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TRANSFORMING HOW CARS OF THE FUTURE ARE BUILT

IEEE802.1DG – SHAPERS | JULY 2021

IEEE contribution

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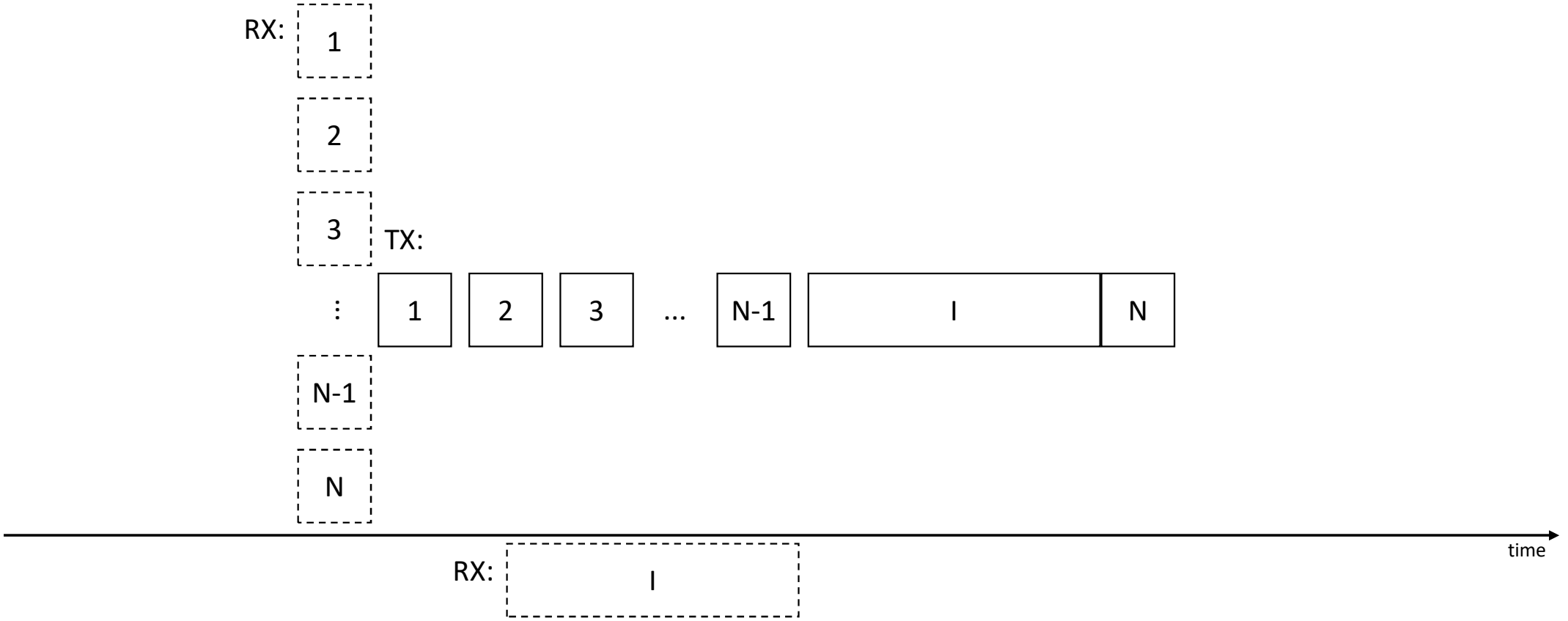
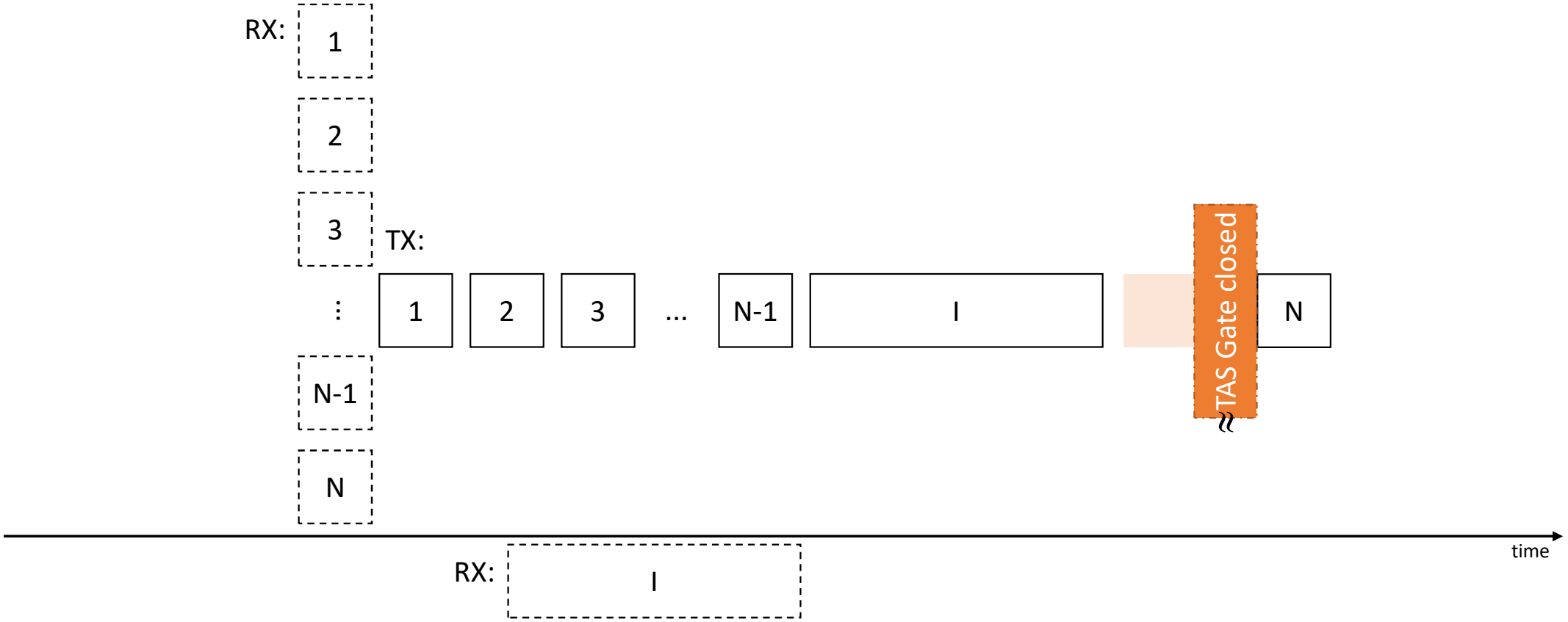
CBS with late interference



