IEEE P802.11  
Wireless LANs

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| IEEE 802.11 TGax  July 2014 San Diego Meeting Minutes | | | | |
| Date: 2014-08-03 | | | | |
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Abstract

TGax meeting minutes from the IEEE 802.11 San Diego session, July 14th – 18th, 2014.

**IEEE 802.11 Task Group ax**

**July 2014 San Diego Meeting**

**Manchester Grand Hyatt, San Diego, CA, USA**

**July 14th – 18th, 2014**

**Monday, July 14th, 2014, AM1 TGax Ad hoc Session (8:30-10:30)**

1. The meeting called to order by Osama Aboul-Magd (Huawei), the chair pro-tem of the TGax, @8:30
   1. About 220 people are in the room.
2. Agenda Doc.11-14/748r1 on the server.
   1. Rev 2 is the working document.
   2. Meeting Protocol: Chair asked to state name and affiliation when speaking for the first time.
   3. Chair reminded attendance.
3. The chair reviewed the mandatory 5 slides of P&P.
   1. Call for potentially essential patents
      1. Chair asked if anyone is aware of potentially essential patents.
      2. No potentially essential patents reported.
4. Agenda items for the week
   1. Approve the May meeting minutes and Teleconference after May meeting.
   2. Continue to advance simulation scenarios (11-14/0621) and Evaluation Methodologies (11-14/0571) documents.
   3. Approve an initial Functional Requirements documents.
   4. Approve an initial Channel Model document.
   5. Discuss and approve TG structure and process.
   6. Technical Presentations
   7. Schedule Teleconference times.
5. General Flow of the meeting
   1. Slide 13 of the 14/748r1 contains general flow of the meetings this week.
   2. There are nine meeting slots for TGax as contained in slide 14 of 14/748r1.

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| --- | --- | --- | --- | --- |
|  | Monday | Tuesday | Wednesday | Thursday |
| AM1 | TGax |  | TGax | TGax |
| AM2 |  | TGax (CCA) |  |  |
| PM1 |  | TGax (CCA) | TGax | TGax |
| PM2 | TGax |  |  |  |
| PM3 |  | TGax |  |  |

1. Call for submissions
   1. Simulation Scenarios
      1. 11-14/0799, “Modifications to Simulation Scenarios and Calibration Process,” Nihar Jindal (Broadcom)
      2. 11-14/0800, “Box 1 and Box 2 Calibration Results,” Nihar Jindal (Broadcom)
      3. 11-14/0803, “Packet Length for Box 0 Calibration,” Wookbong Lee (LG Electronics)
      4. 11-14/0850, “Clarification for MAC Calibration,” Gwen Barriac (Qualcomm)
      5. 11-14/0851, “Rate Control for Mac and Integrated System Simulations,” Gwen Barriac (Qualcomm)
      6. 11-14/0859, “Proposing a Stadium Scenario,” Hakan Persson (Ericsson)
      7. 11-14/0860, “Text proposal of a Stadium scenario to ax,” Hakan Persson (Ericsson)
      8. 11-14/0869, “MAC calibration results,” Zhou Lan (Huawei)
      9. 11-14/0871, “Further calibration towards Integrated system level simulation,” Jiyong Pang (Huawei)
      10. 11-14/0892, “MAC Calibration Text to Simulation Scenarios,” Jarkko Kneckt (Nokia)
      11. 11-14/0894, “Calibration of System Level Simulators,” Sayantan Choudhury (Nokia)
      12. 11-14/0895, “MAC-Calibration-OBSS-scenario,” Chao-CHun Wang, Russell Huang (MediaTek)
   2. Evaluation Methodology
      1. 11-14/0571, “ Evaluation Methodologies”, Ron Porat (Broadcom)
      2. 11-14/0810, “RBIR-based PHY Abstraction with Channel Estimation Error“, Yukun Sun (Marvell)
      3. 11-14/0811, “Overview on RBIR-based PHY Abstraction “ Yukun Sun (Marvell)
      4. 11-14/0827, “Energy Efficiency Evaluation Methodology”, Eric Wong (Apple)
      5. 11-14/0865, “ACI and AACI for 802.11ax”, Yu Cai (Huawei)
      6. 11-14/0866, “Traffic modeling and system capacity performance measure,” Johan Soder (Ericsson)
      7. 11-14/0873, “Discussion on PHY abstraction for 11ax system level simulations,” Jiayin Zhang (Huawei)
      8. 11-14/0874, “Unified traffic model on enterprise scenario”, Phillip Barber (Huawei)
      9. 11-14/0875, “VoIP Traffic Model Content for 11ax EVM & SS”, Phillip Barber (Huawei)
   3. Channel Models
      1. 11-14/0882, “TGax Channel Model Document,” Jianhan Liu (MediaTek)
      2. 11-14/0904, “In-Cabin WiFi Channel Channel: Preliminary Ray Tracing Simulations,” Fan Bai (General Motors)
   4. Functional Requirements
      1. 11-14/0567, “Proposed TGax Functional Requirements,” Lei Wang (Marvell)
      2. 11-14/0818, “Requirements for synchronization,” Yonggang Fang (ZTE)
      3. 11-14/0821, “Coexistence Requirements of 802.11 WLAN and LTE in Unlicensed Spectrum,” Alireza Babaei (CableLabs)
      4. 11-14/0835, “Functional Requirements Discussion,” Ron Murias (InterDigital)
   5. Technologies/Others
      1. 11-14/0779, “DSC Practical Usage,” Graham Smith (DSP Group)
      2. 11-14/0801, “envisioning 11ax phy structure part ii,” Dongguk Lim (LG Electronics)
      3. 11-14/0802, “Consideration on UL MU transmission,” Jinyoung Chun (LG Electronics)
      4. 11-14/0804, “Envisioning 11ax phy structure part-I,” Jinsoo Choi (LG Electronics)
      5. 11-14/0832, “Performance Evaluation of OBSS Densification,” Po-Kai Huang (Intel)
      6. 11-14/0833, “Residential Scenario Sensitivity and Transmit Power Control Simulation Results,” Ron Murias (InterDigital)
      7. 11-14/0838, “Discussion on dual-link STR in IEEE 802.11ax,” Jinsoo Ahn (Yonsei Univ)
      8. 11-14/0839, “Discussion on OFDMA in IEEE 802.11ax,” Jinsoo Ahn (Yonsei Univ)
      9. 11-14/0846, “CCA Study in Residential Scenario,” Gwen Barriac (Qualcomm)
      10. 11-14/0847, “Further Considerations on Enhanced CCA for 11ax,” John Son (WILUS Institute)
      11. 11-14/0854, “DSC and Legacy Coexistence,” William Carney (SONY)
      12. 11-14/0855, “Evaluating Dynamic CCA/Receiver Sensitivity Algorithms,” Brian Hart (Cisco Systems)
      13. 11-14/0856, “Techniques for Short Downlink Frames,” Brian Hart (Cisco Systems)
      14. 11-14/0858, “on Frequency Sensitive Multiplexing in WLAN Systems,” Kaushik Josiam (Samsung)
      15. 11-14/0861, “Impact of CCA adaptation on spatial reuse in dense residential scenario,” Sayantan Choudhury (Nokia)
      16. 11-14/0868, “UL & DL DSC and TPC MAC simulations,” Johan Soder (Ericsson)
      17. 11-14/0872, “A Protocol Framework for Dynamic CCA,” Sean Coffey (RealTek)
      18. 11-14/0880, “Increased Network Throughput with TX Channel Width Related CCA and Rules,” James Wang (MediaTek)
      19. 11-14/0889, “Performance Gains from CCA Optimizations,” Nihar Jindal (Broadcom)
      20. 11-14/419r1, “802.11ax Spec Development Process Proposed ,” Rolf De Vegt (Qualcomm)

Submissions will be confirmed during the PM2 session today.

Chair encouraged to put the documents on the server.

