

# WLAN 802.11n MIMO Analysis

June 17, 2010

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**SHARKFEST '10**

Stanford University

June 14-17, 2010



Trace files and coloring rules can be copied from circulating memory stick



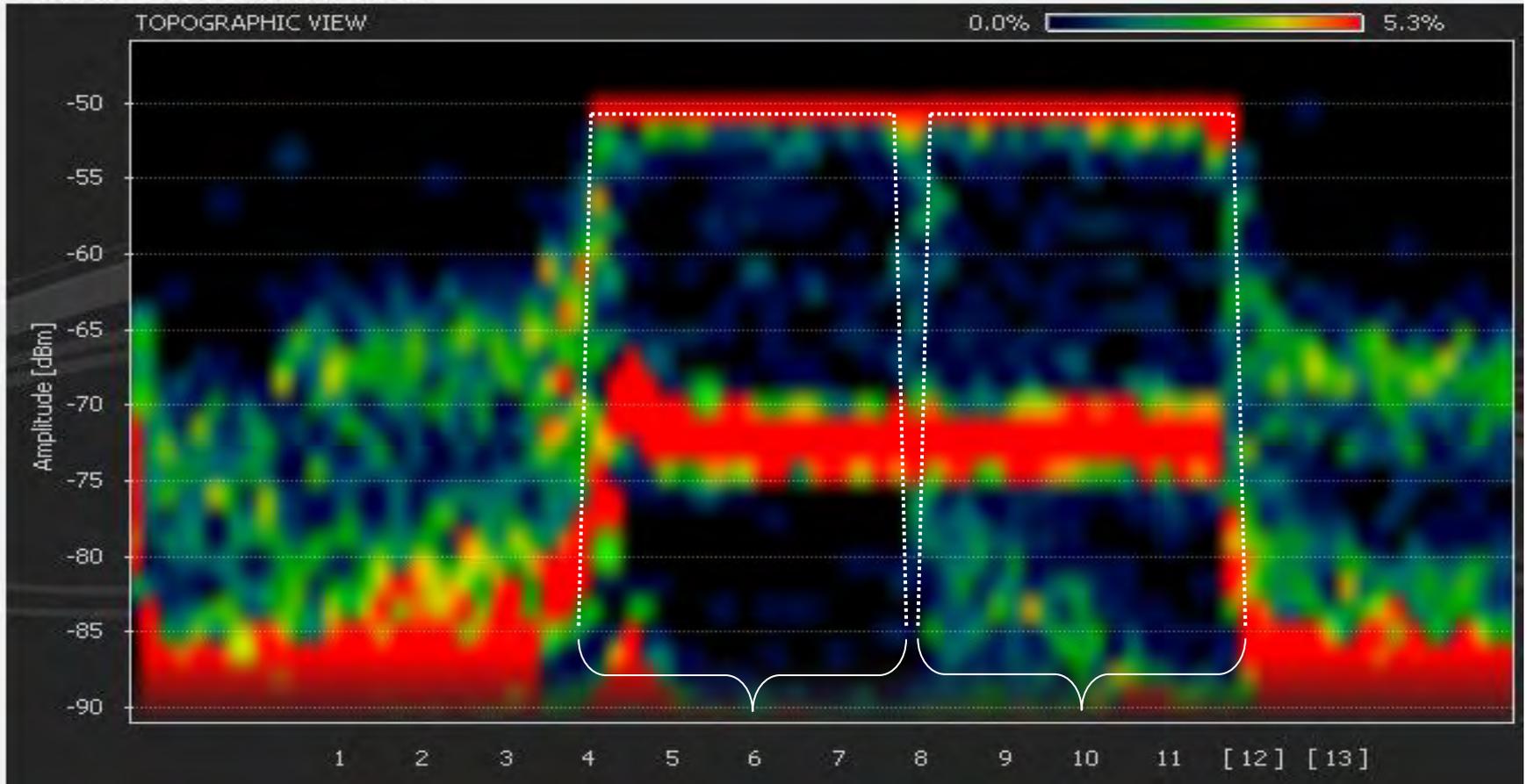




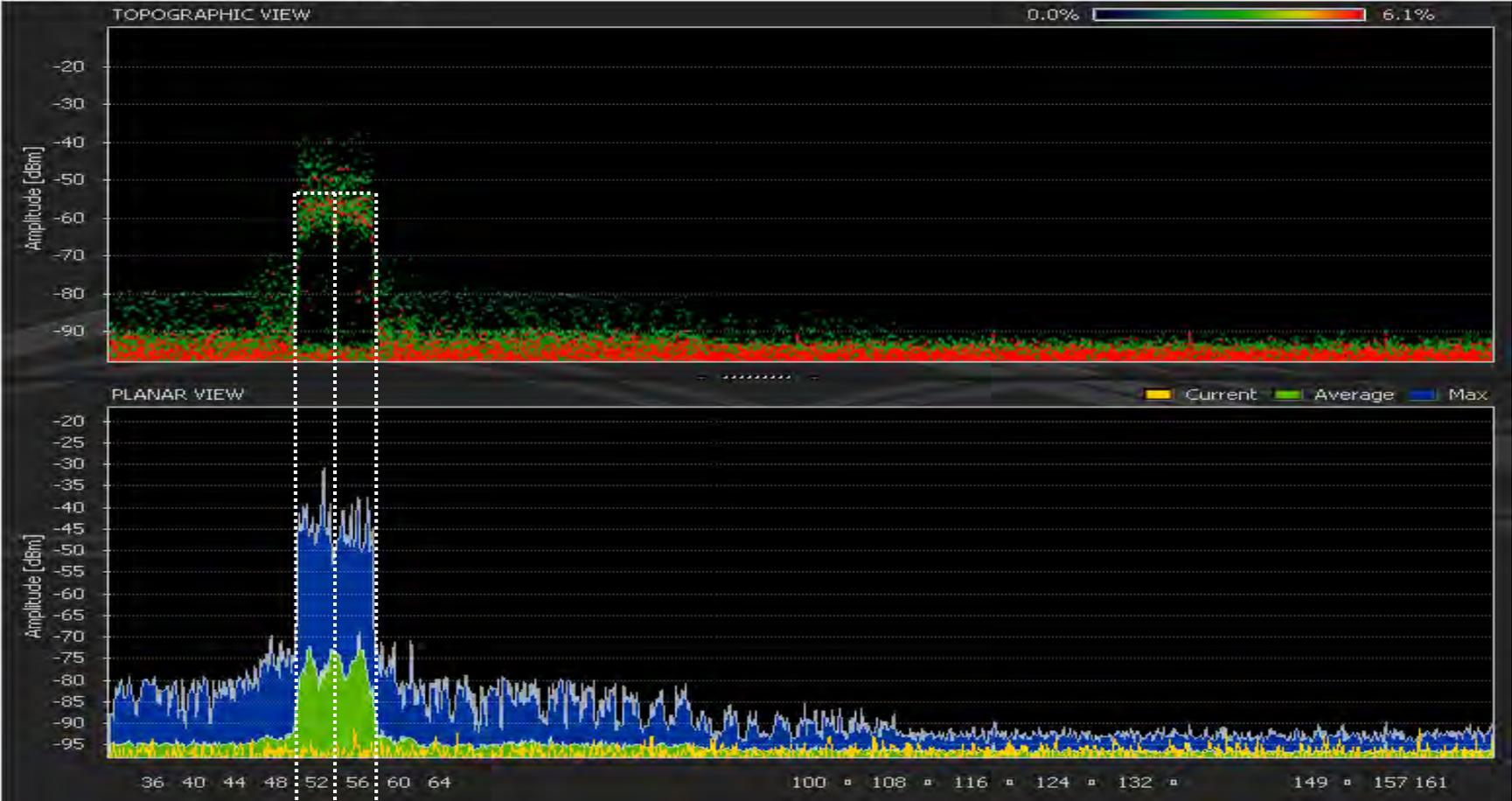




File: Channel Bonding 2\_4.wsr



Channel Bonding 52 and 56.wsr





Dynamic Frequency Selection (DFS) Channel 44 5220 MHz

- Band 1 - 5.150 to 5.250 GHz
- Band 2 - 5.250 to 5.350 GHz
- Band 3 - 5.470 to 5.725 GHz

Above 40 MHz

- < NONE >
- 20 MHz
- Below 40 MHz
- Above 40 MHz

**Interface**

AirPcap N Wireless Capture Device

**Basic Parameters**

Channel: 5220 [A 44]

