IEEE 802.11az Meeting Minutes November 2016 Session P802.11
Wireless LANs

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| TGaz meeting minutes – November meeting |
| Date: 2016-11-15 |
| Author(s): |
| Name | Affiliation | Address | Phone | email |
| Ganesh Venkatesan | Intel Corporation |  |  | ganesh.venkatesan@intel.com |
| Naveen Kakani | Qualcomm |  |  | nkakani@qca.qualcomm.com |

Abstract

Minutes for the TGaz meeting in San Antonio, TX.

**IEEE 802.11 Task Group AZ**

**November 2016 San Antonio, Plenary**

**November 7-11, 2016**

**Tuesday Nov 08, 2016 PM1**

Chair called the meeting to order at 1331 Hrs (local time)

Agenda is in document 16/1309r1

Chair reminded the members to register their attendance

Reviewed Patent Policies and Operating Rules

Call for Essential Patents --  No response received

**3 meeting slots in the week Tue/Wed/Thu PM1**

**Approve Meeting Minutes (from the Sep IEEE meeting)**

Motion: Approve document 16/1320r0 Meeting Minutes for the September 2016 Session

Moved: Ganesh Venkatesan

Seconded: Chaochun Wang

**14/0/0 Motion Passes**

**Overview of the Agenda for the week:**

**(\*) Submissions/Presentations**

16/1338 Liaison from 3GPP RAN4 -- Tue PM1

Need a response ready for discussion in the mid-week plenary in order to be able to collect feedback and bring in a response for approval in the closing plenary

16/1494 (45)

16/1496 (25)

16/1508

16/1509

16/1498

(\*) Schedule Teleconferences

**Review 3GPP RAN4 Liaison (16/1338r0) -- this liaison request was also sent to WFA by 3GPP RAN-4**

WLAN RTT Measurement Requirement (3GPP Rel 14). Rel-14 intends to specify requirements for indoor WLAN RTT Roundtrip Time Measurements - Min RTT, Max RTT, Resolution and Accuracy. Also include information number of samples used to estimate RTT at a defined accuracy.

(\*) WFA may have specific numbers

(\*) almost impossible to respond with numbers. Numbers depends heavily on the assumed environment Need to understand the environment in which these numbers are requested.

(\*) GPS respond with 50% and 90% accuracy levels

(\*) We could respond with numbers and identify the environment for which the numbers apply.

(\*) In some environments, the AP may not be configured correctly with its location

(\*) Request more detail on the environment for which this performance metric is needed

(\*) Identify what environments are considered in the protocol design, point out to theoretical expectations on accuracy and help 3GPP pose a more specific question/request to WFA. Note that IEEE 802.11 does not have numbers from real implementations

(\*)Need to also help identify what it takes to achieve the accuracy (number of samples, etc)

(\*) Response to (1) and (2) in the liaison request will lead to a response to (3). IEEE 802.11 really does not have data on (1) and (2).

(\*) IEEE 802.11az may solicit submissions from members for performance data that could be used to respond to the liaison request. Alternatively, the liaison response may point to WFA as the organization that potentially has performance data.

(\*) This group may respond to the 3GPP Liaison with the response that WFA is a more appropriate organization for this data but the group will not be able to direct WFA to respond to 3GGP.

(\*) 3GPP Rel-13 has a reference to REVmc Fine Timing Measurement. In Rel-14 there is a desire to add performance metrics. In the response to 3GPP request the motivation for specifying performance in Rel-14.

(\*) indoor WLAN RTT Roundtrip Time Measurements - Min RTT, Max RTT, Resolution and Accuracy -- hard to specify numbers unless a channel model/environment is identified.

(\*) indicate granularity for timestamps

(\*) include numbers for an indoor and an outdoor env

-- Work on a response offline and bring the work for discussion/review in the TG.

-- provide a general expectation from the protocol design goals perspective

**Straw Polls:**

**Straw Poll -1:** For Q3. in the Liaison Request, do you support 3GPP with a description of FTM Protocol Limitations?

**Results:** 6/2/7

**Straw Poll-2:** For Q1 and Q2. in the Liaison Request, how should we respond

(1) we do not have data

(2) ask 3GPP for more information

(3) identify a channel condition and respond with corresponding results

(4) provide theoretical expectations

(5) provide theoretical value and ask for additional information from 3GPP (2) + (4)

(6) Use numbers from the WNG presentation and ask for more information

**Results:**

More discussion on this expected during Wed Session.

