Report for: Wifi Capacity Test

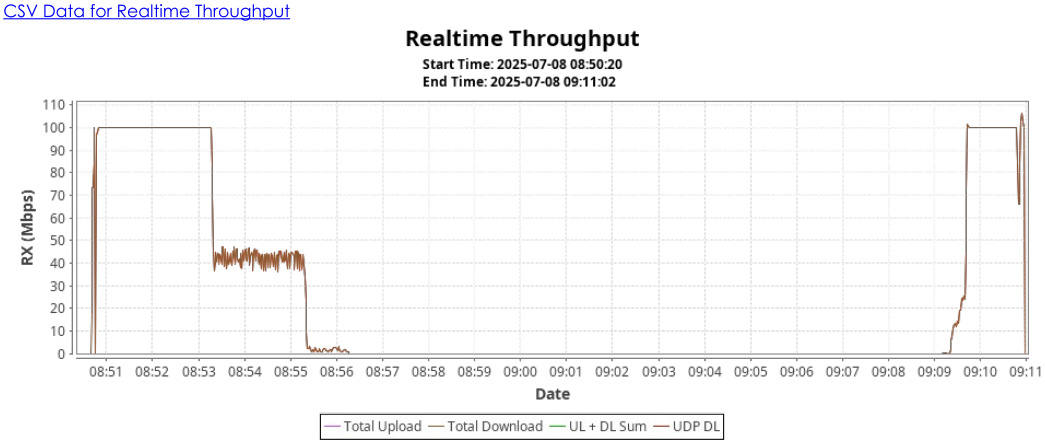
Tue Jul 08 09:12:59 EDT 2025

Objective

The Candela WiFi Capacity test is designed to measure performance of an Access Point when handling different amounts of WiFi Stations. The test allows the user to increase the number of stations in user defined steps for each test iteration and measure the per station and the overall throughput for each trial. Along with throughput other measurements made are client connection times, Fairness, % packet loss, DHCP times and more. The expected behavior is for the AP to be able to handle several stations (within the limitations of the AP specs) and make sure all stations get a fair amount of airtime both in the upstream and downstream. An AP that scales well will not show a significant over-all throughput decrease as more stations are added.

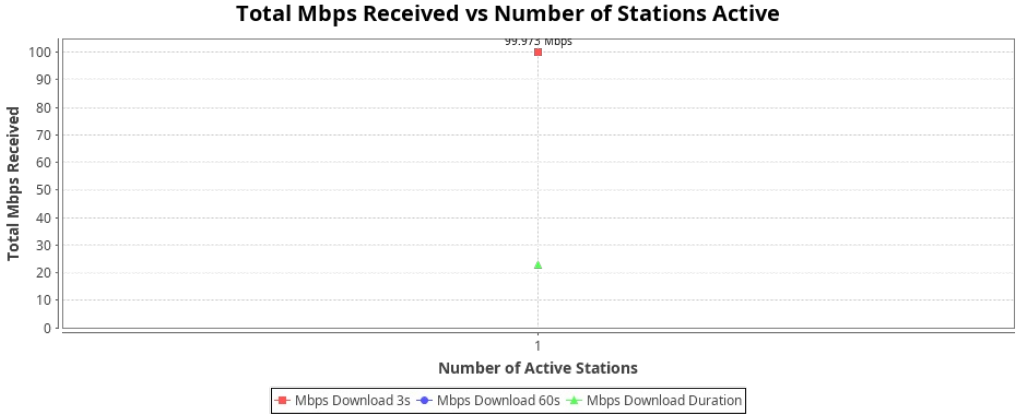
Realtime Graph shows summary download and upload RX Goodput rate of connections created by this test. Goodput does not include Ethernet, IP, UDP/TCP header overhead.

