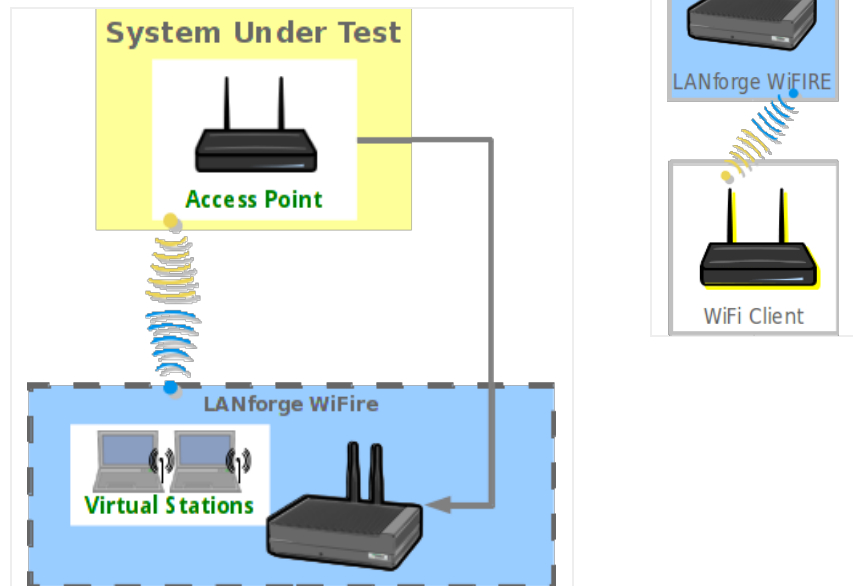


## WiFi Capacity Test with Layer 4-7

**Goal:** Use the WiFi Capacity Test plugin to emulate layer 4-7 traffic from ten virtual stations across an access point and report the results.

Requires 5.2.13 or later. This cookbook will go through setting up a VAP (Virtual Access Point) as an HTTP server, and creating/configuring 10 virtual stations to communicate with the VAP. It will also go through the setup of the WiFi Capacity Test LANforge-GUI plugin to have the virtual stations emulate downloading a file using Layer 4-7 endpoints in LANforge.

This example uses a LANforge CT523 system but the procedure should also work on a CT521, CT522, CT525 or similar system.



1. Create a VAP.
  - A. Verify the wiphy device used for the VAP is on your preferred channel (this test will use channel 11).

- A. In the **Port Mgr** tab of the LANforge Manager, modify the wiphy device that'll be used for the VAP (wiphy0 in this test).

**wiphy0 (brent-523) Configure Settings**

Port Status Information  
Current: LINK-DOWN NONE  
Driver Info: Port Type: WIFI-Radio Driver: ath9k() Bus:

Port Configurables

Standard Configuration RF Patterns Firmware

Enable  
☐ Set IF Down  
☐ Set PROMISC

General Interface Settings  
☐ Down  
Alias:   
MAC Addr: 00:0e:8e:4e:59:2f TX Q Len 0  
Rpt Timer: medium (8 s)

WiFi Settings  
Max-VIFs: 2048 Max-Stations: 2048 Max-APs: 8 Supports: 802.11abgn  
Country: United States (840)  
**Channel/Freq: 11 (2462 Mhz)**  
Antenna: All (3x3) Tx-Power: DEFAULT (-1)  
RTS: DEFAULT Frag: 2346  
☐ Verbose Debug

Print View Details Logs Probe Sync Apply OK Cancel

- I. Select your preferred channel here.

- B. Make sure the wiphy device is up.

LANforge Manager Version(5.3.5)

Control Reporting Tear-Off Info Plugins

Stop All Restart Manager Refresh HELP

Layer-4 Generic Test Mgr Test Group Resource Mgr Event Log Alerts Port Mgr vAP Stations Messages

Status Layer-3 L3 Endps VoIP/RTP VoIP/RTP Endps Armageddon WanLinks Attenuators File-I/O

Disp: 192.168.100.206:0.0 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	Pps TX
1.1.0		<input type="checkbox"/>	192.168.100.192	0	eth0		775,432	7,586	6	5,325	7,367,102	7,139	5
1.1.1		<input type="checkbox"/>	10.0.0.2	0	eth1		0	0	0	0	0	0	0
1.1.2		<input checked="" type="checkbox"/>	0.0.0.0	0	wiphy0		0	0	0	0	0	0	0
1.1.3		<input checked="" type="checkbox"/>	0.0.0.0	0	wiphy1		0	0	0	0	0	0	0
1.1.4		<input checked="" type="checkbox"/>	0.0.0.0	0	wiphy2		0	0	0	0	0	0	0
1.1.5		<input checked="" type="checkbox"/>	0.0.0.0	0	wlan0	wiphy0	0	0	0	0	0	0	0
1.1.6		<input checked="" type="checkbox"/>	0.0.0.0	0	wlan2	wiphy2	0	0	0	0	0	0	0
1.1.7		<input checked="" type="checkbox"/>	0.0.0.0	0	wlan1	wiphy1	0	0	0	0	0	0	0

Logged in to: brent-523:4002 as: Admin

- I. If the device is down like in the above screenshot, select it and click the **Admin UP** button (also indicated in the above screenshot).