Channel Offset: +1

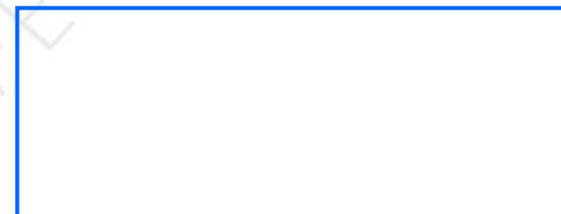
Capture Type: -1, 0, +1

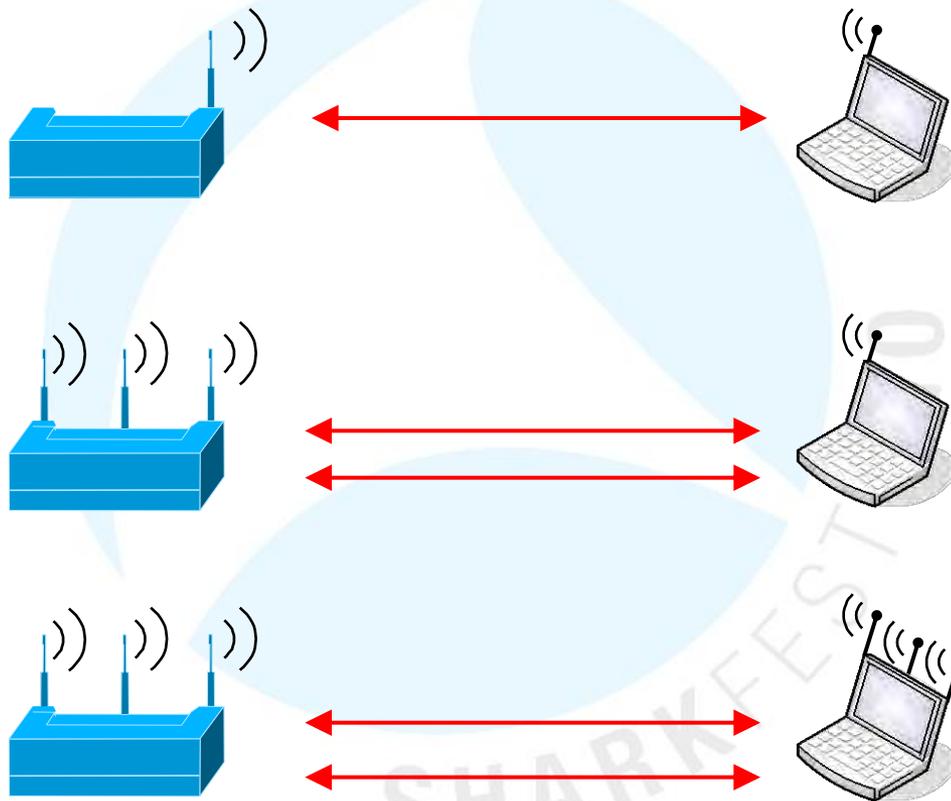
Frequency Band	Channel ID	FCC (GHz)	ETSI (GHz)	MKK (GHz)
Lower Band UNII-1	34	--	--	5.170
	36	5.180	5.180	--
	38	--	--	5.190
	40	5.200	5.200	--
	42	--	--	5.210
	44	5.220	5.220	--
	46	--	--	5.230
	48	5.240	5.240	--
Middle Band UNII-2	52	5.260*	5.260	5.260
	56	5.280*	5.280	5.280
	60	5.300*	5.300	5.300
	64	5.320*	5.320	5.320
High Band UNII-2 extended	100	5.500*	5.500	5.500
	104	5.520*	5.520	5.520
	108	5.540*	5.540	5.540
	112	5.560*	5.560	5.560
	116	5.580*	5.580	5.580
	120	5.600*	5.600	5.600
	124	5.620*	5.620	5.620
	128	5.640*	5.640	5.640
	132	5.660*	5.660	5.660
	136	5.680*	5.680	5.680
	140	5.700*	5.700	5.700
Upper Band UNII-3/ISM	149	5.745	--	--
	153	5.765	--	--
	157	5.785	--	--
	161	5.805	--	--
ISM	165	5.825	--	--

Available non-overlapping channels	
FCC (USA and Canada)	24
ETSI (Europe)	19
MKK (Japan)	19

Transmit Power Control (TPC) required for	
FCC (USA and Canada)	Band 2,2e
ETSI (Europe)	Band 1,2,2e
MKK (Japan)	Band 1,2,2e

Dynamic Frequency Selection (DFS) required for	
FCC* (USA and Canada)	Band 2,2e
ETSI (Europe)	Band 1,2,2e
MKK (Japan)	Band 1,2,2e







Data Rates:

Best Range

Best Throughput

Default

6.0Mb/sec	<input checked="" type="radio"/> Require	<input type="radio"/> Enable	<input type="radio"/> Disable
9.0Mb/sec	<input checked="" type="radio"/> Require	<input type="radio"/> Enable	<input type="radio"/> Disable
12.0Mb/sec	<input checked="" type="radio"/> Require	<input type="radio"/> Enable	<input type="radio"/> Disable
18.0Mb/sec	<input checked="" type="radio"/> Require	<input type="radio"/> Enable	<input type="radio"/> Disable
24.0Mb/sec	<input checked="" type="radio"/> Require	<input type="radio"/> Enable	<input type="radio"/> Disable
36.0Mb/sec	<input checked="" type="radio"/> Require	<input type="radio"/> Enable	<input type="radio"/> Disable
48.0Mb/sec	<input checked="" type="radio"/> Require	<input type="radio"/> Enable	<input type="radio"/> Disable
54.0Mb/sec	<input checked="" type="radio"/> Require	<input type="radio"/> Enable	<input type="radio"/> Disable

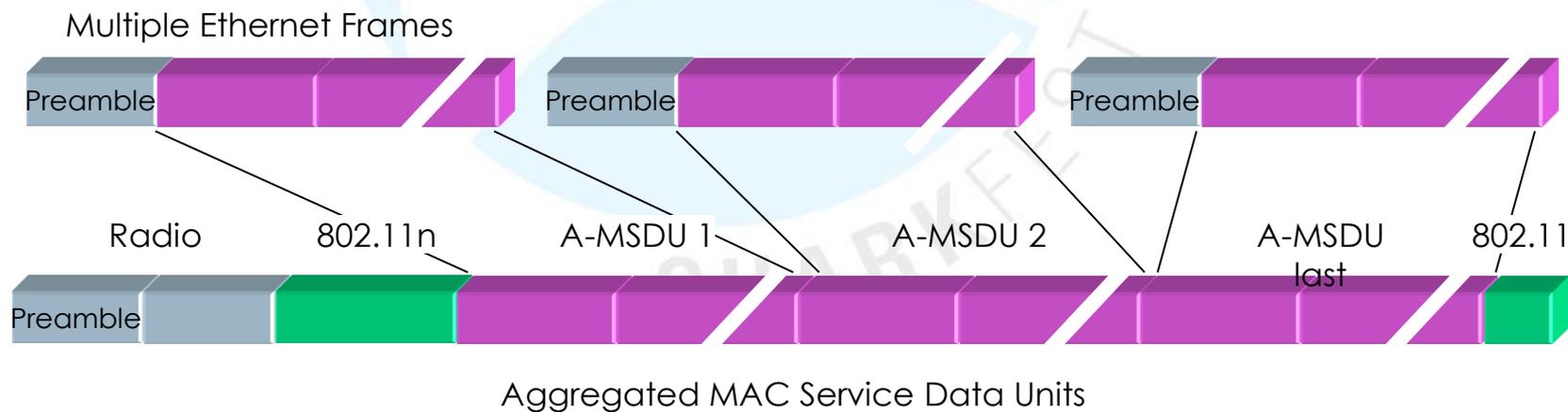
MCS Rates:

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Enable	<input checked="" type="radio"/>															
Disable	<input type="radio"/>															



