IEEE 802 Plenary Session

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AAA_2C – Automotive Requirements for a Flexible Control Traffic Class

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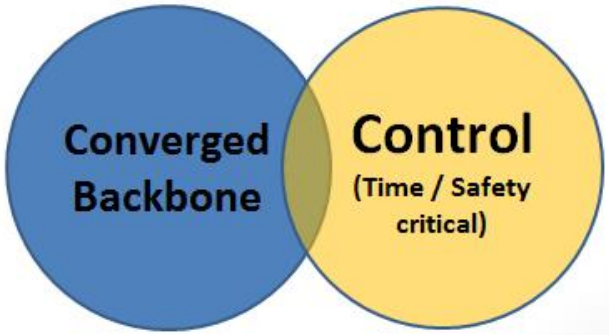
AAA_2C

AAA_2C (1/3)

- AAA_2C: AVnu sponsored Automotive AVB Gen 2 Council
- Industry forum that facilitates discussions around AVB / TSN mechanisms and related automotive requirements.
- Phase 1: (09/2012 - 04/2013)
  Developing an understanding of AVB & TSN. Presentations & Discussions of AVB / TSN.
- Phase 2: (since 04/2013)
  Organized around two AVB Gen2 automotive use cases:

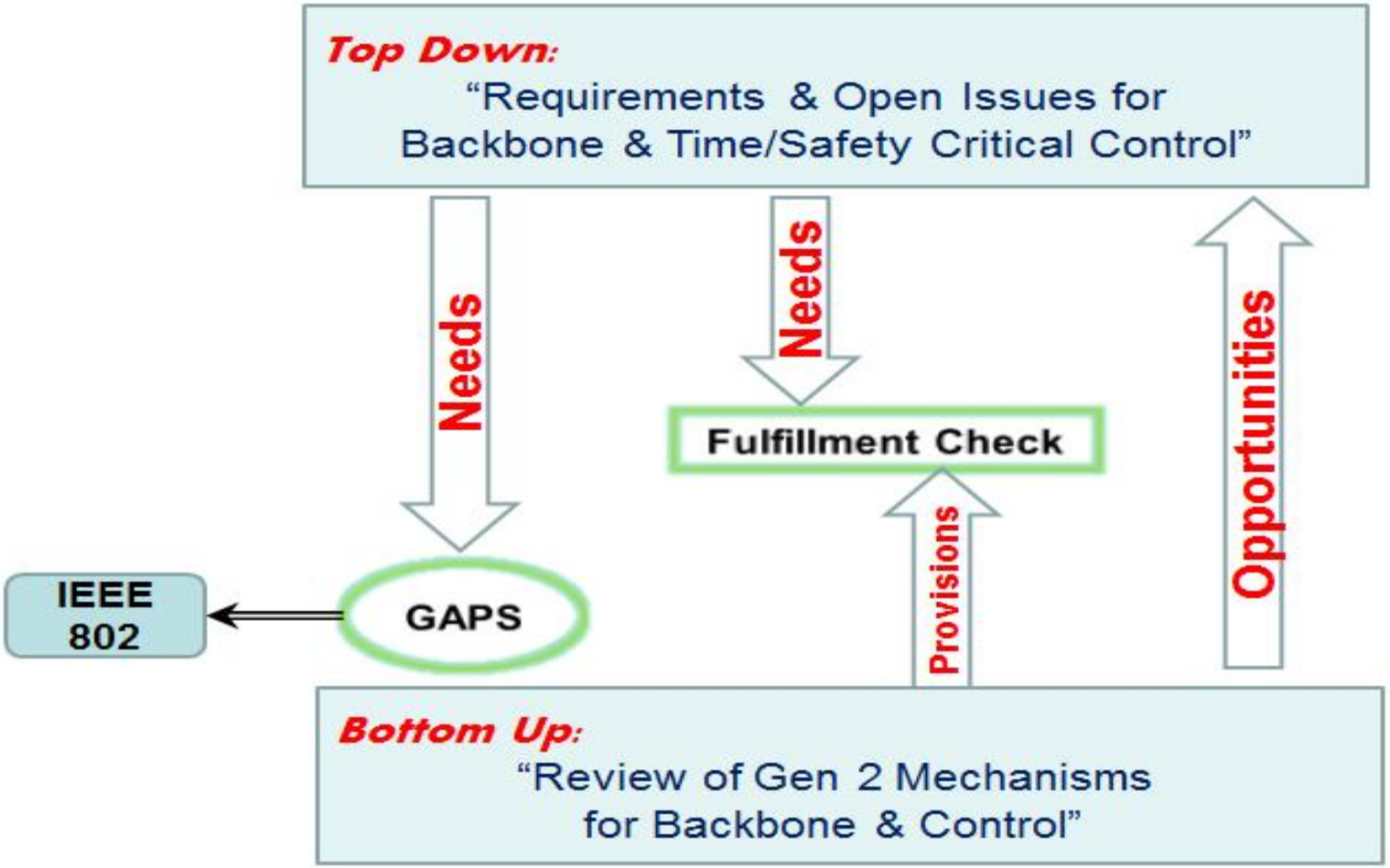


Goals: influencing standardization efforts; defining common utilization strategies

