End System Traffic Shaping for P802.1DP

Abdul Jabbar
GE Research

Objective

Further discussion on TSN Profile Features

Recap: Two Profile Approach

Asynchronous Profile

targets current Ethernet based use cases

- Asynchronous with slower cycle times (> 50 msec)
- Latency bounded with acceptable delay variation (jitter) up to latency bound
- Comfortable with rate constrained shaping
- Controlled network – no undefined traffic on the network
- Highly static – designed, analyzed, configured well ahead of operation
- Certification burden is significant – simplicity is valuable

Asynchronous profile to provide an equivalent solution

Synchronous Profile

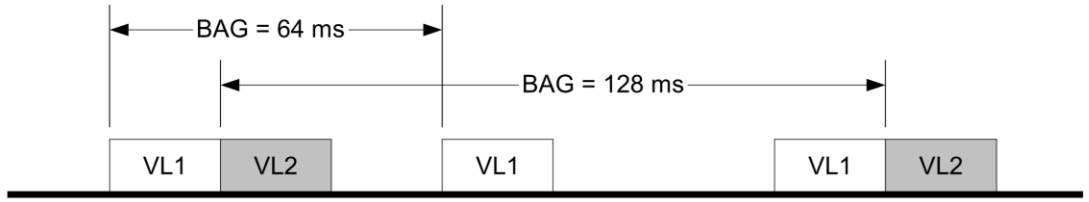
targets current non-Ethernet and future use cases

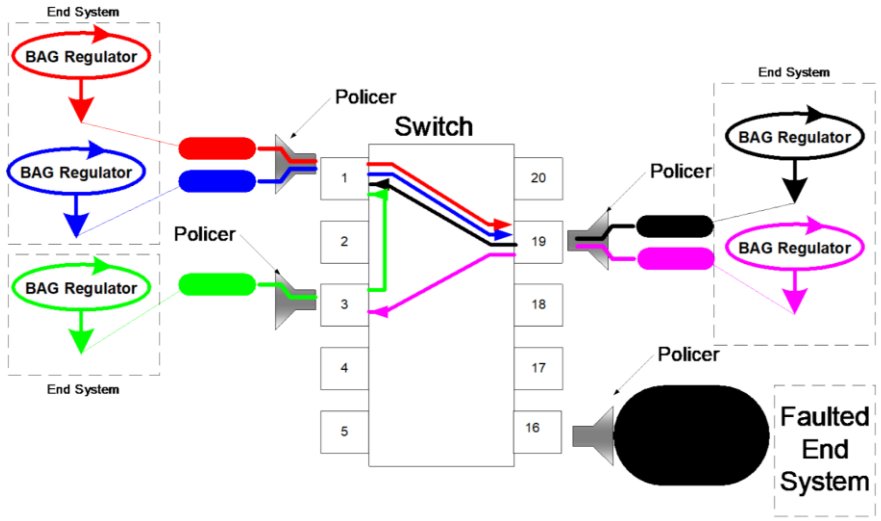
- Segmented/partitioned subsystems
- Synchronous with cycle times in the order of 1 msec. Future use cases with sub-millisecond cycle times
- Sensitive to latency (or deadline) and delay variation (jitter)
- Convergence of mixed critical traffic
- Interoperability of legacy buses on top TSN backbone
- Platform wide clock time distribution
- Potential for dynamic (re)configuration

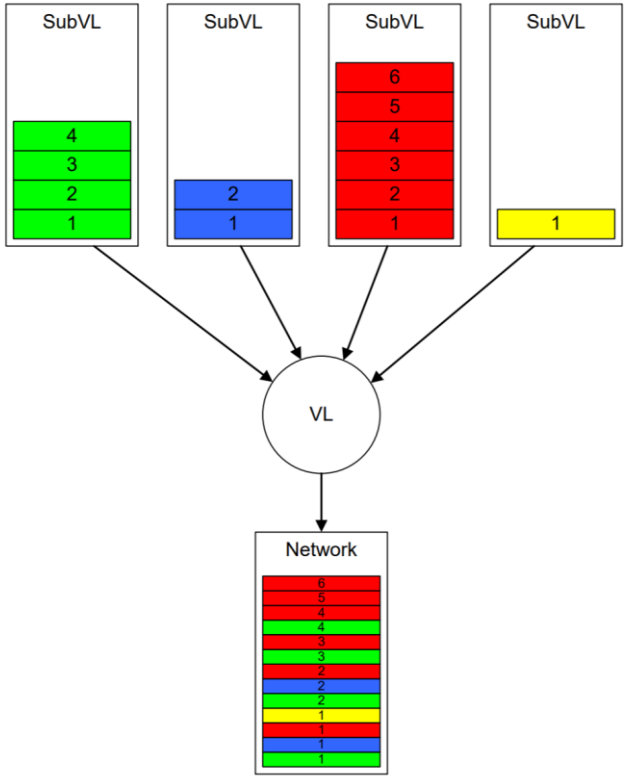
Synchronous profile to provide an ethernet based converged system

