Introduction to whitepaper on "Mapping method of QoS requirements to TSpec for bursty traffic shaping"

May 12, 2020

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Abstract

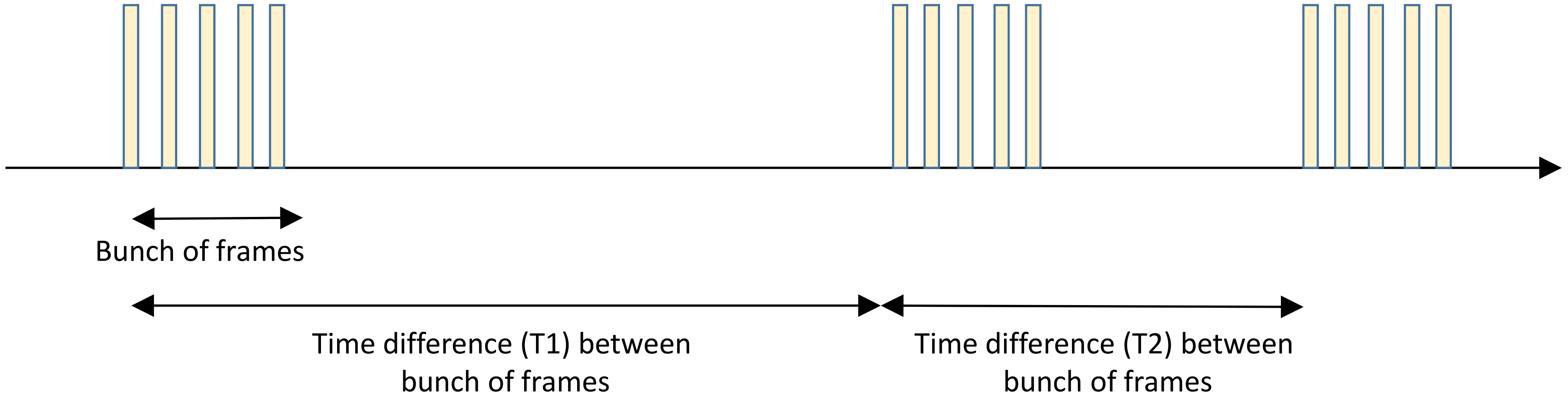
- The paper clarifies how to set Traffic Specification (TSpec) for bursty traffic that has a delivery time tolerance.
- In the case of bursty traffic, measured throughput changes depending on observation interval, and therefore TSpec parameters is difficult to be determined. Inappropriate TSpec setting causes over-provisioning of the bandwidth or makes it unable to satisfy the requirement of the delivery time tolerance.
- To address this issue, Tspec mapping method for bursty traffic must be carefully chosen in order to reduce over-provisioning while satisfying the requirement for the delivery time tolerance at same time.
- Credit-Based Shaper (CBS) and Asynchronous Traffic Shaping (ATS) are considered for busty traffic shaping method.

Details are shown in:

http://www.ieee802.org/1/files/public/docs2020/new-Maruhashi-Zein-Mapping-method-of-QoS-requirements-to-TSpec-for-bursty-traffic-shaping-0320-v00.pdf