https://www.ieee802.org/1/files/public/docs2010/BA-pannell-latency-math-1110-v5.pdf

CBS + TAS with late interference



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ATS Basics (IEEE P802.1Q-Rev/D0.5)

8.6.11.3.3 BucketEmptyTime

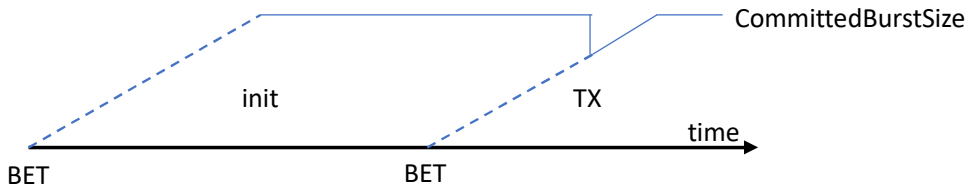
A state variable that contains the most recent instant of time at which the token bucket of the ATS scheduler instance was empty, in seconds.

The BucketEmptyTime variable is initialized with a time earlier than CommittedBurstSize/CommittedInformationRate in the past, as perceived by the ATS Scheduler Clock.

After initialization, the number of tokens in the token bucket is equivalent to the CommittedBurstSize parameter.

8.6.11.3.5 CommittedBurstSize

The committed burst size of the ATS scheduler instance, in bits (8.6.5.6). The CommittedBurstSize parameter defines the maximum token capacity of the token bucket. In the token bucket model, *the number of tokens removed from the bucket by a frame equals the length of the frame*, as defined in 8.6.11.3.11.



