eth1									
eth2	r	R1(NA)							
		112 (104)							
	L								
				III					•
WanLinks	Show Legend	✓ Fire	IPv4s	Info	Print	Sync	Apply	Close	
WanLink Names	🖌 Port Names	Fire Names	Zero-IPv4s	Apply Progress:		100% Compl	ete	Cance	Apply
Peer WanLinks	Parents	🖌 Col. Domains							
WanLink Config				Netsmith Status:					

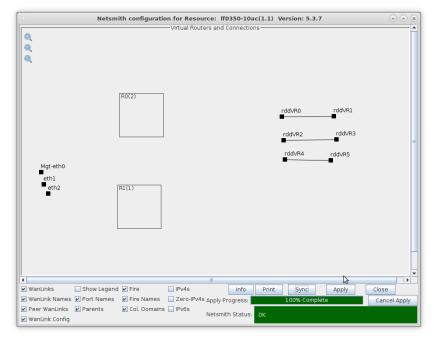
D. Select the 'Skip' option on Port 1-B, WanLink and Port 2-B, then click $\ensuremath{\textbf{OK}}$

	•	Create/M	odify Connection	-	$\overline{\mathbf{x}}$
			Interface-Cost:	1	
	Port 1-A:	<auto create="" new="" port=""></auto>	OSPE Area:	000.000.000.000	-
	Port 1-B: 🗹 Skip	<auto create="" new="" port=""></auto>	VRRP IP:	0.0.0/24	-
	WanLink: 🗹 Skip	<auto create="" new="" wanlink=""></auto>	VRRP ID:		
	Port 2-8: 🗹 Skip	<auto create="" new="" port=""></auto>	VRRP Priority:		
	Port 2-A: Skip	<auto create="" new="" port=""></auto>	VRRP Interval:	1	_
	DHCP Lease Time:	43200	Next-Hop: Subnets (a.b.c.d/xx):		-
	0.000 0.00		Subilets (a.b.c.u/M):		
Mgt-eth	DHCP Range Min:				-
eth1 eth2	DUCD Dopgo Mov				
eth2	DHCP Domain:				
	DHCPv6 DNS:		Next-Hop-IPv6:		_
	DHCPv6 Range Min:		IPv6 Subnets (aaa::0/xx):		-
	DHCPv6 Range Max:]		-
	DHCPd Config File:				-
	NAT DHCP	DHCPv6 Custom DH			
		ок	Cancel		
					_

E. Repeat and create two more connections

	Netsmi	ith configuratio	on for Resour	rce: lf03	350-10a	c(1.1) V	ersion:	5.3.7			\sim
0			—Virtual Route	ers and Co	onnection	IS					
Mgt-eth0 eth1 eth2	[R0(NA)					rddVR0 rddVR2	Nw	rddVR1 rddVR3 Router Connection Bridge		
] WanLinks	Show Legend	✓ Fire	IPv4s		Info	Print	Sync		Apply	Close	
WanLink Names	Port Names	Fire Names	Zero-IPv4s	Apply Pro	gress:		100% C			Cance	Appl
Peer WanLinks WanLink Config	Parents	🗹 Col. Domains	IPv6s	Netsmith	Status:	ок					

F. Click the $\ensuremath{\textbf{Apply}}$ button followed by the $\ensuremath{\textbf{Sync}}$ button



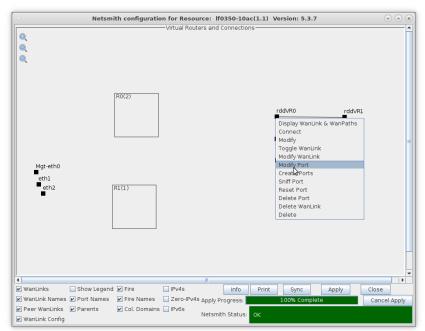
A. NOTE: Modifications in Netsmith are only sent to the LANforge-Server after Applying them

B. Clicking Sync makes sure any changes are synchronized with the current database

For more information see LANforge-GUI User Guide: Virtual Interfaces

2. Setup the Ports.

A. Right-click the rdd ports and select Modify Port



A. Assign each pair of rdd ports a unique subnet and IP address

B. Select the 'IPv4s' checkbox to view the IP addresses of the rdd ports

• Netsm	th configuration for Resource: If0350-10ac(1.1)	Version: 5.3.7	\odot \sim \times
Q. Q. Q.			
	(R0(2)	rddVR0 10.10.10.10/24	rddVR1 10.10.10.11/24
		rddVR2 20.20.20.1/24	rddVR3 20.20.20.20/24
Mgt-eth0 192.168.100.106/24		rddVR4 30.30.30.1/24	rddVR5 30.30.30.30/24
eth1 eth2	RI(1)	Å	
1			
WanLinks Show Legend		Sync Apply	
🖌 WanLink Names 🖌 Port Names	Fire Names Zero-IPv4s Apply Progress:	100% Complete	Cancel Apply
 ✓ Peer WanLinks ✓ Parents ✓ WanLink Config 	☑ Col. Domains ☐ IPv6s Netsmith Status: OK		

C. Configure rddVR3 and rddVR5 with a Gateway IP that corresponds to their peer rdd interface

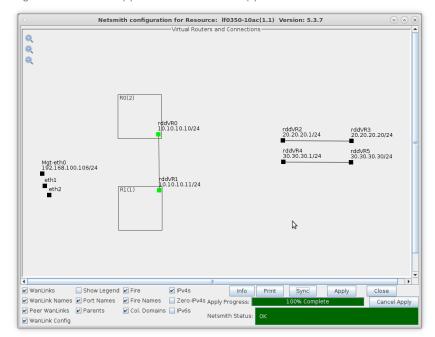
			Port Status Informs K-UP TSO GSO t Type: Redirect-Device Pe			
tandard Configur	ation Extended	Config	Port Configura	bles		
Enable		General Ir	nterface Settings		Port Rates	Advert Rates
Set MAC	Down	Aux-Mgt	DHCP Hostname:	None	0 10bt-HD 0 10bt-FD 0 100bt-HD	10bt-HD 10bt-FD
Set MTU	DHCP-IPv <u>6</u>	DHCP Release	DHCP Vendor ID:	None 👻	0 100bt-FD 0 1000-FD	100bt-HD
Set Officiad	DHCP-IPv4	Secondary-IPs	DHCP Client ID:	None	2.5G-FD 5G-FD 10G-FD	100bt-FD
Set Rx-All/FCS	DNS Servers:	BLANK	Peer IP:	NA	Ö 40G-FD	2.5G-FD
Set Bridge Info	IP Address:	20.20.20.20	Global IPv6:	AUTO	 Autonegotiate 	5G-FD
	IP Mask:	255.255.255.0	Link IPv6:	AUTO	Renegotiate	10G-FD
Services	Gateway IP:	20.20.20.1	IPv6 GW:	AUTO	Restart Xovr	40G-FD
НТТР	Alias:		MTU:	1500	PROMISC	Flow-Control
FTP	MAC Addr:	5e:67:8e:a8:ff:88	TX Q Len	1000	RX-ALL	Officad
DNS RADIUS	Br Cost:	Ignore 🗸	Priority:	Ignore 💌	RX-FCS	TSO Enabled
IPSEC-Client	Rpt Timer:	medium (8 s) 💌	WiFi Bridge:	NONE 👻	Bypass Power-UP	GSO Enabled
IPsec-Upstream	IPSec GW:	0.0.0.0	IPSec Password:		Bypass Power-DOWN	LRÓ Enabled
	IPSec Local ID.:		IPSec Remote ID.:		Bypass Disconnect	GRO Enabled

A. NOTE: In this example, rddVR3 has a Gateway IP of 20.20.20.1 and rddVR5 has a Gateway IP of 30.30.30.1

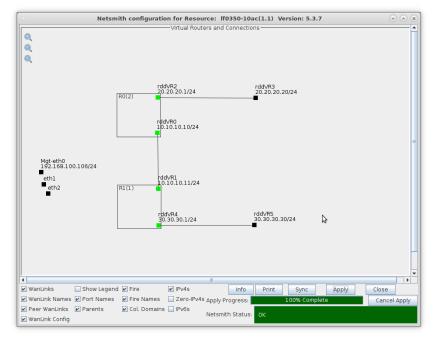
For more information see LANforge-GUI User Guide: Ports (Interfaces)

3. Move the Redirected Interfaces into their desired positions.

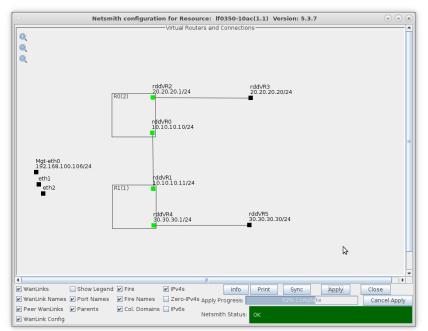
A. Drag rddVR0 into Router R0(2) and rddVR1 into Router R1(1)



B. Drag rddVR2 into Router R0(2) and rddVR4 into Router R1(1)



C. Click Netsmith $\ensuremath{\textbf{Apply}}$ to commit the changes



4. Create a TCP connection and sniff traffic without NAT.

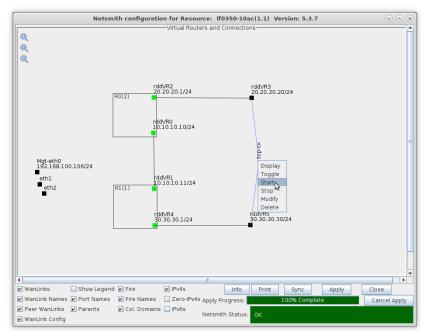
A. Go to the ${\it Layer-3}$ tab and click ${\it Create}$

				LANfor	ge Manager Ver	sion(5.4.3)			\odot \bigcirc \bigcirc
ontrol <u>R</u> eporti	ng Win	id <u>o</u> ws <u>I</u> nfo	Tests						
			Cham	ber <u>V</u> iew	<u>S</u> top All	Resta	art Manager	<u>R</u> efresh	HELP
Status Port	4gr L	ayer-3 L3	Endps La	/er 4-7 War	Links Resource M	gr Alerts M	lessages Warnings	Wifi-Messages	+
Rpt Tin	ner: fas	st (1s)	▼ G0	Fest Manager	all	Select All	Start + Stop -	Quiesce Clear	
View	0 -	500		▼ G0		Disp	ay Cr <u>ea</u> te Mo <u>d</u> i	y Delete	
					nnects for Selected	Fest Manager—			1
Name	Туре	State	Pkt Rx A	Pkt Rx B	Bps Rx A	Bps Rx B	Rx Drop % A Rx Dro	p % B Drop Pkts A	Drop Pkt
1									
gged in to: loc	alhost:4	1002 as: A	dmin					2 station	ns:210↓

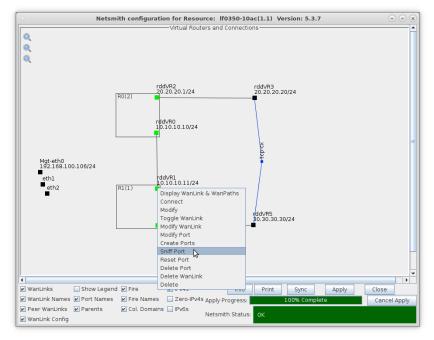
B. Create a Layer-3 TCP connection between endpoints rddVR3 and rddVR5 then click $\pmb{\mathsf{OK}}$

			tcp-cx - (Create/	Modify Cross Conn	ect					\odot
+ - A	11				<u>D</u> isplay	Sync	Batch-Create		Apply	<u>O</u> K	Cano
1	Cross-Connect				9	Cross-Cor	nnect				
CX Name:	tcp-cx				Report Timer:	fast	(1 s)				
CX Type:	LANforge / TCP			-		Endpoint A	(Client)	5.	ndpoint B	(Social)	
	Endpoint A (Client)		Endpoint B (Server)		Pld Pattern	increasing			ncreasing (-
Resource:	1 (ct521b-11b4)	-	1 (ct521b-11b4)	-	Min IP Port:	AUTO			ито	,	
Port:	14 (rddVR3)	-	16 (rddVR5)	-	Max IP Port:	Same		_	ame		
Min Tx Rate:	Old Modem (9.6 Kbps)	-	Old Modem (9.6 Kbps)	-		Forever			orever		_
Max Tx Rate:	Same	-	Same	-	Min Duration:						-
Min PDU Size:	Small (300 B)	-	Small (300 B)	-	Max Duration:	Same			ame		•
Max PDU Size:	Same	-	Same	-	Min Reconn:	0 (0	ms)	• 0		5)	•
		_			Max Reconn:	Same		▼ S	ame		-
P ToS:		-		-	Multi-Conn:	Normal (0) ·	▼ N	lormal (0))	
Pkts To Send:	Infinite	-	Infinite	-		Auto-He	elper	V	Auto-Helj	per	
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ລ	Cross-Connect					Endpoint A	(Client)	Er	ndpoint B	(Server)	
Fest Manager	default_tm			-	Snd Buff Size:	OS Defau	lt	▼ 0	S Default	:	•
Quiesce:	3 (3 sec)			•	Rcv Buff Size:	OS Defau	lt	- 0	S Default	:	
	Endpoint A (Client)		Endpoint B (Server)		Send Bad FCS:	zero (0%)	▼ z	ero (0%)		-
IP Addr:	AUTO	-	AUTO	-	Src MAC:	00:00:00:0	0:00:00	- 0	0:00:00:00	:00:00	
	Replay File		Replay File			Use-Pro	жу		Use-Prox	у	
	Loop		Loop		Proxy Addr:			0			
			Dest Mac		Proxy Port:			0			
	Dest Mac										
Filename:	Dest Mac				Socket Priority:	0		0			

C. In Netsmith, right-click the TCP connection and click Start



D. Right-click port rddVR1 and click Sniff Port

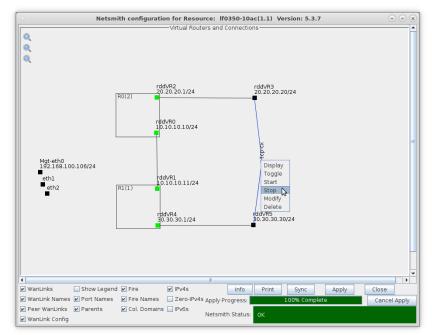


A. NOTE: You must have Wireshark properly installed as described here: Installing Wireshark

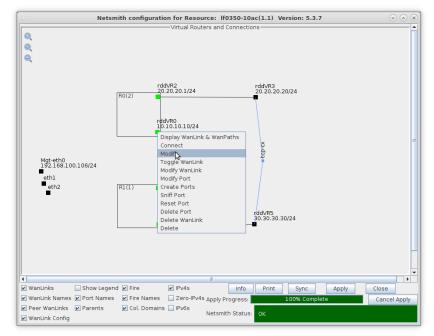
E. After Wireshark begins, notice that the source and destination IP addresses are from 20.20.20.20 (rddVR3) and 30.30.30.30 (rddVR5) as expected without NAT enabled

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Fram Ethe Inte Tran LANf	da da 01 1e 00	: 36 t II t Pr ssio e Tr bc (60 1e (79 (6 byt , Src otocc n Cor affic	: 1 l V tro Ge bd 40 80 00	2:e2 ers: l Pi nera 00 ee 00	2:26 ion 4 rotor ator 12 e 3f 0 c0 b 01 0	:fd:4 4, Sr col, 2 20 6 2 1 0	7:d7 c: 2 Src 5 fd 5 2e 5 e9 3 0a	(1: 0.20 Por 47 14 92 0a	2:e2 0.20 t: 3 d7 0 14 1 46 1 a9 e	:26:f .20, 3005, 3005, 08 00 L4 14 Ld 57 25 88	d:47 Dst: Dst 45 (1e 1 80 1 0a a	':d7) 30. Por Por 1e 18 a9	, Ds 30.3 t: 3	t: da 0.30 3006, 0.?. @.?.	seq: 1 گوم: 1 گور: ۱	ef:b , Ac	d:e9 k: 1,	(da:	bc:e5
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- 5. Enable NAT and sniff traffic on the same port.
 - **NOTE** It is important that Endpoint-A of the connection is **behind** the NAT port because it is the side that initiates the connection. Reversing the endpoint ports will cause the connection to fail.
 - A. Right-click on the TCP connection and select Stop



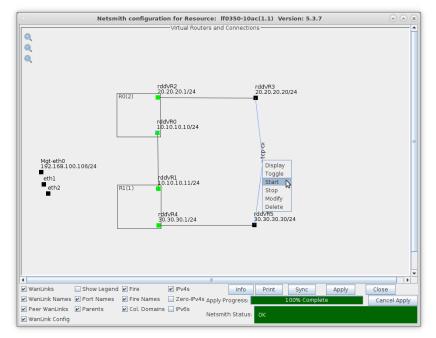
B. Right-click rddVR0 and select Modify



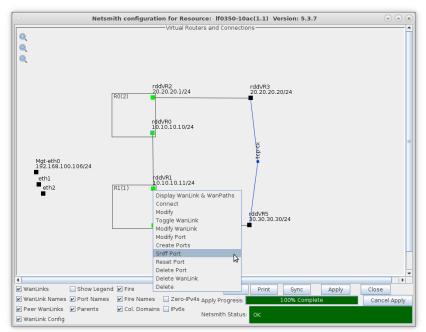
C. Select the 'NAT' checkbox and click **OK**, then click the Netsmith **Apply** button

Q. Q.	Netzini	th configuration for Resource	and Connections		
e,	0	Create/Mo	dify Connection	x	
	Port 1-A:	3 (rddVR0) 💌	Interface-Cost: RIP-Metric: OSPE Area:	1 1 0.0.0.0	
	Port 1-8: 🗹 Skip	<auto create="" new="" port=""> 👻</auto>	VRRP IP:	0.0.0.0/24	
	WanLink: 🗹 Skip Port 2-B: 🗹 Skip	<auto create="" new="" wanlink=""> Auto Create New Port></auto>	VRRP ID: VRRP Priority:	1	
	Port 2-A: Skip	4 (rddVR1)	VRRP Interval: Next-Hop:	0.0.0.0	
Mgt-eth 192.16	DHCP Lease Time: DHCP DNS:		Subnets (a.b.c.d/xx):		
eth1	DHCP Range Min: DHCP Range Max:				
etn2 ■	DHCP Domain: DHCPv6 DNS:		Next-Hop-IPv6:		
	DHCPv6 Range Min: DHCPv6 Range Max:		IPv6 Subnets (aaa::0/xx):		
	DHCPd Config File:				
	NAT DHCP	DHCPv6 Custom DHC	VRRP Cand-RP		
WanLinks	Show Legend		Info Print	Sync Apply Clos	se
	ks 🗹 Parents	Fire Names Zero-IPv4s Ap Col. Domains IPv6s Ne	ply Progress: 10 tsmith Status: 0K	0% Complete Ca	ncel Apply

D. Right-click on the TCP connection and select Start



E. Right-click port rddVR1 and select Sniff Port



F. After Wireshark begins, notice that any source or destination IP address from or to 20.20.20.20 (rddVR3) has been NAT'd to be 10.10.10.10 because rddVR0 is now performing NAT on all outgoing traffic

