Dataplane Test

Candela TECHNOLOGIES

Tue Feb 15 08:11:22 PST 2022

| Test Setup Information				
Device Under Test	Name	cisco9130axe		
	Software Version	17.7.1.11	Hardware Version	cisco9130axe
	Model Number	cisco9130axe	Serial Number	FJC2428146G
	SSIDs			
	Passwords			
	BSSIDs			
	Notes	[BLANK]		

Objective

The Candela WiFi data plane test is designed to conduct an automatic testing of all combinations of station types, MIMO types, Channel Bandwidths, Traffic types, Traffic direction, Frame sizes etc… It will run a quick throughput test at every combination of these test variables and plot all the results in a set of charts to compare performance. The user is allowed to define an intended load as a percentage of the max theoretical PHY rate for every test combination. The expected behavior is that for every test combination the achieved throughput should be at least 70% of the theoretical max PHY rate under ideal test conditions. This test provides a way to go through hundreds of combinations in a fully automated fashion and very easily find patterns and problem areas which can be further debugged using more specific testing.

Throughput for each different traffic type. Datasets with names ending in '-LL' will include the IP, TCP, UDP and Ethernet header bytes in their calculation. For Armageddon traffic only, low-level throughput includes the Ethernet FCS and preamble. Other datasets report 'goodput' for the protocol.
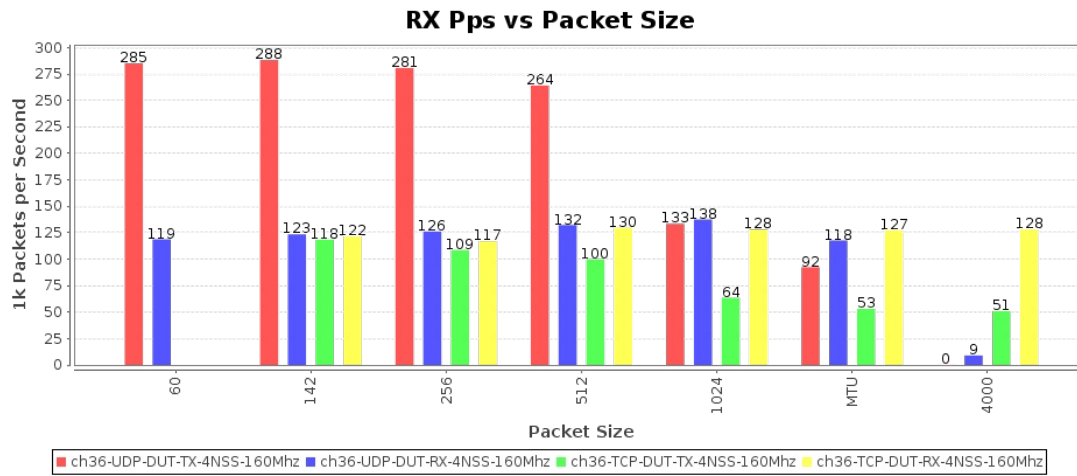
CSV Data for Throughput vs Packet Size
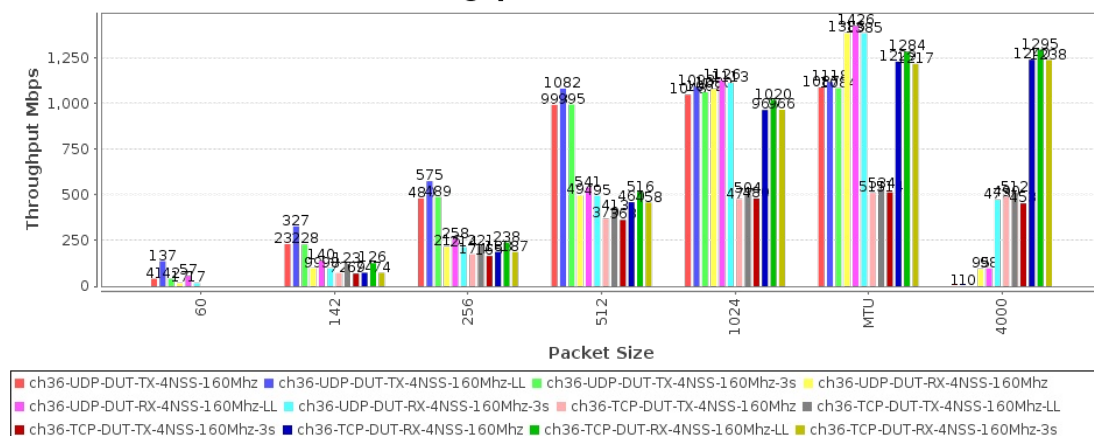
Pps throughput for each different traffic type. The values are estimated packets-per-second over the DUT, but some protocols such as TCP make this difficult to know for certain, so the value is extrapolated.

