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STATELESS RESOURCE SHARING AND ATS

PUTTING TOGETHER THE BEST OF BREADS

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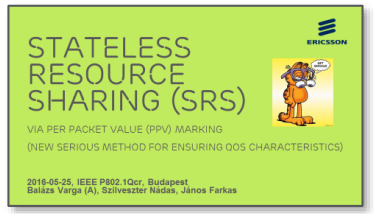
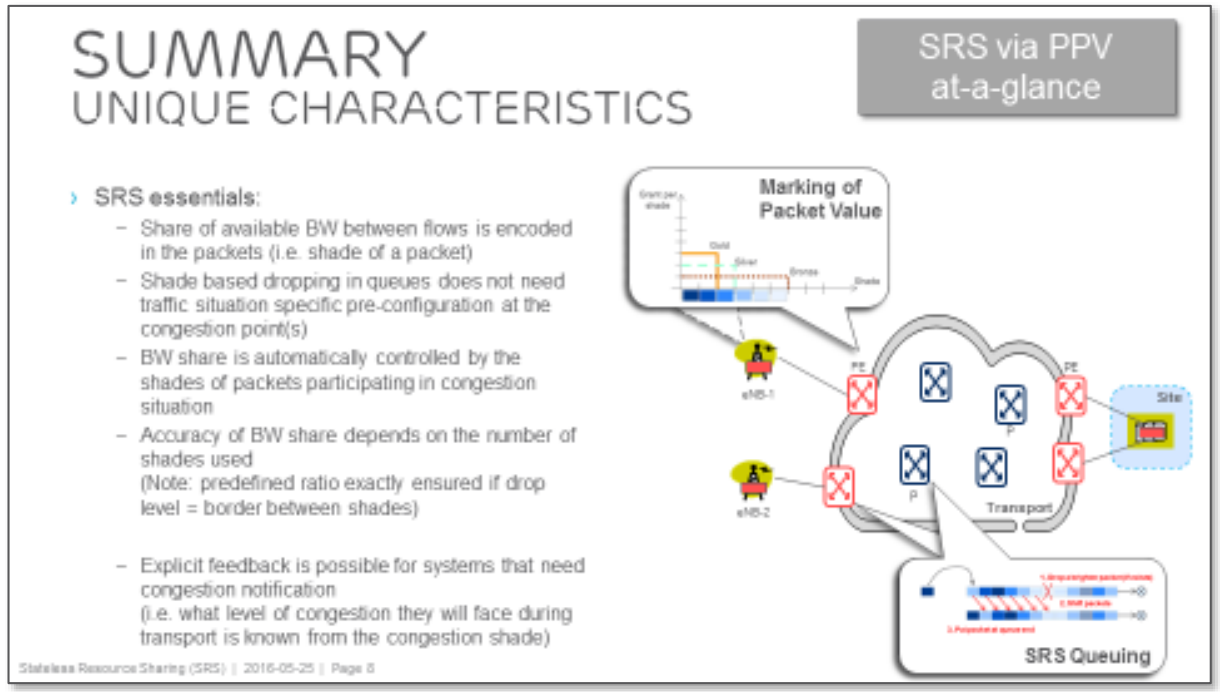
INTRODUCTION
SRS OVERVIEW AND PRESENTATION GOAL

- Stateless Resource Sharing (SRS) via per packet value (PPV) marking
  - Basic concept was presented in Budapest
  - Link-to-contribution
    http://www.ieee802.org/1/files/public/docs2016/cr-varga-srs-ppv-0526-v02.pdf



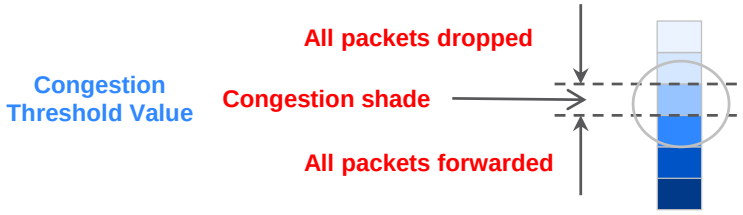


- Goal of this presentation to show
  - Combination of SRS and ATS
  - Achievable advantages by such a combination

