IEEE P802.11  
Wireless LANs

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| IEEE 802.11 TGbb Task Group on Light Communications  January, 2019 St. Louis Meeting Minutes | | | | |
| Date: 2018-01-14 | | | | |
| Author: | | | | |
| Name | Affiliation | Address | Phone | Email |
| Volker Jungnickel | Fraunhofer HHI |  |  | [volker.jungnickel@hhi.fraunhofer.de](mailto:volker.jungnickel@hhi.fraunhofer.de) |
| Nikola Serafimovski | pureLiFi |  |  | [nikola.serafimovski@purelifi.com](mailto:nikola.serafimovski@purelifi.com) |

Abstract

This document contains the Task Group on Light Communications (TGbb) meeting minutes from the IEEE 802.11 St. Louis meeting, January 2019.

**IEEE 802.11 Task Group TGbb**

**Monday, January 14, 2019, AM2 Session**

Attendance: around 15 people.

1. The IEEE 802.11 TGbb meeting was called to order at by the Chair, Nikola Serafimovski (pureLiFi). Volker Jungnickel (Fraunhofer HHI) recorded the minutes.

1. The Chair reviewed the IEEE-SA patent policy, logistics, and reminders, including meeting guidelines and attendance recording procedures.
   * It is reminded all to record their attendance.
2. The Chair introduced the overall agenda for the week

* Submissions to be discussed
* Analytical channel model and blockage model
* Use of front-end models and link to channel model
* PHY evaluation metrics
* Evaluation Framework document
* Hear proposals
* TGbb Timeline update
* Conference call schedule

1. The Chair run a motion to approve the Agenda.

**Approve the proposed agenda in doc. 11-18/2122r1 for the week**

**Move: Volker Jungnickel**

**Second: Harry Bims**

**It was approved with unanimous consent.**

1. After a discussion, several shortcomings were noted that need further action by the group.
2. There has been some criticism on the content of the meeting minutes from November that were considered incomplete. Accordingly, there has been a motion to table the motion on approving the meeting minutes from November 2018.

**Table the Motion to approve the minutes from November 2018** **in doc. 11-18/1993r6.**

**Move: Marc Emmelmann**

**Second: Volker Jungnickel**

**Motion passed with unanimous consent.**

1. The same applies to the telco meeting minutes from November 2018 to January 2019. The documents will be reviewed and approved at the next meeting TUE AM2.
2. Kai Lennert Bober (Fraunhofer HHI) presented doc. 11-18/2037r1 which contains minor updates of the analytical channel and blockage model to be used for system-level simulations.
3. Volker Jungnickel (Fraunhofer HHI) presented doc. 11-18/1574r5 on frontend models. There was a minor change regarding the high-pass behavior of the TX frontend and a revision of the document.

- Q: What is the reason to introduce the high-pass at the transmitter?

- A: This is implicit in the driver design and needed for a fair comparison between pulsed modulation schemes and OFDM based PHY schemes.

1. Kai Lennert Bober (Fraunhofer HHI) presented the text version of the frontend models in doc. 11-19/0087r0.
2. Nikola Serafimovski (pureLiFi) discussed comments on 11-18/1429r3 for simulation methodology.
   * During this discussion, Andrew Myles (Cisco) took over the role as Vice Chair to allow the Chair to contribute to the technical discussion.
   * Q: How to combine the channel and frontend models in the evaluation of proposals.
   * A: It was suggested to explain this by multiplication in the frequency domain but even better as convolution in the time domain. The group should develop a separate document that explains this including by using pseudocode how to implement.
   * Q: Couldn’t we remove the need for *integrated* system-level simulations that include both MAC and PHY in great detail?
   * A: Integrated system simulation is important to capture synergy effects between the PHY and the MAC in multiuser multi-AP scenarios.
   * The outcome was that
     + 1) replace PER by BER simulation for the PHY
     + 2) use the analytical channel and blockage model for the MAC system simulations
     + 3) add a note that the full PHY and MAC system simulation could be based on the CIRs available in the channel model document which are considered as snapshots of the channel
   * Q: Interference-limited scenarios may not be needed for light communication. For instance, part of the modulation bandwidth of an LED could be used by one AP and an orthogonal part by another AP. In this way interference can be easily avoided.
   * A: This is fine and available yet there are concerns on spectrum efficiency.
   * C: 802.11 MAC has sophisticated mechanisms that enable operation of two APs in the same spectrum and which could be more efficient.
   * Discussion: MAC simulations should be done over the same simulation scenarios defined in [1] where STAs are mobile. The analytical channel and blockage model should be used to replace the CIRs when simulating system-level performance.
   * Q: What trajectories that are used for simulations?
   * A: This is open issue and predefined mobility scenarios have to be agreed in a uniform manner.
3. The chair run a number of **straw polls** to capture the opinions in the group.

