Unicast Throughput Report - UDP

Device Tested

WLAN Switch Model:
WLAN Switch Version:
AP Model:
AP SW Version:

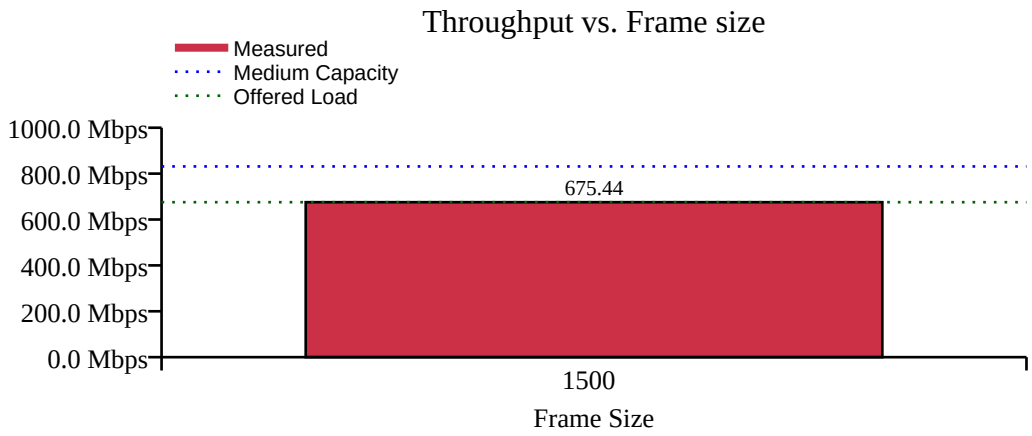
Overview

The throughput test measures a key performance metric: the maximum rate at which frames can be injected into the system under test (SUT) without exceeding a pre-set loss threshold. If the loss threshold is zero, this corresponds to the classical definition of throughput as per RFC 1242.

Throughput is very important in assessing performance under higher-layer protocols such as TCP, where even small amounts of loss can significantly impact user applications.

Measured Throughput

The following graph summarizes the measured throughput performance of the SUT at the specified frame sizes in bytes. Higher values indicate better overall performance. If there are more than 15 frame sizes the graph will represent a sample of the frame sizes only.



The theoretical throughput of the system, as limited by the physical media, is also indicated on the above graph. The SUT throughput should ideally be as close as possible to the indicated theoretical throughput values. NOTE: For 11n clients the theoretical maximum assumes the Best Effort AC, AIFSn of 2, and ECWMin of 4.

Test Conditions

Parameter	Value	Description
Frame Sizes	[1500]	Frame sizes in bytes

Test Configuration

Parameter	Value	Description
Learning Time	2 sec	Transmission time (seconds) for initial learning packets, to allow the SUT to set up forwarding tables
Achieved Transmit Time	20.00 sec	Trial duration (seconds) - i.e., duration of test traffic
Settle Time	2 sec	Idle time after test traffic transmission completes
Aging Time	5 sec	Time allowed for the SUT to recover between iterations
Number of Trials	1	Number of times measurements are repeated for averaging
Search Minimum	1.0%	Lower limit of aggregate ILOAD offered to the SUT, in percent of theoretical maximum throughput
Search Maximum	150.0%	Upper limit of aggregate ILOAD offered to the SUT, in percent of theoretical maximum throughput
Starting Point	50.0%	Initial value of aggregate ILOAD offered to the SUT, in percent of theoretical maximum throughput
Search Resolution	5.0%	Granularity of measured values, in percent of theoretical maximum throughput
Acceptable Loss	0.0%	Frame loss threshold used when determining throughput
Prefer IPv6 addressing	False	If this flag is enabled and clients has an IPv6 address configured, then generated traffic will use IPv6 addresses. If there is no IPv6 address configured on clients then generated traffic will use IPv4 addresses.

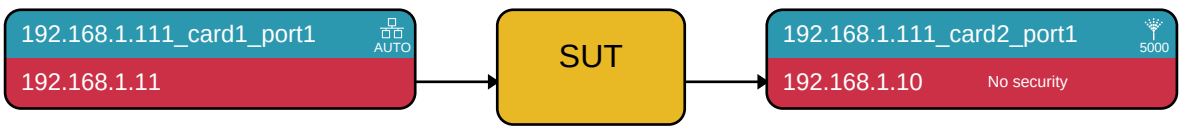
Binary Search Options

The maximum, minimum, starting point and search resolution of aggregate ILOAD values are calculated in percent of the theoretical maximum frame rate for the particular frame size. Please refer to the Test Configuration table for the percent values.

Frame Sizes	Search Max (fps)	Search Min (fps)	Start Point (fps)	Search Resolution (fps)
1500	103913.6	692.8	34637.9	3463.8

Test Topology

The test topology is shown below. Traffic is transmitted in the direction of the arrows. The test client port identifiers and IP addresses are indicated in the boxes, together with the security mode and channel ID for WLAN clients.