Question on the floor: What does this brings us to IEEE 802.11 by responding to 3GPP request

Chair Response: 3GPP has a larger footprint and it can help to respond back to 3GPP

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Moving to next topic: Presentation by Ganesh

Document Number: 11-16-1494r0: A Unified 11az Protocol

**(Count of the number of people in the meeting room: 43)**

Discussion/Questions:

* No questions/comments
* Motion (slide 18 on the presentation): Move to approve 802.11az protocol and develop the corresponding FRD/SRD text for future discussion and approval

Discussion on the text for the Motion:

* Q: Not sure what is being motioned
* Response: Protocol as described on Slide 17
* Q: Slide 17 is not an actionable text, recommend to use the text on Slide 19
* Q: Similar question on the same lines as earlier question.
* C: Recommends the presenter to modify the slide to reflect the content in Slide 19

Presenter: As of now there is no specific SFD text, so the presenter would want to work on the actual text based on the Protocol Shown in the slideset (Slide 17 and not Slide 19).

Motion Text:

Move to approve

* The proposed 802.11az protocol (as exemplified in Slide 17) and
* develop corresponding FRD/SFD text for future discussion and approval

Motion is moved by Ganesh, Seconded by Chitoo.

Chitto: Withdraws seconding the motion, because he thought the Motion was based on Slide 19 and not Slide 17.

Seconded by: Manish (Marvell) to move forward with the process.

Y: 8, N: 4, A: 8

Motion Fails.

**Wednesday PM1: Wednesday Nov 09, 2016 PM1**

Chair called the meeting to order at 1334 Hrs (local time)

Agenda is in document 16/1309r2 (r3 will include changes made in the meeting)

Chair reminded the members to register their attendance

The chair reminded the group of the Patent Policies and Operating Rules

Call for Essential Patents --  **No response received (22 members were in the room)**

**Overview of the Agenda for the week:**

**(\*) One extra time slot THU AM1 allocated to 11az.**

**(\*) Submissions/Presentations**

**(a) 16/1496r0 -- .11ax based negotiation protocol for .11az**

**Q: Trigger Frame Service Request is not defined -**

**A: could re-use the Trigger Frame as defined in .11ax or define a new one for use in .11az**

**Q: Is it possible to coalesce M-BA and iFTM?**

**A: Yes, if iFTM can be generated in SIFS. Otherwise, we need an ack (of M-BA) and an iFTM**

**Straw Poll:**

**Do you agree that 11az negotiation phase should support enhanced FTM Request in both SU and MU modes for both associated and unassociated states?**

**Result 13/0/6**

**Motion:** Move to adopt the following spec frame work requirements

**"11az negotiation phase shall support an enhancement to FTM Request frame in both SU and MU modes for both associated and unassociated states"**

and instruct the SFD Editor to include it in the TGaz SFD for the .11az Ranging protocol and allow editing rights to the editor

**Moved: Ganesh Venkatesan Seconded: SK Yong**

**Discussion**

(a) Is it an enhancement or a set of enhancements? Is it an enhancement to the frame or to the frame and the procedure?

For now, we will focus on frame enhancement for SU, MU, associated and unassociated. The procedure may need enhancements and will be discussed later.

(b) Do we need to deal with Beam Forming -- beam forming may be a factor when ranging is done. Not needed in the Negotiation phase.

**Result: 13/0/5 Motion Passes**

**(b) 16/1498 -- FTM Security in Associated and Un-associated States**

This submission is a follow up to the discussion in the last (Warsaw) meeting (which discussed associated mode) and is focused on the unassociated mode. The proposed mechanism applies to FTM but could be used for all 802.11 Management frames that are exchanged while in an Unassociated State.

Q; What is the threat model

A: FTM frames with the t1 and t4 values and the corresponding ACK are not protected. This proposal protects the FTM frame and the corresponding ACK.

Q: The receiver of the ACK frame can be deceived by an ACK from another party

A: Yes

Straw Poll: **The 802.11az FRD and SFD shall address FTM security.**

Q: Does it apply to both the Negotiation Phase and Ranging Phase?

