

Install LANforge on ESXi Server (Version 8)

Goal: Install LANforge on an ESXI Server, and confirm DHCP can be served over VLANs.

In this test scenario, we use a system compatible with ESXi version 8. ESXi version 8 can run 2 lanforge VMs on 2 different VLANs, host DHCP on one VLAN, and acquire DHCP leases on the other VLAN through a WANlink. This outlines expected behavior and uses cases for VLANs and WANlinks between LANforge and ESXi version 8. Requires LANforge version 5.3.5 or higher.

- 1. Configuring ESXi Server ver. 8.02
 - A. This scenario was built upon ESXi 8.02 build 23305546, using a CT-525 with a 4 port 1g nic as well as an accompanying TPLink SG105E Smart Switch.
 - B. Log into TPLink SG105E 5 port Smart Switch (usually defaults to 192.168.0.1). Assign ports 2 and 3 to a VLAN, name 8 with ID 8. Assign ports 4 and 5 to a VLAN, name 9 with ID 9. Port 1 will be the assigned trunk port.
 - C. In ESXi, create 3 vSwitches. vSwitch0, vSwitch8, vSwitch9. vSwitch0 should have been created and configured by default as the management switch. vSwtich8 connects to ports 1 and 2 on the host port, this corresponds to vmnic8 and vmnic9. vSwtich9 connects to ports 3 and 4 on the host port, which corresponds to vmnic 10 and 11. Vmnic numbers may vary.
 - D. vSwitch0

avigator «	Switch0									
Host										
Manage	+ VSwitch Details	1500					+ vSwitch top	Joiogy		
Monitor	MIU	1500					S VM Net	work	Physical adapte	ers
Virtual Machines 2	Ports	4850 (4820 available)					VLAN ID:	0	T S. vmnic3	
p v-f34-v4	Link discovery	Listen / Cisco discovery prof	tocol (CDP)				Virtual Ma	achines (2)	🖕 🙀 vmnic2 , 1000	Mbps, Full
Monitor	Attached VMs	2 (1 active)					0 v-13	4-v3	to, vmnici	
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itorage 2	Notify switches Yes						ment Network			
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0 v-f34-sd1	Reverse policy	Yes	Yes				ta, vmł	<0: 192.168.98.163		
More storage	Failback	Yes								
Networking 4	+ Security policy									
ySwitch8	Allow promiscuous mode	No								
ySwitch0	Allow forged transmits	No								
ā, vmnic2	Allow MAC changes	No								
ā, vmnic7	* Shaping policy									
ā, vmnic1	Enabled	No								
More networks										
	Recent tasks									
	Task	~ Target	~	Initiator	~	Queued	~	Started	✓ Result ▲	Completed *
	Power On VM	🛱 v-f34-v3		root		12/12/2023 0	9:47:32	12/12/2023 09:47:32	Failed - The attempted operation cannot be per	12/12/2023 09:47:32
	Power On VM	n v-134-v3		root		12/12/2023 03	7:29:09	12/12/2023 07:29:09	Completed successfully	12/12/2023 07:29:10

E. vSwitch8

vigator 《	Switch8							
Host								
fanage	+ vSwitch Details				- vSwitch top	pology		
tonitor	MTU	1500			0.10.000			
Irtual Machines	Ports	4850 (4820 available)			VIANUE			Albert Fall
v-f34-v4	Link discovery	Listen / Cisco discovery protocol (CDP)		Virtual Ma	achines (2)		
Monitor	Attached VMs	2 (1 active)			🛱 v-f3	4-v3		
v-f34-v3	Beacon Interval	1			0 v-13 MAC	4-v4 Address 00:0c:29:aa:7b:80		
Monitor	- NIC teaming policy							
More VMs	Notify switches	Ver						
orage 2	Delies	Doute based on existenting part IS	<u>_</u>					
t10.ATAADAT_	Policy Devices and a	Note based on originating port to	Route based on originating port ID					
v-f34-sd1 More storage	Reverse policy	res						
atworking	Failback	Yes						
vSwitch9	- Security policy							
vSwitch8	Allow promiscuous mode	Yes						
vSwitchO	Allow forged transmits	Yes						
vmnic2	Allow MAC changes	Yes						
vmnlc7	- Shaping policy							
vmnic1	Enabled	No						
More networks	-							
	Recent tasks							
	Task	 Target 	 Initiator 	Queued	~	Started	✓ Result ▲	Completed ¥
	Power On VM	🛱 v-f34-v3	root	12/12/2023 09:>	47:32	12/12/2023 09:47:32	Failed - The attempted operation cannot be per	12/12/2023 09:47:32
	Power On VM	🛱 v-f34-v3	root	12/12/2023 07:2	29:09	12/12/2023 07:29:09	Completed successfully	12/12/2023 07:29:10