CSV Data for Realtime Throughput



Total Megabits-per-second transferred. This only counts the protocol payload, so it will not count the Ethernet, IP, UDP, TCP or other header overhead. A well behaving system will show about the same rate as stations increase. If the rate decreases significantly as stations increase, then it is not scaling we

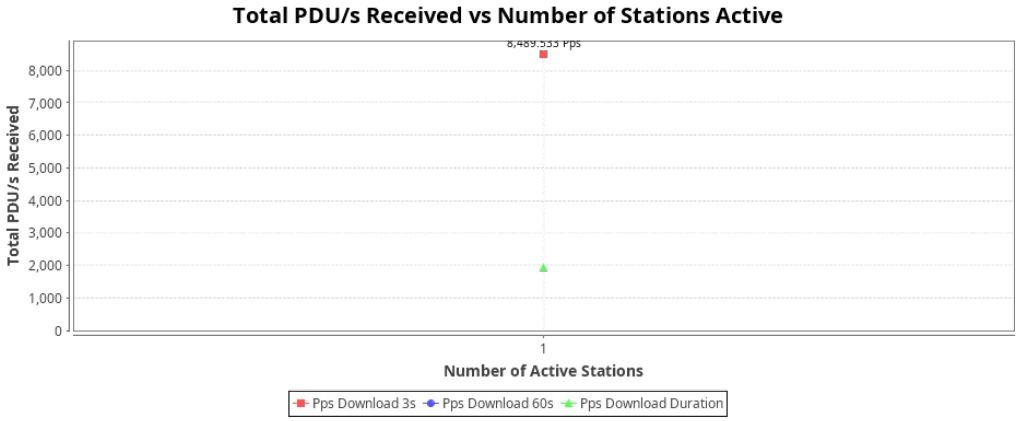
CSV Data for Total Mbps Received vs Number of Stations Active



Protocol-Data-Units received. For TCP, this does not mean much, but for UDP connections, this correlates to packet size. If the PDU size is larger than what fits into a single frame, then the network stack will

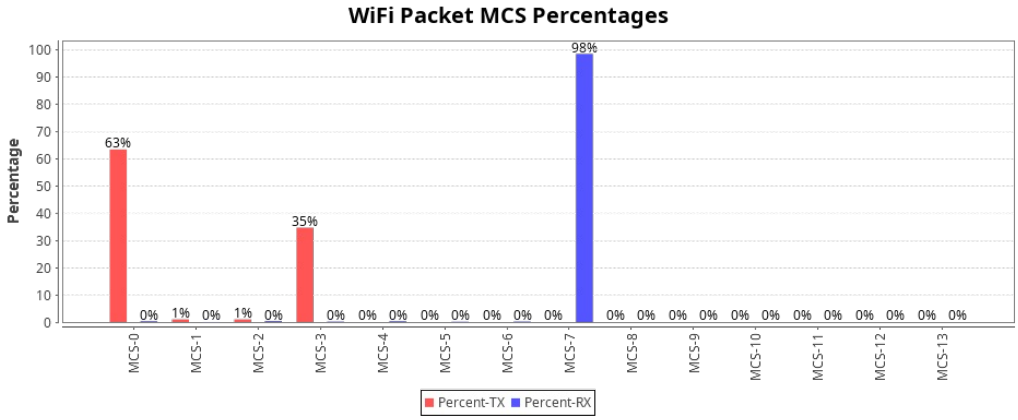
segment it accordingly. A well behaving system will show about the same rate as stations increase. If the rate decreases significantly as stations increase, then it is not scaling well.

