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Proposed Amendments to Time Synchronization Profiles

JasPar

Japan Automotive Software Platform and Architecture

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Background

IEEE **JASPAR**

Dec. 2021
802.1DG D1.4
AS-2020 based Time Sync.

July 2022
- Report on issues by differences in Announcement Message processing when AUTOSAR and IEEE (DG D1.4) profiles are mixed
- Request for the addition of No Announce Message Mode

Nov. 2022
- Request to create specifications to enable the **coexistence of multiple profiles** led by IEEE

Mar. 2023
- Strongly advocation of revising Announce Message processing: "No" in the basic profile, "Yes" in the extended profile

May 2023
802.1DG D2.0
AUTOSAR based Time Sync.

Background

JASPAR

Comments:
Is it correct to understand that AUTOSAR reference is used for time synchronization, including specifications related to VLAN?

Indeed, if we follow Don's proposal, we can solve the AnnounceMessage issue using IEEE 802.1AS.

However, the issue is one of the problems JASPAR is envisioning.

Aug. 2023
802.1DG D2.1

Sep. 2023
Don Pannell,
"Supporting Our Customer's Needs for gPTP"

https://www.ieee802.org/1/files/public/docs2023/as-pannell-Supporting-Our-Customers-0923-v02.pdf

Comments:
In the future, after 802.1ASds etc. are completed, how will we ensure integrity?

JASPAR does not necessarily want to use AUTOSAR profiles.

JASPAR seeks to use a unified profile.

Oct. 2023
802.1DG D2.2

Nov. 2023 (today)
- Our new proposal

Summary of the Profiles

Items	802.1AS	802.1DG	AUTOSAR
BMCA	Optional	Not Used	Not Used
Announce Message	**Yes**	**Yes**	**Not Used**
Signaling Message	Yes	Undefined	Not Used
Pdelay Message	Yes	Yes	Optional
Sync Message Format	2-Step (2011) 2-Step/1-Step (2020)	2-Step	2-Step
Multiple Time Domain	No (2011) Yes (2020)	Yes	Yes
VLAN Tagged Frame	**Not Used**	**Undefined**	**Optional (Enable)**

◆**Announce Message Issue can be resolved by Don's proposal.**
◆**All that's left is to resolve the VLAN Issue !**

Proposed Amendment from JASPAR

Automotive Ethernet AVB Functional and Interoperability Specification	Automotive	Avnu	Auto-Ethernet-AVB-Func-Interop-Spec_v1.6
AUTOSAR Specification for Time Synchronization over Ethernet	Automotive	AUTOSAR	AUTOSAR_SWS_TimeSyncOverEthernet.

22 6.5 Time Synchronization

23 There are multiple specifications available to implement time synchronization (see e.g. https://
24 sagroups.ieee.org/1588/ptp-profiles/). ~~It lies within the responsibility of the system integrator to ensure~~
25 ~~sufficient accuracy and traceability if needed.~~

While it is TRUE that multiple profiles exist, this description confuses most engineers.
The profile should be a document that OEM and supplier engineers can understand clearly.
Since suppliers refer exclusively to IEEE, **it makes sense to write in 802.1DG standard.**