1. Tentative Agenda for Monday, July 14th, AM1 (8:30 – 10:30).
   1. Proposed Agenda
      1. Add Hoc Meeting
      2. Call meeting to order
      3. Patent policy, etc.
      4. Call for submissions.
      5. TG Structure
      6. Presentations
      7. Recess
   2. Chair asked if there are any other items – No items proposed. Meeting will be conducted based on this order.
2. Discussion on the TG structure – From Last Meeting
   1. Two Vice chairs: Responsibilities include running the TG meeting if the chair is unavailable.
   2. Create 4 ad hoc groups (MAC, PHY and others)
      1. Number of chairs per ad hoc is tbd
      2. Responsibilities include: running ad hoc meetings, developing spec framework document (SFD), draft development, maintain comment database
   3. An Editor
      1. Creating the SFD and adding text as it is approved by the task group
      2. Edit the draft amendment
   4. Discussion
      1. C: Good structure. Would like to hear open nomination at least for one week.
      2. C: Structure itself is good. But we do not need ad hoc groups right now.
   5. Presentation
      1. 11-14/419r1 “802.11ax Spec Development Process Proposed”, by Rolf De Vegt (Qualcomm)
         1. Summary
            1. The second presentation following the one given in Beijing meeting.
            2. Will have a straw poll.
         2. Discussions
            1. Phil (Huawei): Endorse the process.
            2. A member commented he expects resolve the regulatory related issues. 🡪 Chair suggested him to participate discussions in regulatory standing committee.
         3. **Straw Poll: Do you agree with the inclusion of a SFD (Spec Framework Document) step in the .11ax selection procedure?**
            1. **This is a straw poll and anyone can vote.**
            2. **Result: Y/N/A = 152/0/10**
   6. Continue discussion on the structure
      1. Vice chair election
         1. Some members asked to have enough time for nomination.
         2. Chair mentioned the possibility of opening nomination on Monday and having an election on Thursday.
            1. It will work if there only a few candidates. But it will be difficult if we have many candidates for the position.
            2. A member asked for clarification on the responsibility of vice chairs.

Chair mentioned that the primary responsibility of the vice chair is to run the meeting when the chair is not available.

* + - * 1. Another member suggested just one vice chair if the responsibility is just to run the meeting on behalf of the chair.
    1. Ad Hoc groups
       1. Ron Porat (Broadcom) suggested four ad hoc groups, i.e. PHY, MAC, MU and Spatial Reuse.
       2. Minho (Newracom) suggested PHY, MAC, MU and COEX ad hoc groups.
          1. Another member commented that he is not sure it is the right time to discuss about this topic without knowing the features of 802.11ax.
       3. Eric (Apple) suggested an ad hoc group to consider energy efficiency.
    2. Chair summarized the discussions:
       1. Ad Hoc groups: decision will be postponed, e.g. until November meeting.
       2. Vice Chair: Call for nomination will be issued soon.
          1. How many vice chairs? – Two vice chairs will be good.
          2. The chair opens nomination for the vice chair position(s). Will have an election during the Athens meeting in September 2014.

1. Presentations
   1. Planning
      1. There was a request to discuss CCA related submissions in the same slots
      2. CCA related submissions to be discussed in the AM1 and PM1 on Tuesday.
      3. Chair asked the authors of those documents to be ready by tomorrow.
   2. Nihar Jindal (Broadcom) presented “Modifications to Simulation Scenario and Calibration Process” based on 14/799r0
      1. Summary – proposed changes to the simulation scenarios on following points:
         1. Antenna Gain and Tx Power, Carrier Frequency, Wall Loss for Scenarios 1 and 2
         2. # of STAs in Scenario 3, Path Loss and Fading models for Scenario 2 and Scenario 3
         3. Minimum AP-STA distance, User dropping for Scenario 3 and 4, with reuse 1 and reuse 3
         4. System Simulation Calibration details.
      2. Discussions
         1. A member G asked for clarification of association
         2. Member C asked clarification on the STA behavior.
         3. Member P asked the background of the proposal to reduce the # of STA from 40 to 30 in Scenario 3.
            1. C: The impact of the active number of STA discussed.
            2. C: The effect of traffic model should also be considered.
            3. As a result of the discussion, Nihar changed some part of the proposal.
         4. Other discussions on Tx Power and User droppings
      3. **Straw Poll: Do you agree to the changes specified in slides 3-14?**
         1. **Result: 102/2/12**
         2. **Nihar will submit a motion to accept the changes.**
2. Ad hoc meeting adjourned @ 10.25. Next TGax meeting will be in PM2 (16:00) today.

**Monday, July 14th, 2014, PM2 TGax Session (16:00-18:00)**

1. Meeting called to order @ 16:00
   1. The agenda is contained in 11-14/0748r1
      1. Rev 2 is the working document.
   2. There were more than 200 people in the room.
2. Administrative Items
   1. Patent policy, etc.
      1. Chair reminded the IEEE 802 and IEEE 802.11 Policies and Procedures.
      2. Call for potentially essential patents
         1. Chair asked if anyone is aware of potentially essential patents.
         2. No potentially essential patents reported.
3. Call for submissions
   1. Slide 16 to slide 20 of the agenda contains submissions.
   2. Since we have large number of submissions, the presentation for each submission has to be limited to 20 minutes.
4. Set and approve agenda
   1. Proposed agenda for Monday PM2
      1. Call meeting to order
      2. Patent policy, etc.
      3. Call for submissions
      4. Set and approve agenda
      5. Summary from May 2014 meeting
      6. TG motions
         1. Approve TG meeting and Telecon minutes since May meeting.
      7. Presentations – Simulation Scenario and Evaluation Methodology
      8. Recess
   2. Chair asked for comments for the agenda. – No response.
   3. Chair asked for approval of the proposed agenda. – Agenda approved.
5. Summary from May 2014 meeting – 1 page summary
   1. Approved initial revisions of the TG Simulation Scenarios (11-14/0621r4) and Evaluation Methodology (11-14/0571r2) documents.
   2. Preliminary discussion on functional requirements.
   3. Preliminary discussion on TG structure.
   4. Approved TG timeline.
   5. Technical presentations
6. TG motions
   1. **Motion: Approve TGax minutes of meetings and teleconferences from May 2014 interim meeting to today:** 
      1. <https://mentor.ieee.org/802.11/dcn/14/11-14-0655-03-00ax-tgax-may-2014-meeting-minutes.docx>
      2. <https://mentor.ieee.org/802.11/dcn/14/11-14-0788-02-00ax-tgax-teleconference-minutes-2014-07-02.docx>
      3. Moved by Allan Jones (Activision), Seconded by Jim
      4. Result: Motion accepted with no objection.
7. Presentations – Simulation Scenario
   1. Wookbong Lee (LG Electronics) presented “Packet Length for Box 0 Calibration” based on the submission 11-14/0803r0.
      1. Summary
         1. Reference packet length for “Box 0: PHY abstraction calibration” proposed.
         2. Proposed reference packet lengths are accurately estimates performance for various packet sizes.
      2. Discussions
         1. Chair: What will be the next step for this contribution? Box 0 in the evaluation methodology.
         2. A member (Sharnaz@Intel) asked applicability of LDPC for the short packets.
         3. Another member asked relation between MIMO 🡪 That is a separate issue.
      3. **Motion (11-14/803): Move to include the following text in the Evaluation Methodology document**

