IEEE P802.11
Wireless LANs

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| Wake-Up Receiver (WUR) Study GroupMeeting Minutes for September 2016 MeetingWarsaw, Poland |
| Date: 09-16-2016 |
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Abstract

Meeting Minutes for the WUR SG sessions held in Warsaw, Poland, September 11-16, 2016.

**Monday, September 12, 2016, 1:30-3:30 pm**

**Meeting Agenda:**

The meeting agenda is shown below, and also published in the agenda document:

<https://mentor.ieee.org/802.11/dcn/16/11-16-1080-01-0wur-july-2016-agenda.ppt>

* Call meeting to order
* WUR SG introduction
* Call for submissions
* Review agenda and approval
* IEEE 802 and 802.11 IPR Policy and procedure
* Summary from July 2016 plenary meeting and teleconferences
* Motion: July 2016 meeting minutes ([doc: IEEE 802.11-16/1062r0](https://mentor.ieee.org/802.11/dcn/16/11-16-1062-00-0wur-meeting-minutes-july-2016.docx)) and teleconference calls ([doc: IEEE 802.11-1104r2](https://mentor.ieee.org/802.11/dcn/16/11-16-1104-02-0wur-wur-sg-teleconference-minutes-august-2016.docx))
* PAR development guideline (Jon Rosdahl’s email)
* Develop PAR and CSD documents
	+ Comment resolution for the draft PAR and CSD documents
	+ Presentations
* Recess

**Chair Minyoung Park (Intel) calls meeting to order at 1.30pm.**

About 95 people in the room.

Minyoung reminds about recording attendance and goes through the session schedule for the week.

Minyoung goes through 11-16/1080r1, which includes an introduction to the WUR SG as well as the submission received in response to the Call for submission.

The agenda is reviewed. The main topic for this week is to complete the PAR and CSD.

Minyoung asks whether there is any more submission that those indicated in the list. One more submission is announced: **11-16/1143r0 “Multi-User access for Wake-Up Radio” (Yonsei Univ.)**

**Motion to approve the Agenda, document number 11-16/1080r1.**

* + Moved: Bin Tian
	+ Seconded: Yunsong Yang
	+ Motion passed by unanimous consent.

Minyoung reviews the Patent policy slides and make a call for potentially essential patents. No response.

Minyoung reviews Other Guidelines etc., slides 16-19.

Minyoung goes through the summary from the July meeting and teleconferences, slides 20-22.

Motion to approve minutes from July f2f and the three teleconferences in August.

* + Moved: Shahrnaz Azizi
	+ Seconded: Yunsong Yang
	+ Motion passed by unanimous consent.

Minyoung goes through slide 24, which is the email from Jon Rosdahl concerning PAR development.

The received submissions for this meeting are:

* **PAR related submissions:**
1. 11-16/1229r0, WUR update on PAR comment resolution, Shahrnaz Azizi (Intel)
2. 11-16/1045r4, A PAR proposal for WUR SG, Shahrnaz Azizi (Intel)
* **CSD related submissions:**
1. 11-16/936r2, A CSD proposal for wake-up radio (WUR), Osama Aboul-Magd (Huawei)
* **Other submissions:**
1. 11-16/1144r0, Further investigation on WUR performance, Eunsung Park (LGE)
2. 11-16/1147r0, WUR and efficiency tradeoffs (Newracom)
3. 11-16/1215r0, Demand of Being Waken Up While Moving Follow-up (ZTE)
4. 11-16/1217r0, WUR based Broadcast Reference Signal, John Son (WILUS)
5. 11-16/1143r0 “Multi-User access for Wake-Up Radio” (Yonsei Univ.)
* **11-16/1229r0, “WUR update on PAR comment resolution,” Shahrnaz Azizi (Intel):**

Shahrnaz goes through document 11-16/1229r0. This presentation is a summary of the discussion on the email thread and the teleconferences. The co-authors are those who have shown interest in being part of these discussions.

Question to the audience if there are any comments or questions. There are no comments or questions. There are two Straw Polls

* Straw Poll 1: Do you agree to remove the user data part in order to have the following text:

“The wake-up packets carry only control information.”

Result: Y/N/A: 35/0/24

* Straw Poll 1b: Which of the following option do you prefer:
	1. Remove the user data part:
		+ The wake-up packets *carry only control information, and they* do not carry *any* user *payload* data.
	2. Keep (only) the user data part:
		+ The wake-up packets *carry only control information, and they* do not carry *any* user *payload* data.
	3. Remove the entire sentence:
		+ The wake-up packets *carry only control information, and they* do not carry *any* user *payload* data.