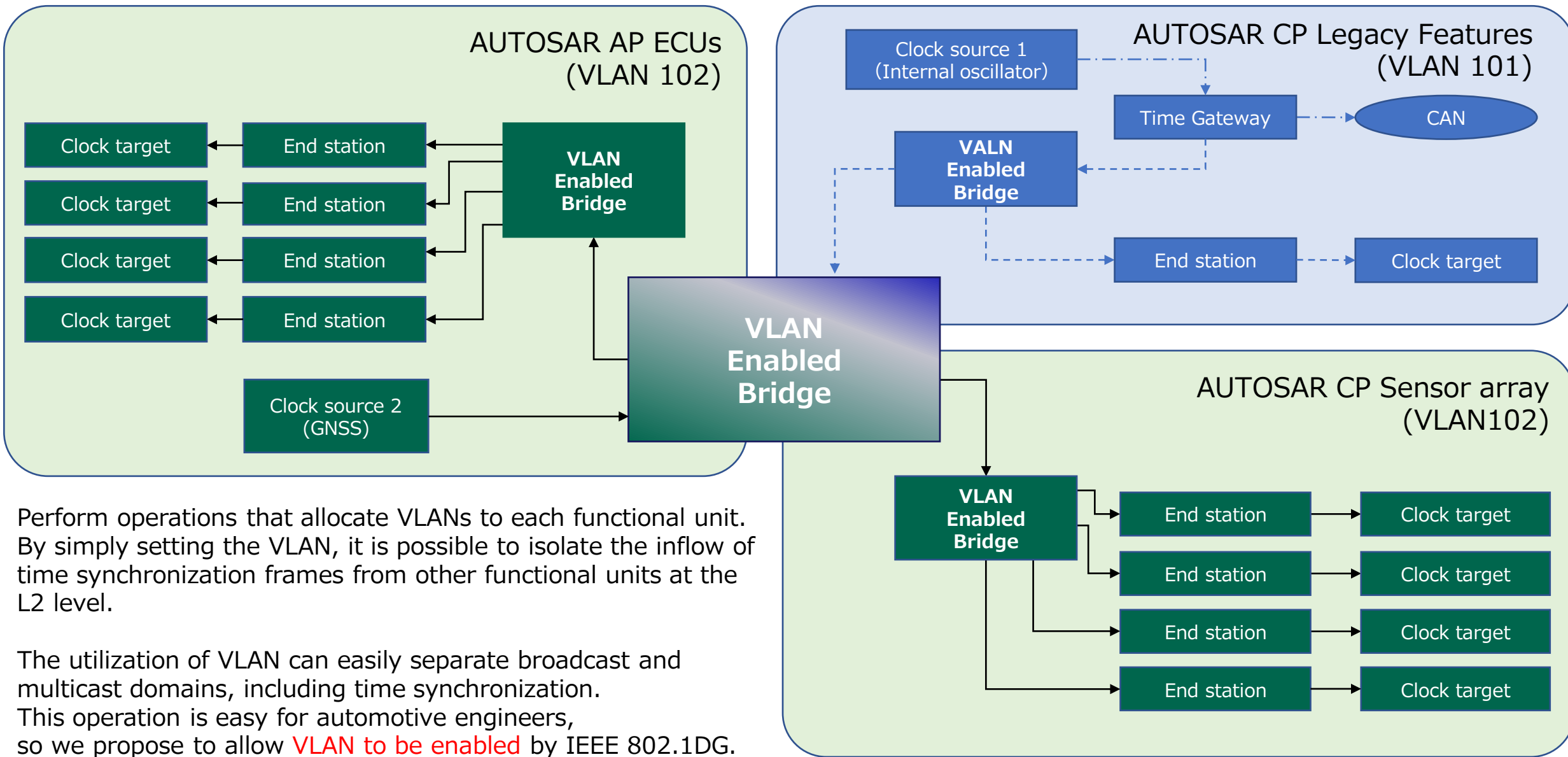① **We suggest adding the following 3 items to Section 6.5**
  a) Basically, IEEE 802.1AS-2020 compliant
  b) BMCA (includes Announce Message) shall not be used
  c) Admit All Frames (includes VLAN-tagged frames)

  ⇒ This suggestion allows the specifications to be determined uniquely
    and can also be consistent with AUTOSAR.

② **"It lies···if needed" should be deleted.**
  ⇒ This is not appropriate for an automotive profile.

Issues Pointed Out from JASPAR

AUTOSAR AP ECUs (VLAN 102)
- Clock target ← End station
- Clock target ← End station
- Clock target ← End station
- Clock target ← End station
- Clock source 2 (GNSS)
- VLAN Enabled Bridge

VLAN Enabled Bridge

AUTOSAR CP Legacy Features (VLAN 101)
- Clock source 1 (Internal oscillator)
- Time Gateway
- CAN
- VALN Enabled Bridge
- End station → Clock target

AUTOSAR CP Sensor array (VLAN102)
- VLAN Enabled Bridge
- End station → Clock target
- End station → Clock target
- End station → Clock target
- End station → Clock target

Perform operations that allocate VLANs to each functional unit.
By simply setting the VLAN, it is possible to isolate the inflow of
time synchronization frames from other functional units at the
L2 level.

