Time Aware Shaper

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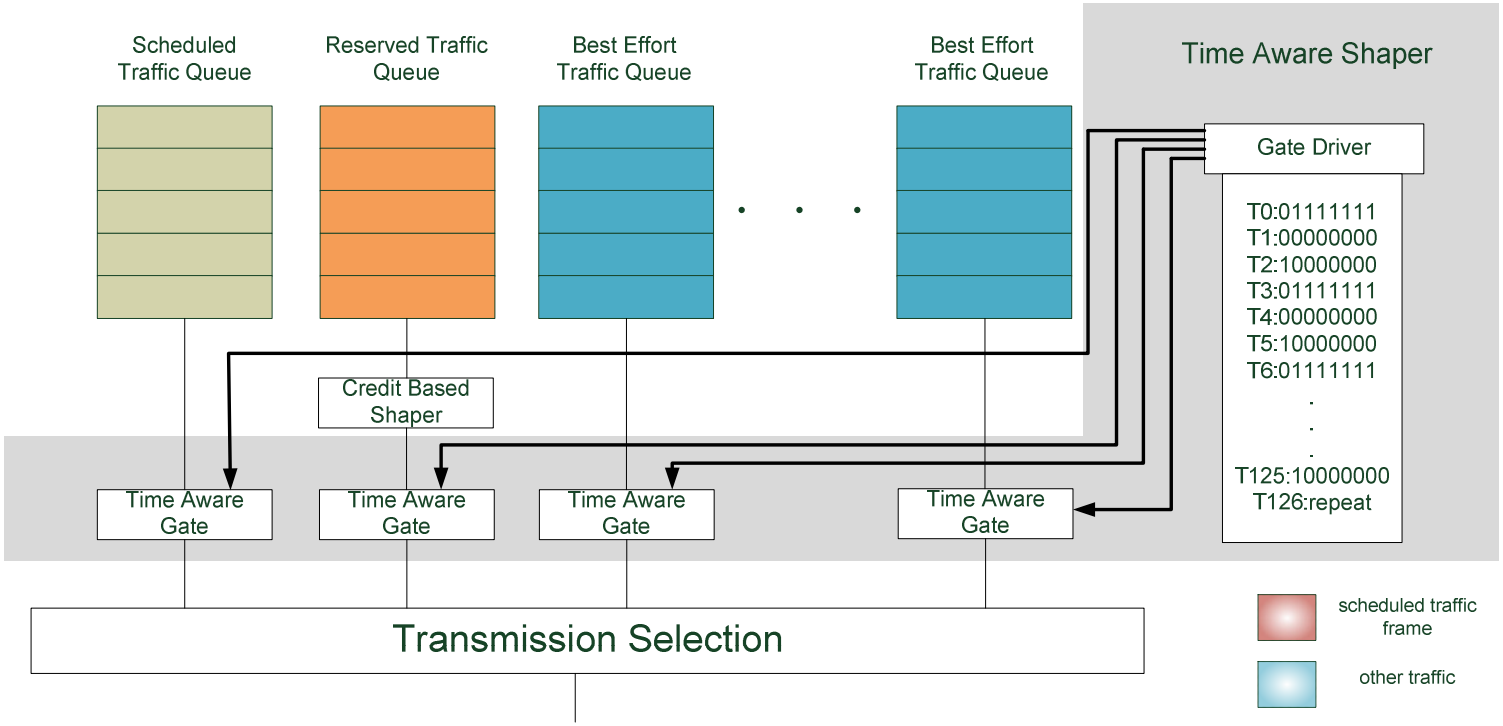
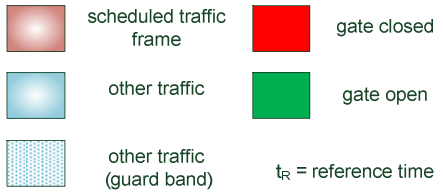
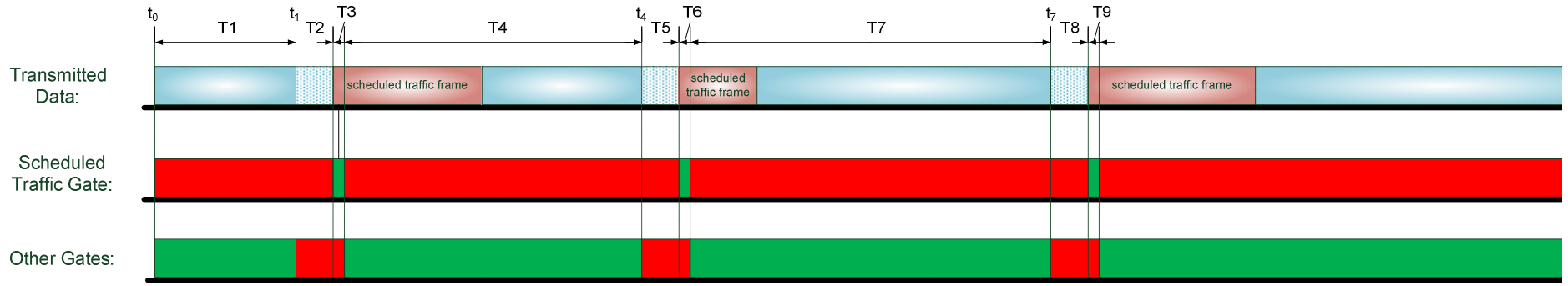
Time Aware Shaper





