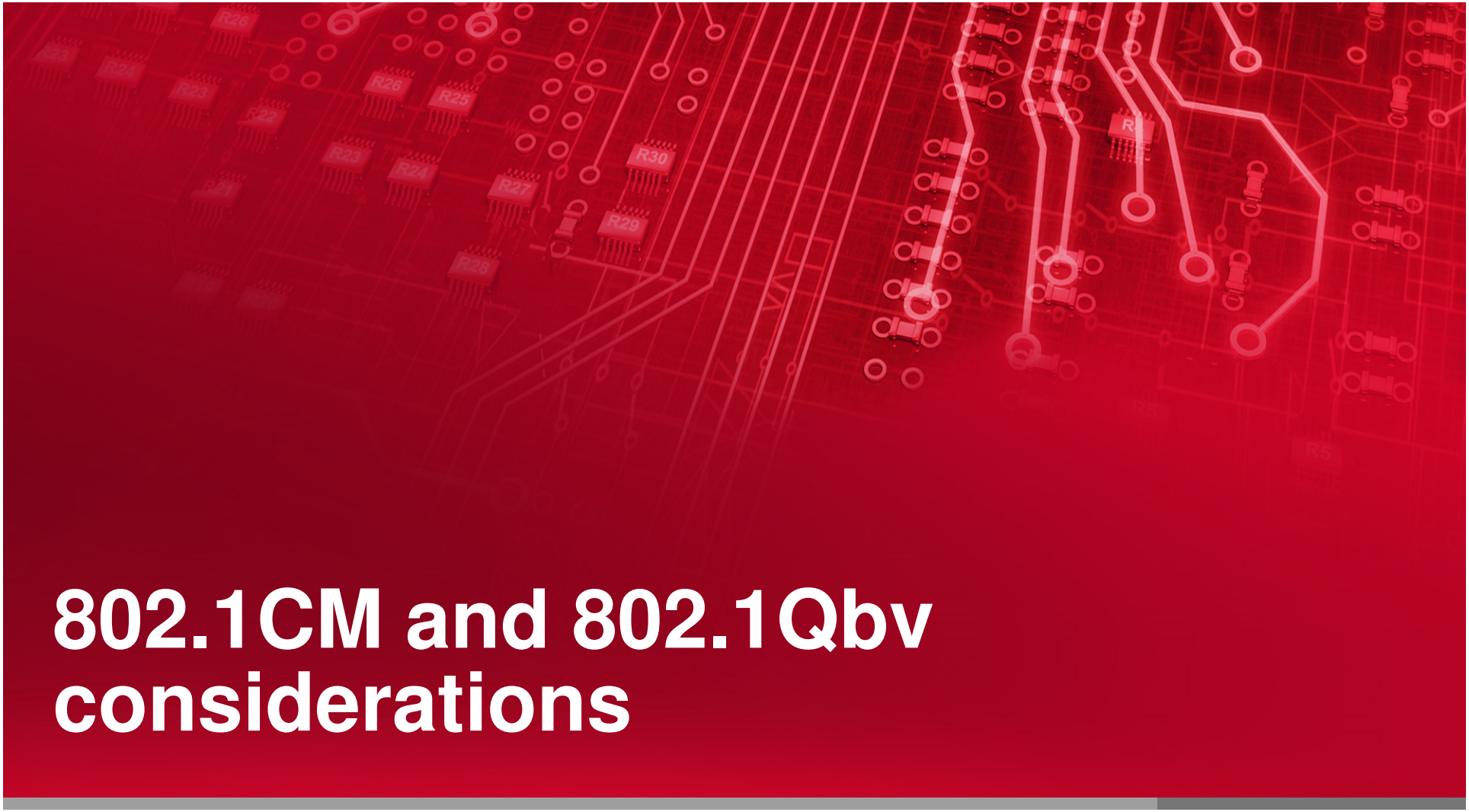

802.1CM and 802.1Qbv considerations

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Background

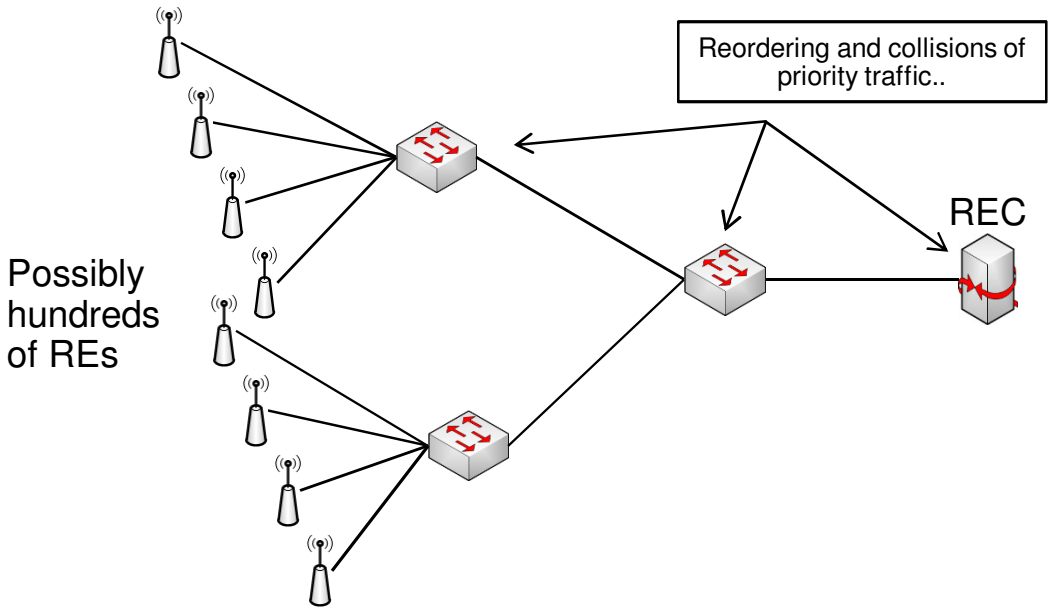
- Time Aware Shaper (TAS), 802.1Qbv, does not assume all nodes in the network are perfectly synchronized but in practice that is expected/required.

- Optimal allocation of streams/schedules is complex in a non-trivial topology and typically results in bandwidth waste due to “making sure” allocations work as planned and schedules are met.

- The assumption is that high priority traffic is not the majority, which might not be the case with fronthaul. (if all traffic is special no traffic is special..)

Additional TAS considerations

- Consider a simplified example topology below:



