Status of 802.1AS-Rev/D5.1 and Questions on Several Items Needing Resolution

Revision 1

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IEEE 802.1 TSN TG
2017.11.08

Outline

- Status of comments against 802.1AS-Rev/D5.0
  - Remaining comments to be incorporated into next draft (802.1AS-Rev/D6.0)
- Questions on items needing clarification
  - Certain editor's notes
  - Questions pertaining to managed objects
  - Questions pertaining to operation of FTM
    - Possibly need 802.11 input on this

Status of comments against D5.0

- Resolutions of all comments against D5.0 have been incorporated into D5.1, EXCEPT for the following:
  - #76
    - Rogue comment that points to items 1) – 10) in front matter
    - Item 6) is incorporated into D5.1; other items are still to be done
    - While all the items are straightforward, the amount of work is not trivial
  - #63, #4
    - Relates to whether TM and/or FTM should be mandatory or optional (and could be different at bridges and end stations
    - Plan is to draft a liaison to WFA at November 2017 meeting, to ask for input on this
    - Incorporation of these comments is deferred until a decision is made on this point
  - #2, #11, #12, #14
    - These pertain to the operation of FTM
    - Several items need clarification or confirmation
  - #15
    - Relates to whether 802.11 primitives are reproduced in 802.1AS-Rev, or referenced; need to confirm the resolution of this

Editor's notes in 10.7.2.2 and 10.7.2.5

- This question pertains to values for fields in messageIntervalRequestTLV that are either reserved or have special meaning
  - 10.7.2.2 and 10.7.2.5 indicates certain values are reserved; statements there are inconsistent with Tables 10-12, 10-13, and 10-14
  - Also applies to analogous sections in clauses 11, 12, and 13 (see editor's note in 10.7.2.2)
  - Editor's note in 10.7.2.5 indicates that resolution of comment #44 against D5.0 says to follow what was done for Pdelay, but what was done for Pdelay is ambiguous due to above inconsistency

Resolution of Comment #36 -- 1

- Comment #36 stated that externalPortConfiguration is an enumeration, but that a table showing all its values is not present
  - The resolution indicates that a table will be inserted, and that it will be checked that tables are present to define values of all enumerations
  - On checking for other enumerations and whether they have defining tables, the following items were discovered:
    - Some variables whose value is a port state are Enumeration2 (e.g., selectedState, 10.2.3.20; portStateInd, 10.3.14.1.4), while some are Enumeration8 (e.g., portState in 14.8.3). IEEE 1588 uses the Enumeration of 14.8.3 for portState (but the Enumeration2 for portState was used in 802.1AS-2011)
    - Many enumerations do not have tables (e.g., rcvdInfo, 10.3.11.1.3, 10.3.11.2.1; infoIs, 10.3.9.4)
    - organizationSubtype is an Enumeration24; this follows 1588. There is no table for this in 1588 (2008 or Rev), and none in 802.1AS (2011 or Rev)
    - In many instances, there are a number of variables that all take on values from the same enumeration. For example, timeSource has datatype Enumeration8, and takes on the values given in Table 8-3. But, other variables also have type Enumeration8 and take on timeSource values (e.g., sysTimeSource, 10.3.8.19; annTimeSource, 10.3.9,23). These are different enumerations that have the same possible values

Resolution of Comment #36 -- 2

- Possible ways of resolving the above
  - If there are multiple variables whose data types are the same enumeration, we actually should define the name of the enumeration, and its possible values (as is done in standard C); e.g.
    - –Enumeration8 TimeSource
      - » And then reference the Time Source Table (currently Table 8-3)
      - » This would all go in a subclause of Clause 6, where data types are defined
      - » Then, where the variables timeSource, sysTimeSource, annTimeSource are defined, we would indicate that their data type is TimeSource
  - Not clear how to resolve portState issue (Enumeration2 vs Enumeration8), because we both want backward compatibility and consistency with 1588
    - Suggestions needed
  - For organizationSubtype, and other enumerations taken from 1588 for which there are no tables in 1588, don't add tables here

Editor's note in 14.1 on data set naming

- The following editor's note is in 14.1:
  - **<<Editor's note: The data set names in 802.1AS, when written out fully, contain the word 'Parameter.' This word is generally not used in 1588 when writing data set names out fully (e.g., 1588 refers to the 'default data set' and also does not capitalize the words). However, 1588 also generally refers to 'defaultDS', i.e., the full name is not used very often. For now, we retain the convention of 802.1AS. However, for consistency, 'Port Parameter Statistics' is changed to 'Port Parameter Statistics Data Set.'**

