METR
Management of Electronic Traffic Regulations

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What is METR (Management for Electronic Traffic Regulations)?

- **Electronic Traffic Regulations**:
  – Traffic rules and regulations that **machines** can **understand** and **trust.**

- What about the word **Management**?
  – This is the challenging part, and the theme for the rest of this presentation

- Some words on what **METR** is **not**

  – It is NOT something new to replace DATEX, TN-ITS, C-ITS, TPEG, TransModel, etc
    - On the contrary; it supplies these services with reliable data

  – It is NOT an American invention
    - METR is based on the EC M/546 on Urban ITS, and is under European lead in standardisation
    - Our colleagues in USA and Asia/Pacific are contributing and cooperating to create a better result

Why do we need METR

- "All" road authorities are in the process of digitizing their operations, including rules and regulations.
  - What is wrong with developing their own local data models?

- There are two essential requirements in a Pan-European setting:
  - **Interoperability**.
    Consider a car with L3/L5 automation from Portugal getting a mandatory convoy regulation in Norway.
    How will it know how to react?
  - **Trust**.
    This L3/L5 equipped car must follow a genuine regulation but shall ignore a false regulation.

- Other factors
  - METR is technically complex, and many (most?) countries don´t have the expertise on their own
  - Common specifications and regulations will drive down implementation cost
  - METR data and security model can stimulate the national digitalization programme.

- In sum, METR can be seen as both **part of NAP** and as a **technical enabler for NAP**

Laws and regulations - from analogue to digital

UN Convention on Road Traffic

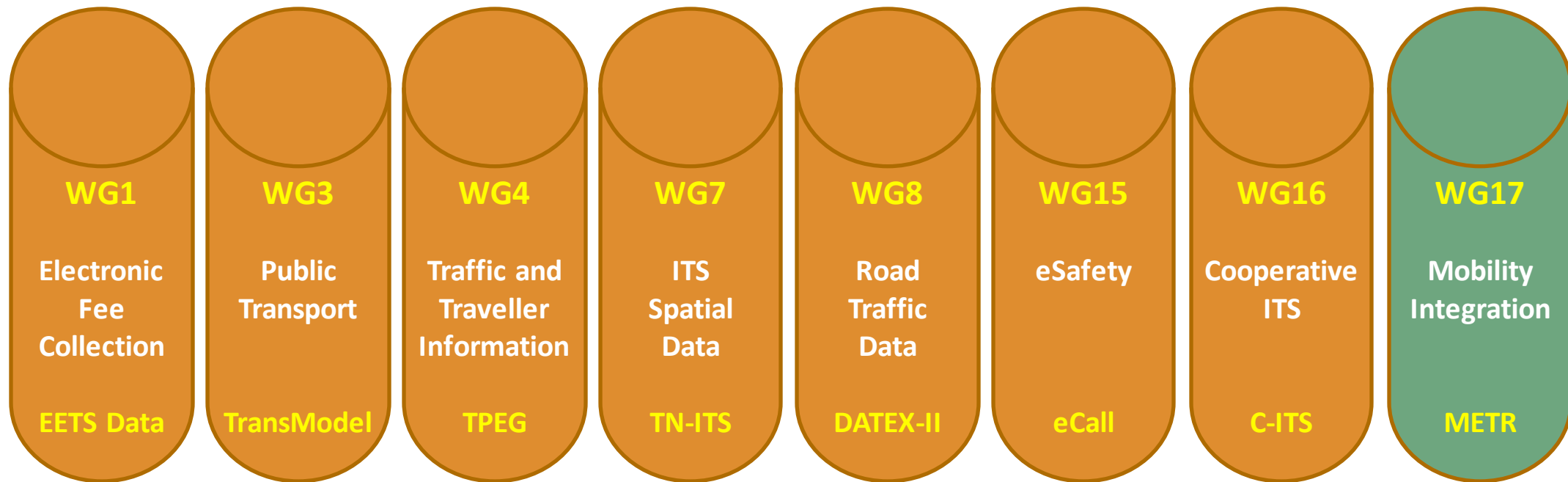*Chapter II, Article 8: Every vehicle shall have a driver.*

*Chapter II, Article 7: Every driver, pedestrian or other road user shall conduct **himself** in such a way as not to endanger or obstruct traffic; **he** shall avoid all behaviour that might cause damage to persons, or public or private property.*

- Some of the laws and regulations are based on common sense, moral and ethics.
  This is difficult – often impossible – for machines to interpret.