CSV Data for RX Pps vs Packet Size

RX Pps vs Packet Size

Latency for each different traffic type. If opposite-direction traffic is non-zero, then round-trip time will be reported. Otherwise, one-way latency will be reported.

CSV Data for Latency vs Packet Size

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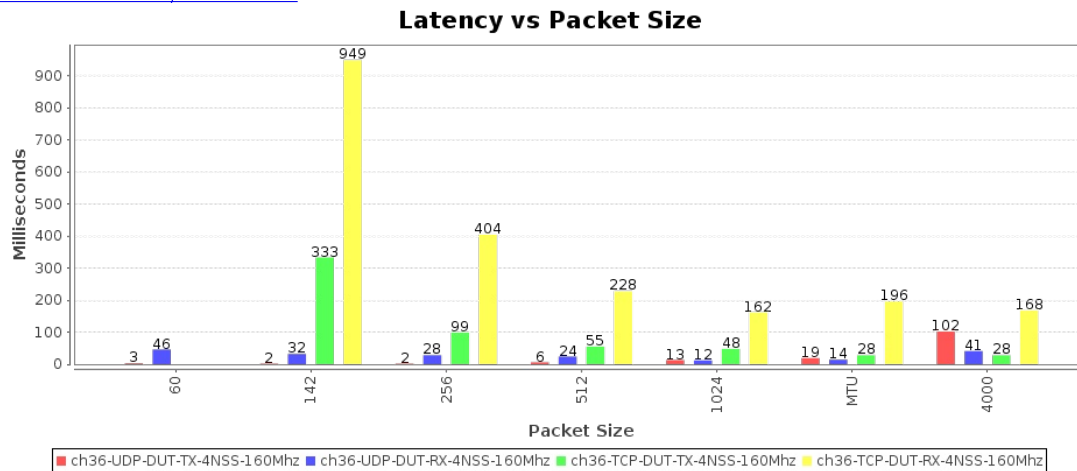
Realtime Graph shows summary download and upload RX Goodput rate of connections created by this test. Goodput does not include Ethernet, IP, UDP/TCP header overhead.

CSV Data for Realtime Throughput

Realtime Throughput
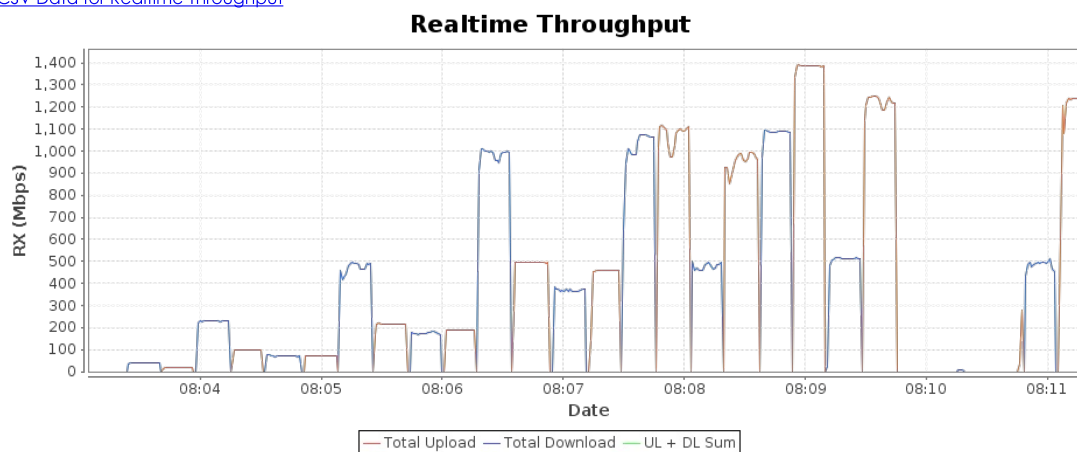
Test Information

Message
Starting dataplane test with: 28 iterations.
Skipping packet size not supported by TCP: 60

