sales@candelatech.com
support@candelatech.com
+1 (360) 380-1618 [PST, GMT -8]

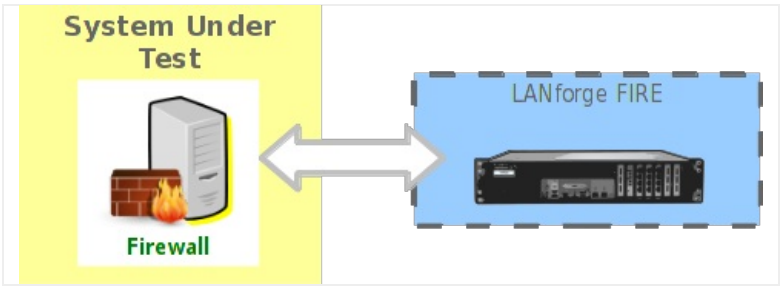
Generating Traffic to a Firewall

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:

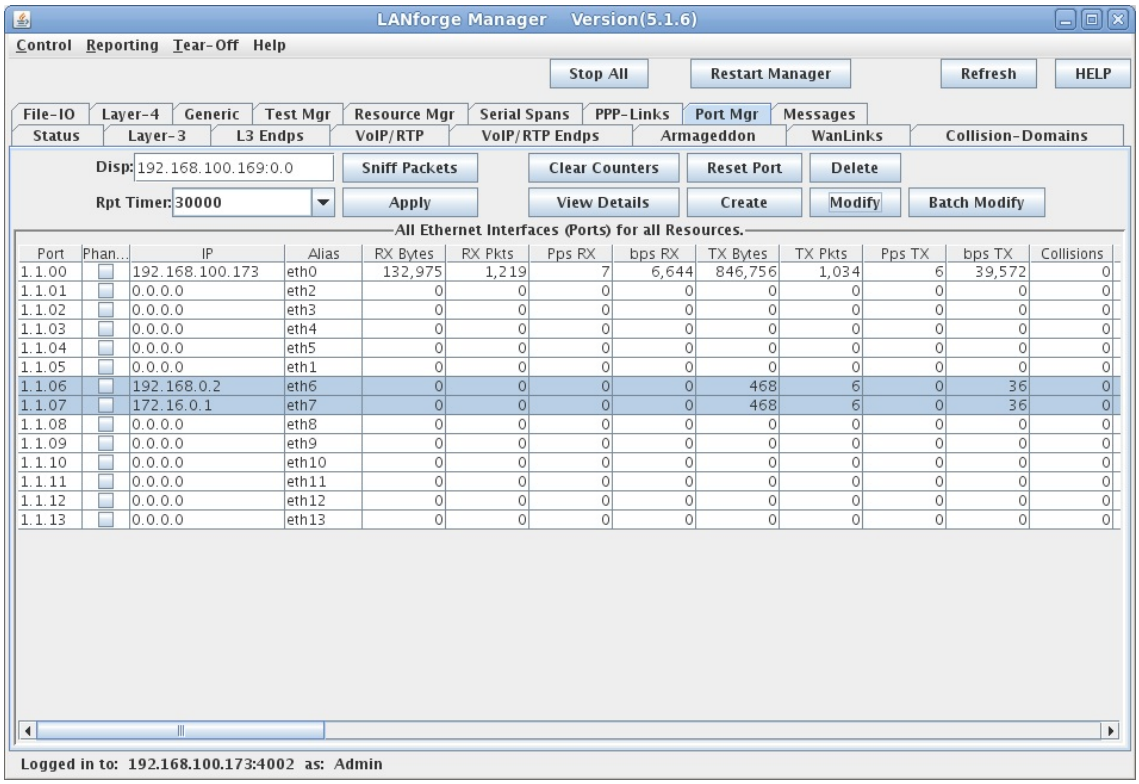
- **UDP Throughput** - Maximum payload bits per second with a UDP traffic flow.
- **TCP Throughput** - Maximum payload bits per second with a TCP traffic flow.
- **TCP Concurrent Connections** - Maximum number of simultaneous TCP connections.
- **TCP Connections per Second** - Maximum number of established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



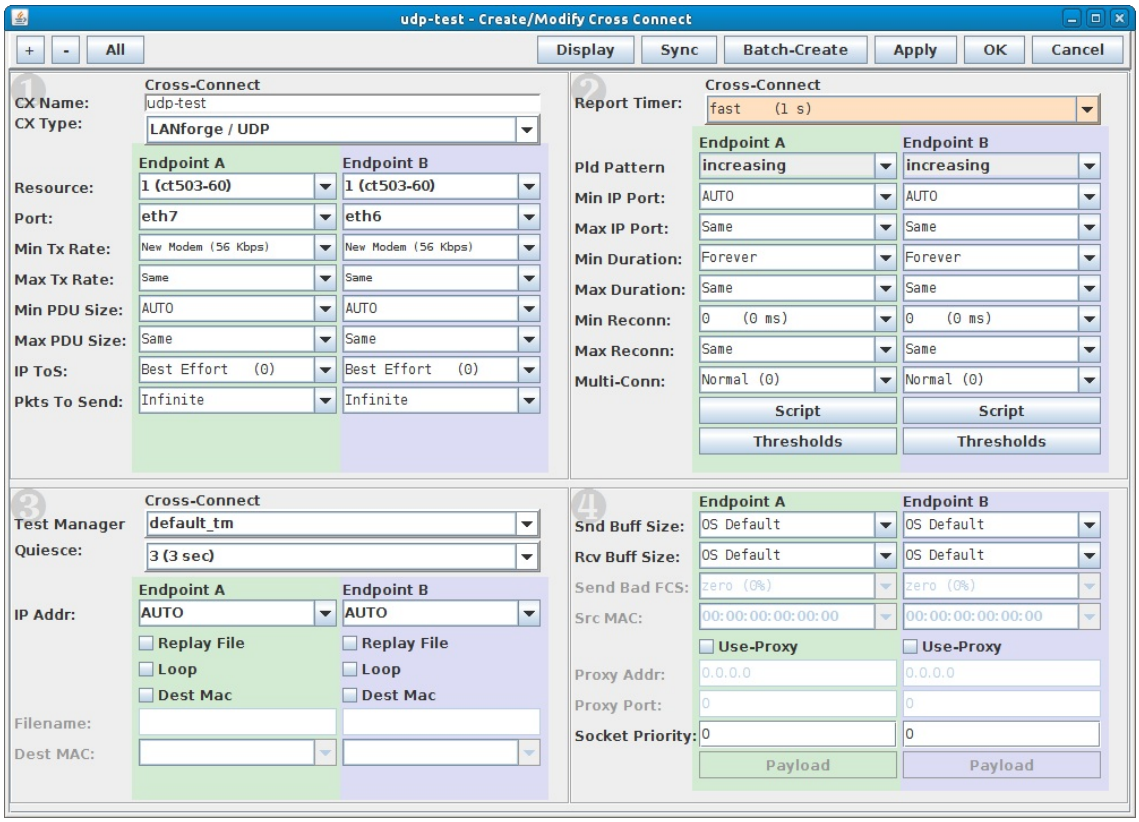
1. The **UDP Throughput** test will use a scripted Layer-3 connection to vary the rate and payload size to determine the bi-directional UDP throughput of the DUT across the scripted parameters.