MCS Rate Chart		20 MHz Channel								40 MHz Channel							
		1 Stream (non MIMO)				2 Streams (MIMO)				1 Stream (non MIMO)				2 Streams (MIMO)			
802.11n 2.4GHz GI = 800ns	MCS Rate	0	1	2	3	8	9	10	11	n.a.	n.a.						
	Mbps	6.5	13	19.5	26	13	26	39	52								
		39	52	58.5	65	78	104	117	130								
MCS Rate	4	5	6	7	12	13	14	15									
802.11n 5GHz GI = 800ns	MCS Rate	0	1	2	3	8	9	10	11	0	1	2	3	8	9	10	11
	Mbps	6.5	13	19.5	26	13	26	39	52	13.5	27	40.5	54	27	54	81	108
		39	52	58.5	65	78	104	117	130	81	108	121.5	135	162	216	243	270
MCS Rate	4	5	6	7	12	13	14	15	4	5	6	7	12	13	14	15	
802.11n 5GHz GI = 400ns	MCS Rate	0	1	2	3	8	9	10	11	0	1	2	3	8	9	10	11
	Mbps	7.2	14.4	21.7	28.9	14.4	28.9	43.3	57.8	15	30	45	60	30	60	90	120
		43.3	57.8	65	72.2	86.7	115.6	130	144.4	90	120	135	150	180	240	270	300
MCS Rate	4	5	6	7	12	13	14	15	4	5	6	7	12	13	14	15	





D05-1\_AMSDU.pcap - Wireshark

File Edit View Go Capture Analyze Statistics Help

Filter:  Expression... Clear Apply

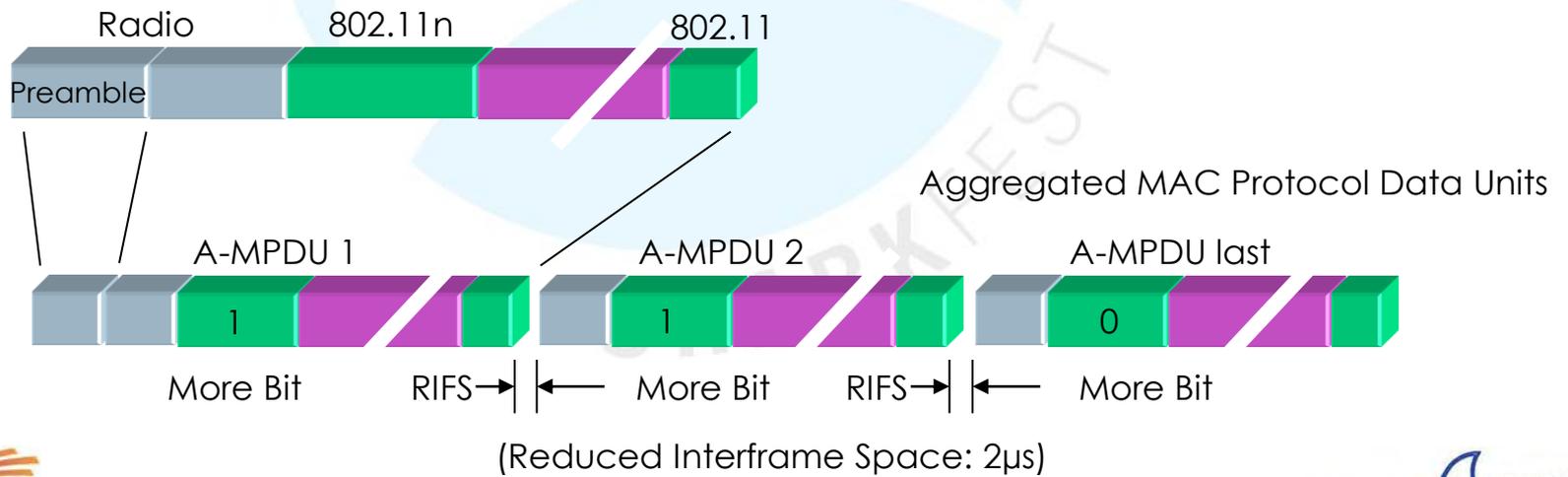
802.11 Channel:  Channel Offset:  PCAP Filter:  Decryption Mode: None Wireless Settings... Decryption Keys...

No.	Delta Time	TX Rate	RSSI	Source	Destination	Protocol	Info
867	0.000129	300.0 Mbps	-40	192.168.0.181	192.168.0.187	UDP	Source port: 4071 Destination port: 4071
868	0.000022	54.0 Mbps	-45		Cisco_a0:8d:c0 (RA)	IEEE 802	Acknowledgement, Flags=.....
869	0.000224	270.0 Mbps	-40	192.168.0.181	192.168.0.187	UDP	Source port: 4071 Destination port: 4071
870	0.000021	54.0 Mbps	-45		Cisco_a0:8d:c0 (RA)	IEEE 802	Acknowledgement, Flags=.....
871	0.000206	270.0 Mbps	-41	192.168.0.181	192.168.0.187	UDP	Source port: 4071 Destination port: 4071
872	0.000021	54.0 Mbps	-45		Cisco_a0:8d:c0 (RA)	IEEE 802	Acknowledgement, Flags=.....

Frame 867 (2628 bytes on wire, 2628 bytes captured)

- PPI version 0, 84 bytes
- IEEE 802.11 QoS Data, Flags: .....F.
- IEEE 802.11 Aggregate MSDU
  - A-MSDU Subframe #1
  - A-MSDU Subframe #2
  - A-MSDU Subframe #3
  - A-MSDU Subframe #4
  - A-MSDU Subframe #5
  - A-MSDU Subframe #6
  - A-MSDU Subframe #7
  - A-MSDU Subframe #8
  - A-MSDU Subframe #9
  - A-MSDU Subframe #10

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D05-2\_AMPDU.pcap - Wireshark

File Edit View Go Capture Analyze Statistics Help

Filter:  Expression... Clear Apply

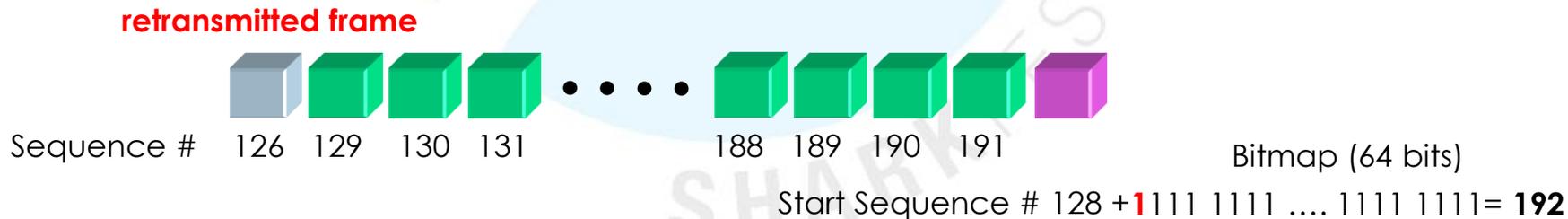
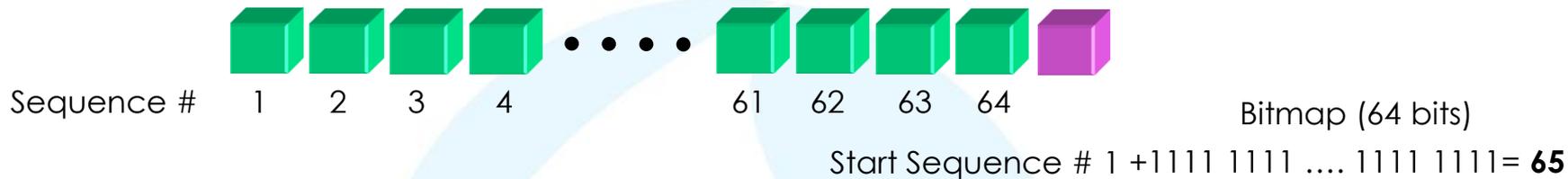
802.11 Channel:  Channel Offset:  FCS Filter:  Decryption Mode: None Wireless Settings... Decryption Keys...

No.	Delta Time	TX Rate	RSSI	Source	Destination	Protocol	Info
66	0.000022	300.0 Mbps	-33	192.168.0.180	192.168.0.185	UDP	Source port: 2658 Destination...
67	0.000022	54.0 Mbps	-44	Buffalo_73:05:af (TA)	Cisco_a0:8d:c0 (RA)	IEEE 802	802.11 Block Ack, Flags=...
68	0.000418	300.0 Mbps	-39			IEEE 802	Unreassembled A-MPDU data
69	0.000026	300.0 Mbps	-39			IEEE 802	Unreassembled A-MPDU data
70	0.000027	300.0 Mbps	-47			IEEE 802	Unreassembled A-MPDU data
71	0.000026	300.0 Mbps	-47			IEEE 802	Unreassembled A-MPDU data
72	0.000025	300.0 Mbps	-47			IEEE 802	Unreassembled A-MPDU data
73	0.000027	300.0 Mbps	-47			IEEE 802	Unreassembled A-MPDU data
74	0.000034	300.0 Mbps	-47			IEEE 802	Unreassembled A-MPDU data
75	0.000132	300.0 Mbps	-33	192.168.0.180	192.168.0.185	UDP	Source port: 2658 Destination...
76	0.000023	54.0 Mbps	-45	Buffalo_73:05:af (TA)	Cisco_a0:8d:c0 (RA)	IEEE 802	802.11 Block Ack, Flags=...