A: May be. At this point, we are leaving it open

A: Think that this is an important topic that needs to be addressed in .11az.

A; we should ensure that one mechanism is defined to cover both the phases

**Result 21/0/1**

Motion: **Should we run a motion -- not at this time.**

**Q: Need to identify what Use Cases are addressed with this feature**

**A: Agree**

**Q; Need more clarity/details on the security aspect before adding anything to FRD/SFD**

* **Straw Poll 2: Do you support to add the following requirement to the 802.11az Functional Requirement document [3] under the section of 2.1.1 “Range measurement and coverage”**

***TGaz Rx: The 802.11az protocol shall describe one     or more mechanisms to provide secure range     measurement***

***- (a) in an associated mode 6/11/3***

***- (b) in an un-associated mode 0/18/2***

***- (c) in both associated and un-associated modes 17/1/2***

***- (d) in neither associated nor un-associated mode***

***Discussion:***

***Q: (d) could be omitted since the previous straw poll indicated support for Security***

***Q: How would (b) work?***

***A: A new unassociated mode authentication/key derivation needs to be defined for un-associated operation***

***Q: Would (b) provide more security?***

***A: FTM has no security at all***

***Q: Would the protocol always enforce security? Is there a mode for operating without Security?***

***A: the security-les mode should be supported***

* **Straw Poll 3: FTM security in an associated state shall leverage the keys derived using the existing 802.11 methods.**

Should we leverage existing methods? Or invent something new?

C: Positioning involves exchanging information with more than one AP and may be associated with only one AP. So, using existing methods may not work all the time.

Q: Are we referring to PMF?

A: PMF and may be something new.

Q: How does it work with MU Modes?

A: Have not explored MU modes? Leverage refers to whatever mechanisms that already exist.

C: May be too early to respond meaningfully to this straw poll

**Result: 10/0/9**

* **Straw Poll 4: The protection of the management frame exchanges (such as, FTM/Ack) in the un-associated state shall use a common mechanism that applies to the protection of all management frame exchanges that require security.**

Q; Does protection mean PMF?

A: Not necessarily. PMF does not apply to un-associated mode(s). Mechanisms for un-associated mode is open (at this time).

C: the straw poll envisions a mechanism that applies to FTM and potentially any management frame exchange that may need protection

Q: are we proposing to use the same mechanism from Straw Poll #3 here?

A: No. In unassociated mode, it is a new mechanism

Out-of-time for this straw poll

**(c) 16/1508 -- FTM Frame Authentication**

**No straw polls**

**Discussion:**

Q: Protocol recovery when packets are lost (or corresponding ACKs are lost) - if FRM Frame\_1 is lost Would we go back to FTM Response?

A: Yes

Q; last successful reception dictates recovery

A; Yes

Q; Can this be a solution to the last presentation?

A: Yes but need some tweak to address the case where non-FTM exchanges are protected

Q: Processing time?

A: Authentication Code from previous frame is used to protect the current frame. Minimum Spacing for FTM has no time constraints (125 usecs). Future protocols which may require SIFs response may have constraints (and may not need protection since to attack a SIFS response is hard but do-able)

A: The attack may be hard (but do-able) for the SU case. However, it may be easy with the MU case

Q: Are there protections against replay attacks?

A: How does a replay attack work?

Q: a third party replays a missed frame

A: Not sure if a replay attack can be staged

Q; Slide #3 iFTMR and iFTM are not protected in this proposal

A: the data to protect is timestamps

**Thursday AM1: November 10th 2016, AM1**

Chair called the meeting to order at 0805 Hrs (local time)

Agenda is in document 16/1309r3

Chair reminded the members to register their attendance

The chair reminded the group of the Patent Policies and Operating Rules

Call for Essential Patents --  **No response received (9 members were in the room)**

