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ETSI standardization

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Introduction

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- ENSEMBLE contributes to the established ecosystem of **ITS protocols** with the aim to increase safety, reduce emissions, and increase efficiency
- ENSEMBLE has developed a **platooning protocol** that can be directly contributed to standardization
- The protocol is located at the facilities layer alongside with other ITS protocols
- Standardization is key for creating an **interoperable multibranded platooning system**!

ETSI TC ITS

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- **ETSI Technical Committee on Intelligent Transport Systems** (TC ITS)
  - Established in December 2007
  - Consists of 5 working groups focusing on different parts of the communication protocol stack
- **ETSI TC ITS** responded to an EC mandate in 2010 for developing ITS standards
  - The purpose of the mandate was to accelerate the standards development for creating an **interoperable V2X system**
  - The work was finalized in 2014 with the first set of protocols supporting day one applications

ETSI World Class Standards

ETSI TC ITS cont'd

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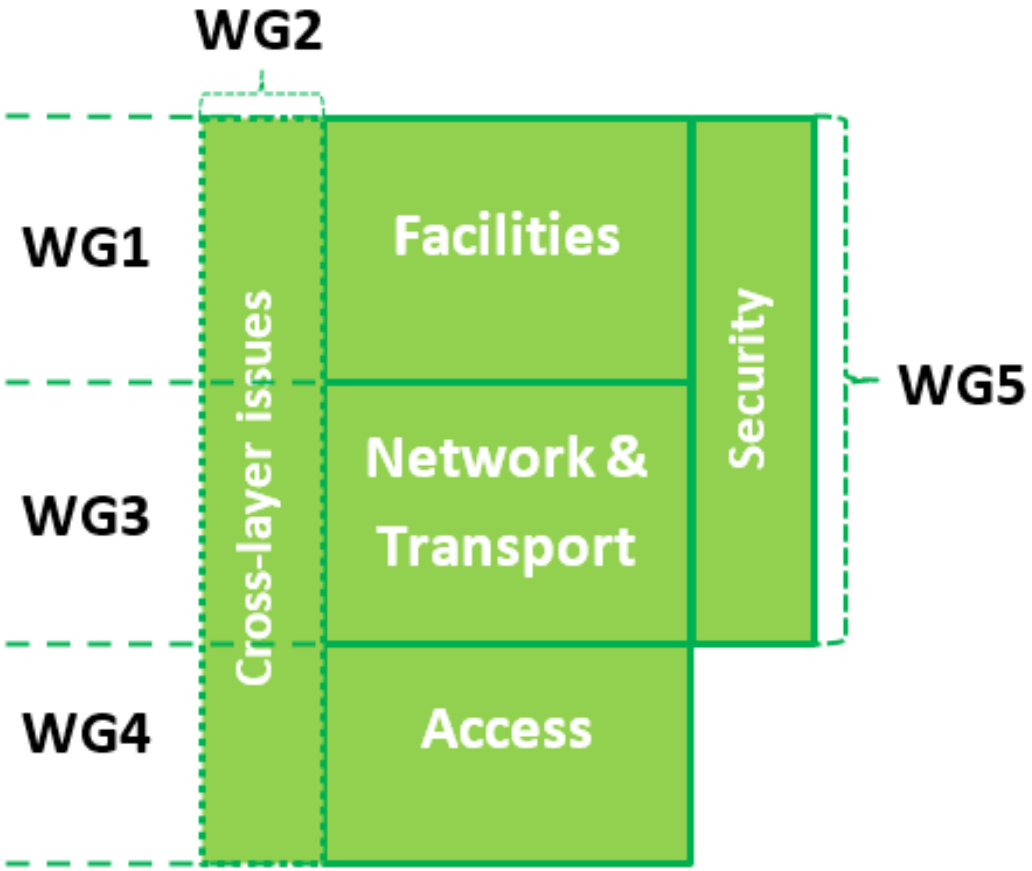
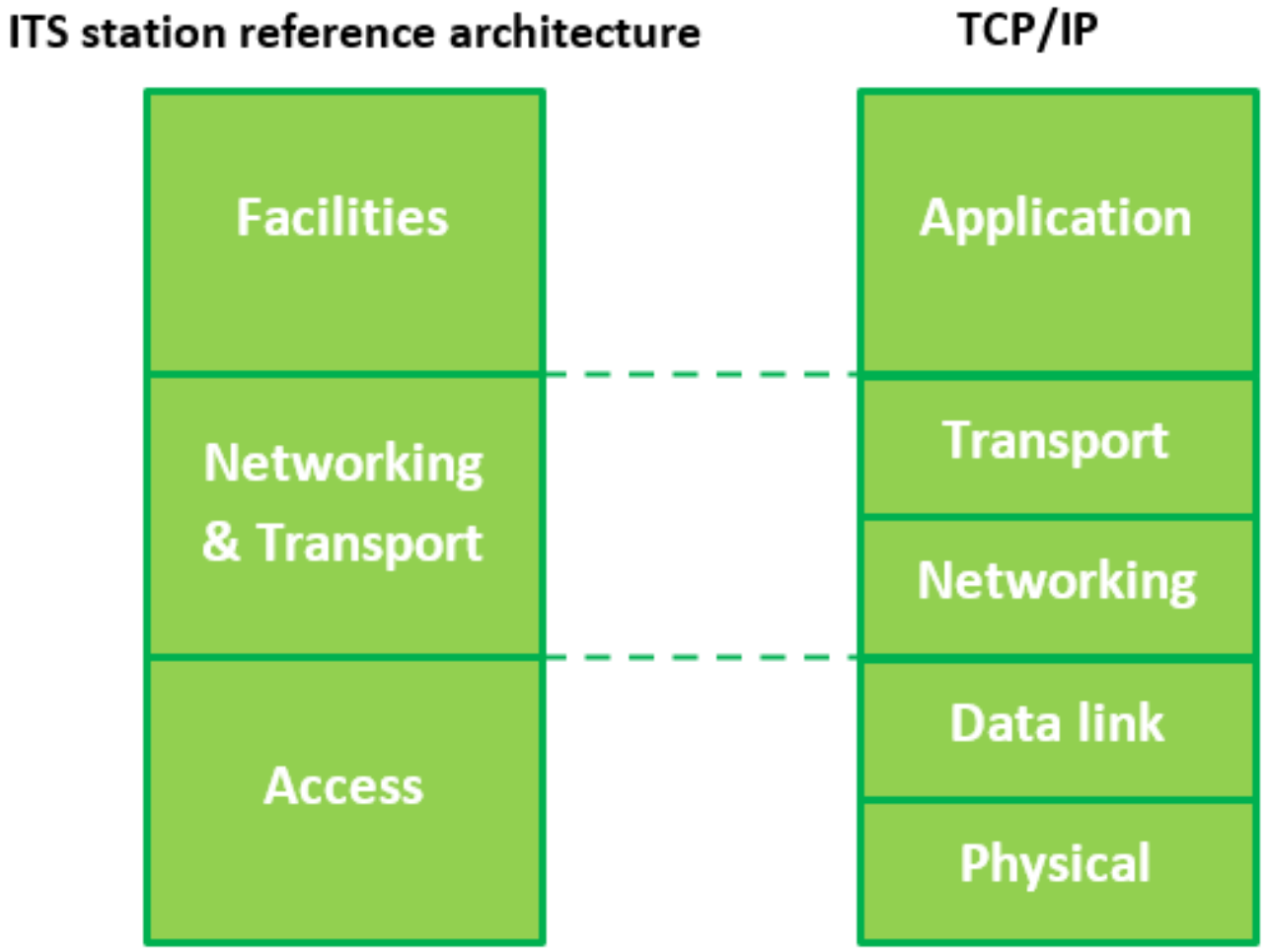


- WG1 – Application requirements and services
- WG2 – Architecture and cross-layer
- WG3 – Transport and network layer
- WG4 – Media and medium related
- WG5 – Security

ITS station reference architecture



Protocol layers of the ITS stations reference architecture in comparison with the layers of the ubiquitous TCP/IP stack.

