Extensions on the TSN UNI traffic specification

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Introduction & Background in IEEE 802.1 TSN

- We focus on the generic TSN UNI Tspec as defined in Table 46.8 **(Section 46.2.3.5, 802.1Qcc)**.

- **What about burst traffic ?** The supported parameters do not suffice in configuring relevant TSN shaping features.

  - **IEEE 802.1Qcr:** ATS concerns the Committed Information Rate (CIR), Committed Burst Size (CBS) and Minimum Frame Size.

  - **IEEE P802.1Qdd:** Token Bucket Tspec sub-TLV includes CIR/CBS parameterization.

  - **Burst arrivals:** Upper bounds on such stream characteristics (i.e., arrival curves) usually described in terms of burst (CBS) and rate (CIR).

  - **Trials** to extend Tspec [1-4] in former meetings. **Disposition:** More discussion is needed.

Gap: No matter the **use case** and no matter the **configuration** model; the **burst traffic** model is not part of the current TSN UNI Tspec.

Table 46-8—TrafficSpecification elements

Name	Data type	Reference
Interval	rational	46.2.3.5.1
MaxFramesPerInterval	uint16	46.2.3.5.2
MaxFrameSize	uint16	46.2.3.5.3
TransmissionSelection	uint8	46.2.3.5.4

IEEE Std 802.1Qcc-2018

	Octet	Length
MaxTransmittedFrameLength	1	2
MinTransmittedFrameLength	3	2
CommittedInformationRate	5	8
CommittedBurstSize	13	4

Figure 99-14—Value of Token Bucket TSpec sub-TLV

IEEE Std P802.1Qdd

[1] https://www.ieee802.org/1/files/public/docs2022/dj-alexandris-extension-TSN-UNI-traffic-specification-0522-v01.pdf
[2] https://www.ieee802.org/1/files/public/docs2022/new-alexandris-extension-traffic-specification-TSN-UNI-0722-v01.pdf
[3] https://www.ieee802.org/1/files/public/docs2022/dd-alexandris-reworking-extensions-TSN-UNI-RAP-1122.pdf
[4] https://www.ieee802.org/1/files/public/docs2023/new-alexandris-extensions-TSN-UNI-0123-v02.pdf

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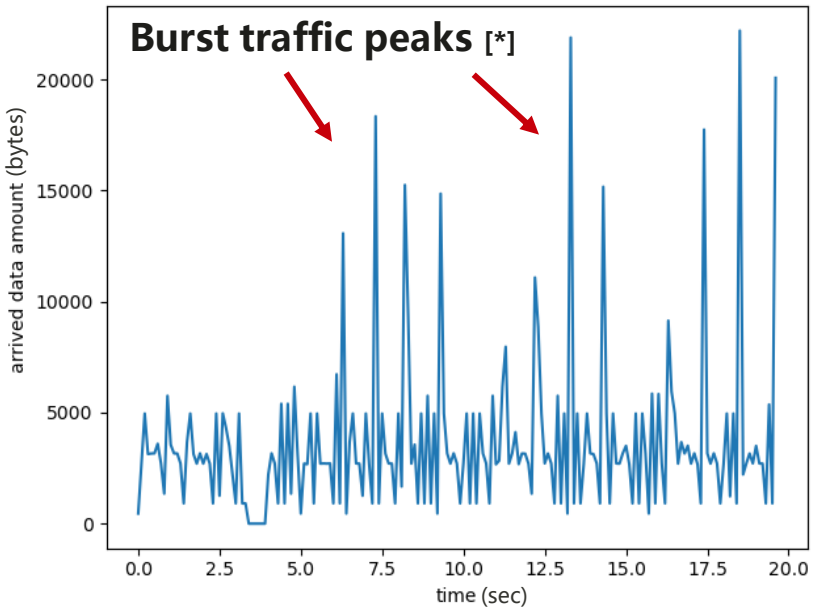
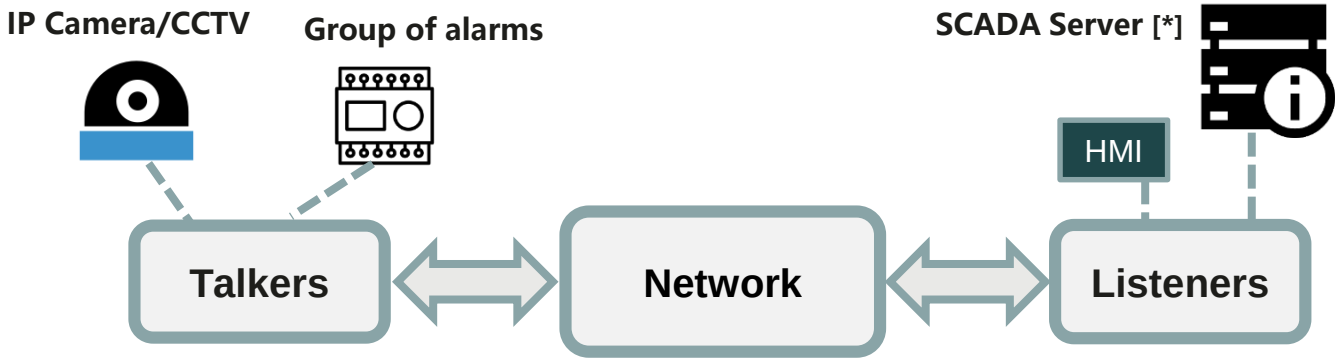
Burst traffic – Use-case example



