IEEE P802.11
Wireless LANs

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| Minutes for 802.11be MAC Ad-Hoc teleconferences in January 2020 and March 2020 |
| Date: 2020-01-30 |
| Author(s): |
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Abstract

This document contains the meeting minutes for the TGbe MAC ad hoc teleconferences held in January 2020 and March 2020.

Revisions:

**Thursday 30 January 2020, 07:00PM – 10:00PM ET (TGbe MAC ad hoc)**

Chairman: Jeongki Kim (LG Electronics)

Secretary: Liwen Chu (NXP)

**Introduction**

1. The Chair Jeongki Kim (LG Electronics) calls the meeting to order at 07:03PM. The Chair introduces himself and the Secretary, Jeongki Kim (LG Electronics)
2. The Chair goes through the 802 and 802.11 IPR policy and procedures and asks if there is anyone that is aware of any potentially essential patents. Nobody speaks up.
3. The Chair reminds everyone to report their attendance by sending an e-mail to the Secretary and the Chairman himself. Based on the join.me app, it appears to be around 70 people in the call.

**Recorded attendance through the join.me app and/or reported attendance through e-mail:**
	* Insun Jang
	* Ianderli
	* Kazuto YANO (ATR)
	* Jeongki Kim (LG)
	* Cheng Chen
	* Ming Gan
	* Sang Kim
	* Abhishek Patil
	* Yunbo Li
	* Akira Kishida
	* Liwen Chu (NXP)
	* Gaurav Patwardhan
	* Greg Ko
	* Srinivas Kandala
	* Chunyu Hu
	* Jason Yuchen Guo
	* Yongho Seok
	* Young Hoon Kwon
	* Jhon Son
	* Taewon Song
	* Namyeong Kim
	* Tomo adachi
	* Shubhodeep Adhikari
	* Minyoung Park
	* Sangyun Kim
	* Rojan Chitrakar
	* Yongsu Gwak
	* Jeff Liu
	* Guogang Huang
	* AI Petrick
	* Sindhu Verma
	* Sharan Naribole
	* Insun Jang

1. The Chair reminds that the agenda can be found in 11-20/0240r2. Today we will go through submissions per 11-20/240r2.

**Submissions**

1. 2071r1–Performance eval. of Multi-link chan. access schemes (Sindhu Verma**)**

**Summary:**

This contribution discusses the impact of channel access schemes used for multi-link operation on the user perceived metrics of latency and outage.

Using single-link performance as baseline, it also tries to quantify the gains of multi-link operation over single-link operation depending on the channel access schemes used for multi-link.

 **Discussion:**

C: clarification slide3,4. It seems basically there is no background traffic. Channel utilization 40%. No full buffer model. 4 links, total throughput 800mbps. 300bps
C: question about simulation result in slide 7.

A: the high value is the best one. Lower the curve, the worse result.

C: the multi-link doesn’t show the improvement compared with legacy single link scheme.

C: slide 5, most results are per synchronized channel access, when one link backoff becomes 0, another link can be used to transmit also.

A: C3 is better.

C: any quality of service analysis between voice and video.

A: best effort and voice. We allow higher TC when low TC back off counter becomes 0. Voice has low delay.

C: slide 5. Clairification question. B and C, syn receiver, there is no such assumption in “A”. A’s receiver capability is different from B and C.

A: no. B has self leakage.

C: after random select one channel, the selected channel will be fixed?

A: yes.

1. 0014r1–Operation of Non-AP MLD with Constraints(Insun Jang)
**Summary:**

The presentation proposes the operation of STAs belonging to a non-AP MLD with non-STR on their operating links. Specifically, the presentation considers STAs of a non-AP MLD with non-STR, when each link has its own primary channel to access.

**Discussion:**
**C:** the followingshould be addressed: AP MLD with no constrain, STA MLD with the constrain. It is difficult to collect the information of another link when the backoff counter becomes 0. Backoff becomes 0 hold until another link’s condition changes create collision?
A: option to reset backoff counter can solve the problem.

C: that option is not true per another channels information sharing condition.

A: information shared immediately or shared delayed.

**C:** slide 8. First option. How does that works? If no sharing, how to transmit in another link.

**A:** the transmittsion is addressed to another device.

**C:** what happens if both links address to same devicce. Is option in slide 8 allowed?

**A:** it is just an example for option 1.

**C:** slide 6. Link1 receiving, link2 almost backoff counter reach 0. The TX should have less influence to link’s RX.

**A:** will trink about it.

**C:** slide 7. Information sharing is within the device. It is the implementation issue. Slide 8, how to deal with the counter is the implementation choice.