Result: A/B/C/Abstain: 29/4/10/11

Shahrnaz will modify the text in accordance with the outcome of Straw Poll 1.

* **11-16/1147r0, “WUR and efficiency tradeoffs,” (Newracom):** Reza gives the presentation, which is concerned with the relatively large fraction of channel occupancy time that may be needed for the wake-up signal. To address this, it is proposed to send the narrow-band wake-up signal e.g. in a similar way that is used for the advertising channel in BLE, e.g., below channel 1, or between channel 1 and channel 6. There are also some suggestions regarding text for the PAR.

Question/comment (Q): Why do you need to specify ED and PD.

Answer (A): Just for clarity.

Q: We also have guard intervals in OFDM

Q: You propose to use the gap between the 20 MHz channels. Is there any receiver burden related to this?

A: No, these are two different receivers.

Q: I don’t think we need to specify how we do coexistence. I do agree that efficiency is very relevant, but would prefer to do this once we have moved to a TG.

Q: I believe the proposed text actually goes into the solution space, and I would prefer if we just have requirements.

A: Agree, but I think a lot of the discussion here actually has been based on design (with a legacy preamble before the wake-up packet).

Q: I don’t quite see the relation between what you presented and what you propose as a suggested text for the PAR.

A: It is not really meant to propose a new design, but rather proposes to use what already has been used for a very long time within IEEE 802.11.

Q: I think it is too early to discuss mechanisms at this point in time and would rather see that we stay at a higher level of discussion.

Q: Maybe you can put something in the CSD under technical feasibility.

A: I will look into this.

Q: Don’t see the relation between the presentation and the proposed text.

* **11-16/936r2, “A CSD proposal for wake-up radio (WUR),” Osama Aboul-Magd (Huawei):**

Osama briefly goes through the purpose of the CSD document, and points out the need for a Coexistence Assurance (CA) document. The different 5C requirements are discussed and how the development of an amendment for a WUR meets these requirements is discussed in some detail.

Osama proposes to remove “based on real world deployment” in Section 1.2.4.

Brief discussion of whether we should use the term Wake-Up Radio or Wake-Up Receiver. Right now WUR is short for Wake-Up Radio in the SG WUR. However, the term Wake-Up Receiver is more commonly used in the literature.

**Minyoung declares the group to be in recess at 3.19 pm.**

**Tuesday, September 13, 2016, 8:00-10:00 pm**

**Meeting Agenda:**

The meeting agenda is shown below, and also published in the agenda document:

<https://mentor.ieee.org/802.11/dcn/16/11-16-1080-02-0wur-july-2016-agenda.ppt>

* Call meeting to order
* IEEE 802 and 802.11 IPR Policy and procedure
* Develop PAR and CSD documents
* Comment resolution for the draft PAR and CSD documents
* Presentations
* Recess

**Chair Minyoung Park (Intel) calls meeting to order at 8.00pm.**

About 70 people in the room at the start, increasing to about 100 towards the end.

Minyoung reminds about recording attendance.

Minyoung goes through the agenda. The agenda is approved.

Shahrnaz go through revisions 4 and 5 of 11-16/1045, and in particular the comments by Robert Stacey and whether we should use the term Wake-Up Radio or Wake-Up Receiver.

Robert Stacey has suggested a reference to what is a typical power consumption for a OFDM receiver. After some discussion, it is agreed to add a sentence along these lines to Section 5.5 Need for the project.

Shahrnaz goes through the rest of the PAR document and as there is no more question this will be the final version used for the motion. The document number is 11-16/1045r6,

Osama goes through the CSD document 11-16/0936r3, which will be used for the motion in PM1.

Minyoung shows the text that will be used for the motions. The texts for the motions are included in the r4 version of the agenda for people to study.

* **11-16/1144r0, “Further investigation on WUR performance,” Eunsung Park (LGE):** The performance of WURs is studied both with coherent and non-coherent reception. In case of non-coherent reception, Manchester coding is also used.

Q: You assume perfect timing in your simulations?

A: Yes

Q: Did you combine Manchester coding and repetition coding?

A: No

Q: What do you mean with that coexistence problem can be avoided?

A: Because no long sequence of all zeros.

Q: Just a comment that once we start doing performance evaluations we need to agree on e.g. noise figure for the WUR as this may be much higher than the noise figure for the main receiver.

