

JASPAR Use Case

~Effective Coexistence between AUTOSAR's gPTP and IEEE 802.1DG~



***Japan
Automotive
Software
Platform
and
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2022.7.12

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Background

- **JASPAR** has been studying many use cases of Ethernet-based in-vehicle networks with IEEE 802.1TSN.
- To contribute to IEEE P802.1DG, we introduced the following use cases according to our studies.
 1. “Overview of TSN use cases from JASPAR,” *Oct. 29 Meeting*.
 2. “Overview of TSN use cases from JASPAR,” *Nov. 2019 Plenary session*.
 3. “(JASPAR) Update of TSN use cases multidrop topology,” *July 2020 Plenary session*.
 4. “TSN for automotive SDN ~ Update of Use cases,” *March 2021 Plenary session*.

Now we are considering *a new use case which treats both time synchronization of IEEE P802.1DG and that of AUTOSAR.* From the consideration, we have found that there is an important issue concerning the utilization of **gPTP**.

The new use case of JASPAR

- In the dawn of Ethernet-based in-vehicle networks, a vehicle has both existing devices and those with origin of IT equipment.
- In general, the former is **a control system ECU designed by AUTOSAR** while the latter **is a communication device with GPS based on IEEE P802.1DG**.
- Control system ECU designed by AUTOSAR synchronizes IVI, *i.e.*, Grand Master, based on IEEE 802.1AS.

Differences between profile of IEEE 802.1 and that of AUTOSAR

- The profile of the time synchronization in AUTOSAR differs from that in IEEE P802.1DG.
This has been already pointed by Mr. Rodney Cummings at May 2019 Interim.
- **[IEEE P802.1DG]**
 - By transmitting Announce message, relationship between Master and Slave is established.
- **[AUTOSAR]**
 - Grandmaster transmits no Announce message. Even if a node receives Announce messages, it will ignore them.

Problem

- The difference in profile **is not problem** itself.
- However, we wonder whether both profiles can coexist with each other or not.
- Our use case shows that such **coexistence is difficult** as follows.

Under the above use case:

1. By **transmitting Announce message**, IVI indicates that it becomes Grand Master.
2. Since ECUs which do time-synchronization based on AUTOSAR profile **ignore the message**, we cannot confirm the establishment of an expected domain of the time synchronization.
To confirm it, we must use the other method.
3. Even if IVI cannot transmit Announce message by some failure, ECUs based on AUTOSAR profile cannot even detect it.

Proposal

It is clear that IEEE 802.1DG is the most legitimate specification since it is compliant with IEEE 802.1AS-2011, 2020 (1588).

On the other hand, IEEE 802.1DG adapts an attitude of permissiveness to AUTOSAR as below, and Automotive Industry, which includes JASPAR must express our thanks to IEEE.

AUTOSAR(R) has specified how to do time synchronization over different shared media ([B12], [B13]).

While these solutions do not provide the resolution and accuracy usually expected from [AS] they are widely used and might limit the system wide time synchronization anyway. While not explicitly specified it may be easier to adopt the solutions given in [B12] than work around the more complex intricacies of [AS] described above.

Not only for AS, Coexistence of AUTOSAR and IEEE will be welcome and have **a great effect for Automotive System Engineers**.

It will be also a good for more diffusion of Ethernet TSN.

So that we ask for considering the best course at IEEE.

Ex; Addition the "No Announce Mode" to IEEE 802.1DG profile