* **For packet length PL, estimating PERPL from following equation**
* ***PERPL* = 1-(1-*PERPL*0)*PL*/*PL*0**
* **In case of BCC, PL0 is 32bytes for less than 400bytes and 1458bytes for other sizes**
* **In case of LDPC, PL0 is 1458bytes for all packet sizes**
  + - 1. **Moved by Wookbong Lee (LG), seconded by Ron Porat (Broadcom)**
      2. **Chair asked if there is any objection to accept the motion. No objection.**
      3. **Motion accepted.**
  1. Chao-Chum Wang (MediaTek) presented “Calibration of MAC Simulator with OBSS Network Scenario” based on submission 11-14/0895r0
     1. Summary
        1. 14/0621 r4 lists five MAC simulator calibration scenarios
        2. 11ax network will consists of 11ax STAs and legacy 11b/g/n/ac STAs.
        3. Proposal: MAC Calibration to include one or more cases to evaluate the performance of BSSs operate with different channel bandwidth
     2. Discussions
        1. No discussions.
     3. **Straw Poll: Do you agree to include the proposed test cases in the simulation calibration scenario?**
        1. **Discussion:**
           1. **A member asked for preference on the number of overlapping BSS? 🡪 Need discussion later.**
           2. **C: Intention of this proposal just for calibration. Should not be too complicated.**
        2. **Straw Poll: Do you agree to include** 
           1. **Result: Y/N/A = 44/8/65**
  2. Gwen Barriac (Qualcomm) presented “Proposed Clarifications for MAC calibration section in Simulation Scenario Document” based on submission 11-14/0850r0
     1. Summary
        1. Proposed to add extra text to the simulation scenarios document to clarify the MAC calibration procedure.
        2. Proposed text for test 2b contained slide 3.
     2. Discussions
        1. A member asked the reason of PER 0 when ACK overlaps with the transmission of an OBSS AP. 🡪 Can be assumed that enough SINR is obtained.
        2. Discussed how to model the interference in the MAC simulation.
        3. A clarification requested for the PER definition.
  3. Zhou Lan (Huawei) presented “MAC Clarifications Results” based on submission 11-14/0869r0.
     1. Summary
        1. Simulation scenarios and evaluation method for MAC system calibration defined in 14/621r4 and 14/571r2.
        2. Preliminary results on MAC calibration presented.
        3. Zhou Lan encouraged other companies to submit their results.
     2. Discussions
        1. Discussed about the use of frame aggregation.
        2. Objective of NAV deferral test discussed.
  4. Yarkko Kneckt (Nokia) presented “MAC Calibration Text to Simulation Scenarios” based on submission 11-14/0892r0
     1. Summary
        1. Presented MAC calibration tests to be added for the Simulation Scenarios document.
     2. Discussions
        1. Discussed difference between PPDUduration and DataPPDUduration on slide 3.
        2. Chair asked what will be the next step. Yarkko to prepare further submission.
  5. Brian Hart (Cisco Systems) presented “Technique for Short Downlink Frames” based on submission 11-14/0855r0
     1. Summary – Proposal: Add to the SFD
        1. What is the best way to send 4 downlink frame to 4 clients, in an 80 MHz BSS, where each frame carries 90 octets?
        2. “The 802.11ax amendment shall require a solution that provides significantly increased efficiency for short MSDUs (<250 octets) intermittently transmitted to different non-AP STAs”
     2. Discussions
        1. Some members asked questions on Technique ID 4 (DL OFDMA data + UL MU-MIMO ACK) and Technique ID 5 (DL OFDMA data + UL OFDMA ACK)
        2. Discussed the effect of sounding for uplink MU transmissions.

1. **Motion (14/799r1)**

**Move to agree to the changes specified in slide 3 to 13.**

* **To be included in simulation scenario document.**
  1. **Moved by Nihar Jindal (Broadcom), Seconded by Wookbong Lee (LG Electronics)**
  2. **Chair asked if there is any objection to accept the motion. No objection. Motion accepted.**

1. Recess @ 18:00 until Tuesday AM2 (10:30 AM)

**Tuesday, July 15th, 2014, AM2 TGax Session (10:30-12:30)**

1. Meeting called to order by Osama Aboul-Magd (Huawei Technologies), chair of TGax, @ 10:30 AM.
   1. The agenda document 11-14/0748r2 is on the server.
      1. Rev 3 is the working document.
      2. There were 240 people in the room.
2. Reminder
   1. Chair reminded that we are still operating under the IEEE 802 and IEEE 802.11 Policy and Procedures.
   2. Chair asked people to address himself/herself when speak for the first time.
   3. Chair also reminded people to do attendance.
   4. Chair mentioned that he will not accept new submissions since we have more than enough.
      1. Chair will ask for additional meeting slots during the mid-week plenary tomorrow.
3. Agenda setting
   1. Proposed agenda
      1. Call Meeting to order
      2. IEEE 802 and 802.11 IPR Policy and procedure.
      3. CCA related presentations
         1. 14/0833, “Residential Scenario Sensitivity and Transmit Power Control Simulation Results,” Pengfei Xia (InterDigital)
         2. 14/0779, “Dynamic Sensitivity Control Practical Usage,” Graham Smith (DSP Group)
         3. 14/0854, “DSC and Legacy Coexistence,” William Carney (Sony)
         4. 14/0856, “Evaluating Dynamic CCA/Receiver Sensitivity Algorithms,” Brian Hart (Cisco Systems)
         5. 14/0872, “A Protocol Framework for Dynamic CCA,” Sean Coffey (RealTek)
         6. 14/0864, “CCA Study in Residential Scenario,” Gwen Barriac (Qualcomm)
         7. 14/0851, “Rate Control for MAC and Integrated System Simulation,” Gwen Barriac (Qualcomm)
      4. Recess
   2. Chair asked if there is any objection to proceed with this agenda. No objection.
      1. The agenda for Tuesday AM2 was approved.
4. Presentations:
   1. Pengfei Xia (InterDigital) presented “Residential Scenario Sensitivity and Transmit Power Control Simulation Results” based on the submission 14/0833r0
      1. Summary
         1. MAC simulation results with different transmit power level and sensitivity level in a dense residential apartments scenario was presented.
         2. Reducing the Tx Power has a potential to improve system performance.
         3. Sensitivity control improves system performance.
      2. Discussions
         1. Clarifications asked for the simulation scenario and what exactly done for the CCA threshold control.
         2. A member asked about the CCA threshold level and the effect of interference. 🡪 This is MAC level simulation and need to do PHY simulation for it.
   2. Graham Smith (DSP Group) presented “Dynamic Sensitivity Control Practical Usage” based on the submission 14/0779r2.
      1. Summary
         1. For managed/enterprise area networks DSC has huge advantages and pretty simple to set up. In residential networks DSC is particularly advantageous for the dense apartment scenario.
         2. In practice the presetting of UL to -30/40dBm and Margin to 20/25dB would probably show significant advantages with respect to efficiency and OBSS.
      2. Discussions
         1. Why DSC STAs can have high throughput even when there are legacy STAs. 🡪 DSC STA can transmit a frame if the interference level is acceptable.
         2. Discussed the relation between the CCA sensitivity and location of a STA having low RSSI.
         3. (Slide 21): Clarification asked for the behaviors of legacy and DSC STAs.
         4. A member expressed concern to reduce the sensitivity especially in the OBSS environment.
   3. Yuichi Morioka (SONY) presented “DSC and Legacy Coexistence” based on the submission 14/0854r0.
      1. Summary
         1. The impact of using DSC in TGax on other Legacy STA exists and is not negligible.
         2. As the number of STAs increases (e.g., dense scenarios), the degradation on performance of Legacy STAs also increases.
         3. Suggest to evaluate impact on fairness with legacy STAs when conducting DSC simulations.
      2. Discussions
         1. Clarifications asked for the simulation conditions such as aggregation, use of RTS/CTS.
   4. Brian Hart (Cisco Systems) presented “Evaluating Dynamic CCA/Receiver Sensitivity Algorithms”, based on the submission 14/0856r0.
      1. Summary
         1. It is easy to design dynamic CCA or dynamic receiver sensitivity algorithms that work well in a network of similarly sized / relatively non-overlapping BSSs.
         2. To preserve Wi-Fi’s “it just works” property, we need something better – something that works even in overlapping BSSs with very different sizes and geometries.
         3. This is not a pipe-dream – such ideas are available.
      2. Discussions
         1. A member emphasized the importance of robustness.
         2. Some solutions suggested for this technology to be more effective.
         3. The effect of RTS/CTS handshake with the DSC discussed.
   5. Sean Coffey (RealTek) presented “A Protocol Framework for Dynamic CCA”, based on the submission 14/0872r0.
      1. Summary
         1. A protocol for dynamically varying CCA thresholds presented.
         2. Extra considerations: (i) Protocol could operate on an AP-control basis, and (ii) Protocol could also operate on the basis of AP control of the enabling parameters.
      2. Discussions
         1. Discussed if the number of transmissions could converge to an optimal number.
         2. The question is how to prevent the transmission affecting too much to another transmission and a member commented he is not sure if the algorithm works appropriately.
         3. Need to understand relation between this technology and power control.