**A:** will think about it.

1. 1927r1–Multi link operation-simulation methodology (Yongho Seok)

Summary:

This submission proposes the Multi-Link Operation simulation methodology for evaluating simulation results more fairly

Also, we proposes the unified terminologies of the Multi-Link Operation mechanisms for more better understanding and comparing the simulation results among submissions

**Discussion:**

**C:** this is useful reference for simulation. What is the chance that two links are available? Slide 6, is single queue used for the links or different queues for the links? This will influence to the simulation results.

A: the different queues are used.

C: good to have common terminology. Slide 3, why 2.4 GHz link is not considered? Then you have S-T/R operation. Slide 5/6, full duffer simulation but CBR should consider .

A: just 80MHz channels are considerred. Mixed traffic can still do full buffer.

1. 1928r0–Multi link operation-performance evaluation (Yongho Seok) **Summary:**.

Discussion:

C: slide 5, some resuts re not reasonable, e.g. CMPC+ is worse than CMPC.
A:simulation doesn’t run enough time.
C: same question on slide 5. How many runs do you get the results.

A: will update the results.
C: should check the results before present them. Otherwise will get wroung conclusion.

A: the conclusion should be fine.

C: not confutable with the conclusion.

C: slied 5, 0%, SPC should be two times compared with single.

C: question about straw poll.

A: straw polls just want to get feedback.

C: latency should be considered.

A: want to know which MLO method should be considered.

C: do you have concern about fairness?

A: have presentation about fairness.

C: throughput in EHT BSS. OBSS throughput should be show.

1. 0105r0–Link Latency Statistics of Multi-band Operations in EHT (Frank Hsu)

The author didn’t attend the meeting. The presentation is deferred.

1. 1918r0–UL MU effic. enhancement considering multi-link (Jeongki Kim)
Summary: the presentation proposes that a STA within a non-AP MLD can report the NAV status(s) or the channel status(s) for other link(s) within the same non-AP MLD, and an AP with an AP MLD can trigger a STA within a non-AP MLD to get the NAV status(s) or the channel status(s) for other link(s) within the same non-AP MLD.

**Adjourned at 10:00PM ET.**

**Thursday 20 Feburary 2020, 10:00AM – 12:00PM ET (TGbe MAC ad hoc)**

Chairman: Jeongki Kim (LG Electronics)

Secretary: Liwen Chu (NXP)

**Introduction**

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2. The Chair goes through the 802 and 802.11 IPR policy and procedures and asks if there is anyone that is aware of any potentially essential patents. Nobody speaks up.
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	* Jarkko Kneckt
	* Insun Jang
	* Young Hoon Kwon
	* Adrian Garcia
	* Sindhu Verma
	* Jeongki Kim
	* LiYiqing
	* Frank Hsu
	* Taewon Song
	* Gaurav Patwardhan
	* Abhishek Patil
	* Sang Kim
	* Jeff Liu
	* Yn Xin
	* Akira Kishida
	* AI Patrick
	* Yunbo Li
	* Osama Aboul-Magd
	* Chunyu Hu
	* Srinivas Kandala
	* Guogang Huang
	* Xin Zuo
	* Jinsoo Choi
	* Jonas Sedin
	* Kazuto YANO (ATR)
	* Liwen Chu (NXP)
4. The Chair reminds that the agenda can be found in 11-20/0240r2. The group ageed to go through submissions per 11-20/240r2.

**Submissions**

1. 1918r0–UL MU effic. enhancement considering multi-link (Jeongki Kim)

Discussion:

No questions and comments

1. 0136r1– Virtual Carrier Sense in Multi-Link (Thomas Handte)

Summary:

This presentation addresses virtual carrier sense (CS) in context of multiple links: On each primary channel of a link the NAV information of the other primary channel(s) of other link(s) is shared.

Discussion:

C: is this used for simultaneous T/R or for non-simultaneous T/R?

A: With single radio or no-restriction, no need to do this. As soon as one STA has restriction, it should be done.

C: slide 13, first bullet’s question.

A: the text is not accurate. STA1 report to AP, AP share the information with other STAs in other link.

C: PHY preamble may not be good to carry the shared info in PHY header.

A: we should think it more.

C: slide 8, STA1 single radio or multiple radio?

A: this is single radio STA. The STA decides to switch to link2. The method solves this link switch in slide 8.

C: why does sharing through PHY give maximal gain?

A: sharing delay is not good for the perromance.

C: can STA share the info with the AP?

A: it may be worth for OBSS case. But I am not sure.

C: Is TSF sync required between links?

A: yes, some synchronization may be required.

C: is notification unicast, broadcast?

A: it depands the number of STAs that require the info.

