![Candela Technologies logo] **Candela TECHNOLOGIES** Network Testing and Emulation Solutions

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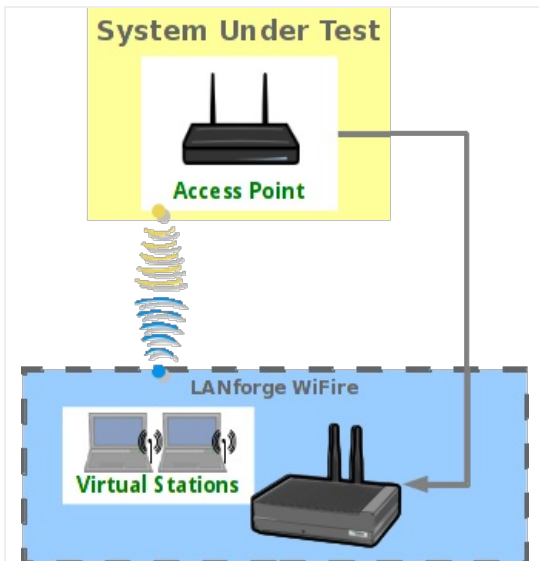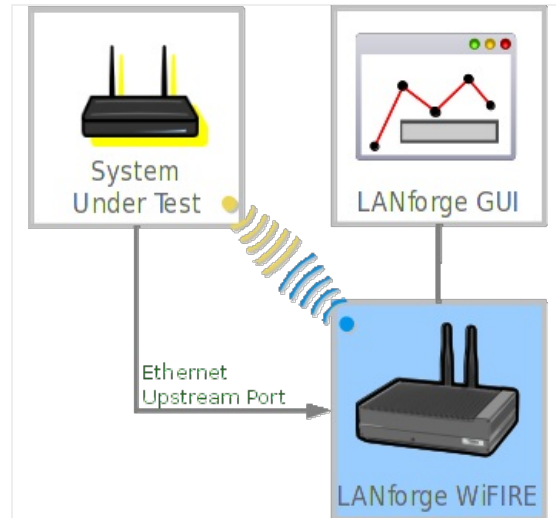support@candelatech.com
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LANforge WiFi Capacity Testing

Goal: Use the WiFi Capacity plugin to emulate traffic from hundreds of virtual stations across an access point and report the results.

Requires LANforge 5.2.11 or later. Configure 128 stations and assign them an SSID. Use the 'WiFi Capacity' LANforge-GUI plugin to emulate:

- Station download traffic through the AP
- Station-to-station traffic

The `eth1` port of our LANforge in this example is connected to the upstream network of the AP.

This example uses a LANforge CT523 system but the procedure should work on all CT520, CT523, CT525 and similar systems.

