

Report for: Wifi Capacity Test

Fri Aug 05 00:43:33 PDT 2022

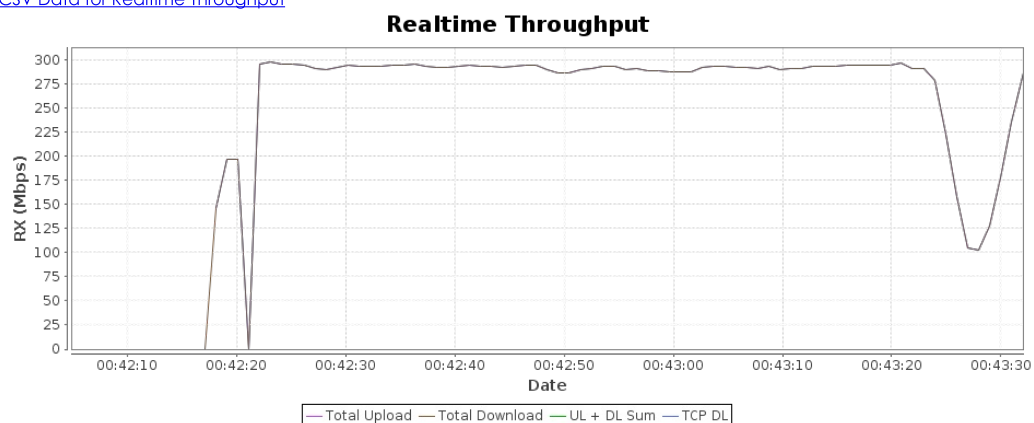


Objective

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.

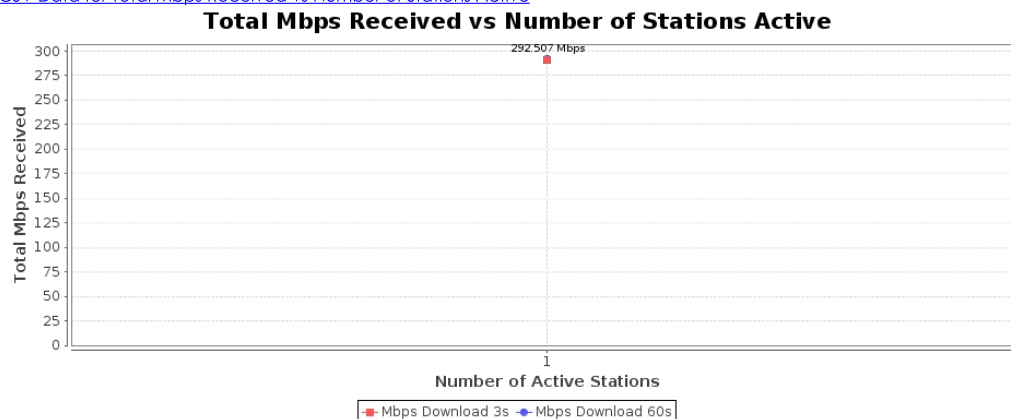
Realtime Graph shows summary download and upload RX Goodput rate of connections created by this test. Goodput does not include Ethernet, IP, UDP/TCP header overhead.

