

## Powersave Test Cases

Goal: Test and verify powersave mode on a station using various methods.

### DTIM multicast testing:

- Set up mcast traffic between upstream port sending to station with parameters of 9kbps *Min Speed*, 128 Kbps *Max Speed* and Default *Pkt Size* using the following cookbook link:  
<http://www.candelatech.com/cookbook.php?vol=wifire&book=WiFi+Station+Multicast>.
- Double-click on the created station in the *Port Mgr* tab. Enable *Powersave* on LANforge station (in the *Misc Configuration* tab)

**sta01500 (ct521b-0bba) Configure Settings**

Port Status Information  
Current: DOWN LINK-DOWN NONE  
Driver Info: Port Type: WIFI-STA Parent: wiphy0 wiphy0...

Port Configurables

Advanced Configuration **Misc Configuration** Corruptions Custom WiFi

Standard Configuration Extended Config

**More WiFi Settings**

☐ Enable TXO ☐ SGI

TX-power: Default (255) Tries: Single Tx (1)

Preamble: OFDM (a/g) (0) MCS: 0 (0)

NSS: NSS 1 (0) Bandwidth: 20 Mhz (0)

OCSP: Disabled (0)

Freq-2.4: 0xffffffff Freq-5: 0xffffffff

AMPDU-Factor: OS Default AMPDU-Density: OS Default

Max-AMSDU: OS Default Bridge-IP: 0.0.0.0

X-Coordinate: 0 Y-Coordinate: 0

Z-Coordinate: 0 Venue-ID: 0

Post IF-UP Script:

☐ Custom WPA Cfg WPA Cfg:

☒ Managed STA ☐ IBSS Mode ☐ MESH Mode ☐ WDS Mode

☐ Scan Hidden ☐ Passive Scan ☐ Allow Migration ☐ Disable Fast Reauth ☒ Powersave

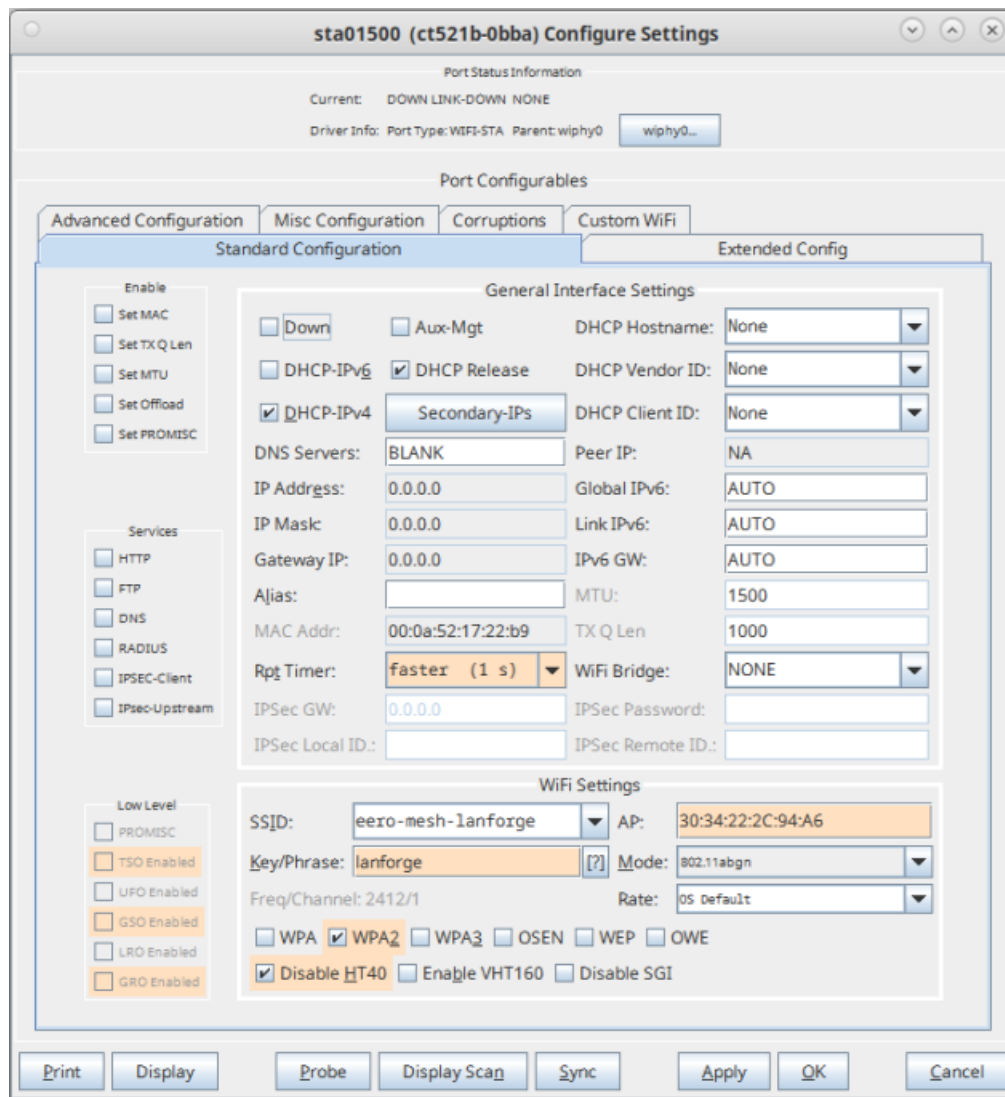
☒ Restart DHCP on Connect ☐ Skip Portal on Roam ☐ No Auto ESS Roaming ☐ No Apply DHCP

☐ Disable Oper Class IE ☐ BSS Transition ☐ Disable TWT ☐ Disable OFDMA ☐ Disable OBSS Scan

☐ Roam FT-DS ☐ Reject Beacon Req

Print Display Probe Display Scan Sync Apply OK Cancel

- Configure station for something easy to sniff (20Mhz a/b/g/n) by clicking the *Disable HT40* button in the *Standard Configuration* tab. Then click *Apply* and *OK* to close the *Configure Settings* window for the station.



- Start sniffer with optional filter to see all frames from AP BSSID or STA BSSID.
- Investigate packet capture:
  - The beacon right before the mcast frame should have the TIM Multicast flag set.
  - Beacon without mcast frame soon after should NOT have the Multicast flag set.
  - DTIM count counts down to zero, only at zero can mcast frames be transmitted.
  - DTIM count should count down, with maximum value being DTIM Period - 1.
  - If AP can change DTIM period, test with multiple DTIM periods.

This pcap file from a station on a mtk7921k radio shows proper unicast behavior. This is using the packet filter: wlan.addr == a8:93:4a:9d:47:a3 || wlan.addr == 04:f0:21:9a:64:65

This pcap file shows bad broadcast Powersave behavior. Frame 157 TIM field should indicate Multicast and the broadcast frame 158 should be immediately after frame 157 instead of being 65ms later.