CSV Data for Total PDU/s Received vs Number of Stations Active



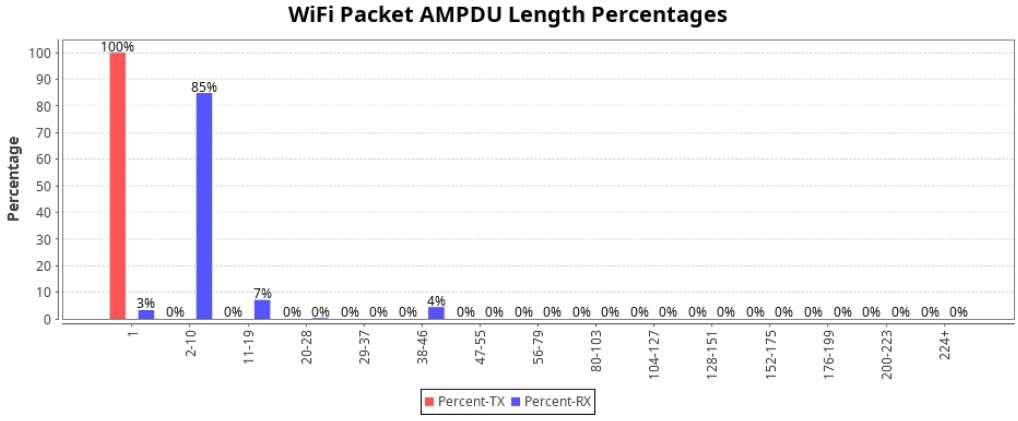
Histogram for WiFi MCS for packets sent and received by the wifi radios in the test.

CSV Data for WiFi Packet MCS Percentages



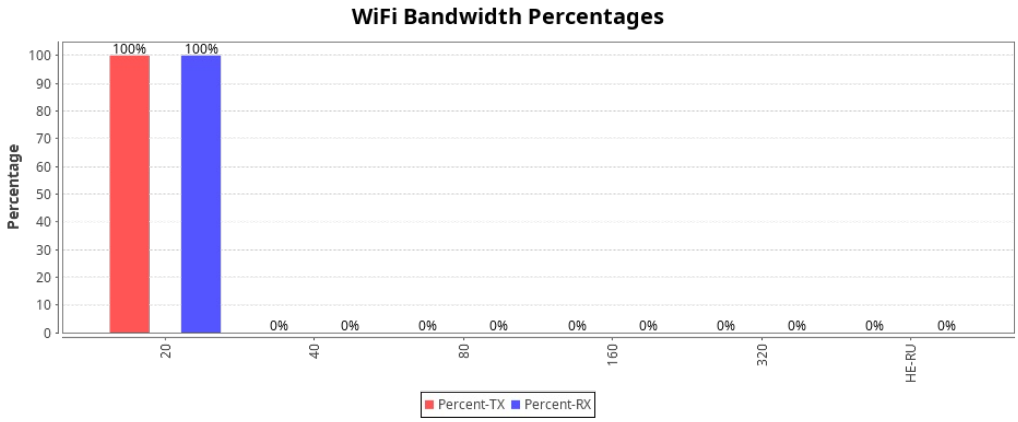
Block-Ack allows a series of frames to be sent in one transmit opportunity. This series of packets is known as a series of AMPDU frames. Having more frames in each AMPDU series normally improves throughput, but may increase latency or decrease airtime fairness. This histogram provides some visibility into the AMPDU chain length used in this test.

CSV Data for WiFi Packet AMPDU Length Percentages



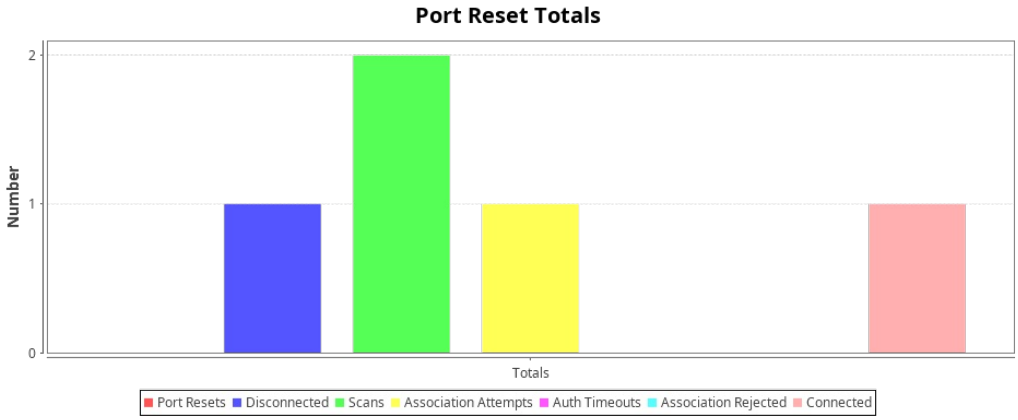
Histogram for WiFi bandwidths for packets sent and received by the wifi radios in the test.