  Comments are requested on whether we should follow 1588 instead (any comments should be very specific on what is desired).>>
- **It is the opinion of the Editor that the 1588 naming convention is more convenient**
  - **Using only the 1588 names would be consistent with 1588, and also avoid having to remember 2 sets of names**
  - **MIB already uses names that are more like the 1588 names**
  - **All or almost all changes would be in clause 14**

Editor's note in 14.1 on commonServicesPortDS

- An editor's note in 14.1 states:

  <<Editor's Note: In 1588-Rev/D1.2, the commonServicesPortDS has been added under the portList[] of each PTP Instance. This has the single member cmldsLinkPortNumber, which has data type UInteger16 and is the portNumber of the CMLDS Link Port that the PTP Port of this data set uses. If this data set is added, the following editor's note can be removed. It is the opinion of the Editor that this data set should be added, both for simplicity and consistency with 1588. Comments are requested.>>

- **Should the above be done?**

Items pertaining to 802.11 FTM -- 1

- The following presentation ([1] in the references at the end of the presentation)_ outlined 5 proposed solutions for handling FTM in 802.1AS-Rev (they were designated A, B, C, D, and E)
  - Ganesh Venkatesan, “IEEE 802.1AS REV D5.0 Review Comments” (available via http://www.ieee802.org/1/files/public/docs2017/as-venkatesan-Review-Comments-on-the-use-of-FTM-07-17.pdf)
- Unfortunately, the resolutions for comments against D5.0 pertaining to FTM do not explicitly say which approach we will use
  - However, it is the recollection of the editor that we will use approach D
  - The editor would like to confirm this
  - In the following slides, we work from this assumption in discussing values for various FTM parameters

Items pertaining to 802.11 FTM -- 2

- The following needs to be confirmed, or at least clarified
  - The measurement exchange figures in 11.24.6.4 of 802.11-2016 (e.g., Figure 11-37) refer to the “Initial FTM Request”; related to this, comment #11 refers to an “iFTMR” that the Slave sends to the master
  - However, 802.11-2016 describes only the MLME-FINETIMINGMSMTRQ.request; there is no “MLME-INITIALFINETIMINGMSMTRQ.request
    - It appears the use of “Initial FTM Request” simply means that this is the first (or initial) FTM Request; it is not meant to be a different message or primitive from the FTM Request
      - The editor would like to confirm (or at least clarify) this
    - Related to this, comment #11 refers to the master responding to the iFTMR with an iFTM after sending the ACK to the iFTMR
      - However, the figures in 11.24.6.4 simply show normal FTM messages that follow the ACK (with each FTM having a corresponding ACK
      - It appears that the iFTM is simply the first of these FTM messages
      - The editor would like to confirm (or at least clarify) this