- Aggregation implies many-to-one race conditions, where several incoming packets and queues compete for shared resources in a switch.
- Intentional talker offsetting at ingress could help but is hard to arrange...
- If intermediate nodes are not properly synchronized, that has to be compensated, which likely means growing guard band size in the case of TAS.

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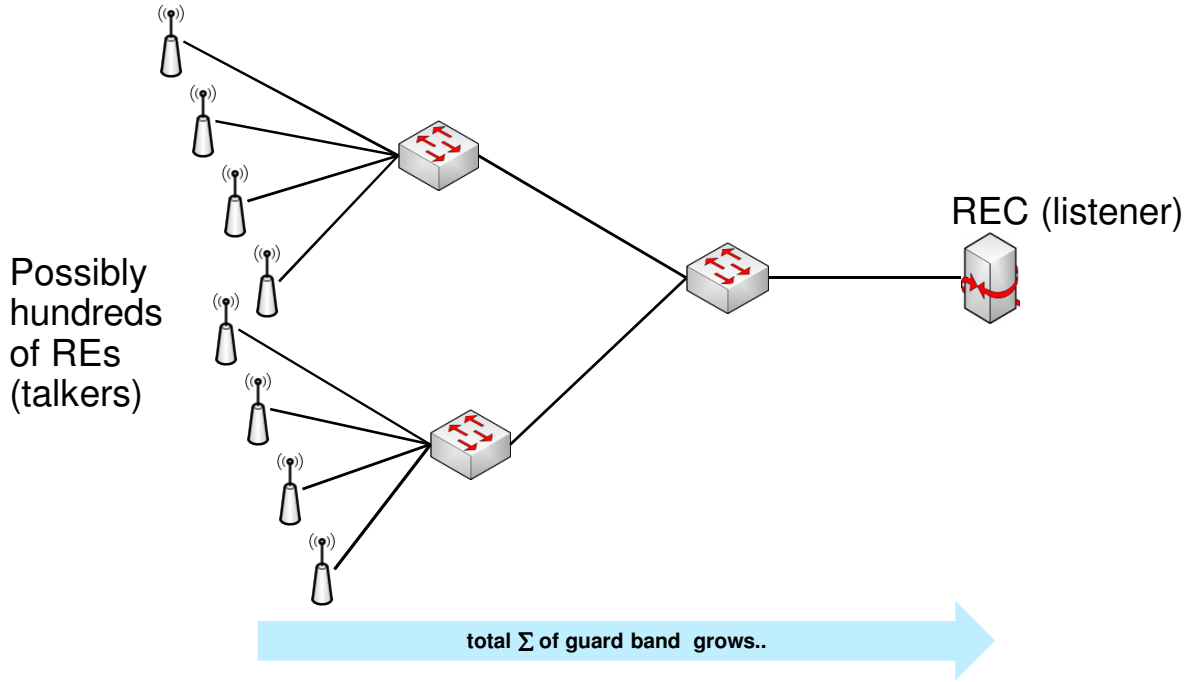
Many-to-one considerations

- Coming up with a proper network wide schedule is obviously hard.
- The guard bands add up on each hop:
  - Merging of multiple priority stream schedules.
  - The bigger network the more wasted bandwidth.
  - Increasing protected window size is an option but has other challenges.