- A rewrite for machines will require significant work:
  – Regulatory interpretations in **UNECE WP.1 etc**
  – Technical standards in **ISO/TC204/WG19 etc**

EUROPEAN STANDARDS

CEN TC278 Intelligent Transport Systems (ITS)

WG1

Electronic Fee Collection

EETS Data

WG3

Public Transport

TransModel

WG4

Traffic and Traveller Information

TPEG

WG7

ITS Spatial Data

TN-ITS

WG8

Road Traffic Data

DATEX-II

WG15

eSafety

eCall

WG16

Cooperative ITS

C-ITS

WG17

Mobility Integration

METR

ISO TC204 WG19 - CEN TC204 WG17 - Mobility Integration

Statens vegvesen
Norwegian Public Roads
Administration

Urban Control Zone

Public-area robots

Parking

Vendor lock-in

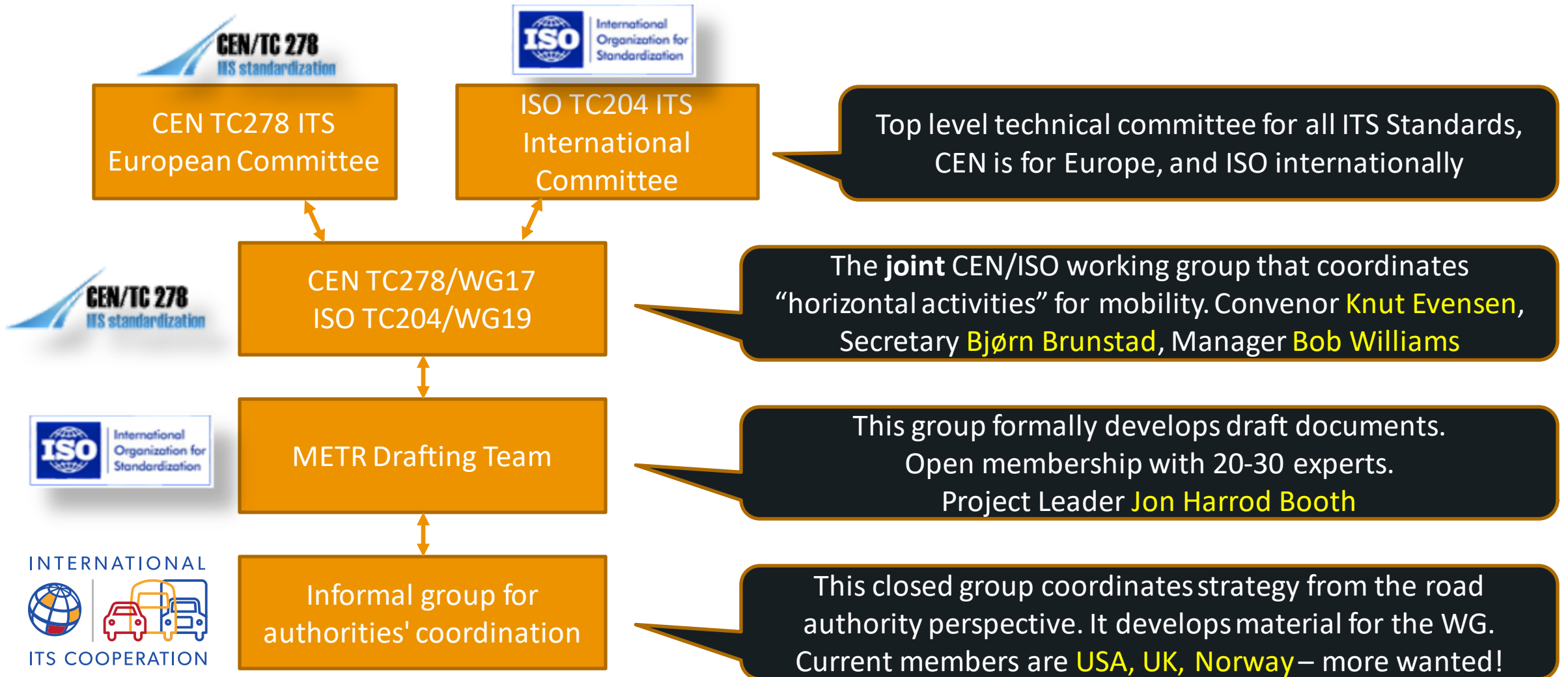Automated cars

Location References

Support other WGs

Overview of all
ITS standards

Mobilityits.eu

Dissemination

Essential Mobility
terms and concepts

MaaS/MoD | Service Model | Data Model
Payment | Aggregator

Harmonization

Traffic regulations → METR data → Automated Driving
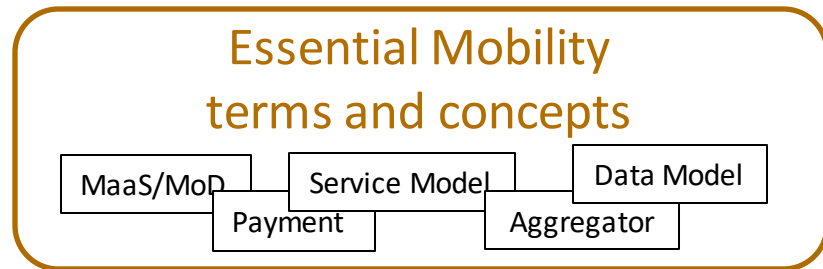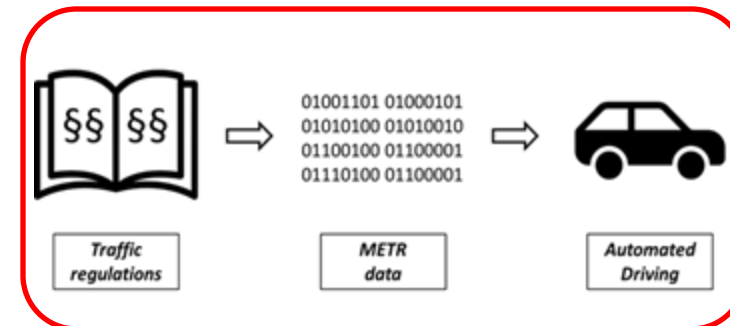
METR

METR standardisation - who is doing what?

METR – the simple story
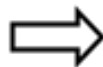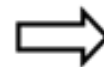
Traffic regulations → METR data → Automated Driving

