

Generating Traffic to a Firewall

Goal: Set up and run traffic to test a firewall.

In this test scenario, LANforge-FIRE is used to generate traffic to a firewall DUT in order to measure the following benchmarks:

- **UDP Throughput** Maximum payload bits per second with a UDP traffic flow.
- **TCP Throughput** Maximum payload bits per second with a TCP traffic flow.
- **TCP Concurrent Connections** Maximum number of simultaneous TCP connections.
- **TCP Connections per Second** Maximum number of established TCP connections per second.

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





1. The **UDP Throughput** test will use a scripted Layer-3 connection to vary the rate and payload size to determine the bi-directional UDP throughput of the DUT across the scripted parameters.

A. On the Port Manager tab, set up the LANforge ports with valid IP addresses.

4	LANforge Manager Version(5.1.6)												
<u>C</u> ontrol	<u>Reporting</u> <u>T</u> ear-Off Hel	р											
					Stop A	JI I	Restart Ma	anager		Refresh	HELP		
					ocop /		incordance in the	inager		nemesii			
File-IO	Layer-4 Generic T	est Mgr	Resource Mgr	Serial S	pans PPI	P-Links	Port Mgr	Messages					
Status	s Layer-3 L3 En	dps	VoIP/RTP	VoIP/R	TP Endps	Arm	ageddon	WanLinks	5 (Collision-D	omains		
	Disp: 192.168.100.169:0	.0	Sniff Packets		Clear Co	Inters	Reset Port	Delete					
	Rpt Timer: 30000	-	Apply	i	View De	tails	Create	Modify	Bat	tch Modify			
			All Etherne	t Interfa	ces (Ports)	for all Res	ources.——						
Port	Phan IP	Alias	RY Butes RY	Pitte	Pric RY	hns RY	TY Butos	TY Pkts	Posity	hps TY	Collisions		
1.1.00	192.168.100.173	eth0	132.975	1.219	7	6.644	846.756	1.034	6	39.572	0		
1.1.01	0.0.0.0	eth2	0	0	0	0	0	0	0	0	0		
1.1.02	0.0.0.0	eth3	0	0	0	0	0 0	0	0	0	0		
1.1.03	0.0.0.0	eth4	0	0	0	0	0	0	0	0	0		
1.1.04	0.0.0.0	eth5	0	0	0	0	0	0	0	0	0		
1.1.05	0.0.0.0	eth1	0	0	0	0	0	0	0	0	0		
1.1.06	192.168.0.2	ethб	0	0	0	0	468	6	0	36	0		
1.1.07	172.16.0.1	eth7	0	0	0	0	468	6	0	36	0		
1.1.08	0.0.0.0	eth8	0	0	0	0	0	0	0	0	0		
1.1.09	0.0.0	eth9	0	0	0	0	0	0	0	0	0		
1.1.10	0.0.0	eth 10	0	0	0	0	0	0	0	0	0		
1 1 1 17	0.0.0	oth12	0	0	0	0	0	0	0	0	0		
1 1 13		eth13	0	0	0	0	0	0	0	0	0		
1.1.15	0.0.0.0	Jenizo											
Logged	in to: 192.168.100.173:40	02 as: Ad	min										