F. vSwitch9

Navigator «	Switch9							
Host								
Manage	 vSwitch Details 				+ vSwitch top	ology		
Monitor	MTU	1500			(A) VI AND		Biburical adap	torr
Virtual Machines	Ports	4850 (4820 available)			VLANID	9		CO Mixed Full
a v-134-v4	Link discovery	Listen / Cisco discovery proto	col (CDP)		Virtual Ma	ichines (2)		
Monitor	Attached VMs	2 (1 active)			@v-f34	4-v3		
0 v-f34-v3	Beacon interval	1			00 v-134 MAC	1+v4 Address 00:0c:29:aa:7b:8a		
Monitor	- NIC teaming policy							
More VMs	Notify switches	Yes						
Storage	Policy	Poute based on origination of	ort ID					
C t10.ATAADAT_	Pewerre policy	Ver	01110					
Wore storage	Reverse policy	Tes						
Networking	Failback	Yes						
🔜 vSwitch9	- Security policy							
Switch8	Allow promiscuous mode	Yes						
Switch0	Allow forged transmits	Yes						
b, vmnic2	Allow MAC changes	Yes						
0, vmnic7	 Shaping policy 							
ti vmnic1	Enabled	No						
More networks								
	Precent tasks							
	Task	~ Target	~ Initiator	~ Queued	~	Started	✓ Result ▲	✓ Completed ▼
	Power On VM	🔂 v+f34+v3	root	12/12/2023 09	.47:32	12/12/2023 09:47:32	Failed - The attempted operation cannot be per.	12/12/2023 09:47:32
	Power On VM	G v-r34-v3	root	12/12/2023 07:	29:09	12/12/2023 07:29:09	Completed successfully	12/12/2023 07:29:10

G. Next, create 2 port groups. First port group named VLAN8 with an ID of 8, assign vSwitch8 to it, inherit all settings from vSwitch8.

vm ESXi Host Client			
Navigator Navigator Nasage Monitor Monitor Monitor Monitor Monitor Monitor Monitor Monitor Monitor	VLANB Cations VEXTURE Creatings VEXTURE Yes Virtual machines: 2 Virtual machines: 2 Virtual machines: 2 Virtual machines: 3 Active ports: 1		
Storage Storage UntATAADAT_ UntATAADAT_ UntATAADAT_ Storage St	vSwitch topology VLANG VLANG Victal adapters Victadapters Victal adapters Vi	Security policy Allow promissicus mode Y Not approximation of the security of the	es
	⑦ Recent tasks Task ∨ Target ∨ Initiator ∨ Ourcued	v Started ∨ R	c) esult ▲ v Completed ▼ v

H. Create another port group named VLAN9, with an ID of 9, assign vSiwtch9 to it as well, inherit all settings from vSwitch9.