Traffic Shaping for Asynchronous Profile

- Example of VL1 with BAG of 64 milliseconds and VL2 with BAG of 128 milliseconds



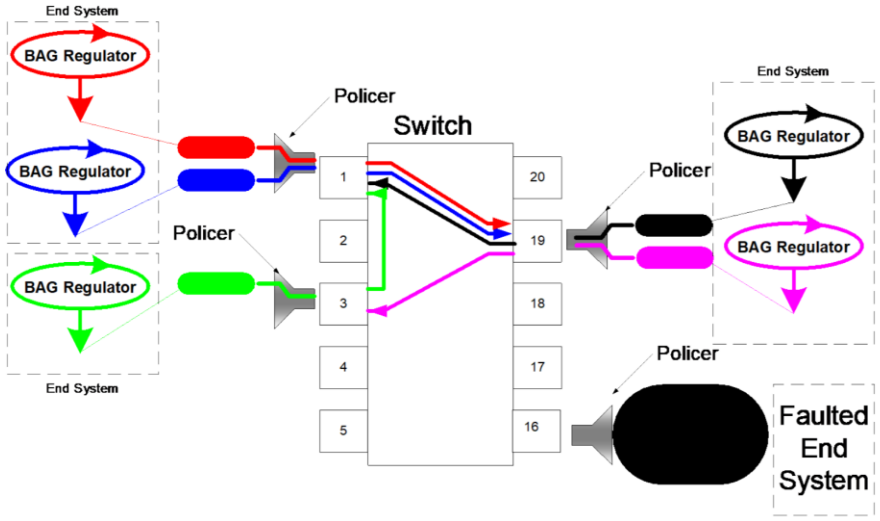




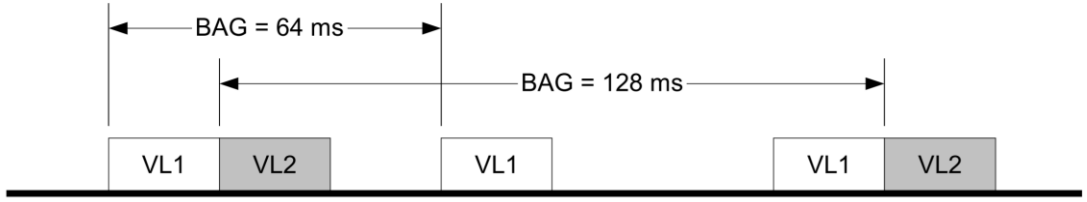
Reference: ARINC 664p7 Traffic Shaping Features by Brent Nelson

https://www.ieee802.org/1/files/public/docs2021/dp-Nelson-A664p7-Traffic-Shaping-0721-v01.pdf

Traffic Shaping for Asynchronous Profile



- Example of VL1 with BAG of 64 milliseconds and VL2 with BAG of 128 milliseconds



