IEEE P802.1Qcc D1.1

Reference point for StartOfInterval – comment #84

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Comment

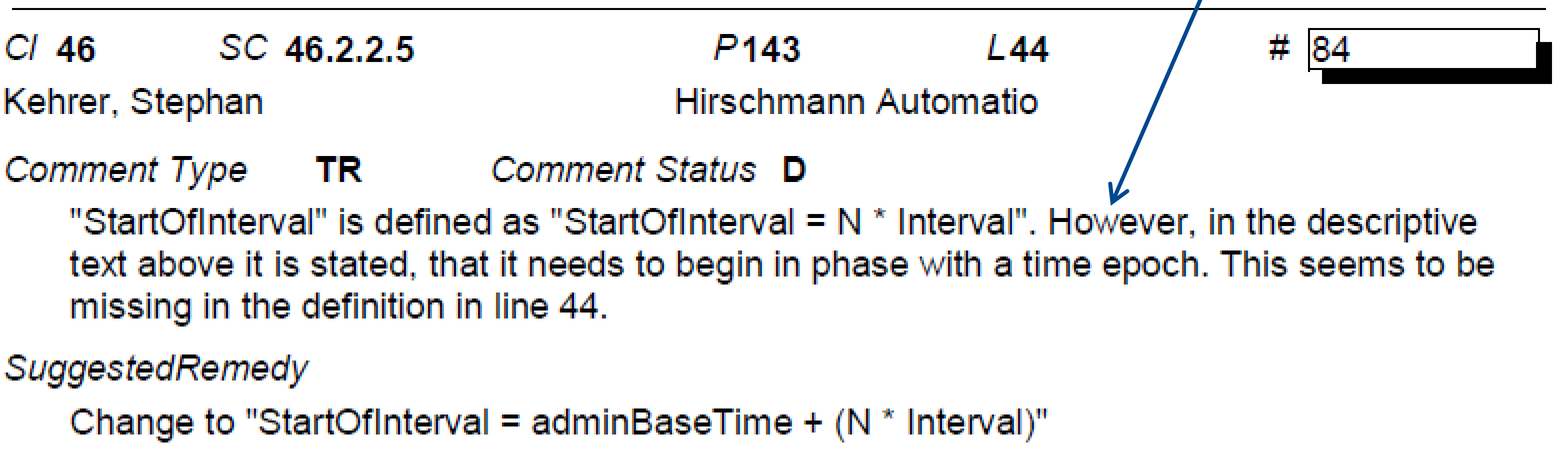
If the Scheduled container is present,
the Interval specifies a window of time that
begins in phase with a time epoch
that is synchronized on the network.
If CurrentTime represents the current time expressed as an IEEE 1588 precision time protocol (PTP) time (see 8.2 of IEEE Std 802.1AS-2011), then the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

StartOfInterval = N * Interval

where N is the smallest integer for which the relation

StartOfInterval >= CurrentTime

would be TRUE.



CI **46** *SC* **46.2.2.5** *P* **143** *L* **44** # 84

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Comment Type **TR** *Comment Status* **D**

"StartOfInterval" is defined as "StartOfInterval = N * Interval". 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.