vm ESXi Host Client					root@192.168.98.163 • Help • Q	Search
Ravigator ≪ Intest Manage Monitor V B Vr84.v4 2 Worktv4 2 Worktv5 2 V Vr84.v4 2	VLAN9 Edit settings C Refresh VLAN9 VLAN9 Accessible: Virtual machines: Virtual switch: VICAN ID: Active ports:	Yes 2 Www.tch9 9				
Storage Storage Storage Storage Storage Storage More storage. More storage. More storage Stor	v vSwitch topology VLAN 0: 9 VLAN 0: 9 VLAN 10: 9 Virtual Machiner (2) Wincl Matchiner (2) Mac Address 00:0:-29 as 7b;8		ि, Physical adapters ित, vmnicti0 , 1000 Meps, Full	Security policy Allow promiscuous model Allow forged transmits Allow MAC changes Nict teaming policy Notify switches Policy Reverse policy Failback Shaping policy Enabled	Yes Yes Yes Yes Route based on originating port ID Yes Yes	
	Recent tasks Task	v Target	v Initiator v Queued	∼ Started	v Result ▲ v Comp	⊆ oleted ▼ ∽

I. Create a LANforge VM.

vm ESXi Host Client										
ি Navigator ≪	🛱 v-134-v3									
V 🗄 Host Manage	🛄 Console 🛛 Monitor 🕨 F	ower on Over off	🛿 Suspend 🏾 🎝	Reset	🖋 Edit	C Refres	ih 🍄 Actions		Í	
Monitor		v-f34-v3 Guest OS Compatibility VMware Tools CPUs Memory	Red Hat Fedora (64 ESXi 8.0 U2 virtual r No 4 16 GB	bit) nachine				······	CPU 336 MHz MEMORY 3.49 GB STORAGE 256.08 GB	
√⊜ Storage 2	- General Information					+ Hardware 0	Configuration			
tto.ataADAT_	> 👲 Networking		> 🔘 CPU					4 vCPUs		
> C v-f34-sd1	> 🖻 VMware Tools	VMware Tools is not installed.	Actions Em Memory				16 GB			
Networking	> Storage 1 disk						k 1	240 GB		
wSwitch9	🗹 Notes 🕜 Edit notes						troller	USB 2.0		
Switch8				> 🔄 Network adapter 1		VM Network (Connected)				
Switch0	 Performance summary last hour 			> 🔄 Network adapter 2		VLAN8 (Connected)				
vmnic2	Consumed host CPU						adapter 3	VLAN9 (Connected)		
in vmnic7		nemory > 🖵 Video caro			> 📮 Video card		16 MB			
in vmnic1 More networks	(%) 60 80			15	Cons	> 🕲 CD/DVD	I drive 1	ISO [v-f34-sd1] Fedora-Workstation-Live-x86_	64-34-1.2.iso Select disc Image	
	/ Re			10	Imed	> 🗊 Others		Additional Hardware		
	Recent tasks									
	Task	- Target	~ Initiator	~	Queued	~	Started	✓ Result ▲	✓ Completed ▼	
	Power On VM	📅 v-f34-v3	root		12/12/2023 09:4	7:32	12/12/2023 09:47:32	Falled - The attempted operation cannot be per.	12/12/2023 09:47:32	
	Power On VM	🛐 v-r34-v3	root		12/12/2023 07:29:09		12/12/2023 07:29:09	S Completed successfully	12/12/2023 07:29:10	

- J. Install Fedora and then LANforge on the VM. See also: Ifserver install.
- K. After successful VM creation and Fedora 34 install, power off the VM.
- L. Add network ports to the VM for VLAN8 and VLAN9.
- 2. Open the terminal and type: vim /etc/sysctl.conf

0	MATE Terminal	\sim \sim \times
File	Edit View Search Terminal Help	
1	<pre># sysctl settings are defined through files in</pre>	*
2	<pre># /usr/lib/sysctl.d/, /run/sysctl.d/, and /etc/sysctl.d/.</pre>	
4	# # Vendors settings live in /usr/lib/sysctl d/	
5	# To override a whole file. create a new file with the same in	
6	<pre># /etc/sysctl.d/ and put new settings there. To override</pre>	
7	# only specific settings, add a file with a lexically later	
8	<pre># name in /etc/sysctl.d/ and put new settings there.</pre>	
10	# # For more information see syscel conf(5) and syscel d(5)	
11	net.ipv4.conf.br0.proxy arp=1	
~		
~		
~		
2	N	
~		
~		
~		
~		
~ ~		
~		
"/et	c/sysctl.conf" [readonly] 11L, 479B 10.1	All 👻

- 3. Here, at the bottom of this file, we will add this line: net.ipv4.conf.br0.proxy_arp=1, this will keep proxy arps consistent across reboots.
- 4. Finally, run the command: **sysctl -p** to force reload system settings.