CSV Data for WiFi Bandwidth Percentages



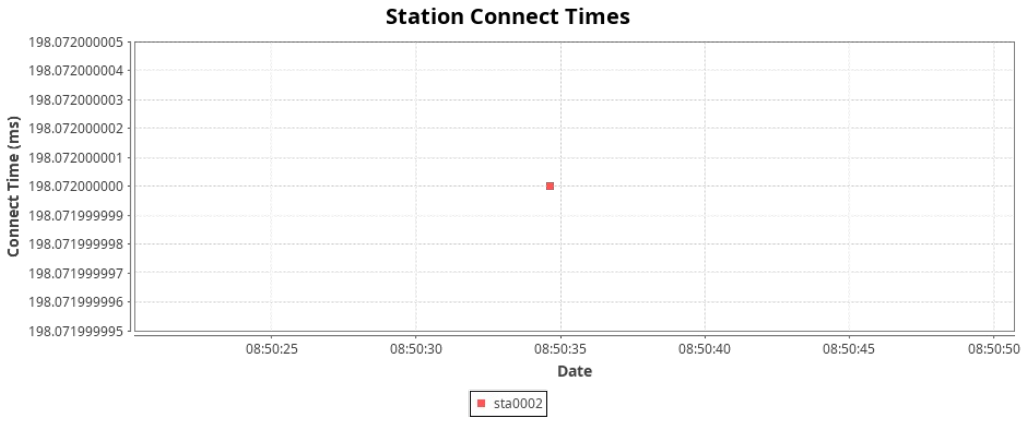
Station disconnect stats. These will be only for the last iteration. If the 'Clear Reset Counters' option is selected, the stats are cleared after the initial association. Any re-connects reported indicate a potential stability issue. Can be used for long-term stability testing in cases where you bring up all stations in one iteration and then run the test for a longer duration. Note: Port Resets shown in the graph happened after the initial association.

CSV Data for Port Reset Totals



Station connect time is calculated from the initial Authenticate message through the completion of Open or RSN association/authentication.

CSV Data for Station Connect Times



Wifi-Capacity Test requested values

Station Increment:	1
Loop Iterations:	Single (1)
Duration:	20 min (20 m)

Estimated Run Duration:	20.5 m
Layer 4-7 Endpoint:	NONE
IP Version	IPv4
MSS	AUTO
Total Download Rate:	100M (100 Mbps)
Total Upload Rate:	Zero (0 bps)
Protocol:	UDP
Payload Size:	AUTO
Socket buffer size:	OS Default
IP ToS:	Best Effort (0)
Multi-Conn:	AUTO
UDP-GRO	false
UDP-Burst	false
Use existing URL rate	false
Set Bursty Minimum Speed:	Burst Mode Disabled (-1)
Percentage TCP Rate:	10% (10%)
Randomize Rates	true
Leave Ports Up	false
Advanced Latency Reporting	false
Settle Time:	5 sec (5 s)
Rpt Timer:	fast (1 s)
Graph Max Samples:	Suggested (1,080)
Graph Compression Interval:	Suggested (5 min) (5 m)
Show-Per-Iteration-Charts	true
Show-Per-Loop-Totals	true
Hunt-Lower-Rates	false
Show Events	true
Clear Reset Counters	false
CSV Reporting Dir	- not selected -
Build Date	Wed Apr 2 12:45:22 PM PDT 2025
Build Version	5.4.9.1
Git Version	ec15252a800cc9a93c3faea0ace84fa0c7082949
Ports	1.1.sta0002 1.1.eth1
Firmware	0. 6-5
Machines	ct521b-da59

Requested Parameters:

Download Rate:	Per station:	100000000 (100 Mbps)	All:	100000000 (100 Mbps)
Upload Rate:	Per station:	0 (0 bps)	All:	0 (0 bps)
Total:				100000000 (100 Mbps)
Station count:				1