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



Port	Phan...	IP	Alias	RX Bytes	RX Pkts	Pps RX	bps RX	TX Bytes	TX Pkts	Pps TX	bps TX	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
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	eth6	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		0.0.0.0	eth9	0	0	0	0	0	0	0	0	0
1.1.10		0.0.0.0	eth10	0	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
1.1.12		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	0

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

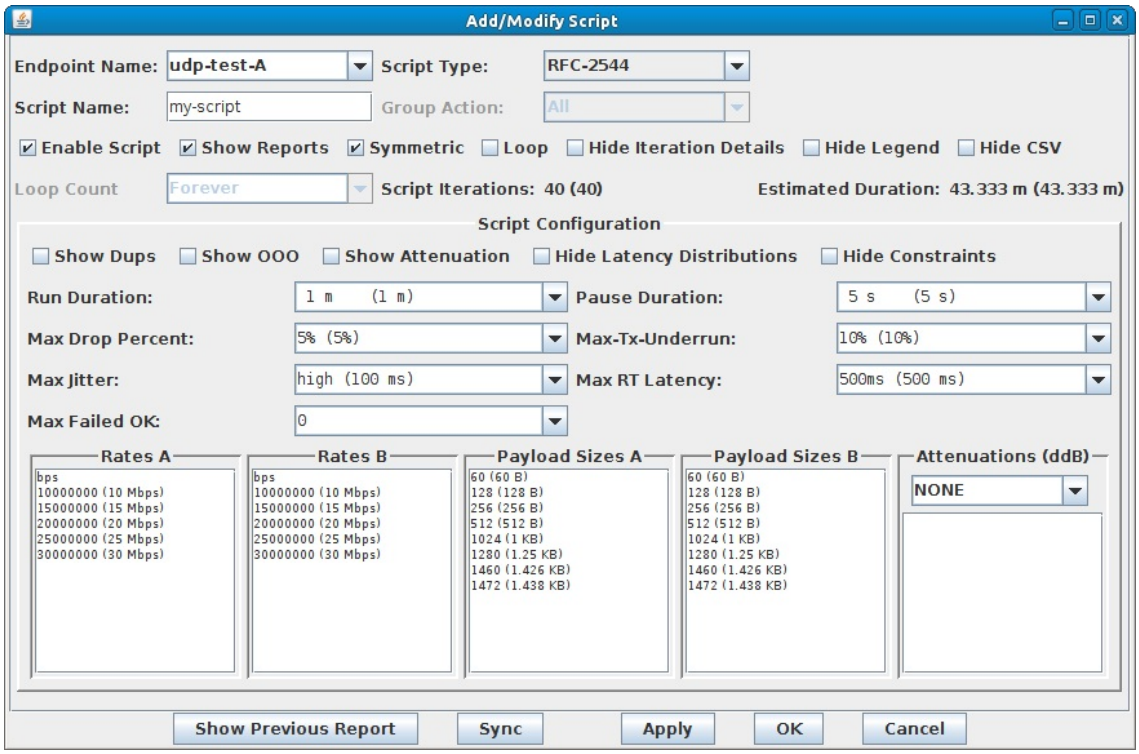


A. Set Endpoint A to use the DUT WAN port.

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.