## TIM unicast testing (with APs set up for multicast → unicast behaviour):

- Set up download unicast TCP traffic between upstream port and station. Set the *Min Speed* as 9 Kbps, *Max Speed* 128 Kbps, and 1400 as the *Pkt Size*.
- Double-click on the created station in the *Port Mgr* tab. Enable *Powersave* on LANforge station (in the *Misc Configuration* tab)

**sta01500 (ct521b-0bba) Configure Settings**

Port Status Information  
 Current: DOWN LINK-DOWN NONE  
 Driver Info: Port Type: WIFI-STA Parent: wiphy0 [wiphy0...](#)

Port Configurables

Advanced Configuration Misc Configuration Corruptions Custom WiFi

Standard Configuration Extended Config

More WiFi Settings

☐ Enable TXO ☐ SGI

TX-power: Default (255) Tries: Single Tx (1)

Preamble: OFDM (a/g) (0) MCS: 0 (0)

NSS: NSS 1 (0) Bandwidth: 20 Mhz (0)

OCSP: Disabled (0)

Freq-2.4: 0xffffffff Freq-5: 0xffffffff

AMPDU-Factor: OS Default AMPDU-Density: OS Default

Max-AMSDU: OS Default Bridge-IP: 0.0.0.0

X-Coordinate: 0 Y-Coordinate: 0

Z-Coordinate: 0 Venue-ID: 0

Post IF-UP Script:

☐ Custom WPA Cfg WPA Cfg:

☒ Managed STA ☐ IBSS Mode ☐ MESH Mode ☐ WDS Mode

☐ Scan Hidden ☐ Passive Scan ☐ Allow Migration ☐ Disable Fast Reauth ☒ Powersave

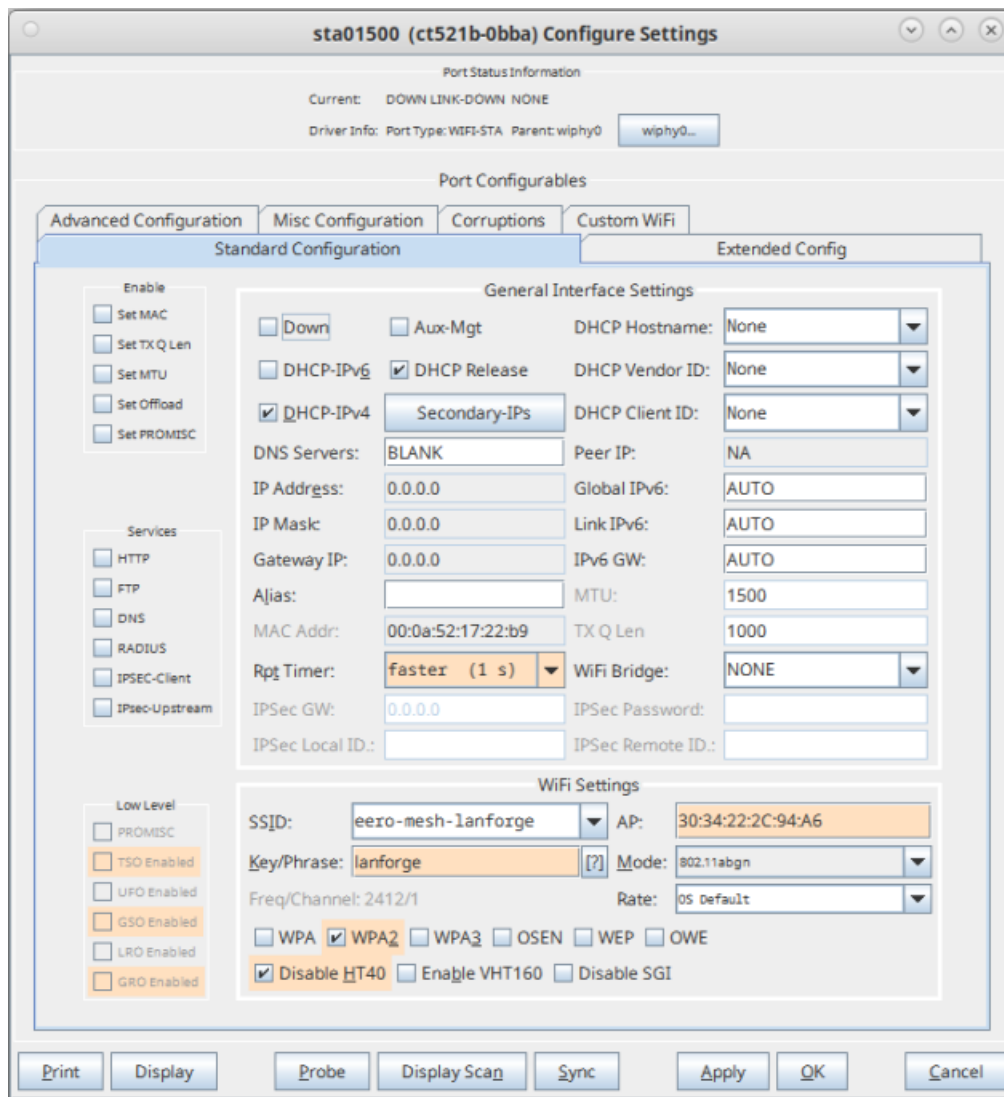
☒ Restart DHCP on Connect ☐ Skip Portal on Roam ☐ No Auto ESS Roaming ☐ No Apply DHCP

☐ Disable Oper Class IE ☐ BSS Transition ☐ Disable TWT ☐ Disable OFDMA ☐ Disable OBSS Scan

☐ Roam FT-DS ☐ Reject Beacon Req

Print Display Probe Display Scan Sync Apply OK Cancel

- Configure station for something easy to sniff (20Mhz a/b/g/n) by clicking the *Disable HT40* button in the *Standard Configuration* tab. Then click *Apply* and *OK* to close the *Configure Settings* window for the station.



- Start sniffer, with optional filter to see all frames from AP BSSID or STA BSSID.
- Investigate packet capture:
  - The beacon should indicate that AID has traffic waiting (and Multicast flag would not be set).
  - STA should send wake-up null-func frame very soon after the beacon is seen (regardless of DTIM count/period, which is not pertinent for unicast frames).
  - AP acks that and proceeds to send queued traffic to STA.
  - STA goes back to sleep after a short period (around 100ms)
  - Average latency for the TCP download frames is around 100ms since frames are held on the AP until the next beacon so that STA can know to wake.

power-save-ax200-asus.pc...

power-save-ax200-sta-998...

power-save-mtk7921k-sta-...

