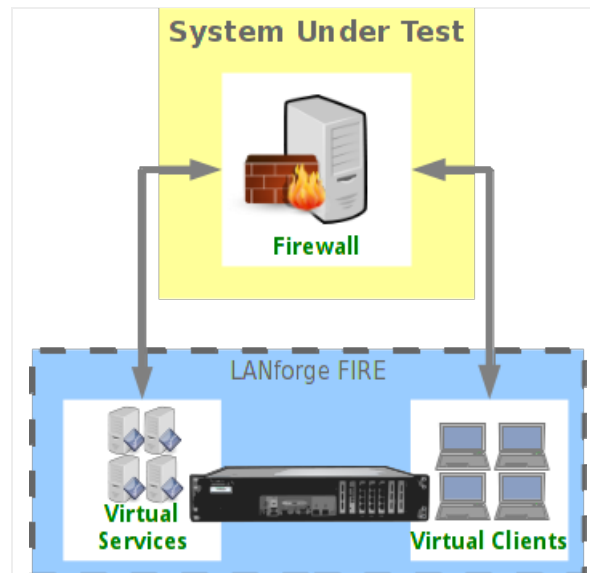
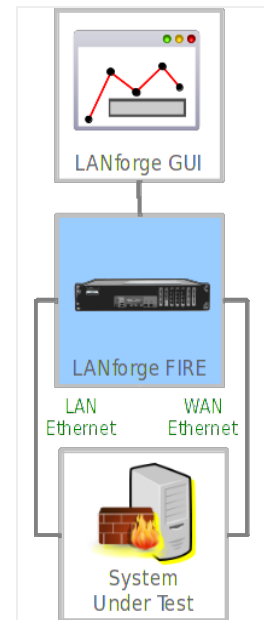


## Multiple Thousands of TCP Connections

**Goal:** Set up and run traffic on multiple thousands of stateful TCP connections. As of LANforge release version 5.1.4, LANforge-FIRE has the capability to create multiple thousands of TCP connections using only two ports on one Layer-3 connection that can all run simultaneously and in a stateful manner. This feature can be used to test connection state aware devices such as firewalls, stateful packet inspection systems and intrusion detection/prevention systems.

The upper limit of the total number of concurrent connections is determined by the processor speed and total memory available on the system running the LANforge software. In addition, the packet rate and payload size of each connection will also affect performance.

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



1. For this example, two physical ports on a single LANforge system are connected together.
2. Set up the LANforge ports so that they have valid IP addresses and IP masks.

A. Using the LANforge GUI, go to the Port Manager tab.

LANforge Manager Version(5.3.3)

Control Reporting Tear-Off Info Plugins

Stop All Restart Manager Refresh HELP

File-IO Layer-4 Generic Test Mgr Test Group Resource Mgr Event Log Alerts Port Mgr Messages

Status Layer-3 L3 Endps VoIP/RTP VoIP/RTP Endps Armageddon WanLinks Attenuators Collision-Domains

Disp: 192.168.100.133:0.0 Sniff Packets Clear Counters Reset Port Delete

Rpt Timer: medium (8 s) Apply View Details Create Modify Batch Modify

All Ethernet Interfaces (Ports) for all Resources.

Port	Pha...	Down	IP	SEC	Alias	Parent Dev	RX Bytes	RX Pkts	Pps RX	bps RX	TX Bytes	TX Pkts	Pp
1.1.0			192.168.100.145	0	eth0		12,349,471	125,350	19	15,568	188,546,974	177,232	
1.1.1			0.0.0.0	0	eth1		0	0	0	0	0	0	
1.1.2			0.0.0.0	0	eth2		0	0	0	0	0	0	
1.1.3			0.0.0.0	0	eth3		0	0	0	0	0	0	
1.1.4			0.0.0.0	0	eth4		0	0	0	0	0	0	
1.1.5			0.0.0.0	0	eth5		0	0	0	0	0	0	

Logged in to: lf1005c-is14120020:4002 as: Admin

B. Assign IP addresses and masks to the two ports.

eth4 (lf1005c-is14120020) Configure Settings

Current: LINK-UP 10G-FD TSO GSO GRO

Driver Info: Port Type: Ethernet Driver: ixgbe(4.0.1-k) Bus: 0000:02:00.1 Cur: 5GT/s x8 Max: 5GT/s x8

Port Status Information

Port Configurables

Enable

- Set IF Down
- Set MAC
- Set TX Q Len
- Set MTU
- Set Offload
- Set Rate Info
- Set PROMISC
- Set Rx-All/FCS
- Set Bypass
- Set Bridge Info
- Set CPU Mask

