

## 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 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

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



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

0			Create VLAN	ls on Port:				$\odot$ $\land$ $\times$
0	○ MAC-VLAN ○ WiFi STA	<ul> <li>○ 802.1Q-VLAN</li> <li>○ Re</li> <li>○ WiFi VAP</li> <li>○ WiFi Mon</li> </ul>	direct 💿 Bridge itor 🔾 WiFi Virtua	O Bond al Radio	) GRE Tun	nel		
0	Shelf:	1	Resource:	l (jw2)	-	Port: 1	(ethl)	-
B	VLAN ID: Parent MAC:	00: 30:18: cb: b8: 07	DHCP-IPv4	None	<b></b>			
	MAC Addr:	>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>	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							
	Appl	<u>C</u> ancel			Re	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		sw-0 (lf035	0-10ac) Configu	re Settings			$\odot$	×		
		Current: LINK-U Driver Info: Port T	Port Status Inform IP PROBE-ERROR TS ype: Bridge Drive	ation 50 UFO GSO GRO r: bridge(2.3) Bus: N/A	\$			•		
			Port Configurab	les						
Enable General Interface Settings										
Set IF Down	Down	Aux-Mgt		Aging Time:	300	-				
Set MAC	DHCP-IPv6	DHCP Release	DHCP Vendor ID:	None	Bridge Priority:	32768	-			
Set IX 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:	3a:2c:3a:e3:43:85	TX Q Len	1000				=		
	Rpt Timer:	medium (8 s) 🔻	WiFi Bridge:	NONE						
Services	Bric Configured P rddVR1 rddVR3	ige Information — orts Current Port	s Add	Ports						
4	Print View	Details Pr		Apply OK	Cancel	]				

- 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

0			Create VLANs o	on Port: 1.1.34		$\odot$ $\otimes$ $\times$
0	O MAC-VLAN O WIFI STA	○ 802.1Q-VLAN	direct 🔾 Bridge itor 🔾 WiFi Virtu	⊖ Bond ⊂ GRE Tu al Radio	unnel	
0	Shelf:	1	Resource:	1 (jw2) 🔻	Port: 3	4 (sw-0) 💌
B	VLAN ID:		DHCP-IPv4		_	
	Parent MAC:	9e:2f:cc:39:a8:ce	DHCP Client ID:	None		
	MAC Addr:	>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>	IP Address:		Global IPv6:	
	Quantity:		IP Mask or Bits:		Link IPv6:	
			Gateway IP:		IPv6 GW:	
	#1 Redir Name:	rddA	#2 Redir Name:	rddB	J	
	STA ID:		SSID:			-
	WIFI AP:		Key/Phrase:			
	WPA	WPA2	WEP			5
4	Down					
	Apply	<u>C</u> ancel		F	Ready	

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

•	sw-0 (lf0350-10ac) Configure Settings 📀 📀								
		Current: LINK-U Driver Info: Port T	IP PROBE-ERROR T ype: Bridge Drive	50 UFO GSO GRO r: bridge(2.3) Bus: N/A					
			Port Configurab	les	N				
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 MIU	DNS Servers:	BLANK	Peer IP:	NA	Hello Time:	2	-		
Set Bridge Info	IP Address:	0.0.0.0	Global IPv6:	AUTO	Forwarding Delay:	15	-		
Jet bridge mild	IP Mask:	0.0.0.0	Link IPv6:	AUTO					
	Gateway IP:	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			=		
	Brid	dge Information	Rem	ove Ports					
Services —	rddVR1	rddVR1	s Add	Ports					
	rddVR3	rddVR3		T OILS					
	radA								
	Print <u>V</u> iew	Details P	robe Sync	Apply <u>O</u> K	Cancel		-		
•				L					