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 Int Tra LAN 0000 0010 0020 0030 0040 	f6 : 01 (1e : 00 (00 (t Pro ssion e Tra 19 f9 60 87 1e 80 2a 51 d5 00	toco Con ffic 8a 71 eb a2 00 00	l Ve trol Gen 39 8 40 0 80 e 90 0 90 0 90 4	d be 0 3f c 7d 0 01 0 1a 0 65	88 06 33 01 2b 14	7c 62 65 3c 8e	47 d7 0c 0a 4d 31	Por 16 0a 3d 0a 15	ee 0a 53 ec 02 e7	3300 08 0 0a 0 f1 a 00 0 e9 0	03, [0 45 a 1e 3 80 f 99 3 01	5 00 9 1e 9 6a 1 08 9 01	Port	t: 3	3004 9··· 0·? ··}3	G b e - = € <m< td=""><td>E 3</td><td></td><td><: 1,</td><td>. Len</td><td>:</td></m<>	E 3		<: 1,	. Len	:
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 Int Tra LAN 0000 0010 0020 0030 0040 0050 0060 0050 0060 0070 0080 	f6 : 01 0 10 : 00 0 00 0 00 0 00 0 00 0 00	t Pro ssion e Tra 19 f9 60 87 1e 80 2a 51 d5 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00	toco Con ffic 8a 71 eb a2 00 00 00 00 00 00 00 1d	l Ve trol Gen 39 8 40 0 80 e 90 0 90 0 90 4 90 0 90 4 90 0 90 0 1e 1	d be 0 3f c 7d 0 01 0 65 2 00 f 10 f 20	88 06 33 01 2b 14 01 11 21	7c 62 65 8e 02 12 22	47 d7 0c 0a 4d 31 03 13 23	Por 16 0a 3d 00 15 04 14 24	ee 0a 53 ec 02 e7 05 15 25	3300 08 0 01 a 00 0 00 0 00 0 00 0 16 1 26 2	03, [045 a 1e 3 80 5 99 3 01 0 06 7 08 7 18 7 28	Dst 5 00 9 1e 9 6a 1 08 9 01 3 09 3 19 3 29	Port	t: 3 •q	3004 9··? 0·? 33 0·? 13	, Sev G G G S G S 	S		(: 1,	. Len	:
 Int Trate LAN 0000 0010 0020 0040 0050 	f6 : 01 (00 (00 (00 (00 (00 (00 (00 (t Pro ssion e Tra 19 f9 60 87 1e 80 2a 51 d5 00 00 00 00 00 00 00 00 00 00 00 00 b 0c 1b 1c 2b 2c	toco Con ffic 8a 71 eb a2 00 00 00 00 00 1d 2d	l Ve trol Gen 39 8 40 0 80 e 90 0 90 0 90 0 90 0 90 0 90 0 90 0 9	d be 0 3f 0 1a 0 65 2 00 f 10 f 20 f 30	88 06 33 01 2b 14 01 11 21 31	7c 62 65 8e 02 12 22 32	A7 d7 0c 0a 4d 31 03 13 23 33	Por 16 0a 3d 0a 00 15 04 14 24 34	ee 0a 53 ec 02 e7 05 15 25 35	3300 08 0 0a 0 f1 a a0 3 00 0 e9 0 06 0 16 1 26 2 36 3	0 45 a 1e 3 80 f 99 3 01 0 00 7 08 7 18 7 28	Dst 0 00 0 18 0 6a 1 08 0 01 3 09 3 19 3 29 3 39	Port	t: 3 `q `*Q	3004 9.? .}3 	, Se G G G C S 2345	S-?-]		(: 1,	Len	:
 Int Tra LAN 0000 0010 0020 0040 0050 0040 00	f6 : 01 (1e : 00 (00 (00 (00 (1a : 2a : 3a :	t Pro ssion e Tra 19 f9 60 87 1e 80 2a 51 d5 00 00	toco Con ffic 8a 71 eb a2 00 00 00 00 00 00 1d 2d 3d	l Ve trol Gen 39 8 40 0 80 e 00 0 00 4 00 0 00 000000	d be 0 3f c 7d 0 1a 0 65 2 00 f 10 f 20 f 30 f 40	88 06 33 01 2b 14 01 11 21 31 41	7c 62 65 08 3c 8e 02 12 22 32 42	A7 d7 0c 0a 4d 31 03 13 23 33 43	Por 16 0a 30 00 15 04 14 24 34 44	ee 0a 53 ec 02 e7 05 15 25 35 45	3300 08 0 0a 0 69 0 06 0 16 1 26 2 36 3 46 4)3, [0 45 1a 1e 3 80 15 99 3 01 0 00 7 08 7 18 7 28 7 38 7 38 7 48	5 00 e 1e 9 6a 1 08 9 6a 1 08 9 01 3 09 3 19 3 29 3 39 3 49	Port	t: 3 `q `+,- ;;<=	3004 9 0 3 3 3 3 4 4 0 8 2 0 8 4 9 7 3 3 9 7 3 3 9 7 3 3 9 7 3 3 9 7 3 3 9 7 7 3 3 9 7 7 3 3 9 7 7 3 3 9 7 7 3 3 9 7 7 3 3 9 7 7 3 3 9 7 7 3 3 9 7 7 3 3 9 7 7 3 3 9 7 7 3 3 9 7 7 3 7 3	, Se G G G C G C G C G C G C G C C	E ?] %&'() 56789 EFGH1	j j	<: 1,	Len	:
► Int ► Tra ► LAN	f6 : 01 (1e : 00 (00 (0a (0a (1a : 2a) 3a : 4a 4	t Pro ssion e Tra 19 f9 60 87 1e 80 2a 51 d5 00 00	toco Con ffic 8a 71 eb a2 00 00 00 00 00 00 00 00 00 00 00 00 00	l Ve trol Gen 39 8 40 0 80 e 00 0 00 4 00 0 00 4 00 0 00 4 00 0 00 4 00 0 22 2 34 4 4 4 4 4 4	d be 0 3f c 7d 0 01 a 0 65 2 00 f 10 f 30 f 40 f 50	88 06 33 01 2b 14 01 11 21 31 41 51	7c 62 65 08 3c 8e 02 12 22 32 42 52	47 d7 0c 0a 4d 31 23 33 43 53	Por 16 0a 30 00 15 04 14 24 34 44 54	ee 0a 53 ec 02 e7 05 15 25 35 45 55	3300 08 0 0a 0 69 0 69 0 616 1 26 2 36 3 46 4 56 5	93, [0 45 a 1e 3 80 f 99 3 01 0 00 7 08 7 18 7 28 7 28 7 28 7 58	5 00 2 1e 3 6a 1 08 3 09 3 19 3 29 3 39 3 49 3 59	Port	t: 3 `q `+,- ;;<= JKLM	3004 9	, Se G b e -= < M · 1 · 1 · 2345 BCDE RSTU	6& '() 56789 FGHJ JVWXY		<: 1,	Len	:
 Int Tra LAN 0000 0010 0020 0040 0050 0040 00	f6 : 01 (1e : 00 (00 (0a (0a (1a : 2a) 3a : 4a 4	t Pro ssion e Tra 19 f9 60 87 1e 80 2a 51 d5 00 00	toco Con ffic 8a 71 eb a2 00 00 00 00 00 00 00 00 00 00 00 00 00	l Ve trol Gen 39 8 40 0 80 e 00 0 00 4 00 0 00 4 00 0 00 4 00 0 00 4 00 0 22 2 34 4 4 4 4 4 4	d be 0 3f c 7d 0 01 a 0 65 2 00 f 10 f 30 f 40 f 50	88 06 33 01 2b 14 01 11 21 31 41 51	7c 62 65 08 3c 8e 02 12 22 32 42 52	47 d7 0c 0a 4d 31 23 33 43 53	Por 16 0a 30 00 15 04 14 24 34 44 54	ee 0a 53 ec 02 e7 05 15 25 35 45 55	3300 08 0 0a 0 69 0 69 0 616 1 26 2 36 3 46 4 56 5	93, [0 45 a 1e 3 80 f 99 3 01 0 00 7 08 7 18 7 28 7 28 7 28 7 58	5 00 2 1e 3 6a 1 08 3 09 3 19 3 29 3 39 3 49 3 59	Port	t: 3 `q `+,- ;;<= JKLM	3004 9	, Se G G G C G C G C G C G C G C C	6& '() 56789 FGHJ JVWXY		<: 1,	Len	:

For more information see LANforge-GUI User Guide

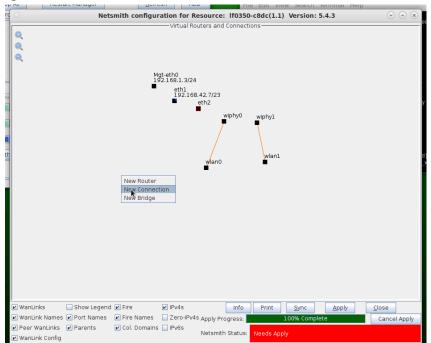
Multiple Layer-2 Switches

Goal: Emulate the behavior of five Layer-2 Switches connected together for traffic fail-over testing.

In this test scenario, the function of several layer-2 switches will be emulated using multiple LANforge Bridge devices with Spanning Tree Protocol (STP) so that each bridge can be connected to at least two others and fail-over tests can be demonstrated.

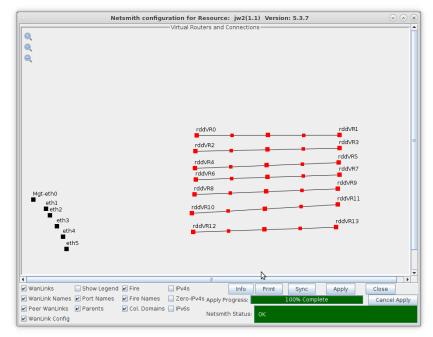
^{1.} Setup seven Netsmith Connections.

A. Right-click inside the Netsmith window and select **New Connection**

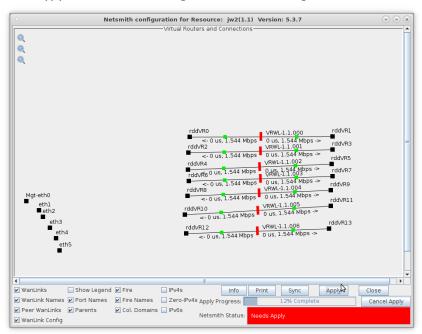


B. Accept defaults *Auto Create* everything then click **OK**.

C. Repeat and create a total of seven (7) connections



D. Click the $\ensuremath{\textbf{Apply}}$ button to commit the changes in Netsmith to the LANforge-Server



A. NOTE: Modifications in Netsmith are only sent to the LANforge-Server after Applying them

For more information see LANforge-GUI User Guide: Virtual Interfaces

- 2. Setup five Bridge devices.
 - A. Right-click inside the Netsmith window and select New Bridge

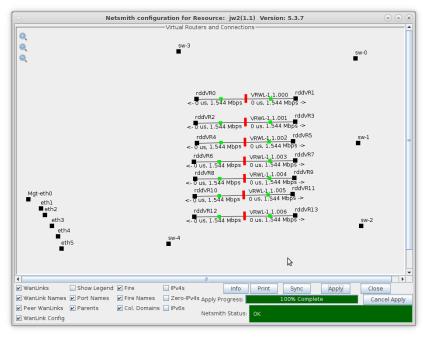
Netsmith configuration for Resource: jw2(1.1) Version: 5.3.7	
Virtual Routers and Connections New Router New Connection New Bridge Virtual Routers and Connections Verset Verset	
WanLinks Show Legend Fire IPv4s Info Print Sync Apply	Close
✓ WanLink Names ✓ Port Names ✓ Fire Names Zero-IPv4s Apply Progress: 100% Complete	Cancel Apply
✓ Peer WanLinks ✓ Parents ✓ Col. Domains □ IPv6s ✓ WanLink Config	

B. Select the **Bridge** button, enter a name and quantity 5

0			Create VLA	Ns on Port:				v A X
0	○ MAC-VLAN ○ WIFI STA	○ 802.1Q-VLAN ○ Rec ⊃ WiFi VAP ○ WiFi Monit			GRE Tunr	nel		
0	Shelf:	1	Resource:	1 (jw2)	•	Port: 1 (ethl)	-
B	VLAN ID:		DHCP-IPv4					
	Parent MAC:	00:30:18:cb:b8:07	DHCP Client ID:	None	-			
	MAC Addr:	xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx	IP Address:			Global IPv6:	AUTO	
	Quantity:	5	IP Mask or Bits:			Link IPv6:	AUTO	
			Gateway IP:			IPv6 GW:	AUTO	
	Bridge Name:	sw-0	#2 Redir Name:					
	STA ID:		SSID:				-	
	WiFi AP:		Key/Phrase:					
	WPA	WPA2	WEP					
4	Down							
	Арр	<u>C</u> ancel			Rea	ady		

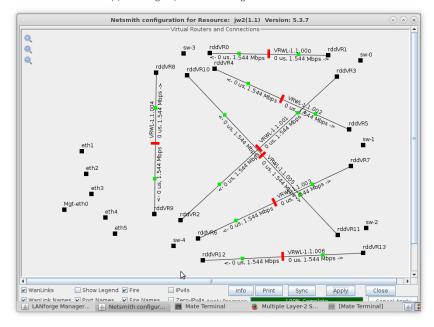
A. NOTE: The 5 bridges here are sw-0, sw-1, sw-2, sw-3, and sw-4

C. In Netsmith, position the bridge devices into separate areas so they can be grouped with WanLink entry points

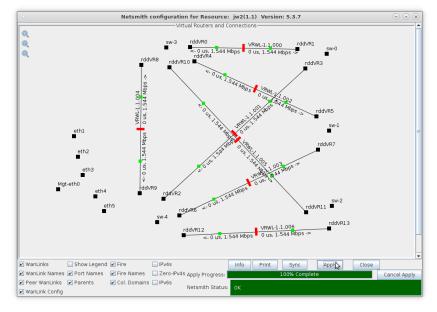


For more information see LANforge-GUI User Guide: Ports (Interfaces)

- 3. Move the WanLinks into their desired positions.
 - A. Position the WanLink entry points in groups near the bridges as follows:

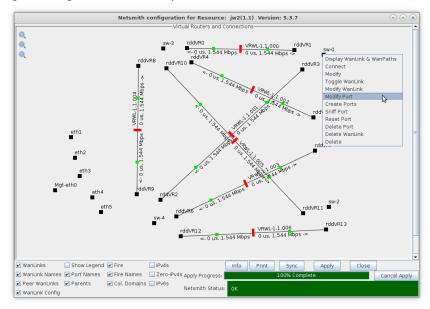


- A. 2 entry points near sw-0, sw-1, and sw-2 (one to sw-3 and one to sw-4)
- B. 3 entry points near sw-3 and sw-4 (one to sw-0, sw-1, and sw-2)
- C. Bridges sw-3 and sw-4 should also have a WanLink between them
- B. Click Netsmith Apply to commit the changes



4. Modify each Bridge to enable Spanning Tree Protocol (STP) and add Bridge Members.

A. Right-click bridge sw-0 and select Modify Port

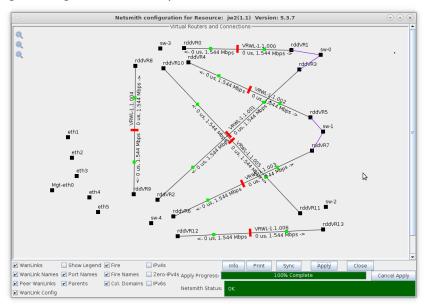


B. Select the 'Set Bridge Info' and 'Spanning Tree' checkboxes, then add bridge members rddVR1 and rddVR3

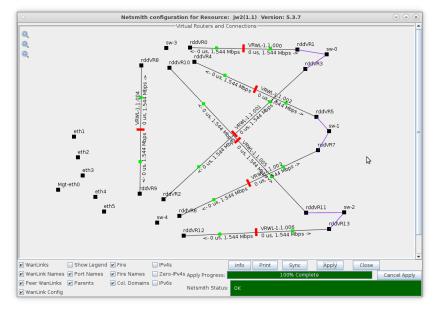
			0-10ac) Configu	5		\odot	\diamond
			Port Status Inform		\$		
			IP PROBE-ERROR T				
		Driver Info: Port T	ype: Bridge Drive	r: bridge(2.3) Bus: N/A			_
			Port Configurab	les			
Enable		General In	terface Settings		Spanning-Tree		
Set IF Down	Down	Aux-Mgt			Aging Time:	300	
Set MAC	DHCP-IPv6	DHCP Release	DHCP Vendor ID:	None 💌	Bridge Priority:	32768	•
Set TX Q Len	DHCP-IPv4	Secondary-IPs	DHCP Client ID:	None	Max Age:	20	•
Set MTU Set Offload	DNS Servers:	BLANK	Peer IP:	NA	Hello Time:	2	•
Set Bridge Info	IP Address:	0.0.0.0	Global IPv6:	AUTO	Forwarding Delay:	15	•
Set Bridge into	IP Mask:	0.0.0.0	Link IPv6:	AUTO			
	Gateway IP:	0.0.0.0	IPv6 GW:	AUTO			
	Alias:		MTU:	1500			
	MAC Addr:	3a:2c:3a:e3:43:85	TX Q Len	1000			
	Rpt Timer:	medium (8 s) 🔻	WiFi Bridge:	NONE			
	Brid	Ige Information	Bem	ove Ports			
— Services —	Configured P	orts Current Port	s	0101010			
HTTP	rddVR1 rddVR3		Add	Ports			
FTP							
RADIUS							
							-
	Print View	Details Pr	robe Sync	Apply OK	Cancel	1	

- A. NOTE: Selecting the 'Spanning Tree' checkbox enables Spanning Tree Protocol (STP) for that port
- B. Click the **Apply** or **OK** button to commit the changes in bridge configuration to the LANforge-Server

C. Right-click bridge sw-1 and select Modify Port

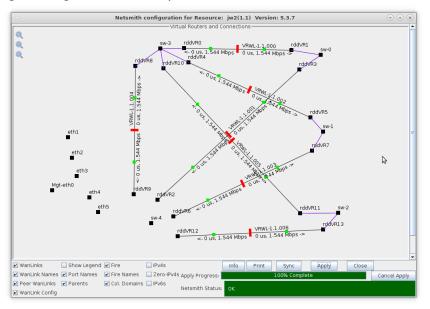


- A. Enable STP and add members rddVR5 and rddVR7
- D. Right-click bridge sw-2 and select Modify Port



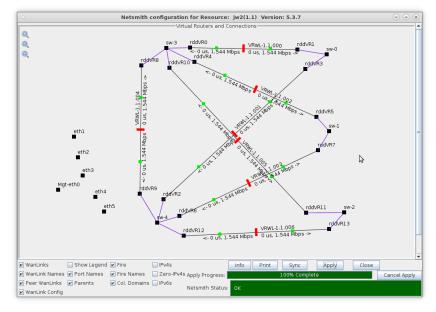
A. Enable STP and add members rddVR11 and rddVR13

E. Right-click bridge sw-3 and select Modify Port



A. Enable STP and add members rddVR0, rddVR4, rddVR8 and rddVR10

F. Right-click bridge sw-4 and select Modify Port



A. Enable STP and add members rddVR2, rddVR6, rddVR9 and rddVR12

- 5. Create virtual interfaces for traffic generation and fail-over tests.
 - A. Right-click sw-0 and select Create Ports and choose Redirect

•			Create VLANs o	n Port: 1.1.34		\odot \sim \times
0		○ 802.1Q-VLAN			inel	
2	Shelf:	1	Resource:	1 (jw2) 🔻	Port: 34	(sw-0) 🔻
B	VLAN ID:		DHCP-IPv4			
	Parent MAC:	9e:2f:cc:39:a8:ce	DHCP Client ID:	None 💌		
	MAC Addr:	xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx	IP Address:		Global IPv6:	
	Quantity:		IP Mask or Bits:		Link IPv6:	
			Gateway IP:		IPv6 GW:	
	#1 Redir Name:	rddA	#2 Redir Name:	rddB		
	STA ID:		SSID:			r
	WiFi AP:		Key/Phrase:			
	WPA	WPA2	WEP			3
4	Down					
Ľ	Apply	<u>C</u> ancel		Re	ady	

- A. This step will create two Redirect Devices, rddA and rddB
- B. Add rddA to bridge sw-0

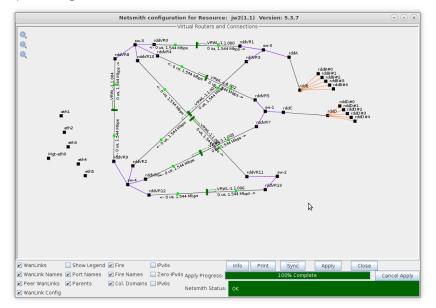
		sw-0 (lf035	D-10ac) Configu	re Settings		\odot	
			P PROBE-ERROR T				ŕ
		Driver Info: Port T	ype: Bridge Drive	r: bridge(2.3) Bus: N/A			
			Port Configurab	les			
Enable			terface Settings	1	Spanning-Tree		
Set IF Down	Down	Aux-Mgt			Aging Time:	300	-
Set MAC	DHCP-IPv6	DHCP Release	DHCP Vendor ID:	None 💌	Bridge Priority:	32768	-
Set TX Q Len	DHCP-IPv4	Secondary-IPs	DHCP Client ID:	None	Max Age:	20	-
Set Offload	DNS Servers:	BLANK	Peer IP:	NA	Hello Time:	2	-
Set Bridge Info	IP Address:	0.0.0.0	Global IPv6:	AUTO	Forwarding Delay:	15	-
1	IP Mask:	0.0.0.0	Link IPv6:	AUTO			
		0.0.0.0	IPv6 GW:	AUTO			
	Alias:		MTU:	1500			
	MAC Addr:	36:e1:69:a2:90:79	TX Q Len	1000			
	Rpt Timer:	medium (8 s) 🔻	WiFi Bridge:	NONE			
		ge Information		ove Ports			
Services —	Configured P rddVR1	orts Current Port rddVR1		Ports			
HTTP	rddVR3	rddVR3	Add	Forts			
RADIUS	rddA		_				
RADIUS							
	,						
	Print View	Details Pr	robe Sync	Apply OK	Cancel		
•	1 100			200	20.000		<u> </u>

- A. Click the **Apply** or **OK** button to commit the changes in bridge configuration to the LANforge-Server
- C. Right-click rddB and select Create Ports, then select the MAC-VLAN button

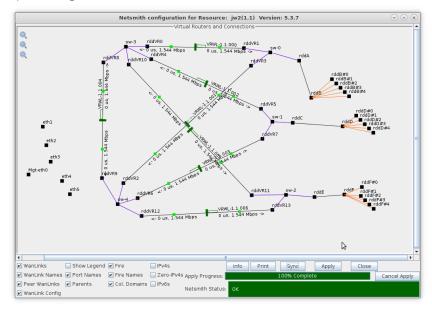
0			Create VLANs o	on Port: 1.1.18		\odot \otimes \otimes
0			direct 📀 Bridge		Innel	\$
- I	🔾 WIFI STA 🔇	🔾 WIFI VAP 🔷 WIFI Mon	itor 🔾 WiFi Virtu	al Radio		
2	Shelf:	1 💌	Resource:	1 (lf0350-10ac) 🔻	Port: 18	3 (rddB)
B	VLAN ID:		DHCP-IPv4			
1	Parent MAC:	62:bb:1e:2b:7f:ab	DHCP Client ID:	None]	
	MAC Addr:	юсюсюс*:*:xxx 💌	IP Address:	172.1.1.101	Global IPv6:	AUTO
	Quantity:	5	IP Mask or Bits:	24	Link IPv6:	AUTO
			Gateway IP:	172.1.1.1	IPv6 GW:	AUTO
	#1 Redir Name:		#2 Redir Name:			
	STA ID:		SSID:			-
	WiFi AP:		Key/Phrase:			
	WPA	WPA2	WEP			
4	Down					
	Apply	<u>C</u> ancel		F	Ready	

A. Enter a starting MAC address, quantity 5, and starting IP address

D. Repeat for bridge sw-1



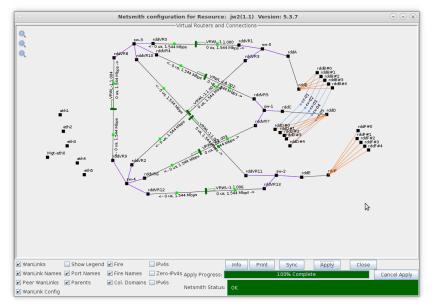
- A. **NOTE:** The Netsmith display has been 'zoomed-out' by clicking the '-' magnifying glass icon located at the top left of the Netsmith display
- E. Repeat for bridge sw-2



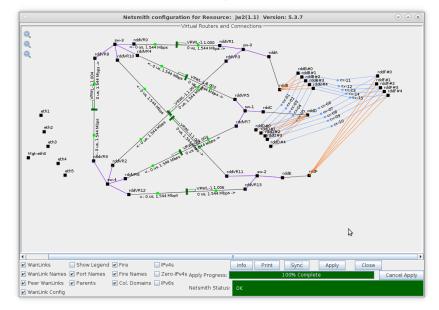
- 6. Create Layer-3 connections.
 - A. On the **Layer-3** tab, create a Layer-3 UDP connection between rddB#0 and rddD#0

	_		CX-01 - Cleate	/Mou	lify Cross Connec				00
+ - All			2		Display	Sync Batch-Create		Apply OK (Cance
CX Name: CX Type:	Cross-Connect cx-01 LANforge / UDP		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	.	Report Timer:	Cross-Connect fast (1 s)			•
	Endpoint A		Endpoint B		Pld Pattern	Endpoint A increasing	-	Endpoint B increasing	-
Resource:	1 (lf0350-10ac)	•	1 (lf0350-10ac)	-	Min IP Port:	AUTO	-	AUTO	-
Port:	43 (rddB#0)	-	48 (rddD#0)	-	Max IP Port:	Same	-	Sane	-
Min Tx Rate:	ISDN (128 Kbps)	-	ISDN (128 Kbps)	-	Min Duration:	Forever	-	Forever	-
Max Tx Rate:	Same	•	Sane	-	Max Duration:	Same	-	Sane	-
Min PDU Size:	UDP Pld (1,472 B)	•	UDP Pld (1,472 B)	-	Min Reconn:	0 (0 ms)	-	0 (0 ms)	-
Max PDU Size:	Sane	-	Same	-	Max Reconn:	Same	-	Sane	-
IP ToS:	Best Effort (0)	-	Best Effort (0)	-	Multi-Conn:	Normal (0)	-	Normal (0)	-
Pkts To Send:	Infinite	•	Infinite	-		Script		Script	_
						Thresholds		Thresholds	