[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

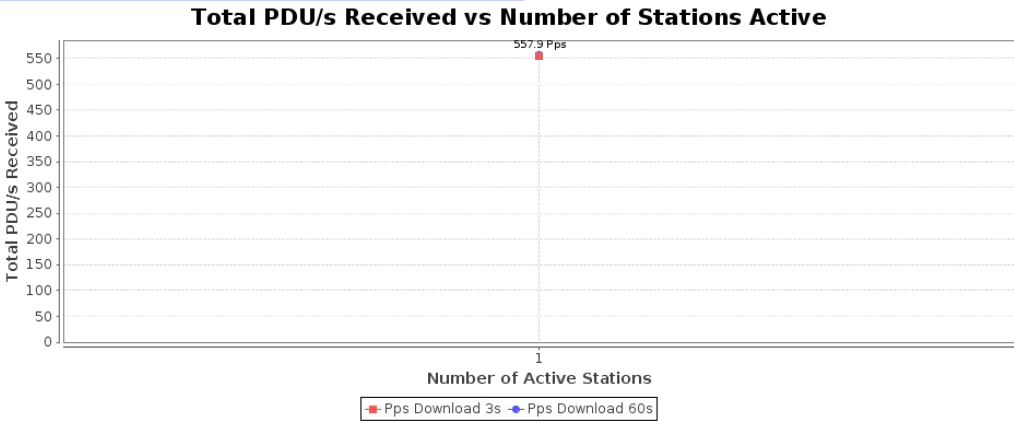
[CSV Data for Total Mbps Received vs Number of Stations Active](#)



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

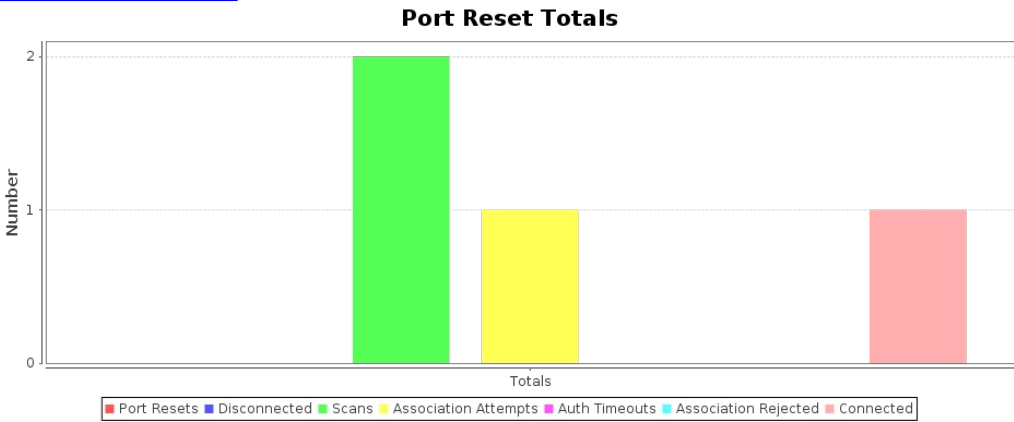
segment it accordingly. A well behaving system will show about the same rate as stations increase. If the rate decreases significantly as stations increase, then it is not scaling well.

[CSV Data for Total PDU/s Received vs Number of Stations Active](#)



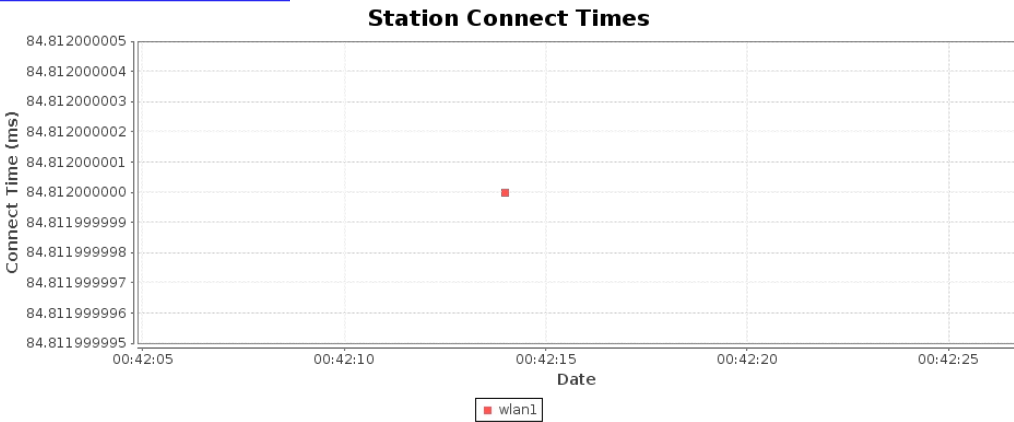
Station disconnect stats. These will be only for the last iteration. If the 'Clear Reset Counters' option is selected, the stats are cleared after the initial association. Any re-connects reported indicate a potential stability issue. Can be used for long-term stability testing in cases where you bring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