AAA_2C (2/3)

- Regular conference calls
- Participants:
  - Several automotive OEMs, Suppliers, Semiconductors, Ethernet Experts, . . .
  - Substantial participation from various different time zones: PST, EST, CEST, JST, KST

AAA_2C (3/3)


Top Down:
"Requirements & Open Issues for Backbone & Time/Safety Critical Control"
Needs
Needs
Opportunities
Fulfillment Check
Provisions
IEEE 802
GAPS
Bottom Up:
"Review of Gen 2 Mechanisms for Backbone & Control"

Automotive Requirements for a Flexible Control Traffic Class

Intention during today's presentation:

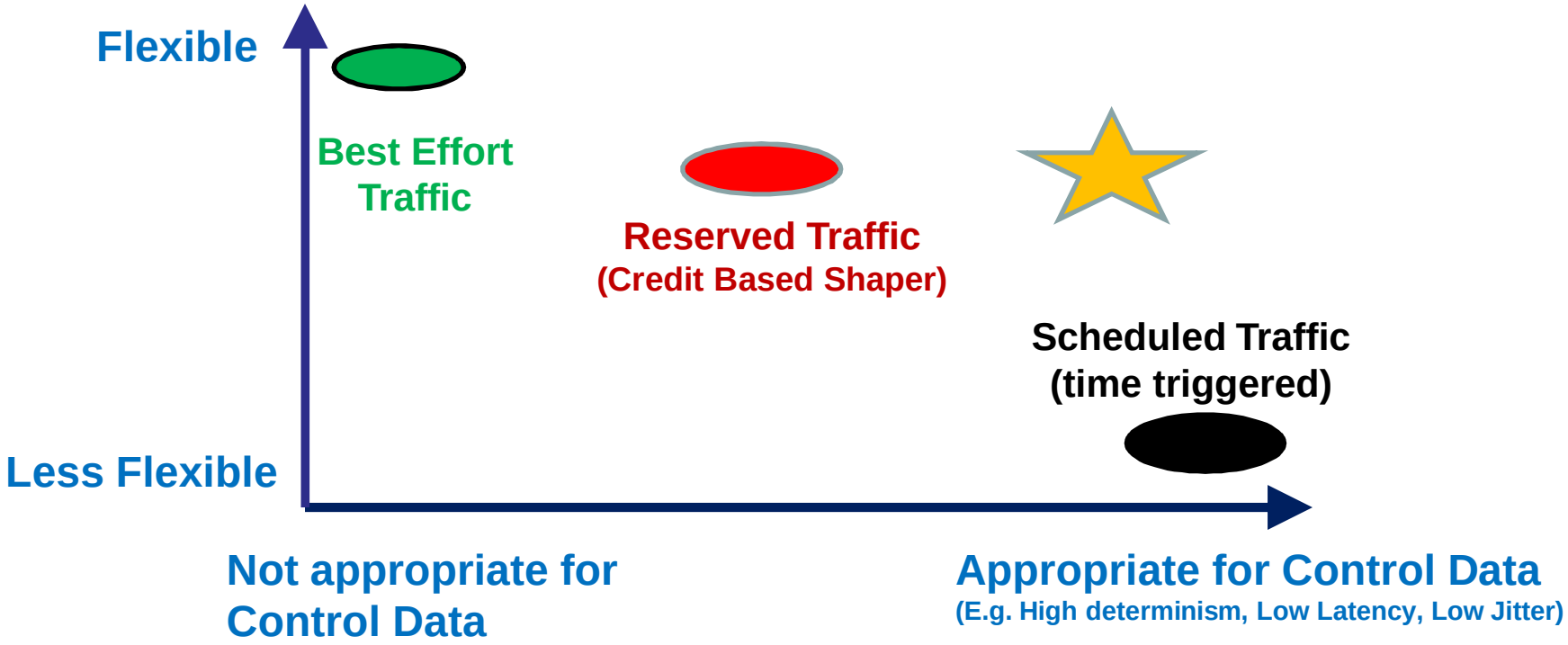
1. Presenting AAA2C Requirements to IEEE 802.1 TSN.
2. Discussion of the requirements & preferences during & after the presentation.