**“Should the Evaluation Methodology document specify the pre-defined/deterministic mobility traces/trajectories for evaluating system level performance?”**

**Y/N/A = 4/1/0**

**“Should the Evaluation Methodology document specify a statistical model for example for evaluating system-level performance, a uniform user distribution in a given fixed AP allocation to generate a Monte-Carlo outcome?”**

**Y/N/A = 2/1/8**

**“Should the Evaluation Methodology document specify a statistical model for example for evaluating system level performance, a uniform user distribution with APs placed in a given random distribution in a space to generate a Monte-Carlo outcome?”**

**Y/N/A = 1 / 2/ 5**

The meeting is recessed until TUE AM2.

**Tuesday, January 15, 2019, AM2 Session**

Attendance = 18 people in the room

1. The IEEE 802.11 TGbb meeting was called to order at by the Chair, Nikola Serafimovski (pureLiFi). Volker Jungnickel (Fraunhofer HHI) recorded the minutes.

1. The Chair reviewed the IEEE-SA patent policy, logistics, and reminders, including meeting guidelines and attendance recording procedures.
   * It is reminded all to record their attendance.
2. The Chair introduced the schedule for the meeting

* Approve minutes from Nov. 2018
* Approve minutes from the teleconferences
* Editor’s meeting feedback
* PHY evaluation metrics
* Evaluation methodology document
* Doc. 11-18/1429r4

1. The Chair run a motion to approve the agenda.

**Approve the proposed agenda in doc. 11-18/2122r2 for this meeting.**

**Move: Volker Jungnickel**

**Second: Stephen McCann**

**Motion is approved with unanimous consent.**

1. The Chair run a motion to approve the minutes from November 2018.

**Approve the meeting minutes from November 2018 in doc. 11-18/1993r9 for this meeting.**

**Move: Stephen McCann**

**Second: Volker Jungnickel**

**Motion is approved by unanimous consent.**

1. The Chair run a motion to approve the minutes from telcos between November 2018 and January 2019.

**Approve the minutes from telephone conference meetings held between the November 2018 session and the January 2019 session.**

* + **doc. 11-18/2106r1**
  + **doc. 11-18/2163r3r1**
  + **doc. 11-18/0048r1**

**Moved: Athanasios Stavridis**

**Second: Stephen McCann**

**Motion passes by unanimous consent.**

1. The Technical Editor Volker Jungnickel (Fraunhofer HHI) reported on the Editor’s meeting held in TUE AM0.
   * 802.11 Editors seek volunteers for Mandatory Draft Review (MDR)
   * The draft documents will be hosted on iMeet. The Technical Editor will obtain an account there, as anyone else who asks Robert Stacey for that.
   * The proposers should take care to create any graph if possible with Microsoft Visio. There is an easy way to feed such graphics into 802.11 drafts.

