

# IEEE 802.1DG

## END STATION REQUIREMENTS

V0.2

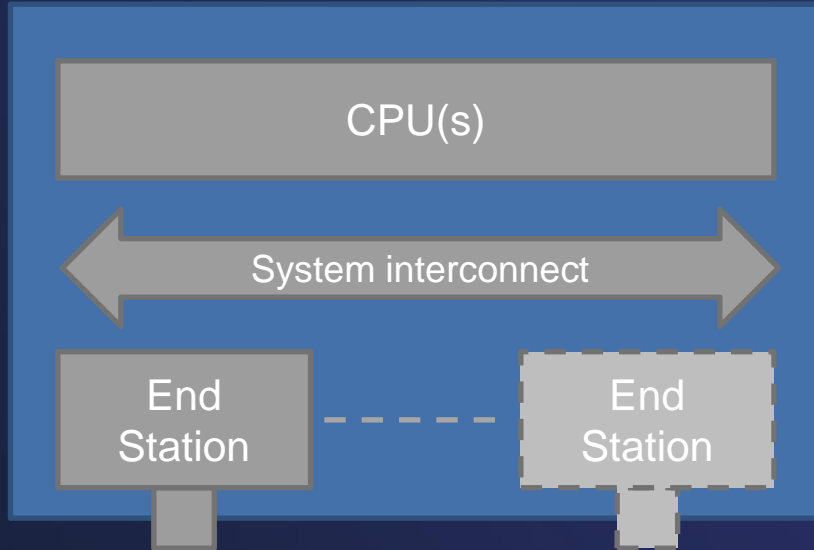
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THORSTEN HOFFLEIT

AUTOMOTIVE CORE TECHNOLOGY

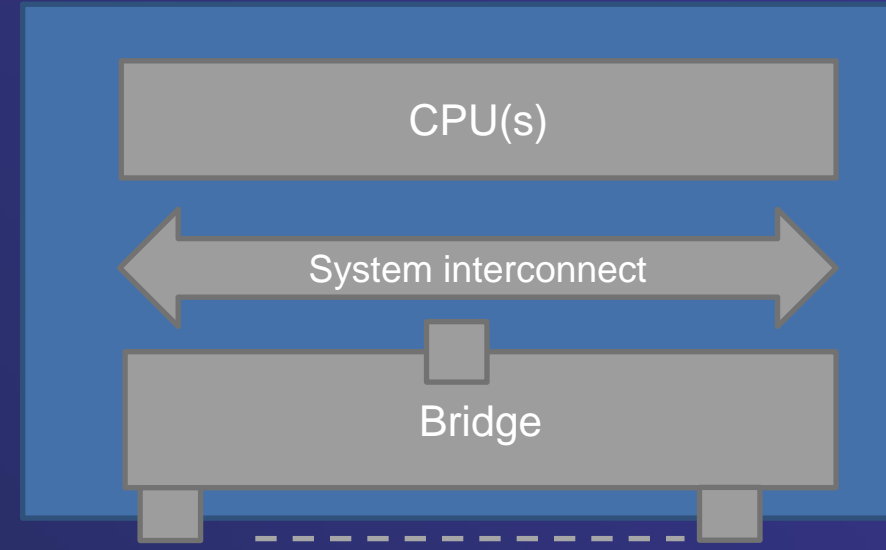
RENESAS ELECTRONICS CORPORATION

# SCOPE



## In scope

- System with at least one Ethernet port and embedded CPU
- System may include more than one Endstation
  - Conformance requirements shall be met for each End Station separately



## Out of scope for this contribution

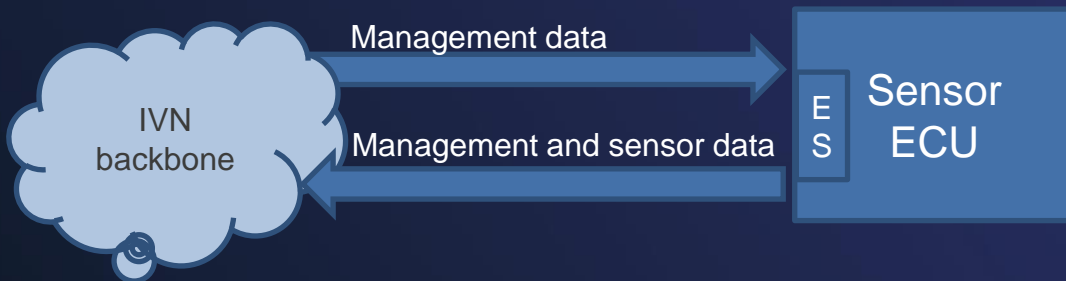
- Systems with embedded Ethernet bridge and embedded CPU
  - There may be also more than one internal port present
- Even CPU may be responsible for data processing all the bridge features apply for internal end point

# END STATION VARIANTS

## TWO EXTREME EXAMPLES

### Variant 1

- ECU with very limited capabilities (e.g. Sensor ECU)
- Required functionality
  - Time synchronization
  - Generation of (TSN shaped?) sensor data
  - Management and diagnostic functions



### Variant 2











- Complex ECU with connected external bridge
- Required functionality
  - Time synchronization
  - Many streams in and out
  - Sophisticated TSN features
  - ....