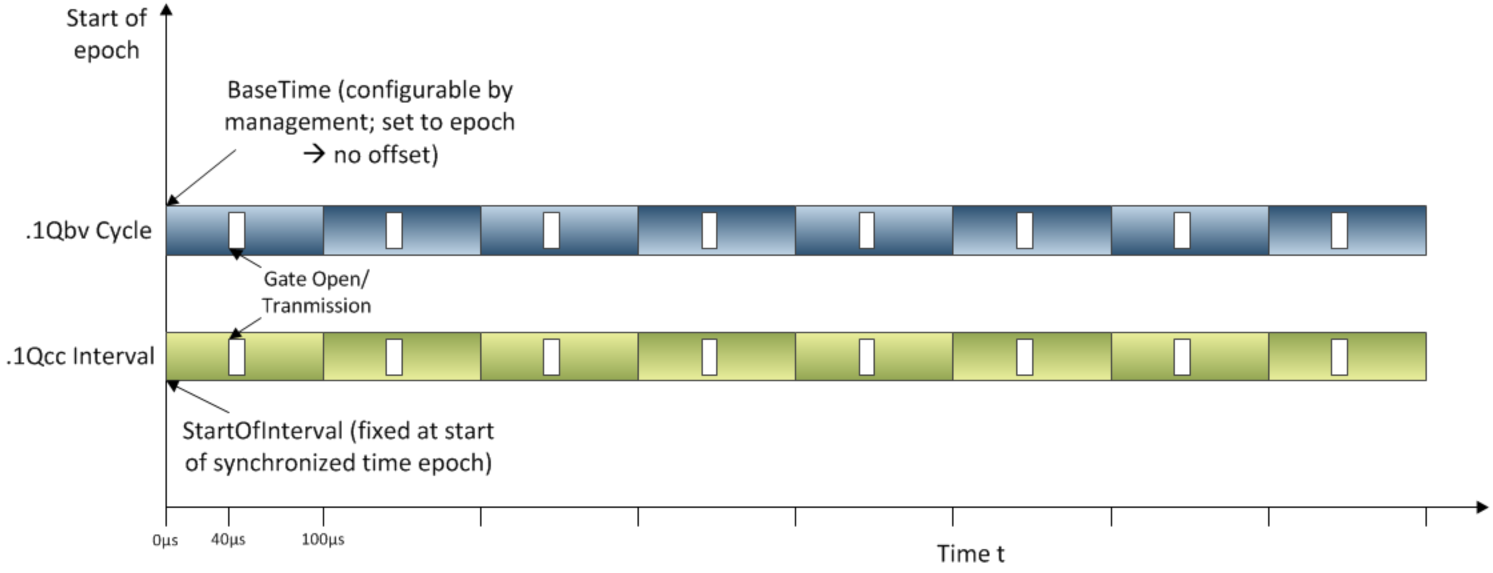
SuggestedRemedy

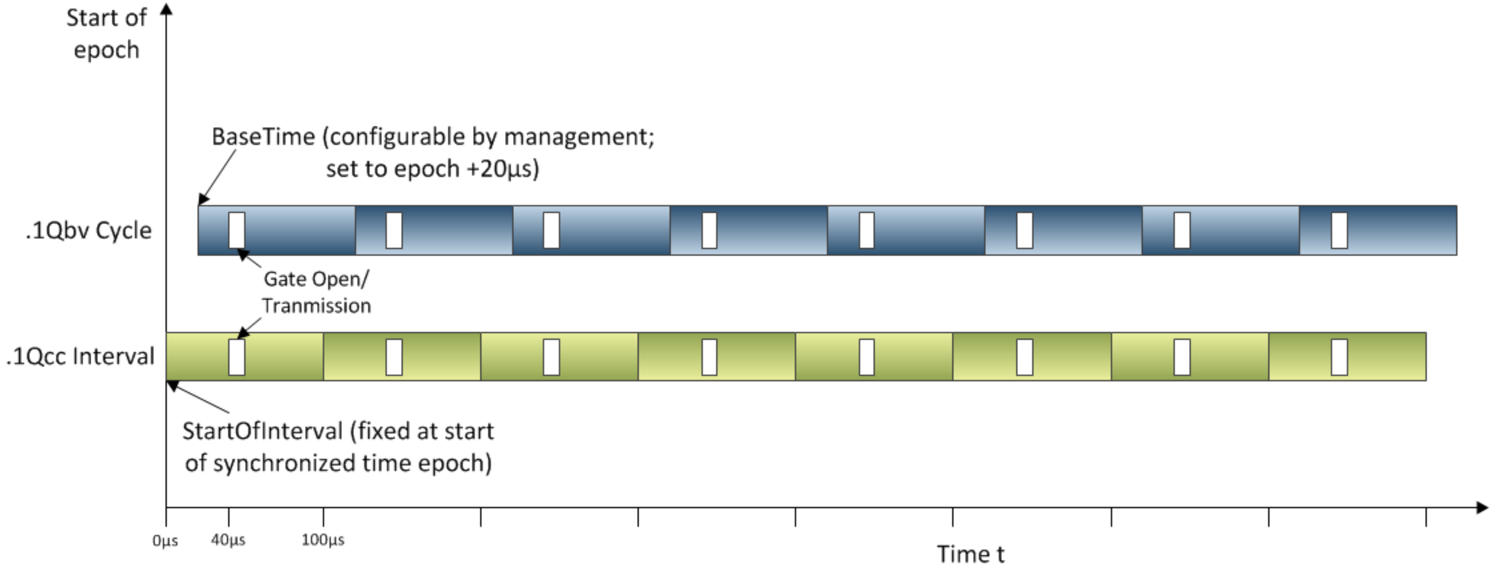
Change to "StartOfInterval = adminBaseTime + (N * Interval)"

Current Situation

- 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?


Start of epoch
BaseTime (configurable by management; set to epoch → no offset)
.1Qbv Cycle
Gate Open/ Tranmission
.1Qcc Interval
StartOfInterval (fixed at start of synchronized time epoch)
0µs
40µs
100µs
Time t


Start of epoch
BaseTime (configurable by management; set to epoch +20µs)
.1Qbv Cycle
Gate Open/ Tranmission
.1Qcc Interval
StartOfInterval (fixed at start of synchronized time epoch)
0µs
40µs
100µs
Time t

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 + 20µs and Interval=OperCycleTime=100µs, a .1Qbv timeIntervalValue=80µs (i.e. offset) would map to 0µs in next interval of a .1Qcc end station
  - …and .1Qcc EarliestTransmitOffset=0µs and LatestTransmitOffset=50µs would lead to .1Qbv TimeIntervalValue between 80µs (of the previous cycle) and 30µs 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

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