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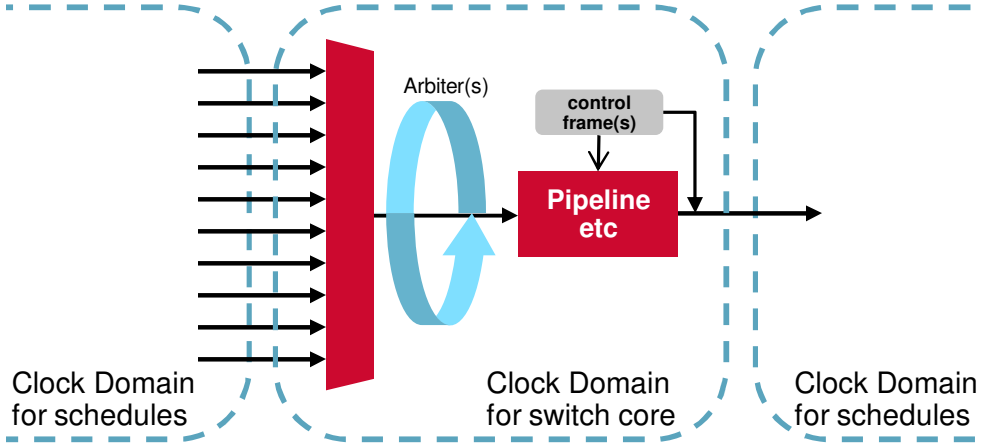
But there is more..

- Switch internal jitter is not often considered, or assumed to be too low to matter, when looking at the benefits of TAS. Sources for switch internal jitter for priority traffic:
  - Arbiters (ports, queues, ...)
  - Multiplexing of control frames (PFC, ...)
  - Asynchronous clock domain crossing
  - Rate adaptations
  - etc…



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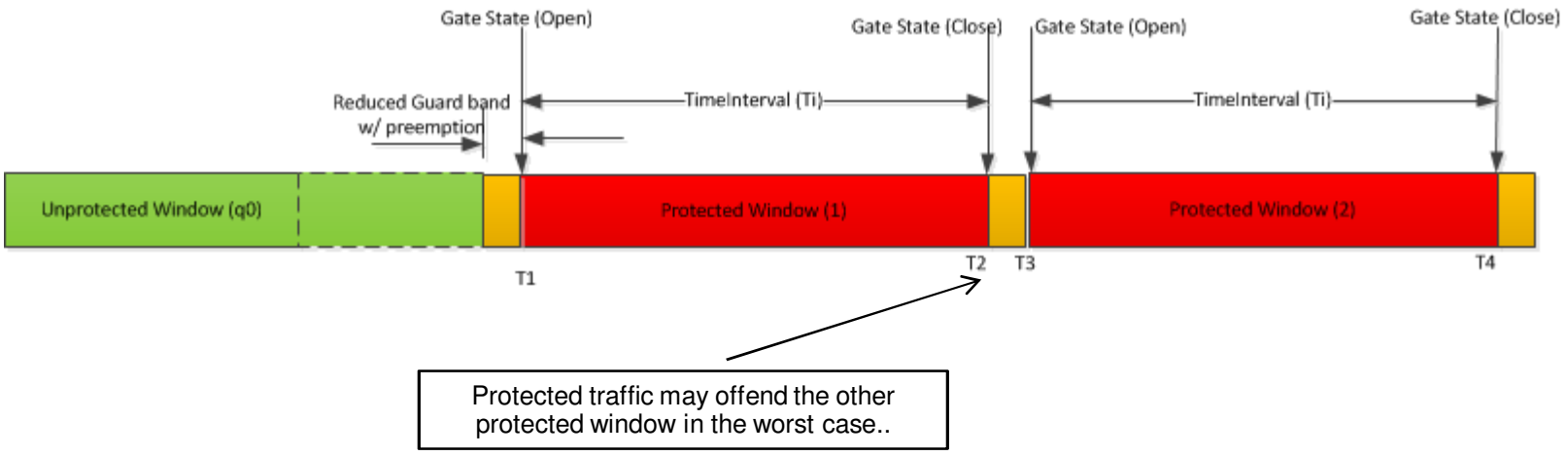
Adding to many-to-one considerations

- The variable latency in a switch is a function of the number of ports/queues competing for the shared resources such as access switch pipeline, queues and output ports.
- The switch internal jitter has to be dealt with somehow:
  - Increase the guard band.



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Summary

- Many-to-one issue:
  - Guard band adds up on each level of the switching hierarchy.
- Switch internal jitter has to be compensated:
  - Increase the guard band size, which can be more than needed for e.g., preemption with TAS.
- Preemption alone brings the PDV to “good” levels in an intermediate node [1]. Adding TAS has a marginal or even negative benefit for fronthaul, compared to what has already been achieved. Consider the cost of:
  - Network management complexity.
  - Wasted bandwidth.
  - Switch implementation complexity.
- 802.1Qbv should not be included in 802.1CM.

[1] http://www.ieee802.org/1/files/public/docs2015/cm-farkas-applicability-of-bu-and-bv-1115-v01.pdf