B. In the **Port Mgr** tab, select a wiphy device (wiphy0 in this test) and click **Create**.

1 ☐ MAC-VLAN ☐ 802.1Q-VLAN ☐ Redirect ☐ Bridge ☐ GRE Tunnel  
☐ WiFi STA ☒ WiFi VAP ☐ WiFi Monitor ☐ WiFi Virtual Radio

2 Shelf: 1 Resource: 1 (brent-523) Port: 2 (wiphy0)

3 VLAN ID:  ☐ DHCP-IPv4  
Parent MAC: 00:0e:8e:4e:59:2f DHCP Client ID: None  
MAC Addr: xx:xx:xx:\*:\*:xx IP Address: 10.0.0.1/24 Global IPv6: AUTO  
Quantity: 1 IP Mask or Bits:  Link IPv6: AUTO  
Gateway IP:  IPv6 GW: AUTO  
#1 Redir Name:  #2 Redir Name:   
STA ID: 0 SSID: layer4test  
WiFi AP:  Key/Phrase:   
☐ WPA ☐ WPA2 ☐ WEP

4 ☐ Down  
Apply Cancel Ready

- A. Select the **WiFi VAP** radio button.
- B. Set **Quantity** to 1.
- C. Set **STA ID** to 0.
- D. Set **IP Address** to 10.0.0.1/24.
- E. Set the **SSID** to **layer4test**.
- F. Click **Apply** and close the create port window.

C. Configure the VAP.

- A. Open **Netsmith** from the **Status** tab.

LANforge Manager Version(5.3.5)

Control Reporting Tear-Off Info Plugins

Stop All Restart Manager Refresh HELP

Layer-4 Generic Test Mgr Test Group Resource Mgr Event Log Alerts Port Mgr vAP Stations Messages  
Status Layer-3 L3 Endps VoIP/RTP VoIP/RTP Endps Armageddon WanLinks Attenuators File-I/O

License Info  
Licenses expire in: 53 days.  
Support expires in: 53 days.

Current Users  
\* Admin from:192.168.100.206  
gnuserver from:127.0.0.1

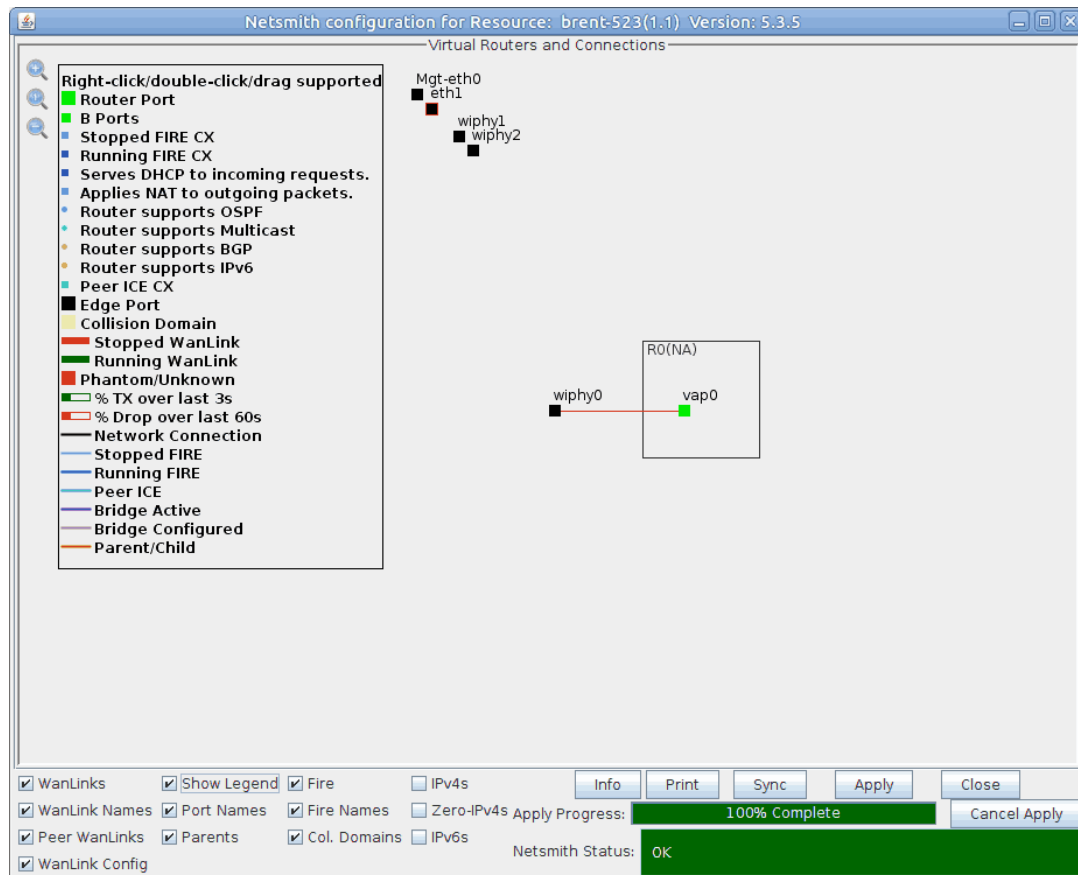
Test Configuration Database  
List: BLANK Load  
Name: Delete  
Load Behavior: Overwrite Save  
Download DB Show Progress

Virtual Shelf 1  
Resource 1  
Netsmith

Logged in to: brent-523:4002 as: Admin

- B. In Netsmith, right click and select **New Router**.
- C. Click **OK**.