Constant values related to the table below.

| Iteration-Duration | 15s |

CSV data focussed on throughput. The values reported are gathered at the end of the test iteration before traffic is stopped. The test iterations consider 'Received' traffic to be received in the dominant direction. So, if the iteration is DUT-TX, then Received traffic is traffic received on the Station from the AP. If the iteration is DUT-RX, then Received traffic is received on Ethernet port from DUT and sent by the station. Columns starting with RSSI are from the perspective of the Station, so Tx-Rate is the Station transmit Phy Rate, and Rx-Rate is the Phy Rate received by the station. Rpt-Mode is negotiated mode, not necessarily Phy Rate mode.

Channel	Frequency	Security	NSS	Cfg-Mode	Bandwidth	Pkt	Traffic-Type	Direction	Atten	Rotation	Offered-1m	Rx-Bps	Rx-Bps-1m	Rx-Bps-LL	Rx-Bps-3s	RSSI	Tx-Failed	Tx-Failed%	Tx-Rate	Rx-Rate	Rpt-Mode	Rpt-Mode-Brief
36	5180	WPA2	4	AUTO	160	60	UDP	DUT-TX	NA	NA	76.48 Mbps	40.969 Mbps	41.025 Mbps	136.75 Mbps	41.561 Mbps	-52	0 / 8139625	0	260 Mbps	1.3 Gbps	802.11an-AC	802.11ac
36	5180	WPA2	4	AUTO	160	60	UDP	DUT-RX	NA	NA	17.217 Mbps	17.052 Mbps	17.093 Mbps	56.975 Mbps	17.1 Mbps	-48	0 / 1792562	0	1733.3 Mbps	1.3 Gbps	802.11an-AC	802.11ac
36	5180	WPA2	4	AUTO	160	142	UDP	DUT-TX	NA	NA	509.574 Mbps	229.63 Mbps	230.562 Mbps	327.398 Mbps	228.248 Mbps	-52	0 / 10087162	0	1733.3 Mbps	1.3 Gbps	802.11an-AC	802.11ac
36	5180	WPA2	4	AUTO	160	142	UDP	DUT-RX	NA	NA	98.762 Mbps	98.221 Mbps	98.725 Mbps	140.189 Mbps	98.295 Mbps	-48	191 / 1851743	0.01	1733.3 Mbps	1.3 Gbps	802.11an-AC	802.11ac
36	5180	WPA2	4	AUTO	160	142	TCP	DUT-TX	NA	NA	73.384 Mbps	71.49 Mbps	71.899 Mbps	123.069 Mbps	69.343 Mbps	-53	0 / 2019324	0	1733.3 Mbps	1.3 Gbps	802.11an-AC	802.11ac
36	5180	WPA2	4	AUTO	160	142	TCP	DUT-RX	NA	NA	77.561 Mbps	73.418 Mbps	73.884 Mbps	126.378 Mbps	73.538 Mbps	-53	191 / 2067089	0.009	1733.3 Mbps	1.3 Gbps	802.11an-AC	802.11ac
36	5180	WPA2	4	AUTO	160	256	UDP	DUT-TX	NA	NA	1.06 Gbps	477.154 Mbps	480.486 Mbps	574.787 Mbps	488.928 Mbps	-53	0 / 9571982	0	1733.3 Mbps	1.3 Gbps	802.11an-AC	802.11ac
36	5180	WPA2	4	AUTO	160	256	UDP	DUT-RX	NA	NA	215.863 Mbps	214.3 Mbps	215.926 Mbps	258.304 Mbps	213.78 Mbps	-48	0 / 1996049	0	1733.3 Mbps	1.3 Gbps	802.11an-AC	802.11ac
36	5180	WPA2	4	AUTO	160	256	TCP	DUT-TX	NA	NA	174.768 Mbps	173.371 Mbps	174.453 Mbps	221.368 Mbps	165.369 Mbps	-53	0 / 1730379	0	1733.3 Mbps	1.3 Gbps	802.11an-AC	802.11ac
36	5180	WPA2	4	AUTO	160	256	TCP	DUT-RX	NA	NA	192.864 Mbps	186.689 Mbps	187.872 Mbps	238.411 Mbps	187.119 Mbps	-53	0 / 1855982	0	1733.3 Mbps	1.3 Gbps	802.11an-AC	802.11ac