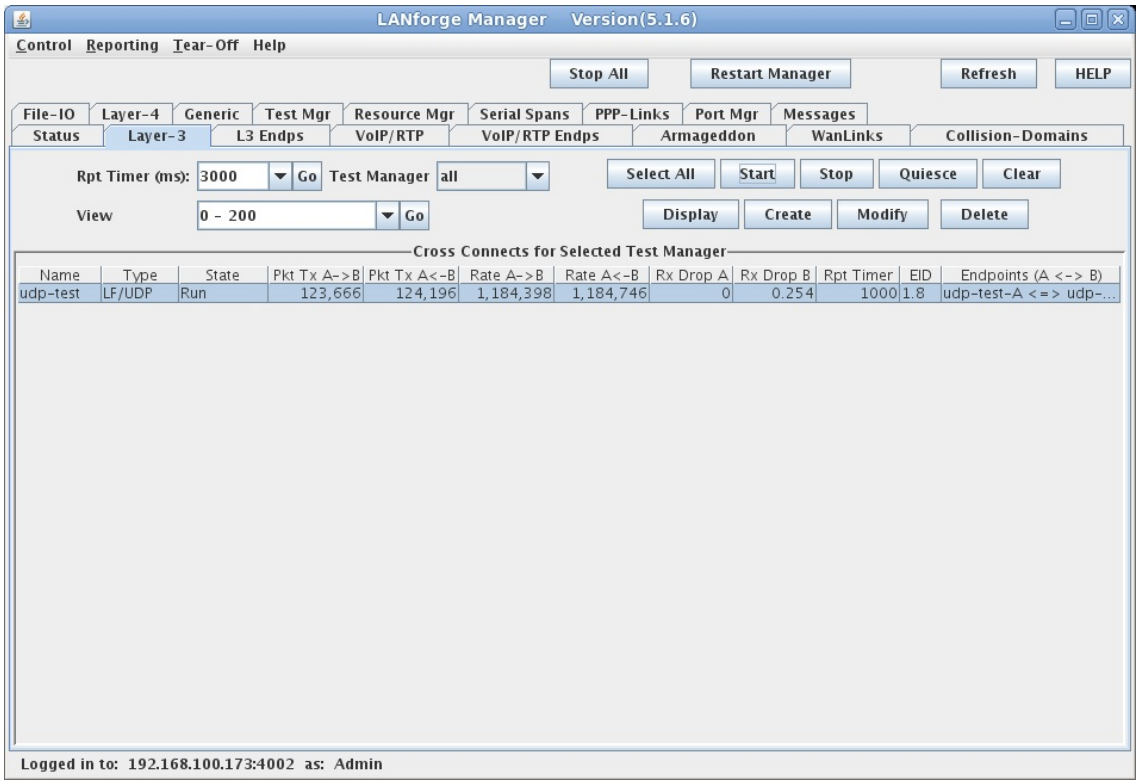


A. Set up the script to iterate over the rates.

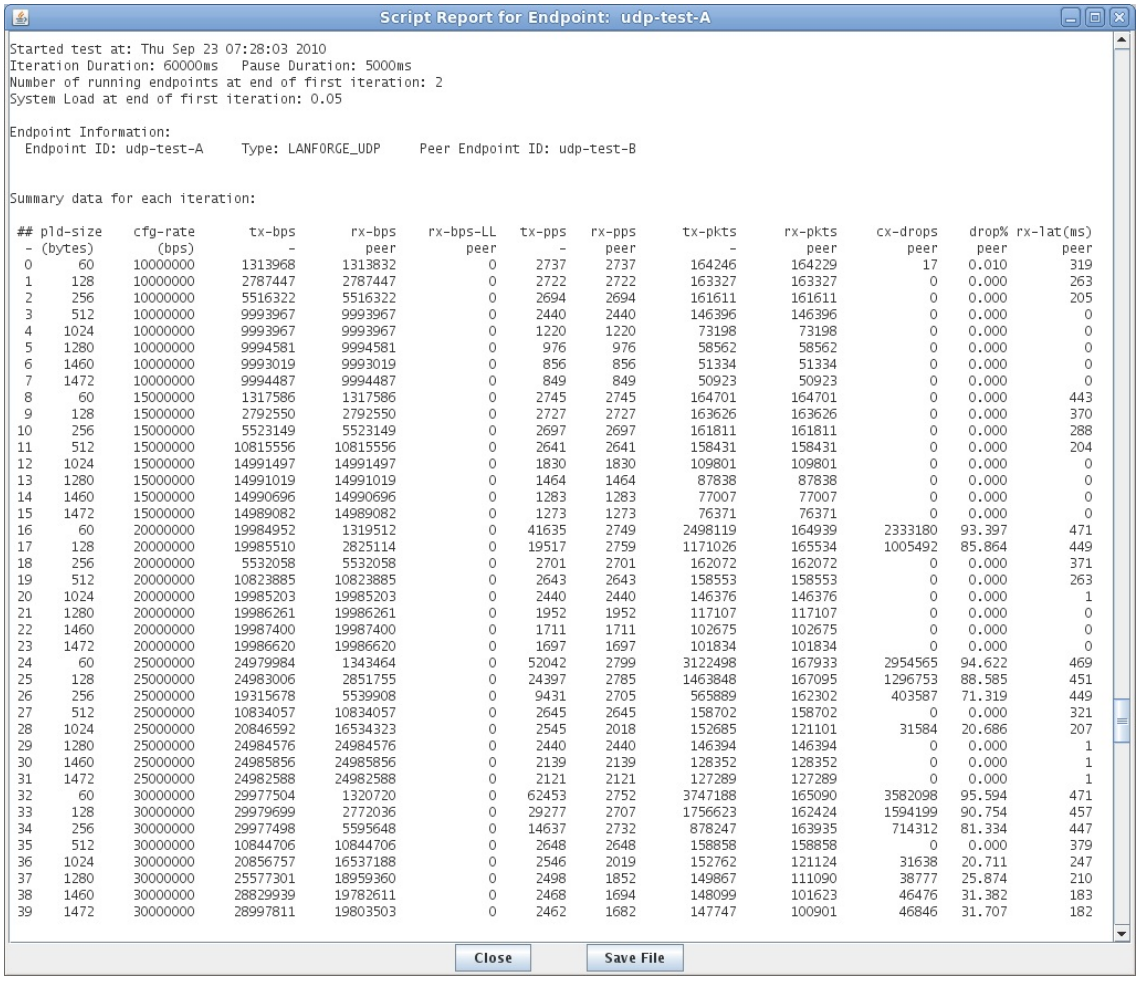
B. Specify the payload sizes to be tested.

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

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



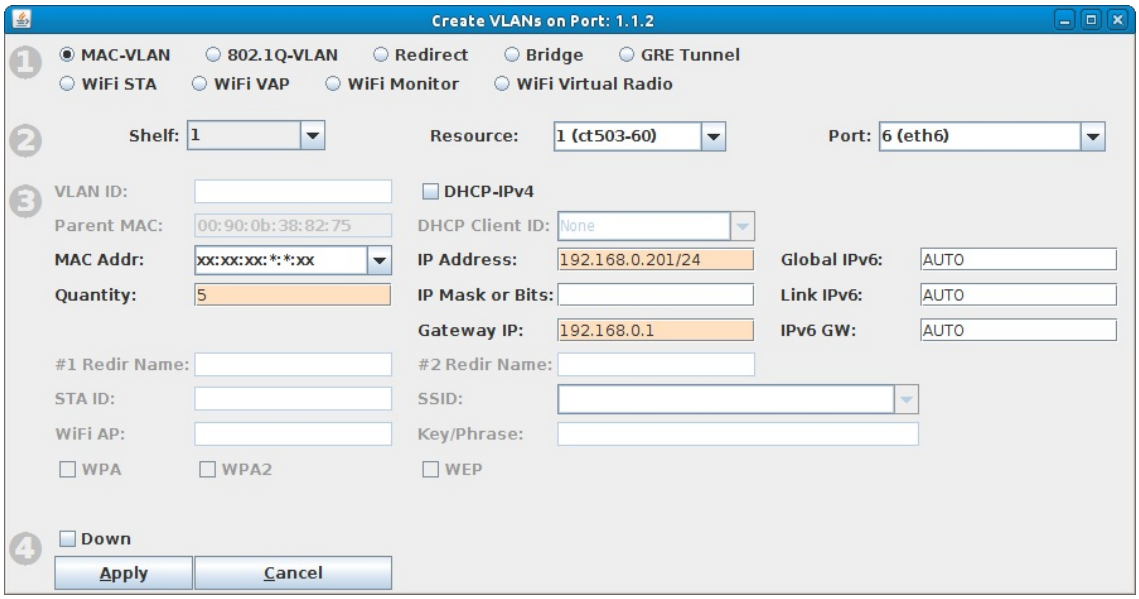
E. The final test report shows the results of the test run. Here we can see that the DUT has the best bi-directional throughput with 1460Byte payloads at 24.9Mbps.