B. On the Layer-3 tab, create a UDP connection.

_			udp-test - Cre	ate/N	lodify Cross Connect					
+ - All					Display Sync	Batch-Create		Apply OK Ca	ance	
1	Cross-Connect				9	Cross-Connect				
CX Name:	udp-test			_	Report Timer:	fast (1 s)			-	
CX Type:	LANforge / UDP			-		Endpoint A		Endpoint B		
	Endpoint A		Endpoint B		Pld Pattern	increasing	-	increasing	-	
Resource:	1 (ct503-60)	-	1 (ct503-60)	-	Min IP Port:	AUTO	-	AUTO	-	
Port:	eth7	-	eth6	-	Max IP Port	Same	-	Same		
Min Tx Rate:	New Modem (56 Kbps)	-	New Modem (56 Kbps)	-	Min Duration:	Forever	-	Forever		
Max Tx Rate:	Same	-	Same	-	Max Duration:	Same	-	Same		
Min PDU Size:	AUTO	-	AUTO	-	Min Decenny		-			
Max PDU Size:	Same	-	Same	-	Min Reconn:	Como	-	Como		
P ToS:	Best Effort (0)	-	Best Effort (0)	-	Max Reconn:	Salle	-	Salle		
Pkts To Send	Infinite	-	Infinite	-	Multi-Conn:	Normal (0)	-	Normal (0)		
Red to being.						Corint		Script		
	Sector and the sector of the s	_				Script		Script		
						Thresholds		Thresholds		
0	Cross-Connect					Thresholds		Thresholds Endpoint B		
Solution Fest Manager	Cross-Connect default_tm				Snd Buff Size:	Thresholds Endpoint A OS Default	-	Thresholds Endpoint B OS Default		
S Fest Manager Quiesce:	Cross-Connect default_tm 3 (3 sec)				Snd Buff Size: Rcv Buff Size:	Endpoint A OS Default	•	Thresholds Endpoint B OS Default OS Default	•	
Test Manager Quiesce:	Cross-Connect default_tm 3 (3 sec) Endpoint A		Endpoint B	•	Snd Buff Size: Rcv Buff Size: Send Bad FCS:	Thresholds Endpoint A OS Default OS Default Zero (O%)	•	Thresholds Endpoint B OS Default OS Default 2ero (0%)		
Quiesce: IP Addr:	Cross-Connect default_tm 3 (3 sec) Endpoint A AUTO		Endpoint B AUTO	▼ ▼ ▼	Snd Buff Size: Rcv Buff Size: Send Bad FCS: Src MAC:	Thresholds Thresholds Endpoint A OS Default OS Default Zero (0%) 00:00:00:00:000		Thresholds Endpoint B OS Default OS Default 2ero (0%) 00:00:00:00:00:00		
Pest Manager Quiesce: IP Addr:	Cross-Connect default_tm 3 (3 sec) Endpoint A AUTO Replay File		Endpoint B AUTO Replay File	•	Snd Buff Size: Rcv Buff Size: Send Bad FCS: Src MAC:	Thresholds Endpoint A OS Default OS Default 2ero (0%) O:00:00:00:00 Use-Proxy		Thresholds Endpoint B OS Default OS Default Erro (0%) O:00:00:00:00:00 Use-Proxy		
P Addr:	Cross-Connect default_tm 3 (3 sec) Endpoint A AUTO Replay File Loop		Endpoint B AUTO Replay File Loop	•	Snd Buff Size: Rcv Buff Size: Send Bad FCS: Src MAC: Proxy Addr:	Script Thresholds Endpoint A OS Default OS Default 2ero (0%) 00:00:00:00:00:00 Use-Proxy 0.0.0		Stript Thresholds Endpoint B OS Default US Default 2ero (0%) 00:00:00:00:00:00 Use-Proxy 0.0.0.0		
P Addr:	Cross-Connect default_tm 3 (3 sec) Endpoint A AUTO Replay File Loop Dest Mac		Endpoint B AUTO Replay File Loop Dest Mac		Snd Buff Size: Rcv Buff Size: Send Bad FCS: Src MAC: Proxy Addr: Proxy Port:	Script Thresholds Endpoint A OS Default 2ero (0%) 00:00:00:00:00:00 Use-Proxy 0.0.0.0 0		Stript Thresholds Endpoint B OS Default OS Default Deror (O%) O0:00:00:00:00:00 Use-Proxy 0.0.0 0		
Pest Manager Quiesce: IP Addr: Filename:	Cross-Connect default_tm 3 (3 sec) Endpoint A AUTO Replay File Loop Dest Mac		Endpoint B AUTO Replay File Loop Dest Mac		Snd Buff Size: Rcv Buff Size: Send Bad FCS: Src MAC: Proxy Addr: Proxy Port: Socket Priority:	Script Thresholds Endpoint A OS Default OS Default 2ero (O%) O0:00:00:00:00:00 Use-Proxy 0.0.0.0 0 0	 ▼ ▼ ▼ ▼ 	Stript Thresholds Endpoint B OS Default OS Default 2ero (C%) 00:00:00:00:00:00 Use-Proxy 0.0.0.0 0 0		

A. Set Endpoint A to use the DUT WAN port.

B. Set Endpoint B to use the DUT LAN port.

C. Make sure CX Type is LANforge / UDP then select Apply.

C. Select the **Script** button to set up the scripting parameters.

4		Add/Modify Script		
Endpoint Name: udp-tes	t-A 💌 Script	Type: RFC-2544		
Script Name: my-script	Group	Action: All	×	
🗹 Enable Script 🗹 Show	w Reports 🕑 Symmet	ric 🗌 Loop 🔲 Hide Iterati	ion Details 🛛 Hide I	Legend 🗌 Hide CSV
Loop Count Forever	 Script 	Iterations: 40 (40)	Estimated Du	uration: 43.333 m (43.333 m)
		Script Configuration		1
Show Dups Show	w OOO 🔲 Show Atte	nuation 🗌 Hide Latency D	istributions 🗌 Hid	e Constraints
Run Duration:	1 m (1 m)	Pause Durat	ion: 5 s	(5 s)
Max Drop Percent:	5% (5%)	Max-Tx-Unde	rrun: 10%	(10%)
Max Jitter:	high (100 ms)	Max RT Later	ncy: 500m	s (500 ms) 👻
Max Failed OK:	0	-		
Rates A	Rates B	Payload Sizes A	—Payload Sizes B—	Attenuations (ddB)—
bps 10000000 (10 Mbps) 15000000 (15 Mbps) 20000000 (20 Mbps) 25000000 (25 Mbps) 30000000 (30 Mbps)	bps 10000000 (10 Mbps) 15000000 (15 Mbps) 20000000 (20 Mbps) 25000000 (25 Mbps) 30000000 (30 Mbps)	60 (60 B) 128 (128 B) 256 (256 B) 512 (512 B) 1024 (1 KB) 1280 (1.25 KB) 1460 (1.426 KB) 1472 (1.438 KB)	50 (60 B) 128 (128 B) 126 (256 B) 512 (512 B) 1024 (1 KB) 1280 (1.25 KB) 1460 (1.426 KB) 1472 (1.438 KB)	NONE
Show	Previous Report	Sync Apply	ОК	Cancel