Services

- HTTP
- FTP
- RADIUS

General Interface Settings

Down  Aux-Mgt

DHCP-IPv6  DHCP Release DHCP Vendor ID: None

DHCP-IPv4  Secondary-IPs DHCP Client ID: None

DNS Servers: BLANK Peer IP: NA

IP Address: 172.16.0.102/24 Global IPv6: AUTO

IP Mask: 0.0.0.0 Link IPv6: AUTO

Gateway IP: 0.0.0.0 IPv6 GW: AUTO

Alias: MTU: 1500

MAC Addr: 00:e0:ed:2c:0b:87 TX Q Len: 1000

Br Cost: ignore Priority: ignore

Rpt Timer: medium (8 s) Watchdog: 0

CPU Mask: NO-SET WiFi Bridge: NONE

Port Rates

- 10bt-HD
- 10bt-FD
- 100bt-HD
- 100bt-FD
- 1000-FD
- 10G-FD
- 40G-FD
- Autonegotiate

Renegotiate  Restart Xcvr

PROMISC  RX-ALL

RX-FCS  Bypass NOW!

Bypass Power-UP  Bypass Power-DOWN

Bypass Disconnect

Advert Rates

- 10bt-HD
- 10bt-FD
- 100bt-HD
- 100bt-FD
- 1000-FD
- 10G-FD
- 40G-FD
- Flow-Control

Offload

- TSO Enabled
- UFO Enabled
- GSO Enabled
- LRO Enabled
- GRO Enabled

Print View Details Probe Sync Apply OK Cancel

C. Verify the port configuration.

LANforge Manager Version(5.3.3)

Control Reporting Tear-Off Info Plugins

Stop All Restart Manager Refresh HELP

File-IO Layer-4 Generic Test Mgr Test Group Resource Mgr Event Log Alerts Port Mgr Messages

Status Layer-3 L3 Endps VoIP/RTP VoIP/RTP Endps Armageddon WanLinks Attenuators Collision-Domains

Disp: 192.168.100.133:0.0 Sniff Packets Clear Counters Reset Port Delete

Rpt Timer: medium (8 s) Apply View Details Create Modify Batch Modify

All Ethernet Interfaces (Ports) for all Resources.

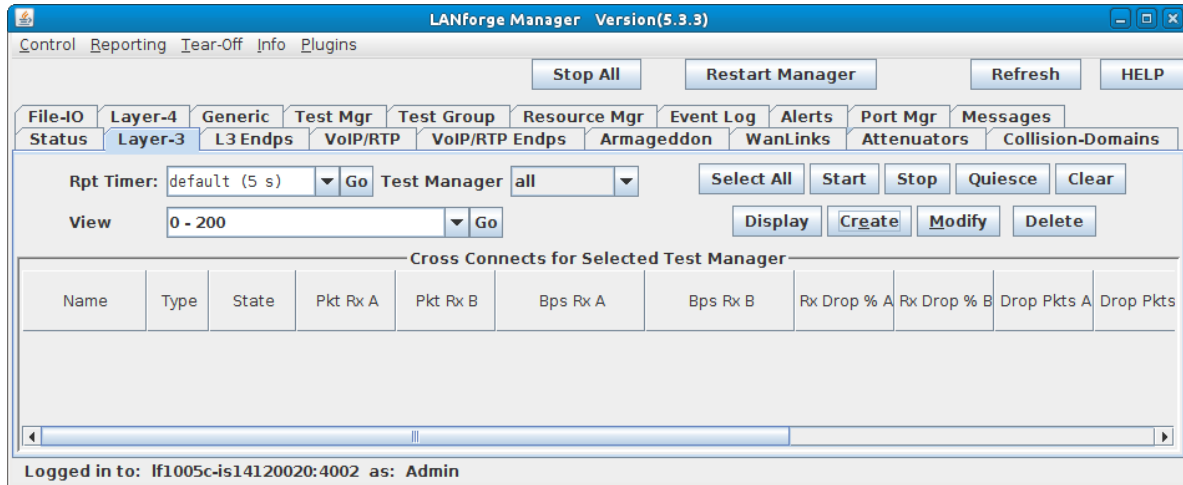
Port	Pha...	Down	IP	SEC	Alias	Parent Dev	RX Bytes	RX Pkts	Pps RX	bps RX	TX Bytes	TX Pkts	Pp
1.1.0			192.168.100.145	0	eth0		13,102,598	132,901	13	11,151	191,921,694	182,089	
1.1.1			0.0.0.0	0	eth1		0	0	0	0	0	0	
1.1.2			0.0.0.0	0	eth2		0	0	0	0	0	0	
1.1.3			0.0.0.0	0	eth3		0	0	0	0	0	0	
1.1.4			172.16.0.102	0	eth4		0	0	0	0	680	8	
1.1.5			172.16.0.103	0	eth5		0	0	0	0	680	8	