D. Drag vap0 into the virtual router.



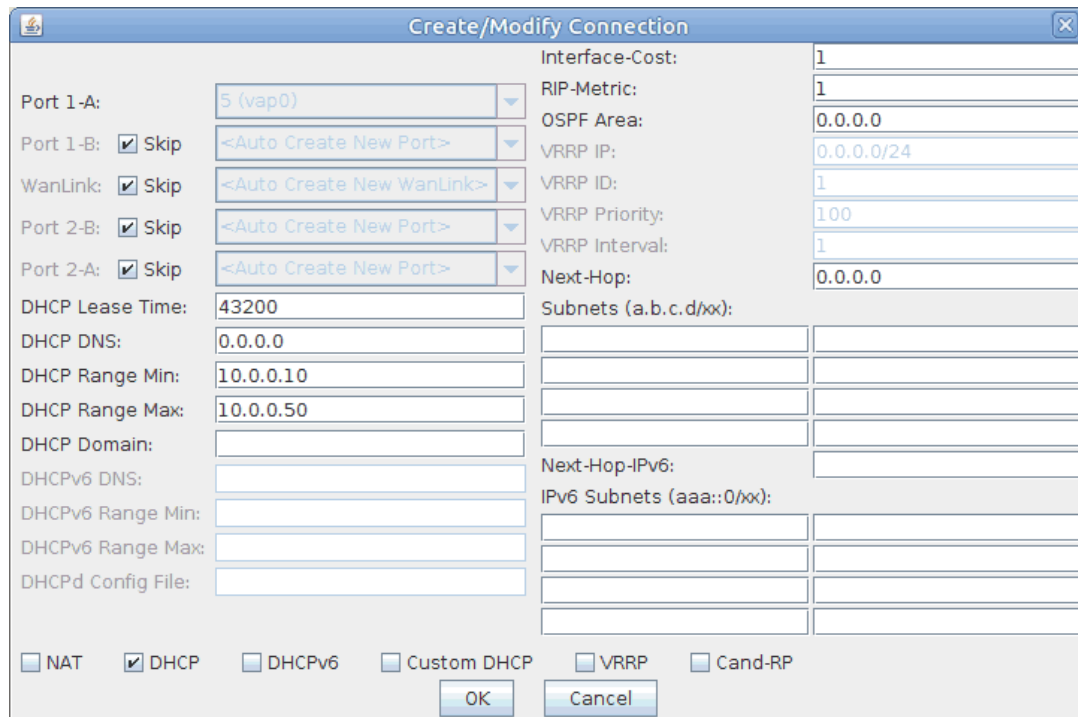
E. Right click vap0 and select **Modify**.

F. Check **DHCP**.

G. Change **DHCP Range Min** to **10.0.0.10**

H. Change **DHCP Range Max** to **10.0.0.50**

I. Click **OK**.



J. Click **Apply** in NetSmith then close the window.

2. Create 10 virtual stations.

- A. Verify the wiphy device used for the stations (wiphy 2 in this test) is on the **AUTO** channel.

wiphy2 (brent-523) Configure Settings

Port Status Information

Current: LINK-DOWN NONE

Driver Info: Port Type: WIFI-Radio Driver: ath9k() Bus:

Port Configurables

Standard Configuration RF Patterns Firmware

Enable

☐ Set IF Down

☐ Set PROMISC

General Interface Settings

☐ Down

Alias:

MAC Addr: 00:0e:8e:56:bb:43 TX Q Len 0

Rpt Timer: medium (8 s)

WiFi Settings

Max-VIFs: 2048 Max-Stations: 2048 Max-APs: 8 Supports: 802.11abgn

Country: United States (840)

Channel Freq: **AUTO (-1 Mhz)**

Antenna: All (3x3) Tx-Power: DEFAULT (-1)

RTS: DEFAULT Frag: 2346

☐ Verbose Debug

Print View Details Logs Probe Sync Apply OK Cancel

- B. Make sure wiphy2 is up.

LANforge Manager Version(5.3.5)

Control Reporting Tear-Off Info Plugins

Stop All Restart Manager Refresh HELP

Layer-4 Generic Test Mgr Test Group Resource Mgr Event Log Alerts Port Mgr vAP Stations Messages

Status Layer-3 L3 Endps VoIP/RTP VoIP/RTP Endps Armageddon WanLinks Attenuators File-I/O

Disp: 192.168.100.206:0.0 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	Pps TX
1.1.0			192.168.100.184	0	eth0		36,547,296	166,113	11	10,971	188,474,567	176,484	14
1.1.1			10.0.0.2	0	eth1		0	0	0	0	0	0	0
1.1.2			0.0.0.0	0	wiphy0		116,015,471	573,229	67	121,375	725,466,970	482,062	0
1.1.3			0.0.0.0	0	wiphy1		0	0	0	0	0	0	0
1.1.4		<input checked="" type="checkbox"/>	0.0.0.0	0	wiphy2		840,600,879	788,150	32	58,540	5,829,035	66,934	0
1.1.5			10.0.0.1	0	vap0	wiphy0	4,317,546	64,881	0	2	723,896,010	478,186	0

Logged in to: brent-523:4002 as: Admin

C. In the **Port Mgr** tab, select a wiphy device (wiphy2 in this test) and click **Create**.

- A. Select the **WiFi STA** radio button.
- B. Set **Quantity** to **10**.
- C. Set **STA ID** to **0**.
- D. Select **DHCP-IPv4**.
- E. Set the **SSID** to **layer4test**.
- F. Click **Apply** and close the create port window.

