

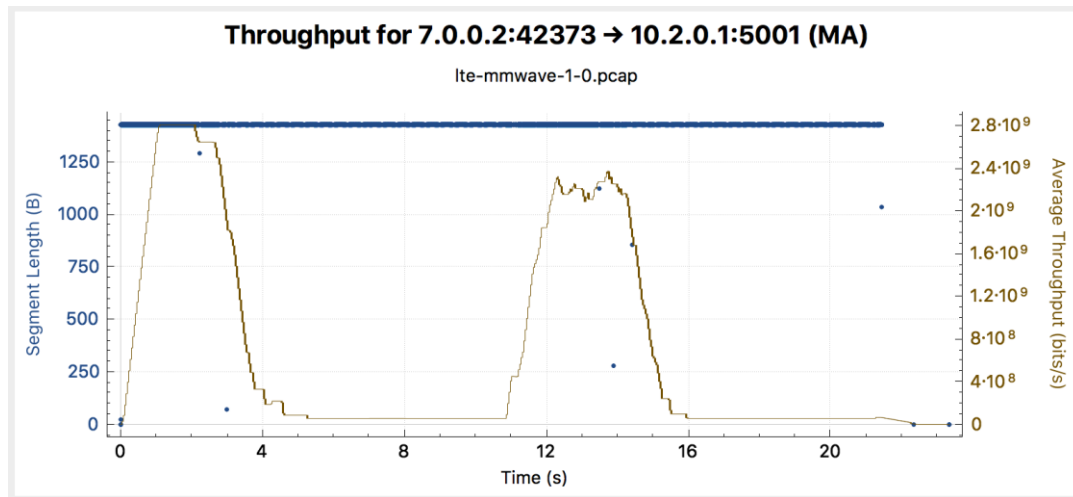
802.11ad with MPTCP: Improve throughput in mobility and blockage

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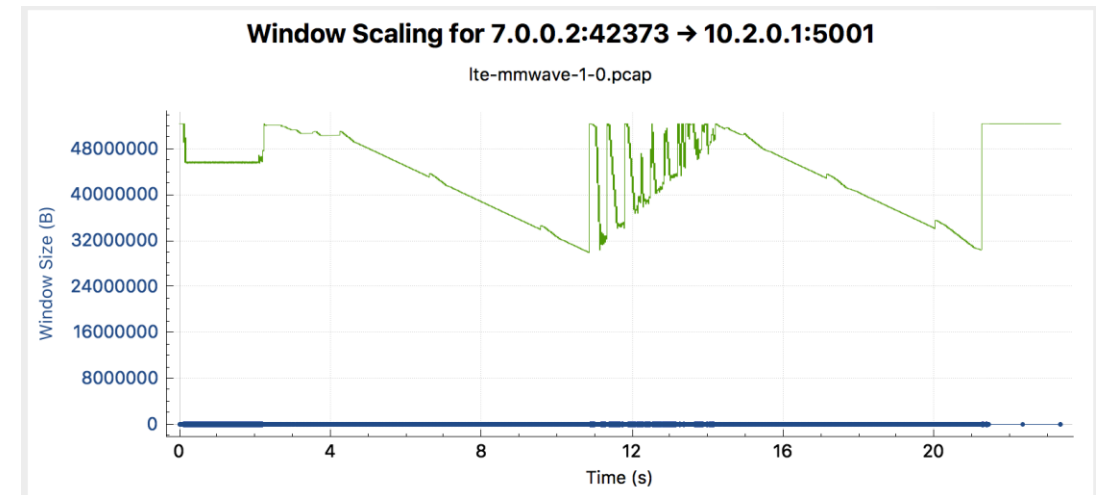
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Receive buffer