A. Set up the script to iterate over the rates.

B. Specify the payload sizes to be tested.

For more information see LANforge FIRE Cookbook example: Scripted Layer-3 Test

D. Highlight the connection and select the **Start** button.

LANforge Manager Version(5.1.6)
Control Reporting Tear-Off Help
Stop All Restart Manager Refresh HELP
File IO (Lawar & Canadie (Tart Mar) Barourra Mar / Sarial Sanar / PDD Links / Bort Mar / Marsanar
Status Layer-3 L3 Endps VolP/RTP VolP/RTP Endps Armageddon WanLinks Collision-Domains
Rpt Timer (ms): 3000 V Go Test Manager all V Select All Start Stop Quiesce Clear
View 0 - 200 🔻 Go Display Create Modify Delete
Cross Connects for Selected Test Manager
Name Type State Pkt Tx A->B Pkt Tx A<-B Rate A->B Rate A<-B Rx Drop A Rx Drop B Rpt Timer EID Endpoints (A <-> B)
udp-test LF/UDP Run 123,666 124,196 1,184,398 1,184,746 0 0.254 1000 1.8 udp-test-A <=> udp
Logged in to: 192.168.100.173:4002 as: Admin

E. The final test report shows the results of the test run. Here we can see that the DUT has the best bi-directional throughput with 1460Byte payloads at 24.9Mbps.

*				Scr	ipt Report f	or Endpo	int: udp	-test-A				
Start Itera Numbe Syste	ed test a tion Dura of run m Load at	at: Thu Sep 23 ation: 60000ms ning endpoints t end of firs1	3 07:28:03 201 s Pause Dura s at end of fi t iteration: (10 ation: 5000ms irst iteratio).05	5 on: 2							-
Endpo Enc	int Info point ID:	rmation: : udp-test-A	Type: LANF	FORGE_UDP	Peer Endpoi	nt ID: udp)-test-B					
Summa	ury data ·	for each itera	ation:									
## p	ld-size	cfg-rate	tx-bps	rx-bps	rx-bps-LL	tx-pps	rx-pps	tx-pkts	rx-pkts	cx-drops	drop%	rx-lat(ms)
- (bytes)	(bps)	-	peer	peer	-	peer	-	peer	peer	peer	peer
0	60	10000000	1313968	1313832	0	2737	2737	164246	164229	17	0.010	319
1	128	10000000	2787447	2787447	0	2722	2722	163327	163327	0	0.000	263
2	256	10000000	5516322	5516322	0	2694	2694	161611	161611	0	0.000	205
3	512	10000000	9993967	9993967	0	2440	2440	146396	146396	0	0.000	0
4	1024	10000000	9993967	9993967	0	1220	1220	73198	73198	0	0.000	0
5	1280	10000000	9994581	9994581	0	976	976	58562	58562	0	0.000	0
6	1460	10000000	9993019	9993019	0	856	856	51334	51334	0	0.000	0
7	1472	10000000	9994487	9994487	0	849	849	50923	50923	0	0 000	0
é	60	15000000	1217586	1217586	ő	2745	2745	164701	164701	0	0.000	112
0	179	15000000	2702550	2702550	0	2745	2745	162626	162626	0	0.000	270
10	120	15000000	2792330	2792000	0	2/2/	2/2/	161011	161011	0	0.000	370
10	250	15000000	1001555	10015555	0	2097	2697	101011	101811	0	0.000	288
11	512	15000000	10815556	10815556	0	2641	2641	158431	158431	0	0.000	204
12	1024	15000000	14991497	14991497	0	1830	1830	109801	109801	0	0.000	0
13	1280	15000000	14991019	14991019	0	1464	1464	87838	87838	0	0.000	0
14	1460	15000000	14990696	14990696	0	1283	1283	77007	77007	0	0.000	0
15	1472	15000000	14989082	14989082	0	1273	1273	76371	76371	0	0.000	0
16	60	20000000	19984952	1319512	0	41635	2749	2498119	164939	2333180	93.397	471
17	128	20000000	19985510	2825114	0	19517	2759	1171026	165534	1005492	85.864	449
18	256	20000000	5532058	5532058	0	2701	2701	162072	162072	0	0.000	371
19	512	20000000	10823885	10823885	0	2643	2643	158553	158553	0	0.000	263
20	1024	20000000	19985203	19985203	0	2440	2440	146376	146376	0	0.000	1
21	1280	20000000	19986261	19986261	0	1952	1952	117107	117107	0	0.000	0
22	1460	20000000	19987400	19987400	0	1711	1711	102675	102675	0	0.000	ő
22	1472	20000000	19986670	19986620	0	1697	1697	101834	101834	0	0.000	ő
20	1472	20000000	24020020	1242464	0	E2042	2700	2122408	167033	DOFARGE	04.633	460
24	128	25000000	24979964	1545404	0	32042	2799	1467040	167005	1206752	94.022	409
20	126	25000000	24983006	2651755	0	24397	2785	1403848	167095	1290755	88.383	451
26	256	25000000	19315678	5539908	0	9431	2705	565889	162302	403587	/1.319	449
21	512	25000000	10834057	10834057	0	2645	2645	158702	158702	0	0.000	321
28	1024	25000000	20846592	16534323	0	2545	2018	152685	121101	31584	20.686	207
29	1280	25000000	24984576	24984576	0	2440	2440	146394	146394	0	0.000	1
30	1460	25000000	24985856	24985856	0	2139	2139	128352	128352	0	0.000	1
31	1472	25000000	24982588	24982588	0	2121	2121	127289	127289	0	0.000	1
32	60	30000000	29977504	1320720	0	62453	2752	3747188	165090	3582098	95.594	471
33	128	30000000	29979699	2772036	0	29277	2707	1756623	162424	1594199	90.754	457
34	256	30000000	29977498	5595648	0	14637	2732	878247	163935	714312	81.334	447
35	512	30000000	10844706	10844706	õ	2648	2648	158858	158858	0	0.000	379
36	1074	30000000	20856757	16537188	0	2546	2019	152762	121124	31638	20 711	247
37	1780	20000000	25577201	18050260	0	2/09	1852	140867	111000	29777	25 874	210
20	1460	20000000	23377301	10792611	0	2490	1604	149007	101622	16176	23.0/4	192
30	1400	30000000	28829939	19/82011	0	2408	1694	148099	101623	404/0	31.382	185
39	1472	30000000	28997811	19803203	0	2462	1082	14//4/	100901	46846	31.707	182
					Clos		Save Ei					
					clos	•	Saveri	C.				

