Discussion of Modifications to 802.1AS-2020 to Resolve Maintenance Items 369, 371, and 372

Geoffrey M. Garner
Analog Devices (Consultant)

gmgarner@alum.mit.edu

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Introduction

❑This presentation discusses changes/edits needed for 802.1AS-2020 (including amendments 802.1ASdr, 802.1ASdm, and 802.1ASdn) to resolve maintenance items 369, 371, and 372

❑Several additional minor items are also identified

❑In cases where old terminology was replaced by inclusive terminology in 802.1ASdr-2024, the relevant text/figures/tables of 802.1ASdr are used

Maintenance Item 369 (Clause 12.5.2.4.4)

May 14, 2024:
At present, the variable is not defined or initialized in the Time Receiver state machine (12.5.2.4.4). A revision to this document should define and initialize the variable for the Time Receiver state machine in the same way that it is defined and initialized for the Time Transmitter state machine. This variable is defined in terms of the 802.11 burstDuration parameter (as shown in the note in 802.1AS-2020 12.5.1.2) This state machine may need to be reviewed further. For instance, it appears that the variable "RESTART" is not being cleared.

August 20, 2024:
In 12.5.2.4.4 it appears that in the first elseif block lines 2-5 are not needed. More review is needed to verify.

Rationale for revision:
The description of the function uses the variable "endofBurstDurationTime". However, according to Clause 12.5.2.3 and 12.5.2.5 this variable is neither part of the local, nor the shared variable set.

Proposed text:
Add a local definition of endOfBurstDurationTime in 12.5.2.3 as well.

Maintenance Item 371 (Clause 12.5.2)

Rationale for revision:
There is a mix of names in the slave state machine (Fig. 12-7) . It seems that "ftmsPerBurst" and "framesPerBursts" is used for the same variable.

Proposed text:
In Fig. 12-7 change "framesPerBursts" to "ftmsPerBurst".

Maintenance Item 372 (Clause 12.5.2.3.7)

Rationale for revision:
This sections describes the parameters to contain the fields of an "MLME-FINETIMINGMSMTRQ.indication". Actually this should contain the fields of an "MLME-FINETIMINGMSMTRQ.request" instead.

Proposed text:
Change paragraph to: "A structure whose members contain the values of the fields of an MLME-FINETIMINGMSMTRQ.request primitive."

Discussion of Maintenance Item 369 - 1

INITIALIZING_TM

(BEGIN || !instanceEnable ||
(!portOper || !ptpPortEnabled || !asCapable))
&& (tmFtmSupport == 0x01)

previousIndParams = NULL;
rcvdIndication = FALSE;

rcvdIndication && portOper &&
ptpPortEnabled && asCapable

CONSTRUCT_MD_SYNC_RECEIVE_STRUCTURE_TM

constructMdSyncReceiveStructure();

rcvdIndication && portOper &&
ptpPortEnabled && asCapable

FTM_BURST_SIZE_2

ftmsPerBurst = 2;
lastFtmRqTime = currentTime;
MLME-FINETIMINGMSMTRQ.request;
rcvdIndicationTimeoutTime=currentTime+(10^7)*(2^16);
// the rcvdIndicationTimeoutTime interval is 10ms, while
//   current time is in units of 2^{-16} ns

currentTime >
rcvdIndicationTimeoutTime

rcvdIndication

!ftmReqGrantedTimeReceiver &&
(ftmsPerBurst == 3)