Chair asked for extension of the meeting time for the next presenter to have 20 min.

* 1. Gwen Barriac (Qualcomm) presented “Changing CCA in the Residential Environment”, based on 14/0846r1.
     1. Summary
        1. Optimal CCA levels are highly dependent on parameter settings.
        2. Difficult to get simultaneously optimize both mean and 5% point.
        3. Two proposals: (i) use of rate control, and (ii) deferral method to be used MAC calibration.
     2. Discussions
        1. Relation between CCA threshold and airtime fairness discussed.
        2. A member commented that the rate adaptation method will have a big impact on the throughput.

1. Recess at 12:32 until Tuesday PM2 (16:00) today.

**Tuesday, July 15th 2014, PM1 Session (13:30-15:30)**

1. The meeting called to order by Osama Aboul-Magd (Huawei Technologies), the chair of TGax, @13:35
   1. Agenda 11-14/0748r2 is on the server. Rev 2 is working document.
   2. There were 220+ people in the room.
   3. Chair reminded that this meeting is operated under the IEEE 802 and IEEE 802.11 P&P.
   4. Chair asked to limit presentation time
2. Proposed agenda for this session
   1. Tuesday PM1
      1. Call Meeting to order
      2. Reminder
         1. IEEE 802 and 802.11 IPR Policy and procedure.
         2. Attendance.
      3. CCA related presentations – continued.
         1. 11-14/832, “Performance Evaluation of OBSS Densification,” Po-kai (Intel)
         2. 11-14/847, “Further Considerations on Enhanced CCA for 11ax,” John Son (WILUS)
         3. 11-14/861, “Impact of CCA adaptation on spatial reuse in dense residential scenario,” Sayantan (Nokia)
         4. 11-14/868, “,” Johan Soder (Ericsson)
         5. 11-14/880, “Increased Network Throughput with Channel Width Related CCA and Rules,” James Wang (MediaTek)
         6. 11-14/889, “Performance Gains from CCA Optimization,” Nihar Jindal (Broadcom)
      4. Recess
   2. Tuesday PM3
      1. Call Meeting to order
      2. IEEE 802 and 802,11 Policy and Procedures
      3. Presentation
         1. 11-14/0904 “In-Cabin WiFi Channel Model: Preliminary Ray Tracing Simulations”, Fan Bai (General Motors)
         2. 11-14/0567, “Proposed TGax Functional Requirements”, (Marvell)
         3. 11-14/0818, “Requirements for synchronization”, Yonggang Fang (ZTE)
         4. 11-14/0821, “Coexistence Requirements of 802.11 WLAN and LTE in Unlicensed Spectrum”, Alireza Babaei (CableLabs).
         5. 11-14/0835, “Functional Requirements Discussion”, Ron Murias (InterDigital)
      4. Recess
   3. Chair asked if there are any objections to proceed with this agenda – no objections.
      1. The agenda approved.
3. Presentations
   1. Po-kai Huang (Intel) presented “Performance Evaluation of OBSS Densification” based on the submission 14/0832r0.
      1. Summary
         1. Potential gain from CCA control can be expected. 🡪 Can be a basis for OBSS densification techniques.
         2. The best CCA level for mean and 5% throughput may not be a fixed value.
         3. Raising CCA levels for AX devices directly will affect the performance of legacy devices.
      2. Discussions
         1. (Slide 5): Reason for the simply increasing throughput questioned.
         2. (Slide 3): Discussed the effect of arrival time difference between the desired and interference signals.
         3. (Slide 4): A member commented that additional 10 dB should be considered in the fading environment.
   2. John Son (WILUS Institute) presented “Further Considerations on Enhanced CCA for 11ax” based on the submission 14/0847r1.
      1. Summary
         1. Several Enhanced CCA options while utilizing 11ah’s BSS color feature with legacy consideration analyzed.
         2. Provided detailed design of Enhanced CCA that utilizes 11ah’s BSS color feature and consideration of legacy devices.
      2. Discussions
         1. There was a question asking how to protect the transmission.
   3. Sayantan (Nokia) presented “Impact of CCA adaptation on spatial reuse in dense residential scenario” based on 14/0861r0.
      1. Summary
         1. Both CCA approaches (BSS Color and Rx Sensitivity Adaptation) can lead to higher spatial reuse.
         2. Need to investigate the achievable gains in different scenarios (e.g., outdoor) and heterogeneous environments (e.g., in presence of legacy nodes or apartment building scenario with different BSS’s using different CCA levels).
      2. Discussions
         1. “Increasing threshold decreases SINR. However, the observed SINR levels are still high” 🡪 SINR depends on the network topology.
         2. DSC and channel selection makes significant increase of the throughput.
         3. A member asked for the reason why result of 3 channels has higher throughput.
   4. Johan Söder (Ericsson) presented “UL & DL DSC and TPC MAC simulations” based on the submission 14/0868r0.
      1. Summary
         1. DSC improves UL performance while setting the CCA threshold at AP (for transmission in DL) gives improvements in DL.
         2. Combining DSC and DL CCAT setting gives a well-balanced UL & DL performance.
         3. TPC gives system capacity gains.
      2. Discussions
         1. Comment: The effect of legacy STAs on the use of power control scheme needs to be considered.
   5. James Wang (MediaTek) presented “Increased Network Throughput with Channel Width related CCA and Rules” based on 14/0880r1.
      1. Summary
         1. Current CCA levels and transmission rules: lower likelihood of wider channel width transmissions.
         2. Significant network throughput increase can be accomplished in dense deployment scenarios due to higher CCA level and transmissions in wider channel width.
         3. Simulation results to be presented.
      2. Discussions
         1. (Slide 9) Some people asked for the reason of primary CCA levels for different channel width 🡪 just suggest the values.
         2. A member asked a question about the preamble preamble detection.
   6. Nihal Jindal (Broadcom) presented “Performance Gains from CCA Optimization” based on 14/0889r3.
      1. Summary
         1. CCA optimization provides very significant gains for simulation scenarios 1, 2, and 3, in terms of mean and 5% throughput.
         2. Dynamic CCA threshold selection still an open issue
         3. PHY system simulations showing (considerably) larger gains from CCA optimization than MAC simulations – what does this mean?
            1. An appropriately modified 802.11 MAC should be able to achieve all/much of this gain.
      2. Discussions
         1. (Slide 10 & 11): A member asked about the difference of performance curves between slide 10 and 11. 🡪 The effect of channel reuse.
         2. Some members commented that the uplink transmissions need to be investigated.
         3. A member commented that the interference caused by other BSSs need to be considered.
4. Recessed at 15:32 until PM3 (21:30) today.