D. Make sure the 10 staX ports get IPs.

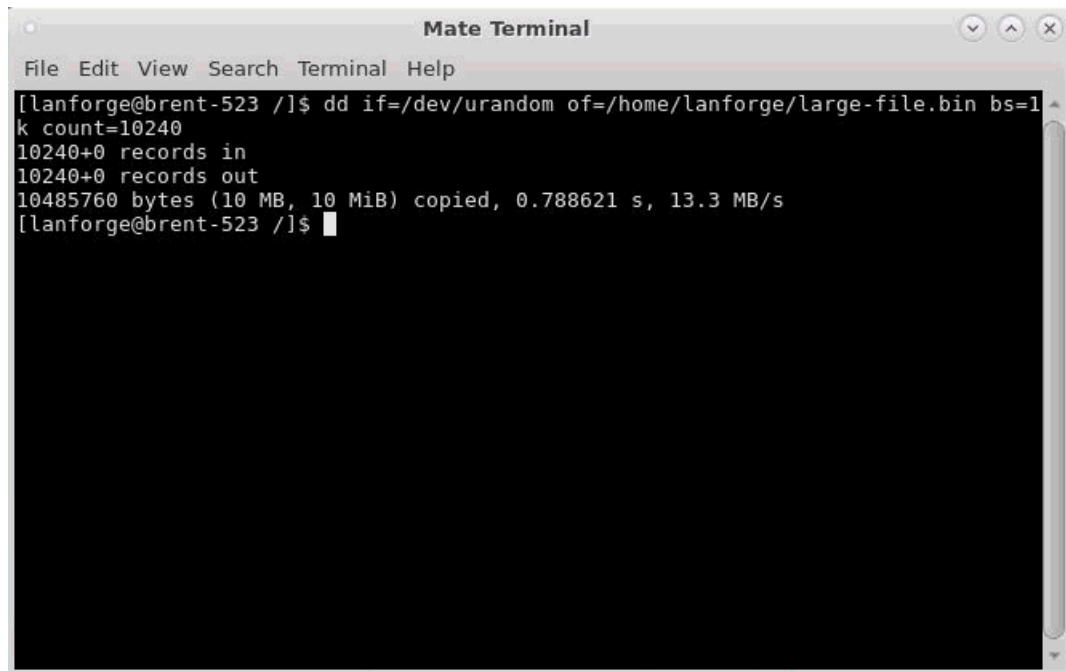
Port	Pha...	Down	IP	SEC	Alias	Parent Dev	RX Bytes	RX Pkts	Pps RX	bps RX	TX Bytes	TX Pkts	Pps TX
1.1.00			192.168.100.192	0	eth0		46,812,745	95,852	8	7,049	64,012,518	76,741	14
1.1.01			0.0.0.0	0	eth1		0	0	0	0	0	0	0
1.1.02			0.0.0.0	0	wiphy0		85,790,508	400,112	83	144,894	237,614	1,490	0
1.1.03			0.0.0.0	0	wiphy1		0	0	0	0	0	0	0
1.1.04			0.0.0.0	0	wiphy2		2,315,229	10,998	78	133,398	19,313	214	0
1.1.05			10.0.0.1	0	vap0	wiphy0	11,030	73	0	0	27,134	140	0
1.1.06			10.0.0.13	0	sta0	wiphy2	9,944	64	0	0	1,622	9	0
1.1.07			10.0.0.16	0	sta1	wiphy2	10,622	71	0	0	1,198	7	0
1.1.08			10.0.0.14	0	sta2	wiphy2	10,532	70	0	0	1,198	7	0
1.1.09			10.0.0.10	0	sta3	wiphy2	10,532	70	0	0	1,198	7	0
1.1.10			10.0.0.17	0	sta4	wiphy2	10,364	68	0	0	1,296	8	0
1.1.11			10.0.0.19	0	sta5	wiphy2	10,694	69	0	0	1,560	8	0
1.1.12			10.0.0.12	0	sta6	wiphy2	10,352	68	0	0	1,198	7	0
1.1.13			10.0.0.15	0	sta7	wiphy2	10,172	66	0	0	1,198	7	0
1.1.14			10.0.0.18	0	sta8	wiphy2	10,082	65	0	0	1,198	7	0
1.1.15			10.0.0.11	0	sta9	wiphy2	9,914	63	0	0	1,296	8	0

3. Create a file for the layer 4-7 endpoint to use.

- A. In a terminal on the LANforge system, run the below command to generate a 10MB file in **/home/lanforge**.