1. The Chair moved on to discuss the comments on evaluation methodology doc. 11-18/1429r3.
   * The discussion about deterministic and statistical results was continued.
   * The discussion was about the mobility trajectory. There is pseudocode in the channel and blockage mode that can be used by the proposers in doc. 11-18/2037r1.
   * For calibration, it was proposed that a reference trace could be provided.
   * The group should invite a simulation expert from TGax to one of the next meetings. The Chair takes an action item on this. Resolution of the comment was postponed.
   * There has been a discussion on the PHY simulation description
   * There are two comments
2. one comment is using the same spectral efficiency for comparison purposes
3. one BER trace for each modulation and coding scheme are needed for MAC
   * We need to define the MCS first, then get BER (for link-level) and PER (for system level) therefore
   * BER includes the channel coding and counts the number of errors relative to the packet size and it depends on the packet size
   * PER is based on the CRC which decides if the whole packet is received or not
   * The text on impairments has been modified according to the text
   * There has been a discussion on impairments such as OBSS interference, this should be considered in integrated system simulations 🡪 the corresponding paragraph has been moved to a later point in the document
   * There has been a discussion whether the 17 dBm TX power is to be specified or not. The concern is that performance needs to be qualified as a function of the SNR essentially and it is widely unclear where the parameters and part of the structure come from. Moreover we need relative performance measures and not absolute ones.
   * It was decided to remove the Tx power limit and the related text in the table.
   * Noise figure requirement is removed because it is included in Rx sensitivity defined in the scenarios document
   * The discussion was postponed to next meeting slot.

The meeting is in recess.

**Wednesday, January 16, 2019, AM1 Session**

Attendance = 10 people in the room

1. The IEEE 802.11 TGbb meeting was called to order at by the Chair, Nikola Serafimovski (pureLiFi). Matthias Wendt (Signify) and Volker Jungnickel (Fraunhofer HHI) recorded the minutes.

1. The Chair reviewed the IEEE-SA patent policy, logistics, and reminders, including meeting guidelines and attendance recording procedures.
   * It is reminded all to record their attendance.
2. The Chair introduced the schedule for this meeting slot.

* Number of slots requested for Vancouver
* Discuss Evaluation Methodology doc. 11-18/1429r4

1. **Motion**

**“Amend the proposed agenda in doc. 11-18/2122r2 for the week as shown in doc. 11-18/2122r3.”**

**Move: Harry Bims**

**Second: Volker Jungnickel**

**Approved with unanimous consent, motion passes**

1. The Chair discussed the number of slots to request for Vancouver. The outcome was 5.
2. Nikola Serafimovski /pureLiFi) discussed his contribution 11-18/1429r4.

**He made a straw poll asking the question**

**“Is Shot Noise as a parameter considered relevant for the Evaluation Methodology?**

**Y / N / A 1 / 4 / 3**

* + Another individual contribution in doc. 11-18/0178r1 was uploaded that will have an impact onto the evaluation methodology in particular for the MAC.
  + The discussion of doc. 11-18/1429r4 was postponed after the presentation of the new contribution.

1. Volker Jungnickel (Fraunhofer HHI) presented doc. 11-18/1429r4.
   * It proposes a frequency upshift method taken over from fixed networks (i.e. ITU-T G.hn) by which the baseband processing of any 802.11 PHY can be reused over LC channels. It works nicely over LOS channels but there are some issues in multipath/NLOS channels.
   * The method is only intended to simplify MAC layer simulations and study the fundamental question, such as whether 802.11 MAC will work over LC or not. For real data transmission, this simplification might be used but it is not recommended as it is only a “quick-and-dirty” integration of LC into 802.11 that would cost significant performance in particular in multipath and NLOS scenarios. The author will explain this in a forthcoming contribution.
   * The advantage of the proposed scheme is that it can be used to study any MAC layer mechanism defined in 802.11 as the same PHYs are being used. Existing evaluation frameworks could be reused and the protocol performance tested more efficiently over LC channels.
   * There has been a discussion about the pros and cons of this approach which was in general considered promising.

The meeting is in recess.

**Wednesday, January 16, 2019, PM2 Session**

Attendance = 10 people in the room

1. The IEEE 802.11 TGbb meeting was called to order at by the Chair, Nikola Serafimovski (pureLiFi). Marc Emmelmann (Koden-TI) recorded the minutes.

1. The Chair reviewed the IEEE-SA patent policy, logistics, and reminders, including meeting guidelines and attendance recording procedures.
   * It is reminded all to record their attendance.
2. The Chair introduced the schedule for this meeting slot.