Connections per station:	1
Payload (PDU) sizes:	AUTO (AUTO)

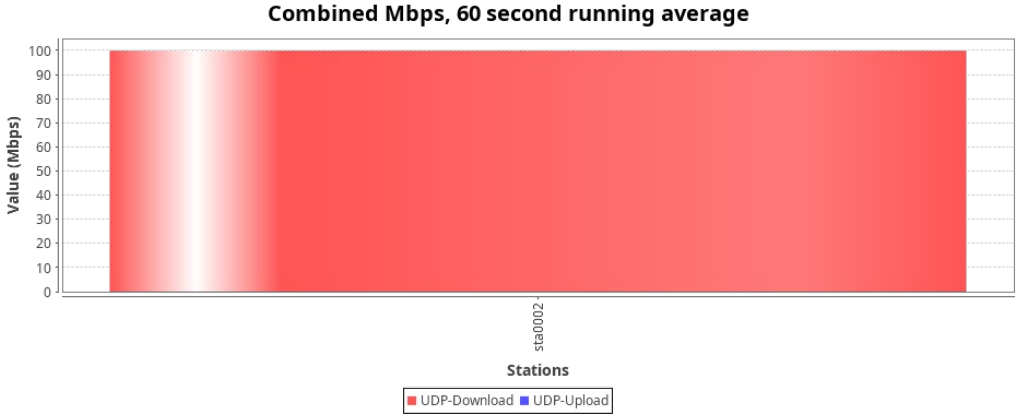
Observed Rate:

This table shows stats for all connections this iteration based on their reporting interval average.

Download Rate:	Cx Min:	99.973 Mbps	Cx Ave:	99.973 Mbps	Cx Max:	99.973 Mbps	All Cx:	99.973 Mbps
Upload Rate:	Cx Min:	0 bps	Cx Ave:	0 bps	Cx Max:	0 bps	All Cx:	0 bps
Total:								99.973 Mbps
Aggregated Rate:	Min:	99.973 Mbps	Avg:	99.973 Mbps	Max:	99.973 Mbps		

This graph shows fairness. On a fair system, each station should get about the same throughput. In the download direction, it is mostly the device-under-test that is responsible for this behavior, but in the upload direction, LANforge itself would be the source of most fairness issues unless the device-under-test takes specific actions to ensure fairness.

CSV Data for Combined Mbps, 60 second running average



Requested Parameters:

Download Rate:	Per station:	100000000 (100 Mbps)	All:	100000000 (100 Mbps)
Upload Rate:	Per station:	0 (0 bps)	All:	0 (0 bps)
Total:				100000000 (100 Mbps)
Station count:				1
Connections per station:				1
Payload (PDU) sizes:				AUTO (AUTO)

Observed Amount:

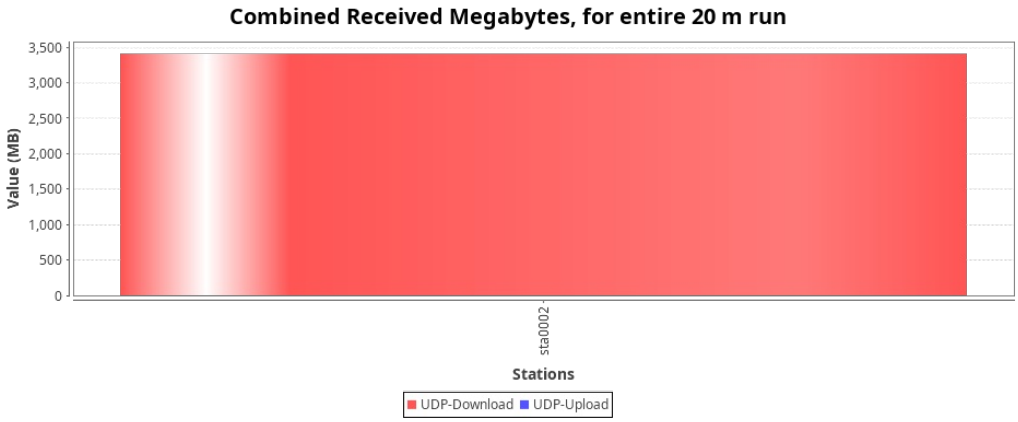
This table shows stats for all connections this iteration based on their reporting interval average.