!ftmReqGrantedTimeReceiver &&
ftmsPerBurst != 3 &&
tmFtmSupport & 0x01 == 0x01

FTM_BURST_SIZE_3

(BEGIN || !instanceEnable ||
(!portOper || !ptpPortEnabled || !asCapable))
&& (tmFtmSupport & 0x02 == 0x02)

ftmsPerBurst = 3;
lastFtmRqTime = currentTime;
MLME-FINETIMINGMSMTRQ.request;
rcvdIndicationTimeoutTime=currentTime+(10^7)*(2^16);
// the rcvdIndicationTimeoutTime interval is 10ms, while
//   current time is in units of 2^{-16} ns

currentTime >
rcvdIndicationTimeoutTime

rcvdIndication

INITIALIZING_FTM

previousIndParams = NULL;
rcvdIndication = FALSE;
nframesRcvd=0
If (ftmReqGrantedTimeReceiver)
    asCapable = TRUE;

!ftmReqGrantedTimeReceiver
&& ftmsPerBurst != 3 &&
tmFtmSupport & 0x01 != 0x01

rcvdIndication && portOper &&
ptpPortEnabled && asCapable

CONSTRUCT_MD_SYNC_RECEIVE_STRUCTURE_FTM

setTimes (&indParams);
constructMdSyncReceiveStructure();
nframesRcvd++;

rcvdIndication && portOper &&
ptpPortEnabled && asCapable &&
nframesRcvd < framesPerBurst

nframesRcvd >= framesPerBurst &&
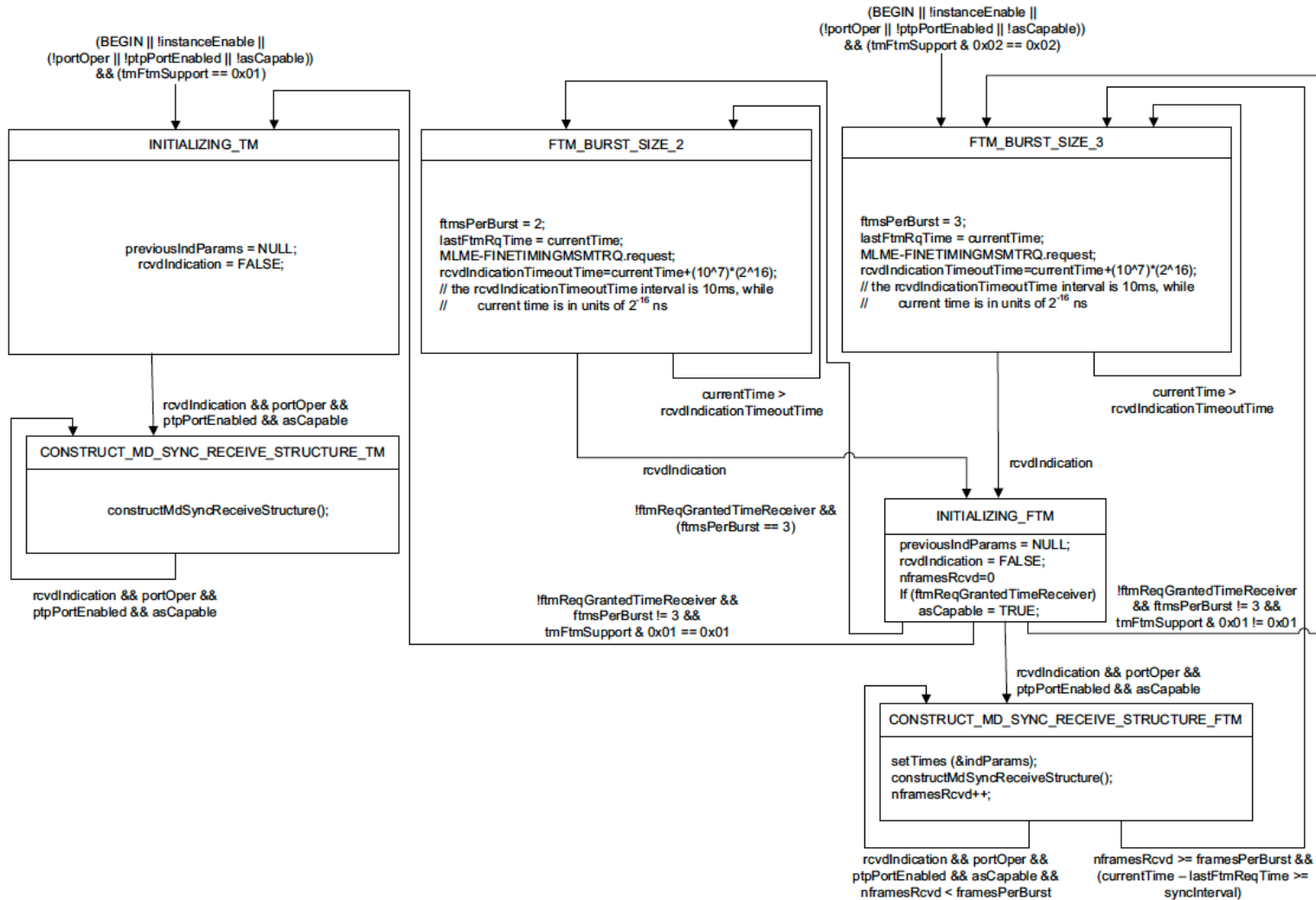(currentTime – lastFtmReqTime >=
syncInterval)