1. In the **Port Mgr** tab, select the radio `wiphy0` and click **Create**.

2. The **Create VLANs** window appears. Set the values below.

A. Check **WiFi STA**.

B. In the **MAC Addr** dropdown, choose `RANDOM`.

C. Select **DHCP-IPv4**.

D. Specify `128` for **Quantity**.

E. Set **STA ID** at `0`.

F. Our AP for this example is using **SSID** `testAP` with **Keyphrase** `test-AP1`. (no dashes allowed)

G. Click the **Apply** button.

H. And then close the window by pressing the **Cancel** button.

I. In the **Port Mgr** tab you will see the new WiFi stations:
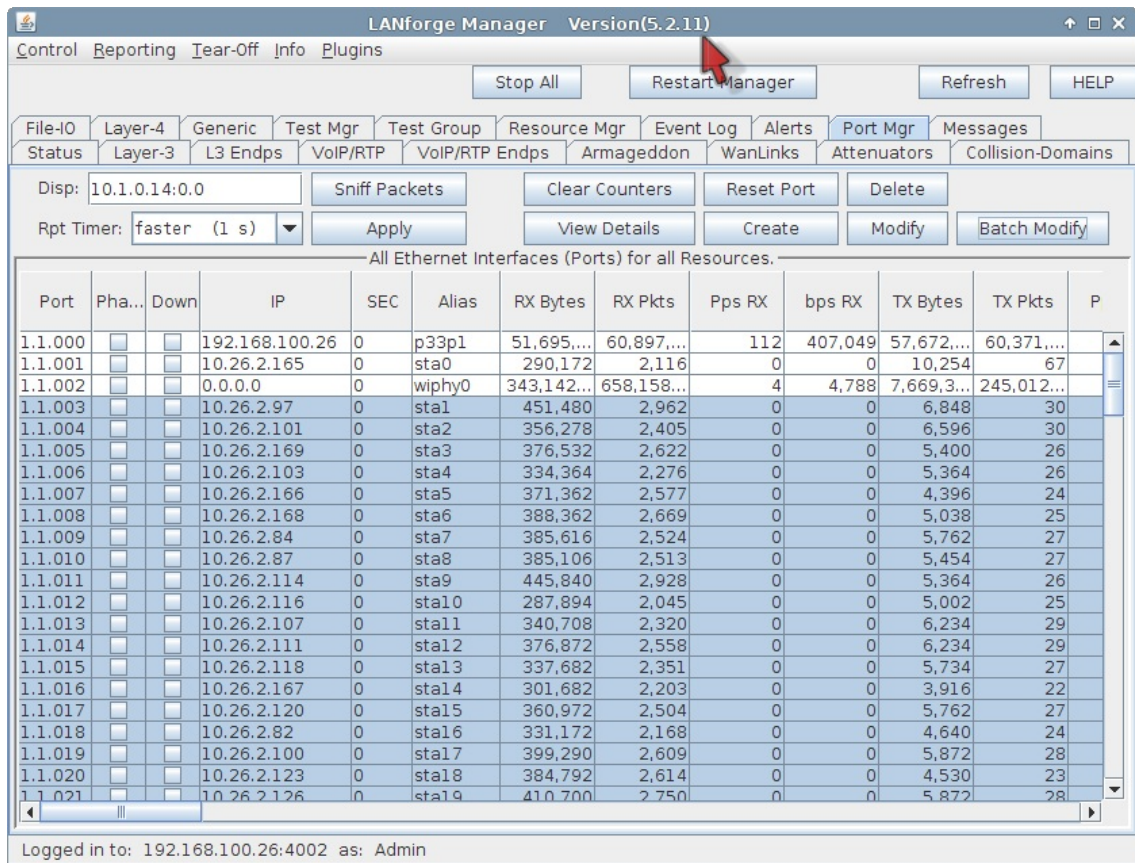
3. Discussion of Capacity Test
   A. **Computing Intervals and Duration:** The WiFi Capacity Test is intended to run in multiple intervals. How many intervals is a product of the number stations in the test divided by the interval increment: `Intervals = (num stations / station increment).` The duration of the test is the product of the number of intervals times the sum of the interval duration plus setup timeout between intervals. Given the setup time between intervals is J seconds, a test of 128 stations with a station increment of 8 and an interval duration of 30 seconds, the entire test duration is: `(128 / 8) * (30 + J) = 480 + 16J seconds.` The actual setup time depends on two factors: a) If **Seek Lower Rates** is enabled, which will attempt to test each rate to try and even out connection rates, and b) DHCP performance. Adding piles of DHCP assignments for every increment can take several seconds, and actual performance depends on your test environment.

