



**EUROPEAN
CONGRESS**
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Clean, resilient and
connected mobility.

Standardised ITS Services: A NAPCORE gap analysis among DATEX II and C ITS

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Autostrade per l'Italia S.p.A.

TP 5 Innovative CCAM solutions

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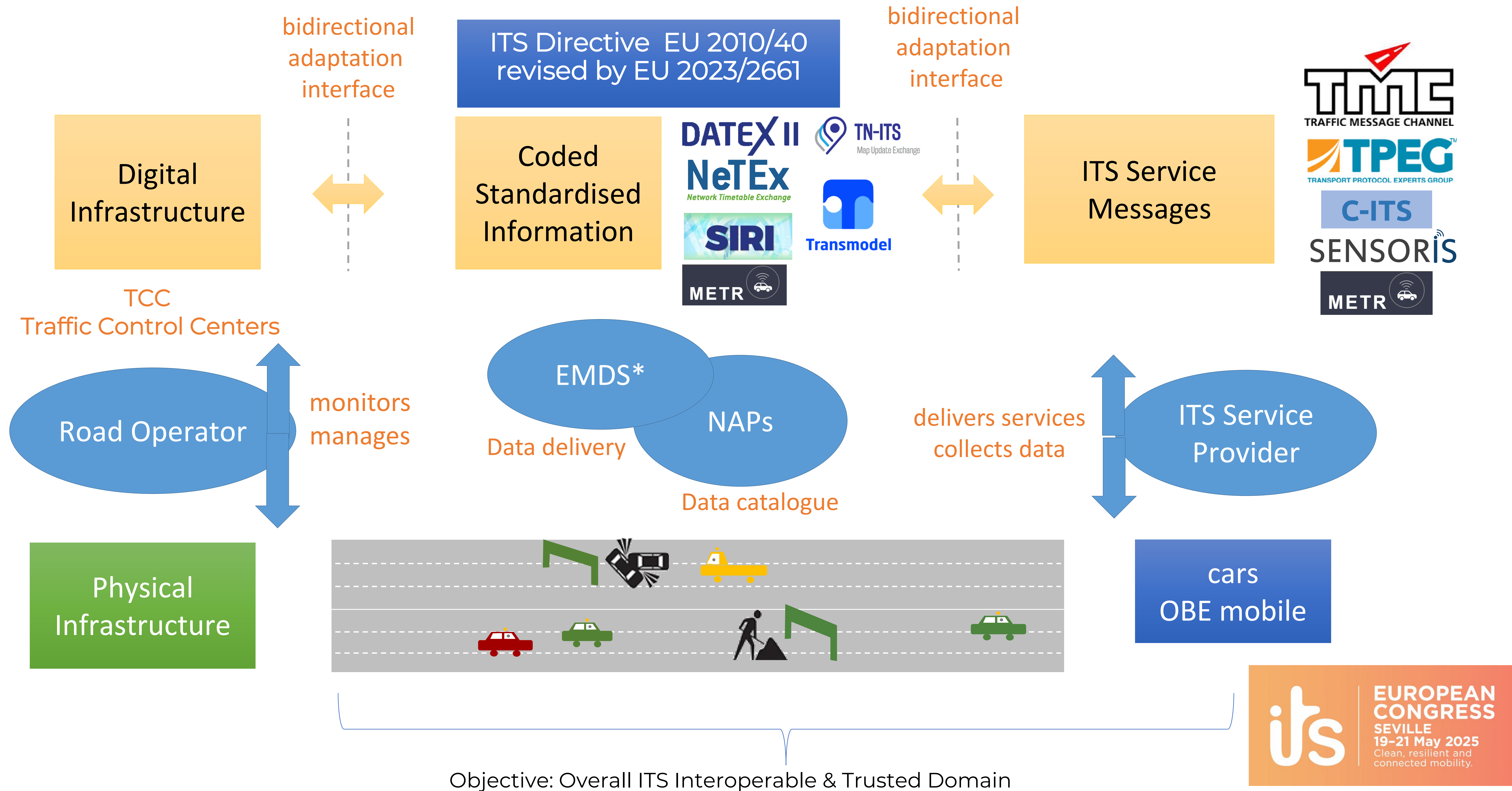
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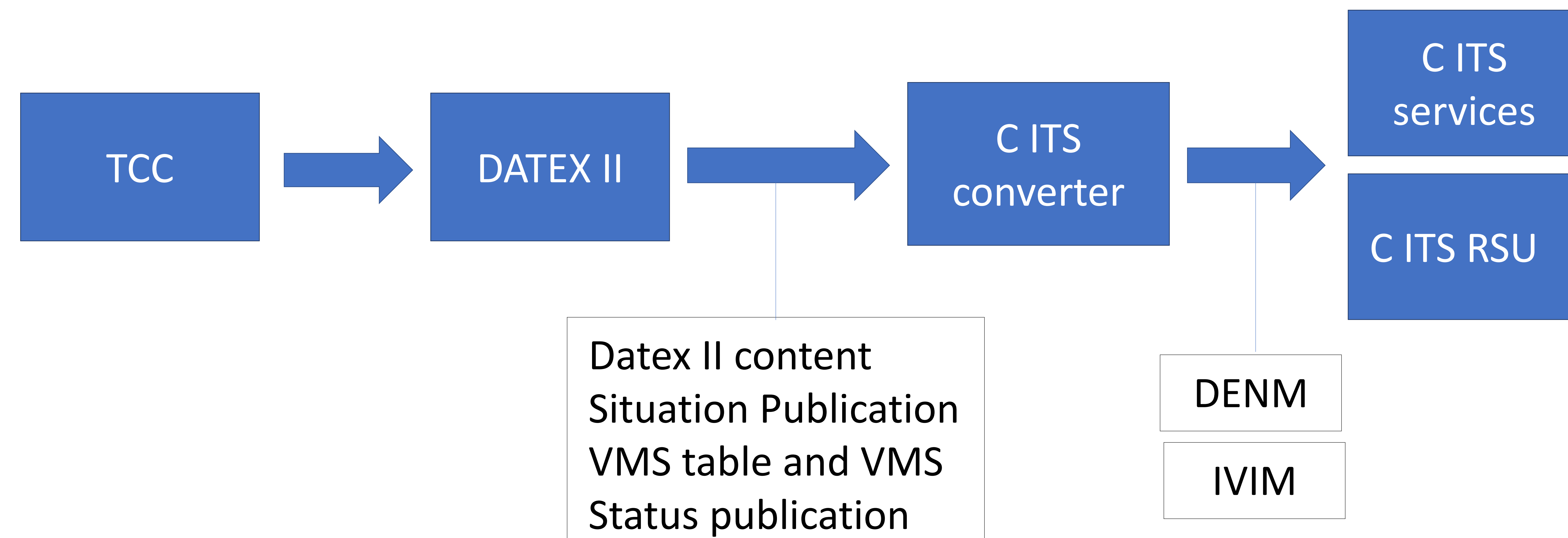
ITS Regulatory Context in Europe