SRS PROVIDES
ZERO CONGESTION LOSS AND DETERMINISTIC LATENCY

- SRS can achieve zero congestion loss and deterministic latency
  - Congestion results in packet drop:
    - Darker packets kick-off brighter ones
  - Congestion level:
    - Can be defined by a „congestion shade”

- **Note:** All traffic having darker shades than the ”Congestion Threshold Value” will experience zero loss and deterministic delay



- SRS shortcomings
  - Congestion Threshold Value is not set in advance, it is rather the result of actual load and bottleneck capacity
  - SRS (itself) does not protect against bad behaving nodes

- **BUT:** Congestion Threshold Value can be dimensioned by resource allocation and worst case delay calculation (by e.g. ATS)

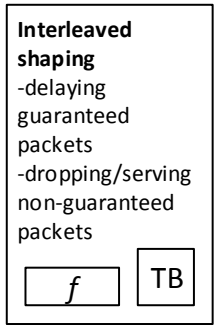
SRS ADD-ONS
DETERMINISTIC DELAY FOR LOSSLESS & LOSSY TRAFFIC

- It is possible to extend the ATS scenario with traffic that has the same delay guarantee as “guaranteed” TSN traffic, but some loss is allowed, i.e., it is lossy
- What does it mean in practice?
  - Allow reservation of less resources for ATS flows which have a loss tolerant component but needs in-order-delivery for all packets of a data-flow
  - Additional loss tolerant flows that require the same deterministic delay can be served easily
  - Other scenarios may also exist …
- The positive effect
  - It can highly increase link utilization when some flows do not use their reservation all the time
  - Under the prerequisite that (some) lossy traffic has delay guarantee too
- This works hop-by-hop, not just for flows following the same path

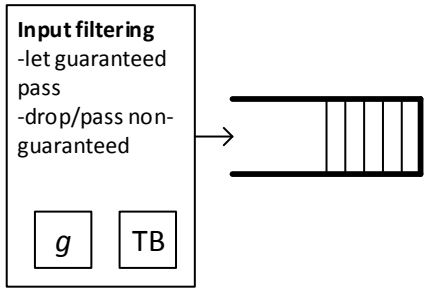
CHANGED COMPONENTS
FOR COMBINING SRS AND ATS

- Need to be able to identify additional traffic (at all hops)

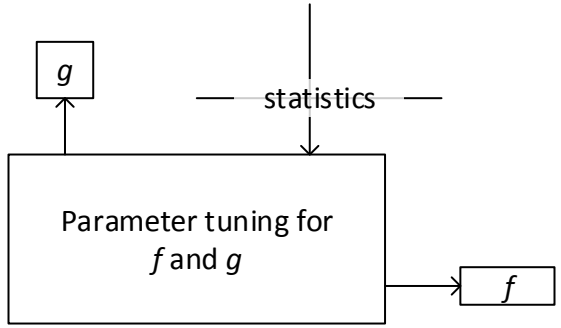
- Slightly larger bucket sizes are needed to allow excess traffic
- Interleaved shaping has to be able to
  - drop excess packets
  - read packet values, and based on that, influence whether a packet is dropped or not