The utilization of VLAN can easily separate broadcast and
multicast domains, including time synchronization.
This operation is easy for automotive engineers,
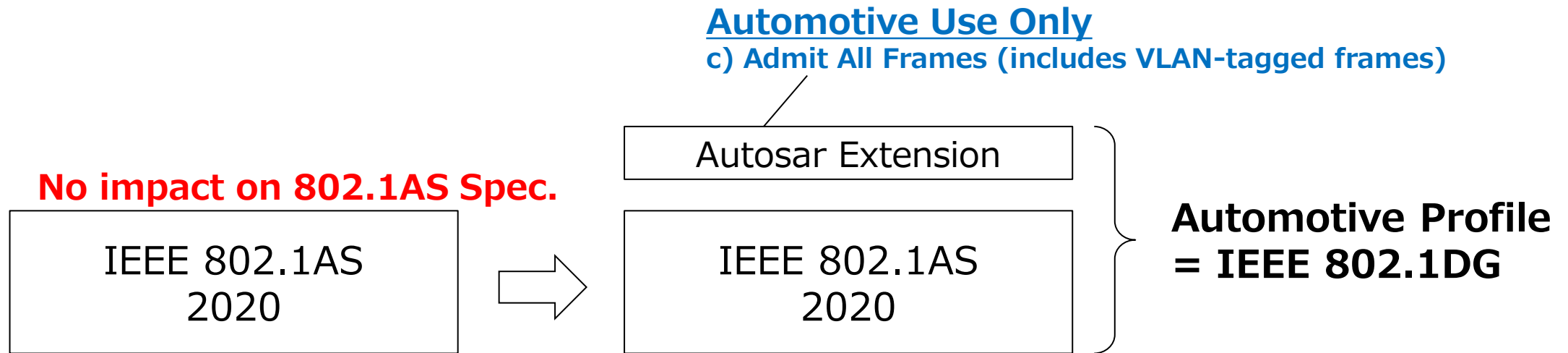so we propose to allow VLAN to be enabled by IEEE 802.1DG.

Further Discussion

Time Sync Profiles in Autosar

1.3.2 Dependencies to other standards and norms

The AUTOSAR Time Synchronization protocol is derived from [1, IEEE 802.1 AS].
For VLAN characteristics refer to [2, IEEE 802.1Q-2011].

4.2 VLAN Support

[PRS_TS_00163] dIf FramePrio exists, a frame format with priority and VLAN tags shall be used. Otherwise a frame format without priority and VLAN tags shall be used.c (RS_TS_20048)

Automotive Use Only
c) Admit All Frames (includes VLAN-tagged frames)

Autosar Extension

No impact on 802.1AS Spec.

IEEE 802.1AS
2020

→

IEEE 802.1AS
2020

Automotive Profile = IEEE 802.1DG

DA	SA	L/T	gPTP message	FCS

802.1AS

or

DA	SA	Tag	L/T	gPTP message	FCS

Our request is to allow either to be used.

We will never care at all if others use gPTP w/o VLAN tags.

If IEEE 802.1DG does not describe the Time Sync Profile based on this situation・・・What will happen ?

① Japanese OEMs may consider that 802.1DG profile does not adapt the automotive network requirements.

② We will define our own specifications, probably it will be based on Autosar, since we need VLAN Tagged Flame and use it now and from now on.

③ As a result, we will request the suppliers not to refer 802.1DG, since it is incompatible with VLAN-based system.

If so, Current Draft2.2 is still more acceptable.

Summary

Summary

JASPAR is not exceptionally particular about adopting AUTOSAR.

> If Don's suggestion solves the AM problem,
> we don't mind if 802.1AS is the standard.

Unfortunately, we have another concern.

> Some automotive OEMs require time synchronization messages to be sent over VLAN for policy reasons.

We are fully aware that this request may seem strange, but it is an actual request nonetheless.

Summary

What we want to suggest is that it does not necessarily mean that time synchronization messages must be transmitted on VLAN. But there may be environments where only VLAN can be passed.

Therefore, it is necessary for us to support such cases. We would like it to be possible to send time synchronization messages via VLAN as an option.

Our requirements are not necessarily complicated; add what is written here to your profile.

Summary

802.1 DG is based in the automotive field, and we want to use VLAN in that world. No standard should be followed in the current situation, so if OEMs don't understand enough requirements and then inform their suppliers, problems may arise where they do not work correctly.

This is a virtually impossible situation, and that's what the standard profile is for, so we want it to fulfill its role.

Our proposal has no impact on AS or 1588 protocols.

Finally, we would like to make efforts to bring AUTOSAR closer to IEEE.