[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
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Loop Iterations:	Single (1)
Duration:	1 min (1 m)
Protocol:	TCP-IPv4
Layer 4-7 Endpoint:	NONE
Payload Size:	AUTO
MSS	AUTO
Total Download Rate:	1G (1 Gbps)
Total Upload Rate:	Zero (0 bps)
Percentage TCP Rate:	10% (10%)
Set Bursty Minimum Speed:	Burst Mode Disabled (-1)
Randomize Rates	true
Leave Ports Up	false
Socket buffer size:	OS Default
Settle Time:	5 sec (5 s)
Rpt Timer:	fast (1 s)
IP ToS:	Best Effort (0)
Multi-Conn:	AUTO
Show-Per-Iteration-Charts	true
Show-Per-Loop-Totals	true
Hunt-Lower-Rates	false
Show Events	true
Clear Reset Counters	false
CSV Reporting Dir	/home/lanforge/report-data/wifi-cap-csv-data-2022-08-05_00.42
Build Date	Fri 17 Jun 2022 05:02:03 PM PDT
Build Version	5.4.5
Git Version	e4afc0739ee746116945e553e48705b0b0eeb7a5
Ports	1.1.eth1 1.1.wlan1
Firmware	0. 6-1
Machines	ct523c-0b31

Requested Parameters:

Download Rate:	Per station:	1000000000 (1 Gbps)	All:	1000000000 (1 Gbps)
Upload Rate:	Per station:	0 (0 bps)	All:	0 (0 bps)
Total:				1000000000 (1 Gbps)
Station count:				1
Connections per station:				1
Payload (PDU) sizes:				AUTO (AUTO)

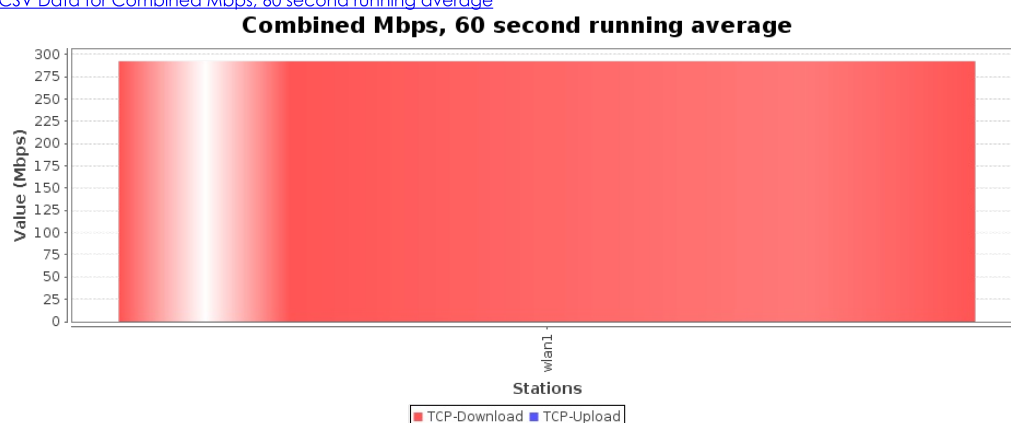
Observed Rate:

Download	Cx	292.507	Cx	292.507	Cx	292.507	All	292.507
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Rate:	Min:	Mbps	Ave:	Mbps	Max:	Mbps	Cx:	Mbps
Upload Rate:	Cx Min:	0 bps	Cx Ave:	0 bps	Cx Max:	0 bps	All Cx:	0 bps
Total:								292.507 Mbps
Aggregated Rate:	Min:	292.507 Mbps	Avg:	292.507 Mbps	Max:	292.507 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:	1000000000 (1 Gbps)	All:	1000000000 (1 Gbps)
Upload Rate:	Per station:	0 (0 bps)	All:	0 (0 bps)
Total:				1000000000 (1 Gbps)
Station count:				1
Connections per station:				1
Payload (PDU) sizes:				AUTO (AUTO)