Day one and day two services

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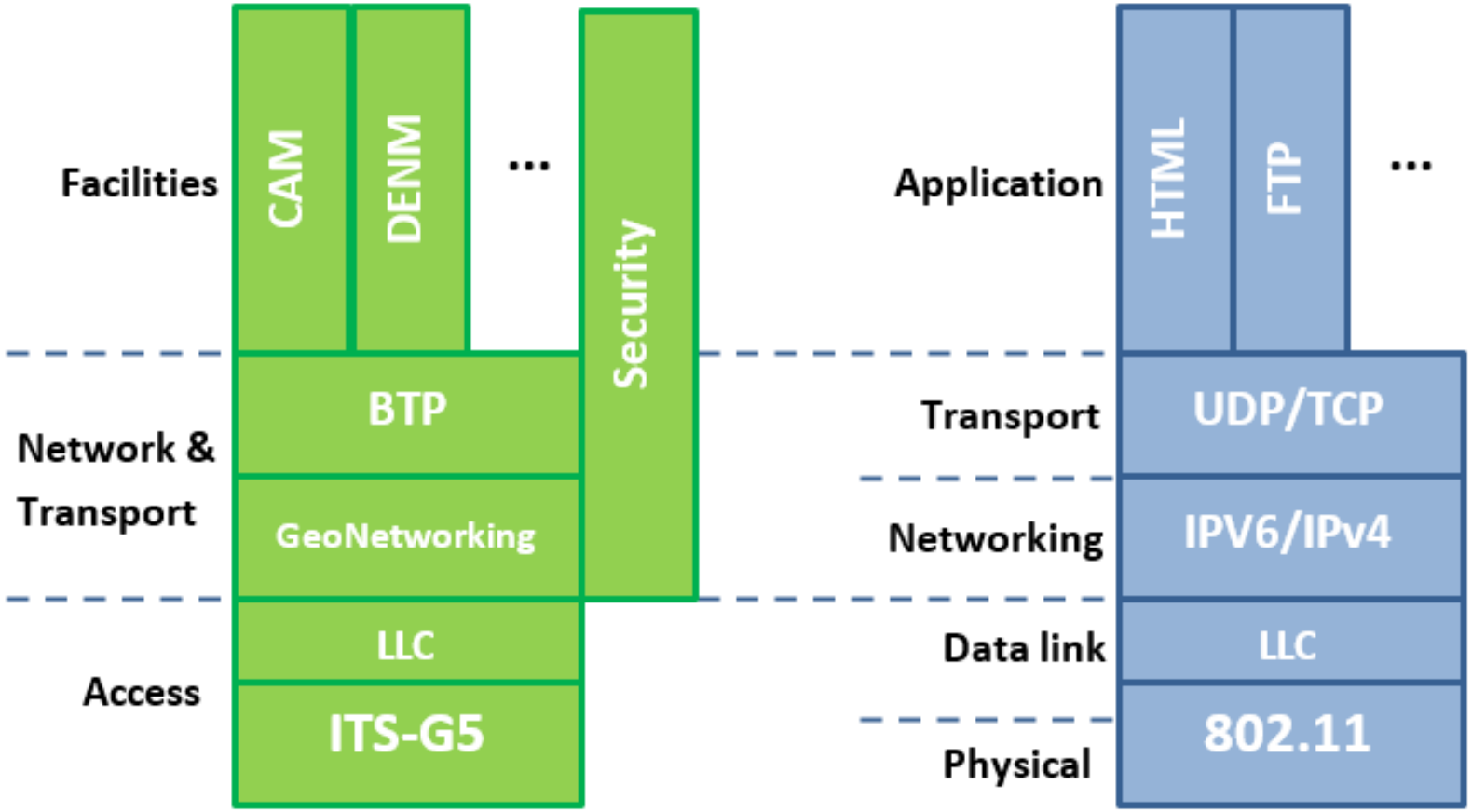
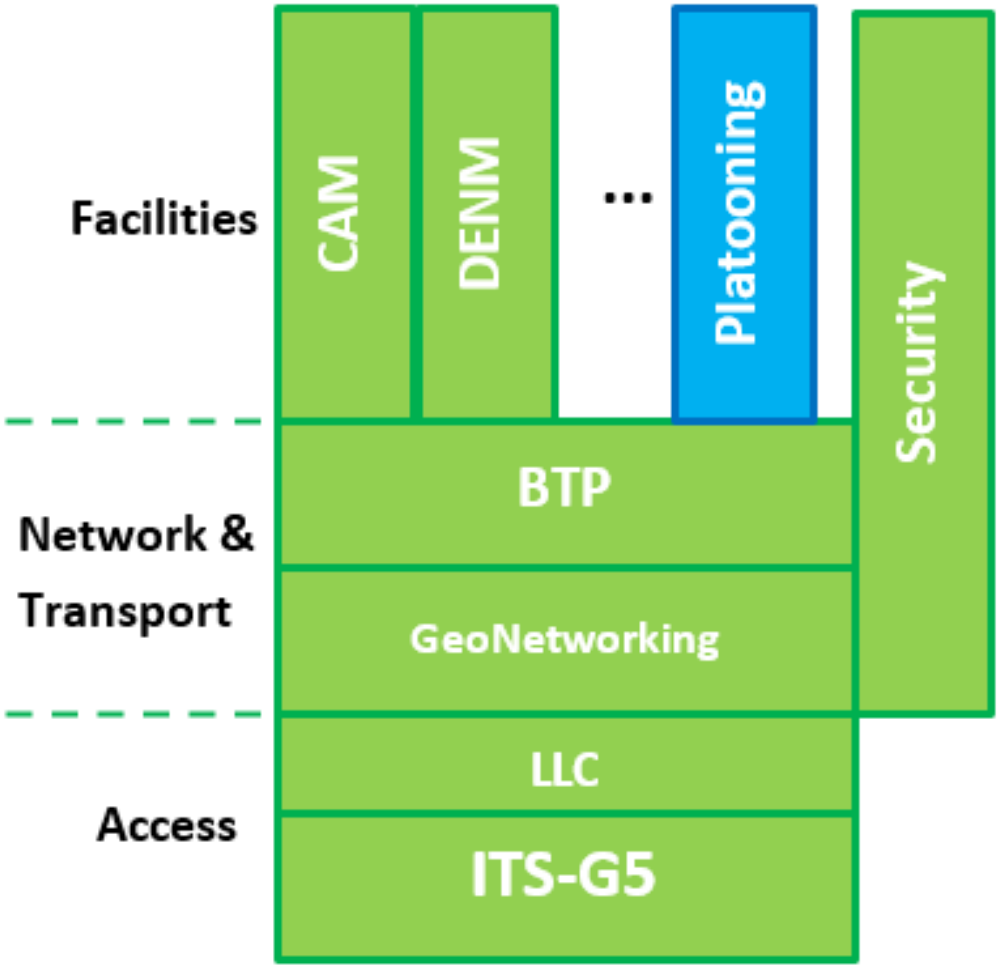
- **Day One services** intend to increase the awareness horizon of the driver
  - Stationary vehicle warning, green light optimal speed advisory, emergency electronic brake light etc
  - Essential protocols: cooperative awareness message (CAM) and decentralized environmental notification message (DENM)
- **Day Two services** intend to increase the awareness horizon of the automated vehicle
  - Collective perception, manoeuvre coordination, **platooning**, cooperative adaptive cruise control etc
  - Protocols underway in standardization