Figure 12-7. TimeReceiver state machine

Discussion of Maintenance Item 369 - 2

12.5.2.4.4 constructMdSyncReceiveStructure(): This function constructs the MDSyncReceive structure and is defined as indicated below. It is used in the ~~Slave~~TimeReceiver state machine. It is defined here so that the detailed code that it invokes does not need to be placed into the state machine diagram.

```
constructMdSyncReceiveStructure()
{
        if (tmFtmSupport == 0x01)
                MLME-TIMINGMSMT.indication(&indParams);
        else if (tmFtmSupport & 0x02 == 0x02)
        {
                MLME-FINETIMINGMSMT.indication(&indParams);

                nframesRcvd++;
                if (nframesRcvd == initReqParamsDot11SlaveTimeReceiver.framesPerBurst) ||
                        (currentTime > endofBurstDurationTime)
                                RESTART=1;
        }


        if ((previousIndParams != NULL) &&
                (previousIndParams.PeerMacAddress == dot11SlaveTimeReceiverMac) &&
                (indParams.FollowUpDialogToken != 0))
        {

                neighborRateRatio =
                        (indParams.T1-previousIndParams.T1) /
                        (indParams.T2-previousIndParams.T2);
                //NOTE: Other methods of computing neighborRateRatio
                                can be used.
```

Discussion of Maintenance Item 369 - 3

```
if (tmFtmSupport == 0x01)
        K = 1;
else if (tmFtmSupport & 0x02 == 0x02)
        K = -3;
//K = 1 for Timing Measurement and K = -3 for Fine Timing Measurement
meanLinkDelay =
        (((indParams.T4 - indParams.T1) -
        neighborRateRatio * (indParams.T3 - indParams.T2)) /
                        (2.0)) * (10^K);

//NOTE: Other methods of computing meanLinkDelay
            can be used.

MDSyncReceive = setMDSyncReceiveDot11SlaveTimeReceiver(indParams);
MDSyncReceive.VendorSpecific.rateRatio +=
        (neighborRateRatio – 1);
MDSyncReceive.VendorSpecific.upstreamTxTime =
            indParams.T2* (2^16) *(10^K) -
            meanLinkDelay*(2^16)/neighborRateRatio;
//NOTE: Actions performed with the timestampError
        parameters of indParams are implementation independent.

        passMDSyncReceiveToPortSync(&MDSyncReceive);
    }
previousIndParams = indParams;
rcvdIndication = FALSE;
}
```

Discussion of Maintenance Item 369 - 4

❑ The CONSTRUCT_MD_SYNC_RECEIVE_STRUCTURE_FTM state has the code:

setTimes(&indParams);

constructMDSyncReceiveStructure();

nframesRcvd++;