Frame 75 (1620 bytes on wire, 1620 bytes captured)

- PPI version 0, 84 bytes
- IEEE 802.11 Aggregate MPDU
  - MPDU #1
  - MPDU #2
  - MPDU #3
  - MPDU #4
  - MPDU #5
  - MPDU #6
  - MPDU #7
  - MPDU #8





D05-2\_AMPDU.pcap - Wireshark

File Edit View Go Capture Analyze Statistics Help

Filter: Expression... Clear Apply

802.11 Channel: Channel Offset: FCS Filter: Decryption Mode: None Wireless Settings... Decryption Keys...

No.	Delta Time	TX Rate	RSSI	Source	Destination	Protocol	Info
4579	0.000021	54.0 Mbps	-47	Buffalo_73:05:af (TA)	Cisco_a0:8d:c0 (RA)	IEEE 802	802.11 Block Ack, Flags=...
4580	0.000369	300.0 Mbps	-39			IEEE 802	Unreassembled A-MPDU data
4581	0.000027	300.0 Mbps	-39			IEEE 802	Unreassembled A-MPDU data
4582	0.000028	300.0 Mbps	-47			IEEE 802	Unreassembled A-MPDU data
4583	0.000024	300.0 Mbps	-47			IEEE 802	Unreassembled A-MPDU data
4584	0.000031	300.0 Mbps	-47			IEEE 802	Unreassembled A-MPDU data
4585	0.000137	300.0 Mbps	-47			IEEE 802	Unreassembled A-MPDU data
4586	0.000021	300.0 Mbps	-47			IEEE 802	Unreassembled A-MPDU data
4587	0.000021	300.0 Mbps	-36	192.168.0.180	192.168.0.185	UDP	Source port: 2658 Destination...
4588	0.000021	54.0 Mbps	-47	Buffalo_73:05:af (TA)	Cisco_a0:8d:c0 (RA)	IEEE 802	802.11 Block Ack, Flags=...

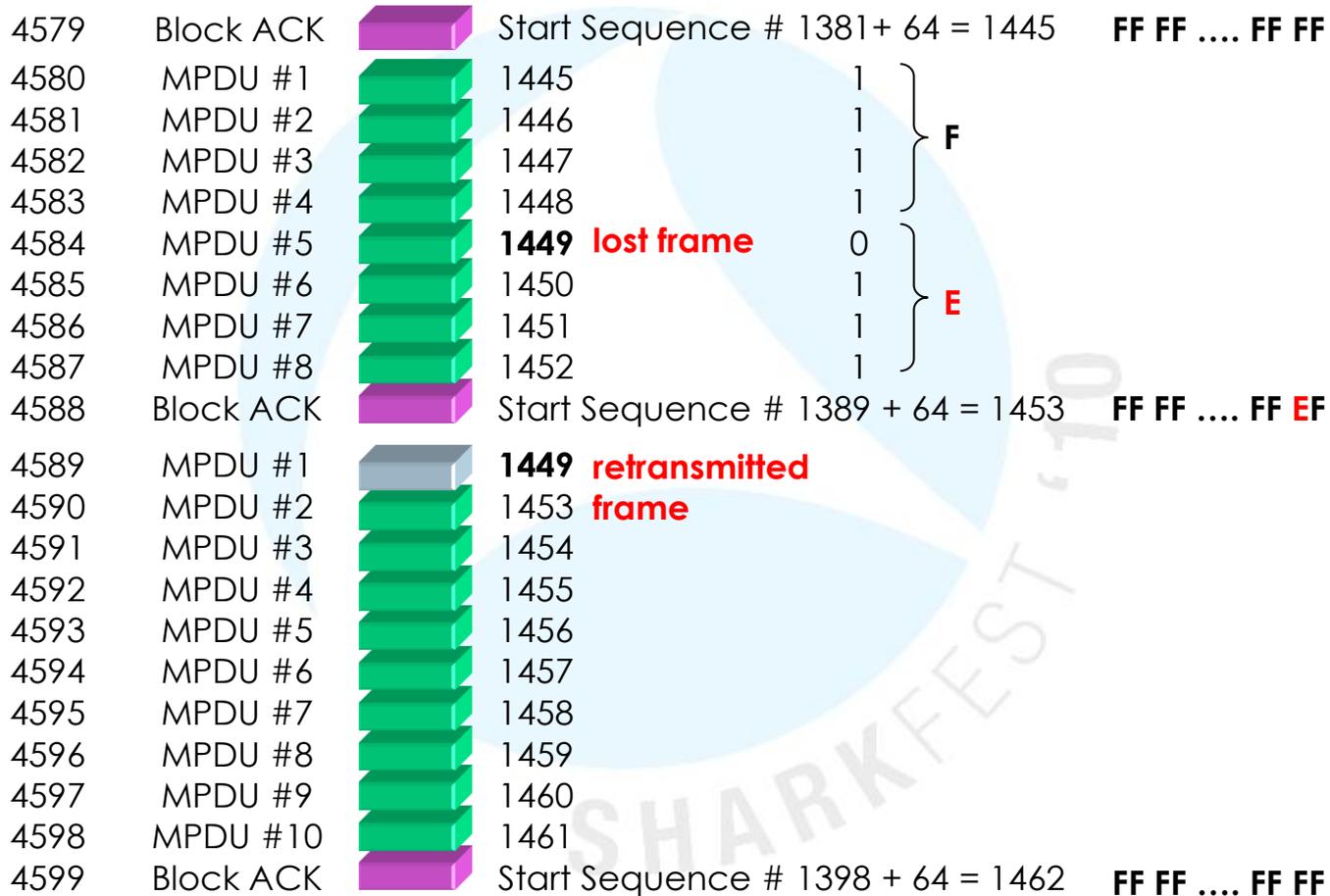
IEEE 802.11 802.11 Block Ack, Flags: .....C

- Type/Subtype: 802.11 Block Ack (0x19)
- Frame Control: 0x0094 (Normal)
- Duration: 0
- Receiver address: Cisco\_a0:8d:c0 (00:17:df:a0:8d:c0)
- Transmitter address: Buffalo\_73:05:af (00:16:01:73:05:af)
- Block Ack Request Type: Compressed Block (0x02)
- Block Ack (BA) Control: 0x0004
- Block Ack Starting Sequence Control (SSC): 0x56d0
- Block Ack Bitmap
- Frame check sequence: 0xf47ea4d2 [correct]

```

0000 00 00 20 00 69 00 00 02 00 14 00 56 f0 08 c6  ...i...V...
0010 01 00 00 00 01 00 6c 00 50 14 40 01 00 00 d1 a0  ....l.P@....
0020 94 00 00 00 00 17 df a0 8d c0 00 16 01 73 05 af  ....s...
0030 04 00 d0 56 ff ff ff ff ff ff ff ef f4 7e a4 d2  ...V.....~..

```





D05-3\_BAR&BA.pcap - Wireshark

File Edit View Go Capture Analyze Statistics Help

Filter:  Expression... Clear Apply

802.11 Channel:  Channel Offset:  FCS Filter:  Decryption Mode: None Wireless Settings... Decryption Keys...

No.	Delta Time	TX Rate	RSSI	Source	Destination	Protocol	Info
140	0.000022	54.0 Mb	-35		Cisco_a0:8d:c0 (RA)	IEEE 802	Acknowledgement, Flags=.....C
141	0.000024	300.0 M	-37	Cisco_a0:8d:c0	Buffalo_73:05:af	IEEE 802	Action, SN=3837, FN=0, Flags=.....C
142	0.000021	54.0 Mb	-35		Cisco_a0:8d:c0 (RA)	IEEE 802	Acknowledgement, Flags=.....C
143	0.001046	6.0 Mbp	-33	Buffalo_73:05:af	Cisco_a0:8d:c0	IEEE 802	Action, SN=79, FN=0, Flags=.....C
144	0.000021	6.0 Mbp	-41		Buffalo_73:05:af (RA)	IEEE 802	Acknowledgement, Flags=.....C
145	0.000145	54.0 Mb	-37	Cisco_a0:8d:c0 (TA)	Buffalo_73:05:af (RA)	IEEE 802	802.11 Block Ack Req, Flags=.....C
146	0.000019	54.0 Mb	-33	Buffalo_73:05:af (TA)	Cisco_a0:8d:c0 (RA)	IEEE 802	802.11 Block Ack, Flags=.....C
147	0.097038	6.0 Mbp	-41	Cisco_a0:8d:c0	Broadcast	IEEE 802	Beacon frame, SN=3838, FN=0, Flags=.....
148	0.104498	6.0 Mbp	-38	Cisco_a0:8d:c0	Broadcast	IEEE 802	Beacon frame, SN=3839, FN=0, Flags=.....