B. Create 4 more connections between the remaining rddB and rddD ports



C. Create 5 connections between the rddD and rddF ports



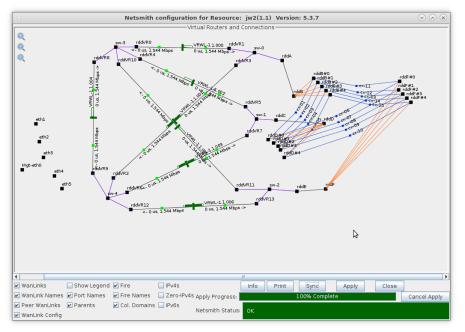
A. Repeat this step for the rddF and rddB ports for a total of 15 connections

7. Test Fail-Over condition.

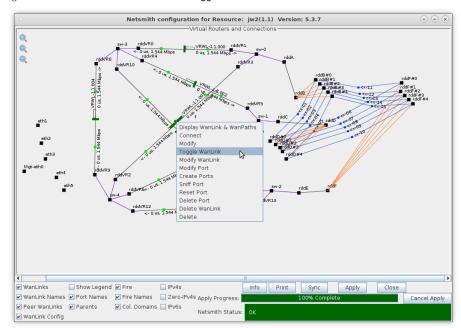
	orting Tear	-Off Info	Plugins						
					Stop All	Restart	Manager	Refr	esh HELP
					Stop All	Restart	Manager	Reil	HELF
Laver-4 Ge	eneric Te	st Mar 1	Fest Group	Resource Mg	r Event Log Ale	erts Port Mar	vAP Stations	Messages	
Status	Layer-3	L3 End			olP/RTP Endps	Armageddon	WanLink		ors File-IO
Status	Layer-5	LUCING	103 000	, icii i		Annageddon	Waricink	S Acconduct	
Rpt	t Timer: fas	st (1s	;) 🔻 Go	Test Manage	r all 🔻	Select All	Start <u>S</u> to	op <u>Q</u> uiesce	Clear
Vie	w 0 -	500		▼ Go		Display	Cr <u>e</u> ate	Mo <u>d</u> ify Delet	e
				-Cross Co	nects 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
сх-01	LF/UDP F		330	330	127,755	127,755	0	0	0
cx-02	LF/UDP F		331	323	127,731	127,600		0	0
cx-03	LF/UDP F		323	325	127,592	127,522		0	0
ск-04	LF/UDP F		327	328	127,885	127,847	0	0	0
cx-05	LF/UDP F		328	328	127,851	127,851	0	0	0
сх-06	LF/UDP F		328	328	127,855	127,851	0	0	0
cx-07	LF/UDP F		329	329	127,645	127,645		0	0
ск-08	LF/UDP F		329	329	127,645	127,641	0	0	0
:x-09	LF/UDP F		329	330	127,645	127,785	0	0	0
ск-10	LF/UDP F		330	330	127,789	127,789		0	0
x-11	LF/UDP F		330	330	127,789	127,789		0	0
x-12	LF/UDP F		330	330	127,793	127,793		0	0
cx-13	LF/UDP F		330	330	127,797	127,793		0	0
x-14 x-15	LF/UDP F		330	330	127,793	127,793		0	0
	LF/UDP F	Run	330	330	127,797	127,797	0	0	0

A. On the Layer-3 tab, select all 15 connections and click Start

8. In Netsmith, verify traffic is flowing through sw-3 or sw-4 via 3 separate WanLinks

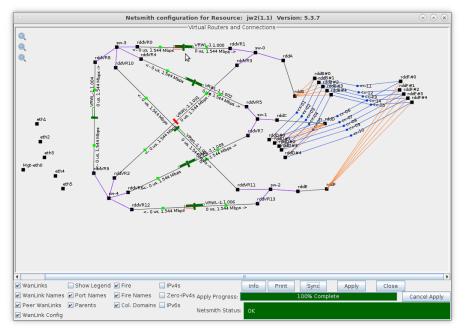


A. In this case, VRWL1.1.001, VRWL-1.1.003 and VRWL-1.1.006 all show traffic flowing

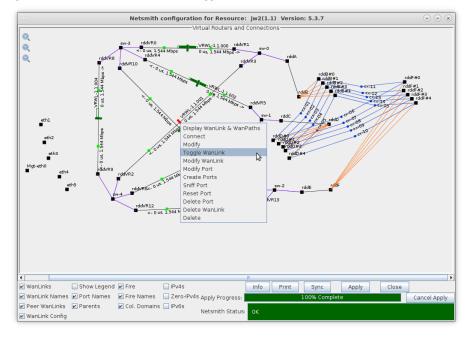


9. Right-click WanLink VRWL-1.1.001 and select Toggle WanLink

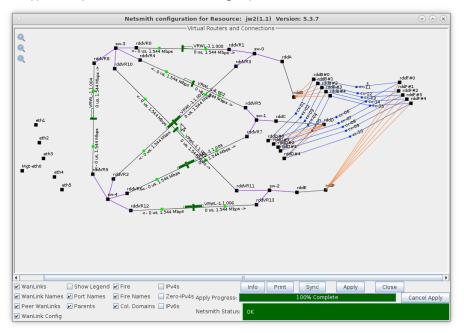
10. After approximately 1 minute, the traffic will find an alternate path



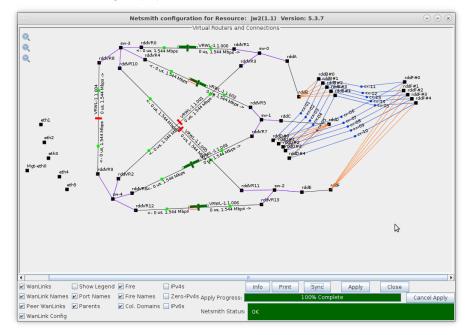
11. Right-click WanLink VRWL-1.1.001 and select $\ensuremath{\textbf{Toggle WanLink}}$



12. After approximately 1 minute, traffic resumes on its original path



13. Traffic flow after simulating multiple path failures



A. A sample LANforge HTML report of this fail-over test can be found here:

B. Fail-Over Test Sample HTML Report

Emulating a Multiple Hop Network

Goal: Use virtual routers to emulate a multi-hop network.

In this example, LANforge is used to emulate a live routed network by using multiple virtual routers to form a working multi-hop network. Each virtual router has its own routing table and can be configured to use one of many different routing protocols. OSPF will be used in this example and traceroute will be used to demonstrate the traversal of each hop.

^{1.} Use Netsmith to create five OSPF virtual routers.

A. From the Status tab, select the Netsmith button.

0	LANforge Manager Ver	sion(5.3.7)		\odot \land \times			
Control Reporting Tear-Off Info Pl	ugins						
	Stop	All Rest	art Manager	Refresh HELP			
Layer-4 Generic Test Mgr Tes Status Layer-3 L3 Endps	t Group Resource Mgr Event Log VoIP/RTP VoIP/RTP Endps	Alerts Port Mg Armageddor		s nuators File-IO			
License Info	Current Users		Test Configuration Databa	ase			
Licenses expire in: 702 days.	* Admin from:192.168.100.239 gnuserver from:127.0.0.1	List:	BLANK	Load			
		Name:		Delete			
Support expires in: 702 days.		Load Behavior:	Overwrite 🗸	Save			
			Download DB	Show Progress			
•		·					
1	Virtual Shel	f 1		ĺ			
	Resource	1					
	· · · · · · · · · · · · · · · · · · ·						
	••		\$				
	Netsmith						
Logged in to: 192.168.100.103:4002	as: Admin						

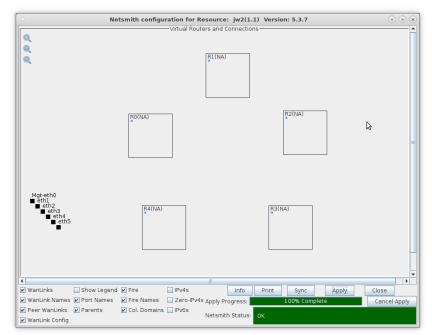
B. Right-click in the Netsmith window and select New Router.

<u> </u>	etsmith configuration for Resource: jw2(1.1) Version: 5.3.7	\sim \times
Q. Q. Q.		<u> </u>
Mgt-eth0 eth1 th2 eth4 eth4 eth5	New Router New Connection New Bridge	-
<u> </u>		
WanLinks Show Legen		Close
V WanLink Names V Port Names	- Apply regressing	Cancel Apply
WanLink Config	Col. Domains 🔲 IPv6s Netsmith Status: OK	

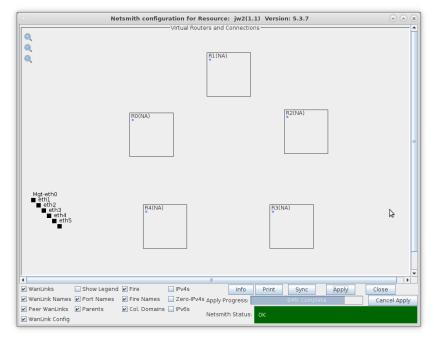
C. Select the Use OSPF checkbox.

			Cr	eate/Modify	Virtual Rou	iter			
Name: <auto c<="" th=""><th>eate New Name</th><th>></th><th></th><th>Width:</th><th>100</th><th></th><th>Height:</th><th>100</th><th></th></auto>	eate New Name	>		Width:	100		Height:	100	
✔ Use OSPF	-				P Dflt Route	-		iter 🔲 IPv6	RADV
Use Existing	fg 📃 BGP Rou	iter 🗌 BC					BGP Dar	mping	
			N	otes about thi	s virtual Rout	er			
			B	GP Configurat	ion Informatio	n			
	Router ID					Cluster ID			
	Confederation		Damp	ing Half Life		Damping Ma	K Suppress 3		
	Damping Reu	se 3	Damp	ing Suppress					
BGP Peer Flags			Peer AS	Peer ID	Local Iface	Nexthop	Nexthop6	Hold Time	Delay Open
	ient 🗌 Confed								
Active C	ient 🗌 Confed	🖌 Ucast							
Active C	ient 🗌 Confed	🖌 Ucast							
Active C	ient 🗌 Confed	🖌 Ucast							
Active C	ient 🗌 Confed	🖌 Ucast							
Active C	ient 🗌 Confed	🖌 Ucast							
Active C	ient 🗌 Confed	🕑 Ucast							
Active C	ient 🗌 Confed	Ucast							
			1			71	14		P1

D. Select OK, then create four more OSPF virtual routers.

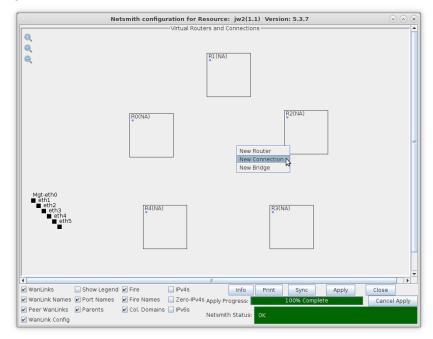


E. After creating five OSPF virtual routers, select Apply.



For more information see LANforge-GUI User Guide: Netsmith

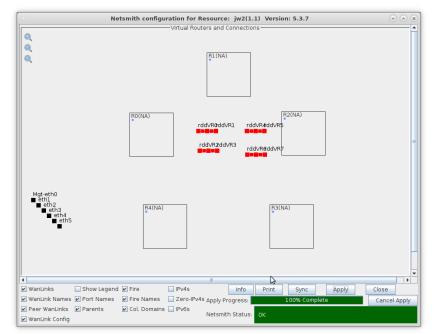
- 2. Create four Netsmith connections to link all of the OSPF virtual routers.
 - A. Right-click in the Netsmith window and select New Connection.



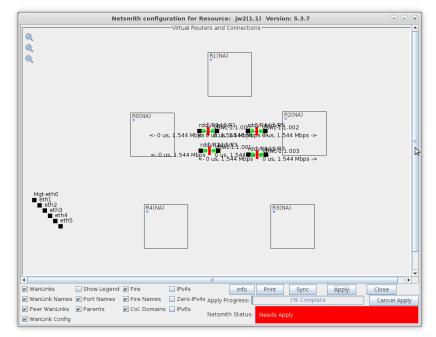
B. Leave all the default settings and select OK.

Q		Virtual Route	rs and Connections		
R.			R1(NA)		
	•	Create/N	lodify Connection	×	
			Interface-Cost:	1	
	Port 1-A:	<auto create="" new="" port=""></auto>	RIP-Metric:	1	
	Port 1-B: 🔲 Skip	<auto create="" new="" port=""></auto>	OSPF Area:	000.000.000.000	
	WanLink: Skip	<auto create="" new="" wanlink=""></auto>	VRRP IP:	1	
			VBBP Priority	100	
	Port 2-B: 🔲 Skip		VRRP Interval:		
	Port 2-A: 🔲 Skip	<auto create="" new="" port=""></auto>	Next-Hop:		
	DHCP Lease Time:		Subnets (a.b.c.d/xx):		
	DHCP DNS:				
	DHCP Range Min:		_		
	DHCP Range Max:		_		
Mgt-eth0 ∎ eth1	DHCP Domain:		Next-Hop-IPv6:		
eth2 eth3			IPv6 Subnets (aaa::0/xx):		
et et					j
	DHCPv6 Range Max: DHCPd Config File:				
	DHCFd Conlig File:				
	NAT DHCP	DHCPv6 Custom DF	ICP VRRP Cand-RF	<u></u> ,	
_		42	Cancel		
WanLinks	Show Legend		Info Print		Close
			Apply Progress:	00% Complete	Cancel App
	nks 🖌 Parents nfig	🖌 Col. Domains 🔲 IPv6s	Netsmith Status: OK		

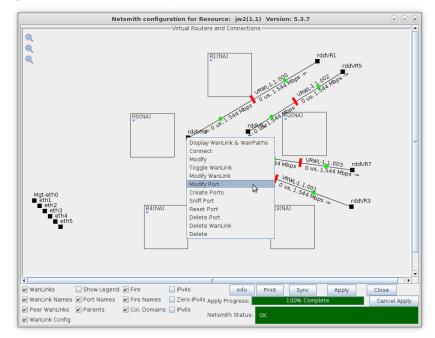
C. Create three more Netsmith connections.



D. After creating four Netsmith connections, select Apply.



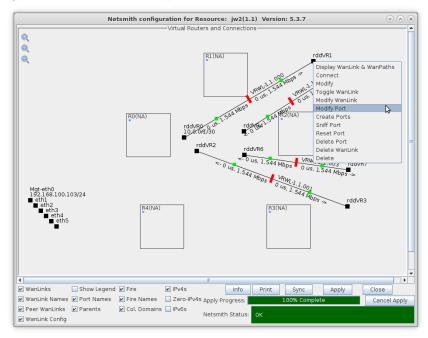
- 3. Assign IP addresses to either end of each of the four Netsmith connections.
 - A. Right-click on rddVR0 and select Modify Port.



B. Set rddVR0 to 10.0.0.1/30 and select OK.

		Current:	Port Status Info	ormation OR TSO UFO GSO GRO		
				-Device Peer: rddVR0b	\$	
		Driver mito.	ront type. Neuriect	-Device Teel. Iddvilor	·	
			Port Configu	ables		
Enable		General Ir	nterface Settings		Port Rates	Advert Rates
Set IF Down					O 10bt-HD O 10bt-FD	10bt-HD
Set MAC	Down	Aux-Mgt			O 100bt-HD	10bt-FD
📃 Set TX Q Len	DHCP-IPv6	DHCP Release	DHCP Vendor ID:	None	O 100bt-FD O 1000-FD	100bt-HD
Set MTU			_		10G-FD 0 40G-FD	100bt-FD
Set Offload	DHCP-IPv4	Secondary-IPs	DHCP Client ID:	None	O Autonegotiate	1000-FD
Set PROMISC	DNS Servers:	BLANK	Peer IP:	NA		10G-FD
Set Rx-All/FCS	IP Address:	10.0.0.1/30	Global IPv6:	AUTO	Renegotiate	40G-FD
Set Bridge Info	IP Mask:	0.0.0.0	Link IPv6:	AUTO	Restart Xcvr	Flow-Contr
	Gateway IP:	0.0.0.0	IPv6 GW:	AUTO		, Offload
	Alias:		MTU:	1500	RX-ALL	TSO Enable
HTTP	MAC Addr:	9e:ad:d8:40:15:d2	TX Q Len	1000	RX-FCS	UFO Enable
FTP	Br Cost:	Ignore 💌	Priority:	Ignore 💌	Bypass NOW!	GSO Enabl
RADIUS	Rpt Timer:	medium (8 s) 🔻	WiFi Bridge:	NONE	Bypass Power-DOWN	LRO Enable
					Bypass Disconnect	GRO Enabl

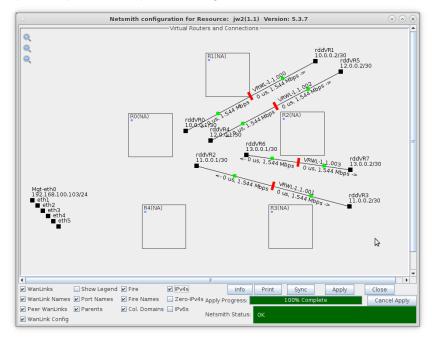
C. Right-click on rddVR1 and select Modify Port.



D. Set rddVR1 to 10.0.0.2/30 and select OK.

			Port Status Info	ormation		
		Current:	LINK-UP PROBE-ERF	OR TSO UFO GSO GRO		
		Driver Info:	Port Type: Redirect	-Device Peer: rddVR1b		
			Port Configu	rables		
		General Ir	terface Settings		Port Rates	-Advert Rates
Set IF Down					O 10bt-HD O 10bt-FD	10bt-HD
Set MAC	Down	Aux-Mat			O 100bt-HD	10bt-FD
🗌 Set TX Q Len	DHCP-IPv6	DHCP Release	DHCP Vendor ID:	None	O 100bt-FD O 1000-FD	100bt-HD
Set MTU	_		_		10G-FD 40G-FD	🗌 100bt-FD
Set Offload	DHCP-IPv4	Secondary-IPs	DHCP Client ID:	None	O Autonegotiate	1000-FD
Set PROMISC	DNS Servers:	BLANK	Peer IP:	NA	Renegotiate	10G-FD
Set Rx-All/FCS	IP Address:	10.0.0.2/30	Global IPv6:	AUTO	Restart Xcvr	40G-FD
🔲 Set Bridge Info	IP Mask:	0.0.0.0	Link IPv6:	AUTO		Flow-Contro
	Gateway IP:	0.0.0.0	IPv6 GW:	AUTO	RX-ALL	Offload
	Alias:		MTU:	1500	RX-ECS	TSO Enable
HTTP	MAC Addr:	7a:84:2b:07:a5:32	TX Q Len	1000	Bypass NOW!	UFO Enable
FTP	Br Cost:	Ignore	Priority:	Ignore 💌	Bypass Power-UP	GS0 Enable
RADIUS	Rpt Timer:	nediun (8 s) 🔻	WiFi Bridge:	NONE	Bypass Power-DOWN	LRO Enable
					Bypass Disconnect	GRO Enable
]	1
	Print Vi	iew Details	Probe Sync	Apply	<u>Cancel</u>	

E. Repeat the steps above to complete the following:



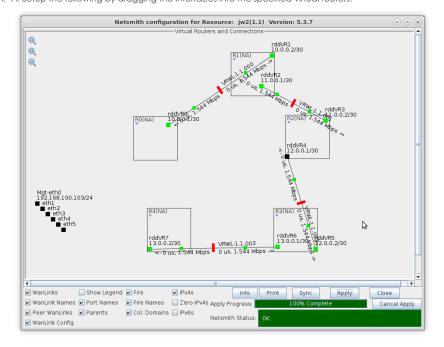
A. rddVR2 is 11.0.0.1/30 and rddVR3 is 11.0.0.2/30

B. rddVR4 is 12.0.0.1/30 and rddVR5 is 12.0.0.2/30

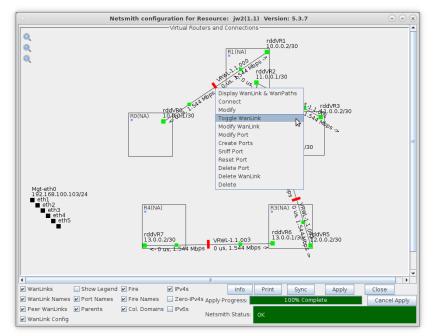
C. rddVR6 is 13.0.0.1/30 and rddVR7 is 13.0.0.2/30

4. Drag each end of a Netsmith connection into a virtual router to setup the network.

A. A: Setup the following by dragging the interfaces into the specified virtual routers:

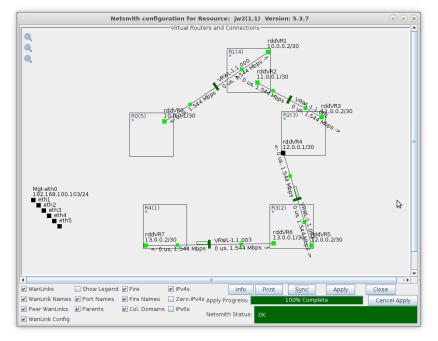


- A. rddVR0 in R0 and rddVR1 in R1 $\,$
- B. rddVR2 in R1 and rddVR3 in R2
- C. rddVR4 in R2 and rddVR5 in R3
- D. rddVR6 in R3 and rddVR7 in R4
- B. B: Right-click on each Wanlink (red bar) and select Toggle Wanlink (change to green bar).

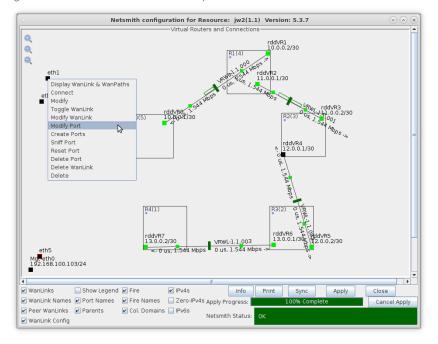


A. **Note:** If you wanted to emulate an /impaired/ multi-hop network, you could modify each Wanlink to have any LANforge impairment such as latency, jitter, dropped packets, etc...

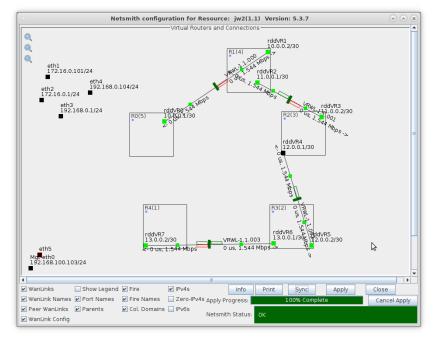
C. After all interfaces are moved and Wanlinks started, select Apply in the Netsmith window.



- 5. Assign IP addresses and Default Gateways to each of four physical interfaces.
 - A. Right-click on each interface and select Modify Port.