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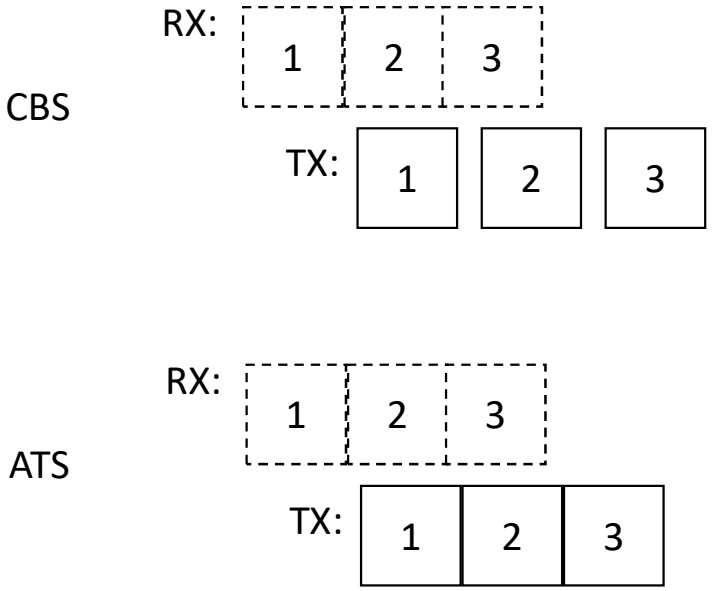
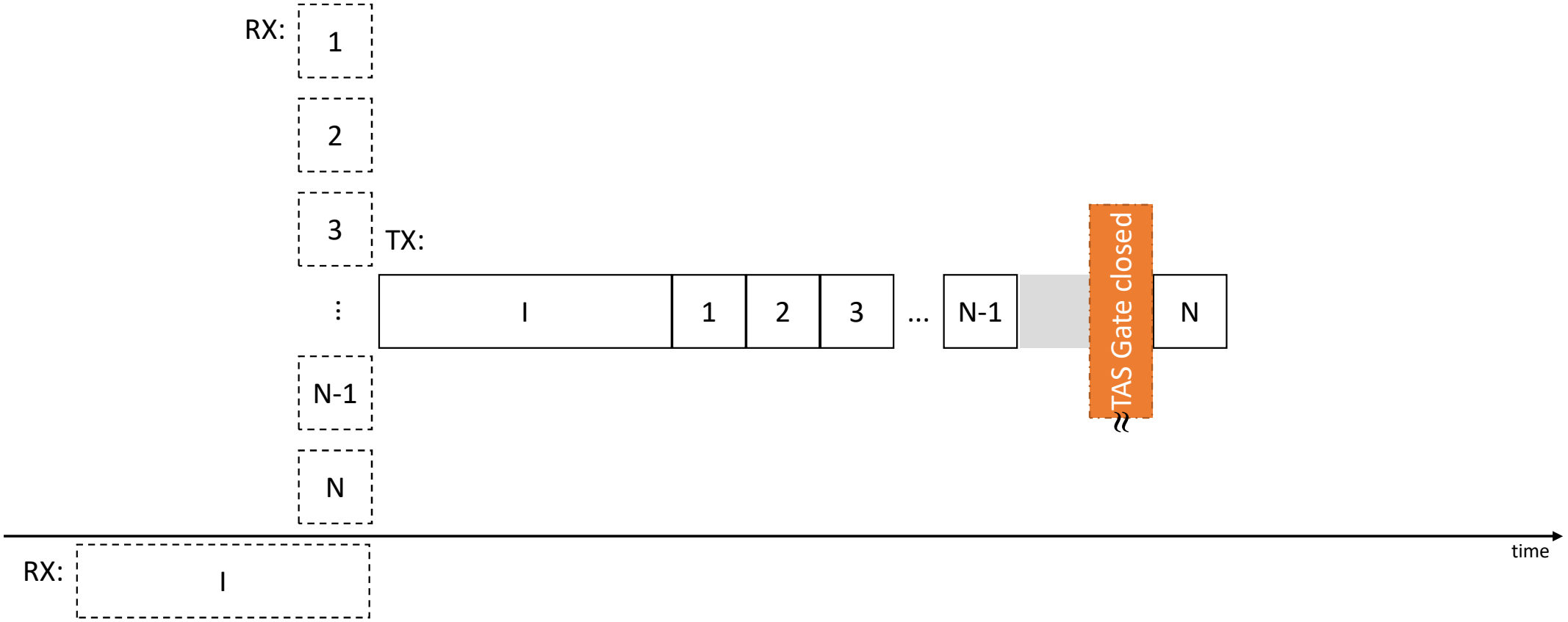
CBS vs. ATS Burst-Behaviour