* How to simplify MAC simulations in TGbb
  + Doc. 11-19/0178r2
* Discussion on the Evaluation Methodology
  + Doc. 11-19/0187r0
  + Doc. 11-19/0186r0
  + Doc. 11-18/1429r4

1. **Motion**

**“Move to amend the proposed agenda in 11-18/2122r3 for the week as shown in doc. 11-18/2122r4”**

**Moved: Harry Bims**

**Seconded: Volker Jungnickel**

**No discussion, Motion is approved by unanimous consent.**

1. Volker Jungnickel (Fraunhofer HHI) presented doc. 11-19/0178r2 — How to simplify MAC simulations in TGbb which contains a few minor updates only.
2. Kai Lennert Bober (Fraunhofer HHI) presented doc. 11-19/187r0 — Evaluation methodology for PHY and MAC proposals.

* The intention is to handle this as empty task group document which is then filled in step by step with content coming from individual contributions. This way, the evaluation framework will match more directly what TGbb actually needs and contain no material which is only confusing.
* The goal is to finish the PHY part during this January session so that simulation work can start besides preparing the proposals. The MAC part should be discussed and finished in teleconferences and at the March meeting.

1. **MOTION**

**“Accept doc. 11-19/0187r0 as the TGbb Evaluation Methodolgy document”**

**Move: Volker Jungnickel**

**Second: Athanasios Stavridis**

**No discussion, approved by unanimous consent, motion passes.**

1. Volker Jungnickel (Fraunhofer HHI) presented doc. 11-19/0186r0 — PHY Evaluation Methodology
   * The Chair suggested to do on-screen modification (to become revision 1) based on discussion of the document. This was agreed in the group.
2. **STRAW POLL**

**“Are less than 10 channel impulse responses sufficient to evaluate the relative performance of different PHY proposals?”**

**Y / N / A = 4 / 0 / 4**

* + Discussion on document will continue in next slot. Rev 1 will be uploaded and in the next slot, Rev 2 will be used to capture additional modifications.

The meeting recessed.

**Wednesday, January 16, 2019, PM2 Session**

Attendance = 10 people in the room

1. The IEEE 802.11 TGbb meeting was called to order at by the Chair, Nikola Serafimovski (pureLiFi). Harry Bims (Bims Laboratories) recorded the minutes.

1. The Chair reviewed the IEEE-SA patent policy, logistics, and reminders, including meeting guidelines and attendance recording procedures.
   * It is reminded all to record their attendance.
2. The Chair introduced the schedule for this meeting slot.

* Conference call schedule
* TGbb Timeline update doc. 11-18/1290r1
* Discussion on the Evaluation Methodology
* Doc. 11-19/0186r1
* Doc. 11-19/0187

1. There was group discussion about a future teleconference schedule for TGbb. A schedule of 3 teleconferences was approved by the task group.
2. **Motion**

“**TGbb would like to request the following teleconference times.”**

**09:30 AM EDT for 1h on 1 Feb.**

**09:30 AM EDT for 1h on 15 Feb.**

**09:30 AM EDT for 1h on 7 Mar.**

**Move: Volker Jungnickel**

**Second: Athanasios Stavridis**

**Motion was approved with unanimous consent.**

1. The WG reviewed and updated the timeline for standards development of the 802.11bb amendment.
2. **Motion**

**“Accept Document 11-18/1290r2 as the TGbb timeline” .**

**Move: Volker Jungnickel**

**Second: Athanasios Stavridis**

**The motion was approved by unanimous consent**.

1. Volker Jungnickel (Fraunhofer HHI) presented doc. 11-19-0186-01-00bb, entitled “PHY Evaluation Methodology” to the group for discussion. The document was previously made available on Mentor.
   * Docs. 11-18/1582r4 and 11-18/1603r1 were reviewed by the task group while discussing channel impulse responses for the analytical front end model.
   * The group selected a set of channel impulse responses and fixed the metrics for evaluation.
2. **Straw poll**:

**“Does the group want the Hospital ward model to be included in the PHY Evaluation?**

**There was unanimous consent to take out the Hospital ward model as binding for simulations.**

1. **Motion**

**“Move to accept the Evaluation Methodology as contained in Document 11-19/0186r2 and incorporate its contents into the TGbb Evaluation Methodology Document 11-19/0187.”**

**Move: Volker Jungnickel**

**Second: Marc Emmelmann**

**The motion was approved by unanimous consent.**

The meeting was adjourned.