- 5. Open LANforge GUI, and in Netsmith tab, right click -> new bridge.
- 6. Uncheck DHCP option for bridge, name it br0.

		Netsmith configuration for Resource: vm-6c95(1.1) Version: 5.4.8	\sim \sim \times
		-Virtual Routers and Connections	
	0	Create VLANs on Port: 💿 🔗 🙁	
0	0	○ MAC-VLAN ○ 802.1Q-VLAN ○ <u>R</u> edirect	
	U	⊖ GRE Tunnel ⊖ WiFi STA → WiFi VAP → WiFi Monitor → WiFi Virtual Radio	
	0		
	2	Shelf: 1 Vm-6c95) Port: 1 (eth1)	
	Ø	Quantity: 1	
		Basic Settings WiFi Settings Advanced Settings	
		VLAN ID:	
		STA ID:	
		Parent MAC: 00:0c:29:7a:6c:9f	
		MAC Addr: vociocite.キャッペ マ	
	4	DHCP-IPv4 Multiple Subnets	
Mgt-et 192.1		IP Address:	
-		IP Mask or Bits:	
		Gateway IP:	
		Bridge Name: br0	
		#2 Redir Name:	
	6	Down Apply Cancel Ready	
VanLink	cs	Show Legend V Fire V IPv4s Info Print Svnc Apply	Close
WanLink	Names	es 🖉 Port Names 🖉 Fire Names 🗌 Zero-IPv4s Apply Progress: 100% Complete	Cancel Apply
Peer Wa	anLinks	s 🗹 Parents 📝 Col. Domains 🗌 IPv6s Netsmith Status: OK	

- A. Apply and Sync in Netsmith.
- B. In Port Mgr tab, double click the the newly created bridge (in this example, it is br0).
- C. Make sure DHCP is unchecked, and all Gateway, IP, DNS are set to 0.0.0.0.
- D. At the bottom, underneath the buttons that say Add Ports and Remove Ports, type eth1 and press enter, then eth2.

E. Click `Add Ports`, Click Apply, then Sync. Once eth1 and eth2 show up under configured as well as current ports, then close the bridge editing tab.

0		br0	(vm-6c95) Config	gure Settings		\odot
		Current: Driver Info	Port Status Inform LINK-UP TSO GSO GRO b: Bridge Driver: bridge B	ation us: N/A Firmware: N/A		
			Port Configura	bles		
Standard Configu	ration Extende	d Config				
Enable		General I	nterface Settings		Spanning-Tree	
Set MAC	Down	Aux-Mgt	DHCP Hostname:	None	Aging Time:	300 🗸
Set MTU	DHCP-IPv6	DHCP Release	DHCP Vendor ID:	None	Bridge Priority:	32768 👻
Set Offload	DHCP-IPv4	Secondary-IPs	DHCP Client ID:	None	Max Age:	20 🗸
Set Bridge Info	DNS Servers:	BLANK	Peer IP:	NA	Hello Time:	2 🗸
	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:	00:0c:29:7a:6c:9f	TX Q Len	1000		
	Rpt Timer:	medium (8 s) 🗖	WiFi Bridge:	NONE	•	
Services	IPSec GW:		IPSec Password:			
НТТР	IPSec Local ID.		IPSec Remote ID.:			
DNS	Brid	dge Information	Rem	ove Ports		
RADIUS	Configured Po	eth1	S Add	Porto		
IPSEC-Client	eth2	eth2	Add	FOILS		
IPsec-Upstream			eth1 eth2			
	Print	Display P	robe <u>S</u> ync	Apply OK	Cancel	

F. In Port Mgr, there will be no IP's showing up here. This is because we're simply redirecting traffic from one VLAN to the next VLAN. If we want IP's here, we need to make a redirect device to spawn off some IP's.