36	5180	WPA2	4	AUTO	160	512	UDP	DUT-TX	NA	NA	2.084 Gbps	987.201 Mbps	992.816 Mbps	1.082 Gbps	994.596 Mbps	-53	0 / 8500243	0	1733.3 Mbps	1.3 Gbps	802.11an-AC	802.11ac
36	5180	WPA2	4	AUTO	160	512	UDP	DUT-RX	NA	NA	497.008 Mbps	494.063 Mbps	496.909 Mbps	541.314 Mbps	495.065 Mbps	-48	191 / 2244729	0.009	1170 Mbps	1.3 Gbps	802.11an-AC	802.11ac
36	5180	WPA2	4	AUTO	160	512	TCP	DUT-TX	NA	NA	371.456 Mbps	368.053 Mbps	369.94 Mbps	413.132 Mbps	362.859 Mbps	-53	0 / 1733107	0	1733.3 Mbps	1.3 Gbps	802.11an-AC	802.11ac
36	5180	WPA2	4	AUTO	160	512	TCP	DUT-RX	NA	NA	467.011 Mbps	457.275 Mbps	459.912 Mbps	515.952 Mbps	458.282 Mbps	-54	0 / 1935642	0	1733.3 Mbps	1.3 Gbps	802.11an-AC	802.11ac
36	5180	WPA2	4	AUTO	160	1024	UDP	DUT-TX	NA	NA	2.96 Gbps	1.041 Gbps	1.048 Gbps	1.093 Gbps	1.062 Gbps	-53	0 / 5773132	0	1733.3 Mbps	1.3 Gbps	802.11an-AC	802.11ac
36	5180	WPA2	4	AUTO	160	1024	UDP	DUT-RX	NA	NA	1.08 Gbps	1.072 Gbps	1.08 Gbps	1.126 Gbps	1.113 Gbps	-48	0 / 2057165	0	1733.3 Mbps	1.3 Gbps	802.11an-AC	802.11ac
36	5180	WPA2	4	AUTO	160	1024	TCP	DUT-TX	NA	NA	478.345 Mbps	476.582 Mbps	476.813 Mbps	504.248 Mbps	479.659 Mbps	-53	0 / 942064	0	1733.3 Mbps	1.3 Gbps	802.11an-AC	802.11ac
36	5180	WPA2	4	AUTO	160	1024	TCP	DUT-RX	NA	NA	967.721 Mbps	962.673 Mbps	964.57 Mbps	1.02 Gbps	965.993 Mbps	-53	0 / 1894517	0	1733.3 Mbps	1.3 Gbps	802.11an-AC	802.11ac
36	5180	WPA2	4	AUTO	160	MTU	UDP	DUT-TX	NA	NA	2.947 Gbps	1.087 Gbps	1.087 Gbps	1.118 Gbps	1.084 Gbps	-54	0 / 3924360	0	1733.3 Mbps	1.3 Gbps	802.11an-AC	802.11ac
36	5180	WPA2	4	AUTO	160	MTU	UDP	DUT-RX	NA	NA	1.386 Gbps	1.385 Gbps	1.386 Gbps	1.426 Gbps	1.385 Gbps	-50	0 / 1776399	0	1733.3 Mbps	1.3 Gbps	802.11an-AC	802.11ac
36	5180	WPA2	4	AUTO	160	MTU	TCP	DUT-TX	NA	NA	512.691 Mbps	510.556 Mbps	510.939 Mbps	533.867 Mbps	513.713 Mbps	-53	0 / 750619	0	1733.3 Mbps	1.3 Gbps	802.11an-AC	802.11ac
36	5180	WPA2	4	AUTO	160	MTU	TCP	DUT-RX	NA	NA	1.233 Gbps	1.227 Gbps	1.229 Gbps	1.284 Gbps	1.217 Gbps	-52	0 / 1868053	0	1733.3 Mbps	1.3 Gbps	802.11an-AC	802.11ac
36	5180	WPA2	4	AUTO	160	4000	UDP	DUT-TX	NA	NA	2.958 Gbps	837.079 Kbps	843.631 Kbps	870.487 Kbps	0 bps	-53	0 / 11917211	0	1733.3 Mbps	1.3 Gbps	802.11an-AC	802.11ac
36	5180	WPA2	4	AUTO	160	4000	UDP	DUT-RX	NA	NA	1.368 Gbps	93.98 Mbps	94.746 Mbps	97.762 Mbps	473.099 Mbps	-49	0 / 1938537	0	1733.3 Mbps	1.3 Gbps	802.11an-AC	802.11ac
36	5180	WPA2	4	AUTO	160	4000	TCP	DUT-TX	NA	NA	490.511 Mbps	486.357 Mbps	490.411 Mbps	512.414 Mbps	453.423 Mbps	-53	0 / 759409	0	1733.3 Mbps	1.3 Gbps	802.11an-AC	802.11ac
36	5180	WPA2	4	AUTO	160	4000	TCP	DUT-RX	NA	NA	1.24 Gbps	1.239 Gbps	1.24 Gbps	1.295 Gbps	1.238 Gbps	-54	0 / 1886672	0	1733.3 Mbps	1.3 Gbps	802.11an-AC	802.11ac