Logged in to: lf1005c-is14120020:4002 as: Admin

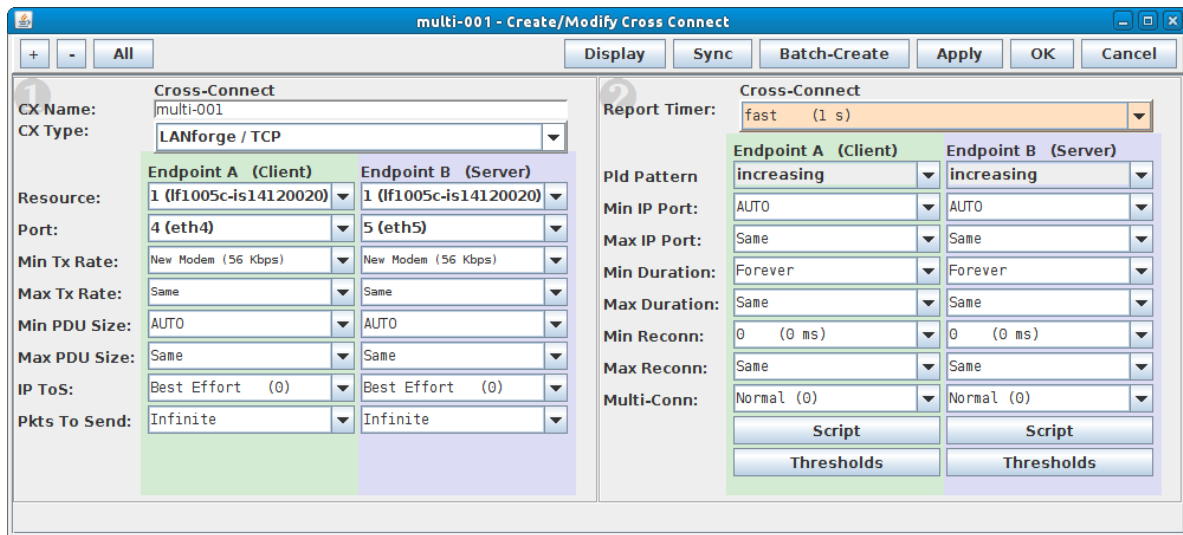
For more information see [LANforge User's Guide: Ports \(Interfaces\)](#)

3. Set up a Layer-3 Multi-Conn TCP connection.

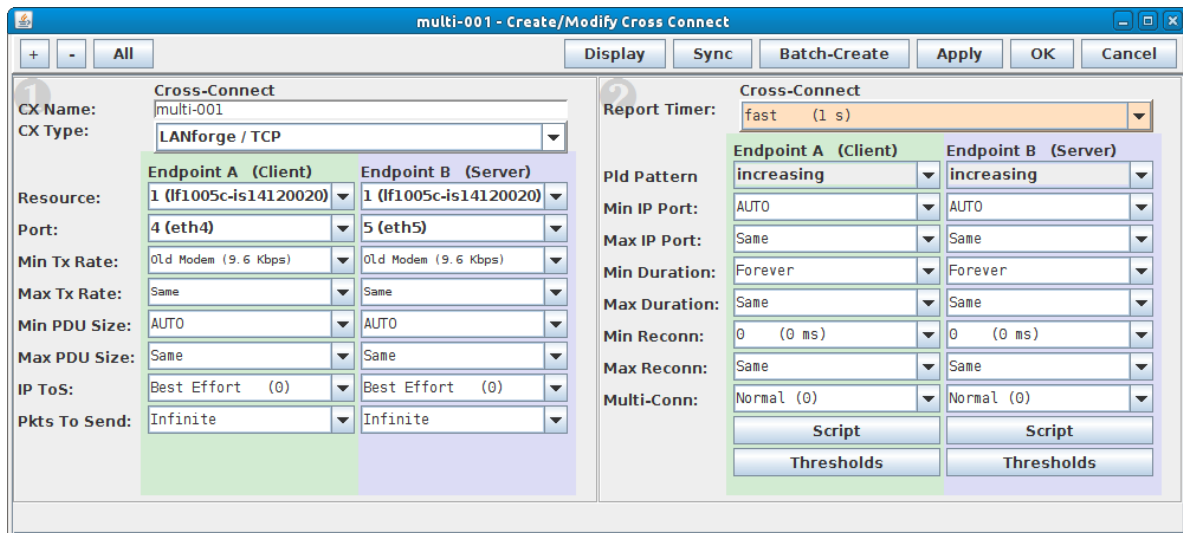
A. Go to the **Layer-3** tab, and select the **Create** button.