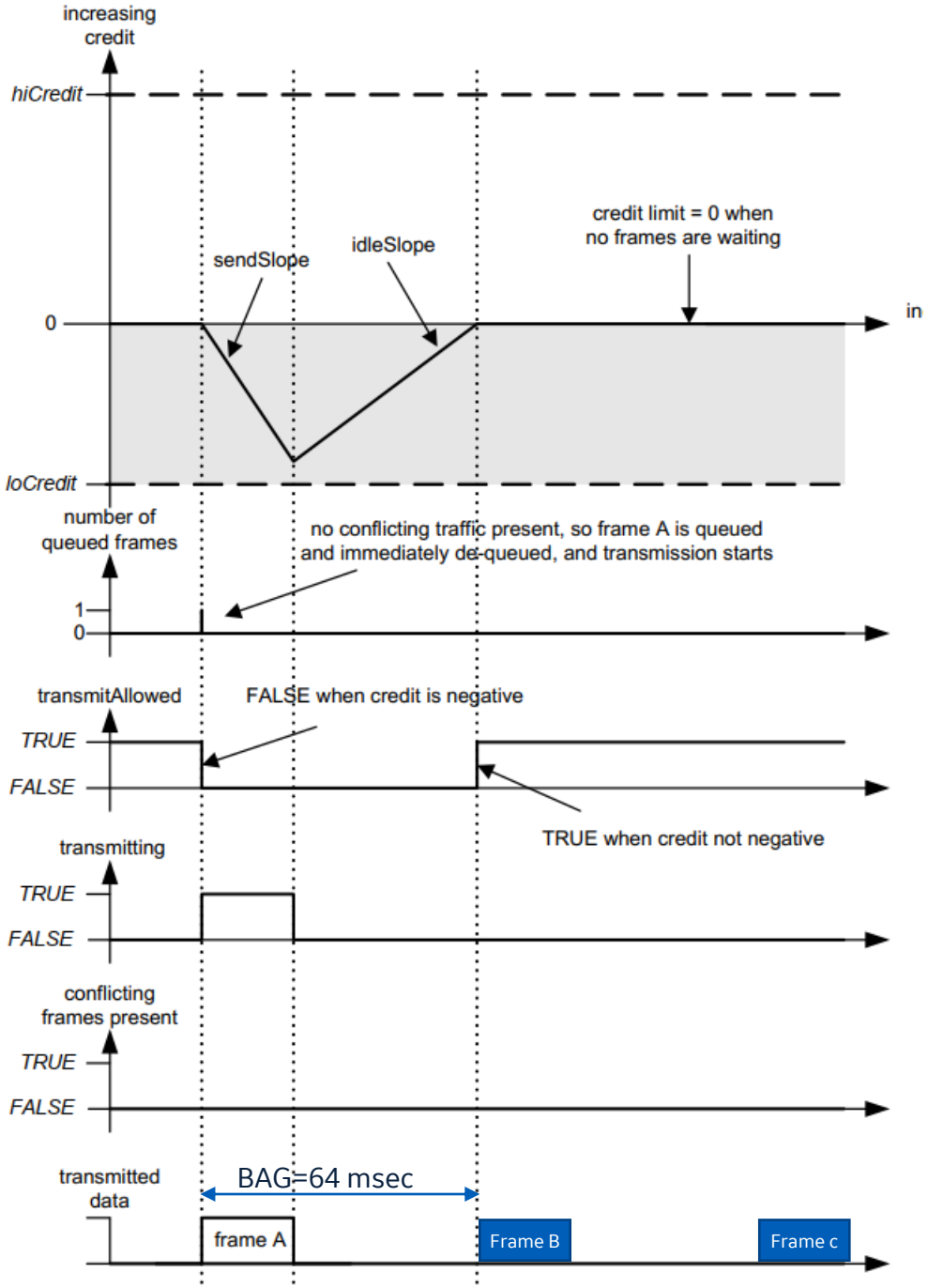
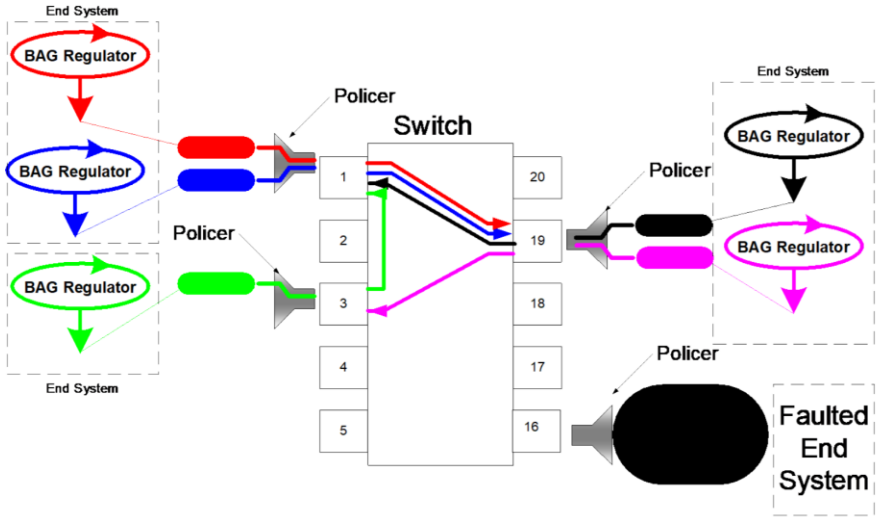
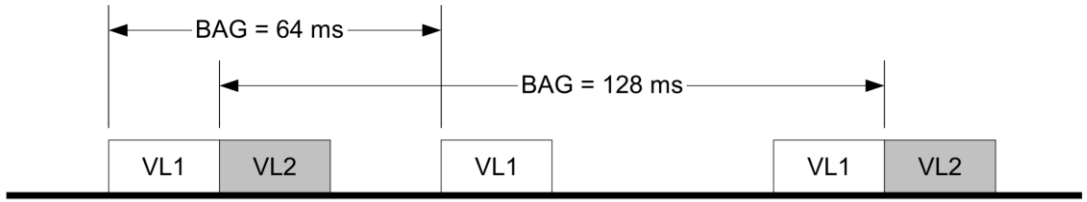