CSV data focussed on TX and RX Link Rate and RSSI reports. The values reported are gathered at the end of the test iteration before traffic is stopped. The Phy Rate and RSSI are from the perspective of the Station, so Tx-MCS is MCS at which station is sending to the AP, and Rx-MCS is MCS at which the AP is sending to the station.

Channel	Frequency	Security	NSS	Cfg-Mode	Bandwidth	Pkt	Traffic-Type	Direction	Tx-Mode-Rpt	Tx-NSS-Rpt	Tx-MCS	Tx-BW-Rpt	Rx-Mode-Rpt	Rx-NSS-Rpt	Rx-MCS	Rx-BW-Rpt	RSSI dBm	Tx-Phy-Rate	Rx-Phy-Rate
36	5180	WPA2	4	AUTO	160	60	UDP	DUT-TX	VHT	4	1	80	3	VHT	1	80	-52 [-57, -62, -52, -57]	260.0 MBit/s VHT-MCS 1 80MHz short GI VHT-NSS 4	1170.0 MBit/s VHT-MCS 8 80MHz short GI VHT-NSS 3
36	5180	WPA2	4	AUTO	160	60	UDP	DUT-RX	VHT	4	9	80	3	VHT	9	80	-49 [-57, -62, -53, -58]	1733.3 MBit/s VHT-MCS 9 80MHz short GI VHT-NSS 4	1300.0 MBit/s VHT-MCS 9 80MHz short GI VHT-NSS 3
36	5180	WPA2	4	AUTO	160	142	UDP	DUT-TX	VHT	4	9	80	3	VHT	9	80	-52 [-57, -62, -52, -58]	1733.3 MBit/s VHT-MCS 9 80MHz short GI VHT-NSS 4	1300.0 MBit/s VHT-MCS 9 80MHz short GI VHT-NSS 3
36	5180	WPA2	4	AUTO	160	142	UDP	DUT-RX	VHT	4	9	80	3	VHT	9	80	-49 [-58, -63, -54, -58]	1733.3 MBit/s VHT-MCS 9 80MHz short GI VHT-NSS 4	1300.0 MBit/s VHT-MCS 9 80MHz short GI VHT-NSS 3
36	5180	WPA2	4	AUTO	160	142	TCP	DUT-TX	VHT	4	8	80	3	VHT	8	80	-54 [-58, -63, -54, -59]	1560.0 MBit/s VHT-MCS 8 80MHz short GI VHT-NSS 4	1300.0 MBit/s VHT-MCS 9 80MHz short GI VHT-NSS 3
36	5180	WPA2	4	AUTO	160	142	TCP	DUT-RX	VHT	4	9	80	3	VHT	9	80	-54 [-58, -63, -54, -59]	1733.3 MBit/s VHT-MCS 9 80MHz short GI VHT-NSS 4	1300.0 MBit/s VHT-MCS 9 80MHz short GI VHT-NSS 3
36	5180	WPA2	4	AUTO	160	256	UDP	DUT-TX	VHT	4	9	80	3	VHT	9	80	-53 [-57, -62, -53, -58]	1733.3 MBit/s VHT-MCS 9 80MHz short GI VHT-NSS 4	1300.0 MBit/s VHT-MCS 9 80MHz short GI VHT-NSS 3
36	5180	WPA2	4	AUTO	160	256	UDP	DUT-RX	VHT	4	9	80	3	VHT	9	80	-49 [-57, -63, -54, -58]	1733.3 MBit/s VHT-MCS 9 80MHz short GI VHT-NSS 4	1300.0 MBit/s VHT-MCS 9 80MHz short GI VHT-NSS 3
36	5180	WPA2	4	AUTO	160	256	TCP	DUT-TX	VHT	4	9	80	3	VHT	9	80	-53 [-57, -62, -53, -58]	1733.3 MBit/s VHT-MCS 9 80MHz short GI VHT-NSS 4	1300.0 MBit/s VHT-MCS 9 80MHz short GI VHT-NSS 3