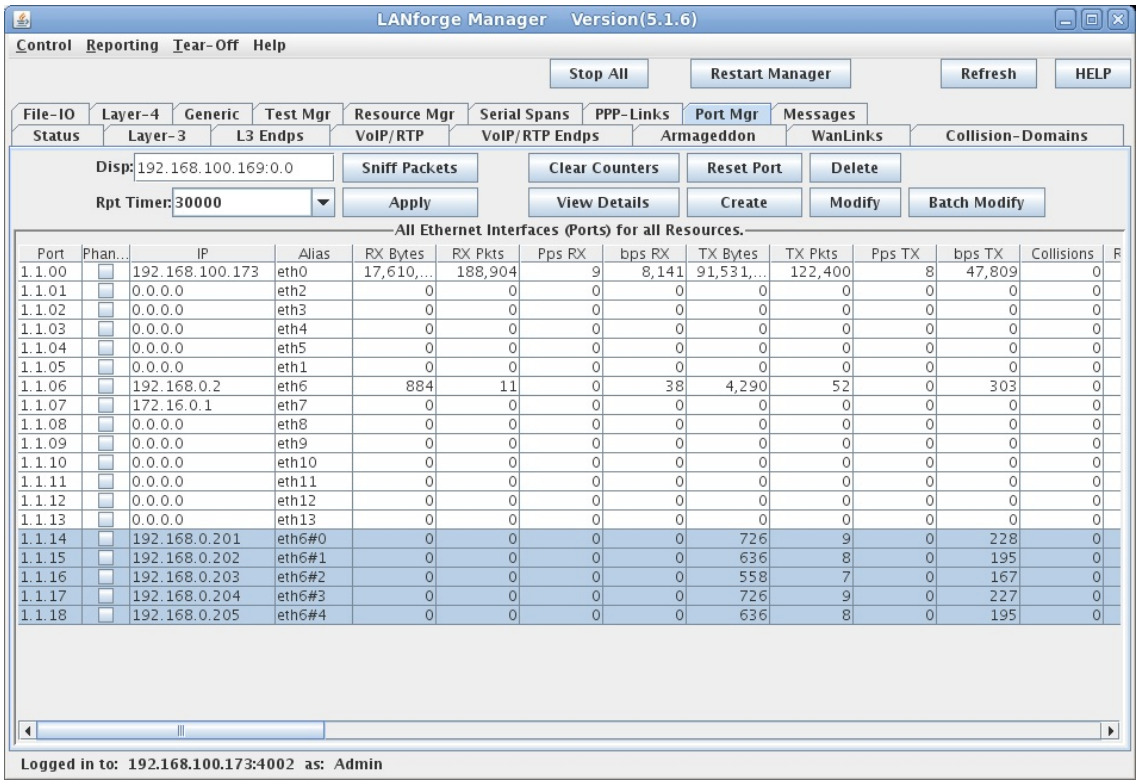
##	pld-size (bytes)	cfg-rate (bps)	tx-bps -	rx-bps peer	rx-bps-LL peer	tx-pps -	rx-pps peer	tx-pkts -	rx-pkts peer	cx-drops peer	drop% peer	rx-lat(ms) peer
0	60	10000000	1313968	1313832	0	2737	2737	164246	164229	17	0.010	319
1	128	10000000	2787447	2787447	0	2722	2722	163327	163327	0	0.000	263
2	256	10000000	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
8	60	15000000	1317586	1317586	0	2745	2745	164701	164701	0	0.000	443
9	128	15000000	2792550	2792550	0	2727	2727	163626	163626	0	0.000	370
10	256	15000000	5523149	5523149	0	2697	2697	161811	161811	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	0
23	1472	20000000	19986620	19986620	0	1697	1697	101834	101834	0	0.000	0
24	60	25000000	24979984	1343464	0	52042	2799	3122498	167933	2954565	94.622	469
25	128	25000000	24983006	2851755	0	24397	2785	1463848	167095	1296753	88.585	451
26	256	25000000	19315678	5539908	0	9431	2705	565889	162302	403587	71.319	449
27	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	0	2648	2648	158858	158858	0	0.000	379
36	1024	30000000	20856757	16537188	0	2546	2019	152762	121124	31638	20.711	247
37	1280	30000000	25577301	18959360	0	2498	1852	149867	111090	38777	25.874	210
38	1460	30000000	28829939	19782611	0	2468	1694	148099	101623	46476	31.382	183
39	1472	30000000	28997811	19803503	0	2462	1682	147747	100901	46846	31.707	182

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.