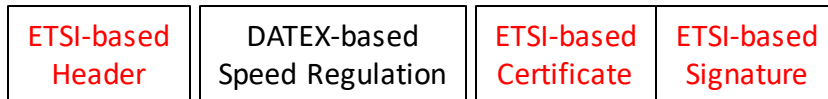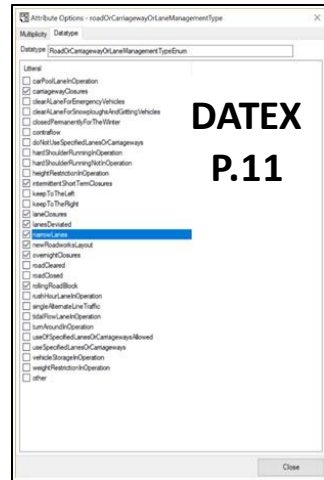The METR main processes – Trust scope and Cybersecurity
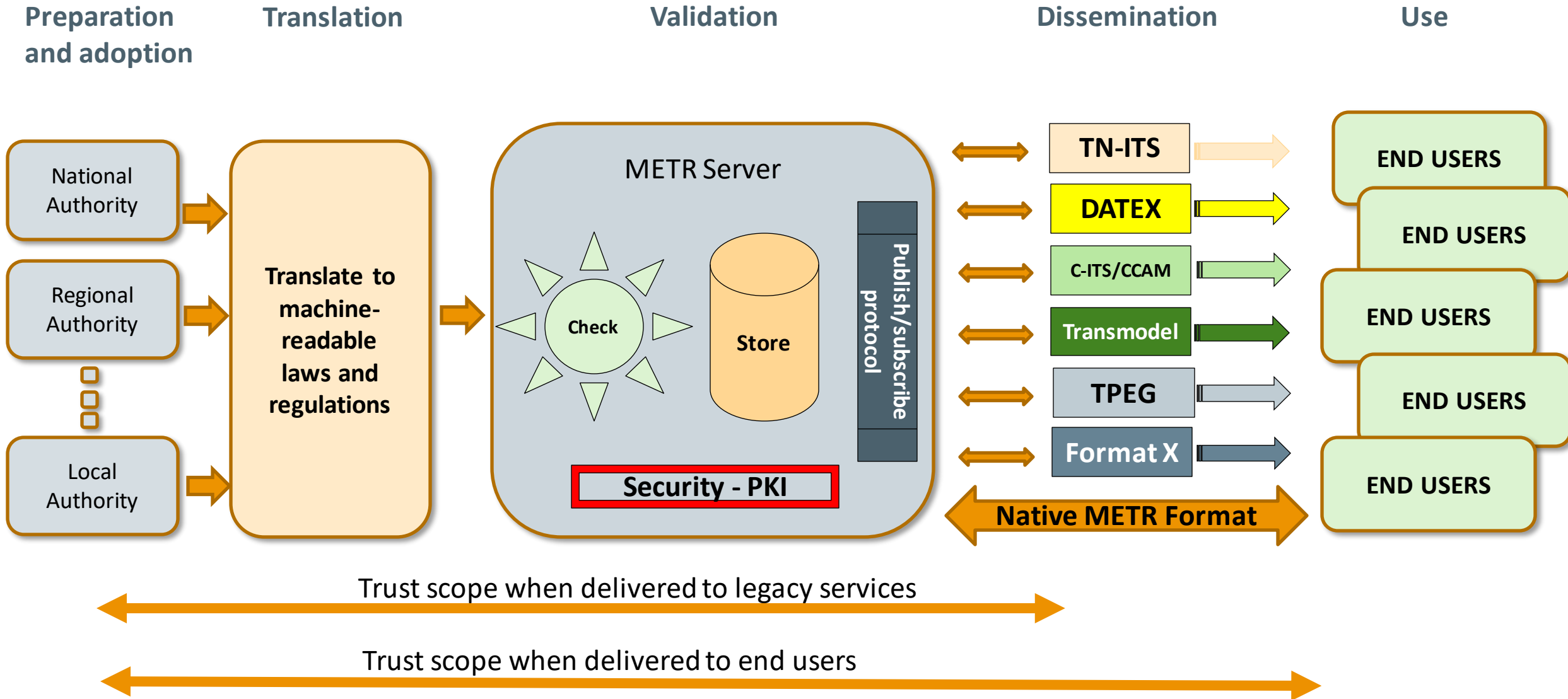
Example: METR Speed Regulation end-to-end protection

DATEX P.11

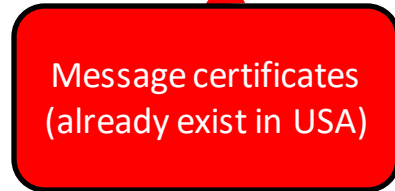| ETSI-based Header | DATEX-based Speed Regulation | ETSI-based Certificate | ETSI-based Signature |

- A Speed Regulation is created in a GIS-tool by an authority.
  - A speed zone is designated
  - Time of validity, exact location, special usage etc is added
- A header is added with the following information
  - Information that this is a speed regulation
  - Exact geolocation of speed zone
  - Start/stop time of validity
  - Other service specific information
- A certificate based on the ETSI format
  - METR SSP (Service Specific Permissions)
  - Identity of the official with regulatory permissions
- A signature based on ETSI/P1609.2 SignMessage
  - Over the entire set (Header, Regulation, Certificate)

- **This format needs to be specified, tested/validated and standardized.**
  - **It is used in USA, but not in Europe due to GeoNetWorking**
- **The format may need to be referenced in national regulations**