**Note:** The smaller a file is, the harder it is to reach higher rates. Therefore it is recommended to use a larger file for these tests.

```
dd if=/dev/urandom of=/home/lanforge/large-file.bin bs=1k count=10240
```

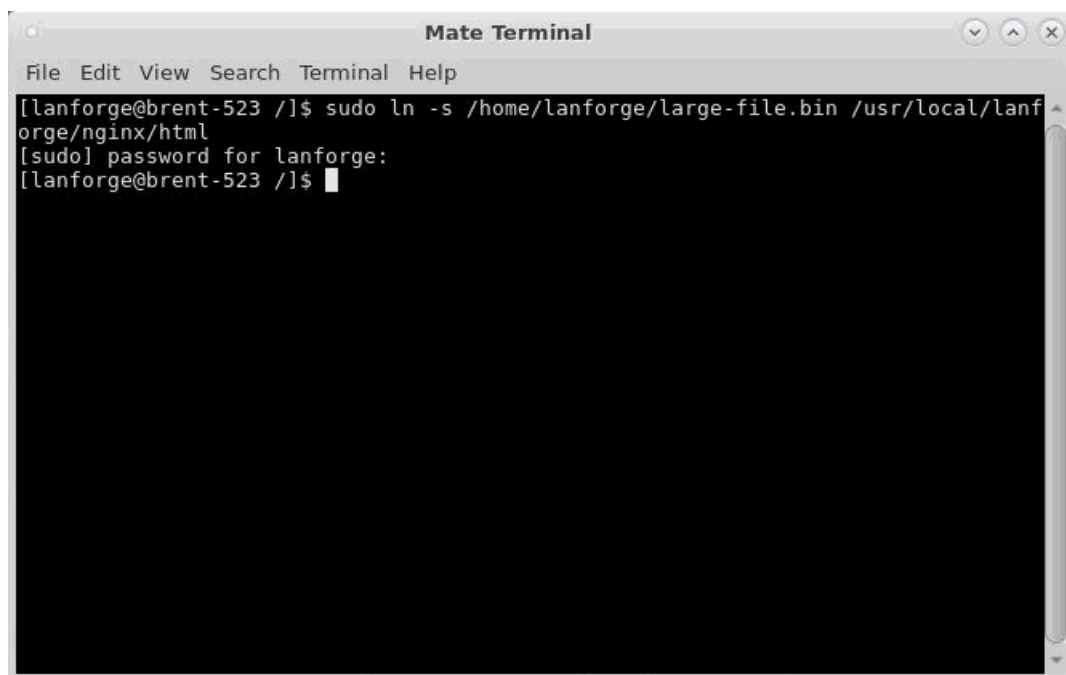


The screenshot shows a terminal window titled "Mate Terminal" with a menu bar (File, Edit, View, Search, Terminal, Help). The terminal output shows the command `dd if=/dev/urandom of=/home/lanforge/large-file.bin bs=1k count=10240` being executed. The output indicates that 10240+0 records were written, totaling 10485760 bytes (10 MB) at a rate of 13.3 MB/s, taking 0.788621 seconds.

```
[lanforge@brent-523 ~]$ dd if=/dev/urandom of=/home/lanforge/large-file.bin bs=1k count=10240
10240+0 records in
10240+0 records out
10485760 bytes (10 MB, 10 MiB) copied, 0.788621 s, 13.3 MB/s
[lanforge@brent-523 ~]$
```

- B. For the webserver to serve the file we created, it needs to know where to find it. Run the below command in a terminal on the LANforge system to link the file.

```
ln -s /home/lanforge/large-file.bin /usr/local/lanforge/nginx/html
```



The screenshot shows a terminal window titled "Mate Terminal" with a menu bar (File, Edit, View, Search, Terminal, Help). The terminal output shows the command `ln -s /home/lanforge/large-file.bin /usr/local/lanforge/nginx/html` being executed. A password prompt is shown, and the command is successfully executed.

```
[lanforge@brent-523 ~]$ sudo ln -s /home/lanforge/large-file.bin /usr/local/lanforge/nginx/html
[sudo] password for lanforge:
[lanforge@brent-523 ~]$
```

4. Set up the HTTP server on **vap0**.

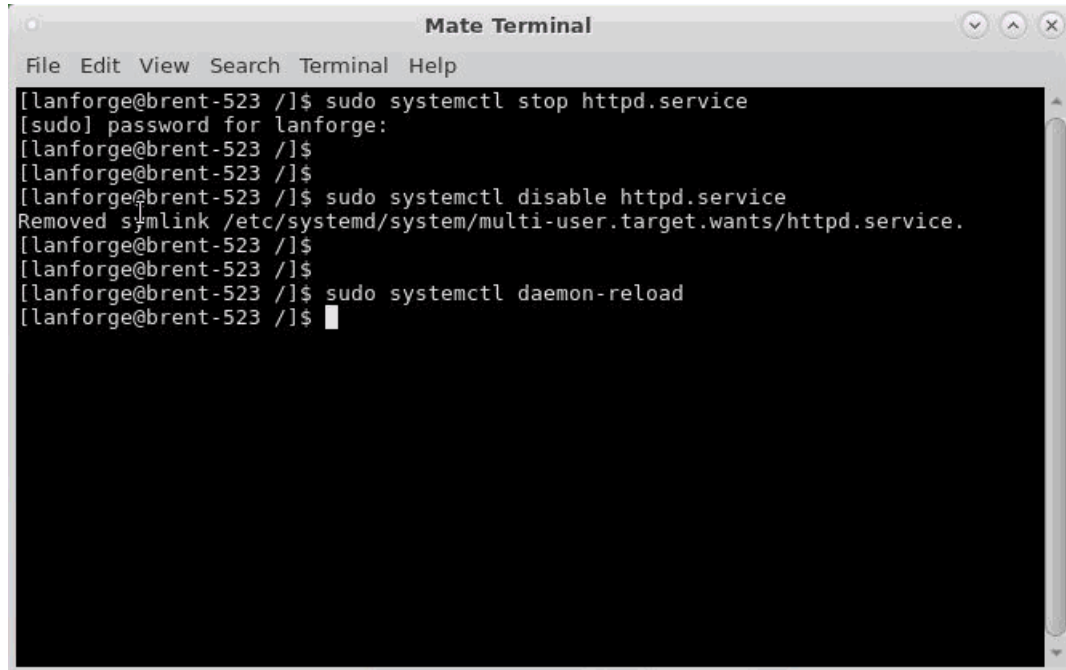
A. Before starting HTTP on vap0, the Apache service may need to be disabled.