For more information see Full script report for the UDP test.

- 2. The **TCP Concurrent Connections** test will measure the maximum number of simultaneous TCP connections that the DUT can maintain at once.
 - A. On the Port Manager tab, create 5 MAC-VLANs on the LANforge port connected to the DUT LAN port.

\$			Create VLANs	on Port: 1.1.2		_ = ×
0	MAC-VLAN WiFi STA	○ 802.1Q-VLAN ○ ○ WiFi VAP ○ WiFi N	Redirect OBri Monitor OWiF	idge 🛛 🔾 GRE Tunnel i Virtual Radio		
0	Shelf:	1 🗸	Resource:	1 (ct503-60) 🔻	Port: 6	(eth6) 🔻
Ø	VLAN ID:		DHCP-IPv4			
	Parent MAC:	00:90:0b:38:82:75	DHCP Client ID:	None 👻		
	MAC Addr:	XX:XX:XX:*:*:XX 💌	IP Address:	192.168.0.201/24	Global IPv6:	AUTO
	Quantity:	5	IP Mask or Bits	:	Link IPv6:	AUTO
			Gateway IP:	192.168.0.1	IPv6 GW:	AUTO
	#1 Redir Name:		#2 Redir Name	:		
	STA ID:		SSID:			-
	WiFi AP:		Key/Phrase:			
	WPA	WPA2	WEP			
0	Down					
	<u>A</u> pply	<u>C</u> ancel				

B. Verify that the MAC-VLANs have correct IP addresses.

4				LANforg	e Manag	jer Ver	sion(5.1.6	5)				_ D X
<u>C</u> ontrol	<u>R</u> epo	rting <u>T</u> ear-Off H	elp									
						Stop	All	Restart M	lanager		Refresh	HELP
File-IO	Lav	ver-4 Generic	Test Mar	Resource Ma	Serial	Spans P	PP-Links	Port Mar	Messages			
Status	5	Layer-3 L3 E	indps	VoIP/RTP	VoIP/	RTP Endps	Arn	nageddon	WanLi	nks	Collision-	Domains
	Dis	p: 192.168.100.169	:0.0	Sniff Packet	5	Clear C	ounters	Reset Por	t Del	ete		
	Rpt	Timer: 30000	•	Apply		View I	Details	Create	Mo	lify B	atch Modify	
				——————————————————————————————————————	rnet Interi	faces (Ports	5) for all Re	sources.—				
Port	Phan.	IP	Alias	RX Bytes	RX Pkts	Pps RX	bps RX	TX Bytes	TX Pkts	Pps TX	bps TX	Collisions F
1.1.00		192.168.100.173	eth0	17,610,	188,904	9	8,141	91,531,	122,400	8	47,809	0
1.1.01		0.0.0.0	eth2	0	0	0	0	0	0	0	0	0
1.1.02		0.0.0.0	eth3	0	0	0	0	0	0	0	0	0
1.1.03		0.0.0.0	eth4	0	0	0	0	0	0	0	0	0
1.1.04		0.0.0.0	eth5	0	0	0	0	0	0	0	0	0
1.1.05		0.0.0.0	eth1	0	0	0	0	0	0	0	0	0
1.1.06		192.168.0.2	etho	884	11	0	38	4,290	52	0	303	0
1.1.07		1/2.16.0.1	etn/	0	0	0	0	0	0	0	0	0
1.1.08		0.0.0.0	etho	0	0	0	0	0	0	0	0	0
1.1.09		0.0.0.0	eth10	0	0	0	0	0	0	0	0	
1 1 11		0.0.0.0	eth11	0	0	0	0	0	0	0	0	0
1 1 1 12		0.0.0.0	eth12	0	0	0	0	0	0	0	0	0
1 1 13		0.0.0.0	eth13	0	0	0	0	0	0	0	0	
1 1 14		192 168 0 201	eth6#0	0	0	0	0	726	9	0	228	0
1.1.15	H	192,168,0,202	eth6#1	0	0	0	0	636	8	0	195	0
1.1.16	TH	192.168.0.203	eth6#2	0	0	0	0	558	7	0	167	0
1.1.17		192.168.0.204	eth6#3	0	0	0	0	726	9	0	227	0
1.1.18		192.168.0.205	eth6#4	0	0	0	0	636	8	0	195	0
		Ш										Þ
Logged	in to:	192.168.100.173:4	002 as: A	dmin								

C. Create a Layer-3 connection that has a low-speed rate with **Multi-Conn** set to 10000 and **Min IP Port** to **0** (zero) on Endpoint-A. **Multi-Conn** should be set to 1 on Endpoint-B.