**Tuesday, July 15th 2014, PM3 Session (19:30-:21:30)**

1. The meeting called to order by Osama Aboul-Magd (Huawei Technologies), the chairperson of TGax, @19:30
   1. Agenda 11-14/0748r3 is on the server. Rev 4 is working document.
   2. There were 180 people in the room.
2. Reminder and announcements
   1. Chair reminded that this meeting is operated under the IEEE 802 and IEEE 802.11 P&P.
   2. Chair also reminded people to do attendance.
   3. We still have 27 presentations to go and the chair will request an additional meeting slot during the WG mid-week plenary session – Wednesday PM2 or Thursday AM2.
3. Proposed agenda for this session
   1. Tuesday PM3
      1. Call Meeting to order
      2. IEEE 802 and 802.11 IPR Policy and procedure.
      3. Presentations
         1. 11-14/0904 “In-Cabin Wi-Fi Channel: Preliminary Ray Tracing Simulations,” Fan Bai (General Motors)
         2. 11-14/0567, “Proposed TGax Functional Requirements,” Lei Wang (Marvell)
         3. 11-14/0818, “Requirements for synchronization,” Yonggang Fang (ZTE)
         4. 11-14/0821, “Coexistence Requirements of 802.11 WLAN and LTE in Unlicensed System,” Alireza Babarei (CableLabs)
         5. 11-14/0835, “Functional Requirements Discussions,” Ron Murias (InterDigital) 🡪 deferred to Thursday AM1.
         6. One more presentation may be accommodated if we have time and a volunteer who is ready to present.
      4. Recess
   2. Chair asked if there are any objections to proceed with this agenda – no objections.
      1. The agenda approved.
4. Presentations
   1. Fan Bai (General Motors) presented “In-Cabin WiFi Channel: Preliminary Ray Tracing Simulations” based on the submission 14/0634r0.
      1. Summary
         1. Despite the multipath in the cabin, 1-ray (direct path) models perform reasonably well for co-polarized component (RMS error ~ 5dB).
         2. Crude model with angle-independent gain only about ½ dB worse RMS error than using actual fields from patch & dipole.
         3. Single specular reflections can be used to generate fluctuations with similar RMS values and distributions as those measured.
         4. Empirically, it appears depolarization from scattering dominates much of the region of interest for cross-polarized components, so specular-reflection models are less useful.
      2. Discussions
         1. A member asked for more information on the channel model. 🡪 It is purely based on the RSSI.

The second question relates to the environment such as OBSS interference.

* + - 1. Another member asked for basic assumptions such as EIRP.
      2. C (slide 21): A member mentioned he was confused to see the graphs.
  1. Lei Wang (Marvell) presented “Proposed TGax Functional Requirements” based on the submission 14/0567r5.
     1. Summary
        1. Lei had gone through the revised functional requirements document.
        2. Lei asked for feedback from people interested in this topic.
     2. Discussions
        1. (TGax R1): This requirement is too strong.
        2. Too many requirements.
        3. Rationale for R5 (95th percentile throughput) asked. The intention is not to sacrifice the top throughput.
  2. Yonggang Fang (ZTE) presented “Requirements for synchronization”, based on 14/0818r0.
     1. Summary
        1. Benefits of Control Frequency/Timing Sync Errors: (1) Improve the system performance (SINR, PER), and (2) Improve the multipath tolerance in OFDM system.
        2. Should define requirements for synchronization: (1) The carrier frequency synchronization error between the carrier frequency of STA and the carrier frequency received from the AP shall be within N% (TBD) of sub-carrier space, and (2) The transmit time measured at the STA antenna port shall be aligned with the symbol boundary of received frame from AP within M ns (TBD).
     2. Discussions
        1. (Slide 14): Requirement for the timing synchronization discussed.
        2. (Slide 8): A clarification requested for frequency synchronization.
        3. (Slide 12): Coexistence with the LTE-U discussed from the view point of timing synchronization.
     3. **Straw Polls**
        1. **Straw Poll #1: Do you support to add requirement about the …**
           1. Result: Y/N/A = 45/2/64
        2. **Straw Poll #2: Do you support to add requirement about the …**
           1. Result: Y/N/A = 41/5/75
  3. Alireza Babarei (CableLabs) presented “Coexistence Requirements of 802.11 WLAN and LTE in Unlicensed System”, based on 14/0821r2.
     1. Summary
        1. Proposed that following requirement to be added to the 802.11ax FR document:
           1. The TGax amendment shall define a mechanism or mechanisms to ensure “minimum performance levels (TBD)” for TGax devices when coexisting with non-listen-before-talk compliant devices in the same unlicensed band.
     2. Discussions
        1. The protocol of LTE-U has not specified yet and may not have listen-before-talk features. 3GPP has not approved such a project yet. It is too early to consider such a system. The commenter identified some more issues.
        2. A member commented on the “fairness”. Coexistence is very important both IEEE and 3GPP should think about. Both parties should comply with the common requirements.
        3. General coexistence statement in the functional requirement will be good. 🡪 Chair mentioned we will create Coexistence Assurance document.

1. Recessed at 21:29 until Wednesday AM1 (8:00 AM).

**Wednesday, July 16th 2014, AM1 Session (8:00-10:00 AM)**

1. The meeting called to order by Osama Aboul-Magd (Huawei Technologies), the chairperson of TGax, @8:02
   1. Agenda 11-14/0748r4 is on the server. Rev 5 is working document.
   2. There were 200+ people in the room at the beginning of the session. More people came in later.
2. Reminder and Announcements
   1. Chair reminded that this meeting is operated under the IEEE 802 and IEEE 802.11 P&P.
   2. Chair asked people to address himself/herself when speaking for the first time.
   3. We still have many presentations to hear. The chair asked each presentation to be done in 20 minutes including Q&A.
3. Agenda for this session
   1. Wednesday AM1
      1. Call Meeting to order
      2. Reminder and Announcements
         1. IEEE 802 and 802.11 IPR Policy and procedure.
         2. Attendance.
      3. Presentations
         1. 11-14/0882, “TGax Channel Model Document”, Jianhan Liu (Mediatek)
         2. 11-14/0851, “Rate Control for Mac and Integrated System Simulations” Gwen Barriac (Qualcomm)
         3. 11-14/0859, “Proposing a Stadium Scenario”, Hakan Persson (Ericsson)
         4. 11-14/0860, “Text proposal of a Stadium scenario to ax”, Hakan Persson (Ericsson)
         5. 11-14/0894, “Calibration of System Level Simulators”, Sayantan Choudhury (Nokia)
         6. 11-14/0871, “Further calibration towards Integrated system level simulation”, Jiyong Pang (Huawei)
         7. 11-14/0800, “Box 1 and Box 2 Calibration Results” Nihar Jindal (Broadcom)
      4. Recess
   2. Chair asked if there are any objections to proceed with this agenda – no objections.
      1. The agenda approved.
4. Presentations

Chair asked to limit the time for each presentation to 20 minutes.

* 1. Jianhan Liu (MediaTek) presented “TGax Channel Model Document” based on the submission 14/0882r2.
     1. Summary
        1. Jianhan had gone through the channel model document highlighting the changes.
           1. For STA-STA indoor channel: TGn channel model is assumed.
     2. Discussions
        1. A member asked for the background on speed of 60Km/h. The answer was to take the effect of the moving object in 60 Km/h into account.
        2. Another member asked if the model could be simplified. Need to have offline discussion.
     3. Chair mentioned we will have a motion to adopt the document tomorrow.
  2. Jiyong Pang (Huawei Technologies) presented “Further Calibration Results towards Integrated System Level Simulation” based on the submission 14/0871r1.
     1. Summary
        1. The calibration results of Scenario 1 – Residential were presented for all Boxes based on latest scenario parameters.
        2. We also provided results of Box-4 and Box-5 with suggested MAC and PHY features for varying CCA threshold.
        3. We recommended using Integrated SS to show more realistic mean and 5% percentile throughputs due to joint modelling of PHY and MAC details.
     2. Discussions
        1. (Slide 8): What exactly was changed here? CCA threshold includes signal detection and energy detection. The answer was signal detection.
        2. A member asked about the MAC overhead that should be considered in the simulation such as Beaconing and Association.
        3. Another member asked about the use of RTS/CTS procedure.
  3. Esa Tuomaala (Nokia) presented “Calibration of System Level Simulators” based on the submission 14/0894r0.
     1. Summary
        1. Simulation calibration verifies that simulators generate the same results on the same simulation scenario.
           1. Calibration improves simulations reliability.
        2. The presentation shows the calibration results for HEW scenario 1 and scenario 3 [1] with different channel allocation.
     2. Discussions
        1. No discussion.
  4. Hakan Persson (Ericsson) presented “Proposing a Stadium Scenario” based on the submission 14/0859r0.
     1. Summary
        1. Stadium has been acknowledged as a important use case for the ax-technology.
        2. The stadium scenario needs specific conditions to evaluate.
     2. Discussions
        1. A member asked for assumptions for the directional antennas.
        2. Discussed the use of the directional antenna (slide 3) and assumption for the environment (i.e., indoor/outdoor in slide 7)
        3. UMi LOS model can be assumed for the channel model. Another member suggested separate models for indoor and outdoor environments.
     3. **Straw Poll: Do you agree to include the text in document 11-14/860r0 …?** 
        1. **Discussions**
           1. **Some members mentioned the straw poll should be deferred.**
           2. **Result: Y/N/A = 66/25/48**
  5. Nihar Jindal (Broadcom) presented “Box 1 and Box 2 calibration results” based on the submission 14/0800r3.
     1. Summary
        1. Simulation results of Broadcom, Huawei, LG and Marvell were compared.
        2. Nihar encouraged other companies to provide their results.
     2. Discussions
        1. No discussion.
  6. Gwen Barriac (Qualcomm) presented “Rate Control for Mac and Integrated System Simulations” based on the submission 14/0851r.
     1. Summary
        1. Simplified MCS selection method proposed.
        2. Use of the MCS selection method described in slide 5 as the Rate Control Method in the MAC Simulator.
     2. Discussions
        1. Discussed (1) how often the MCS selection is carried out, and (2) the effect of traffic model.
        2. Some members expressed concerns to fix the MCS for a long duration and the single MCS selection approach.
        3. A member mentioned he was confused to see the proposed changes to the current evaluation methodology (in slide 7).
        4. Another member asked how to apply this method to OFDMA simulations.