0	C LANforge Manager Version(5.4.8) ⊙ ∧ ⊗											
Control Rep	Control Reporting Windows Info Tests											
	Chamber View Stop All Restart Manager Refresh HELP											
Status Po	ort Mgr Wan	Links F	Resource Mgr D	UT Pro	files Tr	affic-Profil	es Alert	s Wa	arnings W	ifi-Mess	sages +	
Disp: 19	Disp: 192.168.98.193:1 Sniff Packets Down 1 Clear Counters Reset Port Delete											
Rpt Time	r: medium (8	s) 🔻	Apply		VRF	ĩ	Display		Cr <u>e</u> ate	M	10 <u>d</u> ify <u>B</u> atch Mo	odify
			All	Ethernet	Interfaces	(Ports) f	or all Reso	urces.			1	-
Port Ø I	Parent Dev	Alias	IP	bps RX	bps TX	TX-Rate	RX-Rate	Mode	DHCP (ms)	MTU	MAC	Port Type
1.1.0		eth0 19	2.168.98.193	20,250	518,492	10 Gbps	10 Gbps		0	1500	00:0c:29:7a:6c:95	Ethernet
1.1.1		eth1 0.0	0.0.0	64,384	64,390	10 Gbps	10 Gbps		0	1500	00:0c:29:7a:6c:9f	Ethernet
1.1.2		eth2 0.0	0.0.0	64,446	64,442	10 Gbps	10 Gbps		0	1500	00:0c:29:7a:6c:a9	Ethernet
1.1.3		br0 0.0	0.0.0	0	0	0	0		0	1500	00:0c:29:7a:6c:9f	Bridge
	1.1.3 br0 0.0.0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0											

- 7. Have devices (on VLAN9) request DHCP from the server so we can see DHCP crossing through LANforge.
- 8. Highlight the downstream port, eth2, and click sniff packets. Here, we are looking for signs of a DHCP Request and a DHCP ACK external to this virtual lanforge.

