IEEE P802.11
Wireless LANs

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| Long Range Low Power (LRLP) Topic Interest GroupMinutes for Mach 2016 |
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Abstract

Minutes of the LRLP TIG in March 2016

**Minutes for Monday, 14th 2016 (PM1)**

Chair discussed the agenda as shown in 11-16/0254r3; the agenda was approved by the group

Chair inquired about any change in agenda item:

Request for inclusion of a contribution from Newracom: “Considerations for LRLP”

**DCN 11-16/0334r0 - Use cases for LRLP TIG: Stephane Baron (Canon)**

Q: Battery lifetime for camera is 24 hrs for Scenario 1; analysis of power with respect to video streaming

A: Power is related with control, video streaming; high power may be required for short times while some applications may have different requirement for average low power

Q: Data to support 5Mbps

A: Low resolution and high compression images could be supported on 5Mbps data rate with low power

Discussion on 200m maximum distance between STAs, STA to STA communication on sensor data, may be controlled or not controlled by the AP;

Discussion on Use Case 3: 2 years lifetime would be desirable; device to device communication already possible with legacy devices; however, power consumption is an issue and could be solved by LRLP

Comment on Use Case 2: High resolution may be needed in mission-critical scenarios; however, such high resolution images with high throughput, LRLP may be not be the right amendment

**DCN 11-16/0341r0 - Low Power Wake-up Receiver: Minyoung Park** (Intel Corporation)

The Chair reminded that the discussion be limited to the content of the LRLP output document and not get in to the technical details;

Discussion: AGC is not that critical for OOK modulation, probably for other modulations; a weak signal is a problem, but a strong signal may be a problem for OOK-based modulation

Q: Slide showing RA, is that AID of wake-up device

A: Receiver address of the WUR; the parsing is the same as normal legacy packet parsing;

Q: All WUR devices may wake up to receive the WU packet

A: In Slide 7, parsing and information decoding is happening in WUR and 802.11 device is not waking up during this parsing; the CRC parsing is also done at the WUR and hence the 802.11 radio does not wake up; 100uW is the power consumption required during the active WU packet processing;

Discussion on the performance of WUR with respect to receiver sensitivity; WUR addressing the lower transmit power aspect, but about low power receiver perspective;

Clarification on WUR: Device with capability of WUR will have the ability of decoding a WUR packet;

Q: Compare with having BLE vs having a WUR?

A: BLE and WUR power comparison between 10mA vs. 100uA for WUR; coexistence between BLE and Wi-Fi needs not be needed with WUR for 802.11 device

Q: 2 modems, one for WUR and one for 802.11 radio

A: Basically, the WUR has a different RF and baseband when compared to 802.11 modem;

Q: Trade-off for managed systems vs. WUR-based systems

A: This has been discussed in the previous presentation

**Document 0381r0: Discussions on Wake-up Receivers for LRLP, Leif Wilhelmsson, Ericsson**

Questions hold off to next session

**DCN 11-16/0380r0: Discussions on Requirements and Potential STA Categories, Leif Wilhelmsson, Ericsson**

Q: 20dB better with what reference?

A: With reference to MCS 0 of legacy devices

Q: “Free” infrastructure in Slide 10

A: Infrastructure-based having 11ax AP supporting both 11ax and LRLP

**DCN 11-16/0402r0: LP-WUR Wake-up packet identity considerations – Frank Hsu (Mediatek)**

**SP 2 from DCN 11-16/0380r0:**

Discussion on clarification; the author proposed to have 2 categories of having one low power category and the other long range category

Do you believe it makes sense to introduce more than one non-AP STA category for LRLP in order to better address specific requirements with two different PHY layer specifications for each category. This would require APs to implement both PHYs to support LRLP

**Tuesday PM 1 minutes**

Chair went over the agenda from document 0254r3

**DCN 11-16/0417r0 - Considerations on LRLP: Minho Cheong (Newracom); presented by Reza Hedayat**

There was a question about whether to need a new PHY for LRLP or can we use some existing PHY; it was mentioned that the technology is not within the scope of this contribution

Discussion on power save or long range based on narrow band transmission needs to be addressed; what technologies are required to receive ultra-low power; the narrow band transmission needs to be further investigated, but not the goal of this contribution;

11ax PAR defines the scope of power efficiency; how would be differentiated in LRLP; question to be addressed in SG and not within the TIG; discussion also on low power and high data rate requirements at the same time;

If there is a focus of the group, then the results may be negative; there was mention of 11ah and clarification was needed about LRLP in terms of requirements; possibility of writing different PARs to support 2 different requirements; it was mentioned by the contributor that prime focus is on ultra-low power;

If focus is on ultra-low power, it restricts to a class of devices that may not have market currently; separating the 2 class of devices may split the market and consumers may be confused; commenter preferred to have both long range and low power as the initial focus;

Discussion on regulatory limits in Slide 9 may not exist as of today and the comment was agreed by the contributor;

**DCN 11-16/444r0: Introductory paragraph for LRLP output document: Tim Godfrey (EPRI)**

There was a question whether we are concerned about cost for LRLP devices; we are allowed to use “cost” within 802.11 group but not the word “price.” A comment was made that zero-cost requirement would be preferable

**DCN 11-16/ 0443r0: Addressing range and power requirements of indoor use cases: Shahrnaz Azizi (Intel Corporation)**

Question about the communication link between the AP and AS\* or AS in Slide 7; the AP can communicate long range with higher power or higher capacity battery, while the link in the Room 3 may be coin cell batteries with lower power and is short range