B. For Endpoint A, type in a name in the **CX Name** field, choose a **CX Type** of 'LANforge/TCP', choose the correct ports and set the **Report Timer** to 'fast (1 s)'.



C. Set the **Min Tx Rate** on both Endpoints A and B to '9.6Kbps'. Leave the Max Tx Rate on both set to 'Same'.



A. **NOTE:** Higher speeds and/or bursty transmit rates will require more memory to process per connection.

D. Set the **Min PDU Size** on both Endpoints A and B to '1024B'. Leave the Max PDU Size on both set to 'Same'.

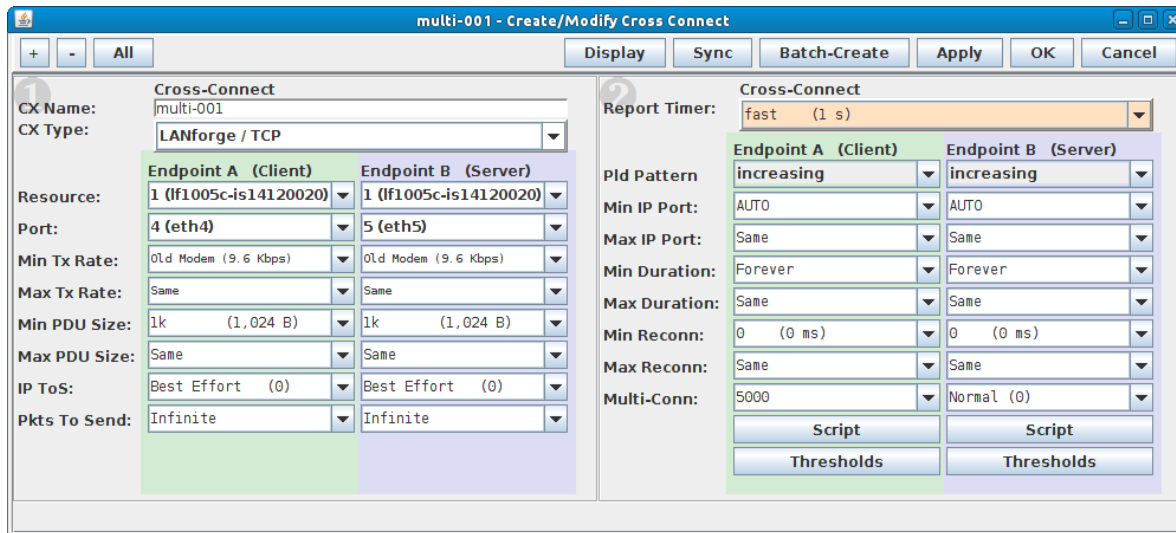
A. **NOTE:** Larger packet sizes will use more memory, smaller packet sizes will require more CPU processing time.

E. Set **Min IP Port** to **0 (zero)** on Endpoint A. Leave the Min IP Port on Endpoint B set to AUTO.

A. Leaving Min IP Port on AUTO would make connections very slow to reconnect due to IP port re-use issues. Multi-conn may not work at all with a fixed IP port.

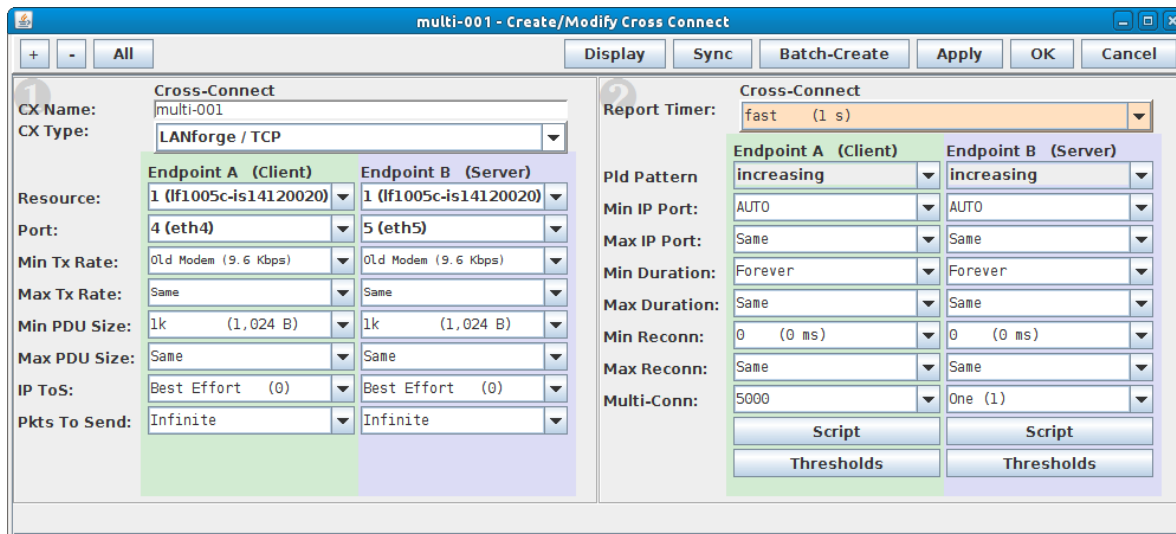
F. Leave the **Min Duration** set to Forever and **Max Duration** set to Same for both endpoints, unless you want each of the multiple TCP connections to teardown and restart after a specified duration.