Frame 141 (121 bytes on wire, 121 bytes captured)

- PPI version 0, 84 bytes
- IEEE 802.11 Action, Flags: .....C
- IEEE 802.11 wireless LAN management frame
  - Fixed parameters
    - Action: 0x03
      - Category code: Block Ack (3)
      - Action code: Add Block Ack Request (0x00)
      - Dialog token: 0x01
    - Block Ack Parameters: 0x1002
      - .... .... = A-MSDUs: Not Permitted
      - .... .... = Block Ack Policy: Immediate Block Ack
      - ..00 00.. = Traffic Identifier: 0x00
      - 0001 0000 00.. .... = Number of Buffers (1 Buffer = 2304 Bytes): 64
    - Block Ack Timeout: 0x0000
    - Block Ack Starting Sequence Control (SSC): 0x0010

D05-3\_BAR&BA.pcap - Wireshark

File Edit View Go Capture Analyze Statistics Help

Filter:  Expression... Clear Apply

802.11 Channel:  Channel Offset:  PCAP Filter:  Decryption Mode: None Wireshark Settings... Decryption Keys...

No.	Delta Time	Tx Rate	RSSI	Source	Destination	Protocol	Info
1	0.000000	6.0 Mbps	-40	Cisco_a0:8d:c0	Broadcast	IEEE 802	Beacon frame, SN=3727, FN=0,
2	0.104453	6.0 Mbps	-38	Cisco_a0:8d:c0	Broadcast	IEEE 802	Beacon frame, SN=3728, FN=0,

- [-] HT Capabilities (802.11n D1.10)
  - Tag Number: 45 (HT Capabilities (802.11n D1.10))
  - Tag length: 26
  - [-] HT Capabilities Info: 0x186e
  - [-] A-MPDU Parameters: 0x001b
  - [-] Rx Supported Modulation and Coding Scheme Set: MCS Set
  - [-] HT Extended Capabilities: 0x0000
  - [-] Transmit Beam Forming (TxBF) Capabilities: 0x0000
  - [-] Antenna Selection (ASEL) Capabilities: 0x00
  - [-] HT Information (802.11n D1.10)**
    - Tag Number: 61 (HT Information (802.11n D1.10))
    - Tag length: 22
    - Primary Channel: 48**
    - [-] HT Information Subset (1 of 3): 0x0F
      - .... ..11 = Secondary channel offset: Secondary channel is below the primary channel (0x03)
      - .... ..1.. = Supported channel width: Channel of any width supported
      - .... ..1.. = Reduced Interframe Spacing (RIFS): Permitted
      - ...0 .... = Power Save Multi-Poll (PSMP) stations only: Association requests are accepted regardless c
      - 000. .... = Shortest service interval: 5 ms (0x00)



**Advanced Wireless Settings**

**Interface**

AirPcap N Wireless Capture Device Blink Led

**Basic Parameters**

Channel: 5220 [A 44]  Include 802.11 FCS in Frames

Channel Offset: +1

Capture Type: 802.11 + PPI FCS Filter: Valid Frames

- 802.11 Only
- 802.11 + Radio
- 802.11 + PPI

Apply Cancel

SHARKFEST

D05-2\_AMPDU.pcap - Wireshark

File Edit View Go Capture Analyze Statistics Help

Filter:  Expression... Clear Apply

802.11 Channel:  Channel Offset:  FC Filter:  Decryption Mode: None Wireless Settings... Decryption Keys...

No.	Delta Time	Tx Rate	RSSI	Source	Destination	Protocol	Info
54	0.000021	54.0 Mbps	-44	Buffalo_73:05:af (TA)	Cisco_a0:8d:c0 (RA)	IEEE 802.11	802.11 Block Ack, Flags=...
55	0.000187	300.0 Mbps	-39			IEEE 802.11	Unreassembled A-MPDU data
56	0.000025	300.0 Mbps	-39			IEEE 802.11	Unreassembled A-MPDU data
57	0.000026	300.0 Mbps	-47			IEEE 802.11	Unreassembled A-MPDU data
58	0.000026	300.0 Mbps	-47			IEEE 802.11	Unreassembled A-MPDU data
59	0.000026	300.0 Mbps	-47			IEEE 802.11	Unreassembled A-MPDU data
60	0.000028	300.0 Mbps	-34	192.168.0.180	192.168.0.185	UDP	Source port: 2658 Destination...
61	0.000024	54.0 Mbps	-44	Buffalo_73:05:af (TA)	Cisco_a0:8d:c0 (RA)	IEEE 802.11	802.11 Block Ack, Flags=...

Frame 60 (1620 bytes on wire (1296 bytes captured) on interface 0)

PPI version 0, 84 bytes

- Version: 0
- Flags: 0x00
- Header length: 84
- DLT: 105
- 802.11-Common
- 802.11n MAC+PHY
- [A-MPDU (9244 bytes w/hdrs): #55(1536), #56(1536), #57(1536), #58(1536), #59(1536), #60(1536)]
- IEEE 802.11 Aggregate MPDU

802.11n MAC+PHY

Field type: 802.11n MAC+PHY Extensions (4)

Field length: 48

MAC flags: 0x00000016

.....0 = Greenfield flag: False  
.....1. = HT20/HT40 flag: HT40  
.....1.. = RX Short Guard Interval (SGI) flag: True  
.....0... = Duplicate RX flag: False  
.....1.... = Aggregate flag: True  
.....0. .... = More aggregates flag: False  
.....0.. .... = A-MPDU Delimiter CRC error after this frame flag: False  
0..... = Debug Flag (more desc): False

AMPDU-ID: 0x000131cd

Num-Delimiters: 0

MCS: 15

Number of spatial streams: 2

RSSI combined: 62

Antenna 0 control RSSI: 53

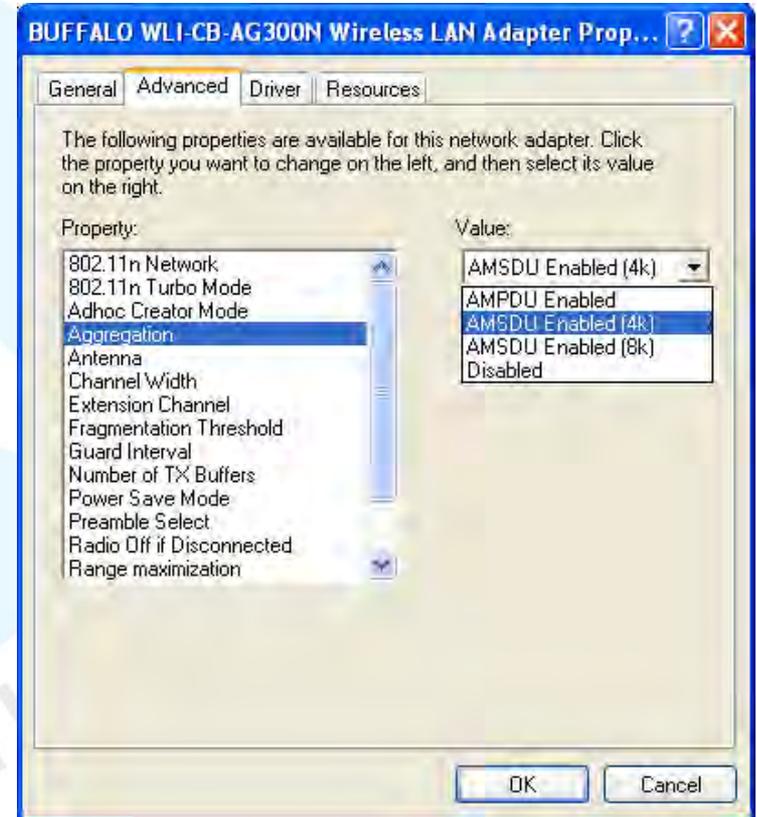
Antenna 1 control RSSI: 58

Antenna 2 control RSSI: 58

Antenna 3 control RSSI: 255 [invalid]