Download Amount:	Cx Min:	3.173 GB	Cx Ave:	3.173 GB	Cx Max:	3.173 GB	All Cx:	3.173 GB
Upload Amount:	Cx Min:	0 B	Cx Ave:	0 B	Cx Max:	0 B	All Cx:	0 B

Total:	3.173 GB

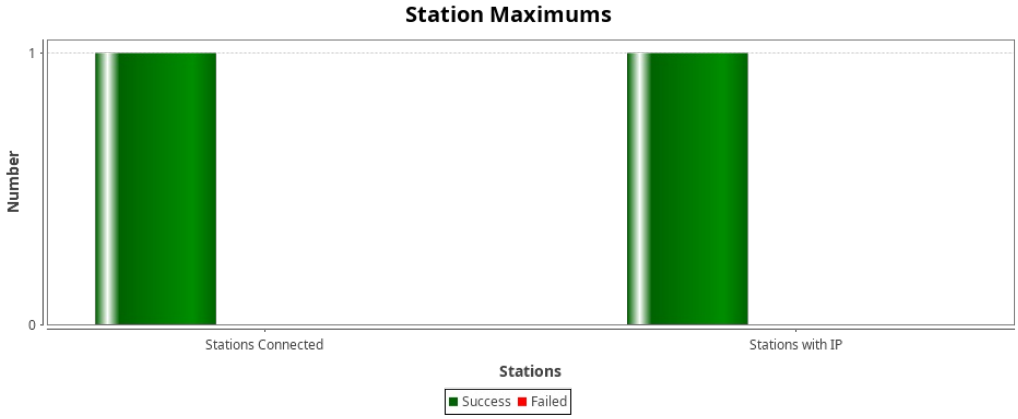
This graph shows fairness. On a fair system, each station should get about the same throughput. In the download direction, it is mostly the device-under-test that is responsible for this behavior, but in the upload direction, LANforge itself would be the source of most fairness issues unless the device-under-test takes specific actions to ensure fairness.

CSV Data for Combined Received Megabytes, for entire 20 m run




```
Maximum Stations Connected: 1
Stations NOT connected at this time: 0
Maximum Stations with IP Address: 1
Stations without IP at this time: 0
```

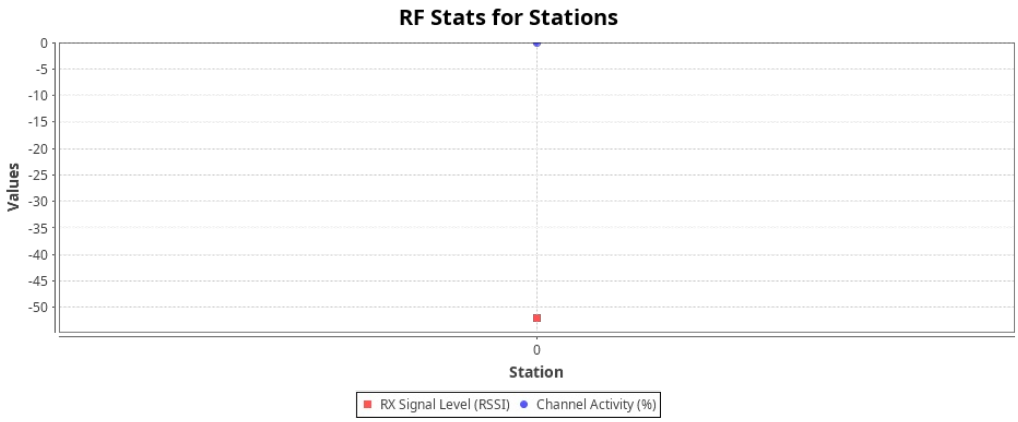
CSV Data for Station Maximums



RF stats give an indication of how well how congested is the RF environment. Channel activity is what the wifi radio reports as the busy-time for the RF environment. It is expected that this be near 100% when LANforge is running at max speed, but at lower speeds, this should be a lower percentage unless the RF environment is busy with other systems.