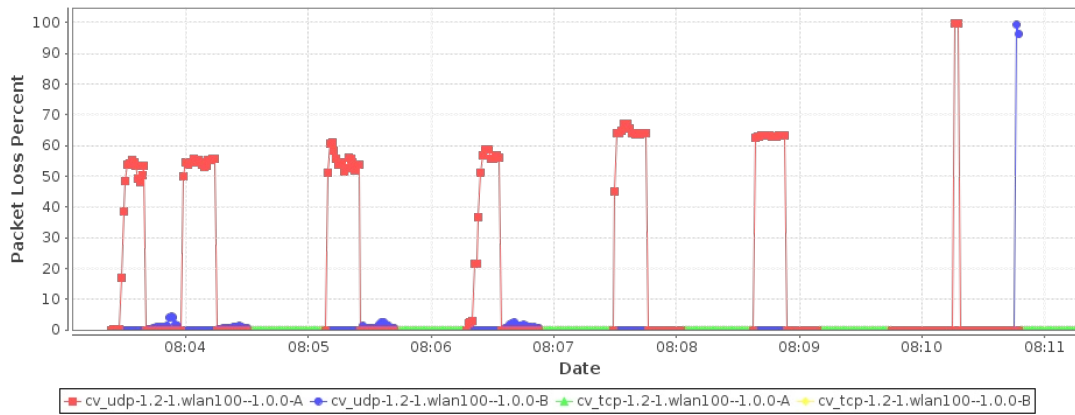| 36 | 5180 | WPA2 | 4 | AUTO | 160 | 256 | TCP | DUT-RX | VHT | 4 | 9 | 80 | 3 | VHT | 9 | 80 | -53 [-57, -62, -53, -58] | 1733.3 MBit/s VHT-MCS 9 80MHz short GI VHT-NSS 4 | 1300.0 MBit/s VHT-MCS 9 80MHz short GI VHT-NSS 3 |
36	5180	WPA2	4	AUTO	160	512	UDP	DUT-TX	VHT	4	9	80	3	VHT	9	80	-55 [-58, -63, -55, -58]	1733.3 MBit/s VHT-MCS 9 80MHz short GI VHT-NSS 4	1300.0 MBit/s VHT-MCS 9 80MHz short GI VHT-NSS 3
36	5180	WPA2	4	AUTO	160	512	UDP	DUT-RX	VHT	3	8	80	3	VHT	8	80	-48 [-58, -63, -54, -59]	1170.0 MBit/s VHT-MCS 8 80MHz short GI VHT-NSS 3	1300.0 MBit/s VHT-MCS 9 80MHz short GI VHT-NSS 3
36	5180	WPA2	4	AUTO	160	512	TCP	DUT-TX	VHT	4	9	80	3	VHT	9	80	-54 [-58, -64, -54, -59]	1733.3 MBit/s VHT-MCS 9 80MHz short GI VHT-NSS 4	1300.0 MBit/s VHT-MCS 9 80MHz short GI VHT-NSS 3
36	5180	WPA2	4	AUTO	160	512	TCP	DUT-RX	VHT	4	9	80	3	VHT	9	80	-54 [-58, -63, -54, -59]	1733.3 MBit/s VHT-MCS 9 80MHz short GI VHT-NSS 4	1300.0 MBit/s VHT-MCS 9 80MHz short GI VHT-NSS 3
36	5180	WPA2	4	AUTO	160	1024	UDP	DUT-TX	VHT	4	9	80	3	VHT	9	80	-48 [-58, -62, -53, -58]	1733.3 MBit/s VHT-MCS 9 80MHz short GI VHT-NSS 4	1300.0 MBit/s VHT-MCS 9 80MHz short GI VHT-NSS 3
36	5180	WPA2	4	AUTO	160	1024	UDP	DUT-RX	VHT	4	9	80	3	VHT	9	80	-49 [-58, -64, -55, -60]	1733.3 MBit/s VHT-MCS 9 80MHz short GI VHT-NSS 4	1300.0 MBit/s VHT-MCS 9 80MHz short GI VHT-NSS 3
36	5180	WPA2	4	AUTO	160	1024	TCP	DUT-TX	VHT	4	9	80	3	VHT	9	80	-54 [-58, -64, -54, -59]	1733.3 MBit/s VHT-MCS 9 80MHz short GI VHT-NSS 4	1300.0 MBit/s VHT-MCS 9 80MHz short GI VHT-NSS 3