Antenna 0 extension RSSI: 55





D05-4\_Bad\_BAR.pcap - Wireshark

File Edit View Go Capture Analyze Statistics Help



Filter: Expression... Clear Apply

802.11 Channel: Channel Offset: FCS Filter: Decryption Mode: None Wireless Settings... Decryption Keys...

No.	Delta Time	TX Rate	RSSI	Source	Destination	Protocol	Info
583	0.000022	54.0 Mbps	-45	Buffalo_73:05:af	Cisco_a0:8d:c0 (RA)	IEEE 802.11	802.11 Block Ack, Flags=.....C
584	0.000260	300.0 Mbps	20	192.168.0.187	195.186.6.80	TCP	2823 > 80 [ACK] Seq=302 Ack=10881 win=65
585	0.000141	54.0 Mbps	-44	18:f0:9f:e5:18:f0	Cisco_a0:8d:c0 (RA)	IEEE 802.11	802.11 Block Ack Reg, Flags=.....C
586	0.000020	54.0 Mbps	-38	Cisco_a0:8d:c0 (T 18:f0:9f:e5:18:f0)	Cisco_a0:8d:c0 (RA)	IEEE 802.11	802.11 Block Ack, Flags=.....C
587	0.000174	54.0 Mbps	-44	18:f0:9f:e5:18:f0	Cisco_a0:8d:c0 (RA)	IEEE 802.11	802.11 Block Ack Reg, Flags=...R...C
588	0.000021	54.0 Mbps	-38	Cisco_a0:8d:c0 (T 18:f0:9f:e5:18:f0)	Cisco_a0:8d:c0 (RA)	IEEE 802.11	802.11 Block Ack, Flags=.....C
589	0.000126	243.0 Mbps	19	195.186.6.80	192.168.0.187	TCP	80 > 2824 [SYN, ACK] Seq=0 Ack=1 win=584
590	0.000256	6.0 Mbps	-43	18:f0:9f:e5:18:f0	Cisco_a0:8d:c0 (RA)	IEEE 802.11	802.11 Block Ack Reg, Flags=...R...C
591	0.000020	6.0 Mbps	-37	Cisco_a0:8d:c0 (T 18:f0:9f:e5:18:f0)	Cisco_a0:8d:c0 (RA)	IEEE 802.11	802.11 Block Ack, Flags=.....C
592	0.000021	54.0 Mbps	-39	Cisco_a0:8d:c0	18:f0:9f:e5:18:f0	IEEE 802.11	Deauthentication, SN=1287, FN=0, Flags=.
593	0.000257	54.0 Mbps	-39	Cisco_a0:8d:c0	18:f0:9f:e5:18:f0	IEEE 802.11	Deauthentication, SN=1287, FN=0, Flags=.
594	0.000196	54.0 Mbps	-38	Cisco_a0:8d:c0	18:f0:9f:e5:18:f0	IEEE 802.11	Deauthentication, SN=1287, FN=0, Flags=.
595	0.000268	243.0 Mbps	-71	195.186.6.80	192.168.0.187	TCP	80 > 2824 [SYN, ACK] Seq=0 Ack=1 win=584
596	0.000020	54.0 Mbps	-44	Buffalo_73:05:af	Cisco_a0:8d:c0 (RA)	IEEE 802.11	802.11 Block Ack, Flags=.....C
597	0.000218	6.0 Mbps	-43	18:f0:9f:e5:18:f0	Cisco_a0:8d:c0 (RA)	IEEE 802.11	802.11 Block Ack Reg, Flags=...R...C
598	0.000020	6.0 Mbps	-36	Cisco_a0:8d:c0 (T 18:f0:9f:e5:18:f0)	Cisco_a0:8d:c0 (RA)	IEEE 802.11	802.11 Block Ack, Flags=.....C
599	0.000212	6.0 Mbps	-43	18:f0:9f:e5:18:f0	Cisco_a0:8d:c0 (RA)	IEEE 802.11	802.11 Block Ack Reg, Flags=...R...C
600	0.000019	6.0 Mbps	-36	Cisco_a0:8d:c0 (T 18:f0:9f:e5:18:f0)	Cisco_a0:8d:c0 (RA)	IEEE 802.11	802.11 Block Ack, Flags=.....C
601	0.000523	6.0 Mbps	-43	18:f0:9f:e5:18:f0	Cisco_a0:8d:c0 (RA)	IEEE 802.11	802.11 Block Ack Reg, Flags=...R...C
602	0.000020	6.0 Mbps	-36	Cisco_a0:8d:c0 (T 18:f0:9f:e5:18:f0)	Cisco_a0:8d:c0 (RA)	IEEE 802.11	802.11 Block Ack, Flags=.....C
603	0.000307	6.0 Mbps	-42	18:f0:9f:e5:18:f0	Cisco_a0:8d:c0 (RA)	IEEE 802.11	802.11 Block Ack Reg, Flags=...R...C
604	0.000021	6.0 Mbps	-35	Cisco_a0:8d:c0 (T 18:f0:9f:e5:18:f0)	Cisco_a0:8d:c0 (RA)	IEEE 802.11	802.11 Block Ack, Flags=.....C
605	0.000707	6.0 Mbps	-41	18:f0:9f:e5:18:f0	Cisco_a0:8d:c0 (RA)	IEEE 802.11	802.11 Block Ack Reg, Flags=...R...C
606	0.000021	6.0 Mbps	-35	Cisco_a0:8d:c0 (T 18:f0:9f:e5:18:f0)	Cisco_a0:8d:c0 (RA)	IEEE 802.11	802.11 Block Ack, Flags=.....C
607	0.000166	6.0 Mbps	-41	18:f0:9f:e5:18:f0	Cisco_a0:8d:c0 (RA)	IEEE 802.11	802.11 Block Ack Reg, Flags=...R...C
608	0.000020	6.0 Mbps	-35	Cisco_a0:8d:c0 (T 18:f0:9f:e5:18:f0)	Cisco_a0:8d:c0 (RA)	IEEE 802.11	802.11 Block Ack, Flags=.....C
609	0.000224	6.0 Mbps	-41	18:f0:9f:e5:18:f0	Cisco_a0:8d:c0 (RA)	IEEE 802.11	802.11 Block Ack Reg, Flags=...R...C
610	0.000020	6.0 Mbps	-36	Cisco_a0:8d:c0 (T 18:f0:9f:e5:18:f0)	Cisco_a0:8d:c0 (RA)	IEEE 802.11	802.11 Block Ack, Flags=.....C
611	0.000119	6.0 Mbps	-42	18:f0:9f:e5:18:f0	Cisco_a0:8d:c0 (RA)	IEEE 802.11	802.11 Block Ack Reg, Flags=...R...C



**BUFFALO WLI-CB-AG300N Wireless LAN Adapter Prop...**

General | **Advanced** | Driver | Resources

The following properties are available for this network adapter. Click the property you want to change on the left, and then select its value on the right.

Property:	Value:
802.11n Network	AMPDU Enabled
802.11n Turbo Mode	AMPDU Enabled
Adhoc Creator Mode	AMPDU Enabled (4k)
<b>Aggregation</b>	AMPDU Enabled (8k)
Antenna	Disabled
Channel Width	
Extension Channel	
Fragmentation Threshold	
Guard Interval	
Number of TX Buffers	
Power Save Mode	
Preamble Select	
Radio Off if Disconnected	
Range maximization	