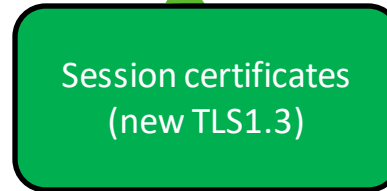# How METR and Cybersecurity are connected in the NPRA pilot
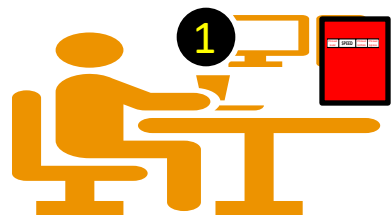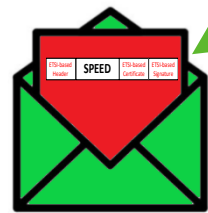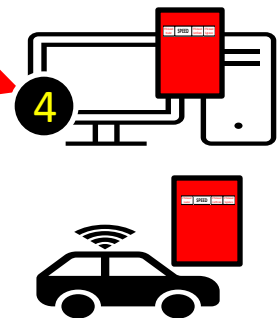
Different deployment models with varying levels of trust

A

TMC with GIS computer setting the actual speed.

ISA actual speed message embedded in TLS 1.3 security

Central system

Central ITS Station

ISA messages embedded In TLS 1.3 security

Full check of TLS 1.3 protocol and METR ISA frame

B

TMC with GIS computer setting the actual speed.

ISA actual speed message embedded in TLS 1.3 security

Central system

Central ITS Station

ISA messages embedded In TLS 1.3 security

Proprietary cloud

Proprietary protocol with embedded METR ISA frame

Full check of METR ISA frame

C

TMC with GIS computer setting the actual speed.

ISA actual speed message embedded in TLS 1.3 security

Central system

Central ITS Station

ISA messages embedded In TLS 1.3 security

Proprietary cloud

ISA data

Reformatted ISA data with proprietary protocol and security

No METR ISA security check

Statens vegvesen
Norwegian Public Roads Administration

METR System - Norwegian draft for Enterprise View (Operations)