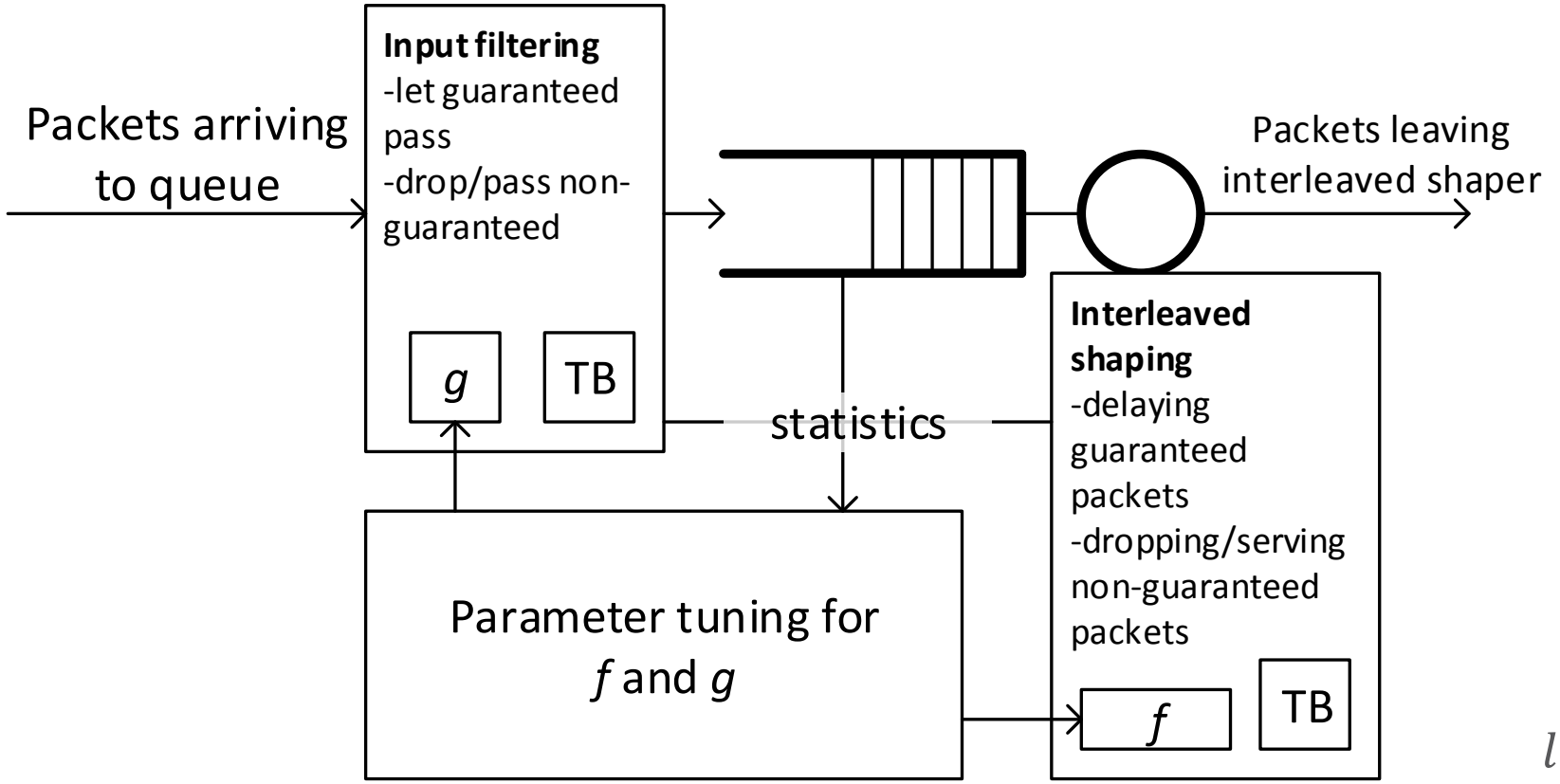
- Input filtering for excess packets is needed in order to avoid flooding the queues
  - Slightly larger buffers are needed



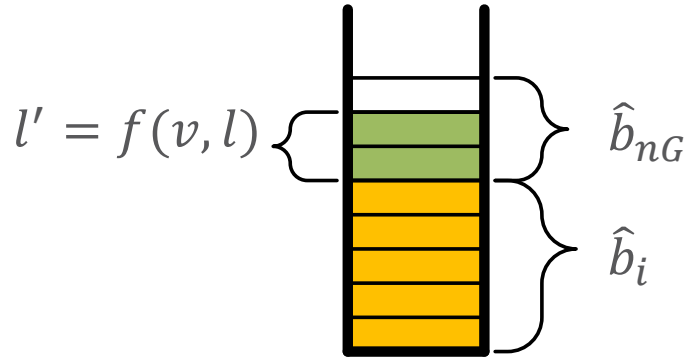
- Statistics from all boxes are needed to tune packet value aware dropping