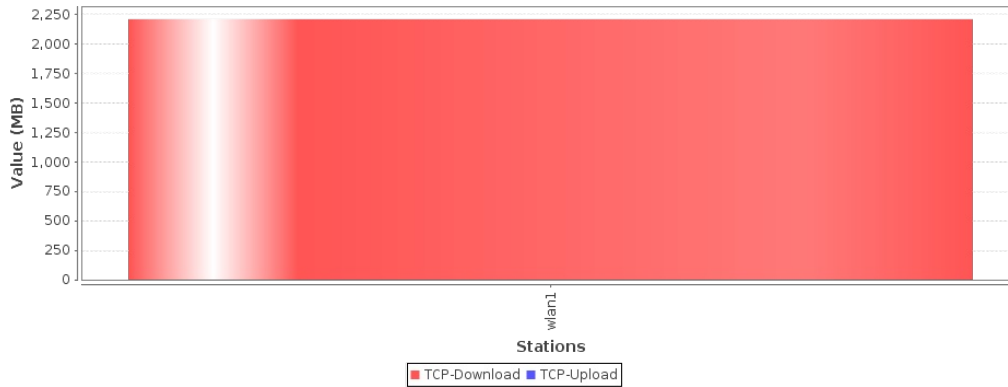
Observed Amount:

Download Amount:	Cx Min:	2.061 GB	Cx Ave:	2.061 GB	Cx Max:	2.061 GB	All Cx:	2.061 GB
Upload Amount:	Cx Min:	0 B	Cx Ave:	0 B	Cx Max:	0 B	All Cx:	0 B
Total:								2.061 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 1 m run](#)

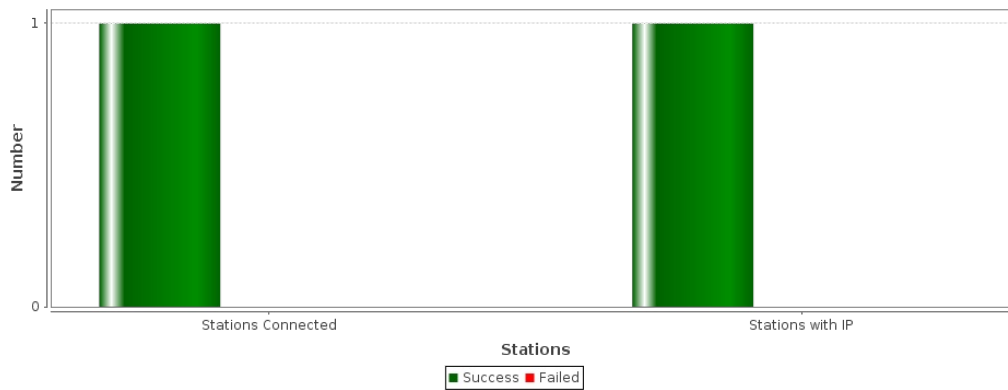
Combined Received Megabytes, for entire 1 m run



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](#)

