IEEE P802.1Qcc D1.1

Reference point for StartOfInterval – comment #84

Stephan Kehrer
Belden/Hirschmann

Version 01
January 17, 2017
If the Scheduled container is present, the Interval specifies a window of time that begins in phase with a time epoch that is synchronized on the network. If CurrentTime represents the current time expressed as an IEEE 1588 precision time protocol (PTP) time (see 8.2 of IEEE Std 802.1AS-2011), then the start of the next Interval in the PTP time (StartOfInterval) is:

\[ \text{StartOfInterval} = N \times \text{Interval} \]

where \( N \) is the smallest integer for which the relation \( \text{StartOfInterval} \geq \text{CurrentTime} \) would be TRUE.

---

Comment

<table>
<thead>
<tr>
<th>CI</th>
<th>SC</th>
<th>Comment Type</th>
<th>TR</th>
<th>Comment Status</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>46</td>
<td>46.2.2.5</td>
<td>&quot;StartOfInterval&quot;</td>
<td>TR</td>
<td>&quot;StartOfInterval&quot; = N * Interval&quot;. However, in the descriptive text above it is stated, that it needs to begin in phase with a time epoch. This seems to be missing in the definition in line 44.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>&quot;StartOfInterval&quot;</td>
<td></td>
<td>&quot;StartOfInterval&quot; = N * Interval&quot;. However, in the descriptive text above it is stated, that it needs to begin in phase with a time epoch. This seems to be missing in the definition in line 44.</td>
<td></td>
</tr>
</tbody>
</table>

SuggestedRemedy

Change to "StartOfInterval = adminBaseTime + (N * Interval)"
IEEE 802.1Qbv-2015 defines managed objects for configuring scheduled traffic (.1Qbv and .1Qch) at bridges and end stations

- defines a BaseTime (AdminBaseTime and OperBaseTime) e.g. on page 26 as “The administrative value of base time, expressed as an IEEE 1588 precision time protocol (PTP) timescale (see 8.2 of IEEE Std 802.1AS-2011). This value can be changed by management, and is used by the ListConfig state machine (8.6.9.3) to set the value of OperBaseTime (8.6.9.4.18).”

- OperBaseTime is used by the SetCycleStartTime state machine (8.6.9.1.1) to set CycleStartTime → allows to configure offset of .1Qbv CycleStartTime

- IEEE P802.1Qcc D1.1 defines configuration parameters for end stations

  - Currently defines a StartOfInterval on page 143 that is “in phase with a time epoch that is synchronized on the network.”
  → no offset configurable for .1Qcc StartOfInterval
What does this lead to?
Resulting Problems

- if $BaseTime$ in .1Qbv is changed to a value different from 0, the cycles of .1Qcc and .1Qbv are not aligned in time
  - this situation will arise as setting $BaseTime$ to the future is useful, e.g. to allow for the network to stabilize before starting TSN transmissions
- significantly increases debugging burden for operators as transmission times of end stations (.1Qcc) and bridges (.1Qbv) do not match
  - e.g. with $OperBaseTime=epoch + 20\mu s$ and $Interval=OperCycleTime=100\mu s$, a .1Qbv $TimeIntervalValue=80\mu s$ (i.e. offset) would map to $0\mu s$ in next interval of a .1Qcc end station
  - …and .1Qcc $EarliestTransmitOffset=0\mu s$ and $LatestTransmitOffset=50\mu s$ would lead to .1Qbv $TimeIntervalValue$ between $80\mu s$ (of the previous cycle) and $30\mu s$ in a GateControlEntry
- alignment of cycle and interval will become necessary in CNC as configuration of bridges is based on $BaseTime$ and configuration of end stations is based on $StartOfInterval$
  - high potential for inconsistent configuration due to lack of consideration in implementations
Possible Solutions

1. Leave everything as it is now
   - .1Qcc Interval and .1Qbv Cycle may be unaligned: high potential for inconsistent configuration due to lack of consideration in implementations

2. Do not permit changing .1Qbv BaseTime to a value other than 0
   - Not always feasible, since changing BaseTime to a point in the future is useful, e.g. for starting TSN transmission only after network is stabilized

3. Add a new managed object to .1Qcc, allowing configuration of an offset to align .1Qcc Interval and .1Qbv Cycle
   - ... stating that “the offset shall be 0 by default and set equal to the reference point of the scheduling mechanism if used (i.e. OperBaseTime for .1Qbv)”

4. Align .1Qcc Interval with .1Qbv CycleTime by using the .1Qbv managed object OperBaseTime as an offset for .1Qcc
   - Preferred solution by this commenter
   - Caveat: end stations might not always be using .1Qbv, so BaseTime might not be available