1. Recessed at 9:53 until PM1 (13:30) today.

**Wednesday, July 16th, 2014, PM1 Session (13:30-15:30)**

1. The meeting called to order by Osama Aboul-Magd (Huawei), the chair of TGax, @13:35
   1. About 180 people are in the room at the beginning of the session.
   2. Agenda Doc.11-14/0748r4 is on the server. Rev 5 still is the working document.
2. Reminder and Announcements
   1. Chair reminded IEEE 802 and 802.11 IPR P&P.
   2. Chair asked people to state name and affiliation when addressing for the first time in the session.
   3. Chair also reminded people to do attendance.
3. Agenda for this session
   1. Tuesday PM2
      1. Call the meeting to order
      2. Reminder and Announcements
         1. IEEE 802 and 802.11 IPR Policy & Procedure.
         2. Attendance
      3. Presentations
         1. 11-14/0938, “802.11ax Selection Procedure,” Rolf De Vegt (Qualcomm)
         2. 11-14/0810, “Overview on RBIR-based PHY Abstraction,” Yakun Sun (Marvell)
         3. 11-14/0811, “RBIR-based PHY Abstraction with Channel Estimation Error,” Yukun Sun (Marvell)
         4. 11-14/0827, “Energy Efficiency Evaluation Methodology,” Eric Wong (Apple)
         5. 11-14/0865, “ACI and AACI for 802.11ax,” Yu Cai (Huawei)
         6. 11-14/0875 “VoIP Traffic Model Content for 11ax EVM & SS,” Phillip Barber (Huawei)
         7. 11-14/0874, “Unified traffic model on enterprise scenario,” Phillip Barber (Huawei)
         8. 11-14/0873, “Discussion on PHY abstraction for 11ax system level simulations,” Jiayin Zhang (Huawei).
         9. 11-14/0866, “Traffic modeling and system capacity performance measure,” Johan Soder (Ericsson)
      4. Recess
   2. Chair asked if there are any objections to proceed with this agenda – no objections.
   3. Agenda was approved.
4. Presentations
   1. Yakun Sun (Marvell) presented “RBIR-based PHY Abstraction with Channel Estimation Error” based on the submission 11-14/0810r0.
      1. Summary
         1. RBIR-based PHY abstraction has been evidently accurate in predicting PER for ideal channel estimation.
         2. A simple method of incorporating channel estimation error in PHY abstraction proposed: (1) assume LS channel estimation for SLS PHY abstraction, (2) LS channel estimation error in PHY abstraction is modeled as addition AWGN with variance of Nss/NLTF x σ2.
      2. Discussions
         1. Can be agreed with basic approach. One possible amendment will be to use SINR instead of SNR.
         2. Chair asked for the next step for this. The intention was to make people think about this issue.
   2. Yakun Sun (Marvell) presented “Overview on RBIR-based PHY Abstraction” based on the submission 14/0811r1.
      1. Summary
         1. An overview on RBIR PHY abstraction including the RBIR Lookup Table is presented.
      2. Discussions
         1. (Re: slide 5): Clarification required for the procedure of RBIR PHY abstraction.
         2. (Re: slide 11): “Further Works” – how to do these?
      3. **Straw Poll: Do you agree to include the procedure of PHY abstraction in slide 4-5 of doc.11-14/811r3 into EMD (11-14/571r2).**
         1. **Result: Y/N/A = 82/0/35**
   3. Rolf De Vegt (Qualcomm) presented “802.11ax Selection Procedure (DRAFT)” based on the submission 14/0938r0.
      1. Summary
         1. Rolf had gone through the DRAFT 802.11ax selection procedure.
         2. The selection procedure was created based on the 802.11ai selection procedure.
         3. Will have a motion to adopt the document.
      2. Discussions
         1. (Re: Flow Chart): The relation between the functional requirements and spec framework asked for.
         2. Will have a motion during Thursday PM1 session.
   4. Jiayin Zhang (Huawei Technologies) presented “PHY Abstraction Tables for 11ax System Level Simulation” based on the submission 14/0873r1.
      1. Summary
         1. In this proposal, the PHY abstraction tables were provided (an excel file attached).
         2. Using the calibrated tables facilitates multiple companies to derive same SLS results under same assumptions.
         3. Suggest inclusion these results in the section of PHY abstraction in EMD document.
      2. Discussions
         1. No discussion.
      3. **Straw Poll: Do you support to include the following curves into Evaluation Methodology Document**
         * **Post SINR to MI mapping curves for BPSK/QPSK/16QAM/64QAM/256QAM**
         * **Effective SNR to PER mapping curves for MCS0~MCS9 of BCC 32bytes/1458bytes and LDPC 1458bytes.**
         * **These curves were averaged from multiple companies' results**
         1. **Discussions**
            1. **Clarification asked for the excel sheet.**
         2. **Result: Y/N/A = 73/0/38**
   5. Eric Wong (Apple) presented “Energy Efficiency Evaluation Methodology” based on the submission 14/0827r3.
      1. Summary
         1. Method to evaluate energy efficiency for 802.11ax proposed.
         2. Changes to the simulation scenario proposed.
         3. Incorporate proposed power model to the evaluation methodology document.
      2. Discussions
         1. (Re: slide 13): A member mentioned that the requirement in slide 13 is a kind of overall requirement. Need to reconsider the wording.
         2. (Re: slide 18): Clarification asked for the table in slide 18.
         3. A member asked for the applicability of power save features to the existing scenarios.
         4. Another member asked for how to change the simulation scenarios.
         5. Measurement period of the power asked. Also, asked for the devices types.
5. Recess @ 15:20 until PM2 (16:00) today.