Protocol stack for day one services



Protocol stack for day one services in comparison with the ubiquitous TCP/IP stack.

The platooning protocol



- The **platooning protocol** is situated alongside with CAM/DENM supporting day one applications
- It uses the **same lower layers as other ITS applications**
- It is **technology agnostic** (it could be any other V2X technology at the bottom of the protocol stack even though ENSEMBLE used ITS-G5)

The specifics of the platooning protocol

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- Two types of messages
  - Platoon Management Message (PMM)
    - Join Request, Join Response, Platoon Update
  - Platoon Control Message (PCM)
    - This message contains information on position, configuration, control parameters, shared status etc
    - Transmitted with 20 Hz by all platoon members during operation
    - Implicit ACKs are used, implying that when several consecutive messages are missing from a single member actions are taken
- Besides the signing and verification of each message transmitted using the standardized security mechanisms, **PCM**s and **PMM Join Response** are also encrypted (only members of the platoon can decode these messages)
  - The symmetric encryption of messages is supported by standards but not used by day one applications

Current activities in ETSI TC ITS WG1

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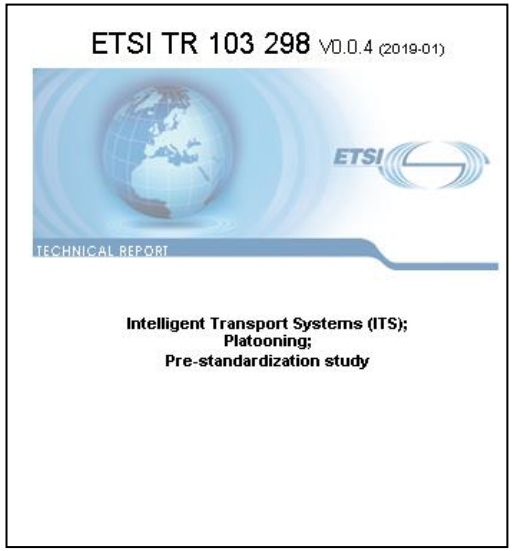

- Technical report on platooning is ongoing
  - **TR 103 298** ” Intelligent Transport Systems (ITS); Platooning; Pre-standardization study”
  - Identify standardization needs, use case desriptions
  - A technical report does not contain requirements, i.e., it is not a standard in that respect only a report
- ENSEMBLE input to this work is ongoing
- Final version of TR expected at the next ETSI TC ITS meetings in October

Next steps in standardization

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- Propose a **new work item** in ETSI TC ITS WG1 for a technical specification (TS) describing the platooning protocol
  - A TS contains requirements, i.e., it is a standard
- The **ENSEMBLE platooning protocols** introduce new data types
  - Requires an update of **TS 102 894-2** containing all data types for ITS applications
    - TS 102 894-2 ” Intelligent Transports Systems (ITS); User and applications requirements; Part 2: Applications and facilities layer common data dictionary”
  - TS 102 894-2 is currently being revised in WG1

Next steps in standardization cont'd

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- Apply for an ITS-AID (application ID) for platooning in **TS 102 965**
  - TS 102 965 "Intelligent Transports Systems (ITS); Application Object Identifier (ITS-AID); Registration"
- Add BTP ports numbers for platooning in **TS 103 248**
  - TS 103 248 "Intelligent Transport Systems (ITS); GeoNetworking; Port Numbers for the Basic Transport Protocol (BTP); BTP port numbers"