For the ASUS capture above, use this filter for **ax200**: **wlan.addr == 50:e0:85:8a:0a:f2 || wlan.addr == F0:2F:74:7C:A3:80**, for ax200 to LANforge VAP use: **wlan.addr == 50:e0:85:8a:0a:f2 || wlan.addr == wlan.addr == 04:f0:21:9a:64:65** and for the mtk to LANforge VAP, use: **wlan.addr == a8:93:4a:9d:47:a3 || wlan.addr == 04:f0:21:9a:64:65**

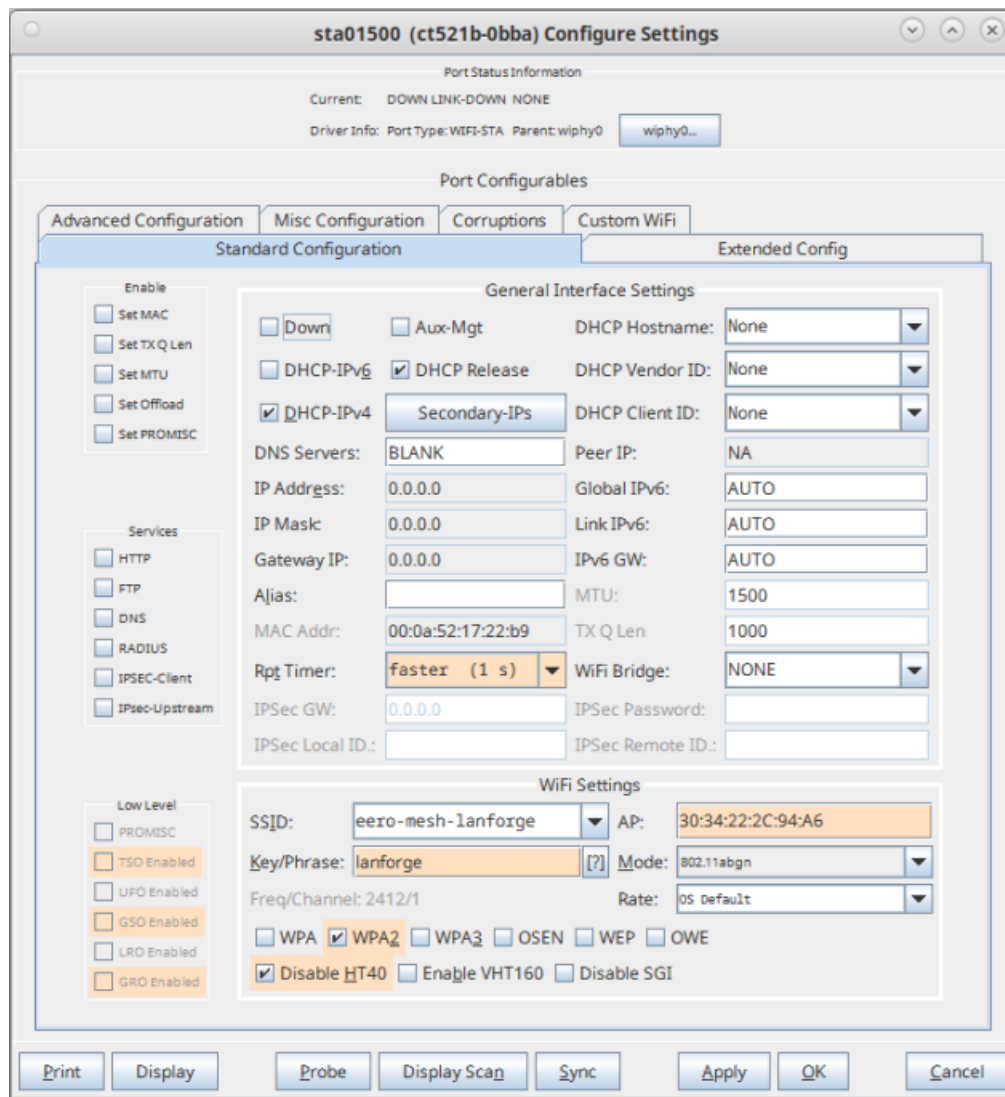
The ax200 capture shows buggy behaviour on the ASUS: ASUS does not ack frames well so ax200 sends lots of retries. The ASUS is doing multicast to unicast behaviour, so the 'multicast' frames are sent as directed unicast frames directly to the station.

## Wake/Sleep testing in upload direction

- Set bursty traffic, min of zero, max of 128kbps, in upload direction.
- Double-click on the created station in the *Port Mgr* tab. Enable *Powersave* on LANforge station (in the *Misc Configuration* tab)

The screenshot shows the 'sta01500 (ct521b-0bba) Configure Settings' window. At the top, it displays 'Port Status Information' with 'Current: DOWN LINK-DOWN NONE' and 'Driver Info: Port Type: WIFI-STA Parent: wiphy0'. Below this is the 'Port Configurables' section, which includes tabs for 'Advanced Configuration', 'Misc Configuration' (selected), 'Corruptions', and 'Custom WiFi'. The 'Misc Configuration' tab is further divided into 'Standard Configuration' and 'Extended Config'. The 'Standard Configuration' section contains 'More WiFi Settings' with various fields: 'Enable TXO' (unchecked), 'SGI' (unchecked), 'TX-power: Default (255)', 'Preamble: OFDM (a/g) (0)', 'NSS: NSS 1 (0)', 'OCSP: Disabled (0)', 'Freq-2.4: 0xffffffff', 'AMPDU-Factor: OS Default', 'Max-AMSDU: OS Default', 'X-Coordinate: 0', 'Z-Coordinate: 0', 'Tries: Single Tx (1)', 'MCS: 0 (0)', 'Bandwidth: 20 Mhz (0)', 'Freq-5: 0xffffffff', 'AMPDU-Density: OS Default', 'Bridge-IP: 0.0.0.0', 'Y-Coordinate: 0', and 'Venue-ID: 0'. There is also a 'Post IF-UP Script' text area. The 'Extended Config' section includes 'Custom WPA Cfg' (unchecked), 'WPA Cfg' (empty), and several checkboxes: 'Managed STA' (checked), 'IBSS Mode' (unchecked), 'MESH Mode' (unchecked), 'WDS Mode' (unchecked), 'Scan Hidden' (unchecked), 'Passive Scan' (unchecked), 'Allow Migration' (unchecked), 'Disable Fast Reauth' (unchecked), 'Powersave' (checked), 'Restart DHCP on Connect' (checked), 'Skip Portal on Roam' (unchecked), 'No Auto ESS Roaming' (unchecked), 'No Apply DHCP' (unchecked), 'Disable Oper Class IE' (unchecked), 'BSS Transition' (unchecked), 'Disable TWT' (unchecked), 'Disable OFDMA' (unchecked), 'Disable OBSS Scan' (unchecked), 'Roam FT-DS' (unchecked), and 'Reject Beacon Req' (unchecked). At the bottom of the window are buttons for 'Print', 'Display', 'Probe', 'Display Scan', 'Sync', 'Apply', 'OK', and 'Cancel'.