RF stats are collected at the end of the iteration.

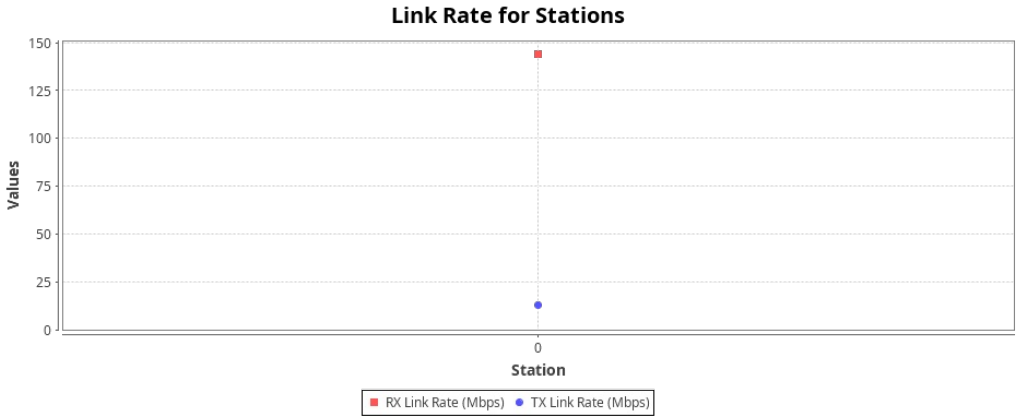
CSV Data for RF Stats for Stations



Link rate stats give an indication of how well the rate-control is working. For rate-control, the 'RX' link rate corresponds to what the device-under-test is transmitting. If all of the stations are on the same radio, then the TX and RX encoding rates should be similar for all stations. If there is a definite pattern where some stations do not get good RX rate, then probably the device-under-test has rate-control problems. The TX rate is what LANforge is transmitting at.

Link Rate is recorded at the end of each iteration. Please see individual station statistics CSV files for link rate over time.

