

LANforge WiFi Capacity Testing

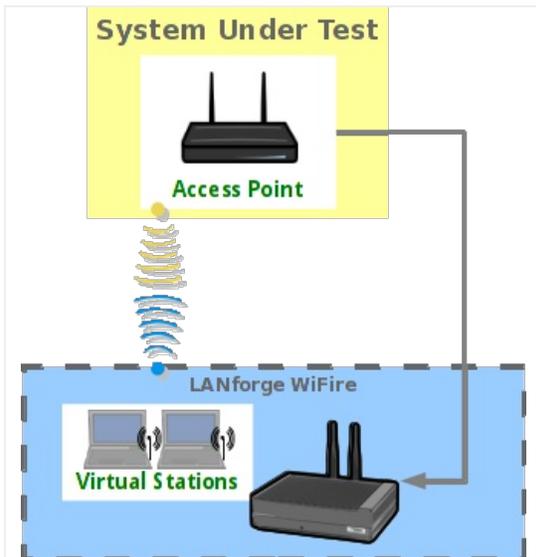
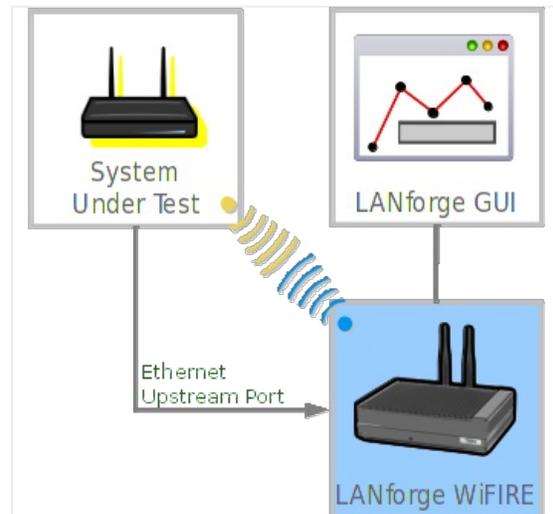
Goal: Use the WiFi Capacity plugin to emulate traffic from hundreds of virtual stations across an access point and report the results.

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**.

LANforge Manager Version(5.2.11)

Control Reporting Tear-Off Info Plugins

Stop All Restart Manager Refresh HELP

File-I/O 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: 10.1.0.14:0.0 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	RX Bytes	RX Pkts	Pps RX	bps RX	TX Bytes	TX Pkts
1.1.0			192.168.100.26	0	p33p1	148,643...	268,227	75	347,472	284,765...	291,864
1.1.1			0.0.0.0	0	wiphy0	0	0	0	0	0	0
1.1.2			0.0.0.0	0	wiphy1	0	0	0	0	0	0
1.1.3			10.26.1.2	0	p1p1	27,822	89	0	103	0	0
1.1.4		<input checked="" type="checkbox"/>	0.0.0.0	0	wlan0	0	0	0	0	0	0
1.1.5		<input checked="" type="checkbox"/>	0.0.0.0	0	wlan1	0	0	0	0	0	0

Logged in to: 192.168.100.26:4002 as: Admin

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

Create VLANs on Port: 1.1.002

1 MAC-VLAN 802.1Q-VLAN Redirect Bridge GRE Tunnel
 WiFi STA WiFi VAP WiFi Monitor

2 Shelf: 1 Resource: 1 (jedtest) Port: 2 (wiphy0)

3 VLAN ID: DHCP-IPv4
 Parent MAC: 00:0e:8e:63:2e:4d DHCP Client ID:
 MAC Addr: 00:18:c4:c8:27:59 IP Address: Global IPv6: AUTO
 Quantity: 128 IP Mask or Bits: Link IPv6: AUTO
 Gateway IP: IPv6 GW: AUTO
 #1 Redir Name: #2 Redir Name:
 STA ID: 0 SSID: test-AP
 WiFi AP: Key/Phrase:
 Use WPA Use WPA2 Use WEP

4 Down
 Apply Cancel

- Check **WiFi STA**.
- In the **MAC Addr** dropdown, choose **RANDOM**.
- Select **DHCP-IPv4**.
- Specify **128** for **Quantity**.
- Set **STA ID** at **0**.
- Our AP for this example is using **SSID testAP** with **Keyphrase test-AP1**. (no dashes allowed)
- Click the **Apply** button.
- And then close the window by pressing the **Cancel** button.