36	5180	WPA2	4	AUTO	160	1024	TCP	DUT-RX	VHT	4	9	80	3	VHT	9	80	-54 [-58, -63, -54, -59]	1733.3 MBit/s VHT-MCS 9 80MHz short GI VHT-NSS 4	1300.0 MBit/s VHT-MCS 9 80MHz short GI VHT-NSS 3
36	5180	WPA2	4	AUTO	160	MTU	UDP	DUT-TX	VHT	4	9	80	3	VHT	9	80	-53 [-57, -62, -53, -58]	1733.3 MBit/s VHT-MCS 9 80MHz short GI VHT-NSS 4	1300.0 MBit/s VHT-MCS 9 80MHz short GI VHT-NSS 3
36	5180	WPA2	4	AUTO	160	MTU	UDP	DUT-RX	VHT	4	9	80	3	VHT	9	80	-50 [-58, -63, -55, -59]	1733.3 MBit/s VHT-MCS 9 80MHz short GI VHT-NSS 4	1300.0 MBit/s VHT-MCS 9 80MHz short GI VHT-NSS 3
36	5180	WPA2	4	AUTO	160	MTU	TCP	DUT-TX	VHT	4	9	80	3	VHT	9	80	-54 [-59, -64, -54, -59]	1733.3 MBit/s VHT-MCS 9 80MHz short GI VHT-NSS 4	1300.0 MBit/s VHT-MCS 9 80MHz short GI VHT-NSS 3
36	5180	WPA2	4	AUTO	160	MTU	TCP	DUT-RX	VHT	4	9	80	3	VHT	9	80	-53 [-58, -63, -53, -58]	1733.3 MBit/s VHT-MCS 9 80MHz short GI VHT-NSS 4	1300.0 MBit/s VHT-MCS 9 80MHz short GI VHT-NSS 3
36	5180	WPA2	4	AUTO	160	4000	UDP	DUT-TX	VHT	4	9	80	3	VHT	9	80	-52 [-58, -63, -52, -59]	1733.3 MBit/s VHT-MCS 9 80MHz short GI VHT-NSS 4	1300.0 MBit/s VHT-MCS 9 80MHz short GI VHT-NSS 3
36	5180	WPA2	4	AUTO	160	4000	UDP	DUT-RX	VHT	4	9	80	3	VHT	9	80	-49 [-58, -63, -53, -59]	1733.3 MBit/s VHT-MCS 9 80MHz short GI VHT-NSS 4	1300.0 MBit/s VHT-MCS 9 80MHz short GI VHT-NSS 3
36	5180	WPA2	4	AUTO	160	4000	TCP	DUT-TX	VHT	4	9	80	3	VHT	9	80	-53 [-58, -62, -53, -58]	1733.3 MBit/s VHT-MCS 9 80MHz short GI VHT-NSS 4	1300.0 MBit/s VHT-MCS 9 80MHz short GI VHT-NSS 3
36	5180	WPA2	4	AUTO	160	4000	TCP	DUT-RX	VHT	4	9	80	3	VHT	9	80	-53 [-58, -62, -53, -59]	1733.3 MBit/s VHT-MCS 9 80MHz short GI VHT-NSS 4	1300.0 MBit/s VHT-MCS 9 80MHz short GI VHT-NSS 3