❑ In addition, the transition out of this state to the initial state for the FTM case, i.e., FTM_BURST_SIZE_3 state, has the condition:

nframesRcvd >= framesPerBurst &&
currentTime – lastFtmReqTime >= syncInterval)

Discussion of Maintenance Item 369 - 5

❑ But, the first else if block of the function constructMdSyncReceiveStructure(); has the statements

```
MLME-FINETIMINGMSMT.indication(&indParams);

nframesRcvd++;
if (nframesRcvd == initReqParamsDot11SlaveTimeReceiver.framesPerBurst) ||
        (currentTime > endofBurstDurationTime)
                RESTART=1;
```

❑ The second and third statements are not needed, as their functionality is contained in the CONSTRUCT_MD_SYNC_RECEIVE_STRUCTURE_FTM state

- Note that the variable RESTART is not set and is not used anywhere else

- Inspection of earlier drafts of 802.1AS-2020 indicates that this had been used in the earlier drafts; however, the variable was subsequently eliminated and the TimeReceiver state machine was revised

- The second and third statements of the first else if block of constructMdSyncReceiveStructure(); should have been deleted when the state machine was revised

Discussion of Maintenance Item 369 - 6

❑Resolution of Maintenance Item 369:

  ▪Delete the statements:

```
nframesRcvd++;
if (nframesRcvd == initReqParamsDot11SlaveTimeReceiver.framesPerBurst) ||
      (currentTime > endofBurstDurationTime)
            RESTART=1;
```

  from the function constructMdSyncReceiveStructure(); (of 12.5.2.4.4)

❑Delete 12.5.2.3.4 (definition of the variable RESTART)

Discussion of Maintenance Item 372 - 1

❑ It is convenient to discuss maintenance item 372 prior to discussing item 371

❑ Subclause 12.5.2.3.7 states:

▪ **12.5.2.3.7 initReqParamsDot11Slave:** A structure whose members contain the values of the fields of an MLME-FINETIMINGMSMTRQ.indication primitive.

❑ Figure 12-2, copied on the next slide, shows the FTM procedure

❑ It is clear from this figure that TimeReceiver issues the MLME-FINETIMINGMSMTRQ.request primitive, and not the MLME-FINETIMINGMSMTRQ.indication primitive

▪ The MLME-FINETIMINGMSMTRQ.indication primitive is issued by the MLME to the TimeTransmitter

❑ Therefore, this maintenance item can be resolved by accepting the proposed text, i.e.,