I. In the **Port Mgr** tab you will see the new WiFi stations:

LANforge Manager Version(5.2.11)

Control Reporting Tear-Off Info Plugins

Stop All Restart Manager Refresh HELP

File-I/O 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: 10.1.0.14:0.0 Sniff Packets Clear Counters Reset Port Delete

Rpt Timer: faster (1 s) Apply View Details Create Modify Batch Modify

All Ethernet Interfaces (Ports) for all Resources.

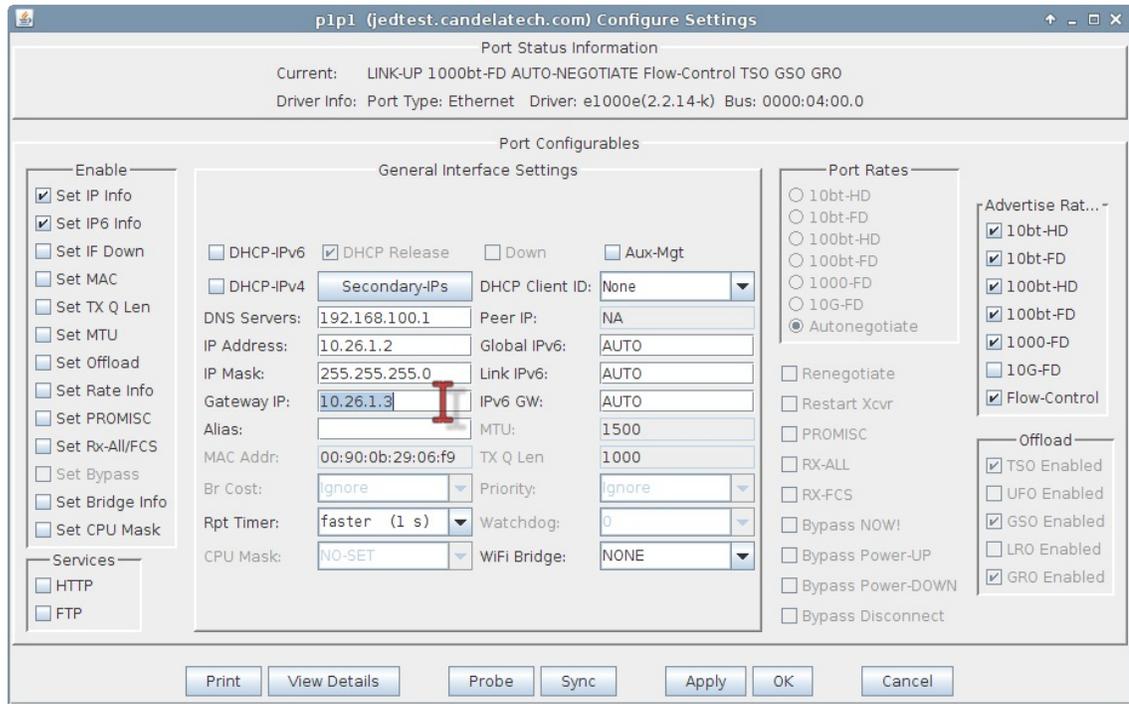
Port	Pha...	Down	IP	SEC	Alias	RX Bytes	RX Pkts	Pps RX	bps RX	TX Bytes	TX Pkts	P
1.1.000			192.168.100.26	0	p33p1	51,695,...	60,897,...	112	407,049	57,672,...	60,371,...	
1.1.001			10.26.2.165	0	sta0	290,172	2,116	0	0	10,254	67	
1.1.002			0.0.0.0	0	wiphy0	343,142...	658,158...	4	4,788	7,669,3...	245,012...	
1.1.003			10.26.2.97	0	sta1	451,480	2,962	0	0	6,848	30	
1.1.004			10.26.2.101	0	sta2	356,278	2,405	0	0	6,596	30	
1.1.005			10.26.2.169	0	sta3	376,532	2,622	0	0	5,400	26	
1.1.006			10.26.2.103	0	sta4	334,364	2,276	0	0	5,364	26	
1.1.007			10.26.2.166	0	sta5	371,362	2,577	0	0	4,396	24	
1.1.008			10.26.2.168	0	sta6	388,362	2,669	0	0	5,038	25	
1.1.009			10.26.2.84	0	sta7	385,616	2,524	0	0	5,762	27	
1.1.010			10.26.2.87	0	sta8	385,106	2,513	0	0	5,454	27	
1.1.011			10.26.2.114	0	sta9	445,840	2,928	0	0	5,364	26	
1.1.012			10.26.2.116	0	sta10	287,894	2,045	0	0	5,002	25	
1.1.013			10.26.2.107	0	sta11	340,708	2,320	0	0	6,234	29	
1.1.014			10.26.2.111	0	sta12	376,872	2,558	0	0	6,234	29	
1.1.015			10.26.2.118	0	sta13	337,682	2,351	0	0	5,734	27	
1.1.016			10.26.2.167	0	sta14	301,682	2,203	0	0	3,916	22	
1.1.017			10.26.2.120	0	sta15	360,972	2,504	0	0	5,762	27	
1.1.018			10.26.2.82	0	sta16	331,172	2,168	0	0	4,640	24	
1.1.019			10.26.2.100	0	sta17	399,290	2,609	0	0	5,872	28	
1.1.020			10.26.2.123	0	sta18	384,792	2,614	0	0	4,530	23	
1.1.021			10.26.2.126	0	sta19	410,700	2,750	0	0	5,872	28	