Agenda for AM1

16/1338 Response to 3GPP RAN4 Liaison Response

Response to 3GPP Liasion

Ganesh reviewed 11-16-1535r0: Comments include

* High level response includes stating that IEEE 802.11 specification does not have a means to provide the data requested
* On the question of specifics:
	1. Based on WNG presentations (11-14-1464r2) i.e., presentations showing possible accuracy that can be possibly provided, measurement accuracy of WLAN RTT: +/- 6ns under line-of-sight conditions
	2. Physical layer measurement period over which the above measurement accuracy is met: depends on implementation and the parameters negotiated to execute the protocol
	3. WLAN RTT measurement reporting range i.e., minimum value of RTT (6nsec), maximum value of RTT (900nsec) and resolution or granularity (RTT is derived from timestamps represented in units of picoseconds) of reported value. Our reported of minimum value of RTT
* There was an additional question of number of samples used:
	1. It is possible to account for the number of samples ..etc, but the protocol itself does not have a means to formulate the number of Samples, Standard deviation
* The time values above are really Time of Flight, given that the request is for RTT, then should the values be scaled by 2 to convert the ToF to RTT?
	1. The error reported in WNG is 1-2m, and the way this is captured if +/- 6ns.
* The response to accuracy depends on:
	1. SNR
	2. Actual range that is being measured
* The current response is based on a WNG presentation and the results are not validated by IEEE 802.11, does it make sense to use these numbers to respond to 3GPP?

Group went back to the discussion on the Straw Polls that were formulated during Monday PM1 session:

* Straw Poll on possible options **f**or Q1 and Q2. in the Liaison Request, how should we respond
	1. (1) we do not have data
	2. (2) ask 3GPP for more information
	3. (3) identify a channel condition and respond with corresponding results
	4. (4) provide theoretical expectations
	5. (5) provide theoretical value and ask for additional information from 3GPP (2) + (4)
	6. (6) Use numbers from the WNG presentation and ask for more information

Modified the Straw Poll to include:

For the 1st and 2nd questions, which options do you support?

1. Indicate the IEEE 802.11 spec does not include minimum performance level and performance is market derived
2. Ask the 3GPP to define the channel condition under which they would like to receive performance level for. Individual contributors present results
3. Select scenarios and channel conditions and do the analysis
4. We provide the supported protocol ranges (protocol analysis).
5. Report the values used as reference for TGaz establishment/early implementation

Results:

O1: 8, O2: 0, O3: 0, O4: 2, O5: 5

Request from the floor: Proposal to include a response that can allow for Option 1, Option 5.

Response: When including data for Option 5, include the reference to the document from which the values were derived

The cited document has data for the first question from 3GPP, but there is no data for the 2nd question, why cite the document for the 2nd question 🡪 3GPP can see that there is no data for question 2

Straw Poll:

For the 1st and 2nd questions we agree to:

Indicate the IEEE spec does not include minimum performance level and performance is market derived, in addition to that report the values used and references presented in TGaz and it’s establishment/early

**Results: Y 11, N 0, A 0**

* Chair and presenter worked out the text details (for Question 1 and 2) of the Liaison based on the Straw Poll that was done.
* Discussion on including the conditions that can effect on the performance, and there was consensus to allow the text in the document to leave it as it is
* Discussion on Question 3 from the Liason:
	1. Response: WLAN RTT measurement reporting range is the same as WLAN communication range.
	2. Regarding Granularity: RTT is derived from timestamps represented in units of picoseconds
* Discussion on UE (Standard deviation, number of samples):
	1. As per Revmc STA reports: Ranges, LCI. Both the reports do not report the number of samples.
	2. Response to 3GPP was recommended to indicate: the spec does not provide the number of samples used for estimating WLAN RTT to the Infrastructure.
* Updated the Liaison response document and Ganesh will post it to the server (11-16-1535r1)
* Edited Abstract (removed the text that was carried forward from 3GPP Liaison document)

**Thursday PM2: November 10th PM1**

Call for essential patent: No one responded to the call

Chair Reviewed Agenda (as shown in Slide 11-16-1309r5):

* Submissions:
	1. Liaison update (11-16-1535r2)
	2. Protocol negotiation (11-16-1509r0)
	3. 60GHz (11-16-1511r0)
	4. 11-16-1494r1 (re-visit motion on FTM Negotiation)
	5. Goals for next meeting, Teleconference
	6. AoB

Reviewed 11-16-1535r2 (Liaison Response document):

Updates from 11-16-1535r1 that was worked during Thu AM1:

* Updated the references to Mentor Links (to allow for easy download of the document)

Member would want to review the updates to the document, the author of the Liaison response document reviewed the changes again.

