Mechanism to support Multiple Sync Domains @ IEEE 802.1AS Gen 2

2012-11-11

IEEE 802.1 AVB TG – San Antonio

Franz-Josef Goetz
Siemens AG
Why Multiple Sync Domains @ Industry?


Reasons for multiple time scales in .1AS:

Universal Time (time of day)
- More flexible, plug & play
- High accuracy for universal time (< 100µs over 128 hops)
- Low requirements on availability and reconfiguration
  - Sync tree for sync message
  - One active GM
- Available on the whole network
- Only one sync domain for universal time within a network

Working Clock
(synchronized applications, scheduler, …)
- Engineered or planned
- Very high accuracy
  - <1µs over 64 hops, <100ns over 8 hops
- High requirements on availability
  - Multiple sync path for sync messages
  - One active GM + cold- or hot-stand-by GM
- Available only within geographically limited areas
  - functional cells can overlap
- Parameter set
  - sync interval << 125ms (application specific)
  - Multiple Working Clock domains can overlap
Why we need Sync Boundaries?

Reasons:

- **ONE common PDdelay measurement for all sync domains (time scales)**

- **Avoid flooding of sync messages from different sync domains**
  (For forwarding sync messages get same behavior as specified in .1AS Gen 1)

- **Avoid circulating sync messages while different mechanism for different domains are used to create the sync path(s):**

  - P2P announce message + BMCA
    (comparable with RSTP, IEEE 802.1AS Gen 1)

  - ISIS-SPB-PCR
    (Routing, IEEE 802.1AS Gen 2)
Sync Boundaries for Multiple Sync Domains

- WC-Domain 1
- WC-Domain 2
- WC-Domain 3

- Time aware network
  - universal time
  - for working Clock
  - and universal time

- Sync boundary for universal time
- Sync boundary WC-Domain 1
- Sync boundary prim. WC-Domain 2
- Sync boundary sec. WC-Domain 2
- Sync boundary WC-Domain 3

- GPS GM
  - Univ. Time

- BR
  - bridge

- BR
  - end station
Proposal to establish Sync Boundaries Using PDelay Mechanism specified in IEEE 802.1AS

Add Sync-Domain-TLV to PDdelay message to control forwarding of sync message

ONE common PDdelay measurement

Default behavior:
- No Sync-Domain-TLV from neighbor & PDelay measurement successful & Slave port
- forward sync message

New behavior:
- Adjacent nodes support sync domain number & PDelay measurement is successful & port in Slave state
  - forward sync message for corresponding sync domain
- The neighbor does not support sync domain number
  - set sync boundary for sync domain
- Adjacent nodes which do not support a certain sync domain number
  - for unknown sync domains nothing to do

Sync-Domain-TLV

<table>
<thead>
<tr>
<th>Octet</th>
<th>Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>1</td>
</tr>
<tr>
<td>Length</td>
<td>2</td>
</tr>
<tr>
<td>Domain Number</td>
<td>3</td>
</tr>
</tbody>
</table>

... Domain Tuple n

<table>
<thead>
<tr>
<th>Domain Number</th>
<th>n + 2</th>
</tr>
</thead>
</table>

IEEE 802.1 AVB TG Meeting – San Antonio
Next Steps?

Thank you for your attention!

Questions?