Logged in to: 192.168.100.26:4002 as: Admin

3. Discussion of Capacity Test

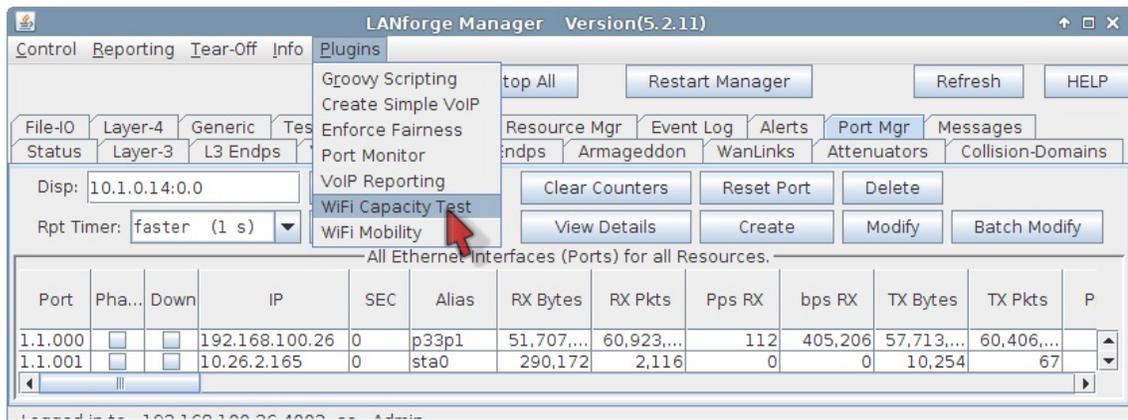
- A. **Computing Intervals and Duration:** The WiFi Capacity Test is intended to run in multiple intervals. How many intervals is a product of the number stations in the test divided by the interval increment: **Intervals = (num stations / station increment)**. The duration of the test is the product 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:
- 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.