Figure L-1—Credit-based shaper operation—no conflicting traffic

Traffic Shaping for Asynchronous Profile



- Example of VL1 with BAG of 64 milliseconds and VL2 with BAG of 128 milliseconds



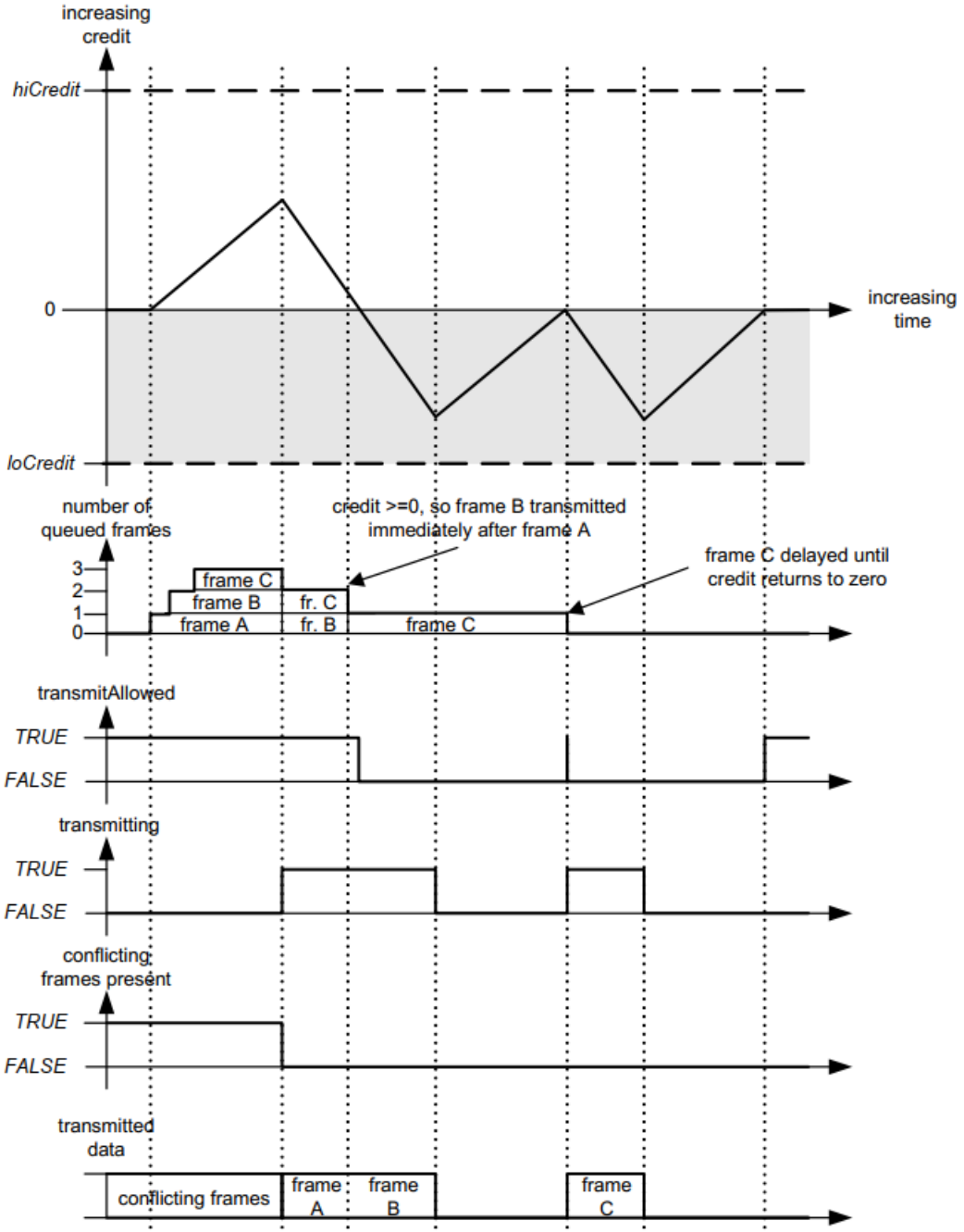
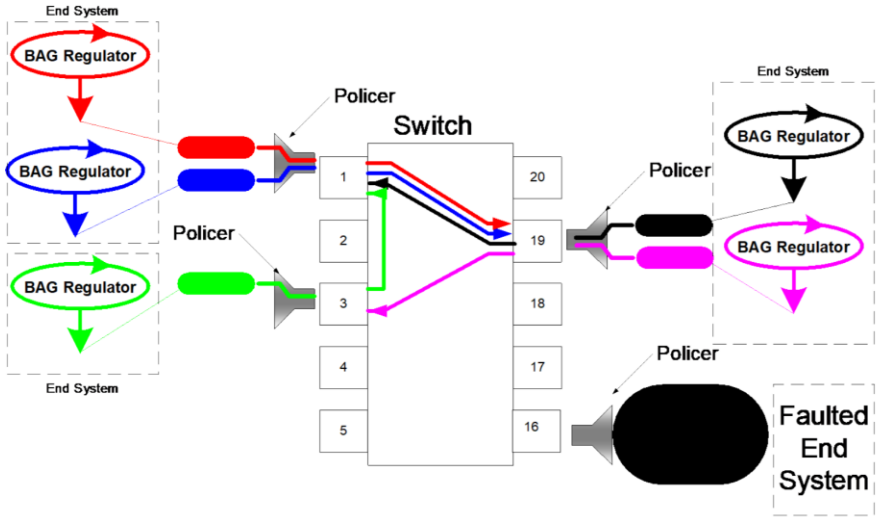
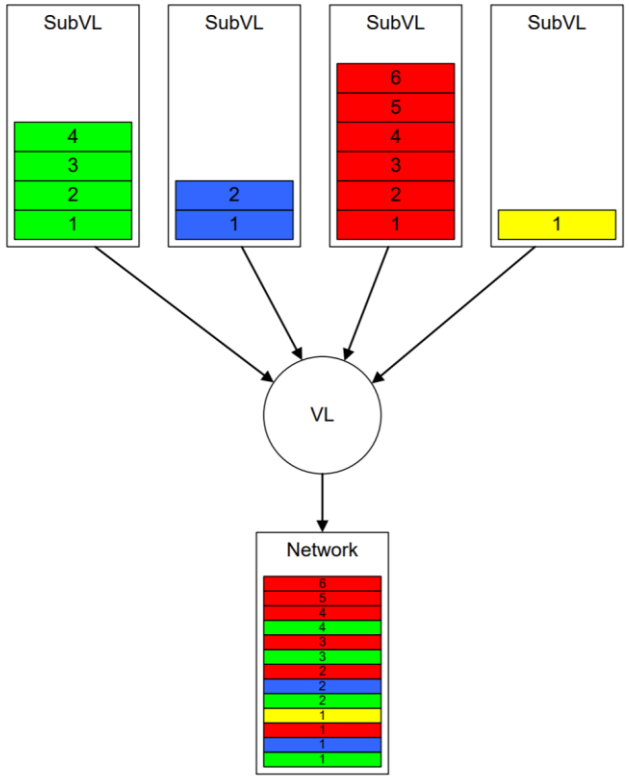