OK Cancel

D05-5\_DeadLock.pcap - Wireshark

File Edit View Go Capture Analyze Statistics Help

Filter:  Expression... Clear Apply

802.11 Channel:  Channel Offset:  FCS Filter:  Decryption Mode: None Wireless Settings... Decryption Keys...

No.	Delta Time	TX Rate	RSSI	Source	Destination	Protocol	Info
22105	0.000022	6.0 Mbps	-39	Buffalo_73:05:af (TA)	Cisco_a0:8d:c0 (RA)	IEEE 802.11	802.11 Block Ack, Flags=.....C
22106	0.001719	216.0 Mbps	78	195.186.8.35	192.168.0.187	TCP	1935 > 2604 [ACK] Seq=3788779 Ack=380
22107	0.000022	6.0 Mbps	-40	Buffalo_73:05:af (TA)	Cisco_a0:8d:c0 (RA)	IEEE 802.11	802.11 Block Ack, Flags=.....C
22108	0.000243	6.0 Mbps	-45	Buffalo_73:05:af (RA)	Buffalo_73:05:af (TA)	IEEE 802.11	Acknowledgement, Flags=.....C
22109	0.001525	216.0 Mbps	-97	195.186.8.35	192.168.0.187	TCP	1935 > 2604 [ACK] Seq=3789303 Ack=380
22110	0.000252	216.0 Mbps	-50	195.186.8.35	192.168.0.187	TCP	[TCP out-of-order] 1935 > 2604 [ACK]
22111	0.000020	6.0 Mbps	-40	Buffalo_73:05:af (TA)	Cisco_a0:8d:c0 (RA)	IEEE 802.11	802.11 Block Ack, Flags=.....C
22112	0.000276	216.0 Mbps	-44	195.186.8.35	192.168.0.187	RTMP	Audio Data[Malformed Packet]
22113	0.000021	6.0 Mbps	-40	Buffalo_73:05:af (TA)	Cisco_a0:8d:c0 (RA)	IEEE 802.11	802.11 Block Ack, Flags=.....C
22114	0.000122	300.0 Mbps	-39	192.168.0.187	195.186.8.35	TCP	2604 > 1935 [ACK] Seq=3803 Ack=378989
22115	0.000115	6.0 Mbps	-45	Buffalo_73:05:af (RA)	Buffalo_73:05:af (TA)	IEEE 802.11	Acknowledgement, Flags=.....C
22116	0.001367	216.0 Mbps	-96	195.186.8.35	192.168.0.187	RTMP	Audio Data[Malformed Packet]
22117	0.000942	216.0 Mbps	107	195.186.8.35	192.168.0.187	RTMP	[TCP out-of-order] Audio Data[Malform
22118	0.000213	216.0 Mbps	-35	195.186.8.35	192.168.0.187	RTMP	[TCP out-of-order] Audio Data[Malform
22119	0.000223	216.0 Mbps	-60	195.186.8.35	192.168.0.187	RTMP	[TCP out-of-order] Audio Data[Malform
22120	0.000346	162.0 Mbps	-60	195.186.8.35	192.168.0.187	RTMP	[TCP out-of-order] Audio Data[Malform
22121	0.000223	162.0 Mbps	-96	195.186.8.35	192.168.0.187	RTMP	[TCP out-of-order] Audio Data[Malform
22122	0.000307	108.0 Mbps	-96	195.186.8.35	192.168.0.187	RTMP	[TCP out-of-order] Audio Data[Malform
22123	0.000233	108.0 Mbps	-125	195.186.8.35	192.168.0.187	RTMP	[TCP out-of-order] Audio Data[Malform
22124	0.000363	54.0 Mbps	-125	195.186.8.35	192.168.0.187	RTMP	[TCP out-of-order] Audio Data[Malform

SHARK

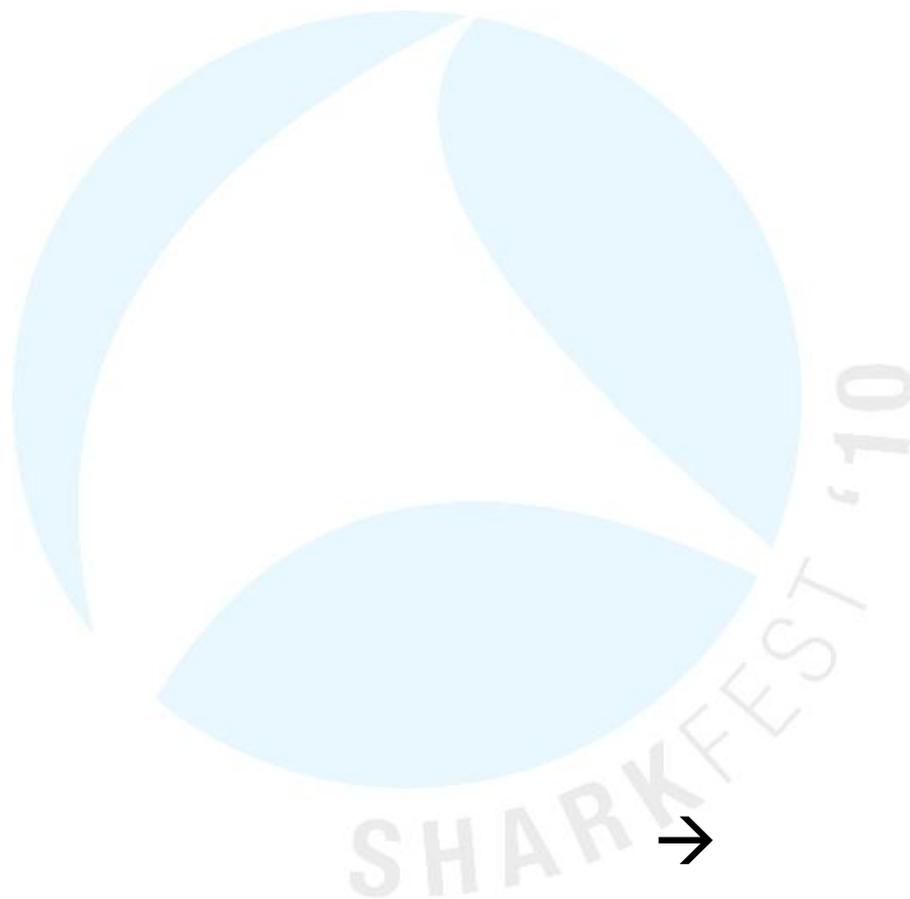
D05\_5\_DeadLock.pcap - Wireshark

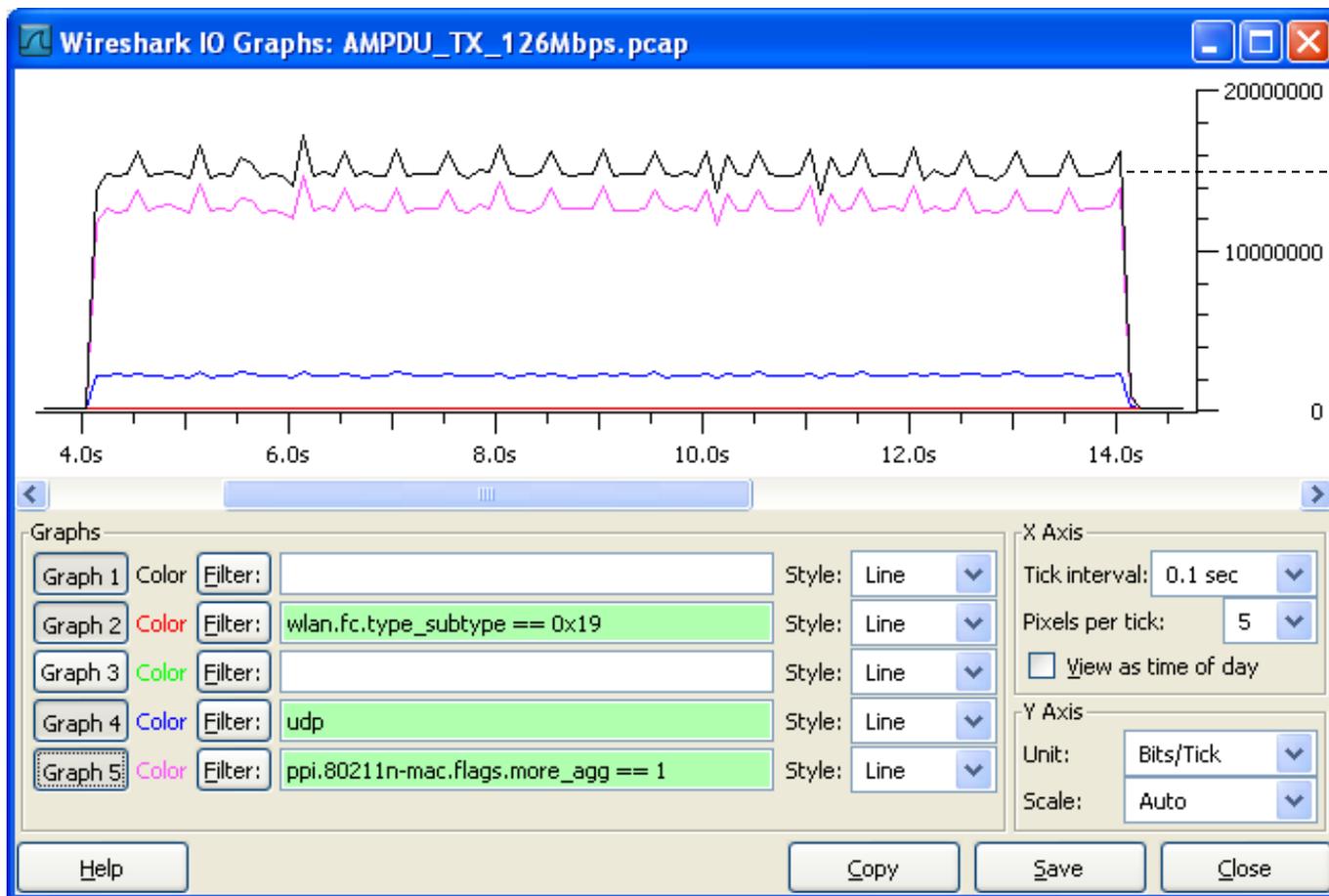
File Edit View Go Capture Analyze Statistics Help