Statens vegvesen
Norwegian Public Roads Administration

T. Foss 13-01-2021
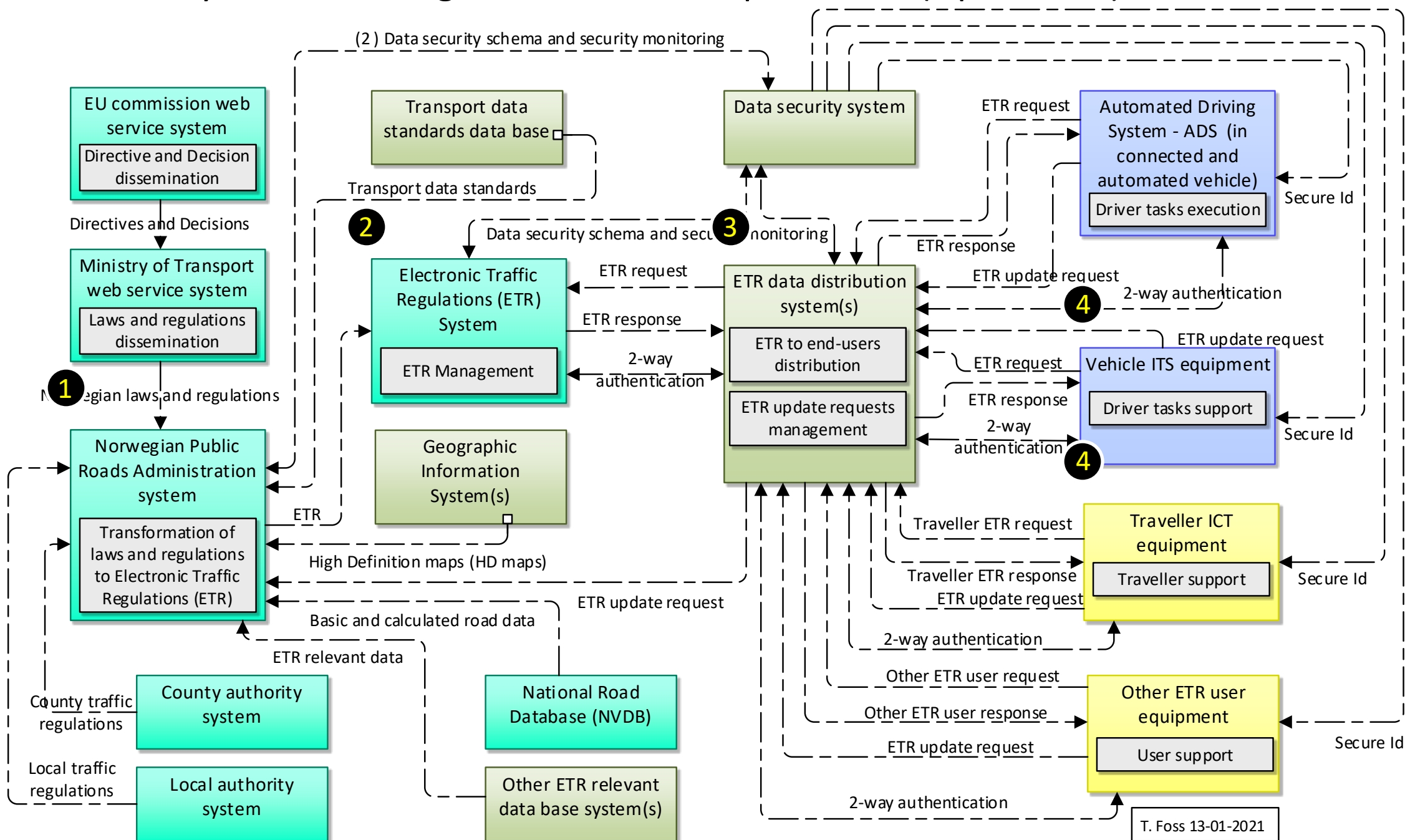
Who are responsible for what?

Global level
ISO standards define basic principles, reference architecture, terminology, high level system requirements

- The first set of ISO standards are nearing completion
- It is essential that European needs are expressed and included at this stage
- UNECE will need to play a role

European level
Regulations to assure cross-border operations at required service level. Supported by technical standards defining data model, protocols and security as needed for interoperability.