B. **Configuring Routes:** the upstream port of your LANforge system should be able to ping the virtual stations. You can use a command from the LANforge command prompt to test this out: `ping -I eth1 10.26.2.100` where eth1 is your upstream port on the same switch as the AP, and 10.26.2.100 is the IP of the virtual station. In the `eth1` **Port Properties** window, you will probably want to set the gateway address for the port to the IP of the AP. In this case it is `10.26.1.2`. Without this routing configured, the only test performed will be the station-to-station test.
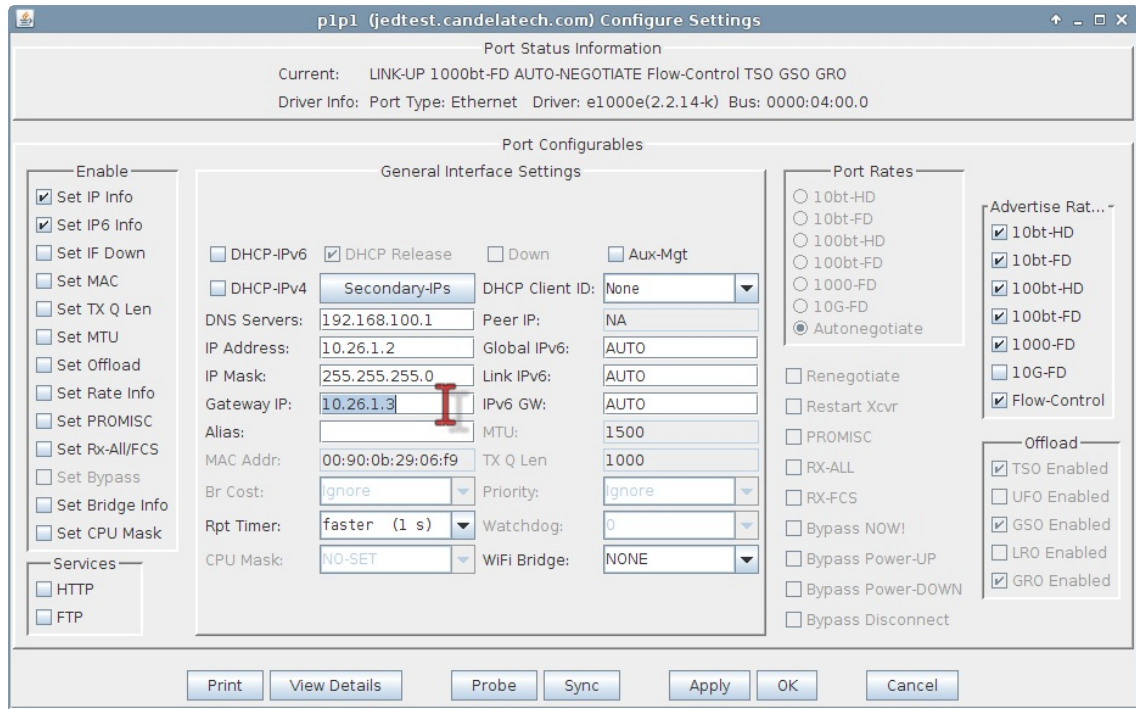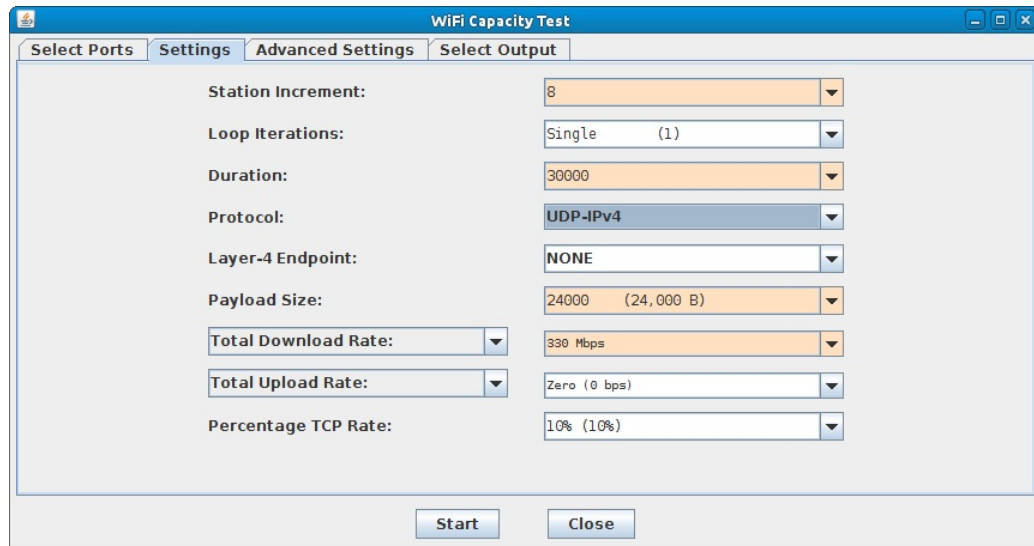

4. Downloading via 128 Virtual Stations

A. In the **Plugins** dropdown menu, select **WiFi Capacity Test**, then begin to configure ports for the test.
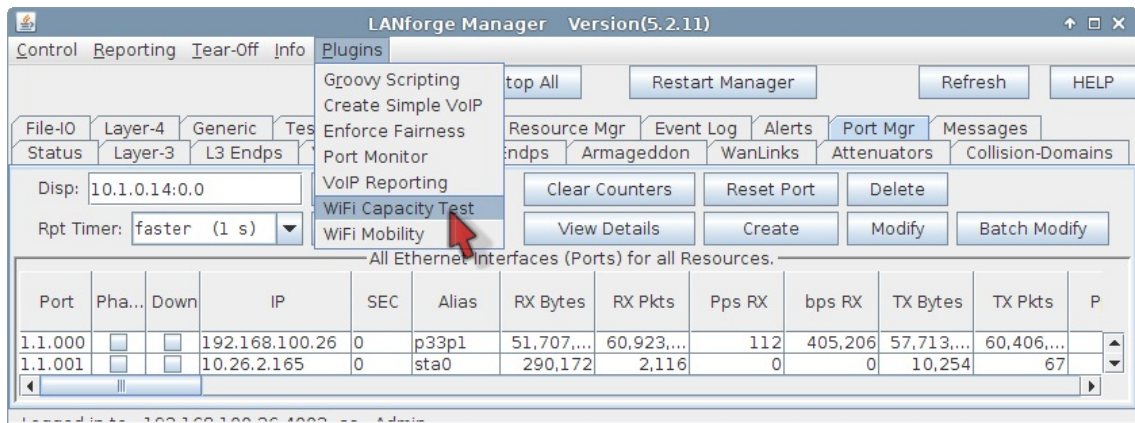