**Wednesday, July 16th, 2014, PM2 Session (16:00-18:00)**

1. The meeting called to order by Osama Aboul-Magd (Huawei), the chair of TGax, @16:01
   1. About 160 people are in the room.
   2. Agenda Doc.11-14/0748r4 is on the server. Rev 5 still is the working document.
2. Reminder and announcement
   1. Chair reminded IEEE 802 and 802.11 IPR P&P.
   2. Chair asked people to state name and affiliation when addressing for the first time in the session.
   3. Attendance
3. Agenda for this session
   1. Wednesday PM2
      1. Meeting call to order
      2. Reminder
         1. IEEE 802 and IEEE 802.11 Policy and Procedure
         2. Attendance
      3. Presentations
         1. 11-14/865, “ACI and AACI for 802.11ax System Simulations,” Yu Cai (Huawei)
         2. 11-14/875, “VoIP Traffic Model content for 802.11ax EVM and SS,” Philip Barber (Huawei)
         3. 11-14/874, “Unified traffic model on enterprise scenario,” Philip Barber (Huawei)
         4. 11-14/866, “Traffic modeling and system capacity performance measure,” Johan Soder (Ericsson)
      4. Recess
   2. Chair asked if there are any items to be added to the agenda. No responses.
   3. Agenda approved without objections.
4. Presentations
   1. Yu Cai (Huawei Technologies) presented “ACI and AACI for 802.11ax System Simulations” based on the submission 14/0865r1
      1. Summary
         1. Impact of Adjacent channel interference (ACI) or alternative adjacent channel interference (AACI) needs to be taken into consideration in system simulation.
         2. Two types ACI impairments and their impact on system performance.
      2. Discussions
         1. Regulatory requirements should be considered for the spectrum mask.
         2. Discussed if we still need to consider ACI in the scenario 3 where only one channel is assumed?
   2. Johan Söder (Ericsson) presented “Traffic modeling and system capacity performance measure,” based on submission 11-14/866r1.
      1. Summary
         1. Traffic modeling is not related to how many STAs per BSS there are, but rather how much traffic load there is in a certain scenario (i.e., certain area).
         2. System capacity should be measured by the amount of traffic that the system can handle, maintaining a certain level of user experience.
         3. Proposals: (1) Model file transfer, web browsing and video streaming using the proposed method, (2) Evaluate system capacity using the proposed methodology.
      2. Discussions
         1. Evaluation Methodology document already contains some of traffic models.
         2. Question about the payload size and arrival process asked.
         3. Clarification requested on the term of “Packet” 🡪 L3 (IP) data unit.
   3. Jinsoo Choi (LG Electronics) presented “Envisioning 11ax PHY Structure – Part I” based on the submission 11-14/0804r1.
      1. Summary
         1. Purpose of 11ax system is to support a lot of use cases and different channel environments.
         2. Based on the requirements, we analyzed OFDM numerology and proposed 11ax PHY structure, 4-times FFT extension and Two CPs: {1/32 or 1/16} CP and {1/8 or 1/4} short CP should be considered.
      2. Discussions
         1. A member expressed concern that preamble part may not be robust enough.
         2. Another member asked about the proposal of two CPs and expressed concern.
   4. Dongguk Lim (LG Electronics) presented “Envisioning 11ax PHY Structure – Part II” based on the submission 14/0801r0.
      1. Summary
         1. CFO is not a critical issue to adopt 4x larger size of FFT in the 802.11ax.
         2. The conventional CP length (0.8us) is not secure the robustness in the outdoor environments.
      2. Discussions
         1. A member asked for the way to detect the packet.
   5. Jinsoo Ahn (Yonsei University) presented “Discussion on OFDMA in IEEE 802.11ax” based on 14/0839r1.
      1. Summary
         1. To achieve goal of 802.11ax, we need to consider not only just adopting OFDMA but also discussing about dense AP and OBSS scenario.
         2. Because using wideband and OFDMA might decrease real world performance and efficiency in dense AP scenarios, we need to evaluate the performances and find solutions.
      2. Discussions
         1. No question.
   6. Woojin Ahn (Yonsei University) presented “Discussion on dual-link STR in IEEE 802.11ax” based on the submission 14/0838r1.
      1. Summary
         1. In-band STR is emerging as a novel technique which could lead a great throughput enhancement.
         2. Dual-link setup is important to fully exploit the spectral efficiency gain of STR.
         3. Further discussions are necessary to take advantage of STR in 802.11ax.
      2. Discussions
         1. Q: Have this technique demonstrated with MIMO? 🡪 MIMO is independent issue with this.
      3. **Straw Poll: Should in-band STR feature be considered in 802.11ax (including adoption as an optional feature)?**
         1. Result: Y/N/A = 5/4/many
5. Plans for tomorrow AM1 – contained in the agenda rev 5.

Six minutes left. Chair asked if we have any business to conduct. No response.

1. Recess @ 18:00 until AM1 (8:00) Thursday morning.

**Thursday, July 17th, 2014, AM1 Session (8:00-10:00)**

1. The meeting called to order by Osama Aboul-Magd (Huawei Technologies), the chairperson of the TGax, @8:03 AM
   1. About 200 people are in the room.
   2. Agenda rev 5 is on the server. Rev. 6 is the working document.
2. Reminder and Announcements
   1. Chair reminded IEEE 802 and 802.11 IPR P&P.
   2. Chair reminded people to do attendance.
3. Agenda for this session
   1. Thursday AM1
      1. Call Meeting to order
      2. Reminder
         1. IEEE 802 and 802.11 IPR Policy and procedure.
         2. Attendance
      3. Presentations
         1. 11-14/875 “VoIP Traffic Model Content for 11ax EVM & SS”, Phillip Barber (Huawei)
         2. 11-14/874, “Unified traffic model on enterprise scenario”, Phillip Barber (Huawei)
         3. 11-14/0802, “Consideration on UL MU transmission”, Jinyoung Chun (LG Electronics)
         4. 11-14/0858, “on Frequency Sensitive Multiplexing in WLAN Systems”, Kaushik Josiam (Samsung)
         5. 11-14/0835, “Functional Requirements Discussion”, Ron Murias (InterDigital)
         6. Straw Poll – Stadium Scenario
      4. Recess
   2. Chair asked if there are any modifications to the agenda.
   3. Agenda approved without objections.
4. Presentations
   1. Phillip Barber (Huawei Technologies) presented “VoIP Traffic Model Content for 11ax Evaluation Methodology & Simulation Scenarios”, based on the submission 14/0875r0.
      1. Summary
         1. Consideration for VoIP traffic in the simulation scenario and evaluation methodology proposed.
         2. Text for simulation scenario and evaluation methodology presented.
      2. Discussions
         1. Is VoIP traffic model to be included in MAC level simulation or system level simulation? 🡪 System level simulation makes more sense.
      3. **Straw Poll: Do you agree to include the text in submission 11-14/875r0 into the Evaluation Methodology document and the Simulation Scenarios document?**
         1. **Result: straw poll accepted without objection.**
      4. Next step: Phillip to work with Ron and Simone.
   2. Phillip Barber (Huawei Technologies) presented “Unified Traffic Model on   
      Enterprise Scenario,” based on the submission 14/0874r0.
      1. Summary
         1. Proposed a unified traffic model for scenario 2 - Enterprise scenario, integrating the multiple traffic types used in Enterprise scenario.
      2. Discussions
         1. No discussions.
         2. Phillip made a recommendation to use individual traffic model for system level simulations since the complexity is essentially is the same.
   3. Jinyoung Chun (LG Electronics) presented “Consideration on Uplink MU Transmissions” based on the submission 14/0802r0.
      1. Summary
         1. Procedure of UL MU transmission and related issues to support UL MU transmission in 11ax discussed.
         2. Future works include the protection mechanism, processing time for the UL frames and medium access procedure.
         3. Need more study on how much gain can be expected.
      2. Discussions
         1. Discussed ACK procedure for UL MU transmissions. Need to define an efficient mechanism.
         2. Any considerations for UL MU-MIMO? It in the scope of this contribution.
   4. Kaushik Josiam (Samsung) presented “Analysis on Multiplexing Schemes exploiting frequency selectivity”, based on the submission 14/0858r0.
      1. Summary
         1. Suggested that frequency selective multiplexing using OFDMA for consideration in the IEEE 802.11ax, and an initial analysis that captures the gains that can be obtained through OFDMA provided.
         2. OFDMA can be considered as a multiplexing technique in 802.11ax.
         3. The channel frequently favors OFDMA over SDMA.
      2. Discussions
         1. (Re: slide 16): SDMA and OFDMA is quiet different.
         2. A member asked about the intention of this analysis.
   5. Joe Kwak (InterDigital) presented “Functional Requirements Discussion”, based on the submission 14/0835r1.
      1. Summary
         1. General Problems with draft Functional Requirements include:
            1. Packet Delay (latency) requirement is inadequate
            2. Proposed Access Efficiency Requirement
      2. Discussions
         1. Some members disagreed with having those straw polls.
      3. **Straw Polls**
         1. **Straw Poll #1: Should all 11ax functional requirements be further detailed to remove ambiguities?**
            1. **Result: Y/N/A = 10/28/75**
         2. **Straw Poll #2: Should all 11ax functional requirements be further detailed to include minimum quantitative performance metric?**
            1. **Result: Y/N/A = 15/24/28**
         3. **Straw Poll #3: Should all 11ax functional requirements be mapped to appropriate simulation scenario(s)?**
            1. **Result: Y/N/A = 20/14/65**
         4. **Should 11ax include a functional requirement for access efficiency?**
            1. **Result: Y/N/A = 23/27/54**
5. Straw Polls and Motions
   1. Chao-Chun Wang (MediaTek) submitted a motion based on the submission 14/0895r1 “Calibration of MAC simulator with OBSS Network Scenario” presented on Monday.
      1. Chao-Chun explained the changes to the document.
      2. Discussions
         1. Motion is not ready. How do we proceed with this proposal? 🡪 Straw Poll is conducted.
      3. **Straw Poll: Do you agree to include the proposed test case on page 4 in the simulation calibration scenario document?**
         1. **Result: A/N/A = 59/0/46**
   2. Stephen Rayment (Ericsson) gave background relevant to this straw poll
      1. **Straw Poll: Do you support the inclusion of scenario 3a “Indoor Small BSSs Scenario for Stadium”, per document 11-14/860r2, as a sub-section of scenario 3 in the “TGax Simulation Scenarios” document 11-14/0621r4?**
         1. **Result: Y/N/A = 55/9/42**
      2. Further discussion
         1. C: Need more time to understand the changes made to the previous version. 🡪 Stephen to make a presentation during the PM1 session highlighting the changes, and after that submit a motion.
6. Recess @ 10:00 AM until PM1 (13:30) today.