Announcing the platooning capability

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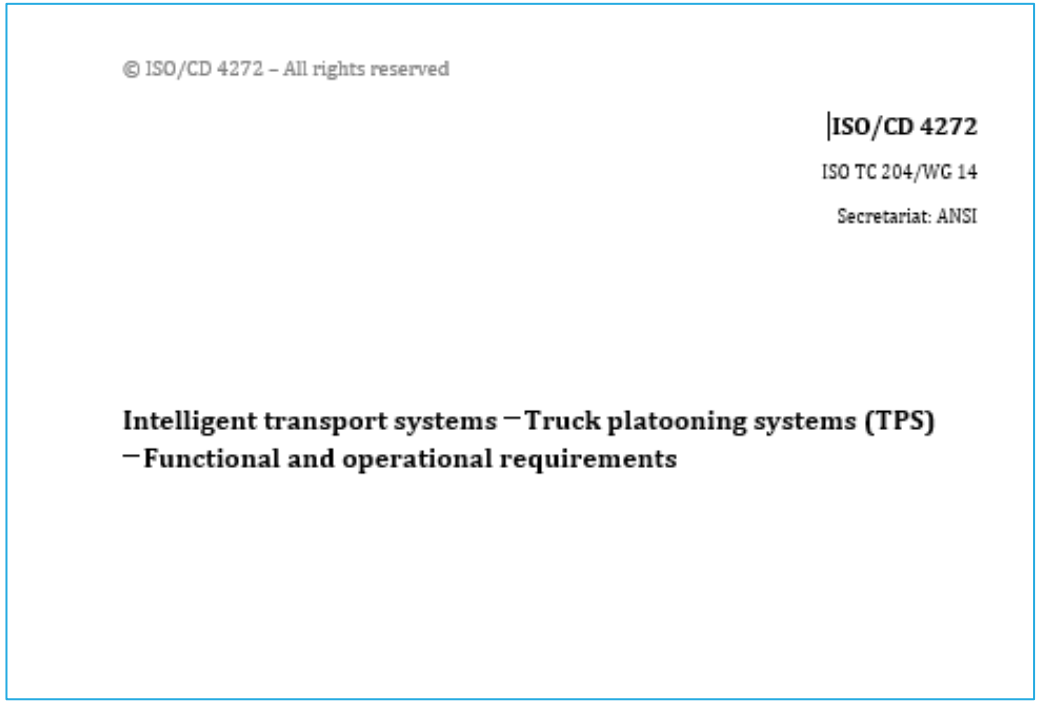
- The ENSEMBLE implementation of the **platooning protocol** uses **CAMs** for announcing the truck's ability to platoon
  - This cannot be used for a real deployment since backward compatibility can be broken by adding containers in CAM
- For deployment of platooning, the service announcement protocol will be used for alerting others about the platooning capability
  - **ETSI EN 302 890-1** "Intelligent Transport Systems (ITS); Facilities layer function; Part 1: Services Announcement (SA) specification"

Platooning activities in ISO

- **ISO TC 204 WG14**
  ”Vehicle/roadway warning and control systems” develops a platooning standard
- **ISO/CD 4272** “Intelligent transport systems — **Truck platooning systems (TPS)** — Functional and operational requirements”



ISO/CD 4272

ISO TC 204/WG 14

Secretariat: ANSI

Intelligent transport systems — Truck platooning systems (TPS) — Functional and operational requirements

Platooning activities in ISO cont'd

- Contains description of use cases
- Communication aspects treated on a functional level
- ENSEMBLE has contributed substantially to this standard

ISO/CD 4272

Bibliography

[1] COMPANION D3.1; Component Specifications for the Overall Architecture

[2] ENSEMBLE D2.3; V2 Platooning use cases, scenario definition and Platooning Levels

[3] ENSEMBLE D2.5; Final Version Functional specification for white-label truck

[4] ENSEMBLE D2.6; Functional specification for intelligent infrastructure & Platooning coordination services - Strategic and Services Layers

[5] ENSEMBLE D2.8; Platooning protocol definition and Communication strategy

[6] ETSI TR 103 298; Intelligent Transport Systems (ITS); Platooning; Pre-standardization study

Conclusions

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- **ENSEMBLE** has developed a platooning protocol fitting the already existing ecosystem of ITS protocols supporting day one applications
- **ENSEMBLE** contributes actively to standardization
  - ENSEMBLE partners will initiate a work item for developing a technical specification in ETSI
- More details about the platooning protocol can be found in **deliverable D2.8** (currently being updated)
- The **platooning protocol** developed in ETSI will support both the platooning support function and the platooning autonomous function
- More details on an **ENSEMBLE's standardization efforts** will be found in **deliverable D6.5** (to be published in November 2021)

Thank you for your attention

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platooningensemble.eu