Aggr. Data ≤ Burst + Rate*Δt



[*] Industry 4.0 example

- Traffic could be **not periodic, time-triggered.**
- Ensure **co-existence** with various types of traffic.
- **Latency bounds described in IEEE Std 802.1Qcr (ATS)-Annex V.2:** TSN can guarantee **deterministic QoS** for those types of traffic on the condition that the arrival stream patterns are described properly (Token bucket traffic model) [5].
- Current TSN UNI Tspec does not cover these use-cases.

- Typical use-cases mentioned in IEEE TSN profiles:
- **IEC/IEEE 60802 (Industrial Automation):** Isochronous traffic (Closed loop control) vs Alarms & Events/Video streaming.
- **IEEE P802.1DP (Aerospace):** Synchronous Sensors vs Audio/Video streaming.
- [*] Packet capture example from video surveillance [6] in a smart factory or a video conference in a campus network.

[5] https://www.ieee802.org/1/files/public/docs2021/new-specht-onats-0921-v01.pdf
[6] https://www.securityworldmarket.com/me/Newsarchive/tdvs-ivs-solution-for-building-and-factory-automation

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Former discussion in January Interim 2023 – Revisit Q/A Session

Q1: Introducing an example of video (burst) traffic does refer to AVB paradigm ? IEEE 802.1BA and 802.1Qav (credit based shaper) standard may suffice.

Video surveillance/streaming traffic is not AVB traffic. AVB refers to specific profiles/domains, products and solutions. To use AVB, end-stations need to support IEEE 802.1AS and SRP. This is not within the scope of the proposal, i.e., we target to provide deterministic connectivity for various traffic use-cases (but not limited to audio and video).

Q2: ATS (Tocken Bucket mechanism) supports CIR/CBS parameters. Hence, those are not part of the generic Tspec in Qcc (Section 46.2.3.5). Why is it crucial to include them in the generic Tspec ?

If network supports ATS, resource reservation shall not be bound to the configuration model. To this end, UNI needs to communicate the relevant requirements and capabilities to the network side. CIR/CBS defined in ATS are managed objects and can be easily embedded to the current TSN UNI Tspec.

Q3: Burst traffic frequency of occurrence is low, why over-provisioning the network does not suffice ?

Deterministic behavior of TSN is based on a priori resource reservation. Also, in terms of cost, over-provisioning is not always considered to be a plausible solution (e.g., network operator).

Q4: Is the proposal related to the P802.1Qdq amendment ?

Our approach is not focusing on shaper (i.e., credit-based shaping, ATS) parameter adaptation that requires adhering to latency constraints. We target to add CIR, CBS and Min. Frame Size parameters in Tspec of the generic TSN UNI (from the user perspective). Hence, any methodologies (from the network perspective) that make use of these parameters apply, e.g., 802.1Qcr, P802.1Qdq. Last, we are not bound to SPR, i.e., fully distributed model, or any other configuration mechanisms.

