Two Profile Approach for IEEE/SAE 802.1 DP

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Background

Aerospace Use Cases

https://www.ieee802.org/1/files/public/docs2021/dp-Jabbar-et-al-Aerospace-Use-Cases-0321-v06.pdf

Aerospace Traffic Types

https://www.ieee802.org/1/files/public/docs2021/dp-Jabbar-et-all-Aerospace-Traffic-Characterization-0421-v02.pdf

Categorizing Aerospace TSN Use Cases

Informed by use cases, traffic types, and high-level design requirements:

Current Ethernet Based Systems (ARINC 664, COTS Ethernet)

- Asynchronous with 50 msec or higher cycle time
- Latency bounded with acceptable delay variation (jitter) up to latency bound
- Comfortable with rate constrained shaping
- Controlled network – no undefined traffic on the network
- Highly static – designed, analyzed, configured well ahead of operation
- Certification burden is significant – simplicity is valuable

Current Non-Ethernet (ARINC 429, FC, 1553, FireWire)

- Partitioned/Segmented subsystems
- Synchronous and Asynchronous with 1 msec or higher cycle time
- Sensitive to both Latency/deadline and delay variation (jitter) – require determinism
- Convergence implies mixed traffic
- Interoperability of legacy buses on top TSN backbone

Future Use Cases

- Sub-millisecond cycle times and latency bounds
- Platform wide clock time distribution
- Varying degrees of dynamic configuration/re-configuration

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PROFILE – A

Current Non-Ethernet (ARINC 429, FC, 1553, FireWire)

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PROFILE – B

TSN Profiles for Aerospace – Initial Proposal

Asynchronous Profile

- Traffic Shaping (Qav/Qcr)
- Redundancy (CB)
- Filtering & Policing (Qci)
- Configuration (Qcc, Qcw, CBcv)

Synchronous Profile

- Time Synchronization (AS)
- Traffic Shaping (Qbv, Qav/Qcr)
- Redundancy (CB)
- Filtering & Policing (Qci)
- Configuration (Qcc, Qcw, CBcv)

- Frame Pre-emption (Qbu, 802.3br)?

Discussion Points

- Two profile approach, where in profile B is backwards compatible with profile A
- Profile A should be able to provide at least a 1-to-1 replacement of ARINC664 capabilities
- Questions to be answered on profile A
  - Asynchronous Traffic shaping to meet profile A requirements
  - Closed vs. Open network considerations
    - Closed implies static, pre-configured, profiled data flows
    - Open implies dynamic, mixed profiled and non-profiled data flows
    - How to ensure stream isolation in an open/closed network
    - What, if any, traffic shaping is needed in the bridges for closed network assuming end station based shaping
  - Configuration options?

Thank You!