0	LANforge Manager Version(5.4.8)	$(\mathbf{x}) (\mathbf{x})$	
Control Reporting Windows Info Tests			
Chambe	r ⊻iew <u>S</u> top All Re	tart Manager Re <u>f</u> resh HELP	
Status Port Mgr WanLinks Resource Mgr	DUT Profiles Traffic-Profiles Alerts	Warnings Wifi-Messages +	
Disp: 192.168.98.193:1 Sniff Packet:	s Down 1 Clear Counters	Reset Port Delete	
Rpt Timer: medium (8 s) - Apply	VRF I Display	Create Modify Batch Modify	
P 1 1 1 1 1 1 1 1	All Ethernet Interfaces (Ports) for all Resource	S	
Port Ø I Parent Dev Alias IP	bps RX bps TX TX-Rate RX-Rate M	*eth2 (as superu	ser) 🔍 A 🗙
1.1.0 eth0 192.168.98.193	53.370 2.864 10 Gbps 10 Gbps	File Edit View Go Capture Analyze Statistics Telephony Wireless Tools	Help
1.1.1 eth1 0.0.0.0	28,116 28,02610 Gbps 10 Gbps		
1.1.2 etn2 0.0.00 1.1.3 br0 0.0.0.0	1,348 0 0 0		
		Apply a display filter <ctrl-></ctrl->	
		No. Time Source Destination Protocol 31 4.126201851 0.0.0 255.255.255 DHCP	342 DHCP Request - Transaction ID 0xc3b2c109
		32 4.126219651 0.0.0 255.255.255.255 DHCP	342 DHCP Request - Transaction ID 0xc3b2c109
		34 4.133424569 172.16.0.1 172.16.0.34 DHCP	342 DHCP ACK - Transaction ID 0xC3b2c109
		35 4.207835525 0.0.0.0 255.255.255 DHCP 36 4.207881226 0.0.0.0 255.255.255 DHCP	342 DHCP Discover - Transaction ID 0x/4060457 342 DHCP Discover - Transaction ID 0x74660457
		37 4.288051120 :: ff02::16 ICMPv6 38 4.288095402 ··· ff02::16 ICMPv6	90 Multicast Listener Report Message v2
		39 4.459423107 0.0.0 255.255.255 DHCP	342 DHCP Discover - Transaction ID 0x2398516c
		40 4.459442077 0.0.0.0 255.255.255.255 DHCP 41 4.690524475 172.16.0.1 172.16.0.35 DHCP	342 DHCP Discover - Transaction ID 0x2398516c 342 DHCP Offer - Transaction ID 0x7508197f
		42 4.691520399 0.0.0 255.255.255 DHCP 43 4.691526630 0.0.0 255.255.255 DHCP	342 DHCP Request - Transaction ID 0x7508197f
		44 4.698369854 172.16.0.1 172.16.0.35 DHCP	342 DHCP ACK - Transaction ID 0x7508197f
		45 4.704608/39 1/2.16.0.1 1/2.16.0.35 DHCP 46 4.891189048 172.16.0.1 172.16.0.32 DHCP	342 DHCP ACK - Transaction ID 0x/50819/T 342 DHCP Offer - Transaction ID 0xf72f592b
	N-	47 4.892188362 0.0.0 255.255.255 DHCP 48 4.892211013 0.0.0 255.255.255 DHCP	342 DHCP Request - Transaction ID 0xf72f592b 342 DHCP Request - Transaction ID 0xf72f592b
		49 4.899102070 172.16.0.1 172.16.0.32 DHCP	342 DHCP ACK - Transaction ID 0xf72f592b
•	11	Frame 1: 1514 bytes on wire (12112 bits), 1514 bytes cantured (12112 bits)	ts) on interface eth2, id 0
Logged in to: localbost:4002 as: Admin		Ethernet II, Src: PCEngines_5e:06:fd (00:0d:b9:5e:06:fd), Dst: PCEngine	es_5a:7b:fe (00:0d:b9:5a:7b:fe)
		 Internet Protocol Version 4, Src: 1/2.16.0.1, Dst: 1/2.16.0.35 Transmission Control Protocol, Src Port: 33003, Dst Port: 33004, Seq: 1 	l, Ack: 1, Len: 1448
		LANforge Traffic Generator	
		wireshark_eth23EQEW2.pcapng	Packets: 64 · Dropped: 0 (0.0%) Profile: Default

- A. Verify traffic flow with the ping command. Use external IPs to the virtual LANForge, because traffic originating within LANforge will only give a partial network traffic route between VLANs. Ping -I 172.16.0.1 172.16.0.32.
- If we are not seeing anything relating to DHCP on wireshark, then check the VLAN configuration in ESXi. Neither VLAN should be configured with EST or VGT tagging modes. (VLAN IDs need to be between 1 and 4094).
- 10. When setting VLAN IDs to [0] you set the vSwitch to External Switch Tagging mode. When setting the VLAN IDs to [4095] you set the vSwitch to Virtual Guest Tagging mode. Please set the VLAN IDs to the corresponding incoming VLAN ID's. This sets the vSwitches to Virtual Switch Tagging mode. In our lab testing, an external switch was used and two tagged ports were created, one containing VLAN 8 and one containing VLAN 9. In ESXi, these port groups should be ID'd the same, 8 and 9.
- 11. Verify upstream and downstream ports.
 - A. Verify upstream port (this is eth2, on the QVLAN9 network) in LANforge with `sudo tcpdump -ni eth2`, the interface for the upstream port can be additionally verified in ESXi under Networking -> Port Groups -> VLAN8. vSwitch topology will show VM's the VLAN services, including the MAC ADDR of the upstream port, as well as the physical adapters on the otherside of the topology.
 - B. Verify downstream port (this is eth1 introducing DHCP to the LANforge and on the VLAN8 network), with `sudo tcpdump -ni eth1`, the interface for the upstream port can be additionally verified in ESXi under Networking -> Port Groups -> VLAN9. This is a similar process as the previous step.

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