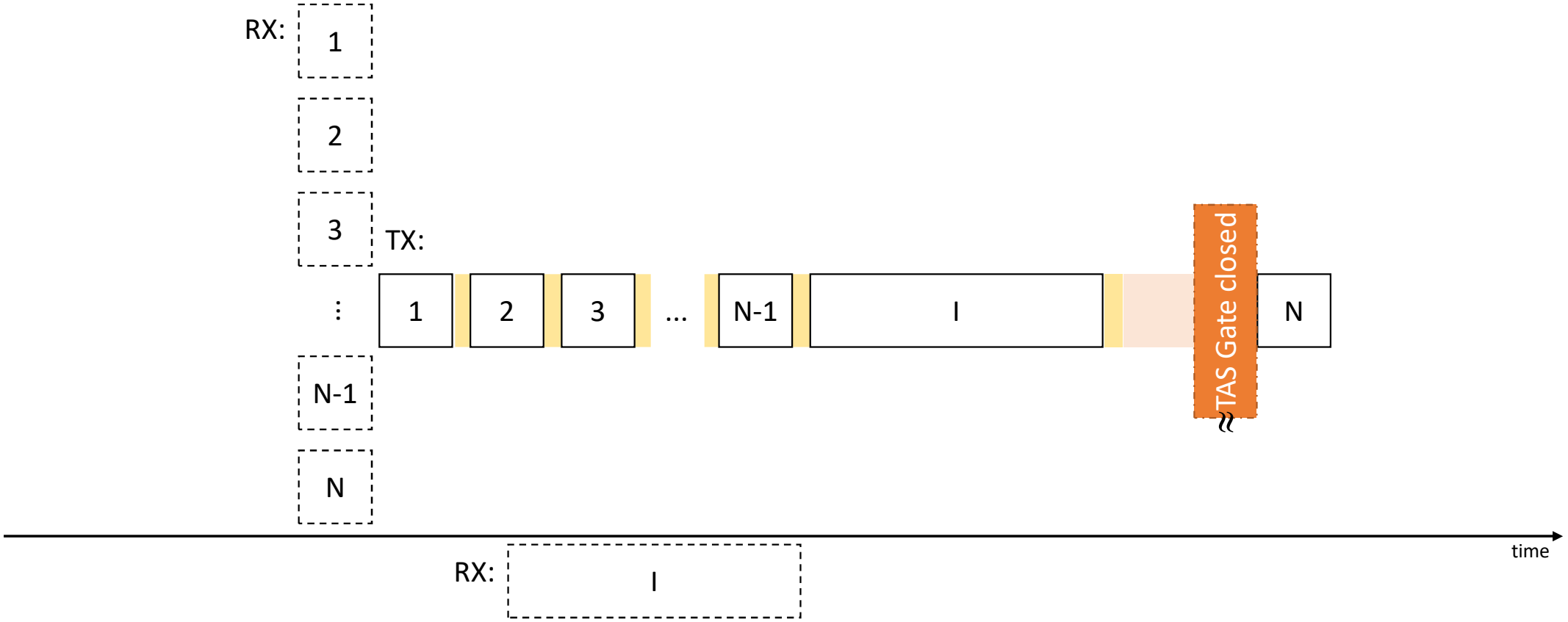
ATS:

- Frames of different streams received on different ports
- If enough tokens in (each) bucket

ATS + TAS with early interference



CBS lost Link-Capacity



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ATS vs. CBS Comparison

- Both give way to interfering traffic - TAS does not!
- ATS intends bursts
- CBS tries to prevent bursts
  - At the cost of bandwidth for other traffic
  - At the cost of "**L.3.1.3 Permanent delay**"
- TAS interaction:
  - CBS config (operIdleSlope) explicitly given, depending on TAS config.
  - ATS config must fulfil stability per stream (committedBurstSize, committedInformationRate)
- ATS has more complex "per stream" configuration
  - How many streams per port are required?