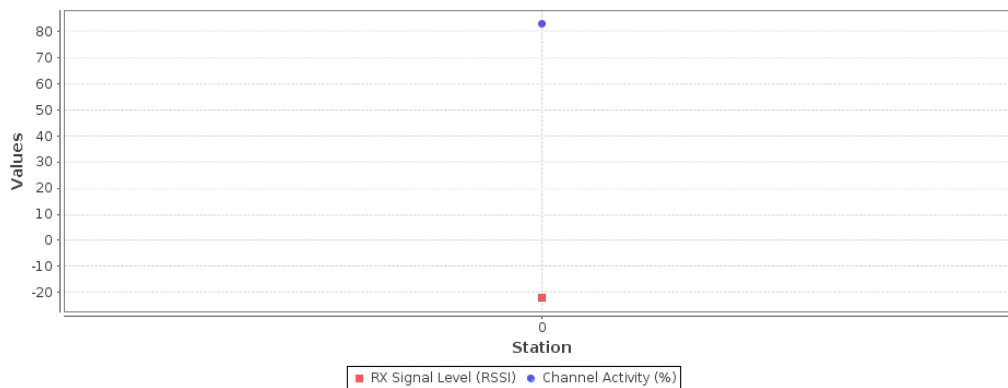
Station Maximums



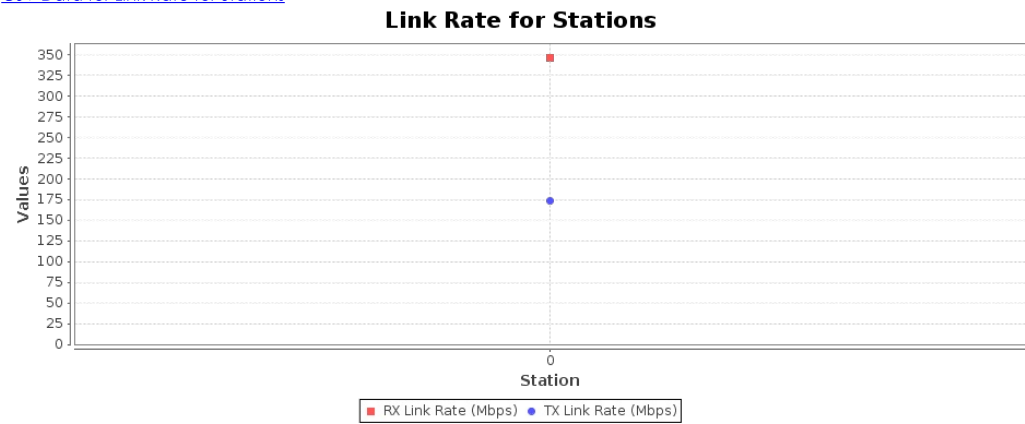
RF stats give an indication of how well how congested is the RF environment. Channel activity is what the wifi radio reports as the busy-time for the RF environment. It is expected that this be near 100% when LANforge is running at max speed, but at lower speeds, this should be a lower percentage unless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

[CSV Data for RF Stats for Stations](#)

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.



[Key Performance Indicators CSV](#)

Scan Results for SSIDs used in this test.

```

BSS cc:19:a8:e6:cd:81(on wlan1) -- associated
  last seen: 407823.179s [boottime]
  TSF: 112461370 usec (0d, 00:01:52)
  freq: 5180
  beacon interval: 100 TUs
  capability: ESS Privacy RadioMeasure (0x1011)
  signal: -13.00 dBm
  last seen: 253 ms ago
  Information elements from Probe Response frame:
  SSID: client_connectivity_al
  Supported rates: 6.0* 9.0 12.0 18.0 24.0* 36.0 48.0 54.0
  TPC report: TX power: 23 dBm
  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: 1
    * channel utilisation: 248/255
    * available admission capacity: 0 [*32us]
  RM enabled capabilities:
    Capabilities: 0x32 0x00 0x00 0x00 0x00
      Neighbor Report
      Beacon Passive Measurement
      Beacon Active Measurement
    Nonoperating Channel Max Measurement Duration: 0
    Measurement Pilot Capability: 0
  HT capabilities:
    Capabilities: 0x1ad
      RX LDPC
      HT20
      SM Power Save disabled
      RX HT20 SGI
      TX STBC
      RX STBC 1-stream
      Max AMSDU length: 3839 bytes
      No DSSS/CKK HT40
    Maximum RX AMPDU length 65535 bytes (exponent: 0x003)
    Minimum RX AMPDU time spacing: 4 usec (0x05)
    HT RX MCS rate indexes supported: 0-31
    HT TX MCS rate indexes are undefined
  HT operation:
    * primary channel: 36
    * secondary channel offset: no secondary
    * STA channel width: 20 MHz
    * RIFS: 0
    * HT protection: no
    * non-GF present: 1
    * OBSS non-GF present: 0
    * dual beacon: 0
    * dual CTS protection: 0
    * STBC beacon: 0
    * L-SIG TXOP Prot: 0
    * PC0 active: 0
    * PC0 phase: 0
  Extended capabilities:
    * Extended Channel Switching
    * BSS Transition
    * Interworking
    * QoS Map
    * Operating Mode Notification
    * Channel Schedule Management
    * Channel Schedule Management
    * 6
    * Max Number Of MSDUs In A-MSDU is
  VHT capabilities:
    VHT Capabilities (0x0f8b69b1):
      Max MPDU length: 7991
      Supported Channel Width: neither 160 nor 80+80
      RX LDPC
      short GI (80 MHz)
      TX STBC
      SU Beamformer
      MU Beamformer
  