   For example:

   - *Which requirements are considered critical?*
   - *Can the requirements be met?*
   - *Is more information required?*

3. Informing AAA2C participants on the results of today's discussion during the next AAA2C telcon.

Flexible Control Traffic Class



- IEEE 802.1 TSN is currently working on proposals for additional traffic types with the desired properties: Flexible AND Appropriate for Control Data
- AAA_2C input on requirements / desired properties.

Requirements / Preferences / Desirable Properties (1/5)

The following slides show the requirements and preferences for a flexible control traffic class that have been identified in AAA_2C discussions:

Assumption:

- *S1: The timing requirements for a flexible automotive control traffic class have been set to values that will enable 90% of the automotive control applications. We assume the most challenging 10% of the applications to be covered by TSN's scheduled traffic (= time triggered traffic).*

Requirements / Preferences / Desirable Properties (2/5)

Periods:

- *For periodic traffic, the following range of periods shall be supported: Minimum: 5 ms, Maximum: 1000 ms.*
  - *Example of a typical period: 8 ms.*
  - *Note: Considering S1, we assume that at least 90% of today's control application will not have periods shorter than 5ms. Looking forward, shorter periods (e.g. 1ms, 2.5ms) are be desirable.*

- *It shall be possible to freely configure the required periods for periodic messages. A traffic class that supports a fixed small number of predefined periods is not considered adequate.*

Requirements / Preferences / Desirable Properties (3/5)

Latency:

- *The traffic class needs to support max latency guarantees.*
- *The required max latency for each periodic and event based message is known at design time. Different messages have different latency requirements.*
- *For periodic and event based traffic, the following minimum latency shall be supported by the traffic class:*
  - *1 ms or lower over 7 hops.*
  - *Example of a typical latency requirement: 3 ms, 7 hops.*

Requirements / Preferences / Desirable Properties (4/5)

Jitter:

- *We assume that it is difficult to tightly control jitter in a switched network. In presence of time stamping mechanisms and a defined maximum latency, a minimum jitter is not an absolute requirement.*

  A small maximum jitter that is determinable for a given topology is however desirable.

Requirements / Preferences / Desirable Properties (5/5)

Latency as a function of other parameters:

- *The maximum latency that can be guaranteed may be a function of the topology, the number of hops and other parameters. For a new traffic class these dependencies should be as simple as possible.*

  Example: The modification or extension of an existing engineered network shall not result in a requirement to execute a complex analysis in order to verify that latency requirements that have been met before extending or modifying the network, are still in place after extending or modifying the network.