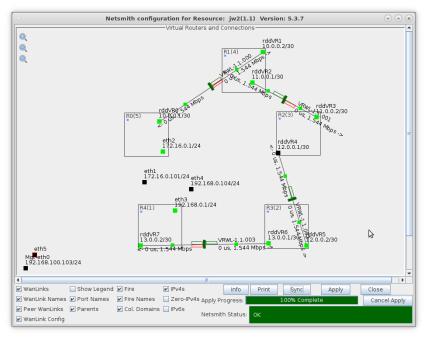


B. Setup the following IP addresses and Default Gateways:



- A. eth1 IP address is 172.16.0.101/24 and Default GW is 172.16.0.1
- B. eth2 IP address is 172.16.0.1/24 and Default GW is 172.16.0.1
- C. eth3 IP address is 192.168.0.1/24 and Default GW is 192.168.0.1
- D. eth4 IP address is 192.168.0.104/24 and Default GW is 192.168.0.1

C. Drag eth2 into R0 and eth3 into R4, then Apply changes.



A. **Note:** In this example, four physical interfaces are used. eth1 and eth2 are physically connected with a cable, as are eth3 and eth4. This allows us to use eth1 and eth4 to generate traffic to each other through the network interfaced by eth2 and eth3.

- 6. Apply all changes in Netsmith, allow OSPF time to converge, and observe routing tables.
 - A. After applying all Netsmith changes, right-click on a virtual router and select Show Routing Table. (Before OSPF converges, only the directly connected networks are shown.)

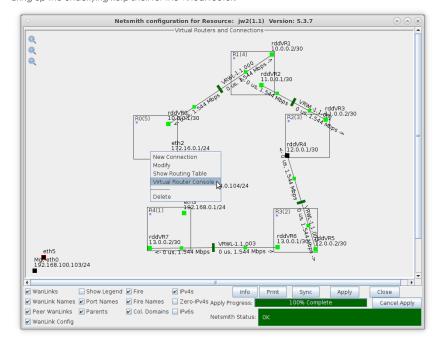


B. After OSPF converges, each virtual router has a complete routing table for the entire network.

	LANforge Dialog	\odot \times
	05	/13 14:09:29.286
	Routing table for Virtual Router: Router-0 (5)	
i	unreachable default proto xorp scope link metric 1 10.0.0.0/30 dev rddVR0 scope link 11.0.0.0/30 via 10.0.0.2 dev rddVR0 proto xorp metr 172.16.0.0/24 dev eth2 scope link	-
	\$	
	OK	

A. Note: If you select Netsmith Apply again, this will restart all virtual routers and OSPF will need time to converge again.

- 7. Alternative method to observe routing tables of each virtual router.
 - A. With OSPF virtual routers, you can right-click on a virtual router and select Virtual Router Console to bring up the underlying xorp shell for the virtual router.



B. Once at the xorp shell prompt, type the following to display the routing table information:

🗖 xor	osh for VR: 5 (on fwa710-blue)	-	÷	×
Welcome to XORP	on fwa710-blue			
	e≥ show route table ipv4 unicast final			
0.0.0.0/0	[static(220)/1]			
	> to 0.0.0.0 via my_discard/my_discard			
172.16.0.0/24	[connected(0)/0]			
	> via eth2/eth2			
192,168,0,0/24				
10.0.0.0/30	> to 10.0.0.2 via rddVR0/rddVR0 [connected(0)/0]			
10.0.0.0750	2 via rddVR0/rddVR0			
11.0.0.0/30				
11.0.0.00	> to 10.0.0.2 via rddVR0/rddVR0			
12.0.0.0/30	[ospf(110)/3]			
	> to 10.0.0.2 via rddVR0/rddVR0			
13.0.0.0/30	[ospf(110)/4]			
	> to 10.0.0.2 via rddVRO/rddVRO			
root@fwa710-blu	e>			

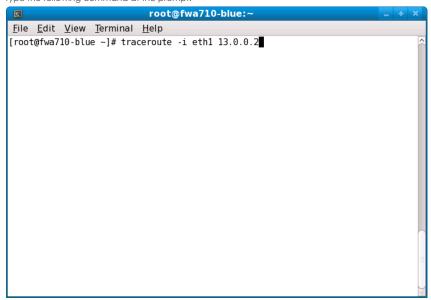
A. show route table ipv4 unicast final

8. Use traceroute to traverse all five hops.

A. Open a terminal window in the LANforge system.

				root@fwa710-blue:~ _	
<u>F</u> ile	<u>E</u> dit	<u>V</u> iew	<u>T</u> erminal	<u>H</u> elp	
[roo	t@fwa7	10-blu	e ~]#		(
					\vee

B. Type the following command at the prompt:



A. traceroute -i eth1 13.0.0.2

- B. Note: -i eth1 forces the traceroute program to use eth1 as its outgoing interface.
- C. Observe the results of each hop in the network.

	root@fwa710-blue:~	
<u>File Edit V</u>	iew <u>T</u> erminal <u>H</u> elp	
traceroute to 1 172.16.0 2 10.0.0.2 3 11.0.0.2 4 12.0.0.2	blue ~]# traceroute -i eth1 13.0.0.2 0 13.0.0.2 (13.0.0.2), 30 hops max, 60 byte packets 1 (172.16.0.1) 0.129 ms 0.098 ms 0.081 ms (10.0.0.2) 0.332 ms 0.299 ms 0.243 ms (11.0.0.2) 0.572 ms 0.549 ms 0.449 ms (12.0.0.2) 2.917 ms 2.902 ms 2.813 ms (13.0.0.2) 4.808 ms 4.712 ms 4.695 ms blue ~]# ■	

D. Traceroute from eth4.

<pre>File Edit View Terminal Help [root@fwa710-blue ~]# traceroute -i ethl 13.0.0.2 traceroute to 13.0.0.2 (13.0.0.2), 30 hops max, 60 byte packets 1 172.16.0.1 (172.16.0.1) 0.111 ms 0.081 ms 0.105 ms 2 10.0.0.2 (10.0.0.2) 0.226 ms 0.338 ms 0.321 ms 3 11.0.0.2 (11.0.0.2) 0.640 ms 0.559 ms 0.539 ms 4 12.0.0.2 (12.0.0.2) 2.937 ms 2.924 ms 3.551 ms 5 13.0.0.2 (13.0.0.2) 4.778 ms 4.687 ms 6.603 ms [root@fwa710-blue ~]# [root@fwa710-blue ~]# traceroute -i eth4 10.0.0.1 traceroute to 10.0.0.1 (10.0.1), 30 hops max, 60 byte packets 1 192.168.0.1 (192.168.0.1) 0.109 ms 0.081 ms 0.100 ms 2 13.0.0.1 (13.0.0.1) 0.243 ms 0.159 ms 0.489 ms 3 12.0.0.1 (12.0.0.1) 2.210 ms 2.177 ms 2.142 ms 4 11.0.0.1 (11.0.0.1) 3.166 ms 3.148 ms 3.177 ms 5 10.0.1 (10.0.0.1) 6.731 ms 6.719 ms 6.699 ms [root@fwa710-blue ~]#</pre>			root@1	fwa710-blu	ie:~		- +	×
<pre>traceroute to 13.0.0.2 (13.0.0.2), 30 hops max, 60 byte packets 1 172.16.0.1 (172.16.0.1) 0.111 ms 0.081 ms 0.105 ms 2 10.0.0.2 (10.0.0.2) 0.226 ms 0.338 ms 0.321 ms 3 11.0.0.2 (11.0.0.2) 0.640 ms 0.559 ms 0.539 ms 4 12.0.0.2 (12.0.0.2) 2.937 ms 2.924 ms 3.551 ms 5 13.0.0.2 (13.0.0.2) 4.778 ms 4.687 ms 6.603 ms [root@fwa7l0-blue ~]# [root@fwa7l0-blue ~]# traceroute to 10.0.0.1 (10.0.1), 30 hops max, 60 byte packets 1 192.168.0.1 (192.168.0.1) 0.109 ms 0.081 ms 0.100 ms 2 13.0.0.1 (13.0.0.1) 0.243 ms 0.159 ms 0.489 ms 3 12.0.0.1 (12.0.0.1) 3.166 ms 3.148 ms 3.177 ms 5 10.0.0.1 (10.0.1) 6.731 ms 6.719 ms 6.699 ms</pre>	<u>File E</u> dit <u>V</u> i	iew <u>T</u> erminal	<u>H</u> elp					
	traceroute to 1 172.16.0 2 10.0.02 3 11.0.02 4 12.0.0.2 5 13.0.02 [root@fwa710 [root@fwa710 traceroute to 1 192.168.0 2 13.0.0.1 3 12.0.0.1 4 11.0.0.1 5 10.0.0.1	b 13.0.0.2 (1 .1 (172.16.0 (10.0.2) (11.0.0.2) (12.0.0.2) (13.0.0.2) -blue ~]# -blue ~]# -blue ~]# -blue ~]# (192.168 (13.0.0.1) (12.0.0.1) (10.0.0.1)	13.0.0.2), .1) 0.111 0.226 ms 0.640 ms 2.937 ms 4.778 ms accroute - 10.0.0.1), .0.1) 0.1 0.243 ms 3.166 ms	30 hops m ms 0.081 0.338 ms 0.559 ms 2.924 ms 4.687 ms i eth4 10. 30 hops m 09 ms 0.0 0.159 ms 2.177 ms 3.148 ms	ax, 60 ms 0. 0.321 0.539 3.551 6.603 0.0.1 ax, 60 81 ms 0.489 2.142 3.177	105 ms ms ms ms byte packets 0.100 ms ms ms ms		<((

A. traceroute -i eth4 10.0.0.1

E. Generate LANforge traffic through the multi-hop network.

A. Go to the Layer-3 tab and select Create.

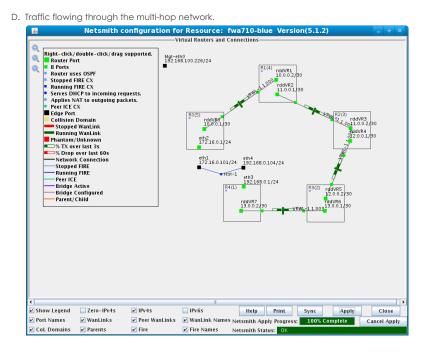
ontrol Report	ting Tea	r-Off Info		lforge Man	ager Version(5				
	-				Stop All	Restart Manager	-	Refresh	HELP
		Test Group .3 Endps	Resource VolP/RTP	Mgr Event VolP/RTP E		rt Mgr 🛛 vAP Statio don 🚽 WanLinks	ons Messa Attenuato		Layer-4
Rpt Timer	fast	(1 s)	▼ Go Test	Manager a	I -	Select All Sta	art <u>S</u> top	Quiesce (lear
View	0 - 500			▼ Go		Display	Cr <u>e</u> ate Moj	dify Delete	
				Cross Connec	ts for Selected Tes	t Manager	10		
Name	Туре	State	Pkt Rx A	Pkt Rx B	Bps Rx A	Bps Rx B	Rx Drop % A	Rx Drop % B	Drop Pkts
								· / -	

B. Set Endpoint-A to use eth1 and Endpoint-B to use eth4.

+ - All	Display	Syn	c Batch-Create	Apply OK Cancel
CX Name:	Cross-Connect test-1	-		- b
CX Type:	LANforge / UDP			•
	Endpoint A		Endpoint B	
Resource:	1 (jw2)	•	1 (jw2)	•
Port:	1 (eth1)	•	4 (eth4)	•
Min Tx Rate:	Mid DSL (768 Kbps)	-	Mid DSL (768 Kbps)	-
Max Tx Rate:	Same	•	Same	•
Min PDU Size:	1k (1,024 B)	•	1k (1,024 B)	•
Max PDU Size:	Same	•	Same	-
IP ToS:	Best Effort (0)	•	Best Effort (0)	-
Pkts To Send:	Infinite	-	Infinite	•

C. Start the Layer-3 connection.

\$										_
			forge M	anager	Version(5.1.2)			-	+ 3
ontrol <u>R</u> eportin	g <u>T</u> ear-Off H	elp								
					Stop All	Res	tart Manag	er	Refresh	HELP
ile-10 Layer-	4 Generic	Test Mgr Reso	urce Mgr	Serial Spans	PPP-Link	s Port M	lgr Mess	ages		
Status Lay	er-3 L3 E	ndps VolP	RTP	VoIP/RTP Er	idps	Armagedd	on V	/anLinks	Collision-Doma	ins
Rpt Timer	(ms): 3000	🔻 Go Test Ma	nager all	-	Sele	at All	Start	Stop Quie	sce Clear	
View	0 - 200		Go			Display	Create	Modify	Delete	
			—Cross C	onnects for S	elected Test	Manager-				
Name Type st-1 LF/UDP	e State Run	Pkt Tx A->B Pkt 1,554	1.573	Rate A->B F 767,583	Rate A<-B F	Rx Drop A	Rx Drop B	Rpt Timer EID	Endpoints (A < test-1-A <=> test	-> B)
ST-1 LF/UDP	Run	1,554	1,573	/6/,583	767,710	0	0	1000 1.6	test-1-A < = > test-	t-1-B



Multiple Physical Port Testing - CT970-48 Example

Goal: Use LANforge and a managed ethernet switch to create 48 unique WAN emulations.

In this example, LANforge is paired with a managed ethernet switch to create 48 unique WAN emulations. Each of the 48 ports on the ethernet switch can be connected to an end-user device such as a PC or networked gaming console to provide 48 independent emulated links each with their own set of network impairments. Please see the CT970-48 product description for more details.

NOTE: If you are attempting to run this test scenario, you will need a LANforge license key that enables the correct number of WanLinks. Please contact us at support@candelatech.com for assistance.

- Download the CT970-48 configuration to your LANforge system. We have provided the LANforge database and managed switch configuration for this example to simplify the setup. You can download all of the CT970-48 configuration files to your /home/lanforge/DB/CT970-48 directory.
 - A. **NOTE:** This LANforge database uses eth0 as the Management port and eth2 as the VLAN trunk port. If you need to modify these, please contact us at support@candelatech.com for assistance.
 - B. NOTE: The managed switch referenced in this example is a Netgear FSM7352SNA ProSafe 48-port 10/100 L3 Managed Switch.

2. Save your existing database, then load the new database into your LANforge system.

A. On the Status tab, under the Test Configuration Database Name field, type in a name for your existing configuration, then select the **Save** button.

	LANforge Manager Version(5.1.4)
<u>\$</u>	LANforge Manager Version(5.1.4) - +
<u>Control Reporting Tear-Off</u> Help	
	Stop All Restart Manager Refresh HEL
File-IO Layer-4 Generic Test Mgr	Resource Mgr Serial Spans PPP-Links Port Mgr Messages
Status Layer-3 L3 Endps	VoIP/RTP VoIP/RTP Endps Armageddon WanLinks Collision-Domains
License Info Licenses expire in: 190 days.	Current Users Test Configuration Database * Admin from:192.168.100.16: gnuserver from:127.0.0.1 List: DFLT v Name: existingDB Load Behavior: Choose One v
Support expires in: 190 days.	Load Delete Save
	Virtual Shelf 1
	Resource 1
	•• • • •
	Netsmith
Logged in to: 192.168.100.213:4002 as: /	Admin

B. Select ${\bf CT970-48}$ from the Test Configuration Database List box.

	LANforge Manager Version(5.1.4)
<u>C</u> ontrol <u>R</u> eporting <u>T</u> ear-Off Help	
	Stop All Restart Manager Refresh HELP
File-IO Layer-4 Generic Test Mgr	
Status Layer-3 L3 Endps	VoIP/RTP VoIP/RTP Endps Armageddon WanLinks Collision-Domains
License Info	Current Users Test Configuration Database
	* Admin from:192.168.100.16
Licenses expire in: 190 days.	gnuserver from:127.0.0.1 List: CT970-48 Vame: existingDB
	Load Behavior: Choose One
Support expires in: 190 days.	Load Delete Save
	Virtual Shelf 1
	Resource 1
	IN
	•• 🔳 •• 🔳
	Netsmith
Logged in to: 192.168.100.213:4002 as:	Admin
Logged In co. 152:100:100:213:4002 a3.	/ ••••••

C. Select Load Behavior Overwrite.

ontrol <u>R</u> eporting <u>T</u> ear-Off Help			
	Stop All	Restart Manager	Refresh
ile-IO Layer-4 Generic Test Mgr	Resource Mgr Serial Spans PPP-	Links Port Mgr Messages	
Status Layer-3 L3 Endps	VoIP/RTP VoIP/RTP Endps	Armageddon WanLinks	Collision-Domains
License Info	Current Users	Test Configuration Da	itabase
	* Admin from:192.168.100.16		
Licenses expire in: 190 days.	gnuserver from:127.0.0.1	List: CT970-48 💌 Nar	ne: existingDB
		Load Behavior: Overwrite	-
Support expires in: 190 days.		Load Delete	Save
	Virtual Shelf 1		
	Resource 1		
	•• •• •• •• ••	•• • •	
		•• •	
	•• •• ••		
	Netsmith		
	Netsintu		

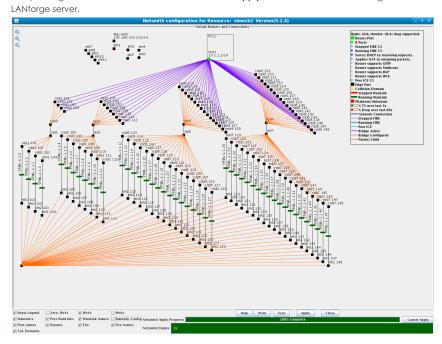
D. Select the Load button and acknowledge the confirmation pop-up message.

<u>s</u>				- 4	. >
Load Database (and o	ver-writ	e the current settin	gs): CT970-48		

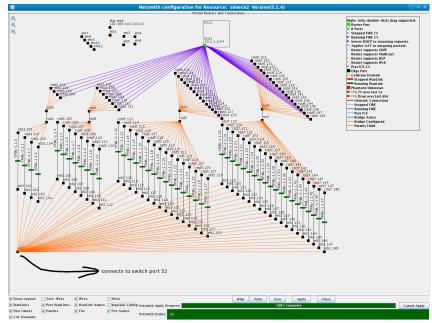
3. After LANforge is finished loading the new database, open Netsmith to view the 48 WanLinks and modify if necessary.

. On the Status tab, under Reso	ource 1, select the Netsmith	button.	
٩	LANforge Manager Versio	on(5.1.4)	_ + ×
<u>Control Reporting Tear-Off Help</u>			
	Stop All	Restart Manager	Refresh HELP
File-10 Layer-4 Generic Test Mgr Status Layer-3 L3 Endps	Resource Mgr Serial Spans PPP- VolP/RTP VolP/RTP Endps	inks Port Mgr Messages Armageddon WanLinks	Collision-Domains
License Info Licenses expire in: 190 days. Support expires in: 190 days.	Current Users Admin from:192.168.100.16 gnuserver from:127.0.0.1	Test Configuration Dat: List: CT970-48 Name Load Behavior: Overwrite Load Delete	
	Netsmith		
Logged in to: 192.168.100.213:4002 as: /	Admin		

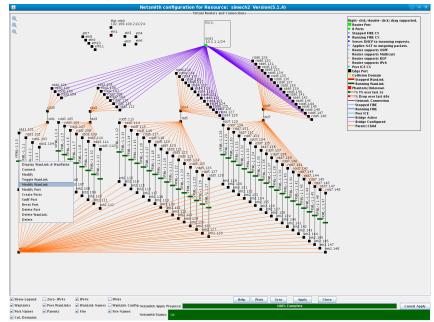
B. If any changes are made to Netsmith, then select the Apply button to commit the changes to the



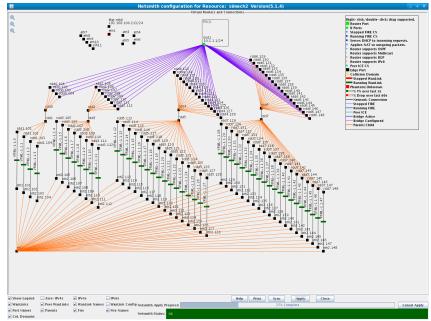
- 4. When the 48port-sw-config.txt is loaded into the Netgear FSM7352SNA switch, port 52 on the switch is configured as the VLAN trunk which will connect to LANforge port eth2. Each switch port and VLAN correspond to a WanLink in LANforge. Here, incoming traffic on switch port 1 is tagged for VLAN 101 and sent out switch port 52 to LANforge eth2 then on to WanLink VRWL-1.1.0 via endpoints eth2.101 and rdd1.101.
 - A. Connect LANforge port eth2 to the FSM7352SNA switch, port 52 which is trunking vlans 101 148 to the LANforge system.



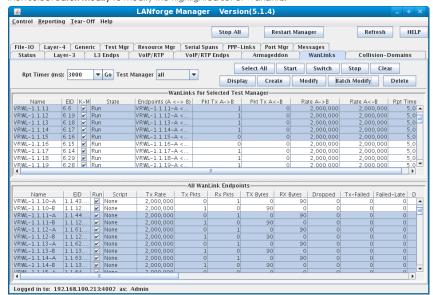
B. Here, each WanLink can be modified to have its own unique impairment profile so that each enddevice has a different upstream connection.



C. If any changes are made to Netsmith, then select the **Apply** button to commit the changes to the LANforge server.



D. Alternatively, a group of WanLinks can be modified together using the Batch Modify on the WanLinks tab in the main LANforge GUI. Highlight the group of WanLinks that you want to modify, then select **Batch Modify** to modify the highlighted set of WanLinks.



E. The Batch Modifier will apply changes to the group of highlighted WanLinks.

ے ا	ANforg	ge Wanl	.ink B	at	ch Modifier				-	+	×
Transfer Rate:	T1	(1.544 Mi	ops)	•	Delay:	high	(100	ms)			-
Jitter-Freq:	NA			•	Jitter:	NA					-
Drop-Freq:	1% (1%)			•	Reorder-Freq:	NA					-
Dup-Freq:	NA			•	Backlog Buffer:	NA					-
Max Allowed Lateness:	NA			•							
	Ар	ply	ОК		Cancel						

5. In this example, any end-devices connected to switch ports 1 - 48 can communicate with each other. Here, an end-device such as PC1 connected to switch port 1 can communicate to PC2 connected to switch port 2 through the network path:

PC1 - switch port 1 - vlan 101 - switch port 52 - LANforge port eth2 - WanLink VRWL-1.1.0 - Virtual Router R0 - vlan 102 - WanLink VRWL-1.1.1 - LANforge port eth2 - switch port 52 - switch port 2 - PC2.

The end-devices used here are LANforge-FIRE interfaces on a separate system. Each interface has its own MAC and IP address and will generate traffic to and receive traffic from the switch port it is connected to.