**Motion:**

**Approve document 11-16-1535-02-00az-response-to-RAN4-liaison-on-RTT-accuracy.doc as the IEEE 802.11 response to 3GPP RAN 4 request for RTT accuracy, and grant the 802.11 chair editorial license.**

**Moved: Allan Zhu**

**2nd: Chittabratha Ghosh**

**Y: 14, N: 0, A: 3**

**Motion passes**

Document 11-16-1509r0: Ranging using 11az

* Parameters listed might not be exhaustive, so it might be early to make an opinion about how to signal Parameters for 11az (VHT Parameters, 11ax Parameters, ..) 🡪 agree with the commenter
* Similar comment that the list of parameters is not exhaustive, need time to review all the parameters
* What does Response at a later time mean:
	1. Processing and allocation of resources to transport measurement of Channel information / Sounding might not be possible to be processed immediately, so resource allocation can be done for response immediately or combined with later Responses
	2. Are the possible responses be SIFS separated? That is a possibility.

**There were 29 people mid way into the session.**

Document 11-16-1511r0: Ranging for 60GHz

* What would happen in the scenario where there is no LOS, Sector sweep: Current implementation will support the strongest one and can be used to use FTM. If this is the LoS then it can work well, but if this is not LoS, however it is possible to measure LoS, it is still okay. However, if the stronger one is not LoS, or the LoS is not measurable then there is ambiguity.
* Clarified by commenter: That the current spec does not require strongest to be reported. Presenter agrees and it is up to implementation.
* Why use the end of the packet: This will make you closer to the Acknowledgement message, which is desirable in 60GHz band operation.
* Issue with LoS and NLoS: Agree with the issue. But when multiple measurements are made, and the distribution of the results are used, it is possible to estimate LoS and NLoS
* In 11ay there is discussion about Channel Bonding, is the intent here to transmit in Single Channel or in Multiple Channel? Based on analysis, with a Single Antenna Array it is possible to get better results (better to not use MIMO). But Channel Bonding (channel BW) will help, even if it has same or different clocks.
* If the end of the packet is used will there be offset issues? This can be handled, but plan to take the discussion offline.
* The expectation is the current FTM will work with un-associated STAs, what is this raised as an issue for 11ay/11ad: In the case of 60GHz, there is use of Beam Forming, this can be an issue with un-associated STAs.
* Why cannot Beam Forming be done for un-associated STAs given that the Association Request can be done with Beam Forming in current system: Can be done, but maintaining the FTM session can be an issue!!!
* Why is AoA (and AoD) raised an issue, isn’t it a capability? There can be MAC and other protocol work that need to be understood and signalled?
* Is there a need to do AoA for every frame (with TRN) or done with only FTM? The expectation is to do AoA only for FTM, but as such there is no problem to do AoA with every frame (but this does not mean anything without range)
* Does the mechanism require to send FTM frame in each sector? If there is a data link already, then they are likely beam formed already. But before FTM, you would do sector sweep again that will be used to pick the LoS and we can use that to do the FTM

Review of 11-16-1494r1:

* Motion to reflect adoption of the changes as shown on Slide 20.
* Where are the changes going to be added? It is true that we do not have Section Numbers for SFD, so the editor can be granted access to do editorial changes (adding Sections …etc)

**Motion Text: Move to approve inclusion of the following in the 802.11ax spec framework Document (SFD); and instruct the SFD editor to incorporate it in the next version of the 802.11az SFD and grant the SFD editor editorial license:**

**The .11az protocol shall define the following phases**

* + **a capability discovery,**
	+ **a Time of Flight (ToF) measurement parameter negotiation and**
	+ **a set of ToF measurement exchanges**

**Note: Other protocol phases may be defined as needed and is <TBD> based on more discussion(s)**

**The .11az protocol shall extend the REVmc iFTMR/iFTM for .11az ToF measurement parameter negotiation**

* **Moved:  Ganesh Venkatesan Seconded: Santosh Pandey**
* **Yes: 9 No: 0 Abstain: 8**
* **Result: Motion Passes**

Program timeline: No update from last meeting

Reviewed Goals as shown in document: 11-16-1309r5:

Goals for the January Meeting:

* Continue FRD, SFD document development
* Review technical submissions

Teleconference: Nov 30th (Wed 10 AM EST for 1 hour)

Chair called for any other business – none identified.

Task Group meeting adjourned (3:10PM)