C ITS Architecture from C ITS EU Projects

DATEX II messages to be delivered to vehicles by C ITS messages, via C ITS RSU or C ITS mobile network services in Hybrid

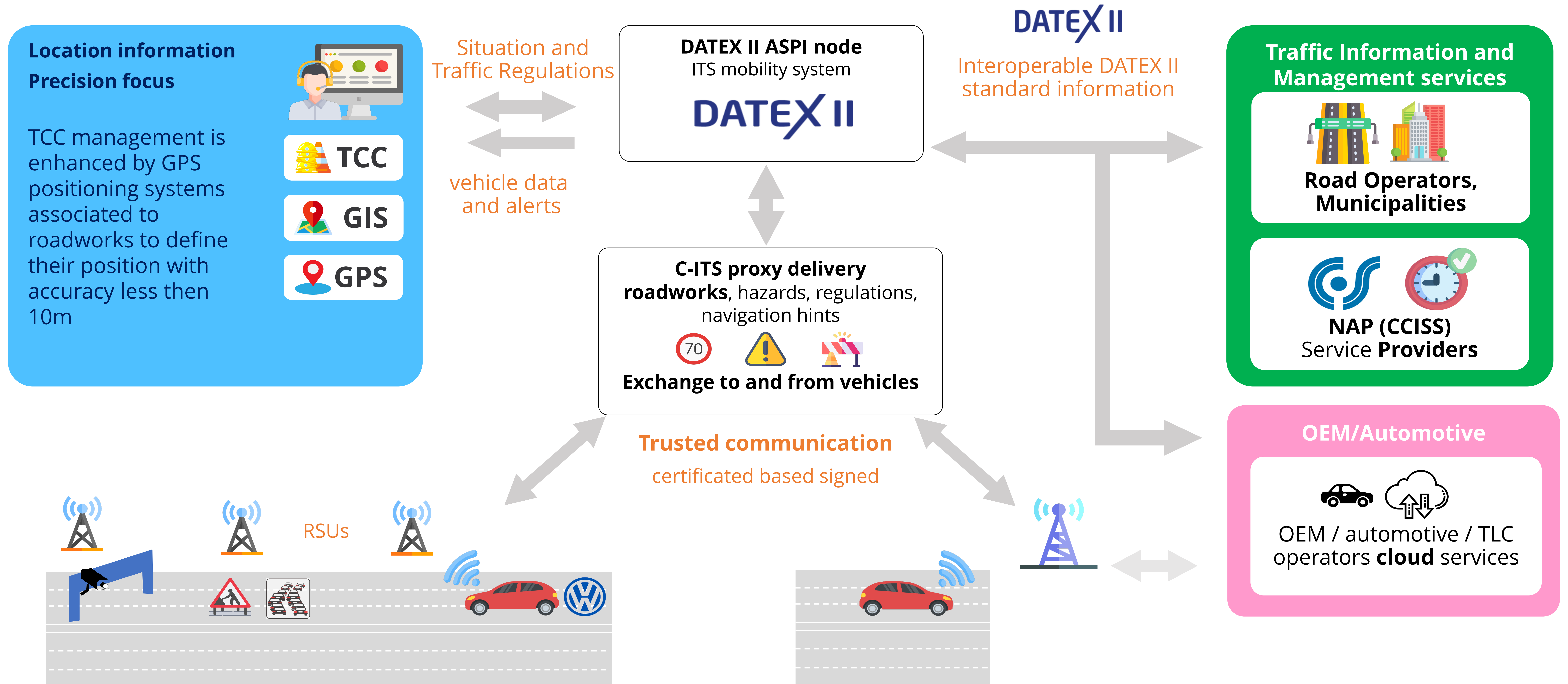
e.g. FR InDid project, Italian motorways implementations for DENM, IVIM messages from DATEX II feeds



NOTE: this is not an officially agreed C ROADS architecture, various options are under discussion

Data Delivery & ITS and C ITS Services Delivery

in a road operator environment



DATEX vs C ITS gap analysis

DATEX II

DATEX II location referencing

Situation Publication

**VMS Publication information for
Dynamic Signs and text messages**

C ITS

C ITS Messages location

DENM Message Structure

IVIM Message Structure



Information Mapping Tables for Situation and Signage

Cross Domain Semantic Adaptation

DATEX II (EN 16157-3)		TMC Events (EN ISO 14819-2)		TPEG2-TEC (ISO/TS 21219-15)				DENM (ETSI EN 302 637-3)		
DATEX Class	Type	Text (EN-English)	Code	Cause Code	Sub Cause Code	Warning Level	Text	Cause Code	Sub Cause Code	Text
EnvironmentalObstruction	flooding	flooding. Danger	908	5	1	3	flooding	9	0	hazardous location - surface condition
WeatherRelatedRoadConditions	surfaceWater	danger of aquaplaning	1002	7		3	aquaplaning	7	0	aquaplaning
WeatherRelatedRoadConditions	surfaceWater	surface water hazard	1041	7		3	aquaplaning	7	0	aquaplaning
WeatherRelatedRoadConditions	slippery	slippery road (above Q hundred metres)	1003	6		3	slippery road	6	0	adverse weather condition - adhesion
NonWeatherRelatedRoadConditions	mudOnRoad	mud on road. Danger	1055	6	3	3	mud on road	6	3	mud on road
NonWeatherRelatedRoadConditions	looseChippings	loose chippings. Danger	1056	6	8	3	loose chippings	6	8	loose chippings
NonWeatherRelatedRoadConditions	oilOnRoad	oil on road. Danger	1057	6	7	3	oil on road	6	7	oil on road
NonWeatherRelatedRoadConditions	petrolOnRoad	petrol on road. Danger	1058	6	2	3	fuel on road	6	2	fuel on road
WeatherRelatedRoadConditions	ice	ice (above Q hundred metres)	1006	6	5	3	ice on road	6	5	ice on road
WeatherRelatedRoadConditions	blackIce	black ice (above Q hundred metres)	1008	6	6	3	black ice on road	6	6	black ice on road
WeatherRelatedRoadConditions	snowDrifts	snow drifts (above Q hundred metres)	1016	9	5	3	snow drifts	9	5	snow drifts
WeatherRelatedRoadConditions	icyPatches	icy patches (above Q hundred metres)	1047	6	5	3	ice on road	6	5	ice on road