A. Stop and disable httpd (Apache) in the LANforge terminal with the below commands.

```
sudo systemctl stop httpd.service
```

```
sudo systemctl disable httpd.service
```

```
sudo systemctl daemon-reload
```

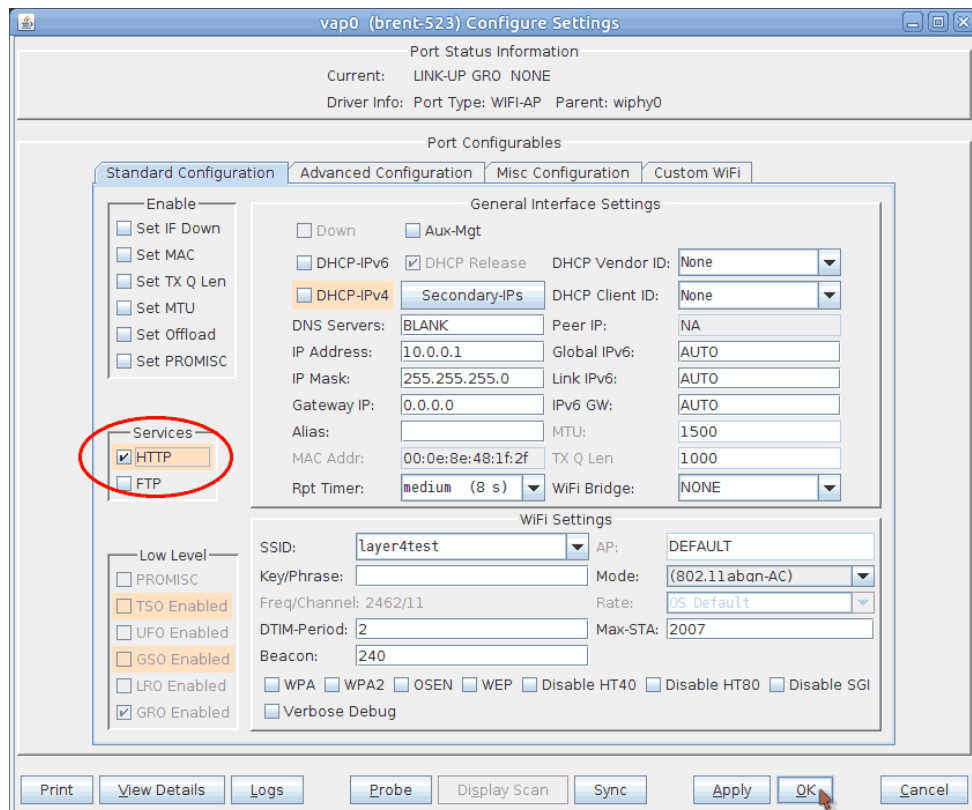


```
Mate Terminal
File Edit View Search Terminal Help

[lanforge@brent-523 /]$ sudo systemctl stop httpd.service
[sudo] password for lanforge:
[lanforge@brent-523 /]$
[lanforge@brent-523 /]$ sudo systemctl disable httpd.service
Removed symlink /etc/systemd/system/multi-user.target.wants/httpd.service.
[lanforge@brent-523 /]$
[lanforge@brent-523 /]$
[lanforge@brent-523 /]$ sudo systemctl daemon-reload
[lanforge@brent-523 /]$
```