Brief csv report, may be imported into third-party tools.

Step Index	Position [Deg]	Attenuation [dB]	Throughput [Mbps]	Beacon RSSI [dBm]	Data RSSI [dBm]
0	NA	0	40.97	-47	-52
1	NA	0	17.05	-48	-48
2	NA	0	229.63	-48	-52
3	NA	0	98.22	-48	-48
4	NA	0	71.49	-48	-53
5	NA	0	73.42	-48	-53
6	NA	0	477.15	-48	-53
7	NA	0	214.30	-48	-48
8	NA	0	173.37	-48	-53
9	NA	0	186.69	-48	-53
10	NA	0	987.20	-48	-53
11	NA	0	494.06	-48	-48
12	NA	0	368.05	-48	-53
13	NA	0	457.28	-48	-54
14	NA	0	1,040.95	-48	-53
15	NA	0	1,071.90	-48	-48
16	NA	0	476.58	-48	-53
17	NA	0	962.67	-48	-53
18	NA	0	1,086.68	-48	-54
19	NA	0	1,385.03	-49	-50
20	NA	0	510.56	-49	-53
21	NA	0	1,227.19	-49	-52
22	NA	0	0.84	-49	-53
23	NA	0	93.98	-49	-49
24	NA	0	486.36	-49	-53
25	NA	0	1,239.18	-49	-54

Packet Loss Percentage graph shows the percentage of lost packets as detected by the receiving endpoint due to packet gaps. If there is full packet loss, then this will not report any loss since there will be no gap to detect. TCP protocol tests will never show drops since the TCP protcol will retransmit any lost frames.

CSV Data for Endpoint RX Packet Loss Percentage

Endpoint RX Packet Loss Percentage

Legend: ■ cv_udp-1.2-1.wlan100--1.0.0-A ● cv_udp-1.2-1.wlan100--1.0.0-B ▲ cv_tcp-1.2-1.wlan100--1.0.0-A ▼ cv_tcp-1.2-1.wlan100--1.0.0-B

Test configuration and LANforge software version	
AP Tx Power:	0
Path Loss	10
Requested Speed	85%
Requested Opposite Speed	0
Multi-Conn	1
Armageddon Multi-Pkt	1000
ToS	0
Station Bringup Wait:	30 sec (30 s)
First Byte Wait:	30 sec (30 s)
Duration:	15 sec (15 s)
Settle Time:	1 sec (1 s)
Send Buffer Size:	OS Default
Receive Buffer Size:	OS Default
RvR Helper Script:	
Channels	AUTO
Spatial Streams	AUTO
Bandwidth	No-Change
Attenuator-1	0
Attenuation-1	0..+50..950
Attenuator-2	0
Attenuation-2	0..+50..950
Turntable Chamber	0
Turntable Angles	0..+45..359
Modes	Auto
Packet Size	60, 142, 256, 512, 1024, MTU, 4000
Security	AUTO
Traffic Type	UDP, TCP
Direction	DUT Transmit, DUT Receive
Upstream Port	1.1.eth2 Firmware: 0x80000aef, 1.1876.0 Resource: ct523c-3011
WiFi Port	1.1.wlan100 Firmware: 10.4b-ct-9984-xtH-13-b1b524c8e5 Resource: ct523c-3011
Outer Loop is Attenuation	false
Show Events	true
Auto Save Report	true
Pass-Fail Tput Criteria	
Build Date	Thu 13 Jan 2022 01:27:32 PM PST
Build Version	5.4.4
Git Version	c419229103db6f1917b40d5169b2c9926b273e51

[Key Performance Indicators CSV](#)

[META Information for Dataplane Test](#)