A. Highlight free ports that you want to add to the test, this includes the upstream port `eth1` and the virtual stations `sta0 – sta127`.

B. Set **Station Increment** to `8`. This will run 16 intervals with 8 stations added each time going up to 128 total.

C. Set the increment **Duration** to thirty seconds (in milliseconds) so `30000`.

D. Select `UDP-IPv4` for the **Protocol**.

E. For the **Payload** size select `24,000 B`.

F. Configure the **Download Rate** at `330 Mbps`. The theoretical maximum for AP throughput on one radio is about 340 Mbps with perfect conditions. Even 330 Mbps might not be achieved. This download rate is the rate requested of the AP by all the virtual stations. With eight virtual stations, the target download rate per station is 41.25 Mbps.

G. In **Advanced Settings**, set a **Socket Buffer** of `1MB`.

H. Deselect **Try Lower Rates**. This will reduce interval setup time.

B. Click the **Start** button to begin the test.

C. You will see a **Graphical Test Results** window appear. It will update every test interval.
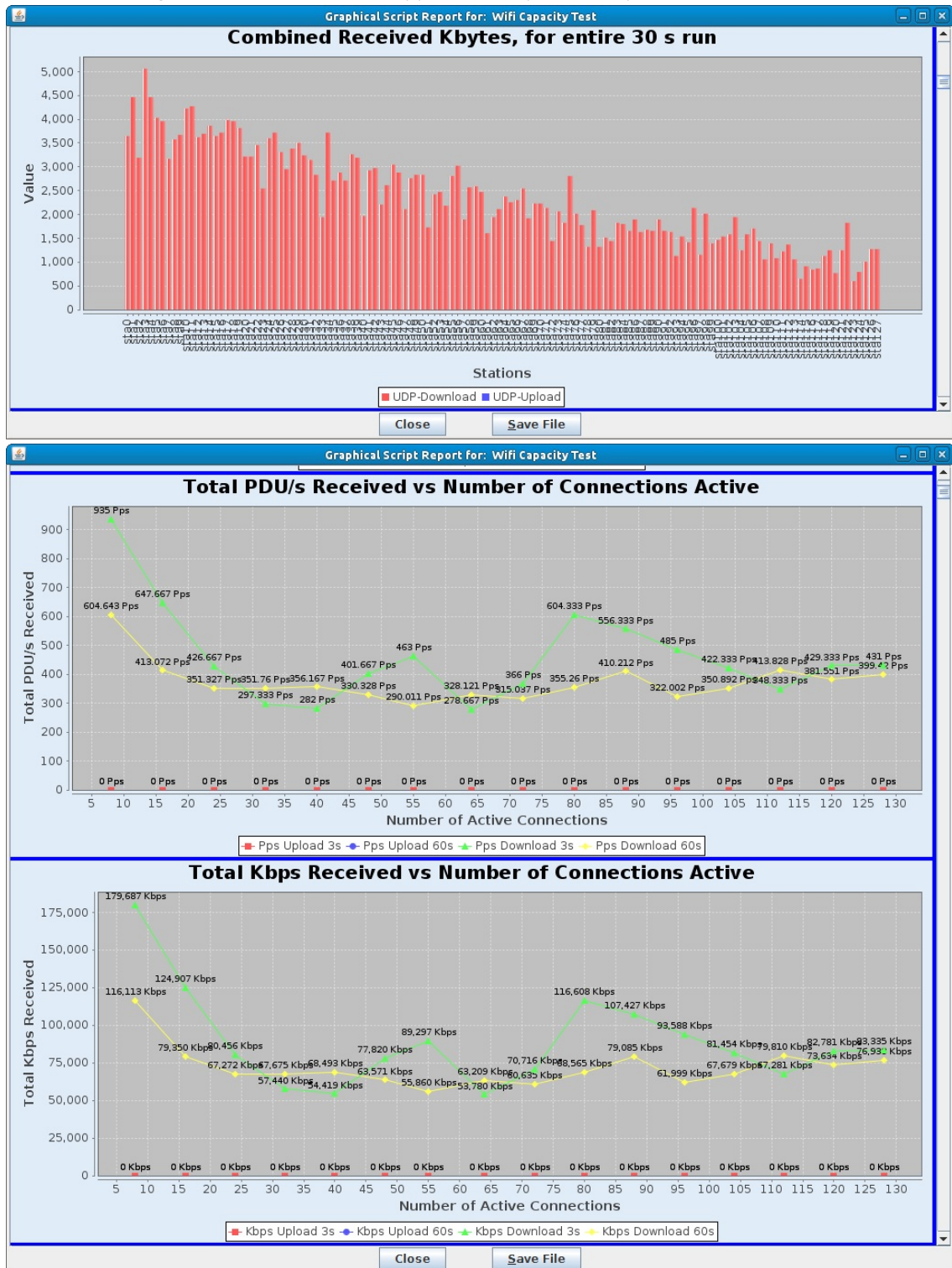
For more information see LANforge GUI User Guide: Plugins:WiFi Capacity Test.