- Configure station for something easy to sniff (20Mhz a/b/g/n) by clicking the *Disable HT40* button in the *Standard Configuration* tab. Then click *Apply* and *OK* to close the *Configure Settings* window for the station.



- Start sniffer, with optional filter to see all frames from AP BSSID or STA BSSID.
- Watch for packets from STA indicating it is going awake or asleep (Frame Control Field → Flags → PWR MGT)
- STA should :
  - indicate it is awake before transmitting frames.
  - go to sleep after a period of idle time (about 100ms, I think, but it may depend on the station).
  - not transmit while asleep
- STA may receive multicast packets while 'asleep' using the DTIM logic described above.
- AP should not transmit unicast frames to STA while STA is asleep.

The following capture: shows power-save-mtk7921k-sta-mtk7915-lanforge-vap-unicast-upload.pcapng capture shows mtk7921k station talking to a LANforge mtk7915 VAP. The capture filter is: **wlan.addr == a8:93:4a:9d:47:a3 | | wlan.sa == 00:0A:52:46:8D:4**. The capture starts with the TCP traffic idle and the station in sleep mode. The STA then wakes up in frame 884 and it starts sending TCP traffic in frame 888. The TCP traffic has then quiesced for a bit in frame 996 and STA goes back to sleep.

## Wake/Sleep testing in download direction

- Configure AP for bridge mode so that NAT is not an issue. Follow the following cookbook link to configure the AP in bridge mode: <http://www.candelatech.com/cookbook.php?vol=wifire&book=wifi+VAP+bridge>
- Double-click on the created station in the *Port Mgr* tab. Enable *Powersave* on LANforge station (in the

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More WiFi Settings

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NSS: NSS 1 (0) Bandwidth: 20 Mhz (0)

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Freq-2.4: 0xffffffff Freq-5: 0xffffffff

AMPDU-Factor: OS Default AMPDU-Density: OS Default

Max-AMSDU: OS Default Bridge-IP: 0.0.0.0

X-Coordinate: 0 Y-Coordinate: 0

Z-Coordinate: 0 Venue-ID: 0

Post IF-UP Script:

☐ Custom WPA Cfg WPA Cfg:

☒ Managed STA ☐ IBSS Mode ☐ MESH Mode ☐ WDS Mode

☐ Scan Hidden ☐ Passive Scan ☐ Allow Migration ☐ Disable Fast Reauth ☒ Powersave

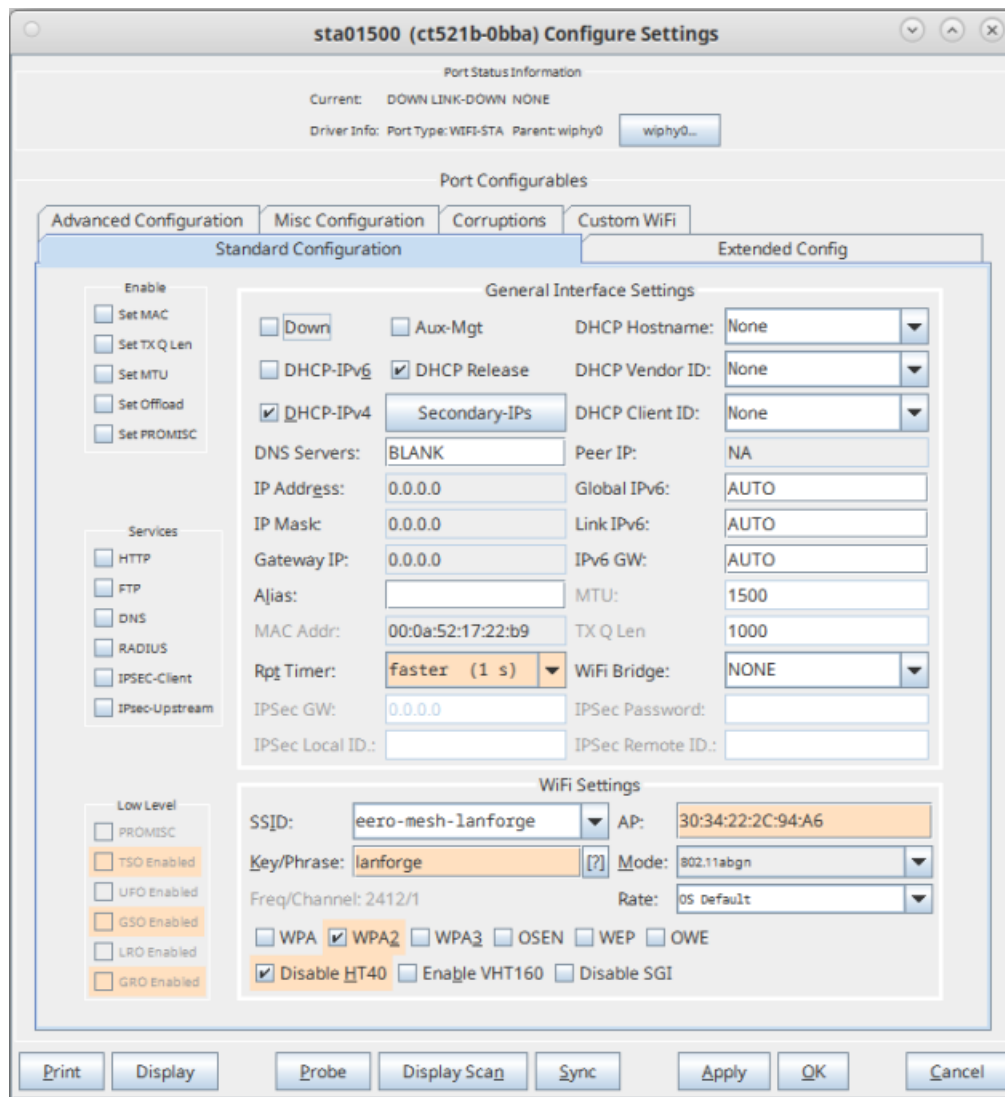
☒ Restart DHCP on Connect ☐ Skip Portal on Roam ☐ No Auto ESS Roaming ☐ No Apply DHCP

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Print Display Probe Display Scan Sync Apply OK Cancel

- Configure station for something easy to sniff (20Mhz a/b/g/n) by clicking the *Disable HT40* button in the *Standard Configuration* tab. Then click *Apply* and *OK* to close the *Configure Settings* window for the station.