- METR seems to form a natural part of the ongoing ITS regulations and should eventually become part of the NAP
- The technical standards will be different from other regions (USA, Japan, Korea,…), since we will likely rely on DATEX II/TN-ITS and other Europe-specific standards. Cybersecurity is clearly a function where we can rely on the existing work from C-ITS
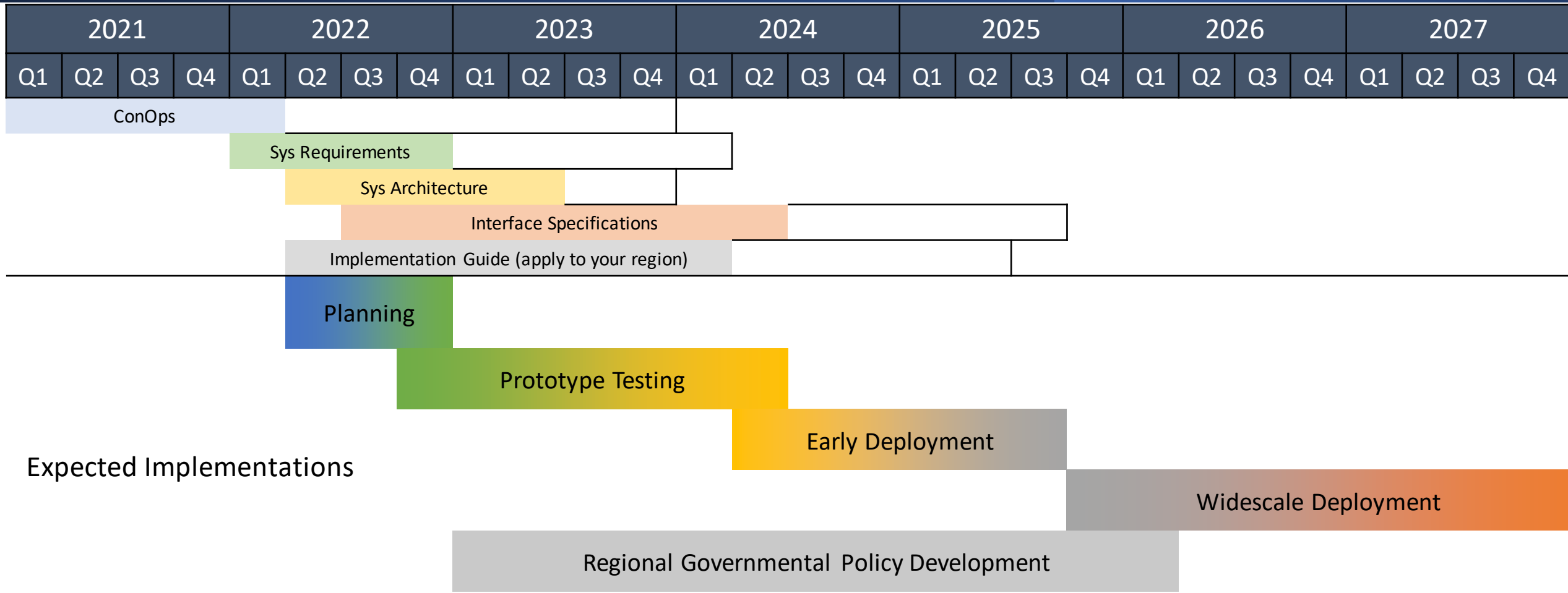
National level
Regulatory binding into national traffic regulations. National reference documents (standards?) for terminology, role/actor models, operations and governance