G. For Endpoint A, set the **Multi-Conn** to the desired number of multiple TCP connections.



A. You can type in any value that your license allows here or choose one from the drop down box. The recommended approach is to create a new Multi-Conn connection for every 5000 connections.

H. For Endpoint B, set the **Multi-Conn** to one, then select **OK** to create the connection.

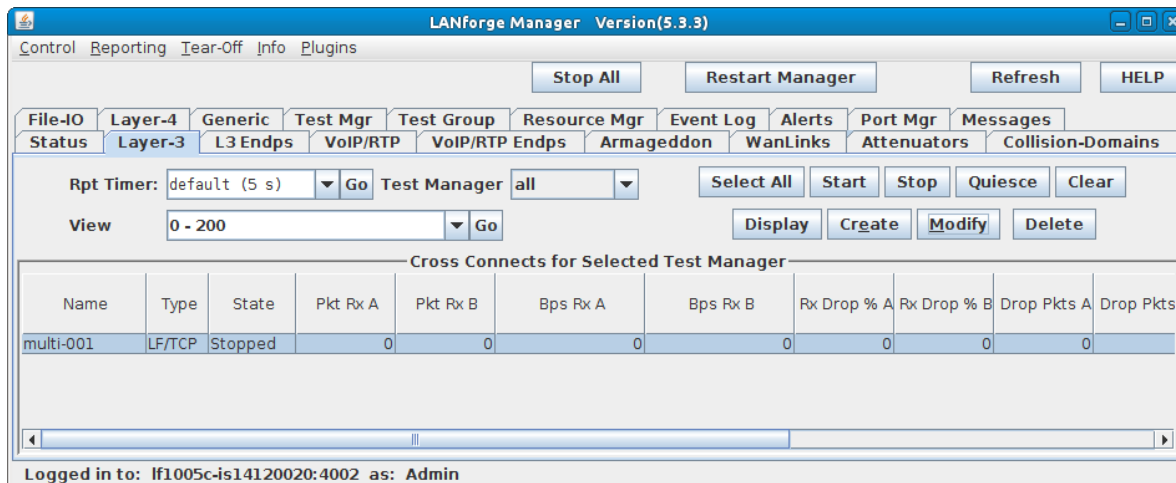


A. Endpoint B is the 'server' side of the TCP connection, therefore it is only necessary to have one Multi-Conn set up on Endpoint B to reply to all of the Endpoint A TCP SYN packets when the 5000 connections are being established.

For more information see [LANforge User's Guide: Creating & Modifying Cross Connects](#)

4. Create 5 more Layer-3 Multi-Conn TCP connections.

A. On the **Layer-3** tab, highlight the first connection created in the previous step and select **Modify**.



B. Select the **Batch-Create** button.

multi-001 - Create/Modify Cross Connect

Buttons: +, -, All, Display, Sync, **Batch-Create**, Apply, OK, Cancel

**1** Cross-Connect  
CX Name: multi-001  
CX Type: LANforge / TCP

Endpoint A (Client)	Endpoint B (Server)
Resource: 1 (If1005c-is14120020)	1 (If1005c-is14120020)
Port: 4 (eth4)	5 (eth5)
Min Tx Rate: Old Modem (9.6 Kbps)	Old Modem (9.6 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

**2** Cross-Connect  
Report Timer: fast (1 s)

Endpoint A (Client)	Endpoint B (Server)
Pid Pattern: increasing	increasing
Min IP Port: AUTO	AUTO
Max IP Port: Same	Same
Min Duration: Forever	Forever
Max Duration: Same	Same
Min Reconn: 0 (0 ms)	0 (0 ms)
Max Reconn: Same	Same
Multi-Conn: 5000 (5,000)	One (1)