B. Modify **vap0** in the LANforge **Port Mgr** tab.

I. Enable the **HTTP** checkbox.

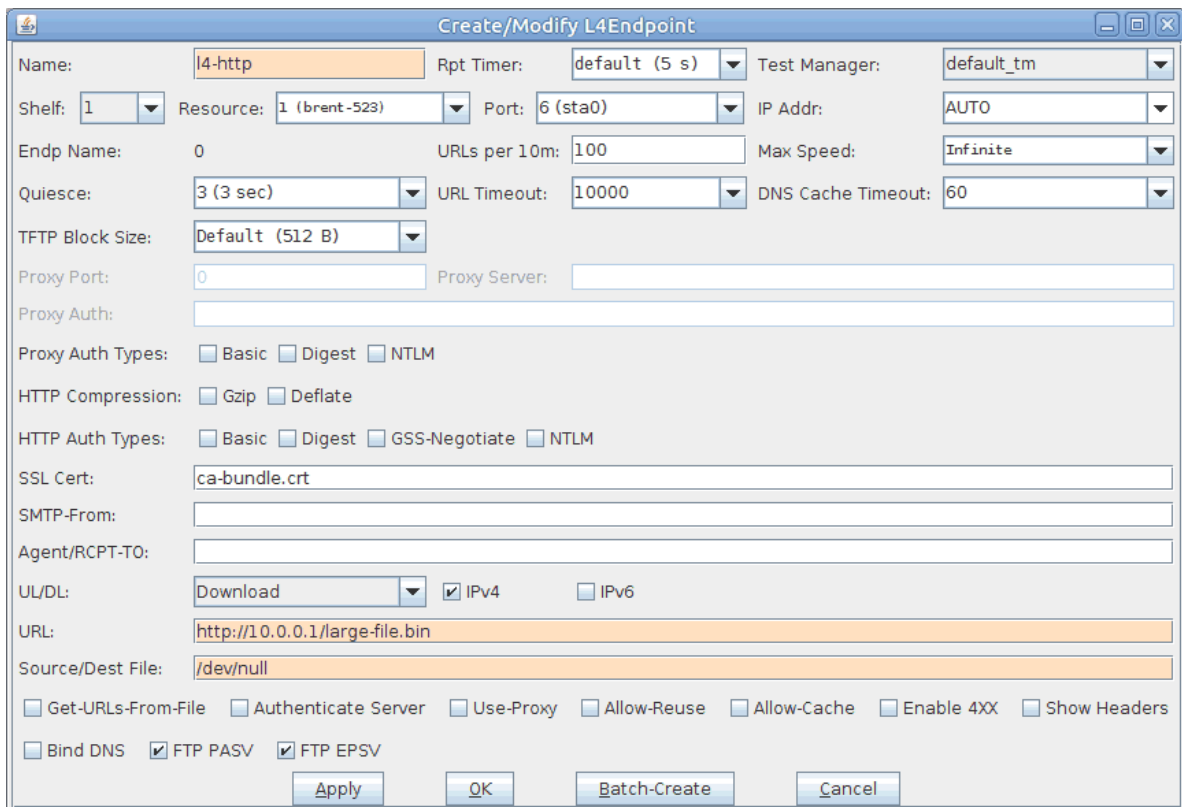


II. Click **OK**.

5. Create a layer 4-7 endpoint. WiFi Capacity will be using this as a template to copy from.



A. In the Layer 4-7 tab, click **Create**.



The 'Create/Modify L4Endpoint' dialog box is shown with the following settings:

- Name: **l4-http**
- Rpt Timer: **default (5 s)**
- Test Manager: **default\_tm**
- Shelf: **1**
- Resource: **1 (brent-523)**
- Port: **6 (sta0)**
- IP Addr: **AUTO**
- Endp Name: **0**
- URLs per 10m: **100**
- Max Speed: **Infinite**
- Quiesce: **3 (3 sec)**
- URL Timeout: **10000**
- DNS Cache Timeout: **60**
- TFTP Block Size: **Default (512 B)**
- Proxy Port: **0**
- Proxy Server:
- Proxy Auth:
- Proxy Auth Types: ☐ Basic ☐ Digest ☐ NTLM
- HTTP Compression: ☐ Gzip ☐ Deflate
- HTTP Auth Types: ☐ Basic ☐ Digest ☐ GSS-Negotiate ☐ NTLM
- SSL Cert: **ca-bundle.crt**
- SMTP-From:
- Agent/RCPT-TO:
- UL/DL: **Download** ☒ IPv4 ☐ IPv6
- URL: **http://10.0.0.1/large-file.bin**
- Source/Dest File: **/dev/null**
- ☐ Get-URLs-From-File ☐ Authenticate Server ☐ Use-Proxy ☐ Allow-Reuse ☐ Allow-Cache ☐ Enable 4XX ☐ Show Headers
- ☐ Bind DNS ☒ FTP PASV ☒ FTP EPSV