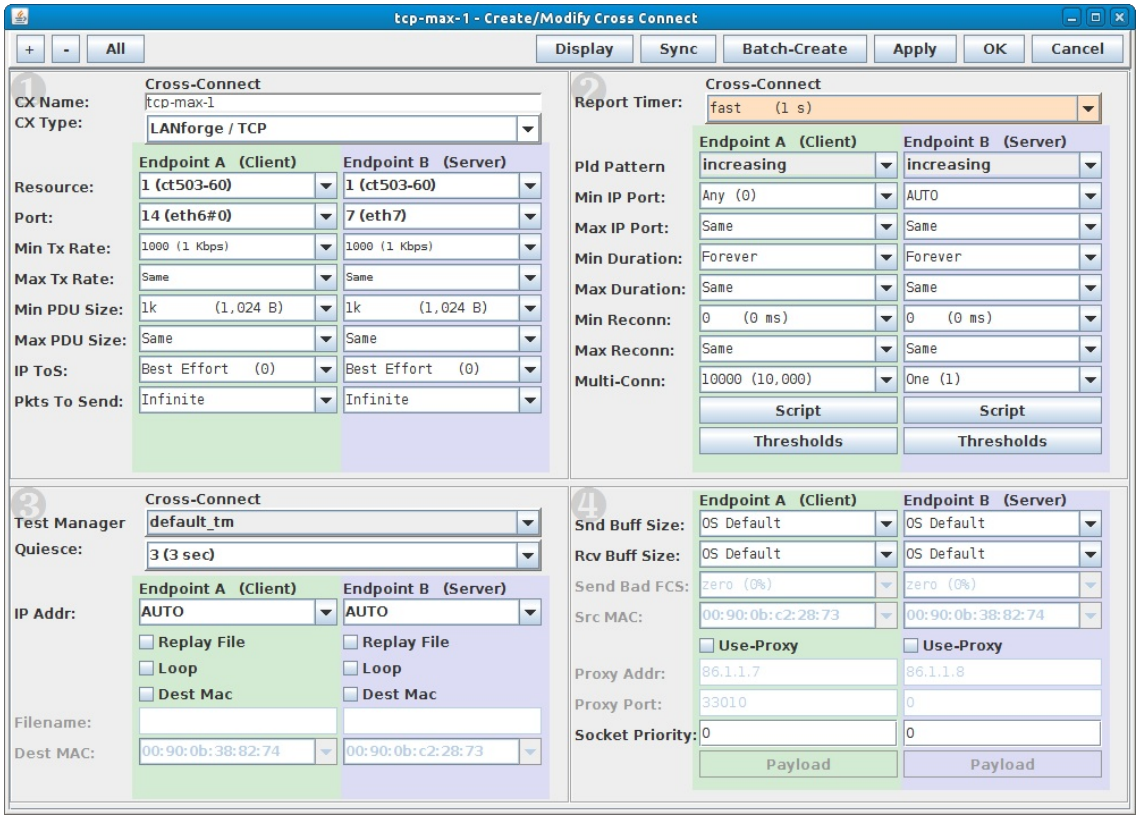


B. Verify that the MAC-VLANs have correct IP addresses.



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	eth6	884	11	0	38	4,290	52	0	303	0	
1.1.07		172.16.0.1	eth7	0	0	0	0	0	0	0	0	0	
1.1.08		0.0.0.0	eth8	0	0	0	0	0	0	0	0	0	
1.1.09		0.0.0.0	eth9	0	0	0	0	0	0	0	0	0	
1.1.10		0.0.0.0	eth10	0	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	
1.1.12		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	0	
1.1.14		192.168.0.201	eth6#0	0	0	0	0	726	9	0	228	0	
1.1.15		192.168.0.202	eth6#1	0	0	0	0	636	8	0	195	0	
1.1.16		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	

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.



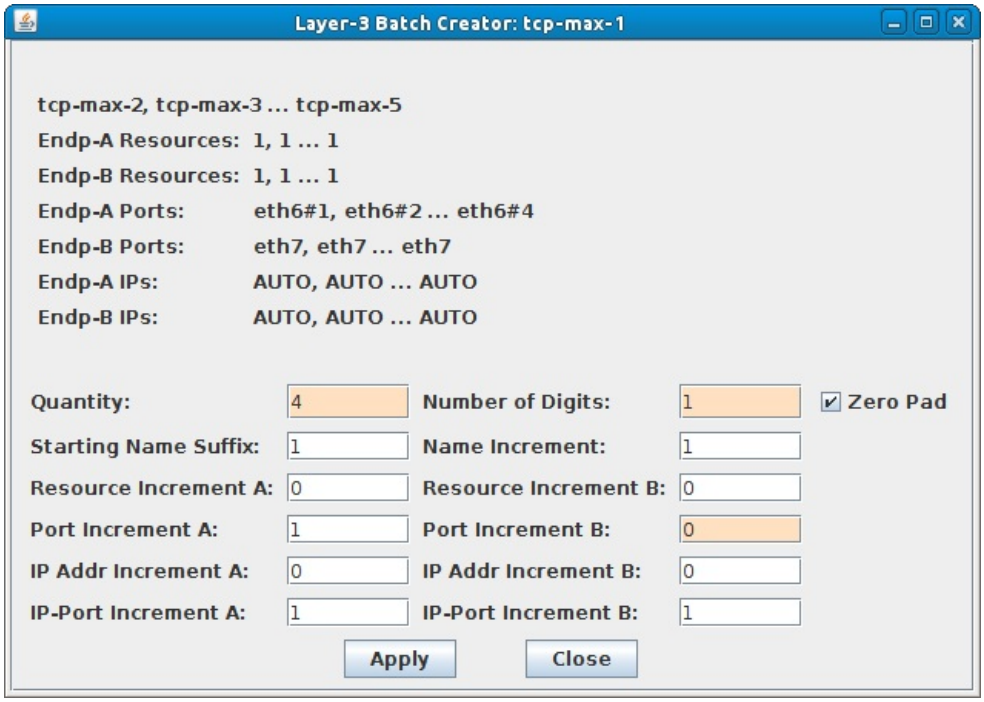
A. Endpoint-A will be one of the MAC-VLANs and Endpoint-B will be the port connected to the DUT WAN port. This setup will initiate the TCP sessions from the LAN side of the DUT.

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.

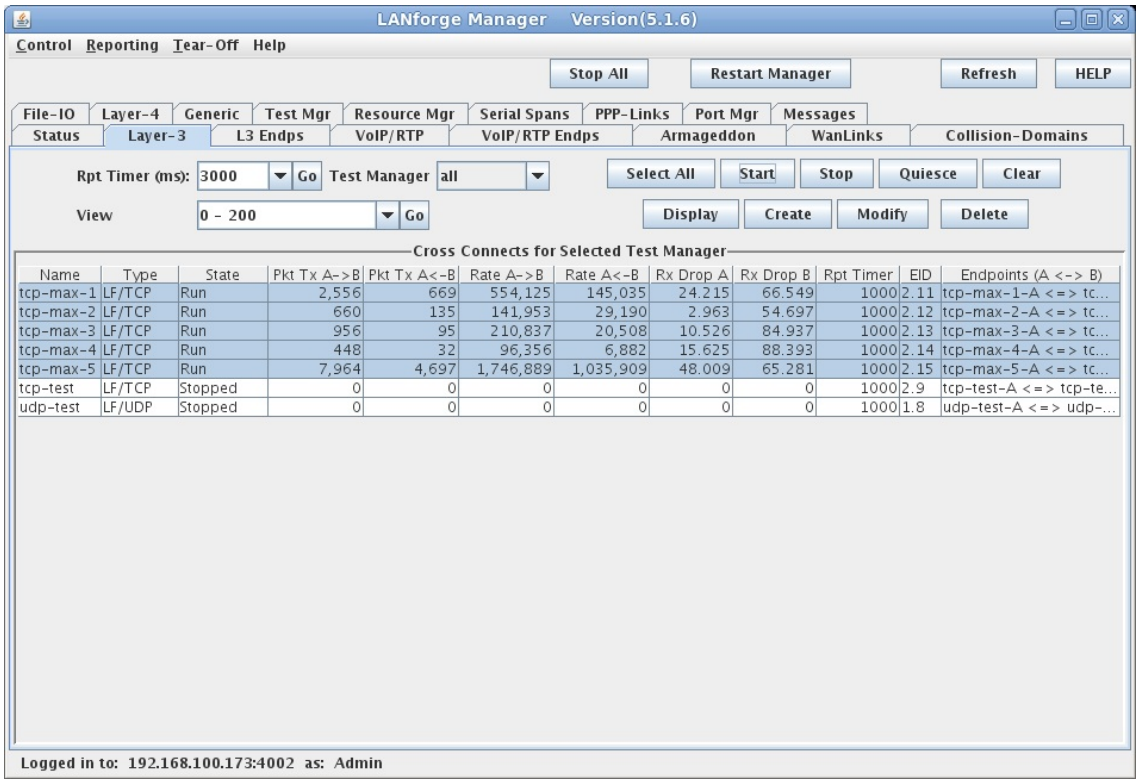
C. This is an iterative test, the number of TCP connections to use will depend on the DUT capabilities. Modify the number of connections as necessary to find the most accurate measurement.