A total of 2 ports were used in this test.

Client Configuration

Client Group	Rx Data MCS	Tx Data MCS	Tx Mgmt. PHY Rate (Mbps)	PHY Rate (Mbps)	IPv6	Port	Adopt Tx Data MCS
Group_001	9	9	54.0	866.7	Disabled	192.168.1.111_card2_port1	Off
Group_002	N/A	N/A	N/A	1000	Disabled	192.168.1.111_card1_port1	N/A

"Rx Data MCS Index" found in WML file will be ignored if "Adopt Tx Data MCS Index" is enabled. In this case, "Rx Data MCS Index" will be set equal to "Tx Data MCS Index".

Client MAC Configuration

Client Group	PHY Type	A-MPDU	RX A-MSDU	TX A-MSDU (Max,Target)	LDPC	Channel Bandwidth	Guard Interval	Channel Model	Dynamic Bandwidth
Group_001	11ac	On	On	On (Auto)	Off	80	short	Bypass	Off

Client MIMO Configuration

Client Group	MIMO	MU/SU-MIMO
Group_001	2x2	MU

Client 802.11k Configuration

Client Group	802.11k	Measurements Enabled	Periodicity	Max. Frames
Group_001	Off	None	N/A	N/A

Methodology

The test is performed by associating test clients with the SUT ports, performing any desired learning transmissions, and then generating test traffic between the test clients. The test then calculates throughput according to the procedure specified in RFC 2544. Proprietary signatures and tags are inserted into the test traffic to ensure accurate measurement results.

A binary search algorithm is used to obtain the throughput, by finding the ILOAD resulting in the highest forwarding rate for which the packet loss ratio is less than the acceptable threshold. The Search Maximum and Search Minimum parameters may be used to constrain the search algorithm. The Starting Point is the starting value of the offered load and its value must be greater or equal to the Search Minimum and less than or equal to the Search Maximum. By default, the search algorithm will start at 50% of the theoretical throughput calculated for the test topology.

The test is repeated for each frame size, and also if the number of trials is greater than 1. The results are recorded separately for each combination of frame size and trial number, as well as being averaged into the graphs shown above.

Detailed Results

Frame Size	Trial	Trial Duration (sec)	Theoretical Throughput pkts/sec	Theoretical Throughput kbits/sec	ILOAD pkts/sec	Throughput pkts/sec	Throughput kbits/sec	Retransmission Rate pkts/sec	Offered Load kbits/sec
1500	1	20.0	69275	831309	56286.5	56286.5	675438	0.0	675438

The following table shows the measured minimum, average and maximum latency performance of the SUT for the best trial on each port. Lower values indicate better performance. Latency measurement consider all receive flows on the port.

Frame Size	Trial	Min Latency Overall (ms)	Avg Latency Overall (ms)	Max Latency Overall (ms)	Direction	Port
1500	1	0.618	2.381	20.645	Downstream	192.168.1.111_card2_port1

Access Point Information

The following table shows the SUT details. The received signal strength indication (RSSI) from the SUT is sampled on each port at the start of each trial and averaged over all of the trials.

Port Name	Type	RxAtt*	Chan	BSSID	SSID	RSSI (dBm) A,B,C,D
192.168.1.111_card2_port1	80211ac	off	149	02:DD:76:00:DC:87	A2-T	-31, -33, N/A, N/A
192.168.1.111_card2_port1	80211ac	off	149	02:DD:76:00:DC:87	A2-T	-32, -33, N/A, N/A
192.168.1.111_card2_port1	80211ac	off	149	02:DD:76:00:DC:87	A2-T	-32, -33, N/A, N/A
192.168.1.111_card2_port1	80211ac	off	149	02:DD:76:00:DC:87	A2-T	-32, -33, N/A, N/A
192.168.1.111_card2_port1	80211ac	off	149	02:DD:76:00:DC:87	A2-T	-32, -33, N/A, N/A

The RSSI is measured at the WaveBlade SMA connector. RSSI values should be between -25 dBm and -35 dBm for port types of 80211 and 80211n ports when the RX attenuation (RxAtt*) option is 'off'. For 80211n port types with attenuation 'on' the RSSI values at the port should be between -5 dBm and -15 dBm. If the RSSI is not in this range, modify the external attenuation to bring it into this range.

Port Configuration

The following table shows the port configuration details like Bandwidth, Channel, Band, CenterFrequency.

PortName	Port Type	Channel	Band	Channel Bandwidth	Center Frequency
192.168.1.111_card2_port1	80211ac	149	5 GHz	80 MHz	5775 MHz

Other Information

Results Directory C:\Users\Dell\VeriWave\WaveApps\Results\20190708-152840

WaveApps Version	7.6, 2019.04.02.18-ixia
WaveTest Version	7.6-124-ixi, 2019.04.02.17

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