Buttons: Script, Thresholds

C. Set the **Quantity** to 5, and set **Port Increment A** and **Port Increment B** to 0 (zero)

Layer-3 Batch Creator: multi-001

multi-002, multi-003 ... multi-006

Endp-A Resources: 1, 1 ... 1  
Endp-B Resources: 1, 1 ... 1  
Endp-A Ports: eth4, eth4 ... eth4  
Endp-B Ports: eth5, eth5 ... eth5  
Endp-A IPs: AUTO, AUTO ... AUTO  
Endp-B IPs: AUTO, AUTO ... AUTO

Quantity: 5 Number of Digits: 3  Zero Pad

Starting Name Suffix: 001 Name Increment: 1

Resource Increment A: 0 Resource Increment B: 0

Port Increment A: 0 Port Increment B: 0

IP Addr Increment A: 0 IP Addr Increment B: 0

IP-Port Increment A: 1 IP-Port Increment B: 1

Buttons: Apply, Close

D. Select the **Apply** button.

E. Verify that six Multi-Conn TCP connections were created.

The screenshot shows the LANforge Manager interface. At the top, there are navigation tabs: Control, Reporting, Tear-Off, Info, and Plugins. Below these are buttons for Stop All, Restart Manager, Refresh, and HELP. A series of sub-tabs are visible: File-IO, Layer-4, Generic, Test Mgr, Test Group, Resource Mgr, Event Log, Alerts, Port Mgr, Messages, Status, Layer-3, L3 Endps, VoIP/RTP, VoIP/RTP Endps, Armageddon, WanLinks, Attenuators, and Collision-Domains. The main control area includes a Rpt Timer set to 'default (5 s)' with a Go button, a Test Manager dropdown set to 'all', and buttons for Select All, Start, Stop, Quiesce, and Clear. Below this is a View dropdown set to '0 - 200' with a Go button, and buttons for Display, Create, Modify, and Delete. The central table is titled 'Cross Connects for Selected Test Manager' and contains the following data:

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 B
multi-001	LF/TCP	Stopped	0	0	0	0	0	0	0	0
multi-002	LF/TCP	Stopped	0	0	0	0	0	0	0	0
multi-003	LF/TCP	Stopped	0	0	0	0	0	0	0	0
multi-004	LF/TCP	Stopped	0	0	0	0	0	0	0	0
multi-005	LF/TCP	Stopped	0	0	0	0	0	0	0	0
multi-006	LF/TCP	Stopped	0	0	0	0	0	0	0	0

At the bottom of the window, it says 'Logged in to: lf1005c-is14120020:4002 as: Admin'.

For more information see [LANforge User's Guide: Layer-3 Endpoints \(FIRE\)](#)

5. Run traffic and verify results.
  - A. Highlight all six connections.

LANforge Manager Version(5.3.3)

Control Reporting Tear-Off Info Plugins

Stop All Restart Manager Refresh HELP

File-IO Layer-4 Generic Test Mgr Test Group Resource Mgr Event Log Alerts Port Mgr Messages  
 Status Layer-3 L3 Endps VoIP/RTP VoIP/RTP Endps Armageddon WanLinks Attenuators Collision-Domains

Rpt Timer: default (5 s) Go Test Manager all Select All Start Stop Quiesce Clear

View 0 - 200 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 B
multi-001	LF/TCP	Stopped	0	0	0	0	0	0	0	0
multi-002	LF/TCP	Stopped	0	0	0	0	0	0	0	0
multi-003	LF/TCP	Stopped	0	0	0	0	0	0	0	0
multi-004	LF/TCP	Stopped	0	0	0	0	0	0	0	0
multi-005	LF/TCP	Stopped	0	0	0	0	0	0	0	0
multi-006	LF/TCP	Stopped	0	0	0	0	0	0	0	0

Logged in to: lf1005c-is14120020:4002 as: Admin

- B. Select the **Start** button

LANforge Manager Version(5.3.3)

Control Reporting Tear-Off Info Plugins

Stop All Restart Manager Refresh HELP

File-IO Layer-4 Generic Test Mgr Test Group Resource Mgr Event Log Alerts Port Mgr Messages  
 Status Layer-3 L3 Endps VoIP/RTP VoIP/RTP Endps Armageddon WanLinks Attenuators Collision-Domains