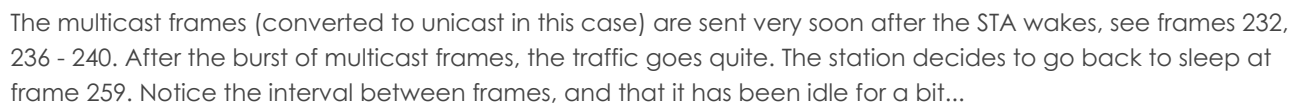
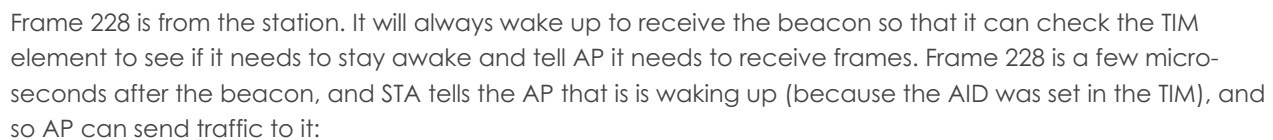
- Start sniffer, with optional filter to see all frames from AP BSSID or STA BSSID.
- Ping from upstream to STA, one packet per second.
- Ping latency should vary from near zero to the beacon interval since AP will store packets between when STA sleeps and wakes again. STA will wake after seeing indication in DTIM that it needs to receive (non multicast) frames.
- Packet loss should not be very high, this indicates AP is storing frames properly and that STA is waking properly.
- Ping from STA to upstream should not have much latency, because STA should wake each time it wants to send ICMP request, and stay awake long enough to receive the response before going back to sleep.

## Packet Capture Analysis of Ucast to Mcast Capture with Buggy AP with Bad Ack on Frames

See 'power-save-ax200-asus.pcapng' file linked above. The captures 'power-save-ax200-sta-9984-lanforge-vap-unicast.pcapng' and 'power-save-mtk7921k-sta-9984-lanforge-vap-unicast.pcapng' show similar behaviour, but without the buggy lack of ACKs from the AP since a different AP (LANforge on QCA 9984 chipset) was used.

Starting with frame 227, a beacon frame, the AP indicates in the TIM IE that (unicast) data is waiting for the station with Association ID (AID) 0x8. This is the LANforge station in question, where it's AID is seen in the 'Probe' text dump in LANforge. This can also be seen by looking at the association frames, though this is not part of the capture. The TIM does not set the Multicast bit since this AP is converting multicast to unicast.





power-save-ax200-asus.pcapng

File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help

Filter: wlan.addr == 50:e0:85:8a:0a:f2 || wlan.addr == f0:2f:74:7c:a3:b0

Expression: + mt-both | a2e | sierra-mac-both | mitltope | mitltope

No.	Time	New Column	Source	Destination	Protocol	Sequence	Receiver address	Transmitter address	Data rate (info)
240	2022-02-11 14:28:03.26654657	0.000001151	192.168.50.239	224.5.6.7	LANforge	230	50:e0:85:8a:0a:f2	f0:2f:74:7c:a3:b0	Seq: 299
241	2022-02-11 14:28:03.26652609	0.000000952	IntelCor_8a:0a:f2 (50:e0:85:8a:0a:f2)	f0:2f:74:7c:a3:b0 (f0:2f:74:7c:a3:b0)	(RA)	802.11	f0:2f:74:7c:a3:b0	50:e0:85:8a:0a:f2	802.11 B
242	2022-02-11 14:28:03.270528937	0.004003328	f0:2f:74:7c:a3:b0 (f0:2f:74:7c:a3:b0)	IntelCor_8a:0a:f2 (50:e0:85:8a:0a:f2)	(RA)	802.11	50:e0:85:8a:0a:f2	f0:2f:74:7c:a3:b0	Request-
243	2022-02-11 14:28:03.270530442	0.000001205	0.000000000	f0:2f:74:7c:a3:b0 (f0:2f:74:7c:a3:b0)	(RA)	802.11	f0:2f:74:7c:a3:b0	50:e0:85:8a:0a:f2	Clear-to
244	2022-02-11 14:28:03.271242298	0.000712156	192.168.50.239	224.5.6.7	LANforge	226	50:e0:85:8a:0a:f2	f0:2f:74:7c:a3:b0	Seq: 299
245	2022-02-11 14:28:03.271243991	0.000001693	192.168.50.239	224.5.6.7	LANforge	227	50:e0:85:8a:0a:f2	f0:2f:74:7c:a3:b0	Seq: 299
246	2022-02-11 14:28:03.271244949	0.000000950	192.168.50.239	224.5.6.7	LANforge	228	50:e0:85:8a:0a:f2	f0:2f:74:7c:a3:b0	Seq: 299
247	2022-02-11 14:28:03.271245681	0.000000732	192.168.50.239	224.5.6.7	LANforge	229	50:e0:85:8a:0a:f2	f0:2f:74:7c:a3:b0	Seq: 299
248	2022-02-11 14:28:03.271246343	0.000000662	192.168.50.239	224.5.6.7	LANforge	230	50:e0:85:8a:0a:f2	f0:2f:74:7c:a3:b0	Seq: 299
249	2022-02-11 14:28:03.271246925	0.000000582	192.168.50.239	224.5.6.7	LANforge	231	50:e0:85:8a:0a:f2	f0:2f:74:7c:a3:b0	Seq: 299
250	2022-02-11 14:28:03.271248166	0.000001241	192.168.50.239	224.5.6.7	LANforge	232	50:e0:85:8a:0a:f2	f0:2f:74:7c:a3:b0	Seq: 299
251	2022-02-11 14:28:03.271302875	0.000054709	IntelCor_8a:0a:f2 (50:e0:85:8a:0a:f2)	f0:2f:74:7c:a3:b0 (f0:2f:74:7c:a3:b0)	(RA)	802.11	f0:2f:74:7c:a3:b0	50:e0:85:8a:0a:f2	802.11 B
252	2022-02-11 14:28:03.312333410	0.041030535	f0:2f:74:7c:a3:b0 (f0:2f:74:7c:a3:b0)	IntelCor_8a:0a:f2 (50:e0:85:8a:0a:f2)	(RA)	802.11	50:e0:85:8a:0a:f2	f0:2f:74:7c:a3:b0	Request-
253	2022-02-11 14:28:03.312334785	0.000001375	0.000000000	f0:2f:74:7c:a3:b0 (f0:2f:74:7c:a3:b0)	(RA)	802.11	f0:2f:74:7c:a3:b0	50:e0:85:8a:0a:f2	Clear-to
254	2022-02-11 14:28:03.312538861	0.000204076	192.168.50.239	224.5.6.7	LANforge	233	50:e0:85:8a:0a:f2	f0:2f:74:7c:a3:b0	Seq: 299
255	2022-02-11 14:28:03.312540931	0.000002070	IntelCor_8a:0a:f2 (50:e0:85:8a:0a:f2)	f0:2f:74:7c:a3:b0 (f0:2f:74:7c:a3:b0)	(RA)	802.11	f0:2f:74:7c:a3:b0	50:e0:85:8a:0a:f2	802.11 B
256	2022-02-11 14:28:03.412707351	0.000001457	IntelCor_8a:0a:f2 (50:e0:85:8a:0a:f2)	f0:2f:74:7c:a3:b0 (f0:2f:74:7c:a3:b0)	(RA)	802.11	50:e0:85:8a:0a:f2	f0:2f:74:7c:a3:b0	Acknowle
264	2022-02-11 14:28:03.469054824	0.057247473	f0:2f:74:7c:a3:b0	Broadcast	802.11	3329	ff:ff:ff:ff:ff:ff	f0:2f:74:7c:a3:b0	Beacon f
265	2022-02-11 14:28:03.470145920	0.000190990	IntelCor_8a:0a:f2	f0:2f:74:7c:a3:b0	802.11	0	f0:2f:74:7c:a3:b0	50:e0:85:8a:0a:f2	QoS Null
266	2022-02-11 14:28:03.470378367	0.000232547	IntelCor_8a:0a:f2	f0:2f:74:7c:a3:b0	802.11	0	f0:2f:74:7c:a3:b0	50:e0:85:8a:0a:f2	QoS Null
267	2022-02-11 14:28:03.470626695	0.000248328	IntelCor_8a:0a:f2	f0:2f:74:7c:a3:b0	802.11	0	f0:2f:74:7c:a3:b0	50:e0:85:8a:0a:f2	QoS Null