- Introducing METR at national level is complex since the legal system varies significantly from country to country. This work is started in many countries as a "digitalization exercise"
- Translating and adapting the global and European requirements must be done at national level. Operation and governance must be politically decided and funded.

Tentative Deployment Schedule

https://iso-tc204.github.io/iso24315p1

2021				2022				2023				2024				2025				2026				2027			
Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4

ConOps

Sys Requirements

Sys Architecture

Interface Specifications

Implementation Guide (apply to your region)

Planning

Prototype Testing

Early Deployment

Expected Implementations

Widescale Deployment

Regional Governmental Policy Development

- Prototyping and deployment efforts are external to ISO and do not entail commitments
- Feedback from prototypes and deployments will help refine standards
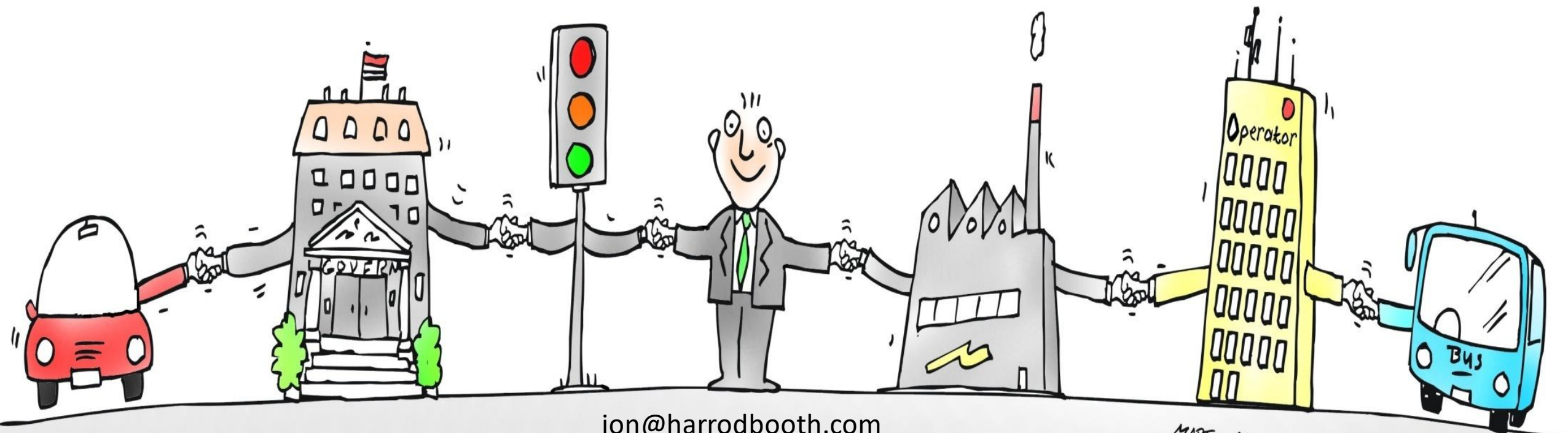
11 May 2022   15