$$t_x = t_R + (n \cdot \sum_{i=0}^{126} T_i) + \sum_{i=0}^{x} T_i$$



Configuration

- Configuration information
  - Reference time
  - Event list
- Reference time t_R
  - PTP timescale
  - PTP epoch (1 January 1970 00:00:00 TAI)
  - IEEE 802.1 AS Timestamp format

    „struct Timestamp

    {

    UInteger48 seconds;

    UInteger32 nanoseconds;

    };“
- Event List
  - Gate event time interval
  - Event

Event List

- One list per port with eight bits for each queue
- Events:

  Gate events:

  – Gate close event = 0

  – Gate open event = 1

  Other events:

  – Repeat

- Gate event time interval (T0, T1, …, Tx)

  – Relative to last gate event

  – Granularity: 1ns

  – 32 bit unsigned integer in units of 1 ns (max ≈ 4.2s)

  – In order to have a defined start configuration at t_R, T0 must be 0

T0:01111111
T1:00000000
T2:10000000
T3:01111111
T4:00000000
T5:10000000
T6:01111111
.
.
.
T125:10000000
T126:repeat

Important Device Specific Parameters

- Device specific latency t_Device

  → Necessary to calculate the schedule

- Device specific Time Aware Shaper granularity

  → Necessary to define the minimum window size

- Maximum event list length

End Station – Talker

Credit Based Shaper:

- Per stream per class shaping

Time Aware Shaper:

- Per stream per class shaping?

  ➔ Each stream and class queue has one Time Aware Gate (TAG)