<u>*</u>			tcp-max-1 - Create,	/M	odify Cross C	onnect					- 0) 🗙
+ - All					Display	Sync	Batch-Create	1	Apply	ОК	Cancel	
CX Name: CX Type:	Cross-Connect tcp-max-1 LANforge / TCP		~]	Report Ti	imer:	Cross-Connect fast (1 s) Endpoint A (Client)		Endpoi	ntB (Se	rver)	
	Endpoint A (Client)		Endpoint B (Server)	_	Pld Patte	rn	increasing	-	increa	sing	-	
Resource:	1 (ct503-60)	-	1 (ct503-60)		Min IP Po	rt:	Any (0)	-	AUTO		-	
Port:	14 (eth6#0)	-	7 (eth7)		Max IP Po	ort:	Same	-	Same		-	
Min Tx Rate:	1000 (1 Kbps)	-	1000 (1 Kbps)		Min Dura	tion:	Forever	-	Forever		-	
Max Tx Rate:	Same	-	Same		Max Dura	ation:	Same	-	Same		-	
Min PDU Size:	1k (1,024 B)	-	1k (1,024 B) 🔻		Min Reco	nn:	0 (0 ms)	-	0 (()ms)	-	
Max PDU Size:	Same	-	Same		Max Reco	onn:	Same	-	Same			
IP ToS:	Best Effort (0)	-	Best Effort (0) 🔻		Multi-Conn:		10000 (10,000)	-	One (1)	6	-	
Pkts To Send:	Infinite	-	Infinite 🗸				Script			Script		
							Thresholds			Threshol	ds	
2	Cross-Connect						Endpoint A (Client)		Endpoi	ntB (Se	rver)	
Test Manager	default_tm				Snd Buff	Size:	OS Default	•	OS Defa	ult	•	
Quiesce:	3 (3 sec)		-		Rcv Buff S	Size:	OS Default	•	OS Defa	ult	-	
	Endpoint A (Client)		Endpoint B (Server)		Send Bad	FCS:	zero (O%)	-	zero (0	196)	-	
IP Addr:	AUTO	-	AUTO		Src MAC:		00:90:0b:c2:28:73	-	00:90:0)b:38:82:	74 💌	
	Replay File		Replay File				Use-Proxy		Use-	Proxy		
	Loop		Loop		Proxy Ad	dr:	86.1.1.7					
F 11	Dest Mac		Dest Mac		Proxy Po	rt:						
Filename:	00:00:05:20:02:24		00:00:00:00:02:20:72		Socket P	riority:	0		0			
Dest MAC:	00:90:00:38:82:74		00:90:00:02:28:73				Payload			Payloa	d	

A. Endpoint-A will be one of the MAC-VLANs and Endpoint-B will be the port connected to the DUT WAN port. This setup will initiate the TCP sessions from the LAN side of the DUT.

- B. Low-speed depends on the DUT, we could also set the rate to zero which would allow the TCP connections to be set up without payload data to be transmitted, but this would not give an accurate picture of the firewall performance. Here we are using 1Kbps connections with 1KB size payload.
- C. This is an iterative test, the number of TCP connections to use will depend on the DUT capabilities. Modify the number of connections as necessary to find the most accurate measurement.
- D. The DUT should be power-cycled to reset it before each test run.

D. Select the Batch-Create button to create 4 more copies of this connection each with a new MAC-VLAN port.

<u>\$</u>	Layer-3 Bat	ch Creator: tcp-max-1		
tcp-max-2, tcp-max-3	. tcp-max-5			
Endp-A Resources: 1,	1 1			
Endp-B Resources: 1,	1 1			
Endp-A Ports: et	h6#1, eth6#	2 eth6#4		
Endp-B Ports: et	h7, eth7 e	eth7		
Endp-A IPs: AU	то, анто	AUTO		
Endp-B IPs: AU	то, аито	AUTO		
Quantity:	4	Number of Digits:	1	Zero Pad
Starting Name Suffix:	1	Name Increment:	1	
Resource Increment A:	0	Resource Increment B:	0	
Port Increment A:	1	Port Increment B:	0	
IP Addr Increment A:	0	IP Addr Increment B:	0	
IP-Port Increment A:	1	IP-Port Increment B:	1	
	Арр	ly Close		