If camera is battery driven in Slide 4, a long range communication was inquired, whether LRLP or 11ax;

Preference was inquired between Option 1 and Option 2: The contributor mentioned that we are open to both options;

Question about future design should consider design target on longer range or use multi-hop; the contributor answered about defining a new waveform for longer range and work with multi-hop; may not need to address agriculture and drone use cases within LRLP

Coexistence was solved in BLE and Zigbee; we may need to solve the coexistence issue in Wi-Fi as was solved in BLE and Zigbee and as a group we need to solve it;

There may be more work needed apart from PHY and MAC changes within the LRLP; this comment was made with reference to the right figure in Slide7;

**DCN 11-16/363r0 – Discussion on LRLP Timeline: Chittabrata Ghosh (Intel Corporation)**

 Review of previous amendments and their timelines, 11ac and 11ad, 11ah and 11ax to set an expectation for possible LRLP timeline

 Review of IoT growth curve, indicates the range of LRLP deployment in 2020

Based on these projects, compare LRLP timeline. Back-track from March 2020 as target of LRLP first generation. With 9 mo sponsor, and 6 month LB cycle, leaves 20 months from PAR to D1.0

Could allow 11ax second generation products to support LRLP.

How to achieve March 2020 completion: 1) focus PAR scope and features. Achieve requirements, quality drafts for shorter comment resolution

Discussion and Q&A

Agreement that a clear scope is helpful to meeting the timeline. Also need to consider major project going on in parallel. Have to be realistic on resources available to work on together.

Note that scope is defined in study group – so that will impact the overall timeline

It is assumed that LRLP is based on 802.11ax.

Notes that the SG normally has a defined scope to create a timeline, but we need better definition to define a timeline from this point. The reason is that we are looking backward from the 2020 target date.

Reasons for opposing the SG is that it is too similar to use cases of 802.11ah. Also has concerns about coexistence. Would prefer to bring ideas into other groups. Would prefer 802.11ah to take hold first.

The reason for LRLP is to operate with mainstream devices in 2.4 GHz. Also there is a focus on reducing peak TX power.

 **LRLP TIG minutes (Wednesday AM1)**

1. DCN 11-15/1446r10 - Reviewed the modification to the LRLP report out document r10 – in the “Ultra low power consumption” section
	1. Chair asked question to adopt this as DCN 11-15/1446r11 – no objection from the group
2. DCN 11-16/444r0 - Reviewed the introductory paragraph
	1. Chair asked to adopt this paragraph to the output document DCN 11-15/1446r11 – no objection from the group
3. There was request to include a conclusion section to the LRLP report out document
4. Discussion on a plan for May meeting
	1. Add conclusion and recommendation in the report out document
	2. Evaluate the LRLP functionality that is not addressed by 11ax and 11ah
5. Chair asked for recess until Thursday PM1 session

No objection from the group

 **LRLP TIG minutes (Thursday PM1)**

* Reviewed agenda items that were first discussions aiming to bring consensus, straw poll on positioning of LRLP, timeline review and finally straw poll on TIG extension.
* Held discussions around next steps (clarify the scope of LRLP, develop list of key differentiators and agree upon them).
	+ There was a comment that this TIG was supposed to work on the above items and we should have had these steps completed by now. Since it didn’t happen during the last six months, there is no point in extending it. The same trend of work won’t make anything more efficient in terms of delivery of these aimed items. The commenter recommended terminating the TIG, and instead starting off with a Study group.
* Straw Poll: LRLP Positioning

Given our current understanding of the use cases and requirements in the output document,

* Do you see the LRLP as:
1. Included into 802.11ax (changing current scope) [Delay 11ax by 6 months?]
2. Concurrent with 11ax 911ax+ 1 year)
3. A “fast follow” after the first generation of 802.11ax
4. Part of the ‘next big thing”
	* Discussions:
		+ Question on the floor: Is it part of 11ax or is it going to be separate from 11ax?
		+ Answer: It will be the next amendment.
		+ Noted that 1, 2, 3 are separate projects. Just timing is used to compare them with 11ax.
	* Someone asked for extra option of “need more time” since despite the output report, we don’t know the main focus yet.
		+ Added option (4) Not sure or need more information
	* There was a comment that since LRLP was not discussed in 11ax at all. It is not correct to have these options that are tightly related to 11ax. The commenter recommended bringing the LRLP discussion to 11ax in the May meeting and taking it from there.
	* There were more comments on lack of clarity of the straw poll
		+ Based on the comments decided to skip the straw poll
* Reviewed the Timeline and noted that the previously presented one had to be changed since the SG didn’t form. This is the best case timeline.
	+ Comment: It is better to go one step at the time. The timeline should we develop in the study group.
		- We need to clarify the scope of LRLP, and not discuss the timeline at this point. Several others talked in favor of not having timeline discussions in the TIG.
			* Chair decided to remove timeline from the output report based on the comments
* Straw poll on LRLP TIG extension
	+ Do you support the extension of the LRLP TIG for two meetings to develop consensus, refine the scope, and further develop technical feasibility and approaches.
		- Y: 52
		- N: 10
		- A: 14
	+ Straw poll passes.
	+ Noted that there was no discussions on the straw poll
	+ The straw poll will be taken to the closing plenary for further decision and motion.