Figure L-3—Credit-based shaper operation—burst traffic

Traffic Shaping for Asynchronous Profile





A single application message is assigned a single subVL
SubVL frames are pulled in round robin fashion in to the VL

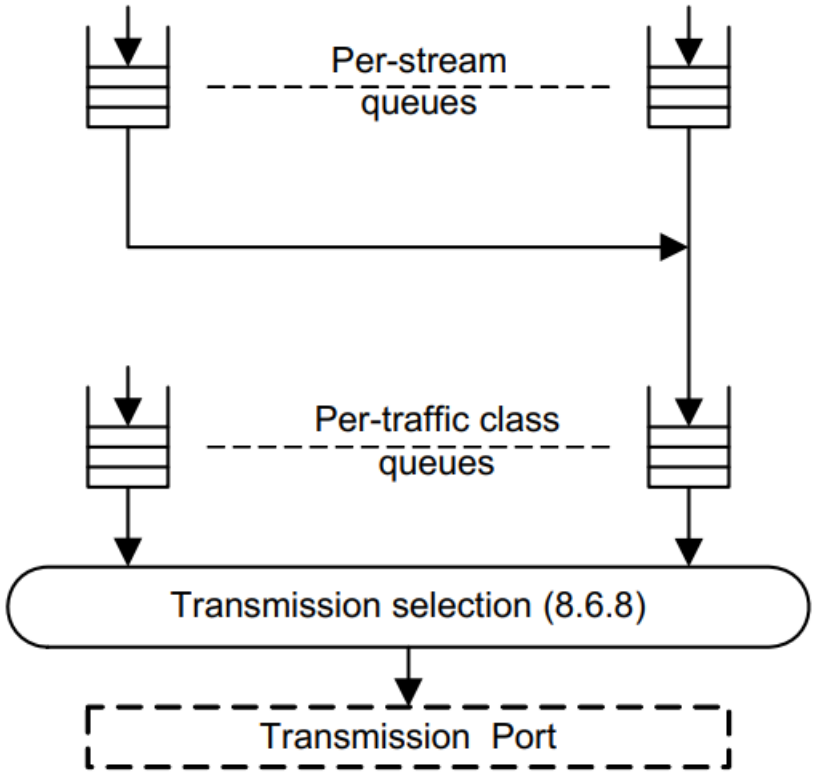
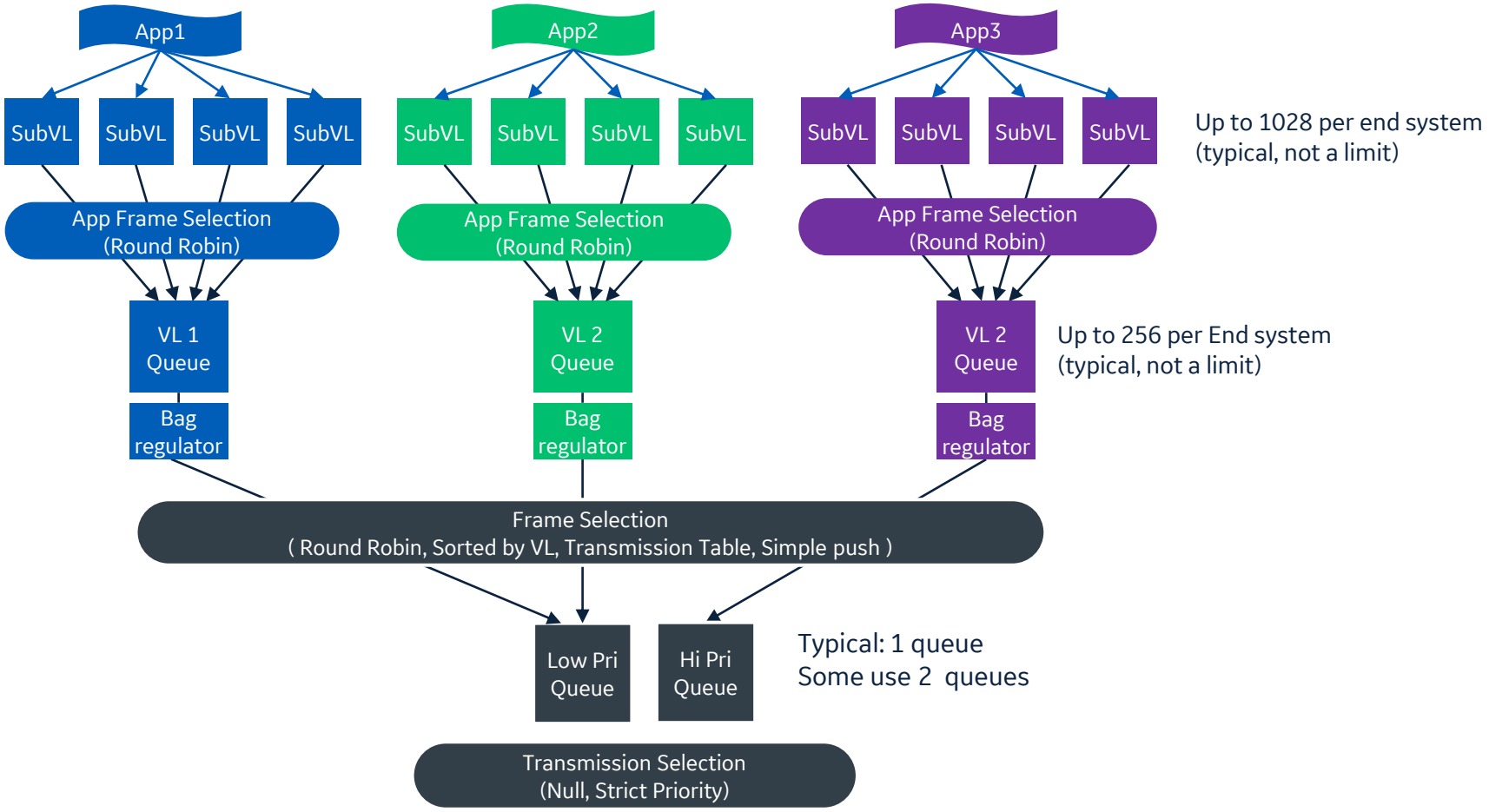