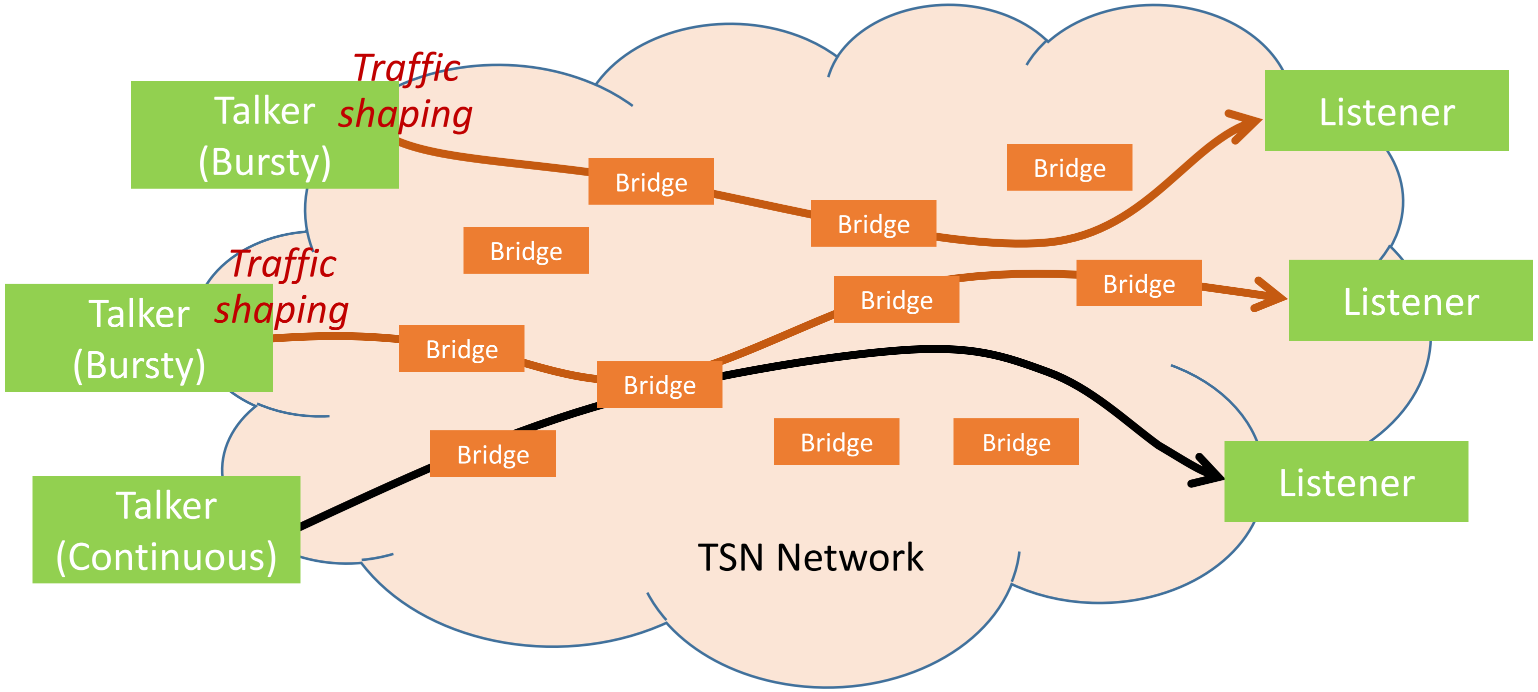
Example of bursty traffic pattern

- A group of frames so-called “bunch of frames” are transmitted intermittently, not continuously.
- The bunch of frames occurs sporadically, not periodically. (T1≠T2)
- Each bunch of frames has delivery time tolerance.