Filter: Expression... Clear Apply

802.11 Channel: Channel Offset: FCS Filter: Decryption Mode: None Wireless Settings... Decryption Keys...

No.	Delta Time	TX Rate	RSSI	Source	Destination	Protocol	Info
22227	0.001221	6.5 Mbps	-125	195.186.8.35	192.168.0.187	RTMP	[TCP Retransmission] Audio Data [Malformed Packe
22228	0.001110	6.5 Mbps	-125	195.186.8.35	192.168.0.187	RTMP	[TCP Retransmission] Audio Data [Malformed Packe
22229	0.001212	6.5 Mbps	-125	195.186.8.35	192.168.0.187	RTMP	[TCP Retransmission] Audio Data [Malformed Packe
22230	0.001186	6.5 Mbps	-125	195.186.8.35	192.168.0.187	RTMP	[TCP Retransmission] Audio Data [Malformed Packe
22231	0.001169	6.5 Mbps	-125	195.186.8.35	192.168.0.187	RTMP	[TCP Retransmission] Audio Data [Malformed Packe
22232	0.001131	6.5 Mbps	-125	195.186.8.35	192.168.0.187	RTMP	[TCP Retransmission] Audio Data [Malformed Packe
22233	0.001169	6.5 Mbps	-125	195.186.8.35	192.168.0.187	RTMP	[TCP Retransmission] Audio Data [Malformed Packe
22234	0.001111	6.5 Mbps	-125	195.186.8.35	192.168.0.187	RTMP	[TCP Retransmission] Audio Data [Malformed Packe
22235	0.001168	6.5 Mbps	-125	195.186.8.35	192.168.0.187	RTMP	[TCP Retransmission] Audio Data [Malformed Packe
22236	0.001111	6.5 Mbps	-125	195.186.8.35	192.168.0.187	RTMP	[TCP Retransmission] Audio Data [Malformed Packe
22237	0.001194	6.5 Mbps	-125	195.186.8.35	192.168.0.187	RTMP	[TCP Retransmission] Audio Data [Malformed Packe
22238	0.001250	6.5 Mbps	-125	195.186.8.35	192.168.0.187	RTMP	[TCP Retransmission] Audio Data [Malformed Packe
22239	0.001219	6.5 Mbps	-125	195.186.8.35	192.168.0.187	RTMP	[TCP Retransmission] Audio Data [Malformed Packe
22240	0.001111	6.5 Mbps	-125	195.186.8.35	192.168.0.187	RTMP	[TCP Retransmission] Audio Data [Malformed Packe
22241	0.001169	6.5 Mbps	-125	195.186.8.35	192.168.0.187	RTMP	[TCP Retransmission] Audio Data [Malformed Packe
22242	0.001265	6.5 Mbps	-125	195.186.8.35	192.168.0.187	RTMP	[TCP Retransmission] Audio Data [Malformed Packe
22243	0.001241	6.5 Mbps	-125	195.186.8.35	192.168.0.187	RTMP	[TCP Retransmission] Audio Data [Malformed Packe
22244	0.001108	6.5 Mbps	-125	195.186.8.35	192.168.0.187	RTMP	[TCP Retransmission] Audio Data [Malformed Packe
22245	0.001170	6.5 Mbps	-125	195.186.8.35	192.168.0.187	RTMP	[TCP Retransmission] Audio Data [Malformed Packe
22246	0.001158	6.5 Mbps	-125	195.186.8.35	192.168.0.187	RTMP	[TCP Retransmission] Audio Data [Malformed Packe
22247	0.000970	6.0 Mbps	-41	Cisco_a0:8d:c0	Buffalo_73:05:af	IEEE 802.11	Deauthentication, SN=1530, FN=0, Flags=.....
22248	0.000225	6.0 Mbps	-41	Cisco_a0:8d:c0	Buffalo_73:05:af	IEEE 802.11	Deauthentication, SN=1530, FN=0, Flags=...R...
22249	0.000235	6.0 Mbps	-41	Cisco_a0:8d:c0	Buffalo_73:05:af	IEEE 802.11	Deauthentication, SN=1530, FN=0, Flags=...R...
22250	0.000232	6.0 Mbps	-41	Cisco_a0:8d:c0	Buffalo_73:05:af	IEEE 802.11	Deauthentication, SN=1530, FN=0, Flags=...R...
22251	0.009058	6.0 Mbps	-41	Cisco_a0:8d:c0	Broadcast	IEEE 802.11	Beacon frame, SN=1531, FN=0, Flags=.....C, E
22252	0.104451	6.0 Mbps	-42	Cisco_a0:8d:c0	Broadcast	IEEE 802.11	Beacon frame, SN=1532, FN=0, Flags=.....C, E
22253	0.104450	6.0 Mbps	-39	Cisco_a0:8d:c0	Broadcast	IEEE 802.11	Beacon frame, SN=1533, FN=0, Flags=.....C, E
22254	0.104446	6.0 Mbps	-42	Cisco_a0:8d:c0	Broadcast	IEEE 802.11	Beacon frame, SN=1534, FN=0, Flags=.....C, E



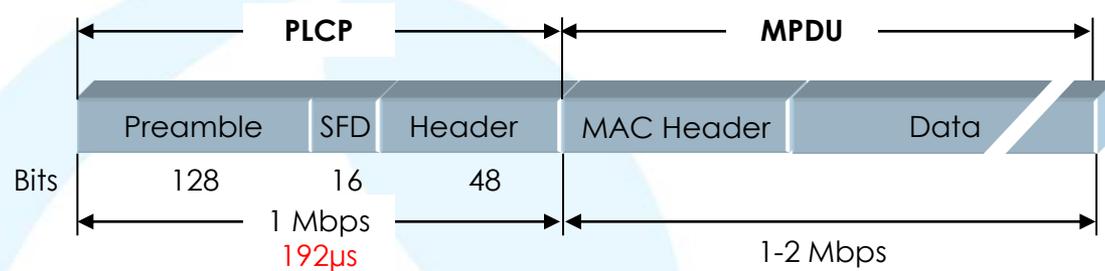




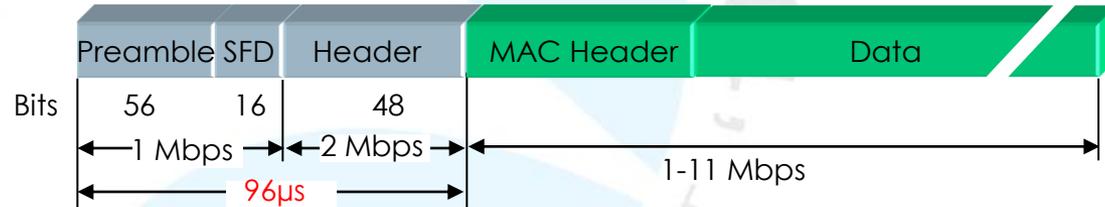
1	Barker Code	<b>802.11</b> <b>DSSS (Clause 15)</b> with ,Long Preamble'		
2	Barker Code			
5.5	CCK	<b>802.11b</b> <b>HR/DSSS (Clause 18)</b> with ,Short Preamble'		
11	CCK			
6	OFDM	<b>802.11g</b> <b>Extended Rate PHY (ERP)</b> new Frame Format		
9	OFDM			
12	OFDM			
18	OFDM			
24	OFDM			
36	OFDM			
48	OFDM			
54	OFDM			
				<b>802.11a</b>



**802.11 DSSS** with  
,Long Preamble'  
**Barker Code**



**802.11b HR/DSSS** with  
,Short Preamble'  
**Barker / CCK**



**802.11g (ERP)**  
**Extended Rate PHY**  
new Frame Format  
**OFDM**