ATS–TAS Configuration Dependency

Assuming there is no interfering traffic for an ATS controlled queue because the TAS gate is open for only this one queue, there is a simple stability condition that needs to be met, in order to not overrun the buffer of the queue.

The ATS stream(s)*) can on average deliver (committedInformationRate * operCycleTime) during one TAS gate cycle. While the gate is open, (portTransmitRate * gateOpenTime) can be transmitted. For stability on average at least as many bits must be transmitted as could be received:

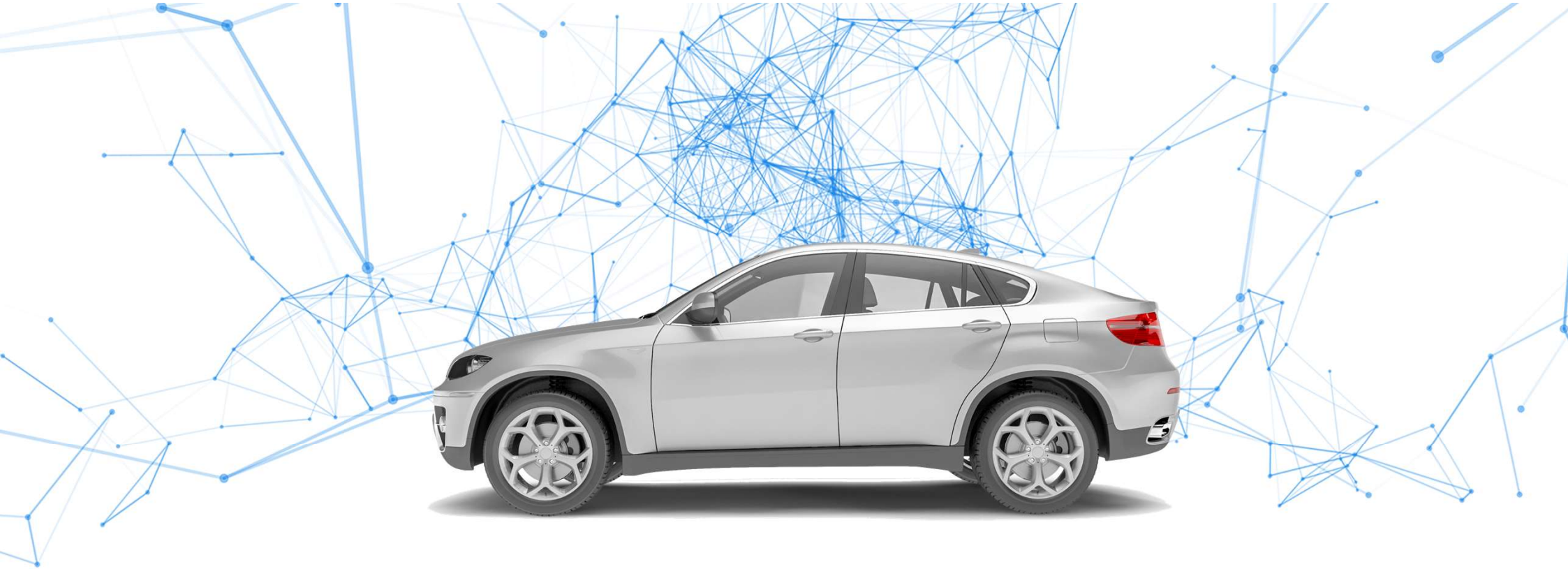
(committedInformationRate * operCycleTime) ≤ (portTransmitRate * gateOpenTime)

For ATS (in contrast to CBS) committedBurstSize can/must be chosen independently from committedInformationRate:

committedBurstSize ≥ (portTransmitRate * GateOpenTime)

Resulting in what was called “Burst Operation” in the CBS discussion for tAllStreams = gateOpenTime.

*) *committedBurstSize and committedInformationRate may be summarized over different streams!*



THANK YOU

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