Tab. 3-3: Corresponding Message Subsets for the category “Temporary slippery road”

Equivalency among DATEX II situation/event encoding and DENM C ITS can be derived by work undertaken by TISA-NAPCORE-DATEX II-C-ROAD-Car2CarCC-SensorIS-DFRS projects

GDD for road signage is used by C-ITS and DATEX II and is intrinsecally interoperable

DRAFT INTERNATIONAL STANDARD
ISO/DIS 14823-1.2

ISO/TC 204

Secretariat: ANSI

Voting begins on:
2022-12-12

Voting terminates on:
2023-02-06

Intelligent transport systems — Graphic data dictionary —

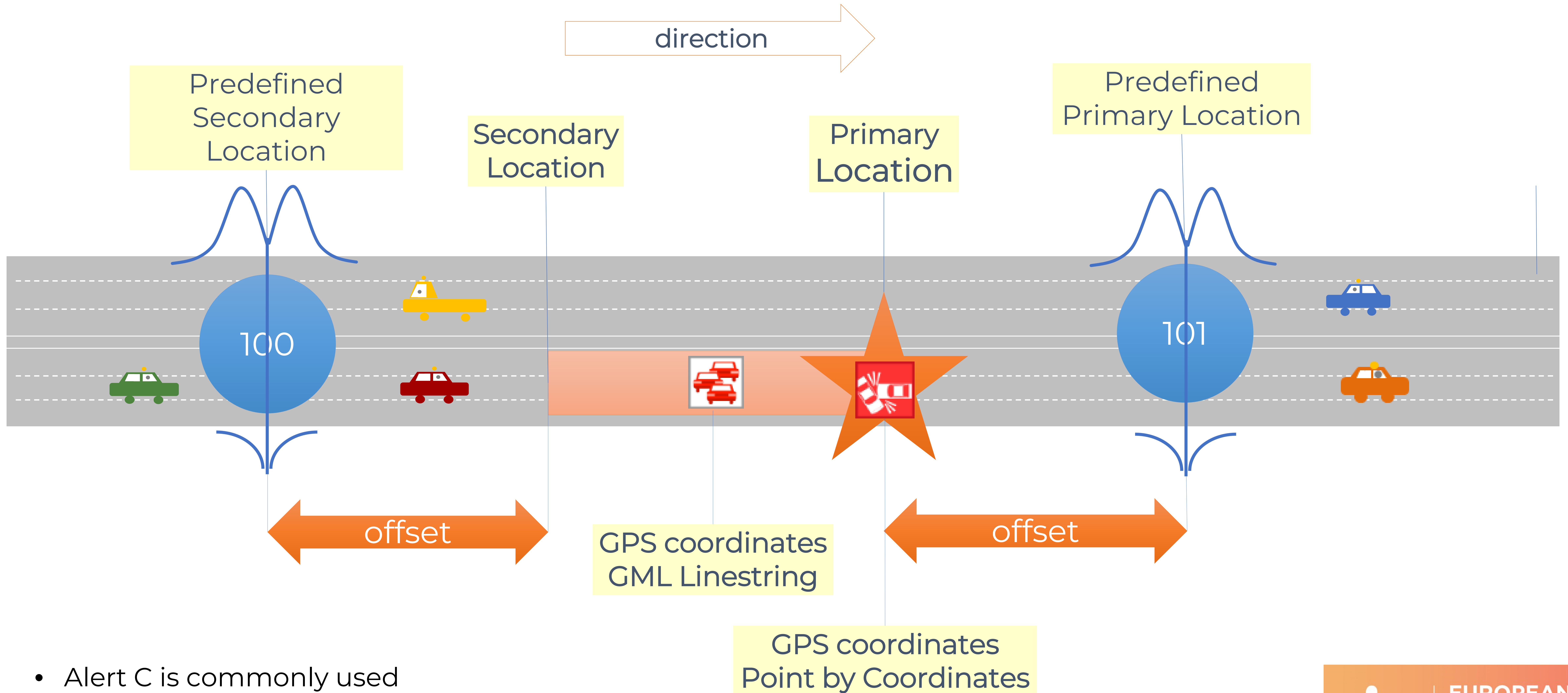
Part 1:
Specification

*Systèmes de transport intelligents — Dictionnaire de données graphiques —
Partie 1: Spécification*