Buttons: **Apply**, **OK**, **Batch-Create**, **Cancel**

A. Set the **Name** to **l4-http**

B. Set the **Port** to **sta0**.

C. The **URL** will point to the VAP's IP:**http://10.0.0.1/large-file.bin**

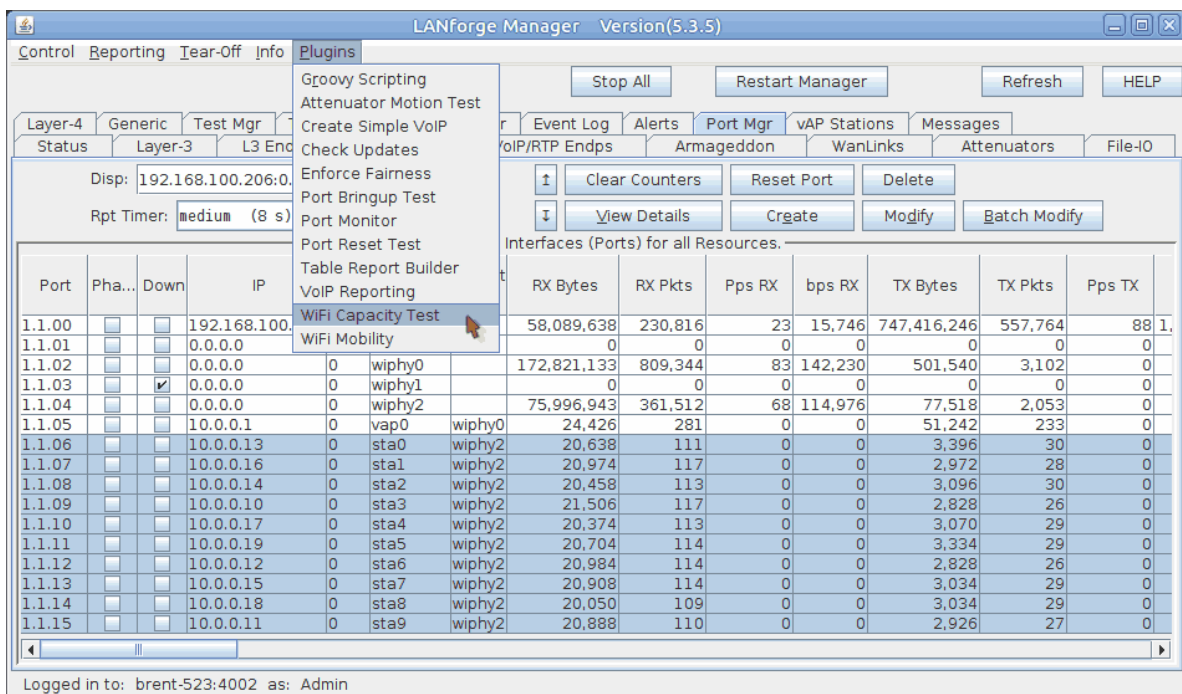
**Note:** This is where you can specify an IP of an AP you wish to test. LANforge also supports other layer 4-7 protocols, for more information you can view a tooltip by hovering over the URL text box.

D. Set the **Source/Dest File** to **/dev/null**

E. Click **OK**.

6. Set up and run a WiFi Capacity test.

A. Select the 10 created stations, then open WiFi Capacity Test from the Plugins menu.



The LANforge Manager interface (Version 5.3.5) is shown with the **Plugins** menu open. The **WiFi Capacity Test** option is highlighted. The main window displays a table of resources and their performance metrics.

Port	Pha...	Down	IP	RX Bytes	RX Pkts	Pps RX	bps RX	TX Bytes	TX Pkts	Pps TX
1.1.00			192.168.100.0	58,089,638	230,816	23	15,746	747,416,246	557,764	88
1.1.01			0.0.0.0	0	0	0	0	0	0	0
1.1.02			0.0.0.0	0	0	0	0	0	0	0
1.1.03			0.0.0.0	0	0	0	0	0	0	0
1.1.04			0.0.0.0	0	0	0	0	0	0	0
1.1.05			10.0.0.1	24,426	281	0	0	51,242	233	0
1.1.06			10.0.0.13	20,638	111	0	0	3,396	30	0
1.1.07			10.0.0.16	20,974	117	0	0	2,972	28	0
1.1.08			10.0.0.14	20,458	113	0	0	3,096	30	0
1.1.09			10.0.0.10	21,506	117	0	0	2,828	26	0
1.1.10			10.0.0.17	20,374	113	0	0	3,070	29	0
1.1.11			10.0.0.19	20,704	114	0	0	3,334	29	0
1.1.12			10.0.0.12	20,984	114	0	0	2,828	26	0
1.1.13			10.0.0.15	20,908	114	0	0	3,034	29	0
1.1.14			10.0.0.18	20,050	109	0	0	3,034	29	0
1.1.15			10.0.0.11	20,888	110	0	0	2,926	27	0

Logged in to: brent-523:4002 as: Admin

B. Go to the Settings tab.

The screenshot shows the 'WiFi Capacity Test' application window with the 'Settings' tab selected. The window has a title bar with standard OS controls. Below the title bar are five tabs: 'Select Ports', 'Settings' (active), 'PDU Mix Settings', 'Advanced Settings', and 'Select Output'. The 'Settings' tab contains several configuration options, each with a label and a dropdown menu. The options are: 'Station Increment' (Single (1)), 'Loop Iterations' (Single (1)), 'Duration' (60000), 'Protocol' (Layer-4), 'Layer-4 Endpoint' (l4-http), 'Payload Size' (AUTO), 'Total Rate' (10M (10 Mbps)), 'Total Upload Rate' (Zero (0 bps)), and 'Percentage TCP Rate' (10% (10%)). At the bottom of the window are two buttons: 'Start' and 'Close'.

Setting	Value
Station Increment:	Single (1)
Loop Iterations:	Single (1)
Duration:	60000
Protocol:	Layer-4
Layer-4 Endpoint:	l4-http
Payload Size:	AUTO
Total Rate:	10M (10 Mbps)
Total Upload Rate:	Zero (0 bps)
Percentage TCP Rate:	10% (10%)

A. Set **Station Increment** to 1.

B. Set the Protocol to **Layer 4-7**. **Note:** This should automatically be set if you first select a Layer 4-7 Endpoint.

C. Select your Layer 4-7 Endpoint (**l4-http** in this test). The capacity test will use this as a template for each of the ten stations.

D. **Total Rate** can stay at 10Mbps. **Note:** This rate can represent either upload or download traffic depending on how you have your layer 4-7 endpoint configured.

C. Run the Capacity test by clicking **Start**.



- A. The test will now make a copy of the selected layer 4-7 endpoint for each station **Note:** You may notice that URLs per 10m is set to a high rate, this is to ensure the maximum amount of URLs are processed as Wifi Capacity adjusts the Max Speed.