D. The DUT should be power-cycled to reset it before each test run.

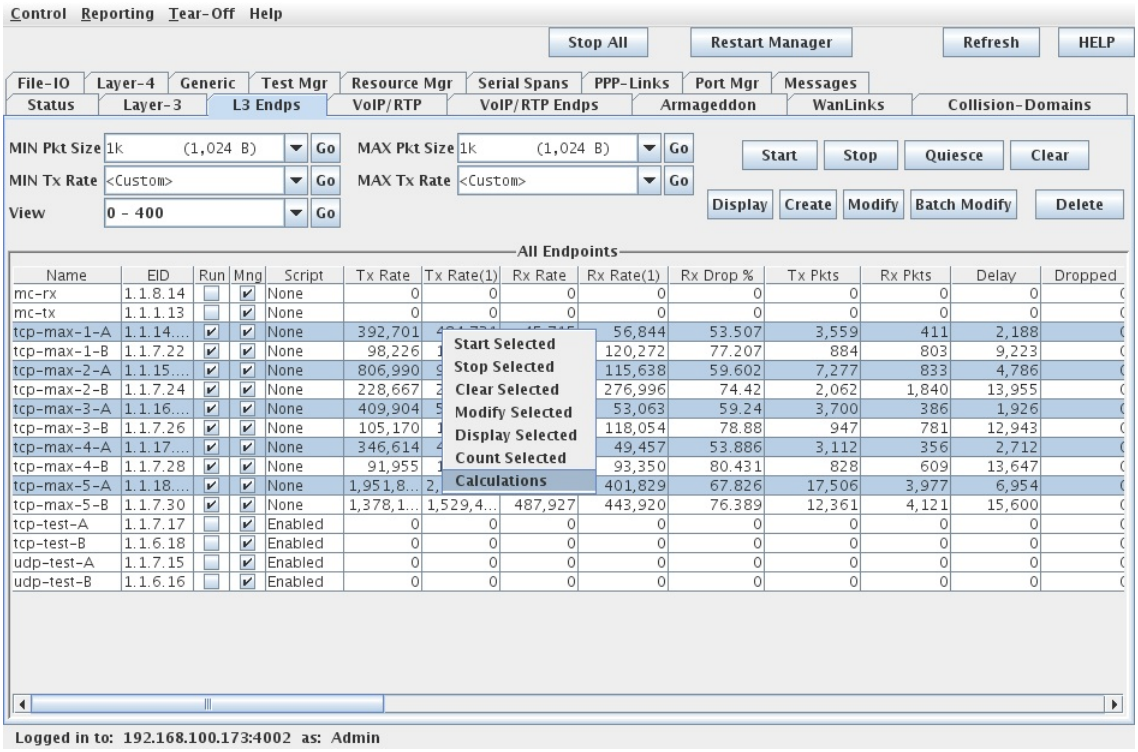
D. Select the Batch-Create button to create 4 more copies of this connection each with a new MAC-VLAN port.