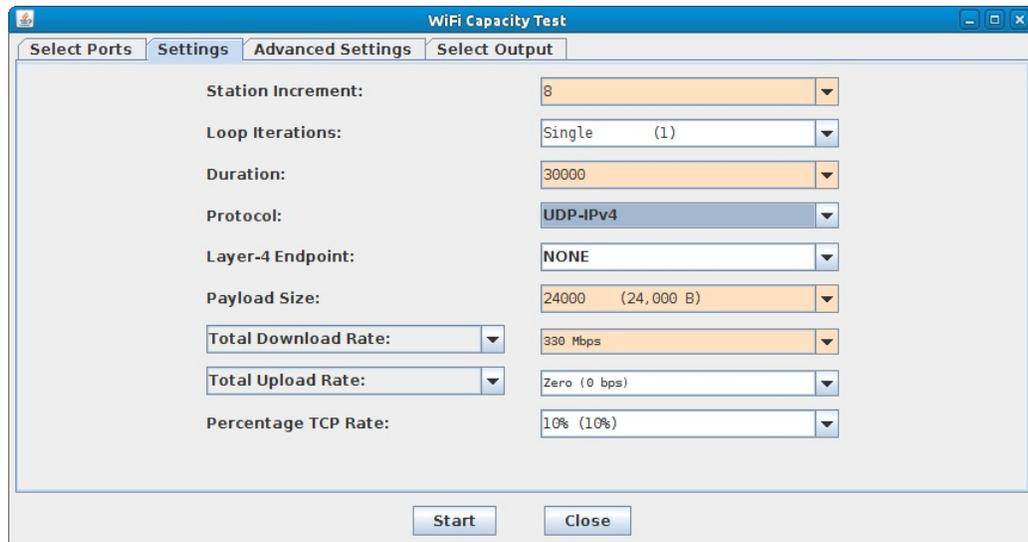


4. Downloading via 128 Virtual Stations

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

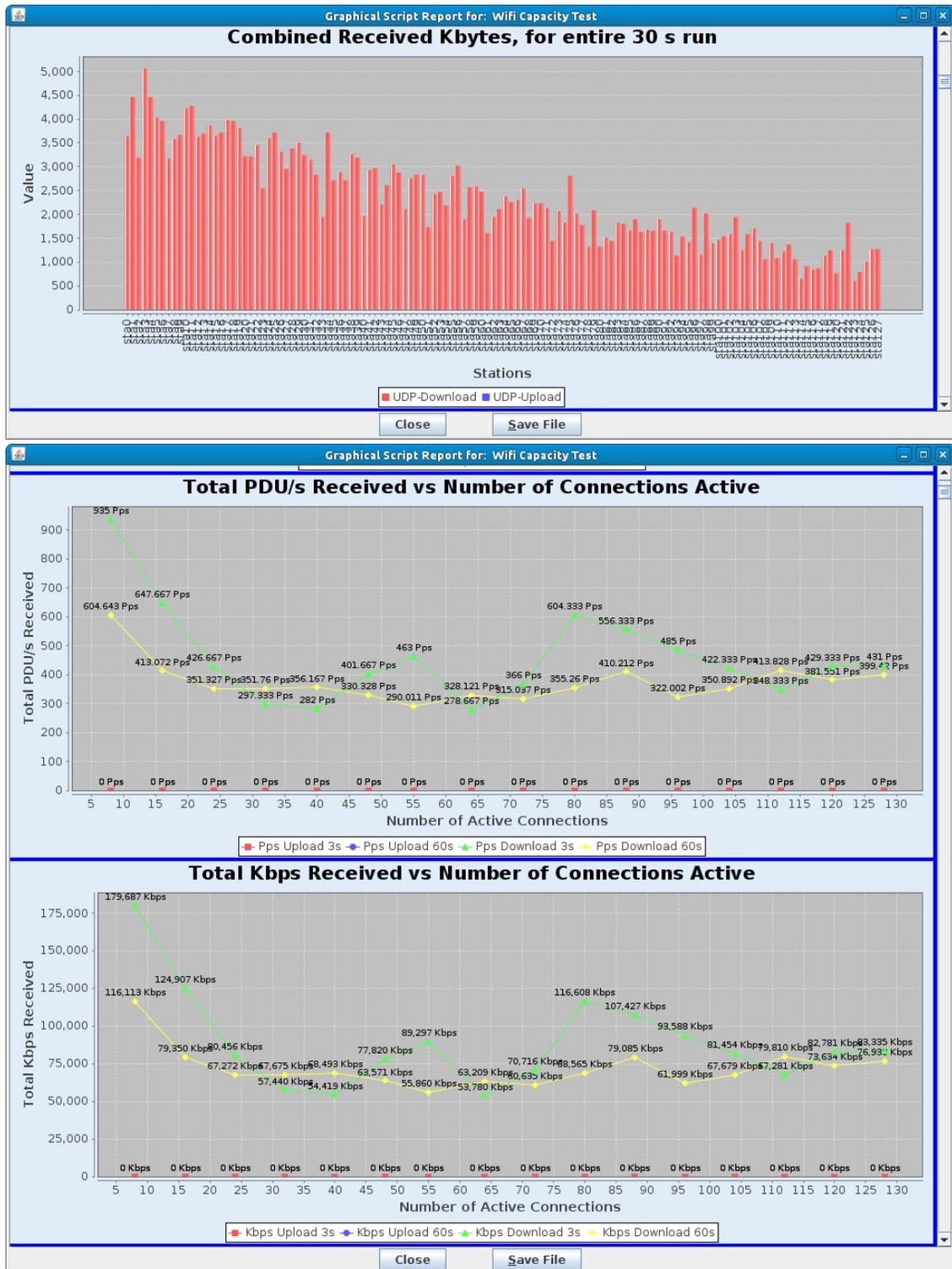


- A. Highlight free ports that you want to add to the test, this includes the upstream port **eth1** and