E. Highlight and start each set of 10000 connections until the target max simultaneous connections are running.

🛃 LANforge Manager Version(5.1.6)													
<u>Control</u> <u>Reportir</u>	ng <u>T</u> ear-Off H	elp											
				[Stop All	Res	tart Manar	er	Refresh	HELP			
				L	Stop / II	inc.	rear c manag		Refresh	meer			
File-IO Layer-	4 Generic	Test Mgr R	esource Mgr	Serial Spa	ns PPP-Lin	ks Port M	Mgr Mess	ages					
Status La	yer-3 L3 E	ndps V	oIP/RTP	VoIP/RTP	Endps	Armagedd	ion V	VanLinks	Collision-Don	nains			
Rpt Timer (ms): 3000 ▼ Go Test Manager all ▼ Select All Start Stop Quiesce Clear													
View 0 - 200 🔻 Go Display Create Modify Delete													
			Cross	Connects for	Selected Tes	t Manager-							
Name Tvr	e State	Pkt Tx A->B	Pkt Tx A<-B	Rate A->B	Rate A<-B	Rx Drop A	Rx Drop B	Rpt Timer EID	Endpoints (A	<-> B)			
tcp-max-1 LF/TC	P Run	2,556	669	554,125	145,035	24.215	66.549	1000 2.11	tcp-max-1-A <	<=> tc			
tcp-max-2 LF/TC	P Run	660	135	141,953	29,190	2.963	54.697	1000 2.12	tcp-max-2-A <	:=> tc			
tcp-max-3 LF/TC	P Run	956	95	210,837	20,508	10.526	84.937	1000 2.13	tcp-max-3-A <	<pre>< => tc</pre>			
tcp-max-4 LF/TC	P Run	448	32	96,356	6,882	15.625	88.393	1000 2.14	tcp-max-4-A <	<pre>tell => tell tell tell tell tell tell tell tel</pre>			
tcp-max-5 LF/TC	P Run	7,964	4,697	1,746,889	1,035,909	48.009	65.281	1000 2.15	tcp-max-5-A <	<pre>< = > tc</pre>			
tcp-test LF/IC	P Stopped	0	0	0	0	0	0	1000 2.9	tcp-test-A <=>	tcp-te			
uap-test LF/OD	Potopped	0	0	0	0	0	0	1000 1.8	uap-test-A < =	> uap]			
0													
Logged in to: 19	2.168.100.173:4	002 as: Adm	in										

F. On the Layer-3 Endpoints tab, highlight the Running A-Side Endpoints, then right-click and select Calculations.

<u>Control</u> <u>R</u> e	porting <u>T</u> ea	ur-Of	ff H	elp																
									St	op All			Restart	Manager				Refresh		HELP
File-10	aver-4 G	eneri	ic	Test N	Aar	Resource	Mar	Serial	Snans	PPP-1	ink		Port Mar	Messar	185					
Status	Laver-3		13 6	Indus	-	VolP/RTP	7	VolP/	RTP End	15	/	Arma	ageddon	Wa	nl inl	45	C	ollision-f)om	ains
ocacao	Lujer o		20 2	-map 2					Lina,				ageauon					empren i		anns
MIN Pkt Size	1k (:	1,024	4 B)	-	Go	MAX Pkt 9	Size	1k	(1,024	B)	•	Go	5	itart	Sto	p	Quie	esce	Clea	ar
MIN Tx Rate	<custom></custom>			-	Go	MAX TX R	ate	<custom:< th=""><th>></th><th></th><th>-</th><th>Go</th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th></custom:<>	>		-	Go								
View	0 - 400			-	Go								Display	Create	Мо	dify	Batch	Modify		Delete
								,	All Endpo	oints—										
Name	EID	Run	Mng	Scr	ipt	Tx Rate	Tx R	ate(1) R	x Rate	Rx Rate	(1)	Rx	Corop %	Tx Pkts	5	Rx P	kts	Delay		Dropped
mc-rx	1.1.8.14		V	None		0		0	0		0		0		0		0		0	(
mc-tx	1.1.1.13		~	None	_	0		0	0		0		0		0		0		0	(
tcp-max-1-	A 1.1.14	V	~	None		392,701	4	start Sala	rtad	56,	844		53.507	3,5	59		411	2,18	8	(
tcp-max-1-	B 1.1.7.22	V	~	None	-	98,226	1	Start Sele	ated	120,	272		77.207	8	384		803	9,22	3	(
tcp-max-2-	A 1.1.15	~		None	<u>.</u>	806,990	9 3	stop sele	ctea	115,	638		59.602	7,2	77		833	4,78	6	(
tcp-max-2-	B 1.1.7.24	~	r	None		228,667	2 (Clear Sel	ected	276,	996		74.42	2,0	62		L,840	13,95	5	(
tcp-max-3-	A 1.1.16			None		409,904		Modify S	elected	53,	063		59.24	3,1	00		386	1,92	6	(
tcp-max-3-	B 1.1.7.20			None		105,170	- 1	Display S	elected	118,	457		78.88		17		781	12,94	3	
tcp-max-4-	A 1.1.1/	V		None		346,614	-	Count Se	lected	49,	457		25.880	5,1	.12		500	2,71	2	
top-max-4-	A 1 1 10			None	-	91,955		Calculati	ons	93,	550		67.936	175	06	-	009	15,04	1	
top max 5	P 1 1 7 20	V		None		1,951,0	1 5 7	94 4	87.077	401,	029		76 2 20	17,3	61		1 1 7 1	15 60	-	
tcp=test=A	1 1 7 17			Enabl	ed	1,570,1	1,52	0	07,927	, , , , , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , - , -	920		.70.505	12,3	0		, 12 1	15,00	0	
tcp-test-B	11618			Enabl	ed	0		0	0		0		0		0		0		0	- i
udp-test-A	1 1 7 15			Enabl	ed	0		0	0		0		0		0		0		0	- d
udp-test-B	1.1.6.16		V	Enabl	ed	0		0	0		0		0		0		0		0	
						1			- 1				- 1							
4																				•
			70.1			den la					_									
Logged in t	0: 192.168.1	100.1	1/3:4	1002 3	is: A	amin														