A. On the Port Mgr tab, assign an IP address on the 10.1.1.0/24 network and a default gateway 10.1.1.1

<u>\$</u>	Shelf: 1 F	Resource: 1 Port: 2	(ice-si-dmz: etl	12) (Ca	nfigure S	ettings)	_ + X
		LINK-UP 1000bt-FD AU 10bt-HD 10bt-FD 100br NONE-SET g: 10bt-HD 10bt-FD 100br p: Port Type: Ethernet Driv	t-HD 100bt-FD 1000bt t-HD 100bt-FD 1000bt	ontrol PR -FD AUTC -FD Flow	- NEGOTIATE		
			Port Configurables				
✓ Set IP Info ✓ Set IP6 Info		General Interface S	iettings		O 10bt-H		Advertise Rates
Set Alias	DHCP-IPv4				0 100bt- 0 100bt- 0 100bt-	HD FD	 ✓ 10bt-FD ✓ 100bt-HD
🔲 Set TX Q Len 🔲 Set MTU	IP Address: IP Mask:	255.255.255.0 Lin	bal IPv6: AUTO k IPv6: AUTO		O 10G-FI		✓ 100bt-FD ✓ 1000-FD
Set Offload	Gateway IP: Alias:	MT			Renegot		□ 10G-FD
Set PROMISC	MAC Addr: Br Cost:		Q Len 1000 prity: Ignore	-	PROMIS	С	TSO Enabled
Set Bypass	Rpt Timer: CPU Mask:	1000 Va	tchdog: 0	-	Bypass		☐ UFO Enabled ☑ GSO Enabled
Set Bridge Info					🗌 Bypass	Power-DOWN Disconnect	☐ LRO Enabled ☐ GRO Enabled
View Details	Probe		Sync	A	pply	ОК	Cancel

B. On the Port Mgr tab, assign an IP address on the 10.1.1.0/24 network and a default gateway 10.1.1.1

4	Shelf: 1 Res	ource: 1 Port: 3	(ice-si-dmz: eth	3) (Co	onfigure S	iettings)	_ + ×
			Port Status Informatior				
	Current: I	LINK-UP 1000bt-FD AUT	O-NEGOTIATE Flow-C	ontrol PR	OMISC TSO G	so	
	Supported: 1	LObt-HD 10bt-FD 100bt-	-HD 100bt-FD 1000bt	FD AUTO	0-NEGOTIATI	E SEND-TO-SELF	
	Partner: N	NONE-SET					
	Advertising: 1	LObt-HD 10bt-FD 100bt-	-HD 100bt-FD 1000bt	FD Flow	- Control		
	Driver Info: F	Port Type: Ethernet Driv	er: e1000e(1.0.2-k2) B	us: 0000:	08:00.1		
			Port Configurables				
✓ Set IP Info		General Interface S	ettings		Por	t Rates	—Advertise Rates——
✓ Set IP6 Info					0 10bt-F		10bt-HD
Set Alias					O 100bt-	HD 🖌	10bt-FD
Set MAC	DHCP-IPv4				0 100bt- 0 1000-		100bt-HD
🔤 Set TX Q Len			bal IPv6: AUTO		O 10G-F		100bt-FD
Set MTU			(IPv6: AUTO		Autone		1000-FD
Set Offload			GW: AUTO		Renego	tiate 🗌	10G-FD
🔄 Set Rate Info	Alias:	MTU			🗌 Restart	Xevr 🛛	Flow-Control
Set PROMISC			Q Len 1000		PROMIS	c 1	
Set RX-All	Br Cost: Ig	nore 🔻 Prio	rity: Ignore	-	RX-ALL		⊮ TSO Enabled
Set Bypass	Rpt Timer: 10	000 🔻 Wat	ch d o g: 0	-	🗌 Bypass	NOW!	UFO Enabled
🖌 Set Rpt Timer	CPU Mask: N	O-SET 💌			🗌 Bypass	Power-UP	🖌 GSO Enabled
📃 Set Bridge Info					🗌 Bypass	Power-DOWN	LRO Enabled
🔲 Set CPU Mask					🗌 Bypass	Disconnect	GRO Enabled
View Details	Probe		Sync	A	Apply	ОК	Cancel

6. The impairment settings on each WanLink will only apply to traffic that is sent or received from the switch port that it is associated with via the VLAN used with that WanLink. For example, WanLinks VRWL-1.1.0 and VRWL-1.1.1 are both set to have a total of 100ms of delay, so PC1 would see a 200ms round-trip delay when sending or receiving traffic to PC2.

A. The total latency of WanLinks VRWL-1.1.0 and VRWL-1.1.1 is 100ms.

<u></u>						LANforge	e Manag	er Vers	ion(5.1.	.4)				- *
ontrol	<u>R</u> eportir	ng <u>T</u> e	ar-O	ff Hel	р									
								Stop A	н	Restart M	lanager		Refresh	HEI
File-10	Layer	4 (Gener	ic T	est Mgr	Resource M	ar Serial	Spans PPP	-Links I	Port Mgr	Messages	1		
Status		yer-3		L3 En		VoIP/RTP		RTP Endps		rgeddon	WanLir	ike C	ollision-E	omains
Status	La	yer-5	_	LJLI	ups	von / km	von /		741116	rgeauon	wanth		JIIISIOII-L	Joinanis
					-				Select Al	I Start	Swite	h Stop	Clea	ır
Rpt T	imer (ms	i): 300	00	▼ G	o Test Ma	inager all	-	Dia	a taul	C	Man alian	Det als Mar a		Delete
								Dis	play	Create	Modify	Batch Mod	лту	Delete
							NanLinks f	or Selected Te	st Manage	r				
Na	me	EID	K-M	S	tate	Endpoints (A	<-> B)	Pkt Tx A->B	Pkt Tx	A<-B	Rate A->B	B Rate	A<-B	Rpt Tim
RWL-1.		6.2		Run		/RWL-1.1.0-		853,15		853,157	44,736,		736,000	5,
RWL-1.		6.3	~	Run		/RWL-1.1.1-		853,65	3	853,155	44,736,		736,000	5,
RWL-1.	1.10	6.7	~	Run	١	/RWL-1.1.10	-A <		8	0	44,736,		736,000	5,
RWL-1.		6.6		Run		/RWL-1.1.11			8	0	44,736,		736,000	5,
RWL-1.		6.19	V	Run		/RWL-1.1.12			8	0	44,736,		736,000	5,
RWL-1.		6.18	r	Run		/RWL-1.1.13			8	0	44,736,		736,000	5,
RWL-1.		6.17	~	Run		/RWL-1.1.14			8	0	44,736,		736,000	5,
RWL-1.		6.16	2	Run		/RWL-1.1.15			8	0	44,736,		736,000	5,
RWL-1.	1.16	6.15	V	Run	N	/RWL-1.1.16	-A <		8	0	44.736	000 44.	736.000	5
1														
							——All W	anLink Endpo	oints					
D Pkts	ODisc		orru	ot-0 0	orrupt-1	Corrupt-2	Corrupt-3	Corrupt-4	Corrupt-5	Delav	SerDelav	Maxlitter F	Reorder	DropFre
0	FIFO			0	0	. 0		0 0		0 50	0.271	0	0	
0	FIFO			0	0	0	(0 0		0 50	0.271	0	0	
	FIFO			0	0	0	(· · · · ·		0 50		0	0	
	FIFO			0	0	0	(0 50	0.271	0	0	
	FIFO			0	0	0	(0 0	0.271	0	0	
	FIFO			0	0	0	(0 0	0.271	0	0	
	FIFO			0	0	0	(0 0	0.271	0	0	
	FIFO			0	0	0	(0 0	0.271	0	0	
	FIFO			0	0	0	(0 0	0.271	0	0	
	FIFO	_		0	0	0	(0 0	0.271	0	0	
L A	LILO	_		0	0	01		N 01			0.271	0	0	1

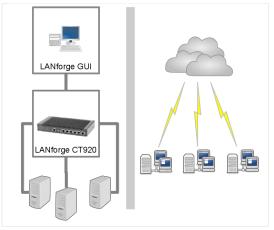
B. Each end of the connection experiences 100ms of delay which gives a total round-trip delay of 200ms.

								Stop All		Rest	art Manager		Refres	h HE
		-		~			v 				V	_		
	ayer-4		neric	L3 Endr		ource Mgr P/RTP	Serial Spa VolP/RTP			Port Me aceddo		jes nLinks		-Domains
Status	Layer-	- 3		L3 End	IS VOI	P/RIP	VOIP/RTP	Enaps	Arm	ageado	n wa	nlinks	Collision	-Domains
MIN Pkt Size	1k	(1	,024	B)	▼ Go M/	X Pkt Size	lk (1	,024 B)	▼ Go		Canad	Chan	Outrast	Clear
		-	,	-/		L	· · ·	,		l	Start	Stop	Quiesce	Clear
MIN TX Rate	<custon:< th=""><th>></th><th></th><th></th><th>▼ Go M/</th><th>AX Tx Rate</th><th><custom></custom></th><th></th><th>▼ Go</th><th></th><th></th><th></th><th></th><th></th></custon:<>	>			▼ Go M/	AX Tx Rate	<custom></custom>		▼ Go					
View	0 - 400				▼ Go					Disp	lay Create	Modify	Batch Modify	Delet
	L													
							——————————————————————————————————————	indpoints—						
Name	EID	Run	Mng	Script	Tx Rate	Tx Rate(1)	Rx Rate	Rx Rate(1)	Rx Dr	p %	Tx Pkts	Rx Pkts	Delay	Dropped
u001-A	1.1.10	~	V	None	9,982,083	9,990,090	9,982,083	9,990,090		0	215,787	215,787	100	C
u001-B	1.1.11	~	~	None	9,990,739	9,989,996	9,990,693	9,989,996		0	215,729	215,728	3 100	(
u002-A	1.1.12		V	None	0	0	0	0		0	0	. (0 0	0
u002-B	1.1.13		~	None	0	0	0	0		0	0	(0 0	C
u003-A	1.1.14		~	None	0	0	0	0		0	0	(0 0	0
	1.1.15			None	0	0	0	0		0	0	(0 0	0
	1.1.16		2	None	0	0	0	0		0	0	(0
	1.1.17		~	None	0	0		0		0	0	(0
	1.1.18		2	None	0	0	0	0		0	0	(0
	1.1.19		~	None	0	0	0	0		0	0	(0
	1.1.20		~	None	0	0	0	0		0	0	(0
	1.1.21		×	None	0	0		0		0	0	((
	1.1.22		K	None	0	0	0	0		0	0	((
	1.1.23			None	0	0	0	0		0	0	(C
	1.1.24		2	None	0	0	0	0		0	0	(0
	1.1.25			None	0	0	0	0		0	0	(C
	1.1.26			None	0	0		0		0	0	(C
	1.1.27			None	0	0		0		0	0	(C
	1.1.28			None	0	0	0	0		0	0	(C
	1.1.29 1.1.30			None	0	0	0	0		0	0	(C
u011-A			~	None	0	0	0	0		0	0	() 0	C

Bridging Multiple WAN-links

Goal: Create a star topology network similar to a central VPN server with remote offices.

Using LANforge Netsmith, we connect three ethernet ports with WAN-links. Each WAN-link has an ethernet port on one side and a virtual redirect on the other. The redirects are then bridged. We can then model the WAN environment by changing the latency (and other parameters) of the WANlinks. In this example, we are using ports eth2, eth3 and eth4 This emulates a bridged network, but it is also possible to do a similar configuration using a Virtual Router instead of a bridge to emulate a routed network.



1. Use Netsmith to create three WAN links

A. In the Status tab, click the Netsmith button

		sion(5.3.7)			\odot
<u>Control Reporting Tear-Off Info P</u>	lugins				
	Stop	All Resta	rt Manager	F	lefresh HEI
Layer-4 Generic Test Mgr Tes	st Group Resource Mgr Event Log	Alerts Port Mgr	vAP Stations	Messages	7
Status Layer-3 L3 Endps	VoIP/RTP VoIP/RTP Endps	Armageddon	WanLinks	Atteni	uators File-IC
License Info	Current Users * Admin from:192.168.100.239		Test Configurat	tion Databas	e
Licenses expire in: 702 days.	* Admin from:192.168.100.239 gnuserver from:127.0.0.1	List:	BLANK	-	Load
Licenses expire in: 702 days.	-	Name:			Delete
		Load Behavior:	Choose One	-	Save
Support expires in: 702 days.			Download		Show Progress
			Download	DB	Show Progress
1	11				
	Virtual Shel				
	Resource	1			
	•• 💻				
	Netsmith				
	K*				
	Config	ire or view the Virt	ual Router and CX	contiguratio	in for the selected

- B. *Right click* in the Netsmith window
- C. Select New Connection

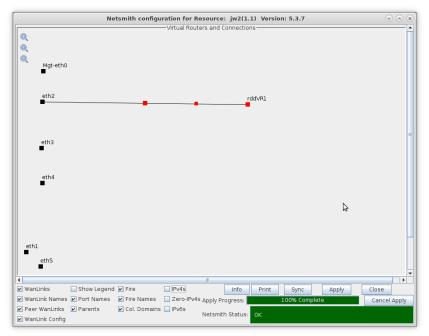
	Ne	tsmith configu					n: 5.3.7			\sim	\bigcirc
Q			-Virtual Rou	ters and Co	nnection	s					_
0											
Mgt-eth0											
eth2 ■											
eth3	New Ro New Co New Bri	nection									
eth4 ■											
eth1 eth5											
eths											
ſ							r	1			•
 WanLinks 	Show Legend		IPv4s		Info	Print	Sync		ply	Close	
WanLink Names			Zero-IPv4	s Apply Pro	gress: 📕		100% Com	plete		Cancel A	Apply
Peer WanLinks	Parents	Col. Domains	IPv6s	Netsmith	Status:	ок					

D. Create new WAN link connection

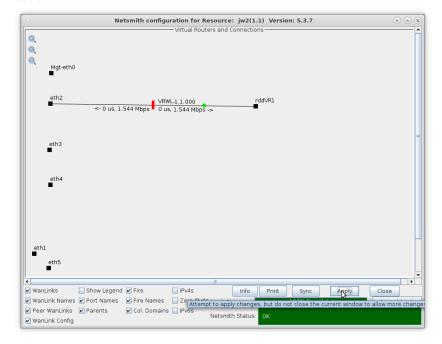
•	Netsmith configuration for Resource: jw2(1.1) Version: 5.3.7 Virtual Routers and Connections									
Q										
0										
Q Mgt-e	***									
Inge-e	•	Create/Mo	dify Connection	× (
			Interface-Cost:	1						
eth2	Port 1-A:	2 (eth2) 💌	RIP-Metric:	1						
	Port 1-B: 🗹 Skip	<auto create="" new="" port=""> <</auto>	OSPF Area: VRRP IP:	000.000.000.000						
	WanLink: Skip	<auto create="" new="" wanlink=""> 🔻</auto>	VRRP ID:	1						
	Port 2-B: Skip	<auto create="" new="" port=""></auto>	VRRP Priority:	100						
			VRRP Interval:	1						
eth3		<auto create="" new="" port=""></auto>	Next-Hop:							
	DHCP Lease Time:		Subnets (a.b.c.d/xx):							
	DHCP DNS:									
eth4										
- 1	DHCP Range Max: DHCP Domain:									
	DHCP Domain: DHCPv6 DNS:		Next-Hop-IPv6:							
	DHCPv6 Range Min:		IPv6 Subnets (aaa::0/xx):							
	DHCPv6 Range Max:									
	DHCPd Config File:									
ethl										
	NAT DHCP	DHCPv6 Custom DHCF	VRRP Cand-RP	·						
eth5	INAT DHCP		Cancel							
_		QK	Cancer							
' WanLinks	Show Legend	Fire IPv4s	Info Print	Sync Apply Clos						
		Fire Names Zero-IPv4s Ap			ncel App					
	nks Parents	Col. Domains DIPv6s		Car	icei App					
WanLink Co		Ne	tsmith Status: OK							

- A. Select Port 1-A: eth2
- B. Select Port 1-B:Skip
- C. Click OK

E. A tentative WAN link is displayed

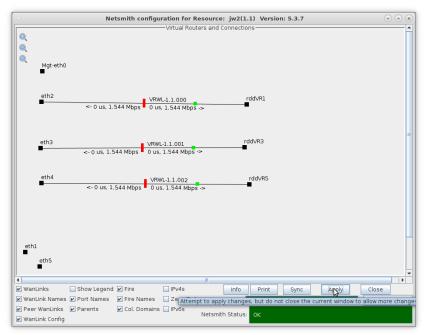


F. Click the **Apply** button at the bottom of the Netsmith window. This commits the WAN link to the resource.



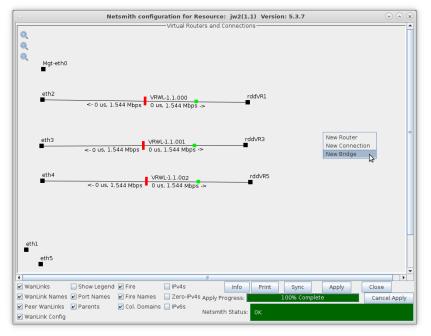
G. Creating two more WAN links is a similar process

H. Repeat these steps:



- A. Right click, New Connection
- B. Choose eth3 for port 1-A and Skip for port 1-B, then OK
- C. Click Netsmith **Apply** to commit connection.
- D. Right click, New Connection
- E. Choose eth4 for port 1-A and Skip for port 1-B, then OK
- F. Click Netsmith Apply to commit connection.
- 2. Use Netsmith to create a bridge port

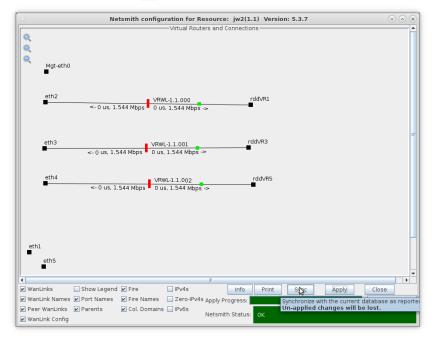
A. Right click, Select New Bridge



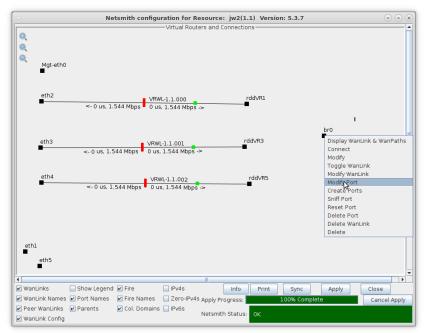
B. Create the bridge with the following attributes:

0			Create VLA	Ns on Port:		\odot \otimes \otimes
O	○ MAC-VLAN ○ WIFI STA	○ 802.1Q-VLAN ○ Red ○ WiFi VAP ○ WiFi Monit			nnel	
0	Shelf:	1	Resource:	1 (jw2) 🔻	Port: 1 (ethl) 🔻
B	VLAN ID:		DHCP-IPv4			
	Parent MAC:	00:30:18:cb:b8:07	DHCP Client ID:	None 💌]	
	MAC Addr:	xxx:*:*:xxx ▼	IP Address:		Global IPv6:	AUTO
	Quantity:	1	IP Mask or Bits:		Link IPv6:	AUTO
			Gateway IP:		IPv6 GW:	AUTO
	Bridge Name:	br0	#2 Redir Name:			
	STA ID:		SSID:			-
	WiFi AP:		Key/Phrase:			
	WPA	WPA2	WEP			
4	Down					
	Apply	<u>C</u> ancel		(Done	

- A. Select Bridge
- B. Quantity: 1
- C. Bridge Name: br0
- C. Click Netsmith Sync to bring the br0 port onto the Netsmith screen



D. *Right click* the br0 port and select **Modify Port**



E. In the text area below the Add Ports button, add the three virtual WAN link endpoints:

•		br0 (jı	w2) Configure S	ettings			\odot	×		
		Current: LINK-U	P PROBE-ERROR T	SO UFO GSO GRO						
		Driver Info: Port T	ype: Bridge Drive	r: bridge(2.3) Bus: N/A						
			Port Configurab	les						
Enable		General In	terface Settings		Spanning-Tree					
Set IF Down	Down	🔲 Aux-Mgt			Aging Time:	300	-			
Set MAC	DHCP-IPv6	DHCP-IPv6 DHCP Release DHCP Vendor ID: None Bridge Priority: 32768								
Set TX Q Len	DHCP-IPv4	Secondary-IPs	DHCP Client ID:	None 💌	Max Age:	20	-			
Set Offload	DNS Servers:	BLANK	Peer IP:	NA	Hello Time:	2	-			
Set Bridge Info	IP Address:	0.0.0.0	Global IPv6:	AUTO	Forwarding Delay:	15	-			
,	IP Mask:	0.0.0.0	Link IPv6:	AUTO						
	Gateway IP:	0.0.0.0	IPv6 GW:	AUTO						
	Alias:		MTU:	1500						
	MAC Addr:	02:c9:69:85:f4:5b	TX Q Len	1000						
	Rpt Timer:	medium (8 s) 🔻	WiFi Bridge:	NONE						
		dge Information		ove Ports						
Services	Configured P	orts Current Port		Ports						
FTP			rddVR1							
RADIUS			rddVR3 rddVR5							
J			TUUVKS							
					1	6				
								-		
Print View Details Probe Sync Apply QK Cancel										
•								1		

- A. rddVR1
- B. rddVR3
- C. rddVR5
- F. Click Add Ports to enter the selection. You will see them show up in the Bridge Information table.