Rpt Timer: default (5 s) Go Test Manager all Select All Start Stop Quiesce Clear

View 0 - 200 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 B
multi-001	LF/TCP	Run	966,616	972,843	46,927,611	47,012,605	0	0	0	0
multi-002	LF/TCP	Run	975,233	976,506	47,150,075	47,350,229	0	0	0	0
multi-003	LF/TCP	Run	971,641	976,080	47,087,849	47,256,566	0	0	0	0
multi-004	LF/TCP	Run	972,768	973,387	47,058,671	47,088,616	0	0	0	0
multi-005	LF/TCP	Run	967,832	975,218	47,047,707	47,177,471	0	0	0	0
multi-006	LF/TCP	Run	963,246	967,196	46,653,686	46,872,712	0	0	0	0

Logged in to: lf1005c-is14120020:4002 as: Admin



C. Go to the **L3 Endpts** tab to verify that all 30,000 connections are running.

LANforge Manager Version(5.3.3)

Control Reporting Tear-Off Info Plugins

Stop All Restart Manager Refresh HELP

File-IO Layer-4 Generic Test Mgr Test Group Resource Mgr Event Log Alerts Port Mgr Messages

Status Layer-3 L3 Endpts VoIP/RTP VoIP/RTP Endpts Armageddon WanLinks Attenuators Collision-Domains

Min PDU Size: AUTO Go Max PDU Size: Same Go

MIN Tx Rate: New Modem (56 Kbps) Go MAX Tx Rate: Same Go

View: 0 - 400

Start Stop Quiesce Clear

Display Create Modify Batch Modify Delete

All Endpoints

Tx Bytes	Rx Bytes	Replays	TCP Rtx	Dup Pkts	Rx Dup %	OOO Pkts	Rx OOO %	RX Wrong Dev	CRC Fail	RX BER	CX Active	CX Estab	CX Estab/s
2,168,671,232	2,165,875,712	0	0	0	0	0	0	0	0	0	5,000	5,000	0
2,168,355,840	2,169,897,984	0	0	0	0	0	0	0	0	0	5,000	5,000	0
2,173,019,136	2,170,444,800	0	0	0	0	0	0	0	0	0	5,000	5,000	0
2,173,028,352	2,173,854,720	0	0	0	0	0	0	0	0	0	5,000	5,000	0
2,172,618,752	2,169,956,352	0	0	0	0	0	0	0	0	0	5,000	5,000	0
2,173,020,160	2,177,105,920	0	0	0	0	0	0	0	0	0	5,000	5,000	0
2,170,354,688	2,168,975,360	0	0	0	0	0	0	0	0	0	5,000	5,000	0
2,170,106,880	2,170,354,688	0	0	0	0	0	0	0	0	0	5,000	5,000	0
2,172,047,360	2,167,830,528	0	0	0	0	0	0	0	0	0	5,000	5,000	0
2,168,659,968	2,171,337,728	0	0	0	0	0	0	0	0	0	5,000	5,000	0
2,167,525,376	2,160,612,352	0	0	0	0	0	0	0	0	0	5,000	5,000	0
2,164,663,296	2,168,122,368	0	0	0	0	0	0	0	0	0	5,000	5,000	0

Logged in to: lf1005c-is14120020:4002 as: Admin

D. Or, go to the **Port Mgr** tab, and sniff one of the ports while the **Multi-Conn TCP** connections are running.

LANforge Manager Version(5.3.3)

Control Reporting Tear-Off Info Plugins

Stop All Restart Manager Refresh HELP

File-IO Layer-4 Generic Test Mgr Test Group Resource Mgr Event Log Alerts Port Mgr Messages

Status Layer-3 L3 Endpts VoIP/RTP VoIP/RTP Endpts Armageddon WanLinks Attenuators Collision-Domains