Q: Do you do time or frequency domain processing?

A: Frequency domain.

* **11-16/1215r0, “Demand of Being Woken Up While Moving Follow-up,” Ke Yao (ZTE):** This is a follow-up presentation of what was presented in the July meeting. The contribution is concerned with being able to effectively use WURs when the devices are moving.

Q: Do you suggest that the WUR do association etc.?

A: Yes.

Q: Does the AP need to distinguish a moving STA from a non-moving STA?

A: Yes.

* **Straw Poll:** Do you agree that WUR moving should be supported by WUR standard?

Result: Y/N/A: 14/6/41

**Minyoung declares the group to be in recess at 9:57.**

**Tuesday, September 13, 2016, 1:30-3:30 pm**

**Meeting Agenda:**

The meeting agenda is shown below, and also published in the agenda document:

<https://mentor.ieee.org/802.11/dcn/16/11-16-1080-04-0wur-july-2016-agenda.ppt>

* Call meeting to order
* IEEE 802 and 802.11 IPR Policy and procedure
* Develop PAR and CSD documents
* Comment resolution for the draft PAR and CSD documents
* Motion: PAR (16/1045r6), CSD (16/936r3)
* Presentations
* Recess

**Chair Minyoung Park (Intel) calls meeting to order at 13.30pm.**

About 70 people in the room.

Minyoung reminds about recording attendance.

The agenda is reviewed. No objection to approve the agenda.

Minyoung reviews the Patent policy slides and make a call for potentially essential patents. No response.

**Motion PAR document**

* Believing that the PAR contained in the document referenced below meets IEEE-SA guidelines,
* Request that the PAR contained in [doc:802.11-16/1045r6] be posted to the IEEE 802 Executive Committee (EC) agenda for WG 802 preview and EC approval to submit to NesCom.

Moved: Shahrnaz Azizi, Seconded: Yunsong Yang, Result: Y/N/A: 39/0/2

**Motion CSD document**

* Believing that the CSD contained in the document referenced below meets IEEE 802 guidelines,
* Request that the CSD contained in [doc:802.11-16/936r3] be posted to the IEEE 802 Executive Committee (EC) agenda for WG 802 preview and EC approval.

Moved: Osama Aboul-Magd, Seconded: Yunsong Yang, Result: Y/N/A: 43/0/3

* **11-16/1217r0, WUR based Broadcast Reference Signal, John Son (WILUS)**

Q: I don’t think the reference signal will be much shorter than the actual wake-up packet. It needs to have the transmitters address, whereas the wake-up packet carries the receiver’s address.

* **11-16/1143r0 “Multi-User access for Wake-Up Radio” (Yonsei Univ.):**

Q: Are all STAs included in the analysis of the energy consumption?

A: Yes.

Q: How do you allow many STAs to send simultaneous WU poll?

A: Same way as in 802.11ax.

Q: I am concerned with the solution to wake up all STAs. Some STAs may have much harder requirements and then this is not good.

A: In this case we may not use this method. We are still investigating.

Discussion of what letters should be used for the TG. Adrian proposed cc, but there is some concern skipping all double letters starting with b.

Minyoung proposes to cancel today’s evening session. No objection. Minyoung mentions that what remains for Thursday AM1 are teleconference schedule and timeline for the SG.

**Minyoung declares the group to be in recess at 2.15 pm.**

**Tuesday, September 13, 2016, 7:30-9:30 pm**

**The session is cancelled.**

**Thursday, September 15, 2016, 8:00-10:00 am**

**Meeting Agenda:**

The meeting agenda is shown below, and also published in the agenda document:

<https://mentor.ieee.org/802.11/dcn/16/11-16-1080-06-0wur-july-2016-agenda.ppt>

* Call meeting to order
* IEEE 802 and 802.11 IPR Policy and procedure
* SG timeline
* Goals for November 2016
* Teleconference call schedule
* Adjourn

**Chair Minyoung Park (Intel) calls meeting to order at 08.00 am.**

About 20 people in the room.

Minyoung reminds about recording attendance.

The agenda is reviewed. No objection to approve the agenda.

Minyoung reviews the Patent policy slides and make a call for potentially essential patents. No response.

Minyoung goes through the timeline for the WUR SG, slide 28.

Minyoung goes through the goals for November 2016. The main goal is to review and resolve comments on the PAR and CSD documents.

Proposed schedule a teleconference on October 24th, 6 pm EDT, 1 hour.

**Meeting is adjourned at 8.12 am.**