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

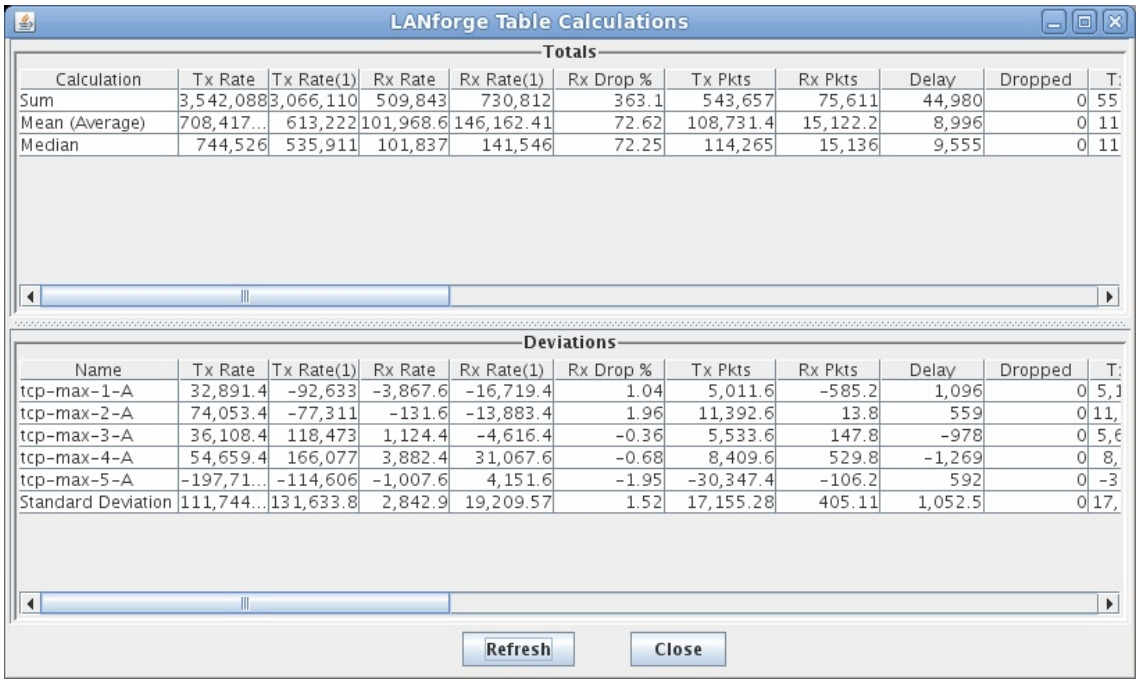


F. On the Layer-3 Endpoints tab, highlight the Running A-Side Endpoints, then right-click and select Calculations.

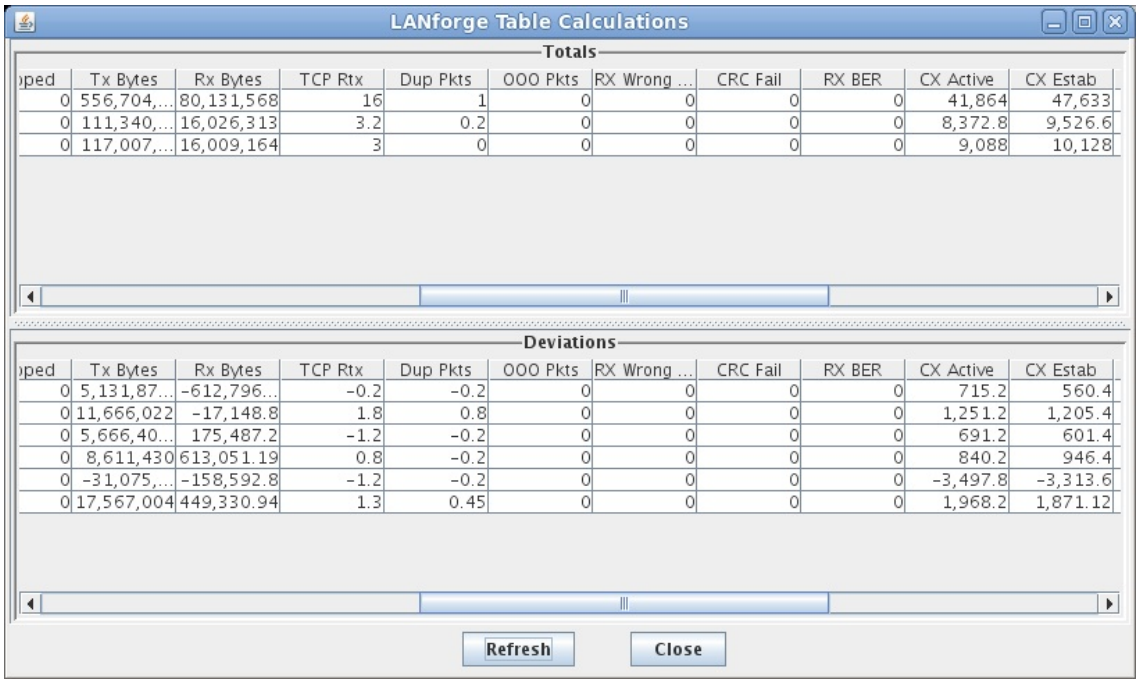


Name	EID	Run	Mng	Script	Tx Rate	Tx Rate(1)	Rx Rate	Rx Rate(1)	Rx Drop %	Tx Pkts	Rx Pkts	Delay	Dropped
mc-rx	1.1.8.14	☐	☑	None	0	0	0	0	0	0	0	0	0
mc-tx	1.1.1.13	☐	☑	None	0	0	0	0	0	0	0	0	0
tcp-max-1-A	1.1.14....	☑	☑	None	392,701	4...	5...	56,844	53.507	3,559	411	2,188	0
tcp-max-1-B	1.1.7.22	☑	☑	None	98,226	1		120,272	77.207	884	803	9,223	0
tcp-max-2-A	1.1.15....	☑	☑	None	806,990	9		115,638	59.602	7,277	833	4,786	0
tcp-max-2-B	1.1.7.24	☑	☑	None	228,667	2		276,996	74.42	2,062	1,840	13,955	0
tcp-max-3-A	1.1.16....	☑	☑	None	409,904	5		53,063	59.24	3,700	386	1,926	0
tcp-max-3-B	1.1.7.26	☑	☑	None	105,170	1		118,054	78.88	947	781	12,943	0
tcp-max-4-A	1.1.17....	☑	☑	None	346,614	4		49,457	53.886	3,112	356	2,712	0
tcp-max-4-B	1.1.7.28	☑	☑	None	91,955	1		93,350	80.431	828	609	13,647	0
tcp-max-5-A	1.1.18....	☑	☑	None	1,951,8...	2,		401,829	67.826	17,506	3,977	6,954	0
tcp-max-5-B	1.1.7.30	☑	☑	None	1,378,1...	1,529,4...	487,927	443,920	76.389	12,361	4,121	15,600	0
tcp-test-A	1.1.7.17	☐	☑	Enabled	0	0	0	0	0	0	0	0	0
tcp-test-B	1.1.6.18	☐	☑	Enabled	0	0	0	0	0	0	0	0	0
udp-test-A	1.1.7.15	☐	☑	Enabled	0	0	0	0	0	0	0	0	0
udp-test-B	1.1.6.16	☐	☑	Enabled	0	0	0	0	0	0	0	0	0

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



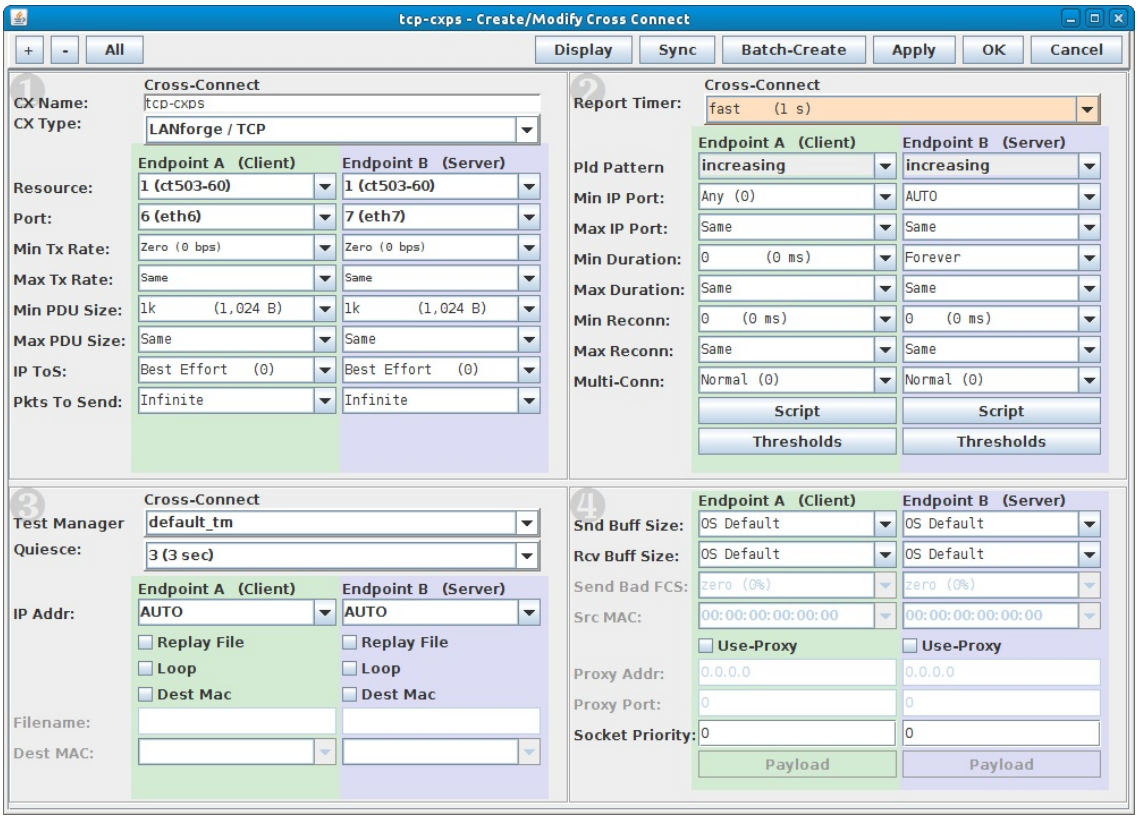
H. Scroll right to the CX Active and CX Established columns and select the **Refresh** button. This DUT can maintain a maximum of 41,864 simultaneous TCP connections.