> Proposed text:
> Change paragraph to: "A structure whose members contain the values of the fields of an MLME-FINETIMINGMSMTRQ.request primitive."
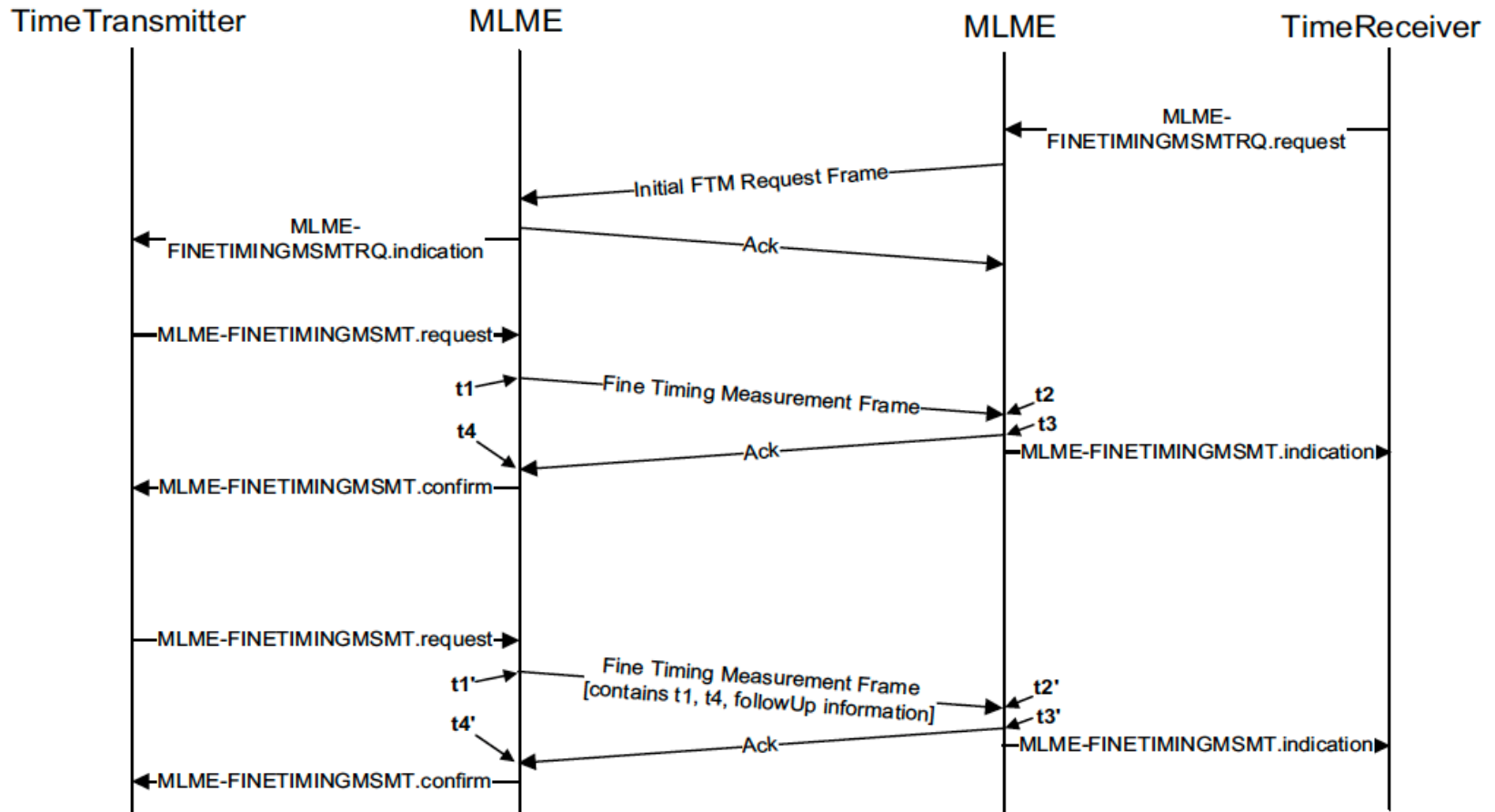
Discussion of Maintenance Item 372 - 2

Figure 12-2—Fine Timing Measurement procedure for IEEE 802.11 links

Discussion of Maintenance Item 371 - 1

❑As indicated in the maintenance item rationale for revision, both framesPerBurst and ftmsPerBurst are used in Figure 12-7

❑ftmsPerBurst is defined in 12.5.2.3.8 as a local variable for the media-dependent TimeReceiver state machine:

12.5.2.3.8 ftmsPerBurst: The value of the FTM parameter 'FTMs per burst' (see 12.6), i.e., the number of FTM frames in the burst granted by the ~~master~~timeTransmitter.

❑framesPerBurst is not explicitly defined; however, it is used in the following places:

- Figure 12-7, in conditions for transitions leading out of the CONSTRUCT_MD_SYNC_STRUCTURE_FTM state
- A parameter of the initReqParamsDot11TimeTransmitter structure
- A parameter of the initReqParamsDot11TimeReceiver structure

Discussion of Maintenance Item 371 - 2

❑ The initReqParamsDot11TimeTransmitter and initReqParamsDot11TimeReceiver structures are defined as:

12.5.2.3.7 initReqParamsDot11~~Slave~~TimeReceiver: A structure whose members contain the values of the fields of an MLME-FINETIMINGMSMTRQ.indication primitive.