Items pertaining to 802.11 FTM -- 3

- The following is Figure 11-37 form IEEE Std 802.11-2016

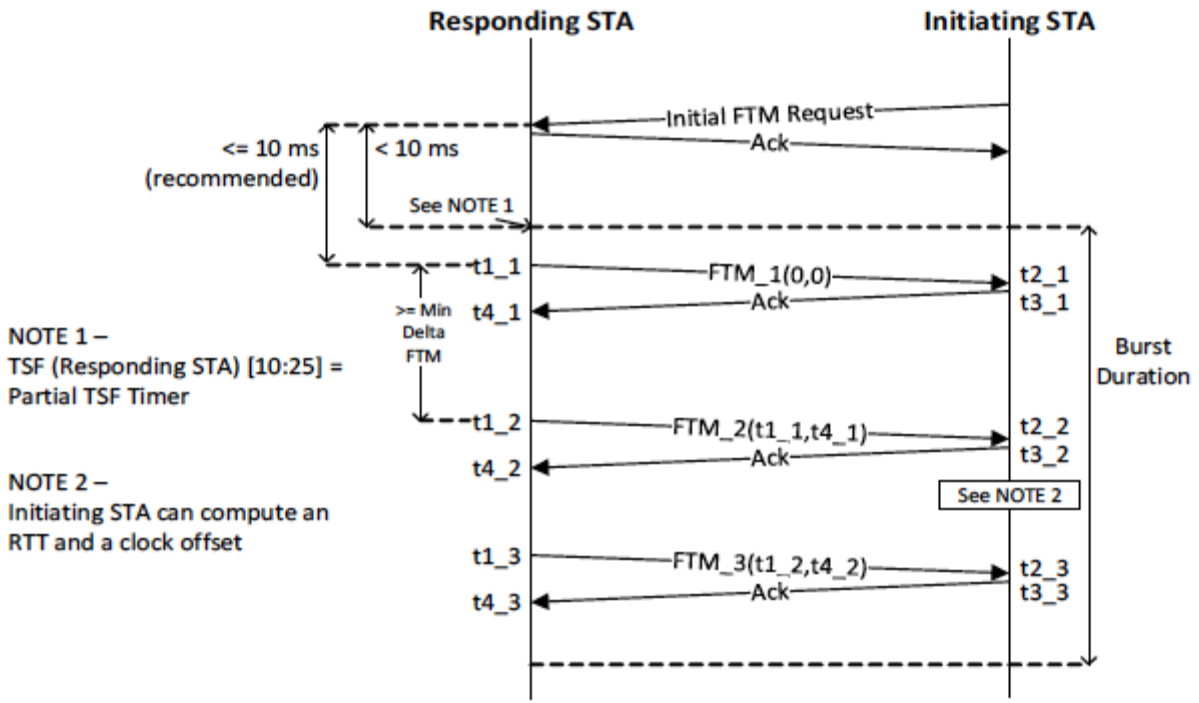

Figure 11-37—Example negotiation and measurement exchange sequence for a single burst instance, ASAP=1, and FTMs per Burst = 3

Items pertaining to 802.11 FTM -- 4

- It is assumed below that the exchange shown in the figure on the previous slide will be used for FTM in 802.1AS-Rev
- In addition, it is assumed that each session will contain a single burst as illustrated in this figure
- With these assumptions, we can begin to suggest values for various FTM parameters, on the following slides

Items pertaining to 802.11 FTM -- 5

- The FTM parameters element is (figure taken from [1]):

Fine Timing Measurement Parameters Element

	Category	Public Action	Trigger	LCI Measurement Request (optional)	Location Civic Measurement Request (optional)	Fine Timing Measurement Parameters (Mandatory)
Octets	1	1	1	variable	variable	11

	Status Indication	Value	Reserved	Number of Bursts Exponent	Burst Duration	Min Delta FTM	Partial TSF Timer
Bits	2	5	1	4	4	8	16
	Partial TSF Timer No Preference	ASAP Capable	ASAP	FTMs per Burst	Reserved	Format and Bandwidth	Burst Period
bits	1	1	1	5	2	6	16

Items pertaining to 802.11 FTM -- 6

- The following FTM parameter values can be used by the slave when sending the Initial MLME-FINETIMINGMSMTRQ.request:
  - Number of Bursts Exponent = 0
  - Burst Duration: see below
  - Min Delta FTM: see below
  - Partial TSF Timer No Preference = 1
  - Partial TSF Timer is reserved in the Initial FTM request
  - ASAP = 1
  - ASAP Capable is reserved in the Initial FTM Request
  - FTMs per burst = 3
  - Burst Period is reserved when Number of Bursts Exponent = 0

Items pertaining to 802.11 FTM -- 7

- From Figure 11-37 of 802.11 (shown on slide 11), which shows the message exchanges in the burst

  - 2*(Min Delta FTM) + SIFS +TXTIME(FTM) + TXTIME(ACK) < Burst Duration Eq. (1)

    where SIFS is the *short interframe spacing*

    - The above is the best you can do

  - A conservative approximation to the above is
    - 3*(Min Delta) < Burst Duration Eq. (2)

  - However, in practice Min Delta ought to be still smaller than is implied by the above equation, to allow for any retransmissions

  - 10 ms + Burst Duration < mean Sync Interval Eq. (3)

Items pertaining to 802.11 FTM -- 8

- Mean sync interval, in seconds, must be a power of 2 (requirement of 1588 and 802.1AS)
- Min Delta FTM is a multiple of 100 μs (from 9.4.2.168 of 802.11-2016)
- Burst Duration, in ms, is a power of 2 in ms, ranging from 0.25 ms (250 μs) to 128 ms (see Table 9-257 of 802.11-2016)
  - i.e., 0.25, 0.5, 1, 2, 4, 8, 16, 32, 64, 128 ms

Items pertaining to 802.11 FTM -- 9

- It would be desirable (or, at least, convenient) if the user of 802.1AS could choose mean Sync interval, and then values of Min Delta FTM and Burst Duration were computed automatically by the respective 802.1AS state machine(s)
- However, the procedure is not completely straightforward, because only certain values of mean Sync interval, Min Delta FTM, and Burst Duration are allowed