Power management status (wlan.fc.pwrmtgt). 1 byte

Packets: 2036 - Displayed: 1347 (66.2%)

Profile: Default

## Packet Capture Analysis of Multicast Capture with Powersave

See file 'power-save-mtk7921k-sta-9984-lanforge-vap.pcapng', using filter: wlan.addr == a8:93:4a:9d:47:a3 | | wlan.addr == 04:f0:21:9a:64:65

The AP in this setup is LANforge using QCA 9984 chipset radio. The AP is not set to convert multicast to unicast, so we get to inspect how multicast traffic is queued and sent to sleeping stations.

In frame 269, the station goes to sleep. It does not wake up again, at least not often, but it does wake up to hear beacons and pay attention to the DTIM so it can stay awake to receive multicast frames when needed. This was verified by ensuring that the multicast receiver endpoint on the station shows proper amount of received traffic.



\*moni3a (on ct523c-0b29)

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wlan.addr == a8:93:4a:9d:47:a3 || wlan.addr == 04:f0:21:9a:64:65

No.	Time	Source	Destination	Protocol	Length	PPDU Format	Type/Subtype	AID12
285	2.765508437	172.16.223.153	224.6.6.6	LANFor...	1592		Data	
310	2.949171336	CompeXPt_9a:64:65	Broadcast	802.11	248		Beacon frame	
318	3.031863685	CompeXPt_9a:64:65	SparkLAN_4e:58:c1	802.11	242		Probe Response	
319	3.032252020	CompeXPt_9a:64:65	SparkLAN_4e:58:c1	802.11	242		Probe Response	
320	3.032639366	CompeXPt_9a:64:65	SparkLAN_4e:58:c1	802.11	242		Probe Response	
321	3.033029663	CompeXPt_9a:64:65	SparkLAN_4e:58:c1	802.11	242		Probe Response	
338	3.194861874	CompeXPt_9a:64:65	Broadcast	802.11	248		Beacon frame	
339	3.197038423	172.16.223.153	224.6.6.6	LANFor...	1592		Data	
340	3.199194556	172.16.223.153	224.6.6.6	LANFor...	1592		Data	
364	3.480816640	CompeXPt_9a:64:65	Broadcast	802.11	248		Beacon frame	
367	3.686459396	CompeXPt_9a:64:65	Broadcast	802.11	248		Beacon frame	
368	3.688557092	172.16.223.153	224.6.6.6	LANFor...	1592		Data	
410	3.932218491	CompeXPt_9a:64:65	Broadcast	802.11	248		Beacon frame	
436	4.177084526	CompeXPt_9a:64:65	Broadcast	802.11	248		Beacon frame	
437	4.180085762	172.16.223.153	224.6.6.6	LANFor...	1592		Data	
459	4.473743678	CompeXPt_9a:64:65	Broadcast	802.11	248		Beacon frame	

Supported Rates: 12(B) (0x08)  
Supported Rates: 18 (0x24)  
Supported Rates: 24(B) (0xb0)  
Supported Rates: 36 (0x48)  
Supported Rates: 48 (0x60)  
Supported Rates: 54 (0x6c)  
Tag: DS Parameter set: Current Channel: 36  
Tag Number: DS Parameter set (3)  
Tag length: 1  
Current Channel: 36  
Tag: Traffic Indication Map (TIM): DTIM 1 of 0 bitmap  
Tag Number: Traffic Indication Map (TIM) (5)  
Tag length: 4  
DTIM count: 1  
DTIM period: 2  
Bitmap control: 0x00  
....0 = Multicast: False  
0000 000. = Bitmap Offset: 0x00  
Partial Virtual Bitmap: 00  
Tag: Supported Operating Classes  
Tag Number: Supported Operating Classes (59)  
0000 00 00 3c 00 2f 40 10 a0 20 08 00 a0 20 08 00 a0 ...</0... ..  
0010 20 08 00 a0 20 08 00 00 1b b1 5a 30 00 00 00 00 ...Z0... ..  
0020 00 0c 3c 14 40 01 d5 00 00 00 00 00 3b ec 19 00 ...<0... ..  
0030 0c 00 00 00 cf 00 cc 01 d5 02 cc 03 80 00 00 00 ... ..  
0040 ff ff ff ff ff ff ff 04 f0 21 9a 64 65 04 f0 21 9a ...!de... ..  
0050 64 65 70 1a 7c c0 9d 1a 00 00 00 00 f0 00 01 00 dep... ..  
0060 00 0c 62 65 6e 2d 35 32 33 2d 39 39 38 34 01 08 ..ben-52 3-9984... ..  
0070 8c 12 98 24 b0 48 60 6c 03 01 24 05 04 01 02 00 ...\$-H'l ..\$... ..  
0080 00 3b 02 00 00 2d 1a 6e 00 1b ff ff ff ff 00 00 ...;...n... ..  
0090 00 00 00 00 00 00 01 00 00 00 00 00 00 00 00 ... ..  
00a0 00 3d 16 24 05 02 00 00 00 00 00 00 00 00 00 ...=\$... ..  
00b0 00 00 00 00 00 00 00 00 7f 08 04 00 00 02 00 ... ..  
00c0 00 00 40 bf 0c b2 59 02 30 aa ff 18 06 aa ff 18 ...@...Y... ..  
00d0 06 c0 05 01 2a 00 fc ff c3 04 02 2e 2e dd 18 ...\*... ..  
00e0 00 50 f2 02 01 01 01 00 03 a4 00 00 27 a4 00 00 ...P... ..  
00f0 42 43 5e 00 62 32 2f 00 BC^b2/..