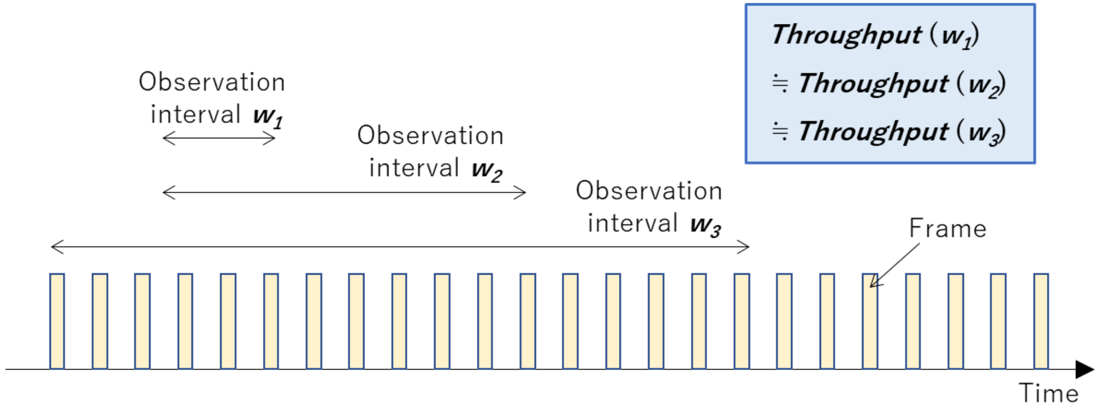
Network structure under consideration

- The network comprises Talkers, Listeners, and bridges which connect directly or indirectly to each other.
- Each traffic is generated at a Talker, and is sent to the Listener via bridges on the route.

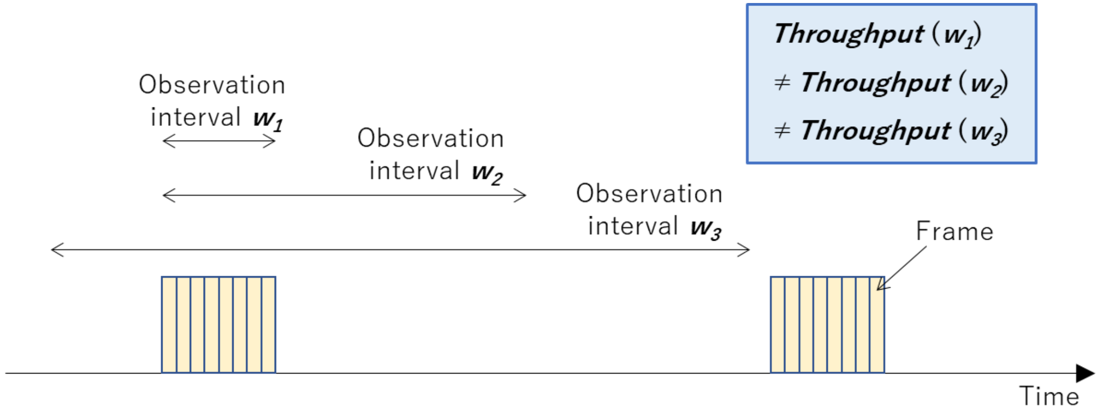


Problem statement - measured throughput for bursty traffic

- Continuous traffic: throughput is independent of observation interval.
- Bursty traffic: throughput changes significantly depending on observation interval.
  -> Appropriate TSpec parameters must be defined for bursty traffic.