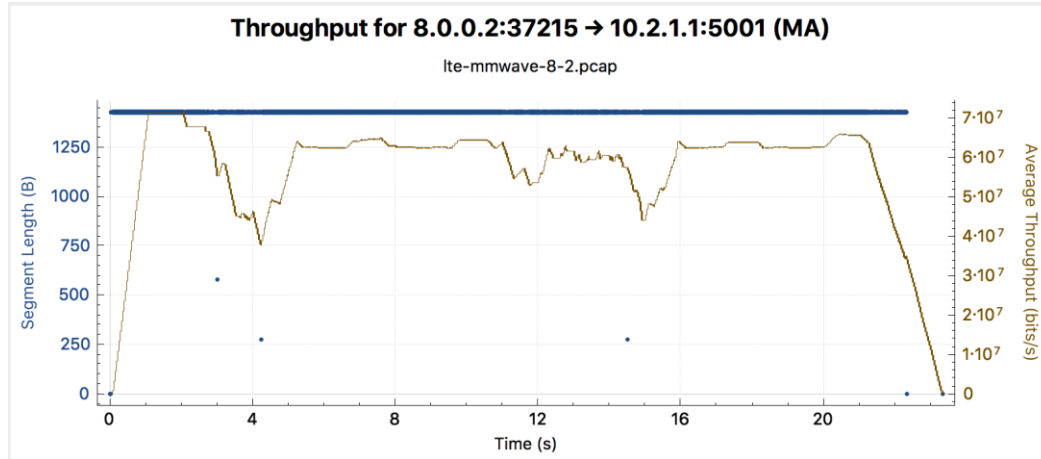


mmWave throughput

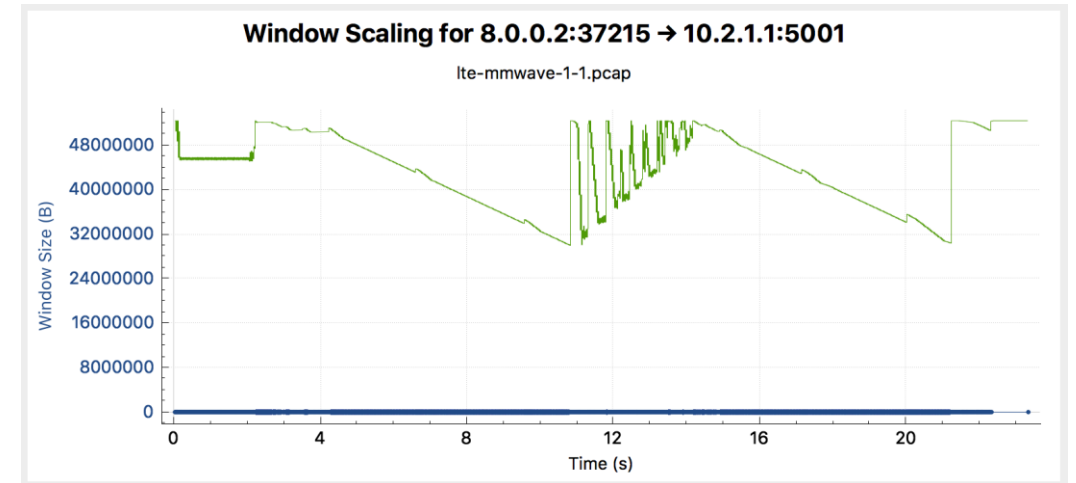


mmWave Awnd

Receive buffer



LTE throughput



LTE Awnd

Timeout ? Out-of-Order ?