Work in progress …

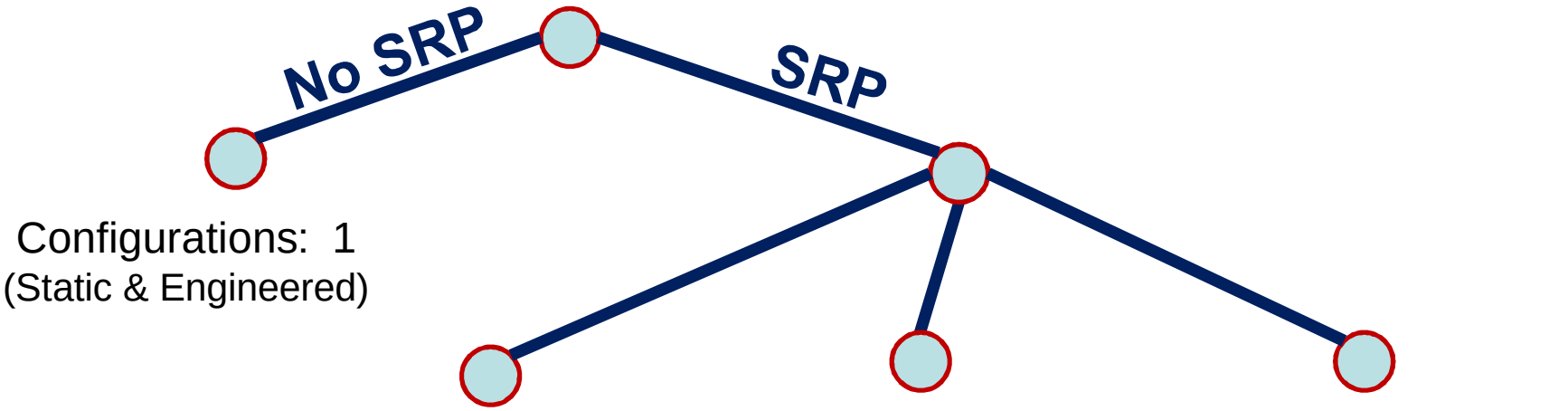
- The AAA2C group identified, discussed and reviewed the preferences & requirements that have been shown on the previous 5 slides.
- Some additional topics that are related to the flexible control traffic class are currently in discussion.
- For these ongoing discussions conclusions have not yet been drawn or reviewed.

The information on the following slides therefore represents the presenters perception of the status of these discussions !

Ingress Policing, Stream Reservation

- Ingress Policing:
  - Rodney gave a presentation on what is currently available in the standard and what options exist.
  - The risks associated with babbling idiots and faults that propagate through the network have been discussed.
  - The relevance of the mechanism has been discussed.
  - The AAA_2C group will continue to discuss the topic and eventually summarize conclusions / requirements.
- Stream Reservation:
  - Topic has been discussed.
  - Note: The groups discussion of SR was focused on the need for a SR mechanism for the new flexible control traffic class only!

Stream Reservation:



n>1: known at design time
x>1: not known at design time

Stream Reservation

	No SRP	SRP	SRP	SRP
	Configs: 1	*Configs: 1*	*Configs: n*	*Configs: x*
Charact-eristics	➢ Static & Engineered ➢ No reconf. during operation.	➢ Static & Engineered ➢ No reconf. during operation.	➢ Dyn. & Engineered ➢ n "prepared" configs. ➢ n typically small (e.g. 2 or 3)	➢ Dyn. & not or not fully engineered ➢ x configs. ➢ x unknown at design time
Pro & Con	+ Simple (V&V) + Quick startup + No SRP overhead - Adding / modifying streams at design time requires changes in multiple devices.	+ Simple (V&V) + Vehicle Developm.: Adding / modifying streams at design time is simple. - Startup time ??? - SRP overhead	+ Enables use cases like "switch to vehicle programming mode" or "switch to emergency / limp home mode" - More complex (V&V) due to mode changes - Startup time ??? - SRP overhead.	+ Enables use cases like "switch to vehicle programming mode" or "switch to emergency / limp home mode" + Enables dynamic decisions / algos. -Very complex (V&V) - Startup time ??? - SRP overhead.

Stream Reservation

- Stream Reservation:
  - "Need to be able to address short term needs for bandwidth"
    - *E.g.: Need to switch to programming mode.*
    - *E.g.: Need to switch to limp home mode.*
  - "We need to understand cost impact of a SR mechanism that enables some or all of the options shown in the table on the previous slide"
    - Will full flexibility require more complex / expensive hardware (switches)?
    - Is it possible to implement a simpler SR mechanism that has no noteable cost impact if full flexibility is not required?
    - If would seem to be OK to drop option 4 ("SRP Configs: x") if cost would otherwise become an issue.

Further Topics . . .

- Further topics planned but not discussed yet:
  - Redundancy.
  - Security (maybe).
  - Anything else ?

Feedback from 802.1TSN to AAA$_2$C ?