1. 0069r1–Multi link communication mode definition (Yonggang Fang)

Summary: This contribution intends to clarify terms used ML operation and proposes the definition of the terms to be used in 802.11be.

Discussion:

C: Question to slide 7: do you consider same ending time?

A: We may add further clarification about ending time.

1. 0105r1– Link Latency Statistics of Multi-band Operations in EHT (Frank Hsu**)**

Summary: This contribution explores latency statistics in current specs. and proposes to add more latency statistics in EHT for MLO.

Discussion:

C: Does the presentation talk only about AP’s report or also include STA’s report?

A: currently AP provides the informaiton. STA use public action frame to report. It can be used for load balancing.

C: AP can steer the TID to link mapping.

A: agree.

C: different links may have different latency statistics for different location.

A: it is difficult to differentiate this based on location.

C: It is good to provide guidance to STA for STA’s steer TID to link.

A: agree.

**Thursday 5 March 2020, 10:00AM – 12:00PM ET (TGbe MAC ad hoc)**

Chairman: Jeongki Kim (LG Electronics)

Secretary: Liwen Chu (NXP)

**Introduction**

1. The Chair Jeongki Kim (LG Electronics) calls the meeting to order at 07:03AM. The Chair introduces himself and the Secretary, Jeongki Kim (LG Electronics)
2. The Chair goes through the 802 and 802.11 IPR policy and procedures and asks if there is anyone that is aware of any potentially essential patents. Nobody speaks up.
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	2. Jonas Sedin
	3. Guogang Huang
	4. Adrian Garcia Rodriguez
	5. LiYiqing
	6. Yonggang Fang
	7. Yongsu Gwak
	8. Srinivas Kandala
	9. Jeongki Kim (LG)
	10. Osama Aboul-Magd
	11. Insun Jang
	12. Kazuto YANO (ATR)
	13. Jinoo Choi
	14. Sang Kim
	15. Young Hoon Kwon
	16. Gaurav Patwardhan
	17. John Soo
	18. Yunbo Li
	19. Sanghyun Kim
	20. Akira Kishida
	21. Jeff Liu
	22. Ming Gan
	23. Afred Asterjadhi
	24. Liwen Chu
4. The Chair reminds that the agenda can be found in 11-20/0240r9.
5. Several persons asked to present their documents since they can’t join March F2F meeting. Finally the group agreed that the agenda still uses 11-20/0240r9.

**Submissions**

1. 0093r3–Multi-link for Low Latency (Adrian Garcia-Rodriguez)

Summary: This contribution proposes a multi-link-based mode of operation to specifically reduce latency in 802.11be.

Discussion:

C: share the similar vision that decreasing the delay is important in 11be, e.g. dedicated link for such operation. But have different view about how to achieve the goal.

A: slide 11 proposes dedicated link.

C: slide 7, two MAC, one PHY?

C: question about how Probe Delay works. It is parameter set by STA. If we go with this way, it should be BSS parameter.

A: Probe Delay is the easy way. Agree that some work needs to be done for Probe Delay.

C: slide 11, one PHY multiple MAC may not be in line with the current common understanding.

A: I assume this is in line with the common understanding.

1. 0119r0–Follow Up Discussion on Multi-link Operations (Xiaofei Wang)

Summary:

This contribution proposes to share NAV between links.

1. 1930r3–AP assisted Multi-link operation (Dibakar Das)

Summary:

This contribution proposes to improve STA MLD’s link transition decision through AP MLD’s help.

Discussion:

C: clarification: single radio MLD can operte in a link at any time. The name of single radio creates confusion.

A: the name can be changed.

1. 1932r1–Multi-link policy framework (Cheng Chen)

Summary:

This contribution investigates Multi-AP group formation.

Discussion:

C: slide 5, admission control for unassociated STAs is not good for STAs. It is nice to use one link for normal data communication and use another link for link setup with another MLD AP.

A: open for discussion, e.g. change the requirement to recommendation.

C: this change is good. Slide 6 looks good. How about dedicating one link for one application.

A: TID to link mapping can satisfy you.

C: do slide 5 and slide 6 show the example policies?

A: Yes

C: It seems most cases should be unicast to indidual STA.

A: agree and mentioned in the slide.

1. 1943r3– Multi-link Management (Taewon Song)

Summary:

This contribution introduces channel/link switch operation for multi-link and address some consideration.

Discussion:

C:slide 8 about shared radio. How fast of the radio switch?

A: no specific time now. We know certern STAs can do this operation.

C: Do you assume the switch can be done instantly?

A: Can’t figure out.

C: slide 5 may use TID to link mapping. Channel switch may not be good for this operation since it applies to whole BSS.

A: open to the suggestion.We think unicast channel switch should be fine.

**Adjourned at 12:00PM ET.**