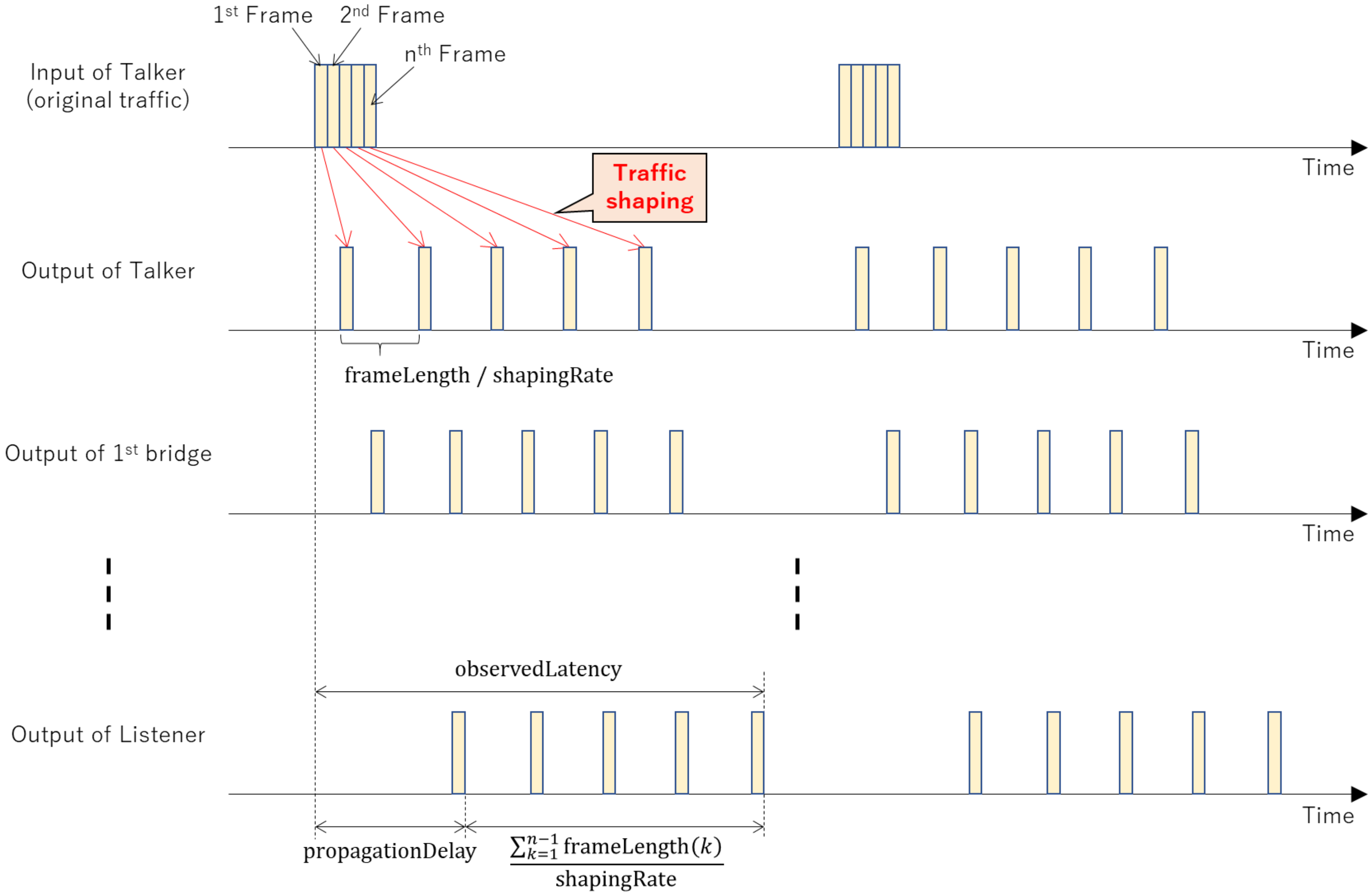
(a) Throughput measurement for continuous traffic