the virtual stations **sta0 - sta127**.



- 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.

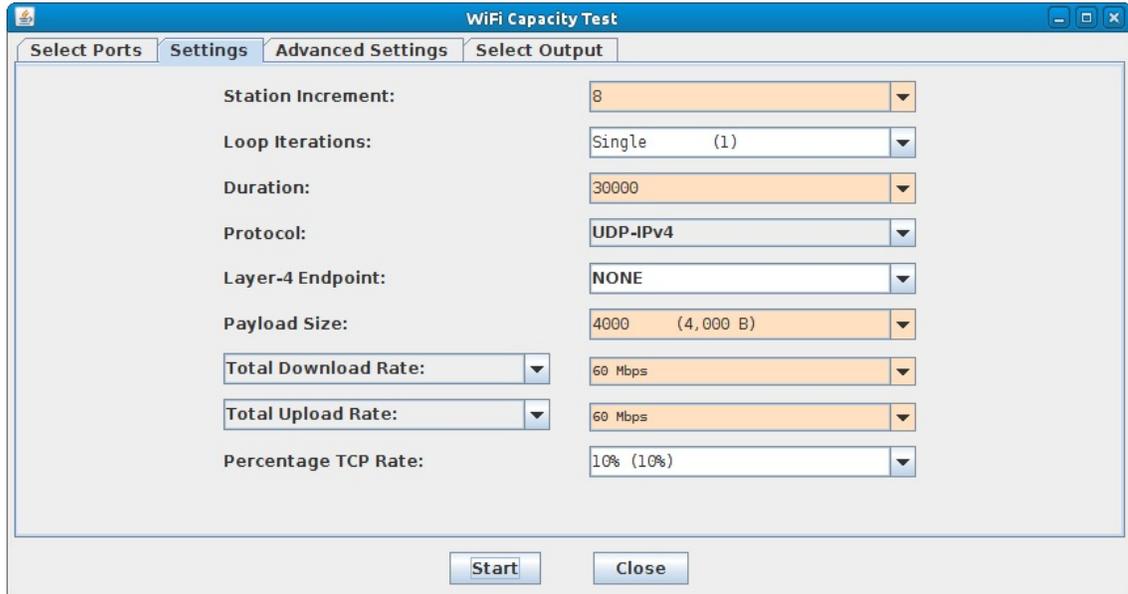


For more information see [LANforge GUI User Guide: Plugins:WiFi Capacity Test](#).

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.