Conclusion

- METR will involve a lot of national and international stakeholders.
  – Coordination of these stakeholders is essential

- Benefits of METR **standards** and **harmonization**:

  – Public sector will benefit from standardisation and common technical solutions
  – Cooperation between countries will reduce risk and cost for all
  – Interoperability in Europe is an absolute need

- The connection to NAPs is obvious
  – How to merge is the question

Traffic regulations → METR data → Automated Driving
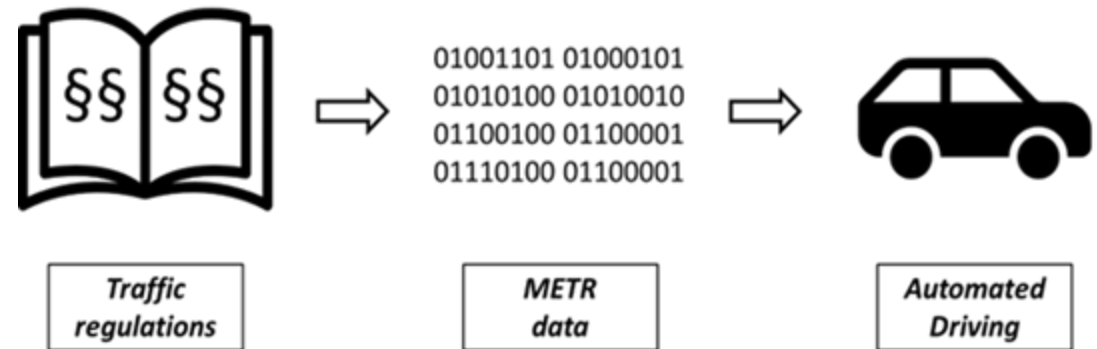
Thanks for your attention!

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ISA scenario with dynamic speed zones

Statens vegvesen
Norwegian Public Roads Administration
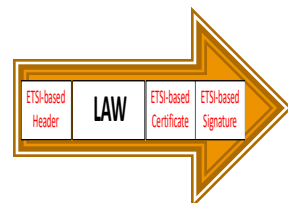
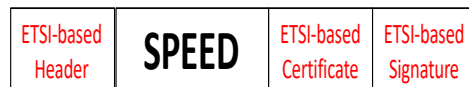| ETSI-based Header | LAW | ETSI-based Certificate | ETSI-based Signature |

"Static data"

Policy setting group creating dynamic speed zone regulation.

ISA dynamic speed zone regulation in TLS 1.3 security

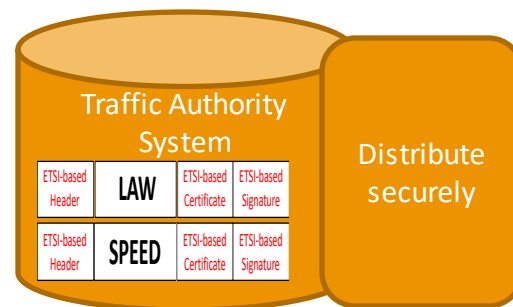| ETSI-based Header | SPEED | ETSI-based Certificate | ETSI-based Signature |

"Dynamic data"

TMC with GIS computer setting the actual speed.
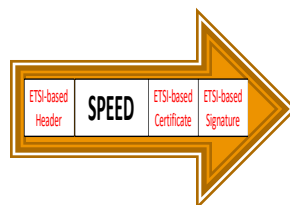
ISA actual speed message embedded in TLS 1.3 security

Traffic Authority System

Distribute securely

Central system

Central ITS Station
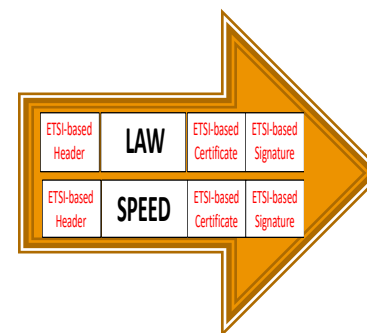
ISA messages embedded In TLS 1.3 security

Vehicle ITS Station

Note: Actual speed can also be provided locally by an automated system