12.5.1.3.12 initReqParamsDot11~~Master~~TimeTransmitterB: A structure whose members contain the values of the fields of an MLME-FINETIMINGMSMTRQ.indication primitive.

❑ Note that in the discussion of maintenance item 372 above, "indication" should be changed to "request" in 12.5.2.3.7

❑ In any case, both the MLME-FINETIMINGMSMTRQ.indication and MLME-FINETIMINGMSMTRQ.request primitives contain the Fine Timing Measurement parameters of 802.11-2020.

❑ The Fine Timing Measurement Parameters are described in 9.4.2.167 of 802.11-2020, and shown schematically in Figure 9-625 of 802.11-2020

❑ This figure shows a parameter "FTMs Per Burst"

Discussion of Maintenance Item 371 - 3

❑ The parameter "FTMs Per Burst" is subsequently described in this subclause as:

The FTMs Per Burst subfield indicates how many successfully transmitted Fine Timing Measurement frames are requested per burst instance by the initial Fine Timing Measurement Request frame, or allocated by the initial Fine Timing Measurement frame, respectively. The value 0 indicates no preference by the initiating STA and is not used by the responding STA.

❑ In the normal case, where the request is granted, this is the same as ftmsPerBurst of 12.5.2.3.8 of 802.1AS-2020, and was intended by the stand-alone local variable "framesPerBurst" in Figure 12-7

❑ Based on this discussion, the stand-alone local variable "framesPerBurst" in Figure 12-7 should be changed to "ftmsPerBurst

❑ In addition, for consistency the nomenclature used in 802.11-2020, the instances where "framesPerBurst" is used as the name of members of the initReqParamsDot11TimeTransmitter and initReqParamsDot11TimeReceiver structures can be changed to "ftmsPerBurst

Discussion of Maintenance Item 371 - 4

❏Therefore, maintenance item 371 can be resolved as follows:

- Change "framesPerBurst" to "ftmsPerBurst in the conditions exiting the CONSTRUCT_MD_SYNC_STRUCTURE_FTM state of Figure 12-7

- Change "framesPerBurst" to "ftmsPerBurst" in the following places:

  - Figure 12-6 (2 places, where it is a member of the structure initReqParamsDot11TimeTransmitterB)

  - 12.5.1.4.5, fourth line of the function initRequestWaitConfirm(), where it is a member of the structure initReqParamsDot11TimeTransmitterB

  - 12.5.2.4.4, ninth line of the function constructMdSyncReceiveStructure(), where it is a member of the structure initReqParamsDot11TimeReceiver

Additional Items – 1

❑ In Figure 12-5, in the state transition between the INITIALIZING and VALIDATE_FOLLOW_UP_INFO states, "ftmRequGrantedTimeTransmitter" should be changed to "ftmReqGrantedTimeTransmitter" (i.e., change "Requ" to "Req") in the condition for this transition

❑ In addition, the conditions for the transitions from the INITIALIZING to VALIDATE_FOLLOW_UP_INFO state and from the INITIATE_REQUEST_WAIT_CONFIRM_OR_SAVE INFO to VALIDATE_FOLLOW_UP_INFO state contain the condition (note the change indicated in the first bullet item above):

  ▪ (tmFtmSupport == 0x01 || ((tmFtmSupport & 0x01 == 0x01) && ftmReqGrantedTimeTransmitter))

❑ However, ftmReqGrantedTimeTransmitter is part of the checking for the case where TM is supported; this check is being done because the FTM request was not granted and TM is to be used instead if it is supported

Additional Items – 1

❑ Based on the above, "ftmReqGrantedTimeTransmitter" should be changed to "!ftmReqGrantedTimeTransmitter" in the above two state transition conditions in Figure 12-5

❑ These additional items can either be added to one of the above maintenance items or added as a new maintenance item

Thank you