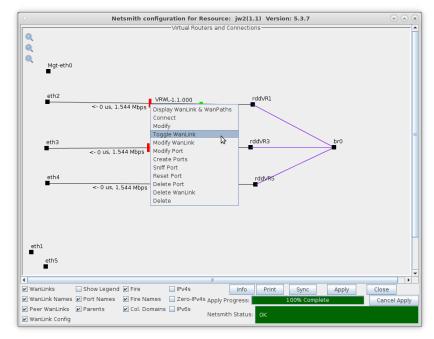
		br0 (j	w2) Configure S	ettings			0	
		Current: LINK-L	JP PROBE-ERROR TS	SO UFO GSO GRO				
		Driver Info: Port T	ype: Bridge Drive	r: bridge(2.3) Bus: N/A				
			Port Configurabl	es				
Enable		General Ir	terface Settings		Spanning-Tree			
Set IF Down	Down	🔲 Aux-Mgt			Aging Time:	300	-	
Set MAC	DHCP-IPv6 DHCP Release DHCP Vendor ID: None Bridge Priority: 32768							
Set TX Q Len	DHCP-IPv4	Secondary-IPs	DHCP Client ID:	None 💌	Max Age:	20	-	
Set MTU Set Offload	DNS Servers:	BLANK	Peer IP:	NA	Hello Time:	2	-	
Set Bridge Info	IP Address:	0.0.0.0	Global IPv6:	AUTO	Forwarding Delay:	15	-	
Set bridge into	IP Mask:	0.0.0.0	Link IPv6:	AUTO				
	Gateway IP:	0.0.0.0	IPv6 GW:	AUTO				
	Alias:		MTU:	1500				
	MAC Addr:	02:c9:69:85:f4:5b	TX Q Len	1000				
	Rpt Timer:	medium (8 s) 💌	WiFi Bridge:	NONE				
	Brid	ge Information	Bem	ove Ports	1			
— Services —	Configured P	orts Current Port	s					
HTTP	rddVR3		Add	Ports				
FTP	rddVR5							
RADIUS								
	1]			
	Print View	Details P	robe Sync	Apply OK	Cancel			

G. Click Apply to commit the change.

H. Click **Sync** to read-in the ports to the screen. You will see them show up in the *Bridge Information* table.

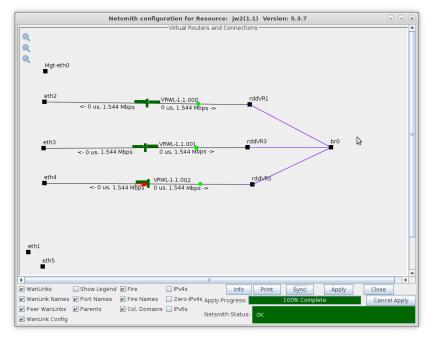
0		br0 (jı	w2) Configure S	ettings			\odot	×		
			JP PROBE-ERROR TS					ŀ		
		Driver Info: Port T	ype: Bridge Drive	r: bridge(2.3) Bus: N/A				1		
			Port Configurab	es				ł		
Enable			terface Settings		Spanning-Tree			I		
Set IF Down	Down	Aux-Mgt			Aging Time:	300	-	I		
Set MAC	DHCP-IPv6	☑ DHCP Release	DHCP Vendor ID:	None 💌	Bridge Priority:	32768	-	I		
Set MTU	DHCP-IPv4	Secondary-IPs	DHCP Client ID:	None 🔻	Max Age:	20	-	I		
Set Offload	DNS Servers:	BLANK	Peer IP:	NA	Hello Time:	2	-	I		
Set Bridge Info	IP Address:	0.0.0.0	Global IPv6:	AUTO	Forwarding Delay:	15	-	I		
	IP Mask:	0.0.0.0		AUTO				I		
	Gateway IP:	0.0.0.0		AUTO				I		
	Alias:		MTU:	1500				I		
	MAC Addr:	0a:22:85:97:12:22	TX Q Len	1000				I		
	Rpt Timer:	medium (8 s) 🔻	WiFi Bridge:	NONE				F		
	Configured P	ge Information orts Current Port		ove Ports				I		
	rddVR1	rddVR1		Ports				I		
FTP	rddVR3 rddVR5	rddVR3 rddVR5	_					I		
RADIUS								I		
,								I		
								I		
								I		
								I		
								I		
	ļ							I		
	Print <u>V</u> iew	Details <u>P</u> I	robe Sync 😽	<u>Apply</u> <u>OK</u> Synchronize with the cur Un-applied changes v	rent database as re	ported by th	e serve	4		
•			i	Un-applied changes v	vill be lost.		2 00.76	1		

- I. Click **Cancel** to close the window.
- 3. Enable the WAN links in Netsmith
 - A. In the Netsmith window, click **Sync** to bring the changes into view



B. *Right click* on VRWL-1.1 and select Toggle WanLink

C. Repeat the toggle for the next two WanLinks



WanPath Corruptions

Goal: Setup a WanLink with WanPath Corruptions.

In this test scenario, LANforge-ICE is used to filter traffic by VLAN on a WanLink with the use of WanPaths and then use WanPath Corruptions to overwrite the DSCP field in the IP packet.

Note: VLAN filtering was recently fixed and should be used with LANforge version 5.3.7 and up.

1. Setup a WanLink connection.

			LAI	Nforge Ma	nager Vers	ion(5.3	.7)				\sim \sim \circ
ontrol <u>R</u> eporting	Tear-Off	Info <u>P</u> lugir	ns								
					Stop A	All	Restart	Manager		Refresh	HELP
Layer-4 Generic Status Lay		r Test Gr 3 Endps	oup Res VolP/RTF	ource Mgr VolF	Event Log P/RTP Endps	Alerts Arm	Port Mgr	vAP Station WanLinl		iges ttenuators	File-I0
Rpt Timer:	fast (l	s) 🔻 (Go Test Ma	anager all	•	[Select All			top Clear	
			🗌 Hide Sto	pped		Disp	olay Cr <u>e</u> a	te Mo <u>d</u> ify	<u>B</u> atch	Modify De	lete
					for Selected 1						
Name	EID K-M	State	Endpo	ints (A ↔ B)	Pkt Tx A →	B Pk	tt Tx A ← B	Bps Rx	B	Bps Rx A	Rpt Timer
1											
4											
				A	ll WanLink End	points —					
·	Run S	cript N	lax Rate		ll WanLink End		Tx Drop %	Dropped	Tx-Failed	Failed-Late	
	Run S	cript N	lax Rate	A	ll WanLink End	points —		Dropped	Tx-Failed	Failed-Late	
	Run S	cript M	lax Rate	A	ll WanLink End	points —		Dropped	Tx-Failed	Failed-Late	
	Run S	cript N	lax Rate	A	ll WanLink End	points —		Dropped	Tx-Failed	Failed-Late	
	Run S	cript N	1ax Rate	A	ll WanLink End	points —		Dropped	Tx-Failed	Failed-Late	
	Run S	cript N	1ax Rate	A	ll WanLink End	points —		Dropped	Tx-Failed	Falled-Late	
	Run S	cript N	tax Rate	A	ll WanLink End	points —		Dropped	Tx-Failed	Failed-Late	

B. Enter the WanLink name, physical ports, base transfer rate, delay, jitter etc... These impairments will be applied to all traffic on the WanLink.

+ - All	<u>Apply</u>	K	Display WanLink & WanPaths	<u>C</u> ancel
Name: Presets:	WanLink Information 100Mbps-wan CUSTOM			
	Endpoint A		Endpoint B	
Port:	2 (eth2)	▼	3 (eth3) 💌	
Transfer Rate:	100M (100 Mbps)	▼	100M (100 Mbps)	
Delay:	tiny (10 ms)	•	tiny (10 ms) 🖵	
Drop-Freq:	zero (0%)	-	zero (0%) 🔻	
Jitter:	zero (0 us)	-	zero (O us) 💌	
Jitter-Freq:	zero (0%)	-	zero (0%) 🔻	
			·	

C. Select **Apply** to create the base WanLink.

For more information see LANforge-GUI User Guide: Creating & Modifying WanLinks

2. Setup the WanPaths.

A. Select **All** to un-hide the other WanLink config panels.

•			100Mbps-wa	n - (Creat	e/Modify W	anLi	nk							
+ - All							Ар	ply	<u>0</u> K	Displa	iy Wa	inLink & Wa	nPaths	Can	cel
Name: Presets:	WanLink Information 100Mbps-wan CUSTOM			•		2		P	Link Inforn ass-Throu oupled-Mo	igh		HW Pass			
Port:	Endpoint A 2 (eth2)	-	Endpoint B 3 (eth3)	-		Resource: Rpt Timer:		1 (j fast	etway-f24)	\	_			-	
Transfer Rate:	100M (100 Mbps)	-	100M (100 Mbps)	-				_)				-	
Delay:	tiny (10 ms)	-	tiny (10 ms)	-	Ì	Reorder-Fred		Endp zero				Endpoint B zero (0%)		-	
Drop-Freq:	zero (O%)	•		•		Dup-Freq:		zero	(0%)		-	zero (O%)		-	
Jitter:	zero (O us)	-		-		Drop Burst:		min 1		ax 1		min 1	max 1		
Jitter-Freq:	zero (0%)	-	zero (0%)	-		Reorder Amt		min 1	-	ax 20		min 1	max 20		
									Scrip	ot		S	cript		
0	Endpoin	AW	AN Paths						End	point B V	VAN I	Paths			_
Cre	ate-WP M	odify-	WP Delete	e-WP		Cre	eate	WP		Modify	/-WP		Delete-	WP	
Name	Tx Rate Disabled !		Filter Pattern		Delay	Name	1 X 1	Rate	Disabled			Filter Patter	m	Delay	
CRU-ID:	WanLink Information				Tae	t Manager:	_		Informatio	n				-	
Gina-ID:	0			-	Tes	t Manager:	de	fault_	tm				-		
	Endpoint A		Endpoint B					point ump f	A Packets			ooint B ump Packet	s		
Replay File:		-		Ţ	Dun	np File:									
ricplay file.	Dir		Dir	۲			F	orce F	Packet Ga	р	E Fo	orce Packet	Gap		
	Loop Replay		Loop Replay					rop-X	th		🗌 Dr	rop-Xth			
	- coop reproy						B	eorde	r-Xth		Re	eorder-Xth			

B. In panel 3, for Endpoint-A WAN Paths, select Create-WP.

🕐 100Mbps-wan - Create/Modify WanLink 💿 🔗 🛞														
+ - All							Арр	у <u>о</u> к	Disp	play	WanLink & Wan	Paths	Cancel	
Name: Presets:	WanLink Information 100Mbps-wan CUSTOM			-		2		VanLink Infi Pass-Thi Coupled	rough		HW Pass-			
Port:	Endpoint A 2 (eth2)	-	Endpoint B 3 (eth3)		1	Resource: Rpt Timer:		l (jetway-f	-				-	
Transfer Bate:	100M (100 Mbps)	-	100M (100 Mbps)	-		npe miller.			s)	_			-	
Delay:	tiny (10 ms)	-	tiny (10 ms)	-		Reorder-Fred		ndpoint A ero (0%)		ŀ	Endpoint B zero (0%)		-	
Drop-Freq:	zero (0%)	-	zero (O%)	-		Dup-Freq:	Z	ero (0%)		ŀ	✓ zero (0%)		-	
Jitter:	zero (O us)	-	zero (O us)	-		Drop Burst:		in 1	max 1		min 1	max 1	-	
Jitter-Freq:	zero (0%)	-	zero (0%)	-		Reorder Amt		n 1	max 20		min 1	max 20	_	
								S	cript		Sc	ript		
8			AN Paths						indpoint 6					
Name	ate-WP M Tx Rate Disabled !	odify-	WP Delet) Delav	Name	ate-W		Moc	any-	Filter Patterr	Delete-	Delay	
]			THEOT BEECH			
CPU-ID:	WanLink Information			_	Tee	t Manager:	_	ink Informa	ation				ni.	
Gind-ID:	0			-	Tes	t Manager:	_	ult_tm		-		-		
	Endpoint A		Endpoint B				Endp	oint A mp Packets	5		ndpoint B Dump Packets			
Replay File:		-		-	Dur	np File:								
	Dir							rce Packet	Gap		Force Packet (Gap		
	🖌 Loop Replay		Loop Replay					op-Xth order-Xth			Drop-Xth			
			_				пке	order-xth			Reorder-Xth			4

- C. Enter a Name and Transfer Rate for the WanPath.
 - Here we are matching the WanLink's transfer rate.

0	Create/Modif	y WanPath for E	ndpoint: 100Mbps	-wan-A	\odot
	Display	Clear Counters	Apply	<u>O</u> K <u>C</u> ancel]
Name:	wp-a		Backlog Buffer:	AUTO	•
PCAP Filter:					
Source IP/MAC:	0.0.0.0		Source Mask:	0.0.0.0	
Dest IP/MAC:	0.0.0.0		Dest Mask:		
Transfer Rate:	100M (100 Mbps)	-	Delay	zero (O us)	•
Jitter	zero (O us)	-	Drop-Freq:	zero (0%)	-
Min Drop Burst:	1		Max Drop Burst:	1	
Min Reorder Amount	: 1		Max Reorder Amour	nt: 20	
Reorder-Freq:	zero (0%)	-	Dup-Freq:	zero (0%)	-
Jitter-Freq:	zero (0%)	-	Test Manager:		-
🗌 ICEcap Replay	Replay File:			L	▼ Dir
. ⊂ t	Disabled	Loop Replay	Replay Latency	🖌 Replay Loss	
. ا	Same As WanLink 🕞	Replay Dup	🖌 Replay Bandwidt	h 📃 Use Pcap Filt	er
🔲 I	nverse Match	Drop-Xth	Duplicate-Xth	Reorder-Xth	
Corrup	tion #0	Corrup	tion #1	Corrup	otion #2
Rate:	0	Rate:	0	Rate:	0
Corruption:	Random Write 💌	Corruption:	Random Write 🔻	Corruption:	Random Write 🔻
Byte-to-Write:	0	Byte-to-Write:	0	Byte-to-Write:	0
Min Offset:	0	Min Offset:	0	Min Offset:	0
Max Offset:	0	Max Offset:	0	Max Offset:	0
Chain-to-Next	🗌 Do Checksum	Chain-to-Next	🗌 Do Checksum	🗌 Chain-to-Next	🗌 Do Checksum
Corrup	tion #3	Corrup	otion #4	Corrup	otion #5
Rate:	0	Rate:	0	Rate:	0
Corruption:	Random Write 👻	Corruption:	Random Write 💌	Corruption:	Random Write 👻
Byte-to-Write:		Byte-to-Write:		Byte-to-Write:	
Min Offset:	0	Min Offset:	0	Min Offset:	0
Max Offset:	0	Max Offset:	0	Max Offset:	0
Chain-to-Next	Do Checksum	Chain-to-Next	Do Checksum	🗌 Chain-to-Next	Do Checksum

D. Select checkbox for $\ensuremath{\text{Use Pcap Filter}}$

 Create/Modify WanPath for Endpoint: 100Mbps-wan-A Solution 									
	Display	lear Counters	Apply	<u>O</u> K <u>C</u> ancel]				
Name:	wp-a		Backlog Buffer:	AUTO	•				
PCAP Filter:									
Source IP/MAC:			Source Mask:						
Dest IP/MAC:	0.0.0.0		Dest Mask:	0.0.0.0					
Transfer Rate:	100M (100 Mbps)		Delay	zero (O us)	-				
Jitter	zero (O us)	-	Drop-Freq:	zero (0%)	-				
Min Drop Burst:	1		Max Drop Burst:	1					
Min Reorder Amount	: 1		Max Reorder Amou	nt: 20					
Reorder-Freq:	zero (0%)	-	Dup-Freq:	zero (0%)	-				
Jitter-Freq:	zero (0%)	-	Test Manager:		-				
🗌 ICEcap Replay	Replay File:				- Dir				
0 D	isabled 🛛	Loop Replay	Replay Latency	🖌 Replay Loss					
• s	ame As WanLink 🛛 🕨	Replay Dup	🗹 Replay Bandwidt	h 🔽 Use Pcap Filt	er				
🗌 Ir	nverse Match	Drop-Xth	Duplicate-Xth	🗌 Reorder-Xth					
Corrupt	tion #0	Corrup	otion #1	Corrup	otion #2				
Rate:	0	Rate:	0	Rate:	0				
Corruption:	Random Write 💌	Corruption:	Random Write 💌	Corruption:	Random Write 💌				
Byte-to-Write:	0	Byte-to-Write:	0	Byte-to-Write:	0				
Min Offset:	0	Min Offset:	0	Min Offset:	0				
Max Offset:	0	Max Offset:	0	Max Offset:	0				
Chain-to-Next	Do Checksum	Chain-to-Next	Do Checksum	Chain-to-Next	Do Checksum				
Corrupt	tion #3	Corrup	otion #4	Corrup	otion #5				
Rate:	0	Rate:	0	Rate:	0				
Corruption:	Random Write 👻	Corruption:	Random Write 💌	Corruption:	Random Write 👻				
Byte-to-Write:	0	Byte-to-Write:	0	Byte-to-Write:	0				
Min Offset:	0	Min Offset:	0	Min Offset:	0				
Max Offset:	0	Max Offset:	0	Max Offset:	0				
Chain-to-Next	Do Checksum	Chain-to-Next	Do Checksum	Chain-to-Next	Do Checksum				

E. Enter the PCAP Filter **vlan 1010** to apply any WanPath impairment or corruptions only to packets with 802.1q vlan id 1010

•	Create/Modify WanPath for Endpoint: 100Mbps-wan-A Solution										
	Display	Clear Counters	Apply	<u>O</u> K <u>C</u> ancel]						
Name:	wp-a		Backlog Buffer:	AUTO	•						
PCAP Filter:	vlan 1010										
Source IP/MAC:			Source Mask:								
Dest IP/MAC:	0.0.0.0		Dest Mask:								
Transfer Rate:	100M (100 Mbps)		Delay zero (0 us)								
Jitter	zero (0 us)	•	Drop-Freq:	zero (O%)	-						
Min Drop Burst:	1		Max Drop Burst:	1							
Min Reorder Amount	: 1		Max Reorder Amou	unt: 20							
Reorder-Freq:	zero (0%)		Dup-Freq:	zero (0%)	-						
Jitter-Freq:	zero (0%)	•	Test Manager:		-						
🗌 ICEcap Replay	Replay File:				- Dir						
00	isabled	Loop Replay	Replay Latency	🖌 Replay Loss							
• s	ame As WanLink 🕞	Replay Dup	🖌 Replay Bandwid	lth 🗹 Use Pcap Filt	ter						
🗌 Ir	nverse Match	Drop-Xth	Duplicate-Xth	🗌 Reorder-Xth							
Corrup	tion #0	Corr	uption #1	Corru	otion #2						
Rate:	0	Rate:	0	Rate:	0						
Corruption:	Random Write 👻	Corruption:	Random Write 🔻	Corruption:	Random Write 👻						
Byte-to-Write:		Byte-to-Write:		Byte-to-Write:							
Min Offset:	0	Min Offset:	0	Min Offset:	0						
Max Offset:	0	Max Offset:	0	Max Offset:	0						
Chain-to-Next	Do Checksum	Chain-to-Nex	t 🔲 Do Checksum	Chain-to-Next	Do Checksum						
Corrup	tion #3	Corr	uption #4	Corru	ption #5						
Rate:	0	Rate:	0	Rate:	0						
Corruption:	Random Write 💌	Corruption:	Random Write 💌	Corruption:	Random Write 👻						
Byte-to-Write:	0	Byte-to-Write:	0	Byte-to-Write:	0						
Min Offset:	0	Min Offset:	0	Min Offset:	0						
Max Offset:	0	Max Offset:	0	Max Offset:	0						
Chain-to-Next	Do Checksum	Chain-to-Nex	t 🔲 Do Checksum	Chain-to-Next	Do Checksum						

Expression is based on the tcpdump expression field.

F. Select **Apply** to create the WanPath.

For more information see Tcpdump man page, Pcap Filter Syntax

- 3. Setup the Corruptions.
 - A. Enter the following values into Corruption #0 fields
 - A. Rate 100000
 - (how often, per million packets, should the corruption be applied)
 - B. Corruption Write Byte
 - C. Byte-to-Write 40
 - (hex 0x00-0xff or decimal 0-255)
 - If you enter 0x28 and select OK, the GUI will translate it to decimal 40.
 - D. Min Offset 19
 - E. Max Offset 20

The Differentiated Services Field is in byte 20 of the ethernet frame which corresponds to the 2nd byte of the IP header.

B. Select checkbox **Do Checksum** which will re-calculate the checksum after making the errors so that the packet is still valid.

0	Create/Modif	y WanPath for	Endpoint: 100Mbps	s-wan-A	\odot \sim \times
	Display	Clear Counters	Apply	<u>O</u> K <u>C</u> ancel	
Name:	wp-a		Backlog Buffer:	AUTO	-
PCAP Filter:	vlan 1010		-		
Source IP/MAC:			Source Mask:		
Dest IP/MAC:	0.0.0.0		Dest Mask:	0.0.0.0	
Transfer Rate:	100M (100 Mbps)		Delay	zero (O us)	-
Jitter	zero (O us)		Drop-Freq:	zero (0%)	-
Min Drop Burst:	1		Max Drop Burst:	1	
Min Reorder Amount:	: 1		Max Reorder Amou		
Reorder-Freq:	zero (0%)	-	Dup-Freq:	zero (0%)	-
Jitter-Freq:	zero (0%)		Test Manager:		-
🔲 ICEcap Replay	Replay File:				- Dir
0 D	isabled 🛛	Loop Replay	🖌 Replay Latency	🖌 Replay Loss	
🖲 S	ame As WanLink 🛽 🛽	Replay Dup	🖌 Replay Bandwidt	:h 🔽 Use Pcap Filt	er
🗌 In	verse Match	Drop-Xth	Duplicate-Xth	🗌 Reorder-Xth	
Corrupt	ion #0	Corru	ption #1	Corrup	otion #2
Rate:	100000	Rate:	0	Rate:	0
Corruption:	Write Byte 💌	Corruption:	Random Write 💌	Corruption:	Random Write 💌
Byte-to-Write:	40	Byte-to-Write:		Byte-to-Write:	
Min Offset:	19	Min Offset:	0	Min Offset:	0
Max Offset:	20	Max Offset:	0	Max Offset:	0
Chain-to-Next	🖌 Do Checksum	Chain-to-Next	🔲 Do Checksum	Chain-to-Next	🔲 Do Checksum
Corrupt	ion #3	Corru	ption #4	Corrup	otion #5
Rate:	0	Rate:	0	Rate:	0
Corruption:	Random Write 💌	Corruption:	Random Write 💌	Corruption:	Random Write 💌
Byte-to-Write:	0	Byte-to-Write:	0	Byte-to-Write:	0
Min Offset:	0	Min Offset:	0	Min Offset:	0
Max Offset:	0	Max Offset:	0	Max Offset:	0
Chain-to-Next	Do Checksum	Chain-to-Next	Do Checksum	Chain-to-Next	Do Checksum

C. Select **OK** then create a second WanPath for this WanLink on Endpoint-B using the same values.

0	Create/Modif	y WanPath for	Endpoint: 100Mbp	s-wan-B	\odot \otimes \otimes
	Display	Clear Counters	Apply	<u>O</u> K <u>C</u> ancel	
Name:	wp-b		Backlog Buffer:	AUTO	-
PCAP Filter:	vlan 1010				
Source IP/MAC:			Source Mask:		
Dest IP/MAC:	0.0.0.0		Dest Mask:	0.0.0	
Transfer Rate:	100M (100 Mbps)		 Delay 	zero (O us)	-
Jitter	zero (0 us)		 Drop-Freq: 	zero (0%)	-
Min Drop Burst:	1		Max Drop Burst:	1	
Min Reorder Amount	: 1		Max Reorder Amou	unt: 20	
Reorder-Freq:	zero (0%)		 Dup-Freq: 	zero (O%)	-
Jitter-Freq:	zero (0%)		 Test Manager: 		-
🗌 ICEcap Replay	Replay File:				- Dir
00	isabled 🛛	Loop Replay	Replay Latency	✓ Replay Loss	
• s	ame As WanLink 🕞	Replay Dup	🖌 Replay Bandwid	th 🔽 Use Pcap Filt	ter
🗆 Ir	nverse Match	Drop-Xth	Duplicate-Xth	Reorder-Xth	
Corrupt	tion #0	Corr	uption #1	Corru	ption #2
Rate:	100000	Rate:	0	Rate:	0
Corruption:	Write Byte 👻	Corruption:	Random Write 👻	Corruption:	Random Write 👻
Byte-to-Write:	40	Byte-to-Write:	0	Byte-to-Write:	0
Min Offset:	19	Min Offset:	0	Min Offset:	0
Max Offset:	20	Max Offset:	0	Max Offset:	0
Chain-to-Next	Do Checksum	Chain-to-Ne	kt 🔲 Do Checksum	Chain-to-Next	Do Checksum
Corrupt	tion #3	Corr	uption #4	Corru	ption #5
Rate:	0	Rate:	0	Rate:	0
Corruption:	Random Write 👻	Corruption:	Random Write 👻	Corruption:	Random Write 👻
Byte-to-Write:	0	Byte-to-Write:	0	Byte-to-Write:	0
Min Offset:	0	Min Offset:	0	Min Offset:	0
Max Offset:	0	Max Offset:	0	Max Offset:	0
Chain-to-Next	🗌 Do Checksum	Chain-to-Ne	kt 🔲 Do Checksum	Chain-to-Next	🗌 Do Checksum