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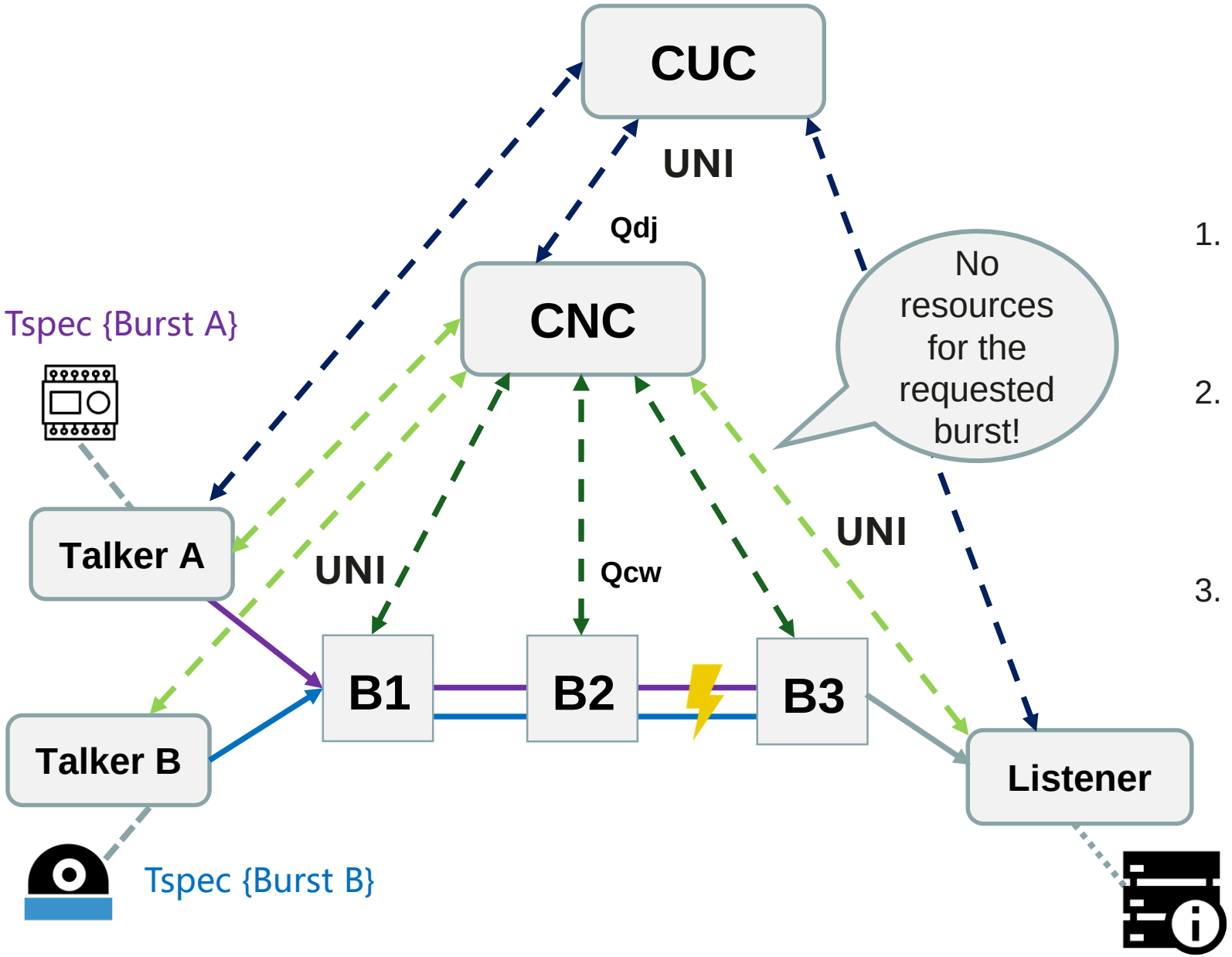
Resource management – TSN UNI Tspec and Status



1. The **user** shall inform the **network** with the respective **Tspec** projected to the burst traffic requirements.
2. A **status** information carrying configuration shall be received from the **network** to the **user** in case the stream establishment is successful.
3. Otherwise, a **failure** information is received by the user.

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Summary – Open discussion

- **Main parameters** needed to characterize burst traffic requirements are missing in the generic TSN UNI Tspec (**Section 46.2.3.5, 802.1Qcc**), i.e., irrespectively of the applied configuration model.
- Present only in **802.1Qcr-Annex V.2** to compute the latency bounds of a stream.
- **Token bucket TSpec sub-TLV** specifies the aforementioned parameters in **P802.1Qdd**.
- **Proposal:** Specify a **new Tspec** based on the extensions on top of the **existing TSN UNI TSpec**.
- Would that lead to a **Nendica study item**? How to proceed further after drawing conclusions?

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Thank you.