Disp: 192.168.100.133:0 Sniff Packets Clear Counters Reset Port Delete

Rpt Timer: medium (8 s) Apply View Details Create Modify Batch Modify

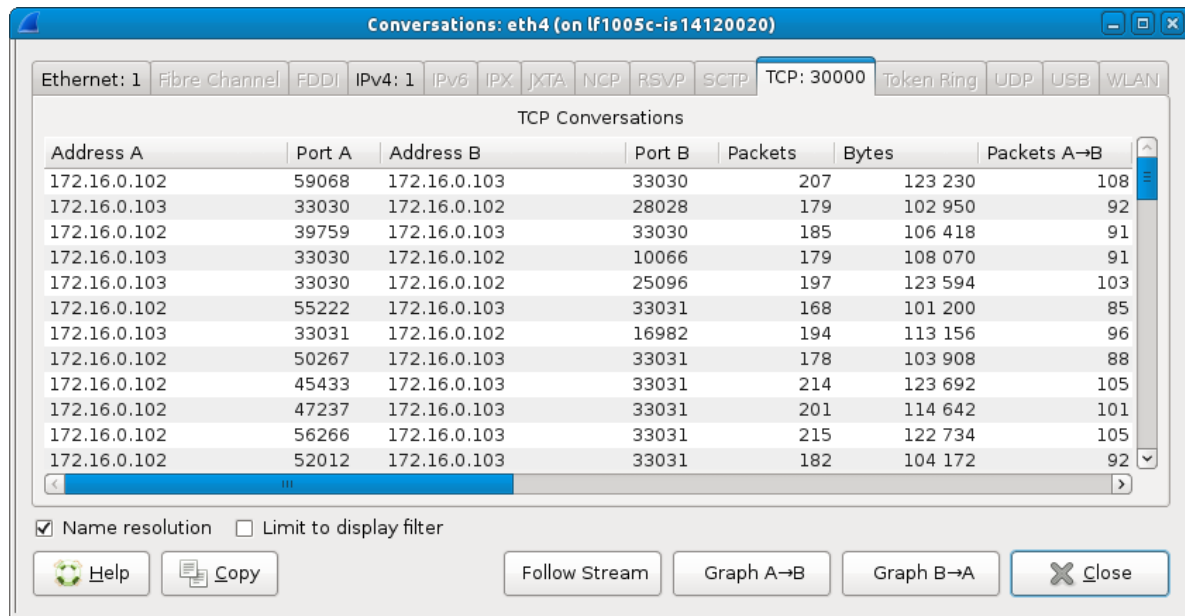
All Ethernet Interfaces (Ports) for all Resources.

Port	Pha...	Down	IP	SEC	Alias	Parent Dev	RX Bytes	RX Pkts	Pps RX	bps RX	TX Bytes	TX Pkts	Pps TX	bps
1.1.0			192.168.100.145	0	eth0		23,461,784	229,340	30	30,642	249,569,158	255,318	42	330
1.1.1			0.0.0.0	0	eth1		0	0	0	0	0	0	0	0
1.1.2			0.0.0.0	0	eth2		0	0	0	0	0	0	0	0
1.1.3			0.0.0.0	0	eth3		0	0	0	0	0	0	0	0
1.1.4			172.16.0.102	0	eth4		19,487,445...	33,333...	69,796	327,00...	19,498,153...	33,231...	69,478	326,8
1.1.5			172.16.0.103	0	eth5		19,498,153...	33,231...	69,483	327,00...	19,487,446...	33,333...	69,812	327,0

Logged in to: lf1005c-is14120020:4002 as: Admin

A. **NOTE:** You will need a lot of memory to run a Wireshark capture on 30,000 connections. It is probably best to stop all connections, set up the Wireshark capture, start all connections and let them run for 30 seconds to 1 minute before stopping them all, then stop the Wireshark capture and wait for it to process all those packets!

- E. After the Wireshark capture is complete, go to **Statistics - Conversations** to allow Wireshark to analyze the conversations and show that all 30,000 connections were captured. This will take some time to complete depending on the size of the capture.



The screenshot shows the 'Conversations: eth4 (on lf1005c-is14120020)' window in Wireshark. The 'TCP: 30000' tab is selected, displaying a table of TCP conversations. The table has columns for Address A, Port A, Address B, Port B, Packets, Bytes, and Packets A→B. The data shows multiple connections between 172.16.0.102 and 172.16.0.103 on various ports. Below the table, there are checkboxes for 'Name resolution' (checked) and 'Limit to display filter' (unchecked). At the bottom, there are buttons for 'Help', 'Copy', 'Follow Stream', 'Graph A→B', 'Graph B→A', and 'Close'.

Address A	Port A	Address B	Port B	Packets	Bytes	Packets A→B
172.16.0.102	59068	172.16.0.103	33030	207	123 230	108
172.16.0.103	33030	172.16.0.102	28028	179	102 950	92
172.16.0.102	39759	172.16.0.103	33030	185	106 418	91
172.16.0.103	33030	172.16.0.102	10066	179	108 070	91
172.16.0.103	33030	172.16.0.102	25096	197	123 594	103
172.16.0.102	55222	172.16.0.103	33031	168	101 200	85
172.16.0.103	33031	172.16.0.102	16982	194	113 156	96
172.16.0.102	50267	172.16.0.103	33031	178	103 908	88
172.16.0.102	45433	172.16.0.103	33031	214	123 692	105
172.16.0.102	47237	172.16.0.103	33031	201	114 642	101
172.16.0.102	56266	172.16.0.103	33031	215	122 734	105
172.16.0.102	52012	172.16.0.103	33031	182	104 172	92

For more information see [LANforge User's Guide: Layer-3 Endpoints \(FIRE\)](#)

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