(b) Throughput measurement for bursty traffic

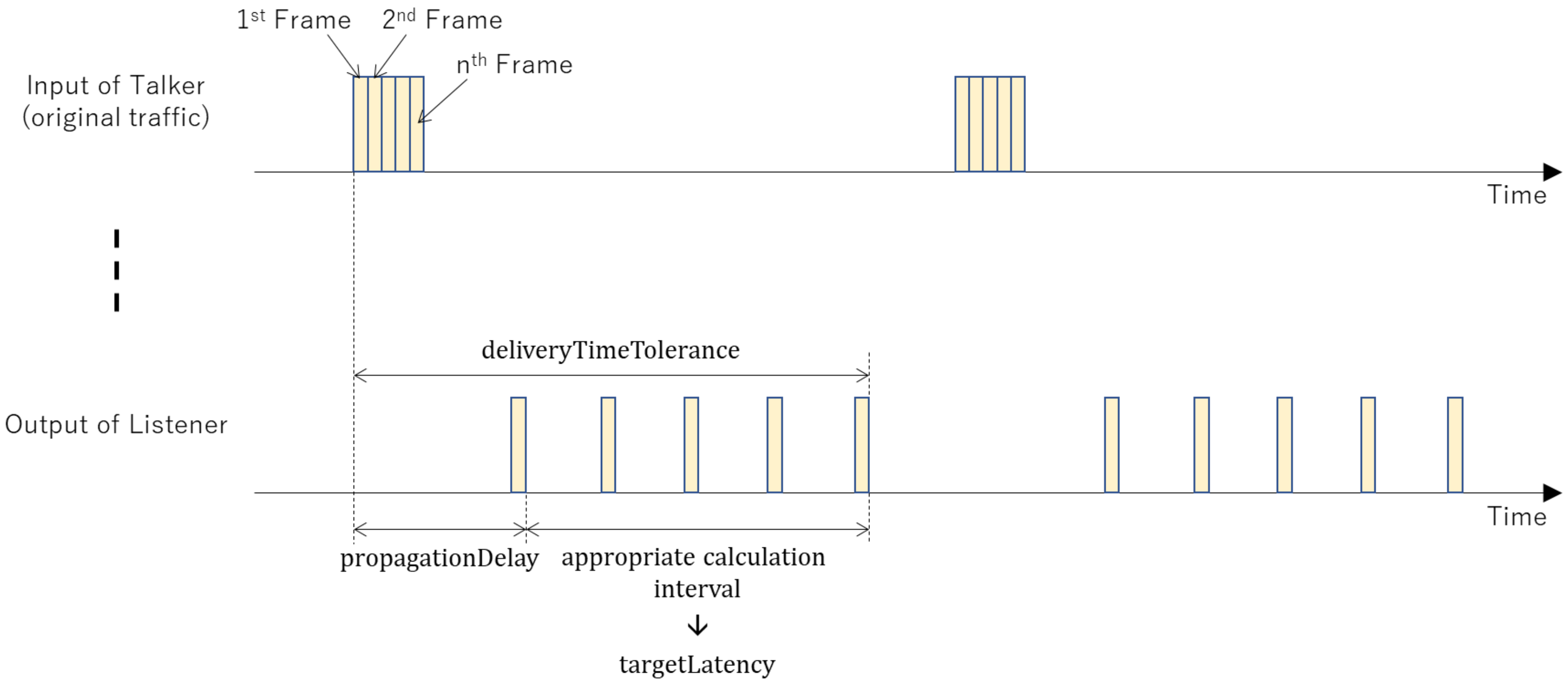
Frame propagation from Talker to Listener (general case)

- Bursty traffic is shaped by the Talker. The interval in which the Talker sends each frame becomes "frame length" divided by "shaping rate".



Frame propagation from Talker to Listener (appropriate case)

- In order to minimize over-provisioning and to ensure requirement for Delivery Time Tolerance, the bursty traffic should be shaped until the observed latency becomes within the required Delivery Time Tolerance.



Suggested TSpec mapping method for bursty traffic

- Since the mapping of application requirements to TSpec and TSpec Type 2 is undefined in the current IEEE Std. 802.1Q.
- Description on how to set (i.e. map) TSpec parameters for burtsy traffic needs to be added in the standard in order to transport/process bursty traffic correctly.

TSpec for CBS

$$\mathrm{MaxFrameSize} = \min\left(\mathrm{floor}\left(\frac{\mathrm{dataSize}}{\mathrm{targetLatency}} \times \mathrm{classMeasurementInterval}\right), \mathrm{Maximum\ SDU\ Size}\right) \quad (5)$$

$$\mathrm{MaxIntervalFrames} = \mathrm{ceil}\left(\frac{1}{\mathrm{MaxFrameSize}} \times \frac{\mathrm{dataSize}}{\mathrm{targetLatency}} \times \mathrm{classMeasurementInterval}\right) \quad (6)$$

TSpec Type 2 for ATS (P802.1Qcr)

$$\mathrm{CommittedInformationRate} = \frac{\mathrm{dataSize}}{\mathrm{targetLatency}} \quad (7)$$