Indicates how many Beacon frames (including the current frame) before the next DTIM (wlan.tim.dtim\_count), 1 byte(s) Packets: 618 · Displayed: 52 (8.4%) · Dropped: 0 (0.0%) Profile: Default

Frame 365 is next beacon, and it shows mcast frames are queued, and the DTIM count indicates that stations should wake NOW to receive the queued frames.



LANforge Manager Version(5.4.5) test1 - Create/Modify Cross Connect

Display Sync Batch>Create Apply OK Cancel

1 Cross-Connect  
CX Name: test1  
CX Type: LANforge / Eth

Resource: Endpoint A: 1 (ct523c-3011) Endpoint B: 0  
Port: 2 (eth2) 0  
Min Tx Rate: Old Modem (9.6 Kbps) New Modem (56 Kbps)  
Max Tx Rate: Same Same  
Min PDU Size: AUTO AUTO  
Max PDU Size: Same Same  
IP ToS: Best Effort (0) Best Effort (0)  
Pkts To Send: Infinite Infinite

2 Report Timer: fast (1 s)  
Pld Pattern: Endpoint A: increasing Endpoint B: increasing  
Min IP Port: AUTO AUTO  
Max IP Port: Same Same  
Min Duration: Forever Forever  
Max Duration: Same Same  
Min Reconn: 0 (0 ms) 0 (0 ms)  
Max Reconn: Same Same  
Multi-Conn: One (1) One (1)  
☒ Auto-Helper ☒ Auto-Helper  
Script Script  
Thresholds Thresholds

3 Test Manager  
Quiesce: default\_tm 3 (3 sec)  
IP Addr: Endpoint A: AUTO Endpoint B: AUTO  
☐ Replay File ☐ Replay File  
☐ Loop ☐ Loop  
☒ Dest Mac ☐ Dest Mac  
Filename:   
Dest MAC: ff:ff:ff:ff:ff:ff 9c:69:b4:60:ab:5a

4 Snd Buff Size: Endpoint A: OS Default Endpoint B: OS Default  
Rcv Buff Size: OS Default OS Default  
Send Bad FCS: zero (0%) zero (0%)  
Src MAC: 9c:69:b4:60:ab:5a 00:00:00:00:00:00  
☐ Use-Proxy ☐ Use-Proxy  
Proxy Addr: 0.0.0.0 172.16.0.1  
Proxy Port: 0 0  
Socket Priority: 0 0  
Payload Payload

5 Conn Timeout: Endpoint A: 10s (10 s) Endpoint B: 10s (10 s)  
TCP MSS: OS Default OS Default  
Endpoint A: ☐ Do Checksum ☐ Do Checksum  
☐ Duration Quiesce ☐ Duration Quiesce  
☐ Quiesce-After-Range ☐ Quiesce-After-Range  
☐ TCP\_NODELAY ☐ TCP\_NODELAY  
☐ Concurrent IP Addr ☐ Concurrent IP Addr  
☐ Clear-Port-On-Start ☐ Clear-Port-On-Start  
☐ Linear-IP-Ports ☐ Linear-IP-Ports  
☐ UDP-NAT ☐ UDP-NAT  
Endp Name: test1-A test1-B

This AP is not buffering broadcast packets and sending them after the beacon like it is supposed to. Frame 157 (beacon) does not have Multicast bit set in its TIM:





power-save-mtk7921k-sta-mtk7915-lanforge-vap-unicast-upload.pcapng

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wlan.addr == a8:93:4a:9d:47:a3 || wlan.sa == 00:0A:52:46:8D:49

No.	Time	Source	Destination	Protocol	Length	Data rate	PHY type	Sequence number	Info
830	8.529672485	AsiaRF_46:8d:49	Broadcast	802.11	330		6 802.11a (OFDM)	2975	Beacon frame, SN=2975, FN=0, Flags=....., BI=...
853	7.775416041	AsiaRF_46:8d:49	Broadcast	802.11	330		6 802.11a (OFDM)	2976	Beacon frame, SN=2976, FN=0, Flags=....., BI=...
875	8.021210907	AsiaRF_46:8d:49	Broadcast	802.11	330		6 802.11a (OFDM)	2977	Beacon frame, SN=2977, FN=0, Flags=....., BI=...
884	8.11288576	Chongqin_9d:47:a3	AsiaRF_46:8d:49 (00:0A:52:46:8D:49)	802.11	76		24 802.11a (OFDM)		Request-to-send, Flags=.....
885	8.112889692	Chongqin_9d:47:a3	Chongqin_9d:47:a3	802.11	70		24 802.11a (OFDM)		Clear-to-send, Flags=.....
886	8.112438941	Chongqin_9d:47:a3	AsiaRF_46:8d:49 (00:0A:52:46:8D:49)	802.11	76		24 802.11a (OFDM)		Request-to-send, Flags=.....
887	8.112440243	Chongqin_9d:47:a3	Chongqin_9d:47:a3	802.11	70		24 802.11a (OFDM)		Clear-to-send, Flags=.....
888	8.112651462	172.16.223.154	172.16.223.153	LANfor	1590		104 802.11n (HT)	16	Seq: 1
889	8.112653310	172.16.223.154	172.16.223.153	TCP	162		104 802.11n (HT)	17	33033 - 33034 [PSH, ACK] Seq=1449 Ack=1 Win=42 Len=0
890	8.112653887	AsiaRF_46:8d:49 (00:0A:52:46:8D:49)	Chongqin_9d:47:a3	802.11	88		24 802.11a (OFDM)		802.11 Block Ack, Flags=.....
891	8.113395693	Chongqin_9d:47:a3	AsiaRF_46:8d:49 (00:0A:52:46:8D:49)	802.11	76		6 802.11a (OFDM)		Request-to-send, Flags=.....
892	8.113396838	Chongqin_9d:47:a3	Chongqin_9d:47:a3	802.11	70		6 802.11a (OFDM)		Clear-to-send, Flags=.....
893	8.113492971	Chongqin_9d:47:a3	AsiaRF_46:8d:49	802.11	86		6 802.11a (OFDM)	77	QoS Null function (No data), SN=77, FN=0, Flags=...
894	8.113494712	Chongqin_9d:47:a3	Chongqin_9d:47:a3	802.11	70		6 802.11a (OFDM)		Acknowledgement, Flags=.....
895	8.113804233	172.16.223.153	172.16.223.154	TCP	150		39 802.11n (HT)	8	33034 - 33033 [ACK] Seq=1 Ack=1461 Win=41 Len=0
896	8.113805857	Chongqin_9d:47:a3	AsiaRF_46:8d:49 (00:0A:52:46:8D:49)	802.11	88		6 802.11a (OFDM)		802.11 Block Ack, Flags=.....
897	8.113807023	AsiaRF_46:8d:49	Broadcast	802.11	330		6 802.11a (OFDM)	2978	Beacon frame, SN=2978, FN=0, Flags=....., BI=...