Figure 34-1—Queuing model for a Talker station

ARINC 664 End System Traffic Shaping

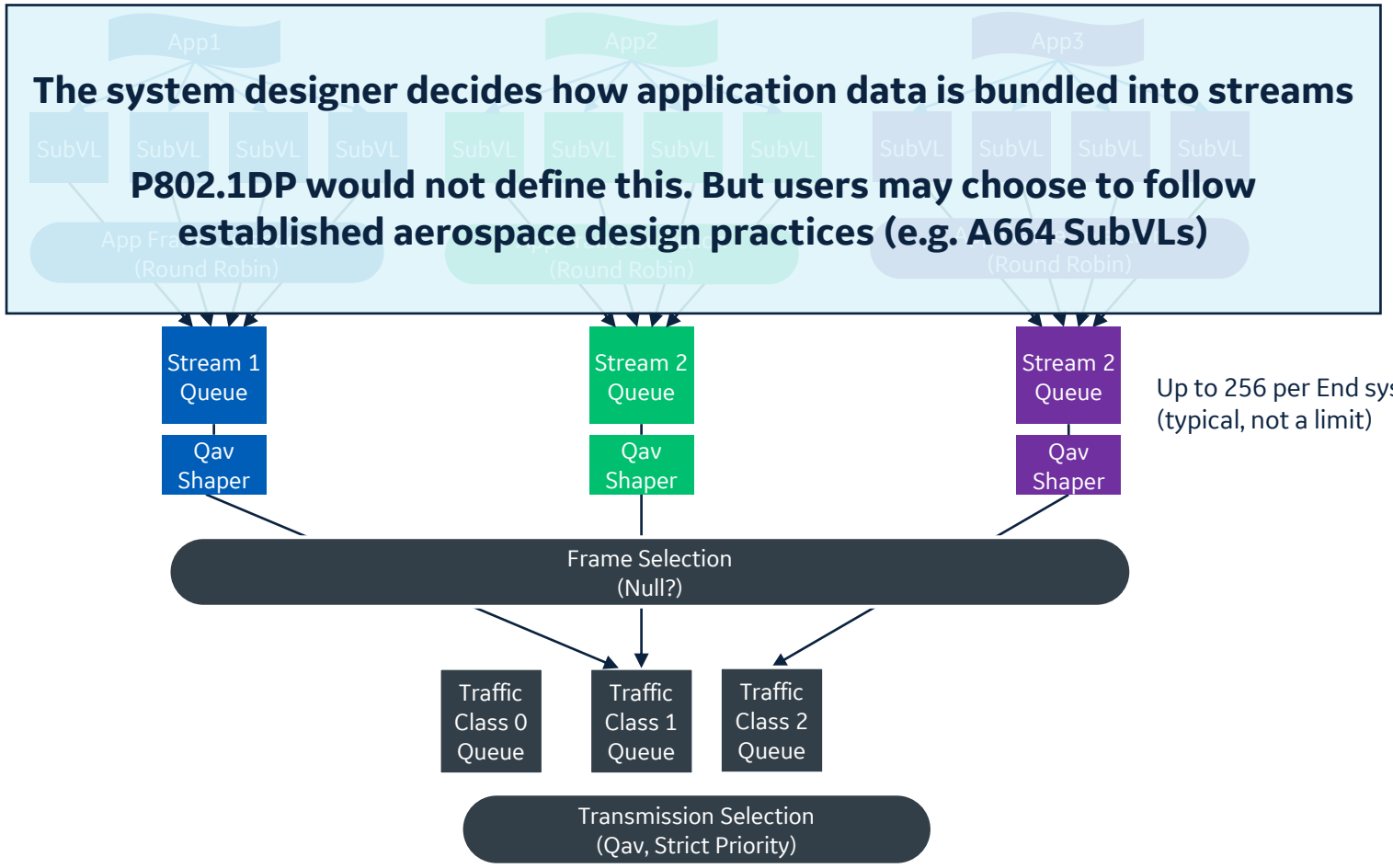


Up to 1028 per end system
(typical, not a limit)

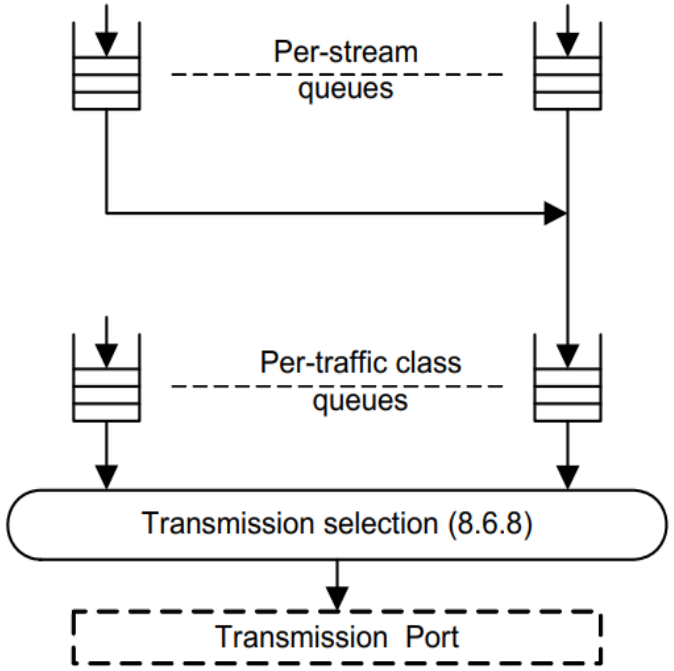
Up to 256 per End system
(typical, not a limit)

Typical: 1 queue
Some use 2 queues

Proposed P802.1DP Asynchronous Profile Shaping



Up to 256 per End system (typical, not a limit)



TSN Shaping compared to A664

Discussion

- Is Qav an appropriate replacement for current aerospace shaping solutions?
- Is Qav only needed on end stations?
- What about mixed traffic scenarios?

Notes from Meeting:

Large end systems have 64-256 transmit Virtual Links (VL) → maps to 256 TSN streams

Each VL may have up to 4 sub VLs.

Need to understand if Qav end systems can support up to 265*4 streams

Requesting contributions from the group