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	on Port: 1.1.18			$\bigcirc$ $\land$ $\times$
0	● MAC-VLAN ○ WiFi STA	○ 802.1Q-VLAN ○ Re ○ WiFi VAP ○ WiFi Moni	direct 🔾 Bridge itor 🔾 WiFi Virtu	○ Bond ○ GRE Tui ial Radio	nnel	\$	
0	Shelf:	1	Resource:	1 (lf0350-10ac) 🔻	Port: 18	(rddB)	-
6	VLAN ID:		DHCP-IPv4				
<b>1</b>	Parent MAC:	62:bb:1e:2b:7f:ab	DHCP Client ID:	None			
	MAC Addr:	XX:XX:XX:*:*:XX	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	Cancel		R	eady		

- 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 - Create/Modify Cross Connect 📀 🔗 🛞										
+ - All			R	Display Sync Batch-Create Apply OK						
CX Name: CX Type:	Cross-Connect  cx-01  LANforge / UDP		~ 	Report Timer:	Endpoint B	-				
	Endpoint A		Endpoint B	Pld Pattern	increasing	•	increasing	-		
Resource:	1 (lf0350-10ac)	-	1 (lf0350-10ac)	Min IP Port:	AUTO	•	AUTO	-		
Port:	43 (rddB#0)	-	48 (rddD#0)	Max IP Port:	Same	-	Same	-		
Min Tx Rate:	ISDN (128 Kbps)	-	ISDN (128 Kbps) V	Min Duration:	Forever	-	Forever	-		
Max Tx Rate:	Same	-	Same	Max Duration:	Same	-	Same	-		
Min PDU Size:	UDP Pld (1,472 B)	-	UDP Pld (1,472 B) 🔻	Min Reconn:	0 (0 ms)	-	0 (0 ms)	-		
Max PDU Size:	Same	-	Same 💌	Max Reconn:	Same		Same	-		
IP ToS:	Best Effort (0)	-	Best Effort (0) 🔽	Multi-Conn:	Normal (0)	-	Normal (0)	-		
Pkts To Send:	Infinite	-	Infinite 💌		Script		Script			
					Thresholds		Thresholds			

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.

0				LANforge M	lanager Versio	n(5.3.7)				$\odot$ $\land$ $\times$		
Control Reporting Tear-Off Info Plugins												
					Stop All	Restart	Manager		Refresh	HELP		
Laver-4 Ger	Laver-4 Generic Test Mar Test Group Resource Mar Event Log Alerts Port Mar VAP Stations Messages											
Status	Status Laver-3 L3 Endps / VolP/RTP / VolP/RTP Endps / Armageddon / WanLinks / Attenuators / File-10											
Status Layers Comment and Status Antigedulin Waitelines Attendators Priedo												
Rpt Timer: fast (1 s) 🗸 Go Test Manager all 🗸 Select All Start Stop Quiesce Clear												
View	v O	- 500		🔻 Go		Display	Cr <u>e</u> ate	Mo <u>d</u> ify	Delete			
				-Cross Con	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 Pkt										Drop Pkt:		
cx-01	LE/UDP	Run	330	330	127,755	127,755	0	0	0			
cx-02	LE/UDP	Bun	331	323	127,731	127,600	0	0	0			
cx-03	LE/UDP	Run	323	325	127,592	127,522	0	0	0			
cx-04	LF/UDP	Run	327	328	127.885	127.847	0	0	0			
cx-05	LF/UDP	Run	328	328	127.851	127.851	0	0	0			
cx-06	LF/UDP	Run	328	328	127,855	127,851	0	0	0			
сх-07	LF/UDP	Run	329	329	127,645	127,645	0	0	0			
сх-08	LF/UDP	Run	329	329	127,645	127,641	0	0	0			
cx-09	LF/UDP	Run	329	330	127,645	127,785	0	0	0			
сх-10	LF/UDP	Run	330	330	127,789	127,789	0	0	0			
сх-11	LF/UDP	Run	330	330	127,789	127,789	0	0	0			
сх-12	LF/UDP	Run	330	330	127,793	127,793	0	0	0			
cx-13	LF/UDP	Run	330	330	127,797	127,793	0	0	0			
cx-14	LF/UDP	Run	330	330	127,793	127,793	0	0	0			
сх-15	LF/UDP	Run	330	330	127,797	127,797	0	0	0			
										1.1		
Logged in to:	192.168.	100.103:40	02 as: Admir	1								

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 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

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