```

```

VHT RX MCS set:
  1 streams: MCS 0-9
  2 streams: MCS 0-9
  3 streams: MCS 0-9
  4 streams: MCS 0-9
  5 streams: not supported
  6 streams: not supported
  7 streams: not supported
  8 streams: not supported
VHT RX highest supported: 0 Mbps
VHT TX MCS set:
  1 streams: MCS 0-9
  2 streams: MCS 0-9
  3 streams: MCS 0-9
  4 streams: MCS 0-9
  5 streams: not supported
  6 streams: not supported
  7 streams: not supported
  8 streams: not supported
VHT TX highest supported: 0 Mbps
VHT operation:
  * channel width: 0 (20 or 40 MHz)
  * center freq segment 1: 36
  * center freq segment 2: 0
  * VHT basic MCS set: 0x0000
Transmit Power Envelope:
  * Local Maximum Transmit Power For 20 MHz: 25 dBm
HE capabilities:
  HE MAC Capabilities (0x000512081000):
    +HTC HE Supported
    TWT Responder
    BSR
    OM Control
    Maximum A-MPDU Length Exponent: 2
    OM Control UL MU Data Disable RX
  HE PHY Capabilities: (0x42002c00f438518000c00):
    HE40/HE80/5GHz
    242 tone RUs/5GHz
    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
    MU Beamformer
    Beamformee STS <= 80MHz: 3
    Sounding Dimensions <= 80MHz: 3
    Ng = 16 SU Feedback
    Codebook Size SU Feedback
    Triggered SU Beamforming 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 0x7b 0x1c 0xc7 0x71 0x1c 0xc7 0x71 0x1c 0xc7 0x71 0x1c 0xc7 0x71
WPS:
  * Version: 1.0
  * Wi-Fi Protected Setup State: 2 (Configured)
  * Response Type: 3 (AP)
  * UUID: adf4e098-1169-2efb-52cd-30431a11b6fd
  * Manufacturer: AlticeLabs
  * Model: AlticeLabs GR140DG
  * Model Number: GR140DG
  * Serial Number: 5054494EA8E6CD7F
  * Primary Device Type: 6-0050f204-1
  * Device name: FiberGateway
  * Config methods: Display
  * RF Bands: 0x3
  * Version2: 2.0
WMM:
  * Parameter version 1
  * u-APSD
  * BE: CW 15-1023, AIFS 3
  * BK: CW 15-1023, AIFS 7
  * VI: CW 7-15, AIFS 2, TXOP 3008 usec
  * VO: CW 3-7, AIFS 2, TXOP 1504 usec
802.11u Advertisement:
  Query Response Info: 0x7f
    Query Response Length Limit: 127
    ANQP

```

[Auxiliary files: wifi-cap-csv-data](#)

[META Information for Report for: Wifi Capacity Test](#)