ARCHITECTURE
PUTTING IT ALL TOGETHER

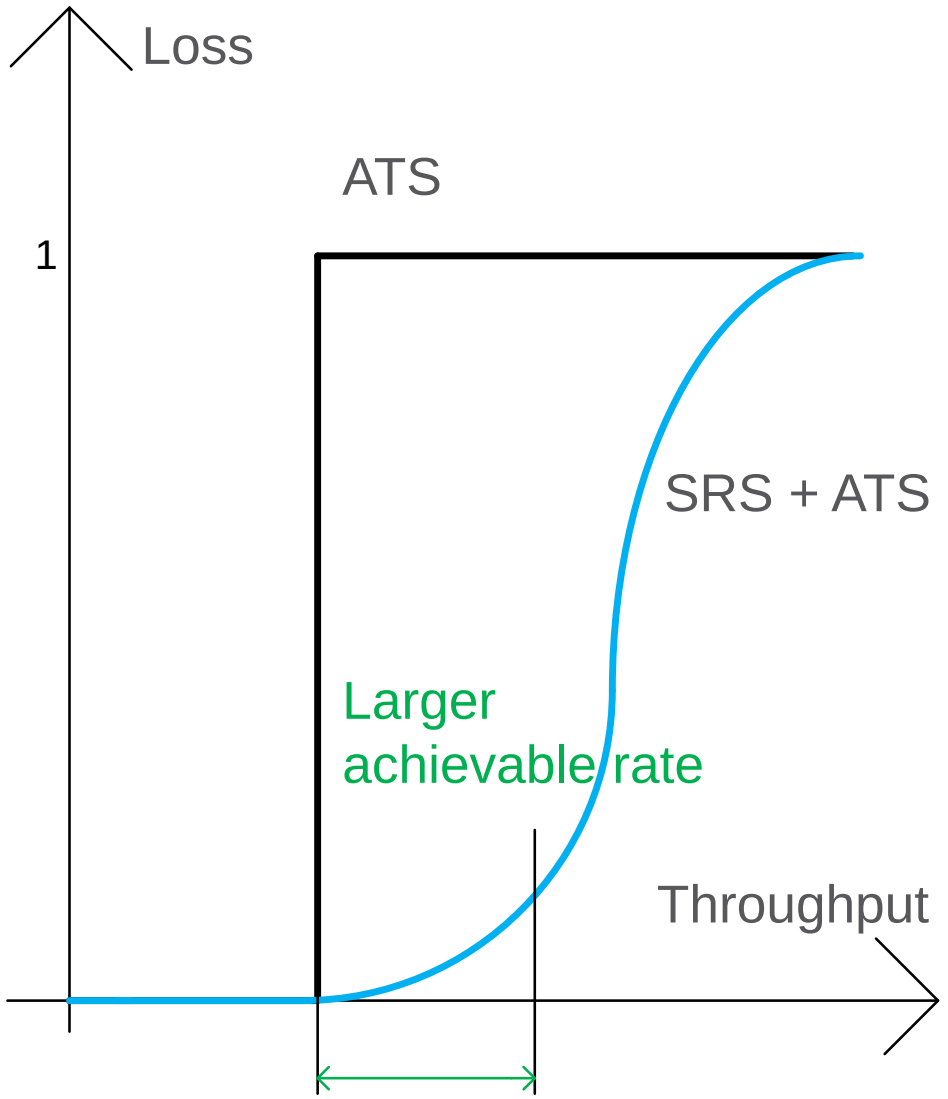


Non-guaranteed eligible of at least $\hat{b}_i + l'$ tokens in bucket



OUTCOME OF COMBINATION
LOSS VS. THROUGHPUT

- A slightly larger bucket size might be needed for each flow
- The possibility of forwarding non-guaranteed packets results in a larger achievable flow rate
- The packet value determines
  - Whether or not a packet is guaranteed
  - Whether a non-guaranteed packet is dropped or forwarded (note: there can be more important and less important non-guaranteed packets)
- The size of the larger bucket is chosen based on a compromise between (1) delay, (2) allowed total guaranteed rate, and (3) allowing excess traffic
  - In many cases, slightly increased delay is still within the E2E delay budget



SUMMARY
FURTHER WORK

- This is an initial proposal to evolve ATS further
- Delay model and math to be discussed and verified in detail
- Creating a list of use cases

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