CSV Data for Link Rate for Stations



Key Performance Indicators CSV

```
Scan Results for SSIDs used in this test.

BSS 6c:cd:d6:27:fc:e6(on sta0002) -- associated
        last seen: 12433.822s [boottime]
        TSF: 2621455750 usec (0d, 00:43:41)
        freq: 2437.0
        beacon interval: 100 TUs
        capability: ESS Privacy SpectrumMgmt ShortSlotTime RadioMeasure (0x1511)
        signal: -46.00 dBm
        last seen: 11 ms ago
        Information elements from Probe Response frame:
        SSID: NETGEAR_2G
        Supported rates: 1.0* 2.0* 5.5* 11.0* 18.0 24.0 36.0 54.0
        DS Parameter set: channel 6
        Country: US     Environment: bogus
                Channels [1 - 11] @ 30 dBm
        Power constraint: 0 dB
        TPC report: TX power: 24 dBm
        ERP: Barker_Preamble_Mode
        Extended supported rates: 6.0 9.0 12.0 48.0
        RSN:     * Version: 1
                 * Group cipher: CCMP
                 * Pairwise ciphers: CCMP
                 * Authentication suites: PSK
                 * Capabilities: 16-PTKSA-RC 1-GTKSA-RC MFP-capable (0x008c)
        BSS Load:
                 * station count: 2
                 * channel utilisation: 189/255
                 * available admission capacity: 0 [*32us]
        RM enabled capabilities:
                Capabilities: 0x02 0x00 0x00 0x00 0x00
                        Neighbor Report
                Nonoperating Channel Max Measurement Duration: 0
                Measurement Pilot Capability: 0
        AP Channel Report:
```

```
         * operating class: 134
         * channel(s): 69
Supported operating classes:
         * current operating class: 83
         * operating class: 12
         * operating class: 32
         * operating class: 33
         * operating class: 81
         * operating class: 83
         * operating class: 84
HT capabilities:
        Capabilities: 0x11ef
                RX LDPC
                HT20/HT40
                SM Power Save disabled
                RX HT20 SGI
                RX HT40 SGI
                TX STBC
                RX STBC 1-stream
                Max AMSDU length: 3839 bytes
                DSSS/CCK HT40
        Maximum RX AMPDU length 65535 bytes (exponent: 0x003)
        Minimum RX AMPDU time spacing: 4 usec (0x05)
        HT RX MCS rate indexes supported: 0-32
        HT TX MCS rate indexes are undefined
HT operation:
         * primary channel: 6
         * secondary channel offset: above
         * STA channel width: any
         * RIFS: 1
         * HT protection: 20 MHz
         * non-GF present: 1
         * OBSS non-GF present: 1
         * dual beacon: 0
         * dual CTS protection: 0
         * STBC beacon: 0
         * L-SIG TXOP Prot: 0
         * PCO active: 0
         * PCO phase: 0
Extended capabilities:
         * Extended Channel Switching
         * Event
         * BSS Transition
         * Interworking
         * QoS Map
         * Operating Mode Notification
         * Reserved Reserved Channel Schedule Management
         * Reserved Channel Schedule Management
         * TWT Responder Support
802.11u Interworking:
        Network Options: 0x0
                Network Type: 0 (Private)
802.11u Advertisement:
        Query Response Info: 0x7f
                Query Response Length Limit: 127
                ANQP
HE capabilities:
        HE MAC Capabilities (0x000512181000):
                +HTC HE Supported
                TWT Responder
                BSR
                Broadcast TWT
                OM Control
                Maximum A-MPDU Length Exponent: 2
                OM Control UL MU Data Disable RX
        HE PHY Capabilities: (0x222002c00d43811800cc00):
                HE40/2.4GHz
                242 tone RUs/2.4GHz
                LDPC Coding in Payload
                NDP with 4x HE-LTF and 3.2us GI
                Rx HE MU PPDU from Non-AP STA
                SU Beamformer
                SU Beamformee
                Beamformee STS <= 80Mhz: 3
                Sounding Dimensions <= 80Mhz: 3
                Ng = 16 SU Feedback
                Codebook Size SU Feedback
                PPE Threshold Present
                Max NC: 3
                TX 1024-QAM
                RX 1024-QAM
        HE RX MCS and NSS set <= 80 MHz
                1 streams: MCS 0-11
                2 streams: MCS 0-11
                3 streams: MCS 0-11
                4 streams: MCS 0-11
                5 streams: not supported
                6 streams: not supported
                7 streams: not supported
                8 streams: not supported
        HE TX MCS and NSS set <= 80 MHz
                1 streams: MCS 0-11
                2 streams: MCS 0-11
                3 streams: MCS 0-11
                4 streams: MCS 0-11
                5 streams: not supported
                6 streams: not supported
                7 streams: not supported
                8 streams: not supported
        PPE Threshold 0x1b 0x1c 0xc7 0x71 0x1c 0xc7 0x71
WPS:     * Version: 1.0
         * Wi-Fi Protected Setup State: 2 (Configured)
```

```
                * AP setup locked: 0x01
                * Response Type: 3 (AP)
                * UUID: c47c75fa-8316-68d8-2e95-d22b03063432
                * Manufacturer: Broadcom
                * Model: RAXE500
                * Model Number: 123456
                * Serial Number: 267
                * Primary Device Type: 6-0050f204-1
                * Device name: RAXE500
                * Config methods: Display
                * RF Bands: 0x3
                * Version2: 2.0
        WMM:    * Parameter version 1
                * u-APSD
                * BE: CW 15-1023, AIFSN 3
                * BK: CW 15-1023, AIFSN 7
                * VI: CW 7-15, AIFSN 2, TXOP 3008 usec
                * VO: CW 3-7, AIFSN 2, TXOP 1504 usec
```

META Information for Report for: Wifi Capacity Test