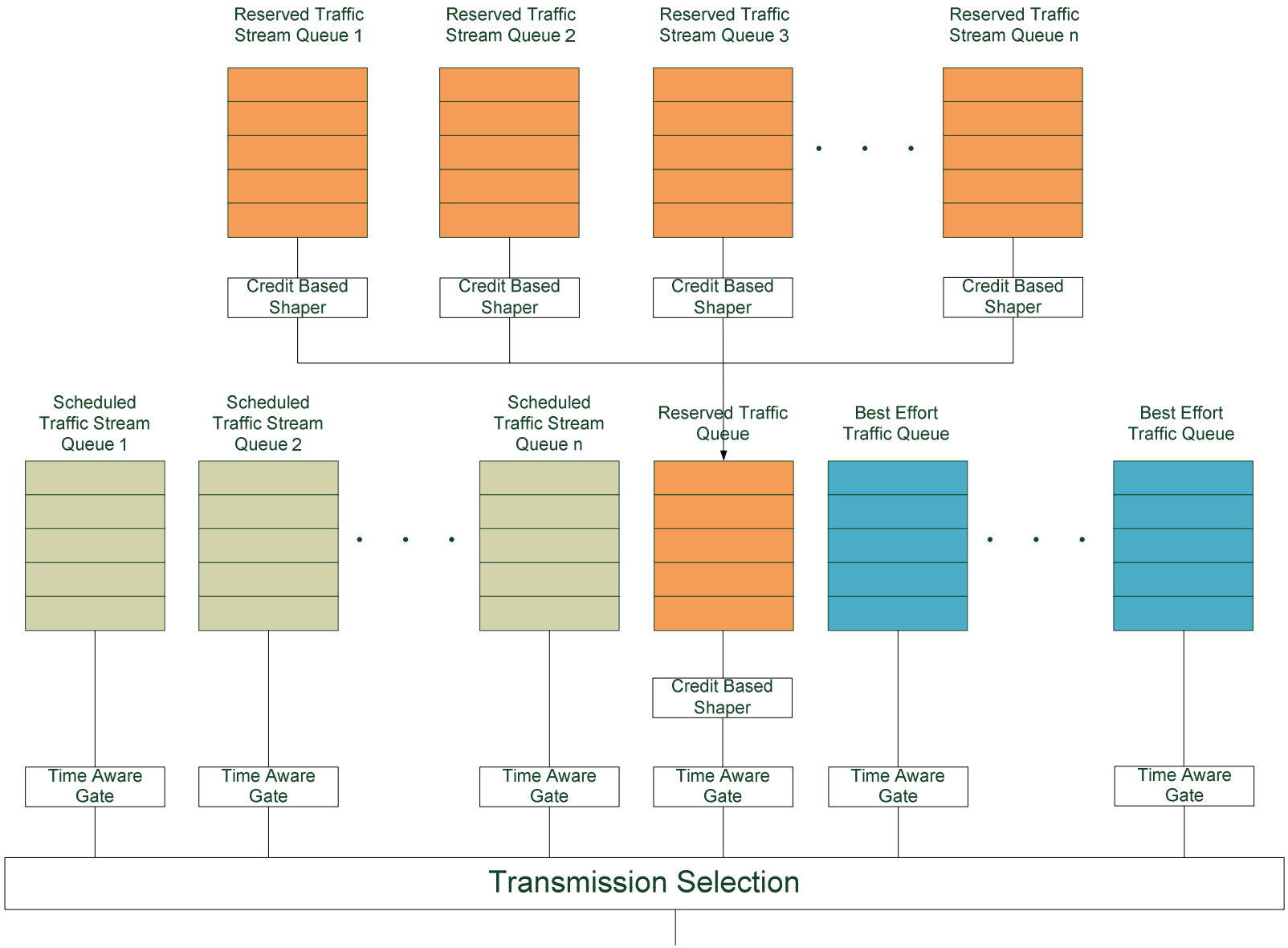
- What is the relation between the TAG of the stream queues and the class queue?
- Is a per class shaping in the talker necessary?
- Possible solution: Per stream queues which are directly connected to the transmission selection through a TAG

  ➔ Per stream shaping in the end stations

    ➔ Less complicated

    ➔ Ensures that a frame from the scheduled stream is transmitted

End Station – Talker



Priority Regeneration

- A domain boundary concept seems to be necessary

  ➔ SRP needs to be extended (Gen1 and Gen2 SRP)

- Should the domain be called SRP domain?

  ➔ SRP domain is defined for SR classes

- Is the Scheduled Traffic class a SR class?

  Current definition of SR class:

  "stream reservation (SR) class:

  A traffic class whose bandwidth can be reserved for AV traffic. A priority value is associated with each SR class. SR classes are denoted by consecutive letters of the alphabet, starting with A and continuing for up to seven classes."

Priority Regeneration

- Is it possible to redefine SR class A as the one which is used for Scheduled Traffic?

  ➔ SR class A is currently tightly linked to the Credit Based Shaper (as the term SR class)

  ➔ Many changes in 802.1Q necessary

- It seems to be simpler to create a new type of class (“Scheduled Traffic Class”)

Priority Mapping

What is the default priority for Scheduled Traffic?

- Priority 3? (as AVB Gen1 SR class A?)
  - It would be necessary to decouple the CBS125 and CBS250 from the terms class A and B to allow PCP 3 for Scheduled Traffic and PCP 2 for CBS125
- Other priority e.g. 4
  - Easier to integrate
  - Fully compatible with AVB Gen1
  - Drawback: New PCP necessary

- Scheduled Traffic has the highest priority (above AVB Gen1 SR class A)

What should be part of 802.1Qbv?

- Explanation (in an informative annex?) of the basic idea to block non Scheduled Traffic in order to have an idle port for the Scheduled Traffic transmission
- General explanation of possible ways to configure the TAS e.g. performance optimized vs. bandwidth optimized)

- Or is the description of the TAS enough?

Thank You