Items pertaining to 802.11 FTM -- 10

- As an example, consider the default value of mean sync interval, i.e. 0.125 s (125 ms, with logMessageInterval = -3)
  - Since 10 ms + Burst Duration < mean Sync Interval (i.e., Eq. (3) above), we have
    - Burst Duration < 115 ms
  - If we choose the largest Burst Duration consistent with this, we obtain Burst Duration = 64 ms
  - If we assume the constraint of Eq. (2) above, i.e., 3*(Min Delta FTM) < Burst Duration, we obtain
    - Min Delta FTM < 64/3 ms = 21.333 ms
    - Since Min Delta FTM must be a multiple of 100 μs, the largest value consistent with the above is Min Delta FTM = 213 (corresponding to 21.3. ms)
  - However, it is indicated above that Min Delta FTM ought to be still smaller, to allow for any retransmissions
  - A reasonable value might be Min Delta = 10 ms

Items pertaining to 802.11 FTM -- 11

- With the above values, we would have 1 FTM burst per 0.125 ms, assuming the Initial FTM Request for the next burst is made 0.125 ms after the previous Initial FTM Request.
- Note that we get one set of timestamps per single burst because, even though there are 3 FTMs in the burst, only the timestamps from the minimum delay frames will be used
- With the above, the desired mean sync interval is obtained
- Note also that constraints imply that the mean Sync interval cannot be less than 10 ms + Burst Duration.
  - Since the minimum burst duration is 0.25 ms, this means that the mean Sync interval must be at least 10.25 ms, or the largest possible mean Sync rate is approximately 97.6 messages/s
  - Since the logMessageInterval in 1588 and 802.1AS must be a power of 2, this means that the actual largest mean Sync rate is 64 messages/s

Items pertaining to 802.11 FTM -- 12

- Possible approaches to setting Min Delta FTM and Burst Duration, given logMessage interval
- Approach 1: consider all possible values of logMessageInterval, and pre-compute corresponding values of Min Delta FTM and Burst Duration
  - All these values would be specified in 802.1AS-Rev, e.g., in a table that gives values of Min Delta FTM and Burst Duration for each value of logMessageInterval in the allowable range
  - logMessageInterval has data type Integer8, with range -128 through 127
  - However, the values -128 through -125 and 125 through 127 are either reserved or have special meaning; therefore, we need only consider the range -124 through 124
  - In addition, it was shown on the previous slide that the actual maximum rate achievable is 64 messages/s, i.e., mean message interval = 1/64 s, or logMessageInterval = -6
  - Therefore, the actual range that must be considered is -6 through 124
  - It would be possible to compute appropriate values of Min Delta FTM and Burst Duration for each value of logMessageInterval in the above range, using assumptions similar to those on the previous slides
  - Alternatively, if it were decided that mean Sync rates slower than some rate were so slow that they were not practical, then the range could be reduced (e.g., it might be considered that a rate slower than 1 message every 1024 s (17.1 min) is not useful)

Items pertaining to 802.11 FTM -- 13

- Approach 2: given a value of logMessageInterval, compute Min Delta FTM and Burst Duration based on Eqs. (1) – (3) above and additional approximations
- For example (this is just an initial example; for now, the main point is to show the general approach)
  - Burst Duration = largest power of 2 multiple of 0.25 ms that is smaller than max(2^logMessageInterval, 128 ms)
  - Min Delta FTM = largest multiple of 100 μs that is smaller than A*(Min Delta FTM / 3), where A is a suitable fraction that allows for the number of expected retransmissions
    - E.g., A = 0.5

Items pertaining to 802.11 FTM -- 14

- Clarification is needed for the resolution of comment #15
- The comment resolution states
  - ACCEPT IN PRINCIPLE. The missing primitives will be added. The missing parameters are not used (and therefore were not included). However, if we are using the primitives exactly as specified in 802.11, it might be best to simply reference 802.11. This should be discussed.
  - We will reference 802.11-2016. We will reference the exact sublclauses, by number. For each current subclause of P802.1AS-Rev that describes a primitive, we will reference the specific subclause of 801.11-2016. We will add to 802.1AS-Rev subclause with pointers to the missing primitives.
- The editor would like to confirm that 802.11-2016 will be referenced (with specific clause and sublclause numbers) for the primitives
  - The primitives will not be copied from 802.11-2016, and existing copies of primitives in the draft will be removed.

References

[1] Ganesh Venkatesan, “IEEE 802.1AS REV D5.0 Review Comments” (available via http://www.ieee802.org/1/files/public/docs2017/as-venkatesan-Review-Comments-on-the-use-of-FTM-07-17.pdf)

Thank you