G. The top line, Sum, is what we are interested in for Maximum Concurrent TCP Connections.

🛃 LANforge Table Calculations 📃 🗆 🗙												
				T	otals							
Calculation	Tx Rate	Tx Rate(1)	Rx Rate	Rx Rate(1)	Rx Drop %	Tx Pkts	Rx Pkts	Delay	Dropped T			
Sum	3,542,088	3,066,110	509,843	730,812	363.1	543,657	75,611	44,980	0 55			
Mean (Average)	708,417	613,222	101,968.6	146,162.41	72.62	108,731.4	15,122.2	8,996	0 11			
Median	744,526	535,911	101,837	141,546	72.25	114,265	15,136	9,555	0 11			
JI												
				Dev	iations							
Name	Tx Rate	Tx Rate(1)	Rx Rate	Rx Rate(1)	Rx Drop %	Tx Pkts	Rx Pkts	Delay	Dropped T			
tcp-max-1-A	32,891.4	-92,633	-3,867.6	-16,719.4	1.04	5,011.6	-585.2	1,096	0 5,1			
tcp-max-2-A	74,053.4	-77,311	-131.6	-13,883.4	1.96	11,392.6	13.8	559	0 11,			
tcp-max-3-A	36,108.4	118,473	1,124.4	-4,616.4	-0.36	5,533.6	147.8	-978	0 5,6			
tcp-max-4-A	54,659.4	166,077	3,882.4	31,067.6	-0.68	8,409.6	529.8	-1,269	0 8,			
tcp-max-5-A	-197,71	-114,606	-1,007.6	4,151.6	-1.95	-30,347.4	-106.2	592	0 -3			
Standard Deviation	111,744	131,633.8	2,842.9	19,209.57	1.52	17,155.28	405.11	1,052.5	0 17,			
4									•			
,												
				Refresh	CI	ose						

H. Scroll right to the CX Active and CX Established columns and select the **Refresh** button. This DUT can maintain a maximum of 41,864 simultaneous TCP connections.

🛃 LANforge Table Calculations 🗕 🗆 🗙															
	Totals														
bped	Tx Bytes	Rx Bytes	TCP Rtx	Dup Pkts	000 Pkts	RX Wrong	CRC Fail	RX BER	CX Active	CX Estab					
	0 556,704,	80,131,568	16	1	0	0	0	0	41,864	47,633					
	0 111,340,	16,026,313	3.2	0.2	0	0	0	0	8,372.8	9,526.6					
	0 117,007,	16,009,164	3	0	0	0	0	0	9,088	10,128					
ill –															
					-Deviatio	ns									
bped	Tx Bytes	Rx Bytes	TCP Rtx	Dup Pkts	000 Pkts	RX Wrong	CRC Fail	RX BER	CX Active	CX Estab					
	0 5.131.87	-612.796	-0.2	-0.2	0001145	0	0	0	715.2	560.4					
	0 11,666,022	-17,148.8	1.8	0.8	0	0	0	0	1,251.2	1,205.4					
	0 5,666,40	175,487.2	-1.2	-0.2	0	0	0	0	691.2	601.4					
	0 8,611,430	613,051.19	0.8	-0.2	0	0	0	0	840.2	946.4					
	0 -31,075,	-158,592.8	-1.2	-0.2	0	0	0	0	-3,497.8	-3,313.6					
	0 17,567,004	449,330.94	1.3	0.45	0	0	0	0	1,968.2	1,871.12					
										•					
II															
				F	lefresh	Close									

- A. **CX Active** is the metric we are attempting to measure for Maximum Simultaneous TCP Connections. It will fluctuate with the DUT's ability to maintain the number of active TCP connections.
- B. **CX Established** is the number of TCP connections LANforge has established since the start of the test. It will continue to increase as the DUT closes the TCP connections it cannot maintain.

- 3. The **TCP Connections per Second** test will measure the rate of TCP connections that can be set up through the DUT.
 - A. Create a Layer-3 TCP connection with the Duration and IP Port set to zero.

📓 tcp-cxps - Create/Modify Cross Connect 📃 🗖 🔀												
+ - All				Display Syn	c Batch-Create	1	Apply OK Cancel					
CX Name:	Cross-Connect		Report Timer:	Cross-Connect fast (1 s)								
Resource: Port: Min Tx Rate: Max Tx Rate: Min PDU Size: Max PDU Size: IP ToS: Pkts To Send:	LANforge / TCP Endpoint A (Client) 1 (ct503-60) 6 (eth6) Zero (0 bps) Same lk (1,024 B) Same Best Effort (0) Infinite	Endpoint B (Server) ↓ (ct503-60) ▼ 7 (eth7) ▼ Zero (0 bps) ▼ Same ▼ 1k (1,024 B) ▼ Best Effort Infinite		Pld Pattern Min IP Port: Max IP Port: Min Duration: Max Duration: Min Reconn: Max Reconn: Multi-Conn:	Endpoint A (Client) increasing Any (0) Same 0 (0 ms) Same 0 (0 ms) Same Normal (0) Script Thresholds		Endpoint B (Server) increasing AUTO Same Forever Same 0 (0 ms) Same Normal (0) Script Thresholds V					
Filename: Dest MAC:	Cross-Connect default_tm 3 (3 sec) Endpoint A (Client) AUTO Replay File Loop Dest Mac	Endpoint B (Server) AUTO Replay File Loop Dest Mac		Snd Buff Size: Rcv Buff Size: Send Bad FCS: Src MAC: Proxy Addr: Proxy Port: Socket Priority	Endpoint A (Client) OS Default 2ero (0%) 00:00:00:00:00 Use-Proxy 0.0.0 0 0 Payload		Endpoint B (Server) OS Default ▼ Zero (0%) ▼ USe-Proxy 0.0.0.0 0 0 Payload					