**Thursday, July 17th, 2014, PM1 Session (13:30-15:30)**

1. The meeting called to order by Osama Aboul-Magd (Huawei Technologies), the chairperson of the TGax, @ 13:30.
   1. About 180 people are in the room at the beginning of the session.
2. Reminder and Announcements
   1. Chairperson reminded IEEE 802 and 802.11 IPR P&P.
   2. Chairperson reminded attendance.
   3. Agenda Doc.11-14/0478r4 is on the server. Rev 5 is the working document
3. Agenda for this session
   1. Thursday PM1
      1. Call Meeting to order
      2. Reminder
         1. IEEE 802 and 802.11 IPR Policy and procedure.
         2. Attendance
      3. Goals for September 2014
      4. Presentations – no presentations
      5. TG Motions
         1. Motion on Stadium Scenario, 11-14/860r2, Filip Mestanov (Ericsson)
         2. Motion on OBSS
         3. Motion on Calibration
         4. Selection Procedure update and motion, 11-14/, Rolf (Qualcomm)
         5. Simulation Scenario
         6. Evaluation Methodology
         7. Channel Model
         8. Functional Requirement
      6. Goals for September 2014
      7. Teleconference Schedule
      8. Adjourn
   2. Chair asked if there are any objections to proceed with this agenda – no objections. The agenda was approved.
4. TG Motions
   1. Motion on Stadium Scenario (11-14/860r2)
      1. Filip has gone throughput the document.
      2. Discussions
         1. Indoor channel model is assumed in the proposal.
      3. **Motion**

**Move to accept the text in doc. 11-14/0860r2 to be included in the simulation scenarios baseline document.**

* + - 1. **Moved by Guido H (Ericsson), Seconded by Brian Hart (Cisco)**
      2. **Discussion**
         1. **Q: Is this addition to the existing scenario or amendment?**
      3. **Result: Y/N/A = 36/32/29 🡪 Motion fails.**
  1. Motion on OBSS simulation (11-14/0972r1)
     1. Chao-Chun (MediaTek) explained the calibration scenario added to the simulation scenarios.
     2. Discussions
        1. C: Need more detailed description on the scenario.
     3. **Motion:**

**Move to accept the text in doc. 11-14/0972r1 to be included in the simulation scenarios baseline document.**

* + - 1. **Moved by Chao-Chun Wang (MediaTek), Seconded by Bo Sun (ZTE)**
      2. **Discussion on the motion – no discussion**
      3. **Result: Y/N/A = 52/0/33, motion passes.**
  1. Motion on MAC calibration (11-14/0967r5)
     1. Gwen explained the document.
     2. Discussions
        1. A member commented on the use of RTS/CTS handshake.
     3. **Motion:**

**Move to accept the text in doc. 11-14/0967r5 to be included in the simulation scenarios baseline document.**

* + 1. **Moved by Gwen Barriac (Qualcomm), Seconded by Zhou Lan (Huawei)**
    2. **Discussion on the motion**
    3. **Result: Y/N/A = 61/2/25, motion passes.**
  1. Selection Procedure update and motion (11-14/0938r4):
     1. Rolf received feedback on the selection procedure document that he presented earlier in this week and has made modification to the document.
     2. Discussions
        1. A member suggested an editorial change to the document.
        2. Another member asked for a summary.
     3. **Motion:**

**Move to accept document in 11-14/0938r4 as the baseline for TGax selection procedure.**

* + - 1. **Moved by Rolf De Vegt (Qualcomm), Seconded by Rakesh Taori (Samsung)**
      2. **Discussion on the motion – no discussion.**
      3. **Result: motion approved by unanimous consent.**
  1. Channel Model update and motion (11-14/0882r3):
     1. Jianhan Liu (MediaTek) explained the channel model document highlighting the changes.
     2. Discussions
        1. No discussion.
     3. **Motion:**

**Move to accept document in 11-14/0882r3 as the baseline document for TGax channel model.**

* + - 1. **Moved by Jianhan Liu (MediaTek), Seconded by Ron Porat (Broadcom)**
      2. **Discussion on the motion – no discussion.**
      3. **Result: motion passed by unanimous consent.**
  1. Evaluation Methodology update and motion (11-14/0571r3):
     1. Ron Porat (Broadcom) explained changes made to the evaluation methodology document.
     2. Discussions – no discussion.
     3. **Motion**

**Move to accept document in 11-14/0571r3 as the baseline for TGax evaluation methodology.**

* + 1. **Moved by Ron Porat (Broadcom), Seconded by Lei Wang (Marvell)**
    2. **Discussion on the motion – no discussion.**
    3. **Result: motion approved by unanimous consent.**
  1. Simulation Scenario update and motion (11-14/0980r1):
     1. Simone Merlin (Qualcomm) explained changes made to the simulation scenario document.
        1. Three changes approved by motions adopted in the document.
     2. Discussions – no discussion.
     3. **Motion**

**Move to accept document 11-14/0980r1 as the baseline document for TGax Simulation Scenarios.**

* + - 1. **Moved by Simone Merlin (Qualcomm), Seconded by Allan Jones (Activision)**
      2. **Discussion on the motion – no discussion.**
      3. **Result: motion approved by unanimous consent.**
  1. Functional Requirements update and motion (11-14/0567r7):
     1. Lei Wang (Marvell) explained changes made to the functional requirement document.
     2. Discussions
        1. C: So many requirements have been added. Need more time to take a look at.
           1. R1 seems to cover some requirements such as R6 and R7.
        2. C: Requested to simplify just compliant to the PAR.
           1. R10 should be reworded.
        3. C: Suggested replacement of “one mode of operation” with “one use case”.
        4. C: Identified an issue in R2 – support for the legacy devices.
        5. C: TBD should be resolved.
     3. Motion not conducted. FR document to be revised incorporating the feedbacks from the members.

1. Goals for September 2014

* TG Vice Chair election
* Continue to advance TG documents
* Technical Presentations

Chair asked to put initial version of the presentation before the first session.

1. Teleconference Planning
   1. Chair three teleconferences between now and July meeting.
      1. Thursday April 14, 10:00 – 12:00 ET proposed.
         1. Chair asked how many conference calls we should have.
         2. Data: no objection to the proposed one.
2. AOB
   1. No other businesses.
   2. Chairperson asked if there is any objection to adjourn at this time. No objections.
3. TGax has adjourned@15:17.