5. Emulating station-to-station traffic with 128 virtual stations:
   A. Go to the **WiFi Capacity Test** window.

B. This test is very similar. We remove the upstream port `eth1` from the **Ports in Use** list (in the **Select Ports** tab). We then configure the traffic to use smaller TCP packets.
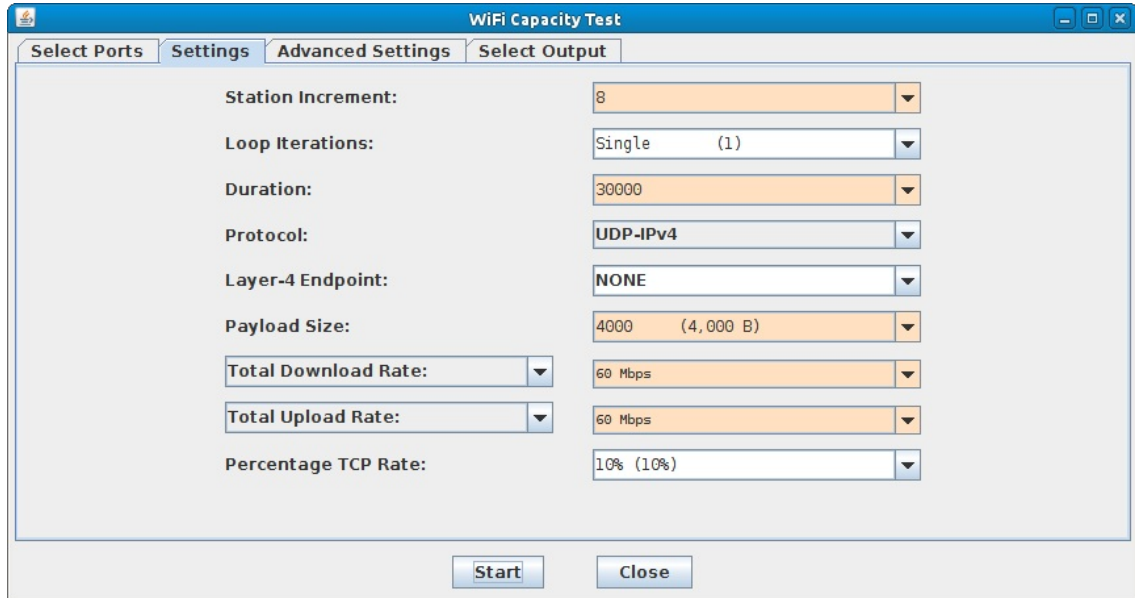
A. In the settings tab, set **Protocol** and **Payload** to `TCP-IPv4` and `4000 B`.

B. Change **Total Download** and **Total Upload** rate to `60 Mbps` and `60 Mbps`. These settings should allow up to 120 Mbps between two stations, which will clearly saturate an AP.

C. Click **Start** to begin the test.

D. You will see a **Graphical Test Results** window appear. It will upon each test interval.

Graphical Script Report for: Wifi Capacity Test

Total PDU/s Received vs Number of Connections Active

Total Kbps Received vs Number of Connections Active

Close   Save File