Within the automotive profile we should not over specify requirements for end stations to allow efficient DG compliant products

# END STATION REQUIREMENTS PROPOSAL (SHALLS)

## COMPARED TO WHAT IS REQUIRED FOR BRIDGES

Any End Station claiming conformance to this present standard shall:

1. Process ingress frames in the order as specified in **XXX** 
2. Process egress frames in the order as specified in **YYY** 
- ~~3. Comply to CM-IS as specified in 5.6.~~ 
4. Comply to CM-Pol as specified in 5.7. 
5. Comply to CM-BS as specified in 5.8. 
- ~~6. Support the Learning Process as specified in 6.16.~~ 
- ~~7. Support the Frame lifetime limitations as specified in 6.26.~~ 
- ~~8. Support Congestion Isolation as specified in 7.2.~~ 
9. Support the maximum SDU size as specified in 6.4 
- ~~10. Support the Frame Filtering ([Q]:8.6.3) as specified in 6.17~~ 
- ~~11. Support the Stream Filter ([Q]:8.6.5.3) as specified in 6.18~~

# END STATION REQUIREMENTS PROPOSAL (SHOULD / MAY)

## COMPARED TO WHAT IS REQUIRED FOR BRIDGES

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Any End Station claiming conformance to this present standard may:

1. CM-TSyn as specified in 5.9

Any End Station claiming conformance to this present standard should:

1. comply to CM-TAS as specified in 5.10
2. comply to CM-Pre as specified in 5.11

# RECEIVE PATH PROCESSING ORDER FOR END STATIONS

## COMPARED TO WHAT IS REQUIRED FOR BRIDGES

On the receive path (ingress), the IEEE 802.1 Features are executed in the following order, if they are available and activated, in either hardware or software:

1. <MACsec as discussed on July 4<sup>th</sup>>
2. ~~Default Priority Assignment ([AC]:13.1)~~
3. ~~Support of the EISS ([Q]:6.9.1)~~
4. Frame Type Acceptance filter ([Q]:6.9 c))
5. ~~Ingress VID translation ([Q]:6.9 f))~~
6. ~~Port-based VLAN Classification ([Q]:6.9 d))~~
7. ~~Port and Protocol-based VLAN classification ([Q]:6.12)~~
8. ~~Priority Code Point Decoding ([Q]:6.9.3)~~
9. ~~Priority Regeneration ([Q]:6.9.4)~~
10. **Out-facing Ingress Stream Identification Function(s)**  
**([CB]:9.1.1.5)**

11. ~~FRER Functionality, like Sequence decode ([CB]:7.6)/~~  
~~Sequence generation ([CB]:7.4.1)~~
12. **In-facing Ingress Stream Identification Function(s)**  
**([CB]:9.1.1.2)**
13. ~~Active topology enforcement ([Q]:8.6.1)~~
14. Ingress filtering ([Q]:8.6.2)
15. Frame filtering ([Q]:8.6.3 a) and b))
16. Stream filter assignment  
([Q]:8.6.5.3 b) and c))
17. Maximum SDU Size Filtering ([Q]:8.6.5.3.1)
18. Stream Gating ([Q]:8.6.5.4)
19. Flow metering ([Q]:8.6.5.5)
20. ~~ATS Eligibility Time Assignment ([Q]:8.6.5.6)~~

Q:8.8.10? How many VID has an end station?

Isn't it required to add here d) and f) as well?

# TRANSMISSION PATH PROCESSING ORDER FOR END STATIONS

## COMPARED TO WHAT IS REQUIRED FOR BRIDGES

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On the transmit path (egress), the IEEE 802.1 Features are executed in the following order, if they are available and activated **in either hardware or software**:

- ~~1. In-facing Egress Stream Identification Function(s) ([CB]:9.1.1.4)~~
- ~~2. FRER Functionality, like Sequence generation ([CB]:7.4.1)~~
- ~~3. Out-facing Egress Stream Identification Function(s) ([CB]:9.1.1.3)~~
4. Queuing frames ([Q]:8.6.6)
5. Transmission selection ([Q]:8.6.8)
- ~~6. Priority Code Point Encoding ([Q]:6.9.3)~~
- ~~7. Egress VID translation ([Q]:6.9.g))~~
- ~~8. Support of the EISS ([Q]:6.9.2)~~
- ~~9. Support of the ISS ([Q]:6.7.1)~~
10. <MACsec as discussed on July 4<sup>th</sup>>



# REMAINING SECTION 6 ITEMS

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- Section 6 needs a walk through and check what is required for an end station and what not. E.g.
- 6.6 Flow Filtering
  - Drop counter required?
- 6.27 Number of Traffic Class queues
  - “A Relay supports no less than 8 Traffic Classes (TCs) per egress port.” – needs rewording
- 6.32 Frame loss
  - “A Frame can be lost if the Relay is unable to process it:” – also valid for end stations



# CLARIFY HOW REQUIREMENTS CAN BE REALIZED

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- Coming from bridge, users expect that several features are realized by hardware implementation with assistance software
  - e.g. MAC address (filter) table learned by hardware
  - Filtering done in hardware
  - Aging done in software
- An End Station
  - may provide MAC address filter but same task could be also done in software, .... if performance target is met
  - This applies to Policing function, stream identification

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