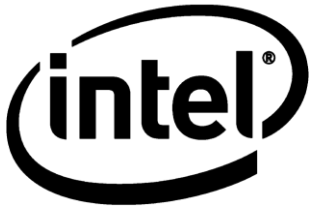

The use of 802.11 Timing Measurement by p802.1ASbt / p802.1AS-Rev

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July 14, 2014

Questions

- **What is *Fine* Timing Measurement?**
- **When should a dot11 port assert asCapable?**

The new dot11 Fine Timing Measurement

- **IEEE Std. 802.1AS™-2011 specifies the use of Timing Measurement**
  - Which is published in IEEE Std. 802.11™-2012

> "A STA that supports the timing measurement procedure may transmit Timing Measurement frames addressed to a peer STA that also supports the timing measurement procedure. One higher-layer protocol for synchronizing a local clock time between STAs using this feature is specified in IEEE Std 802.1AS."

- **P802.11REV-mc adds *Fine* Timing Measurement**
  - It's nearly the same as Timing Measurement
    - Increased timestamp resolution (10ns→100ps)
    - Public Action Frame → Private Action Frame
    - Other changes expected
  - Expected to be published in late 2015
- **A change to P802.1ASbt is not recommended at this time**
  - In other words, stay with 802.11-2012 Timing Measurement

Determination of asCapable

> "The per-port global variable asCapable shall be set to FALSE if the *timing measurement* bit … indicates that the peer IEEE 802.11 station is incapable of participating in the timing measurement protocol. Otherwise, asCapable *may* be set to TRUE."

This was intentionally ambiguous, to reflect special needs of battery-powered wireless devices

There are multiple approaches for a mobile device to advertise its need for precision time:

- Use an existing SIGNALING message
  - Redefine the default TimeSyncInterval as 127 (stop)
  - A subsequent SIGNALING message then set the TimeSyncInterval to something else, e.g. -3 or 1/8s
- TimingMeasurementReq Frame

This deserves further discussion and involvement of other experts

BACKUP

Residence Time of a Station-Bridge

- **P802.11ak introduces WLAN Stations that Bridge**
- **Residence Time of a WLAN Station-Bridge is large**
  - FOLLOWUP information for message `n` sent in message `n+1`
  - With fixed Sync Interval, Residence Time ≥ sync interval
- **Implications to P802.1ASbt, if we do nothing:**
  - Introduces small lag in time propagation through Station Bridge
  - And this grows linearly with # of Station-Bridge

    += Sync Interval * # of Station-Bridges
- **Approaches**
  1. Bi-modal sync interval (“burst-of-two”)
  2. Increased sync rate
  3. Live with the lag
     - Probably fine for Stations, less fine for long chains of Station-Bridges

IEEE Std. 802.11™-2012 Timing Measurement

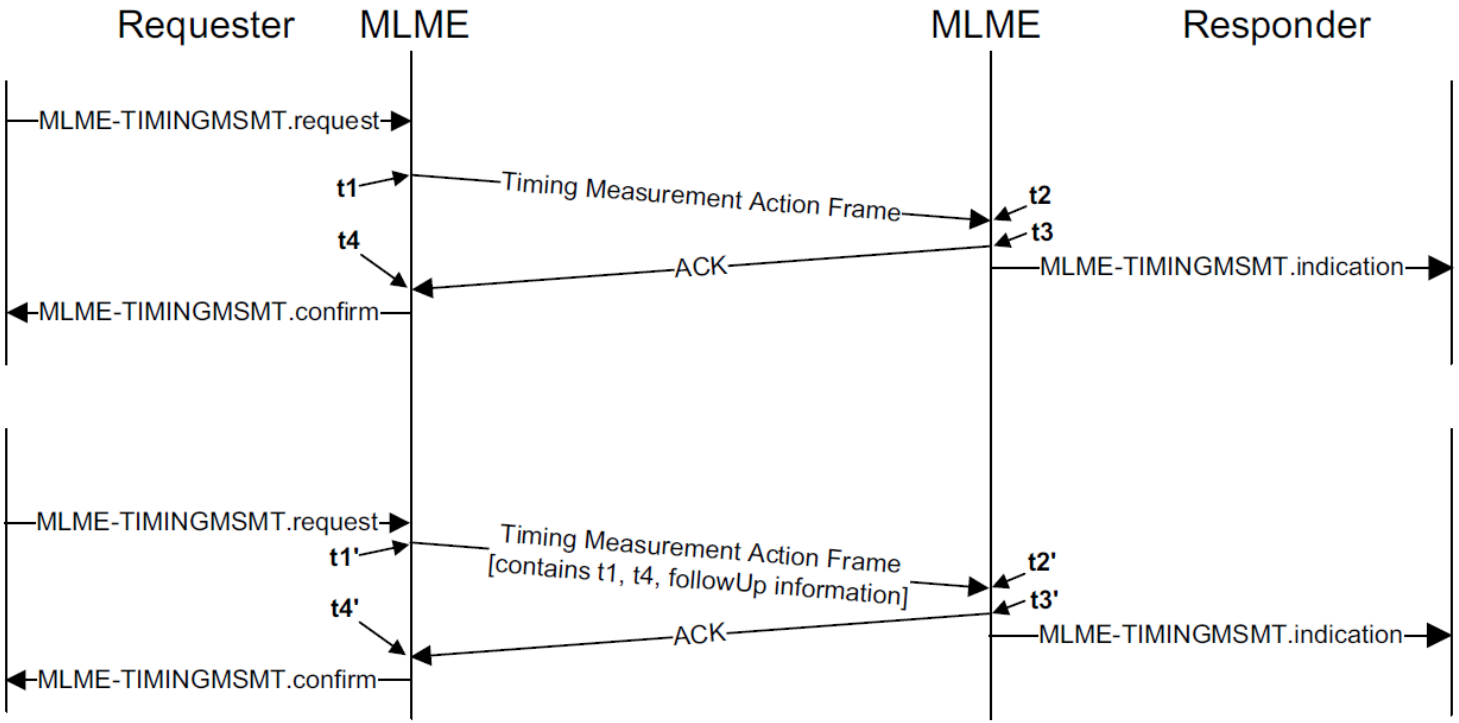

Figure 12-1—Timing measurement procedure for IEEE 802.11 links