D. Verify that the WanPaths on this WanLink are setup correctly, then select **OK** on the *Create/Modify WanLink* window shown here

			100Mbps-wa	n - (Crea	te/Modify W	anLink				\odot	
+ - All							Apply	QK	Display	WanLink & WanPaths	<u>C</u> a	ancel
Name: Presets:	WanLink Information 100Mbps-wan CUSTOM			•		2		anLink Inforr Pass-Throu Coupled-M	ugh	HW Pass-Throug	h	
	Endpoint A		Endpoint B			Resource:	1	(jetway-f24)			-	
Port:	2 (eth2)	-	3 (eth3)	-		Rpt Timer:	fa	ist (1 s	;)		-	
Transfer Rate:	100M (100 Mbps)	-	100M (100 Mbps)	-			End	lpoint A		Endpoint B		
Delay:	tiny (10 ms)	-	tiny (10 ms)	-		Reorder-Fred		10 (0%)		v zero (G%)	-	
Drop-Freq:	zero (0%)	-	zero (0%)	-		Dup-Freg:	zer	no (0%)		✓ zero (0%)	-	
Jitter:	zero (O us)	-	zero (0 us)	-		Drop Burst:	min	1		min 1 max 1		
Jitter-Freq:	zero (O%)	-	zero (G%)	-		1 · · ·			ax 20			
						Reorder Amt	min				<u> </u>	
								Scri	pt	Script		
0	Endpoint	A 14	AN Paths		_		_	En	dpoint B W	AN Pathe		
3 Cre		dify		e-WP		Cre	eate-WP		Modify-		te-WP	
Name wp-a 1	Tx Rate Disabled !	Pca	Filter Pattern 5: vlan 1010	0	Delay 0	Name wp-b	Tx Rate	Disabled		Filter Pattern v vlan 1010	Dela	ay 0 🔺
						-						-
	WanLink Information						WanLin	k Informatio	on			
CRU-ID:	0			-	Те	st Manager:	defaul	t_tm			-	
	Endpoint A		Endpoint B				Endpoir	nt A	E	ndpoint B		
	🗌 ICEcap Replay		🗌 ICEcap Replay				🗌 Dumj	o Packets		Dump Packets		
Replay File:		-		-	Du	mp File:						
	Dir							Packet Ga		Force Packet Gap		
	🖌 Loop Replay		Loop Replay				Drop			Drop-Xth		
							Reon	der-Xth		Reorder-Xth		

For more information see LANforge-GUI User Guide: Creating & Modifying WanPaths

- 4. Run traffic through LANforge-ICE ports eth2 and eth3, and capture traffic on eth2.
 - A. Here we are using LANforge-FIRE on a secondary resource to send a 10Mbps bi-directional UDP flow between 802.1q VLAN endpoints eth2.1010 and eth3.1010 with an IP ToS value of decimal 184 which corresponds to DSCP value decimal 46 or Expedited Forwarding

			udp-1010 - Creat	te/M	odify Cross Conn	ect			\sim
+ - All					Display	Sync Batch-Create		Apply OK	Cancel
CX Name: CX Type:	Cross-Connect Judp-1010 LANforge / UDP Endpoint A	_	Endpoint B	•	Report Timer:	Cross-Connect fast (1 s) Endpoint A increasing	•	Endpoint B	•
Resource: Port:	2 (jw2) 25 (eth2.1010)	•	2 (jw2) 15 (eth3.1010)	-	Min IP Port:	AUTO	-	AUTO	-
Min Tx Rate:	10M (10 Mbps)	-	10M (10 Mbps)	-	Max IP Port: Min Duration:	Same Forever	▼	Same Forever	• •
Max Tx Rate: Min PDU Size:	Same AUTO	•	Same AUTO	-	Max Duration:	Same	-		-
Max PDU Size:	Same	•	Same	-	Min Reconn: Max Reconn:	0 (0 ms) Same	• •	0 (0 ms) Same	▼ ▼
IP ToS:	Voice (EF) (184)	-	Voice (EF) (184)	-	Multi-Conn:	Normal (0)	-	Normal (0)	-
Pkts To Send:	Infinite	•	Infinite	-		Script		Script	
						Thresholds		Thresholds	

B. Go to the Port Mgr tab and highlight WanLink port eth2, then select the Sniff Packets button to bring up Wireshark.

ontrol	Repo	rting	<u>T</u> ear-Off <u>I</u> nfo <u>P</u> lu	gins												
								Stop All		Restart Ma	nager		F	Refresh	HE	÷L
Layer-4	Yee	neric	Test Mgr Test	Grou	Resource	Mar	Eve	ent Log A	lerts Po	rt Mgr 🛛 VA	P Stations	Mess	0.000	7		
Status		Layer			VoIP/RTP			Endps	Armage		WanLink			Jators	File-I	0
Status	•	Layer	-5 L5 Ellups		VOIP/RTP	VUIP/I		Enups	Annaya	suuon	wantunk	> ^	ALLEIN	Jacors	riten	-
	Disp:	127.0	.0.1:1	S	niff Packets		1	Clear Co	ounters	Reset Po	rt D	elete				
	Rpt T	imer:	nedium (8 s) 🔻		Apply	ī i	I	View D	etails	Cr <u>e</u> ate	M	lodify	Bat	tch Modify		
	<u> </u>	l				net Inte	rfad	es (Ports)	for all Reso	urces —			_			
		1	1			1				l						
Port	Pha.	Dow	n IP	SEC	Alias	Parent Dev		RX Bytes	RX Pkts	Pps RX	bps RX	TX Byt	es	TX Pkts	Pps	5
L.1.00			192.168.100.198	0	eth0		5.	529.927	8.709.413	55	143.334	5.281.5	52	9.617.541		i
.1.01			0.0.0.0	0	eth1		-	0	0	0			0			ſ
.1.02			0.0.0.0	0	eth2		3,	482,049,	2,399,718	0	4	7,757,6	60,	4,297,3		
.1.03			0.0.0.0	0	eth3		3,	482,026,	2,399,705	0	0	7,757,6	66,	4,297,3	_	
.1.04			0.0.0.0	0	eth4			0	0	0	0	12	2,506	147		Ì
.1.05			0.0.0.0	0	eth5			0	0	0	0	12	2,234	147		
.1.06			0.0.0.0	0	wiphy0			0	0	0	0		0	0		
.1.07			0.0.0.0	0	wiphy1			0	0	0	0		0	0		
.1.08		~	0.0.0.0	0	wlan0	wiphy0		0	0	0	0		0	0		
.1.09		~	0.0.0.0	0	wlan1	wiphy1		0	0	0	0		0	0		
.2.00			192.168.100.103	0	eth0		65	53,572,601	5,346,946	13	15,109	5,202,1	01,	4,863,373		
.2.01		~	0.0.0.0	0	eth1			0	0				0	0		
.2.02			172.16.0.102	0	eth2			460,380,	2,384,176					2,399,880		
.2.03			172.16.0.103	0	eth3		3,	460,386,	2,384,178	0	0	3,482,0	36,	2,399,868		
.2.04			0.0.0.0	0	eth4			2,394	7	0	0	9	9,852	138		
.2.05			0.0.0.0	0	eth5			2,052	6	0	0	9	9,852	138		
.2.06			192.168.9.29	0	eth3.1009	eth3		0	0	0	0		9,306			
.2.07			192.168.8.28	0	eth3.1008	eth3		0	0				9,306			
.2.08			192.168.1.11	0	eth2.1001	eth2	- 8	34,760,294	68,374							
.2.09			192.168.9.19	0	eth2.1009	eth2		0	0				9,236			
2.10			192.168.5.15	0	eth2.1005	eth2		0	0				9,236			
.2.11			192.168.7.17	0	eth2.1007	eth2		0	0	0	0	9	9,306	131		
4		//													•	ł

C. The capture will show that periodically the DSCP field gets overwritten per the WanPath corruption logic of writing a decimal value 40 in the IP ToS field which corresponds to a DSCP value of decimal 10 or Assured Forwarding 11.

File Edit View Go Ca		rruption.pcap [Wireshark		Unknown from unknown)] (as sup	oeruser)	\odot
• • 🖌 🗖	🔬 🖪 🛅 🗙 C	Q & > > =			5 🗵 😳	
Filter:		▼ E>	pression C	lear Apply Save		
No. Time	Source	Destination	Protocol	Length Differentiated Services	Codepoint Info	
149 0.086121	192.168.0.30	192.168.0.20	LANforge	1518 Expedited Forwarding	Seq: 73	
150 0.086902	192.168.0.30	192.168.0.20	LANforge	1518 Assured Forwarding 11	Seq: 74	
151 0.089134 152 0.089337	192.168.0.20 192.168.0.20	192.168.0.30 192.168.0.30	LANforge LANforge	1518 Expedited Forwarding 1518 Expedited Forwarding	Seq: 75 Seq: 76	
153 0.089607	192.168.0.30	192.168.0.20	LANforge	1518 Expedited Forwarding	Seq: 75	
154 0.089652	192.168.0.20	192.168.0.30	LANforge	1518 Expedited Forwarding	Seq: 77	
155 0.090103	192.168.0.30	192.168.0.20	LANforge	1518 Expedited Forwarding	Seg: 76	
156 0.090684	192.168.0.20	192.168.0.30	LANforge	1518 Expedited Forwarding	Seq: 78	
157 0.091129	192.168.0.30	192.168.0.20	LANforge	1518 Expedited Forwarding	Seq: 77	
158 0.091657	192.168.0.20	192.168.0.30	LANforge	1518 Expedited Forwarding	Seq: 79	
159 0.092085 160 0.092601	192.168.0.30 192.168.0.20	192.168.0.20 192.168.0.30	LANforge LANforge	1518 Expedited Forwarding 1518 Expedited Forwarding	Seq: 78 Seq: 80	
161 0.093118	192.168.0.30	192.168.0.20	LANforge	1518 Expedited Forwarding	Seq: 79	
162 0.093899	192.168.0.30	192.168.0.20	LANforge	1518 Assured Forwarding 11	Seq: 80	
163 0.095637	192.168.0.20	192.168.0.30	LANforge	1518 Expedited Forwarding	Seq: 81	
		192.168.0.30			Seg: 82	
164 0.095843	192.168.0.20		LANforge	1518 Expedited Forwarding		
165 0.096231	192.168.0.30	192.168.0.20	LANforge	1518 Expedited Forwarding	Seg: 81	
165 0.096231 Frame 147: 1518 byt Ethernet II, Src: J	192.168.0.30 102.168.0.30 tes on wire (12144 bi JetwayIn_cc:5b:d3 (00	192.168.0.20 103.160.0.30 ts), 1518 bytes capture :30:18:cc:5b:d3), Dst:	LANforge	1518 Expedited Forwarding		,
165 0.096231 Frame 147: 1518 byt Ethernet II, Src: 3 802.10 Virtual LAN, Internet Protocol V	192.168.0.30 103.160.0.30 tes on wire (12144 bi JetwayIn_cc:5b:d3 (00 , PRI: 0, CFI: 0, ID: Version 4, Src: 192.1 ocol, Src Port: 33018	192.168.0.20 102.168.0.20 ts), 1518 bytes capture :30:18:cc:5b:d3), Dst: 1010 68.0.30, Dst: 192.168.0	LANforge LANforge LANforge d (12144 bits) JetwayIn_cc:5b	1518 Expedited Forwarding	Seg: 81	,
165 0.096231 Frame 147: 1518 byt Ethernet II, Src: J 802.10 Virtual LAN, Internet Protocol V User Datagram Proto	192.168.0.30 103.160.0.30 tes on wire (12144 bi JetwayIn_cc:5b:d3 (00 , PRI: 0, CFI: 0, ID: Version 4, Src: 192.1 ocol, Src Port: 33018	192.168.0.20 102.168.0.20 ts), 1518 bytes capture :30:18:cc:5b:d3), Dst: 1010 68.0.30, Dst: 192.168.0	LANforge LANforge LANforge d (12144 bits) JetwayIn_cc:5b	1518 Expedited Forwarding	Seg: 81	,
165 0.096231 Frame 147: 1518 byt Ethernet II, Src: J 802.10 Virtual LAN, Internet Protocol V User Datagram Proto	192.168.0.30 103.160.0.30 tes on wire (12144 bi JetwayIn_cc:5b:d3 (00 , PRI: 0, CFI: 0, ID: Version 4, Src: 192.1 ocol, Src Port: 33018	192.168.0.20 102.168.0.20 ts), 1518 bytes capture :30:18:cc:5b:d3), Dst: 1010 68.0.30, Dst: 192.168.0	LANforge LANforge LANforge d (12144 bits) JetwayIn_cc:5b	1518 Expedited Forwarding	Seg: 81	
165 0.096231 Frame 147: 1518 byt Ethernet II, Src: J 802.10 Virtual LAN, Internet Protocol V User Datagram Proto	192.168.0.30 103.160.0.30 tes on wire (12144 bi JetwayIn_cc:5b:d3 (00 , PRI: 0, CFI: 0, ID: Version 4, Src: 192.1 ocol, Src Port: 33018	192.168.0.20 102.168.0.20 ts), 1518 bytes capture :30:18:cc:5b:d3), Dst: 1010 68.0.30, Dst: 192.168.0	LANforge LANforge LANforge d (12144 bits) JetwayIn_cc:5b	1518 Expedited Forwarding	Seg: 81	
165 0.996231 165 0.996231 Frame 147: 1518 byt Ethernet II, Src: J 802.10 Virtual LAN, Internet Protocol V User Datagram Proto LANforge Traffic Ge	192,168.0.30 193 166 0.30 tes on wire (12144 bi DetwayIn cc:bb:d3 (00 , PRI: 0, CFI: 0, ID: Version 4, Src: 192.1 acol, Src Port: 33018 enerator	192.168.0.20 103.160.0.20 153.1518 bytes captur 390.183cc:5b:d3),Dst: 1010 6.0.30,Dst: 192.168.0 ,Dst Port: 33017	LANFORGE LANFORGE 2d (12144 bits) JetwayIn_cc:5b	1518 Expedited Forwarding	Seg: 81	•
165 0.096231 166 0.096231 Frame 147: 1518 byt 802.10 Virtual LAN, 10 Virtual LAN, 11 Hernet Protocol V User Datagram Froto LANforge Traffic Ge	192.168.0.30 103.168.0.30 tes on wire (12144 bi 20tawajin.ccibid3 (00 , PRI: 0, CFI: 0, ID: Version 4, Src: 192.1 cccl, Src Port: 33018 enerator	122.168.0.20 103.160 4 South of the sector	LANforge (112144 bits) JetwayIn_cc:5b 0.20	1518 Expedited Forwarding	Seg: 81	,
165 0.996231 165 0.996231 Frame 147: 1518 byt Bthernet II, Src: J 802.10 Virtual LAN, Internet Protocol V User Datagram Proto LANForge Traffic Ge 0000 00 30 18 cc 5b	192,168.0.30 103 166 0.30 tes on wire (12144 bi DetwayIn cc:5b.d3 (00 , PRI: 0, CFI: 0, IDC Version 4, Src: 192.1 ocol, Src Port: 33018 enerator d2 00 30 18 cc 5b c dc 79 90 40 00 40 10	122.168.0.20 103.160 0.20 103.160 0.50 101.050 0.50 101.050 0.50 0.050 0.50 101.050 0.50 102.168.0 102.168.0 103.160 0.51 102.168.0 103.160 0.51 103.160 0.51		1518 Expedited Forwarding	Seg: 81	
165 0.096231 166 0.096231 Frame 147: 1518 byt 802.10 Virtual LAN, 10 Virtual LAN, 11 Hernet Protocol V User Datagram Froto LANforge Traffic Ge	192.168.0.30 193.168.0.30 tes on wire (12144 b) Etwayin cc5b:d3 (00 , PRI: 0, CFI: 0, ID: version 4, Src: 192.1 acol, Src Port: 33018 emerator 42.00 30 18 cc 5b c dc 79 90 40 60 40 14.80 f a 80 90 90 50	122.168.0.20 103.160 a Sa 153.1518 bytes captur 101.060.051.051.101 1010 60.030, bst: 192.168.6 , bst Port: 33017 13.01.00.03.f2	LANforge (112144 bits) JetwayIn_cc:5b 0.20	1518 Expedited Forwarding	Seg: 81	,
165 0.096231 165 0.096231 Frame 147: 1518 byt 802.10 Virtual LAN. 1802.10 Virtual CAN. User Datagram Froto User Datagram Froto User Datagram Froto 0000 00 30 19 cc 55 0000 00 30 19 cc 55 0000 00 45 bs 85 0000 00 01 a 2b 52 0000 00 01 a 2b 57 0000 00 00 1a 2b 57 0000 00 00 00 00 1a 2b 57 0000 00 00 00 00 00 00 00 00 00 00 00 0	192.168.0.30 193.168.0.30 tes on wire (12144 b) Etwayin (c:5b:d) (00 yersion 4, Src: 192.1 acol, Src Port: 31018 emerator d (2:00.30 18 cc 5b c d (c:70.90 0.00 40 0 d (c:70.90 0 d	132.168.0.20 103.160 4 20 103.160 4 20 103.160 4 20 103.181 5 20 101.0 5 20 6 0.30, 5 5 1 22.168.6 0 5 0 7 2 0.5 1 22.168.6 0 5 0 7 2 0.5 1 22.168.6 0 5 0 7 2 0.5 1 22.168.6 1 3 8 0 0 0 3 7 2 0.5 1 1 2 1 3 8 0 0 0 3 7 2 0.5 1 1 2 1 3 8 0 0 0 3 7 2 0.5 1 1 2 1 3 8 0 0 0 0 1 2 0.5 1 1 2 1 3 8 0 0 0 0 1 2 0.5 1 1 2 1 3 8 0 0 0 0 1 2 0.5 1 1 2 1 3 8 0 0 0 0 0 0 0 0 0 0 0.5 1 2 1 3 8 0 0 0 0 0 0 0 0 0 0 0.5 1 2 1 3 8 0 0 0 0 0 0 0 0 0 0 0 0.5 1 2 1 3 8 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	LANForge ed (12144 bits) JetwayIn_cc:5b 3.20 .0[y. @.@.9F 	1518 Expedited Forwarding	Seg: 81	•
165 0.096231 166 0.096231 Frame 147: 1518 byt 802.10 Virtual LAN, 10 V	192.168.0.30 193.168.0.30 tes on wire (12144 bi petwayin.cc:bid (00 , PRI: 0, CFI: 0, ID: persion 4, Src: 192.1 cccl, Src Port: 33018 emerator dc 70 90 40 00 40 14 40 51 48 07 95 55 15 81 10 2 e7 78 00 15 40 40 67 08 67 08 6	132.168.0.20 103.160 a sub 153.1518 bytes captur 303.186.cc350.33, bst: 1010 66.0.30, pst: 192.168.6 , bst Port: 33017 113.946 c0 a8 113.946 c0 a8 124.94 fa 00 00 125.05 for the sub	LANforge LANforge d (12144 bits) JetwayIn_cc:5b 3.20	1518 Expedited Forwarding	Seg: 81	
165 0.996231 166 0.996231 Frame 147: 1518 byt Bthernet 11, Src: J 802.10 Virtual LAN, Internet Protocol V User Datagram from file LANForge Traffic Ge 0000 00 30 18 cc 5b 0010 08 00 45 b8 05 0010 08 00 48 5a 7a 20 0040 00 48 5a 7a 20 0040 00 48 00 60 01 20	192.168.0.30 193.168.0.30 tes on wire (12144 b) Etwayin (c:5b:d) (00 yersion 4, Src: 192.1 acol, Src Port: 31018 emerator d (2:00.30 18 cc 5b c d (c:70.90 0.00 40 0 d (c:70.90 0 d	132.168.0.20 103.160 a sub 153.1518 bytes captur 303.186.cc350.33, bst: 1010 66.0.30, pst: 192.168.6 , bst Port: 33017 113.946 c0 a8 113.946 c0 a8 124.94 fa 00 00 125.05 for the sub	.0[.0[1518 Expedited Forwarding	Seg: 81	

WanLink Queue Discipline

Goal: Setup a WanLink with an alternate queue discipline. In this test scenario, the default WanLink queue discipline of FIFO (First In First Out) is replaced with WRR (Weighted Round Robin) to demonstrate how to setup queuing that will prioritize traffic flows based on IP ToS.

Note: WRR can only be used with User Mode WanLinks.

- 1. Setup a WanLink connection.
 - A. Go to the WanLinks tab and select Create.

LANforge Manager Version(5.3.7)
Control Reporting Tear-Off Info Elugins
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-10
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
())))))))))
All Marcola Table Table States
- All WanLink Endpoints
WPs Name Run Script Max Rate Tx Pkts Rx Pkts Tx Rate Tx Drop % Dropped Tx-Failed Failed-Late TX Bytes
u Logged in to: localhost:4002 as: Admin

- B. Enter the WanLink name, physical ports, base transfer rate, delay, jitter etc...
- These impairments will be applied to all traffic on the WanLink.