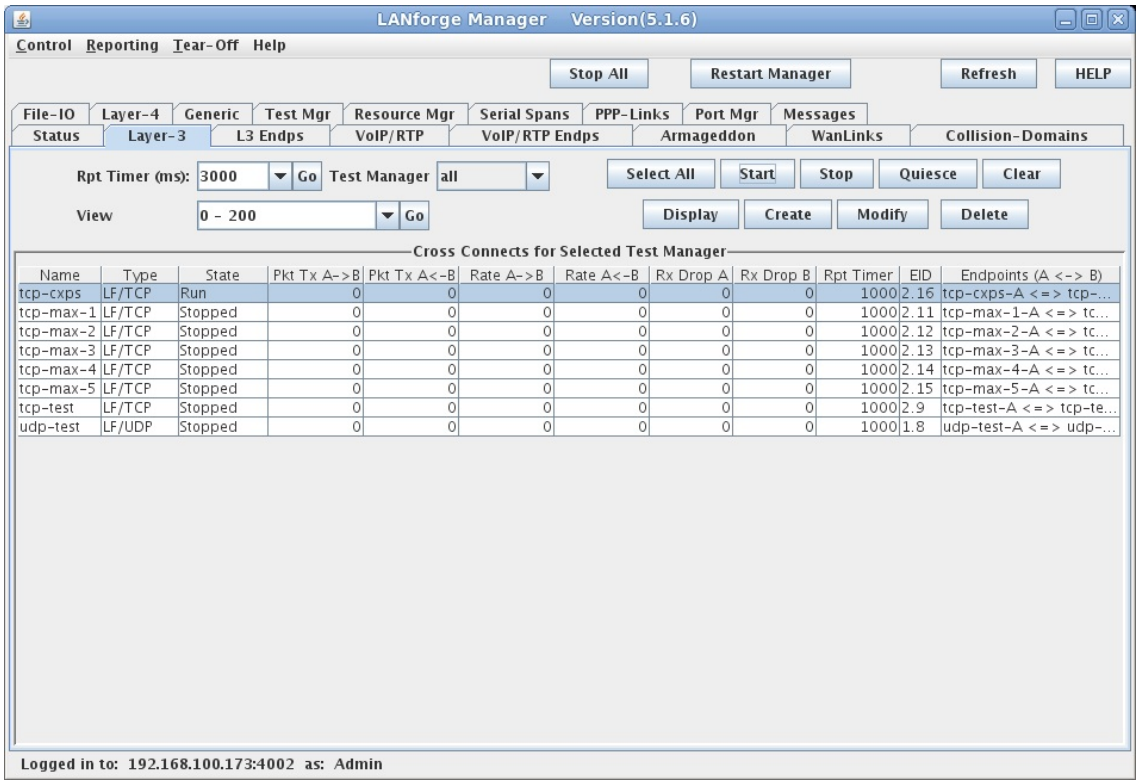
A. **CX Active** is the metric we are attempting to measure for Maximum Simultaneous TCP Connections. It will fluctuate with the DUT's ability to maintain the number of active TCP connections.

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.

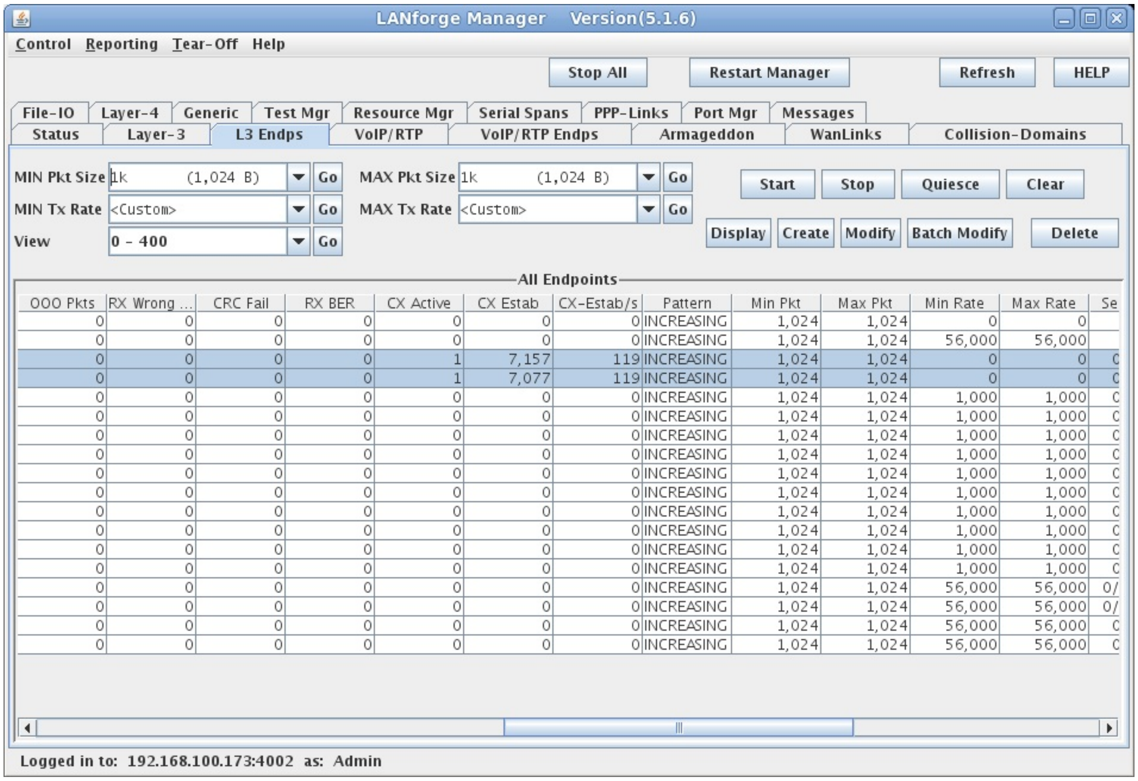
3. The **TCP Connections per Second** test will measure the rate of TCP connections that can be set up through the DUT.
    A. Create a Layer-3 TCP connection with the Duration and IP Port set to zero.



B. Highlight and Start the connection.



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



For more information see LANforge GUI User's Guide