644	1970-01-01 09:00:01.005201	7.0.0.2	1.0.0.2	TCP	1454	49153 → cisco-sccp(2000) [ACK] Seq=385001 Ack=1 Win=5242880 Len=1400 TSv
645	1970-01-01 09:00:01.005296	7.0.0.2	1.0.0.2	TCP	1454	49153 → cisco-sccp(2000) [ACK] Seq=386401 Ack=1 Win=5242880 Len=1400 TSv
646	1970-01-01 09:00:01.005298	7.0.0.2	1.0.0.2	TCP	1454	49153 → cisco-sccp(2000) [ACK] Seq=387801 Ack=1 Win=5242880 Len=1400 TSv
647	1970-01-01 09:00:01.005396	7.0.0.2	1.0.0.2	TCP	1454	49153 → cisco-sccp(2000) [ACK] Seq=389201 Ack=1 Win=5242880 Len=1400 TSv
648	1970-01-01 09:00:01.005397	7.0.0.2	1.0.0.2	TCP	62	[TCP Dup ACK 515#34] search-agent(1234) → 49153 [ACK] Seq=1 Ack=172201 V
649	1970-01-01 09:00:01.005397	7.0.0.2	1.0.0.2	TCP	62	[TCP Dup ACK 515#35] search-agent(1234) → 49153 [ACK] Seq=1 Ack=172201 V
650	1970-01-01 09:00:01.005397	7.0.0.2	1.0.0.2	TCP	62	[TCP Dup ACK 515#36] search-agent(1234) → 49153 [ACK] Seq=1 Ack=172201 V
651	1970-01-01 09:00:01.005397	7.0.0.2	1.0.0.2	TCP	62	[TCP Dup ACK 515#37] search-agent(1234) → 49153 [ACK] Seq=1 Ack=172201 V
652	1970-01-01 09:00:01.005397	7.0.0.2	1.0.0.2	TCP	62	[TCP Dup ACK 515#38] search-agent(1234) → 49153 [ACK] Seq=1 Ack=172201 V
653	1970-01-01 09:00:01.005397	7.0.0.2	1.0.0.2	TCP	62	[TCP Dup ACK 515#39] search-agent(1234) → 49153 [ACK] Seq=1 Ack=172201 V
654	1970-01-01 09:00:01.005397	7.0.0.2	1.0.0.2	TCP	62	[TCP Dup ACK 515#40] search-agent(1234) → 49153 [ACK] Seq=1 Ack=172201 V
655	1970-01-01 09:00:01.005397	7.0.0.2	1.0.0.2	TCP	62	[TCP Dup ACK 515#41] search-agent(1234) → 49153 [ACK] Seq=1 Ack=172201 V
656	1970-01-01 09:00:01.005397	7.0.0.2	1.0.0.2	TCP	62	[TCP Dup ACK 515#42] search-agent(1234) → 49153 [ACK] Seq=1 Ack=172201 V
657	1970-01-01 09:00:01.023195	1.0.0.2	7.0.0.2	TCP	1454	49153 → search-agent(1234) [ACK] Seq=252001 Ack=1 Win=5242880 Len=1400 T
658	1970-01-01 09:00:01.023196	1.0.0.2	7.0.0.2	TCP	1454	49153 → search-agent(1234) [ACK] Seq=253401 Ack=1 Win=5242880 Len=1400 T
659	1970-01-01 09:00:01.023196	1.0.0.2	7.0.0.2	TCP	1454	[TCP Fast Retransmission] 49153 → search-agent(1234) [ACK] Seq=172201 Ac
660	1970-01-01 09:00:01.023296	1.0.0.2	7.0.0.2	TCP	1454	[TCP Out-Of-Order] 49153 → search-agent(1234) [ACK] Seq=173601 Ack=1 Wir
661	1970-01-01 09:00:01.023296	1.0.0.2	7.0.0.2	TCP	1454	[TCP Out-Of-Order] 49153 → search-agent(1234) [ACK] Seq=175001 Ack=1 Wir
662	1970-01-01 09:00:01.023296	1.0.0.2	7.0.0.2	TCP	1454	[TCP Out-Of-Order] 49153 → search-agent(1234) [ACK] Seq=176401 Ack=1 Wir
663	1970-01-01 09:00:01.023296	1.0.0.2	7.0.0.2	TCP	1454	[TCP Out-Of-Order] 49153 → search-agent(1234) [ACK] Seq=177801 Ack=1 Wir
664	1970-01-01 09:00:01.023297	1.0.0.2	7.0.0.2	TCP	1454	[TCP Out-Of-Order] 49153 → search-agent(1234) [ACK] Seq=179201 Ack=1 Wir
665	1970-01-01 09:00:01.023297	1.0.0.2	7.0.0.2	TCP	1454	[TCP Out-Of-Order] 49153 → search-agent(1234) [ACK] Seq=180601 Ack=1 Wir
666	1970-01-01 09:00:01.023297	1.0.0.2	7.0.0.2	TCP	1454	[TCP Out-Of-Order] 49153 → search-agent(1234) [ACK] Seq=182001 Ack=1 Wir
667	1970-01-01 09:00:01.023297	1.0.0.2	7.0.0.2	TCP	1454	[TCP Out-Of-Order] 49153 → search-agent(1234) [ACK] Seq=183401 Ack=1 Wir
668	1970-01-01 09:00:01.023497	1.0.0.2	7.0.0.2	TCP	54	cisco-sccp(2000) → 49153 [ACK] Seq=1 Ack=261801 Win=5242880 Len=0 TSval=
669	1970-01-01 09:00:01.023499	1.0.0.2	7.0.0.2	TCP	54	cisco-sccp(2000) → 49153 [ACK] Seq=1 Ack=264601 Win=5242880 Len=0 TSval=
670	1970-01-01 09:00:01.023501	1.0.0.2	7.0.0.2	TCP	54	cisco-sccp(2000) → 49153 [ACK] Seq=1 Ack=267401 Win=5242880 Len=0 TSval=
671	1970-01-01 09:00:01.023598	1.0.0.2	7.0.0.2	TCP	54	cisco-sccp(2000) → 49153 [ACK] Seq=1 Ack=270201 Win=5242880 Len=0 TSval=
672	1970-01-01 09:00:01.023600	1.0.0.2	7.0.0.2	TCP	54	cisco-sccp(2000) → 49153 [ACK] Seq=1 Ack=273001 Win=5242880 Len=0 TSval=

In other scenarios, When timeout or out-of-order occurs, It is showed in pcap file. But our scenario doesn't occur.

Thank you