•	100Mbps-wan - Cr	ea	te/Modify WanLink			\odot \times
+ - All	<u>Apply</u>	к	Display WanLink & W	/anPat	hs	<u>C</u> ancel
Name: Presets:	WanLink Information 100Mbps-wan CUSTOM			•		
	Endpoint A		Endpoint B			
Port:	2 (eth2)	•	3 (eth3)	-		
Transfer Rate:	100M (100 Mbps)	•	100M (100 Mbps)	-		
Delay:	tiny (10 ms)	-	tiny (10 ms)	-		
Drop-Freq:	zero (0%)	-	zero (0%)	-		
Jitter:	zero (0 us)	•	zero (O us)	-		
Jitter-Freq:	zero (0%)	-	zero (0%)	-		

C. Select Apply to create the base WanLink.

For more information see LANforge-GUI User Guide: Creating & Modifying WanLinks

2. Setup WanLink for **User Mode**.

A. Select **All** to un-hide the other WanLink config panels.

0			100Mbps-wa	n - (Create	e/Modify W	anLink						\bigcirc	1
+ - All							Apply	QK	Display	y WanLink & Wa	anPaths	Car	ncel	
Name: Presets:	WanLink Information 100Mbps-wan CUSTOM			•		2		nLink Infor Pass-Thro Coupled-M	ugh	HW Pas				
Port:	Endpoint A 2 (eth2)	-	Endpoint B 3 (eth3)	-		Resource: Rpt Timer:		jetvay-f24				-		
Transfer Bate:	100M (100 Mbps)	-	100M (100 Mbps)	-		ripe niner.	fa		5)			-		
Delay:	tiny (10 ms)	•	tiny (10 ms)	-		Reorder-Fred		point A		Endpoint B ✓ zero (0%)		-		
Drop-Freq:	zero (0%)	-	zero (0%)	-		Dup-Frea:	zen	o (0%)		✓ zero (0%)		-		l
Jitter:	zero (O us)	-	zero (O us)	-		Drop Burst:	min]		nax 1	min 1	max 1			
Jitter-Freq:	zero (0%)	-	zero (0%)	-		Reorder Amt:	min]		тах 20	min 1	max 20			
								Scri	pt		Script			
0	Endpoint	AW	AN Paths					En	dpoint B W	AN Paths			_	
Cre	ate-WP Mo	dify	WP Delet	e-WP		Cre	eate-WP		Modify	-WP	Delete-	WP		
Name	Tx Rate Disabled !		Filter Pattern	C	elay	Name	Tx Rate	Disabled	1	Filter Patte	rn	Dela	iy	
Д.	WanLink Information							(Informati	on			4		
CPU-ID:	0			•	Test	Manager:	default	_tm			-			
	Endpoint A		Endpoint B				Endpoint	t A	E	Endpoint B				
	🗌 ICEcap Replay		🗌 ICEcap Replay				🔲 Dump	Packets		Dump Packet	s			
Replay File:		-		-	Dum	p File:								
	Dir						Force	Packet Ga	ap [Force Packet	Gap			
	Loop Replay		Loop Replay				Drop-	Xth		Drop-Xth				
							Reord	ler-Xth		Reorder-Xth				-

B. In panel 2, un-check the Kernel-Mode box.

			100Mbps-w	an -	Creat	e/Modify W	anLink							0	$\mathbf{v} \otimes \mathbf{v}$
+ - All							Apply	Qk		Displa	y War	nLink & Wa	anPaths	<u> </u>	ancel
Name: Presets:	WanLink Information 100Mbps-wan CUSTOM			•		2		anLink In Pass-Th Couple	nroug	jh		HW Pas	s-Throug 1ode	n	
Port:	Endpoint A 2 (eth2)	-	Endpoint B 3 (eth3)	-]	Resource: Rpt Timer:	- E	(jetway- ast (f24) (1 s)		_			•	
Transfer Rate: Delay: Drop-Freg:	100M (100 Mbps) tiny (10 ms) zero (0%)	• •	100M (100 Mbps) tiny (10 ms) zero (0%)			Reorder-Fre	a: ze	dpoint A ro (0%)			▼ Z	ndpoint B ero (0%)			
Jitter: litter-Freq:	zero (0 us) zero (0%)	•	zero (0 us) zero (0%)			Dup-Freq: Drop Burst:	min		-	1		ero (0%)	max 1	•	
					,	Reorder Amt	: min	I	Script	20		a 1	script]
8 Cre	Endpoint ate-WP Mo	A W dify-		te-WF		Cr	eate-WF		Endp	oint B V Modify		aths	Delet	e-WP	
Name	Tx Rate Disabled !		Filter Pattern		Delay	Name	Tx Rat			!	F	ilter Patte	em	De	elay =
CRU-ID:	WanLink Information			-	Tes	t Manager:	WanLi defau	nk Inform ilt_tm	atior	1				-	
	Endpoint A		Endpoint B				Endpo	nt A Ip Packet	ts		Endpo	oint B mp Packe	ts		
Replay File:	Dir Loop Replay	-	Dir Loop Replay	-	Dur	np File:	Dro	e Packet o-Xth rder-Xth	: Gap	(Dro	rce Packet op-Xth order-Xth	: Gap		

C. Select Apply to change the WanLink.

For more information see LANforge-GUI User Guide: Creating & Modifying WanLinks

- 3. Demonstrate the FIFO Queue Discipline.
 - A. Start the WanLink, then run traffic through LANforge-ICE ports eth2 and eth3.
 - Here we are using LANforge-FIRE on a secondary resource to over-subscribe the 100Mbps WanLink with five 30Mbps traffic flows each with a different IP ToS value set to show that the FIFO WanLink ignores the ToS bits by treating all packets equally and processing them in the order they enter the queue.

				Nforge Mar	ager Version(5	.3.7)			\odot
ontrol <u>R</u> eporting	Tear-0	ff <u>I</u> nfo <u>P</u> lu	igins						
					Stop All	Restart Ma	nager	Refr	resh HE
Layer-4 Generic	Test	Mar Test	Group Res	source Mgr	Event Log Alerts	Port Mgr VA	P Stations	Messages	
Status Laye		L3 Endps	VoIP/RT			Armageddon	WanLinks	Attenuat	ors File-
Rpt Time	er: fast	(1 s)	▼ Go Tes	st Manager a	all 🔽	Select All S	tart <u>S</u> top	Quiesce	Clear
View	0 - 50	00		🔻 Go		Display	Cr <u>e</u> ate M	o <u>d</u> ify Dele	te
				Cross Conne	cts for Selected Tes	t Manager			
Name	Туре	State	Pkt Rx A	Pkt Rx B	Bps Rx A	Bps Rx B	Rx Drop % A	Rx Drop % B	Drop Pkts A D
dp-001-ToS-0	LF/UDP	Stopped	0	0	0	C	0	0	0
dp-002-ToS-64	LF/UDP	Stopped	0	0	0	C	0	0	0
dp-003-ToS-96	LF/UDP	Stopped	0	0	0	C	0	0	0
dp-004-ToS-128	LF/UDP	Stopped	0	0	0	C	0	0	0
Jdp-005-ToS-192	LF/UDP	Stopped	0	0	0	C	0	0	0
.ogged in to: loca	lhost:40	02 as: Adr	nin						

B. The dropped packet percentages show that even with a high value ToS, no priority is observed.

			LA	Nforge Mar	nager Version(5.3.7)			$\overline{\mathbf{v}}$	\bigcirc
<u>Control</u> <u>Reporting</u>	Tear-0	ff <u>I</u> nfo <u>P</u> lu	igins							
					Stop All	Restart Ma	nager	Re	fresh	HELP
					ocop / a	Hostart Ha	lager	110		
Layer-4 Generic	c Test	Mgr Test	Group Res	source Mgr	Event Log Alert	s Port Mgr VA	P Stations	Messages		
Status Lay	er-3	L3 Endps	VoIP/RTI	P VolP	/RTP Endps	Armageddon	WanLinks	Attenua	tors Fil	e-IO
	_							1		
Rpt Time	er: fast	(1 s)	Go Tes	st Manager a	ill 🔽	Select All St	art <u>S</u> top	Quiesce	Clear	
View	0 - 50	00	✓ Go Display				ay Cr <u>e</u> ate Mo <u>d</u> ify Delete			
				Cross Conne	cts for Selected Te	st Manager				
Name	Туре	State	Pkt Rx A	Pkt Rx B	Bps Rx A	Bps Rx B	Py Drop % /	Rx Drop % B		Dro
Name	Type	Juace	T KCINA A	T KCTO D	bps for A	bps for b	To brop 70 A		Diopikts A	Dio
udp-001-ToS-0	LF/UDP	Run	30,986	29,019	24,731,675	23,640,798	15.753	15.913	5,794	
dp-002-ToS-64	LF/UDP		31,203	32,229	25,341,139		4.697		1,733	
idp-003-ToS-96	LF/UDP		24,693	26,359	20,052,738					
udp-004-ToS-128	LF/UDP		18,211	18,788	14,787,804				14,714	
udp-005-ToS-192	LF/UDP	Run	16,050	14,245	12,948,194	11,490,452	49.169	61.644	18,261	
	LF/UDP		16.050	14.245	12,948,194				18,261	
مgged in to: اoca	albest: 40	02.00.44	<u> </u>							

For more information see LANforge-GUI User Guide: Layer-3 Cross-Connects

- 4. Change the WanLink queue discipline to WRR.
 - A. Select the **Stop All** button to stop all connections, then **Modify** the WanLink.

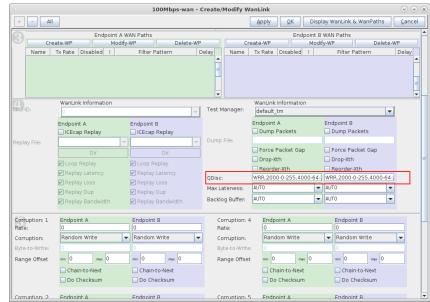
LANforge Manager Version(5.3.7)	\odot \otimes \otimes
Control Reporting Tear-Off Info Plugins	
Stop All Restart Manager F	Refresh HELP
Layer-4 Generic Test Mgr Test Group Resource Mgr Event Log Alerts Port Mgr vAP Stations Messages Status Layer-3 L3 Endps VolP/RTP VolP/RTP Armageddon WanLinks Atten	uators File-IO
Rpt Timer: fast (1 s) 🔻 Go Test Manager all 💌 Select All Start Switch Stop	Clear
Hide Stopped Display Create Modify Batch Mod	lify Delete
	Rx A Rpt Timer
100Mbps-wan 6.32 Stopped 100Mbps-wan-A < 1,652,866 1,652,224 100,000,000 100	0,000,000 1,000
4	
All WanLink Endpoints	
WPs Name Run Script Max Rate Tx Pkts Rx Pkts Tx Rate Tx Drop % Dropped Tx-Failed Fa	ailed-Late TX Bytes
+ 100Mbps-w None 100,0000 1,652,224 2,542,720 98,956,507 35.085 889,687 0	0 2,501,42
+ 100Mbps-w None 100,000,000 1,652,866 2,539,975 98,953,254 35.062 887,592 0	0 2,502,38
	Þ
Logged in to: localhost:4002 as: Admin	

B. In panel 4, change the **QDisc** field to the following string:

WRR,2000-0-255,4000-64-255,8000-96-255,16000-128-255,32000-192-255 for both Endpoint-A and Endpoint-B.

The WRR string format is weight-ToS-mask where higher weights are given higher priority to packets matching the ToS and bit mask.

Note: Minimum weighting should be equal to or greater than your MTU.



C. Select \mathbf{OK} to apply changes to the WanLink and close the modify window.

For more information see LANforge-GUI User Guide: Creating & Modifying WanLinks

- 5. Demonstrate the WRR Queue Discipline.
 - A. Run the WanLink and the same five UDP traffic flows through LANforge-ICE ports eth2 and eth3.

0				LA	Nforge Ma	nager Ve	ersion(5.3	3.7)				\odot \otimes \times
Control Re	porting	Tear	-Off <u>I</u> nfo <u>P</u>	lugins								
						Sto	p All	Restart	Manager		Refresh	HELP
Layer-4 (Status	Generic Laye		t Mgr Te L3 Endp		source Mgr P Voli	Event Log P/RTP Endps		Port Mgr nageddon	vAP Stations WanLink		es enuators	File-I0
Rpt T	limer: f	ast	(1 s)	▼ Go Test M	anager all	-		Select All		witch <u>S</u> to]
				🗌 Hide St	opped		Dis	play Cr <u>e</u> a	te Mo <u>d</u> ify	Batch M	odify De	lete
						for Selecte	d Test Mar	nager — —				
Name			-M Sta		oints (A ↔ B)		→B P	kt Tx A ← B	Bps Rx		ps Rx A	Rpt Timer
100Mbps-w	an 6	.32	Run	100Mbp	os-wan-A <		0	(100,00	0,000 1	00,000,000	1,000
•						m						
					Δ	ll WanLink E	ndnoints —					
WPs N	Name	Run	Script	Max Rate	Tx Pkts	Rx Pkts	Tx Rate	Tx Drop %	Dropped	Tx-Failed	Failed-Late	TX Bytes
	1bps-w		None	100,000,000	0	0	0		0	0	0	0
+ 100M	1bps-w		None	100,000,000	0	0	0	0	0	0	0	0
•												•
Logged in t	o: local	host:4	1002 as: A	dmin								

B. This time, the higher valued ToS UDP flows are experiencing less drops due to the WRR priorities setup in the WanLink.

			LA	Nforge Mai	nager Version(5.3.7)			\bigcirc	\bigcirc
ontrol <u>R</u> eporting	Tear-O	ff <u>I</u> nfo <u>P</u> lu	igins							
					Stop All	Restart Mai	nager	Re	resh	HELP
Layer-4 Generic Status Lay	c Test er-3	Mgr Test L3 Endps	Group Res	source Mgr	Event Log Alert	s Port Mgr VAI Armageddon	P Stations WanLinks	Messages Attenua	tere Fil	e-IO
Status Lay	er-3	L3 Endps	VOIP/KI	r Voir	TRIP Endps	Annageddon	wantlinks	Attenua		e-10
Rpt Tim	er: fast	(1 s)	▼ Go Tes	st Manager	all 🔻	Select All St	art <u>S</u> top	Quiesce	Clear	
View	0 - 50	00		🔻 Go		Display	Cr <u>e</u> ate M	o <u>d</u> ify Dele	ete	
				Cross Conne	cts for Selected Te	st Manager				
Name	Туре	State	Pkt Rx A	Pkt Rx B	Bps Rx A	Bps Rx B	Rx Drop % A	Rx Drop % B	Drop Pkts A	Dro
udp-001-ToS-0	LF/UDP	Run	5,785	3,705	6,763,717	4,331,818	66.944	84.413	17,056	
udp-002-ToS-64	LF/UDP		38,161	41,833	13,897,326				41,741	
idp-003-ToS-96	LF/UDP		43,067	34,538	15,736,044				36,468	
udp-004-ToS-128	LF/UDP		80,270	62,238	25,151,921				10,152	
udp-005-ToS-192	LF/UDP	Run	104,400	77,234	32,449,505	24,003,895	0	15.729	0	
		,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,								

For more information see LANforge-GUI User Guide: Layer-3 Cross-Connects

WiFi: Gaming Test: video demonstration

Goal: Learn about how to combine the WAN emulation and programmable attenuation to emulate different network environments for game consoles.

Watch a demonstration of how to modify the gaming experience using WAN links to drop packets and combining that with attenuating the wifi signal in an isolation chamber. This scenario requires LANforge version 5.3.9, two isolation chambers, one or more programmable attenuators a DUT and three mesh AP nodes.



WiFi Gaming Test demonstration

Using Custom DNS on LANforge with DNSmasq

Goal: Create a nameserver for your test network when no Internet access is available.

Isolated testbeds still regularly require their DUTs to resolve hostnames. The dnsmasq package on Linux provides this feature. Requires release 5.4.6 or later.

Role of dnsmasq and how to combine it with Virtual Routers

The dnsmasq service provides BOTH DHCP and DNS services.

¹ If the **dhcp-range** directive is present in the **/etc/dnsmasq.conf** file, then it will respond to DHCP requests.

This setting is NOT governed by the *Netsmith -> Virtual Router -> Modify -> DCHP*setting. You can accidentally leave DNSmasq running in DHCP serving mode and use Chamber View test scenarios that also create a new DHCP service in a virtual router. LANforge does not track the status of DNSmasq like it does the *dhcpd* process it starts in a virtual router. You can end up running two DHCP services if you are not careful

The two modes you would configure are:

- **DNS mode** and use virtual routers for DHCP. Configure the DNS entry of the virtual router to let clients see the nameserver entry.
- DNS and DHCP mode and never use the DHCP option of the virtual router.

We suggest configuring DNSmasq in a DNS-only mode most of the time.

Typical Port Setup

If you are crafting a test scenario where you are providing DHCP as an upstream port, create a Virtual Router and drag your upstream port into it. You will probably want a static IP on the port. For this example, we will use eth1 with address 10.45.0.1.

- Right-click the port and select Modify
- In the Create/Modify Connection window:
 - Select DHCP
 - Configure DHCP DNS to be the IP of the port (10.45.0.1)

Enable the DNS service on the port

• Open the Port modify window by either double-clicking on the row in the Port Mgrtab or selecting

the Modify Port option from the Netsmith right-click menu.

- At the lower left of the window, in the Services box, select DNS.
- Click OK.

You have now enabled DHCP in the virtual router.

Configure DNSmasq

The /etc/dnsmasq.conf file controls the behavior of the DNSmasq service. The configuration below will serve entries out of /etc/hosts. This example is configured to run on interface **eth1**.

/etc/dnsmasq.conf

Hosts file /etc/hosts

Running DNSmasq:

- Check for configuration errors using dnsmasq --test.
- Restart DNSmasq to apply changes: sudo systemctl restart dnsmasq.service.

Creating GRE Tunnels on LANforge

Goal: create a GRE port and send traffic through it.

Overview of GRE

GRE stands for Generic Routing Encapsulation. This is an unencrypted manner of nesting packets destined for a separate network. GRE tunnelling is intended to construct overlay networks without the computational burden of encryption. The GRE client needs to know the local IP it will bind to, and the remote IP of its peer providing GRE access.

In LANforge, GRE ports are treated as any other VLAN ports, such as MAC-VLANs or QVLANs, but they are a Layer 3 device: they do not have MAC addresses. These GRE tunnels expect an already existing port with an IP.

▲ This cookbook purposely avoids the phrase *GRE endpoint* because LANforge refers to *endpoints* in the context of traffic connections (Layer 3 or Layer 4-7 *endpoints*).

Example

- The client gains a normal DHCP lease and is granted 192.168.0.234/24.
- A GRE provider is at the DHCP server address: 192.168.0.1.
- The client creates a GRE instance with the outer tunnel IPs 192.168.0.234 and 192.168.0.1.
- The client sets an overlay address of 10.0.0.5/24 on the GRE port.
- The client may then send tunneled traffic into the 10.0.0.0/24 network.

GRE Driver Devices

- () When the GRE kernel module is loaded, you will see three GRE devices:
- gre0
- gretap0
- erspan0

Creating a GRE port

- 1. In the LANforge Manager -> Port Mgr tab, click the Create button.
- 2. Select GRE tunnel.
- 3. Enter the local IP of an existing port on the LANforge (EG 10.40.0.100)
- 4. Enter the remote IP of the port acting as a GRE gateway (EG 10.40.0.1)
- 5. (Optional) Enter the overlay IP for the GRE port in the IP Address field. (EG 10.39.0.100/24)

It is possible to create multiple GRE ports. Those port names should be different though.

Sending Traffic over GRE

To send traffic over GRE ports, the GRE port must be selected as an endpoint of a connection. It is not valid to select the associated local port to send traffic from (it would be coming from the wrong network).

Layer 4-7 Traffic

- 1. In the LANforge Manager -> Layer 4-7 tab, click the Create button.
- 2. Select the source port (EG 1.1.07 gre0)

3. Add the URL to query (EG http://10.39.0.1/)

See more in the Layer 4-7 Cookbook.

Layer 3 Traffic

Layer 3 traffic is possible so long as you have two different ports to transmit to. These could both be GRE tunnel ports with different IPs, or one GRE tunnel port and one upstream port on the overlay network itself. Please see: Generating Traffic to a Switch.

Linux Commands

For some versions of LANforge, the GUI might not create the GRE tunnel that you want, and you will want to alter the details of the GRE port. When restoring a test configuration from the *Status tab->Saved Test Configurations->Configuration* dropdown, the IPs of the tunnel might be missing.

To perform these commands, you will required to open a terminal on the LANforge and become root:

1. Click on the MATE Terminal icon in the toolbar

```
2. Use the command: sudo -s Enter
```

Listing GRE details

• Show the tunnel IPs: ip link show gre0

```
[root@ct522-jedway3 lanforge]# ip tunnel show
gre0: gre/ip remote any local any ttl inherit nopmtudisc
gre2p0001: gre/ip remote 10.40.0.239 local 10.40.0.2 ttl 255
```

• Show the tunnel overlay IP: ip addr show gre0

```
[root@ct522-jedway3 lanforge]# ip addr show gre0
55: gre0@NONE: <NOARP> mtu 1476 qdisc noop state DOWN group default qlen 1000
link/gre 0.0.0 brd 0.0.0.0
[root@ct522-jedway3 lanforge]# ip addr show gre2p0001
58: gre2p0001@NONE: <POINTOPOINT,MULTICAST,NOARP,UP,LOWER_UP> mtu 1476 qdisc noqueue master vrf10001 state UNKNOWN gr
link/gre 10.40.0.2 peer 10.40.0.239
inet 10.39.0.2/32 scope global gre2p0001
valid_lft forever preferred_lft forever
inet6 fe80::a28:2/64 scope link
valid_lft forever preferred_lft forever
```

Changing the IPs

To change the **overlay IP** you will first add a new IP and then delete the old IP (if necessary). You might find that the IPs are missing when the tunnel is restored from a saved configuration.

```
ip addr add 10.39.0.123/24 dev gre0
ip addr del 10.39.0.100/24 dev gre0
```

To change the tunnel IPs: ip tunnel change gre0 local 10.40.0.111 remove 10.40.0.2

Deleting the GRE tunnel

If you wish to delete all the GRE tunnels, it involves unloading the *ip_gre* kernel module. Just removing the module is insufficient because LANforge will attempt to re-load the module any time it finds a GRE referenced in a saved scenario.

- ▲ This GRE tunnel then might show up in a scenario inadvertently when switching to a new scenario.
- (Optional) If you want save the scenario with the GRE tunnel, Use the Status tab->Saved Test Configurations->Save DB Name and click the Save button.
- 2. Open a terminal, because root with sudo -s
- 3. Stop the LANforge service: cd /home/lanforge; ./serverctl.bash stop
- 4. Erase the present database: rm -f /home/lanforge/DB/DFLT/*
- 5. Remove the modules: rmmod ip_gre gre
- 6. Start the LANforge service: ./systemctl.bash start

You might have to connect the GUI again. You will notice that this starts LANforge with a blank database. Use the *Status tab->Saved Test Configurations->Configuration* dropdown to load a previous scenario.

Adding a GRE Tunnel Port

These are the commands for adding a tunnel:

```
ip tunnel add grel001 mode gre local 10.40.0.100 remote 10.40.0.1
ip link set up dev grel001
ip addr add 10.39.0.100/24 dev grel001
```

Sniffing a Tunnel

GRE ports can be sniffed with Wireshark or *tcpdump*, and can be performed on the GRE port or the port with the local ip. Examples of **tcpdump** commands:

• On the GRE port: tcpdump -ni gre0

• On the local port: tcpdump -ni ethl proto gre or icmp

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