802.11 radio information

- IEEE 802.11 Request-to-send, Flags=.....
  - Type/Subtype: Request-to-send (0x001b)
  - Frame Control Field: 0xb400
    - .... 00 = Version: 0
    - .... 01.. = Type: Control frame (1)
    - 1011 .... = Subtype: 11
  - Flags: 0x00
    - .... 00 = DS status: Not leaving DS or network is operating in AD-HOC mode (To DS: 0 From DS: 0) (0x0)
    - .... 0.. = More Fragments: This is the last fragment
    - .... 0... = Retry: Frame is not being retransmitted
    - ..0 .... = PWR MGT: STA will stay up
    - ..0 .... = More Data: No data buffered
    - ..0.. .... = Protected flag: Data is not protected
    - 0... .... = +HTC/Order flag: Not strictly ordered
  - 000 0001 0000 0000 = Duration: 256 microseconds
  - Receiver address: AsiaRF\_46:8d:49 (00:0A:52:46:8D:49)
  - Transmitter address: Chongqin\_9d:47:a3 (a8:93:4a:9d:47:a3)

Power management status (wlan.fc.pwrmtgt), 1 byte

Packets: 7157 · Displayed: 1676 (23.4%)

Profile: Default

At frame 996, the TCP traffic has quiesced for a bit, and STA goes back to sleep.

power-save-mtk7921k-sta-mtk7915-lanforge-vap-unicast-upload.pcapng

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wlan.addr == a8:93:4a:9d:47:a3 || wlan.sa == 00:0A:52:46:8D:49

No.	Time	Source	Destination	Protocol	Length	Data rate	PHY type	Sequence number	Info
960	8.593206012	Chongqin_9d:47:a3	AsiaRF_46:8d:49 (00:0A:52:46:8D:49)	802.11	76		24 802.11a (OFDM)		Request-to-send, Flags=.....
961	8.593207211	Chongqin_9d:47:a3	Chongqin_9d:47:a3	802.11	70		24 802.11a (OFDM)		Clear-to-send, Flags=.....
962	8.593374734	172.16.223.154	172.16.223.153	LANfor	1590		130 802.11n (HT)	19	Seq: 2
963	8.593376629	172.16.223.154	172.16.223.153	TCP	162		130 802.11n (HT)	20	33033 - 33034 [PSH, ACK] Seq=2909 Ack=1 Win=42 Len=0
964	8.593377673	AsiaRF_46:8d:49 (00:0A:52:46:8D:49)	Chongqin_9d:47:a3	802.11	88		24 802.11a (OFDM)		802.11 Block Ack, Flags=.....
965	8.593995230	Chongqin_9d:47:a3	AsiaRF_46:8d:49 (00:0A:52:46:8D:49)	802.11	76		6 802.11a (OFDM)		Request-to-send, Flags=.....
966	8.593996377	Chongqin_9d:47:a3	Chongqin_9d:47:a3	802.11	70		6 802.11a (OFDM)		Clear-to-send, Flags=.....
967	8.594079915	AsiaRF_46:8d:49	Chongqin_9d:47:a3	802.11	86		6 802.11a (OFDM)	81	QoS Null function (No data), SN=81, FN=0, Flags=...
968	8.594081377	Chongqin_9d:47:a3	Chongqin_9d:47:a3	802.11	70		6 802.11a (OFDM)		Acknowledgement, Flags=.....
969	8.594398058	172.16.223.154	172.16.223.153	TCP	150		39 802.11n (HT)	9	33034 - 33033 [ACK] Seq=1 Ack=2921 Win=41 Len=0
970	8.594399979	Chongqin_9d:47:a3	AsiaRF_46:8d:49 (00:0A:52:46:8D:49)	802.11	88		6 802.11a (OFDM)		802.11 Block Ack, Flags=.....
991	8.758471762	AsiaRF_46:8d:49	Broadcast	802.11	330		6 802.11a (OFDM)	2980	Beacon frame, SN=2980, FN=0, Flags=....., BI=...
994	8.795917821	Chongqin_9d:47:a3	AsiaRF_46:8d:49 (00:0A:52:46:8D:49)	802.11	76		6 802.11a (OFDM)		Request-to-send, Flags=.....
995	8.795920844	Chongqin_9d:47:a3	Chongqin_9d:47:a3	802.11	70		6 802.11a (OFDM)		Clear-to-send, Flags=.....
996	8.796095715	Chongqin_9d:47:a3	AsiaRF_46:8d:49	802.11	86		6 802.11a (OFDM)	82	QoS Null function (No data), SN=82, FN=0, Flags=...
997	8.796096990	Chongqin_9d:47:a3	Chongqin_9d:47:a3	802.11	70		6 802.11a (OFDM)		Acknowledgement, Flags=.....

802.11 radio information

- IEEE 802.11 QoS Null function (No data), Flags=...P...T
  - Type/Subtype: QoS Null function (No data) (0x002c)
  - Frame Control Field: 0xc811
    - .... 00 = Version: 0
    - .... 10.. = Type: Data Frame (2)
    - 1100 .... = Subtype: 12
  - Flags: 0x11
    - .... 01 = DS status: Frame from STA to DS via an AP (To DS: 1 From DS: 0) (0x1)
    - .... 0.. = More Fragments: This is the last fragment
    - .... 0... = Retry: Frame is not being retransmitted
    - ..1 .... = PWR MGT: STA will go to sleep
    - ..0 .... = More Data: No data buffered
    - ..0.. .... = Protected flag: Data is not protected
    - 0... .... = +HTC/Order flag: Not strictly ordered
  - 000 0000 0010 0100 = Duration: 36 microseconds
  - Receiver address: AsiaRF\_46:8d:49 (00:0A:52:46:8D:49)
  - Transmitter address: Chongqin\_9d:47:a3 (a8:93:4a:9d:47:a3)
  - Destination address: AsiaRF\_46:8d:49 (00:0A:52:46:8D:49)

Power management status (wlan.fc.pwrmtgt), 1 byte

Packets: 7157 · Displayed: 1676 (23.4%)

Profile: Default