B. Highlight and Start the connection.

4			ANforge	Manager	Version(5.1.6)							
Control Reporting Tear-Off Help													
					Stop All	Res	tart Manager		Refresh	HELP			
				L	Stop / III	Res	care manager		Refresh	meer			
File-IO Layer-4 Generic Test Mgr Resource Mgr Serial Spans PPP-Links Port Mgr Messages													
Status Layer-3 L3 Endps VolP/RTP VolP/RTP Endps Armageddon WanLinks Collision-Domains													
Rpt Timer (ms): 3000 🔻 Go Test Manager all 💌 Select All Start Stop Quiesce Clear													
View	0 - 200		Go			Display	Create	Modify	Delete				
Cross Connects for Selected Test Manager													
Name Type	State	Pkt Tx A->B Pkt	Tx A<-B	Rate A->B	Rate A<-B	Rx Drop A	Rx Drop B Rp	t Timer EID	Endpoints (A	<-> B)			
tcp-cxps LF/TCP	Run	0	0	0	0	0	0	1000 2.16	tcp-cxps-A <=	:> tcp			
tcp-max-1 LF/TCP	Stopped	0	0	0	0	0	0	1000 2.11	tcp-max-1-A	< = > tc			
tcp-max-2 LF/TCP	Stopped	0	0	0	0	0	0	1000 2.12	tcp-max-2-A	< = > tc			
tcp-max-3 LF/TCP	Stopped	0	0	0	0	0	0	1000 2.13	tcp-max-3-A	< = > tc			
tcp-max-4 LF/TCP	Stopped	0	0	0	0	0	0	1000 2.14	tcp-max-4-A	< = > tc			
tcp-max-5 LF/TCP	Stopped	0	0	0	0	0	0	1000 2.15	tcp-max-5-A	< = > tc			
tcp-test LF/TCP	Stopped	0	0	0	0	0	0	1000 2.9	tcp-test-A <=	> tcp-te			
udp-test [LF/UDP	Stopped	0	0	0	0	0	0	1000 1.8	udp-test-A <=	> udp			
Logged in to: 1921	68.100.173:4	002 as: Admin											

C. View the **CX-Estab/s** rate on the Layer-3 Endpoints tab. This DUT can set up about 120 connections per second.

4					(LANforge	Manager	Versio	n(5	.1.6)						
Control Reporting Tear-Off Help																
								Stop Al			Rac	tart Manage	r	Refres	b HE	EL P
								Stop A			Res	care manage		Refres		
File-IO	laver-4 G	eneric	Test	Mar	Res	ource Mar	Serial Sp	ans PPP-	Lin	ks F	Port N	Aar Messa	ides			
Status	Laver-3	L3	Endps		Vol	P/RTP	VolP/RTF	Endps	7	Arma	aedd	on W	anLinks	Collisio	n-Domains	
MIN Pkt Size	tk C	1.024 B		Go	MA	X Pkt Size	1k (1.024 B)	-	Go		Ctrue	64-14	0	Chan	
							-	.,,	-			Start	Stop	Quiesce	Clear	
MIN TX Rate	<custom></custom>			Go	M/	X Tx Rate	<custom></custom>		-	Go						_
View	0 - 400		-	Go							Dis	play Create	e Modify	Batch Modify	y Delet	te
							——————————————————————————————————————	Endpoints-								
000 Pkts	RX Wrong	CRC F	ail	RX BE	R	CX Active	CX Estab	CX-Estab	/s	Patte	rn	Min Pkt	Max Pkt	Min Rate	Max Rate	Se
C	0		0		0	0) (0	011	ICREAS	SING	1,024	1,024	0	0	
0	0		0		0	0) ()	011	ICREAS	SING	1,024	1,024	56,000	56,000	
0	0		0		0	1	7,15	7 1	1911	ICREAS	SING	1,024	1,024	0	0	C
0	0		0		0	1	7,07	7 1	1911	ICREAS	SING	1,024	1,024	0	0	C
0	0		0		0				010	ICREAS		1,024	1,024	1,000	1,000	C
	0		0		0				010	ICREAD		1,024	1,024	1,000	1,000	-
	0		0		0				010	ICREAS	SING	1,024	1,024	1,000	1,000	- C
	0		0		õ)	010	ICREAS	SING	1.024	1.024	1,000	1.000	č
0	0		0		0	0) ()	011	ICREAS	SING	1,024	1,024	1,000	1,000	C
0	0		0		0	0) ()	011	CREAS	SING	1,024	1,024	1,000	1,000	С
C	0		0		0	0) ()	0 11	ICREAS	SING	1,024	1,024	1,000	1,000	С
0	0		0		0	0) ()	10	ICREAS	SING	1,024	1,024	1,000	1,000	C
0	0		0		0	C) ()	011	ICREAS	SING	1,024	1,024	1,000	1,000	C
0	0		0		0	0			0 11	ICREAS	SING	1,024	1,024	56,000	56,000	0/
0	0		0		0	(/	OIN	ICREAS		1,024	1,024	56,000	56,000	0/
	0 0 0			0			<u></u>	010	ICREAD		1,024	1,024	56,000	56,000		
	0	1	0		0		1 (1	opin	VCINEAC		1,024	1,024	55,000	55,000	
Logged in t	0: 192.168.1	100.173:	4002	as: A	dmin	1										

For more information see LANforge GUI User's Guide

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