ICS: 43.040.15; 35.240.60

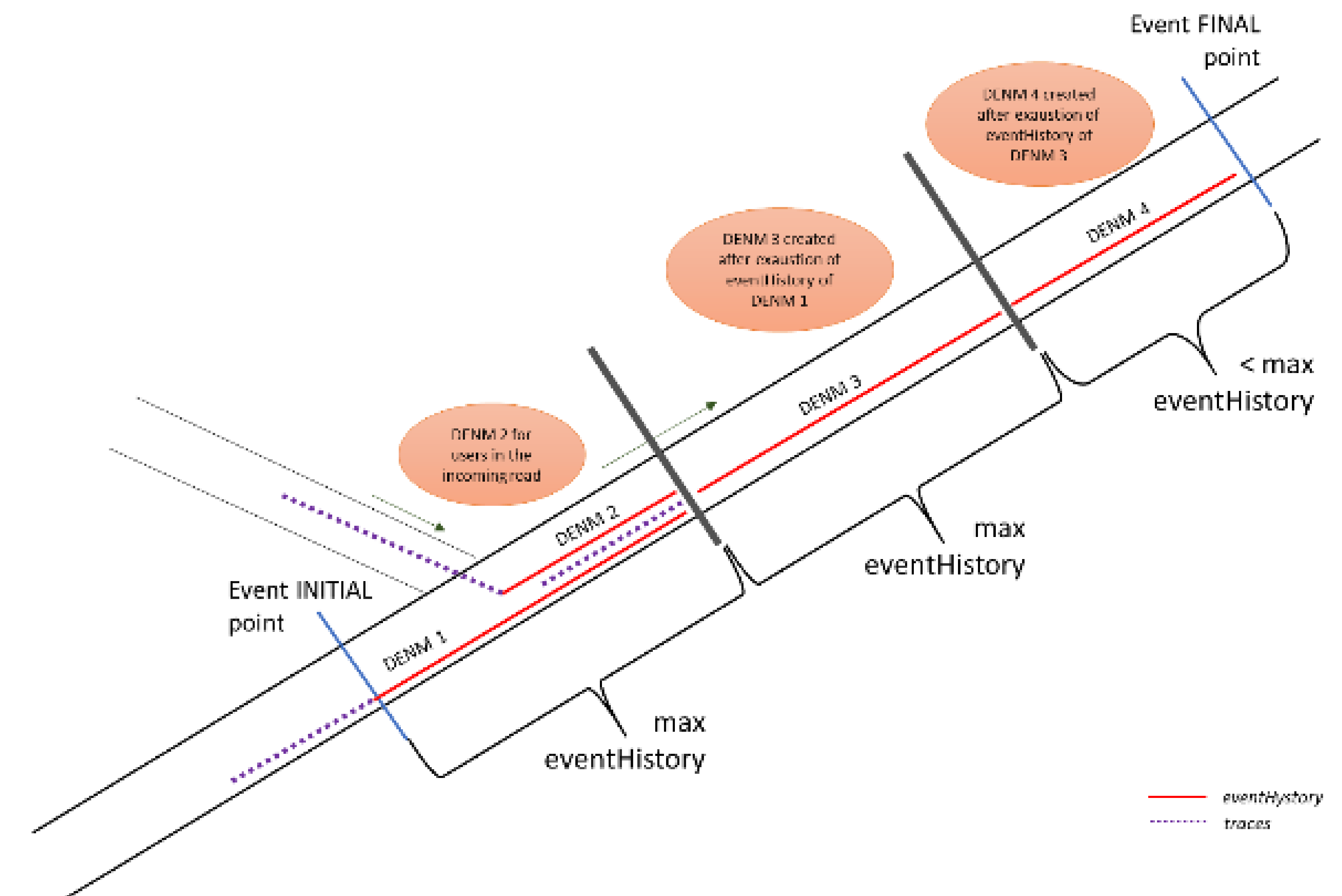
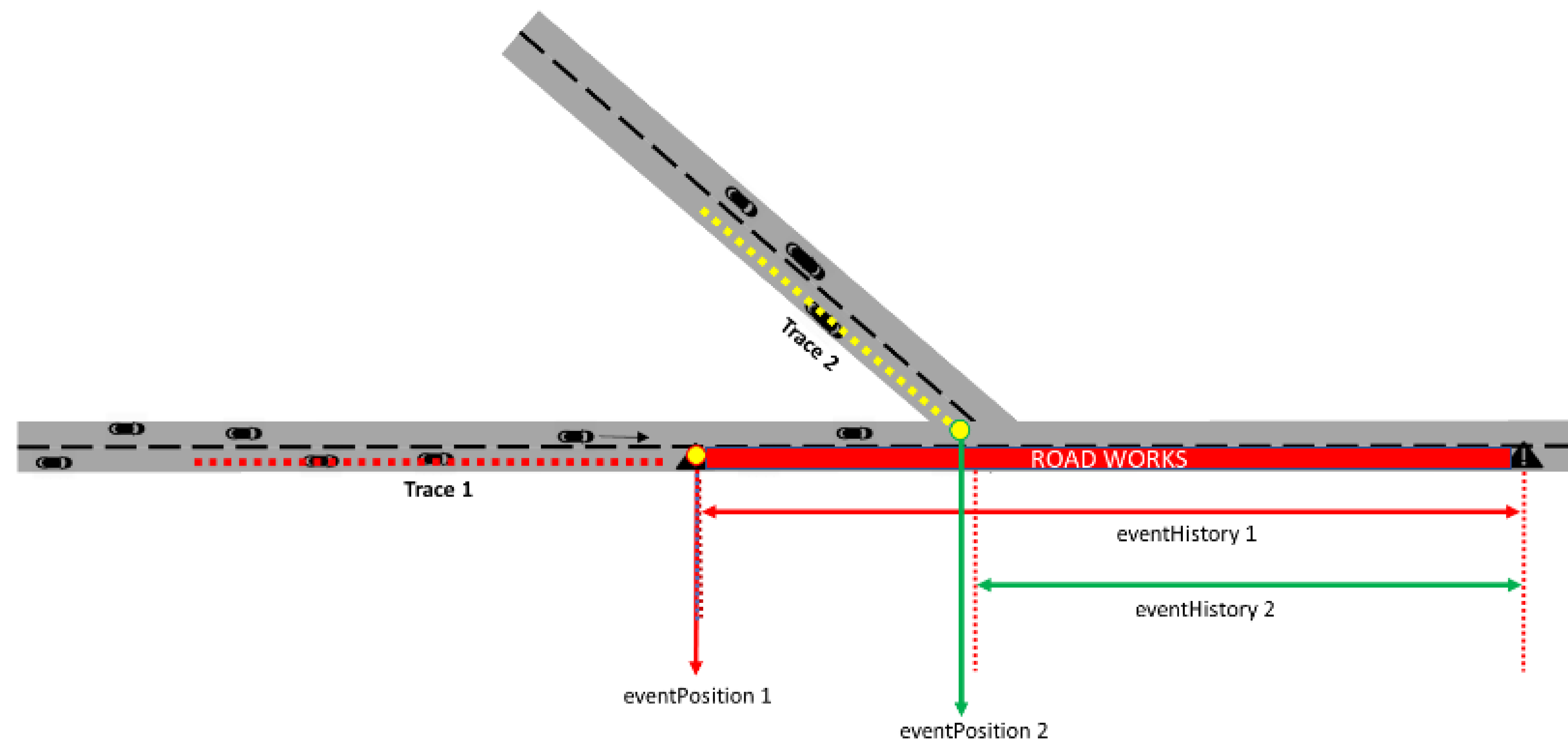


DATEX II embeds several Location Referencing



- Alert C is commonly used
- GPS position is essential to implement C ITS messages

Location Referencing in DATEX II & C ITS



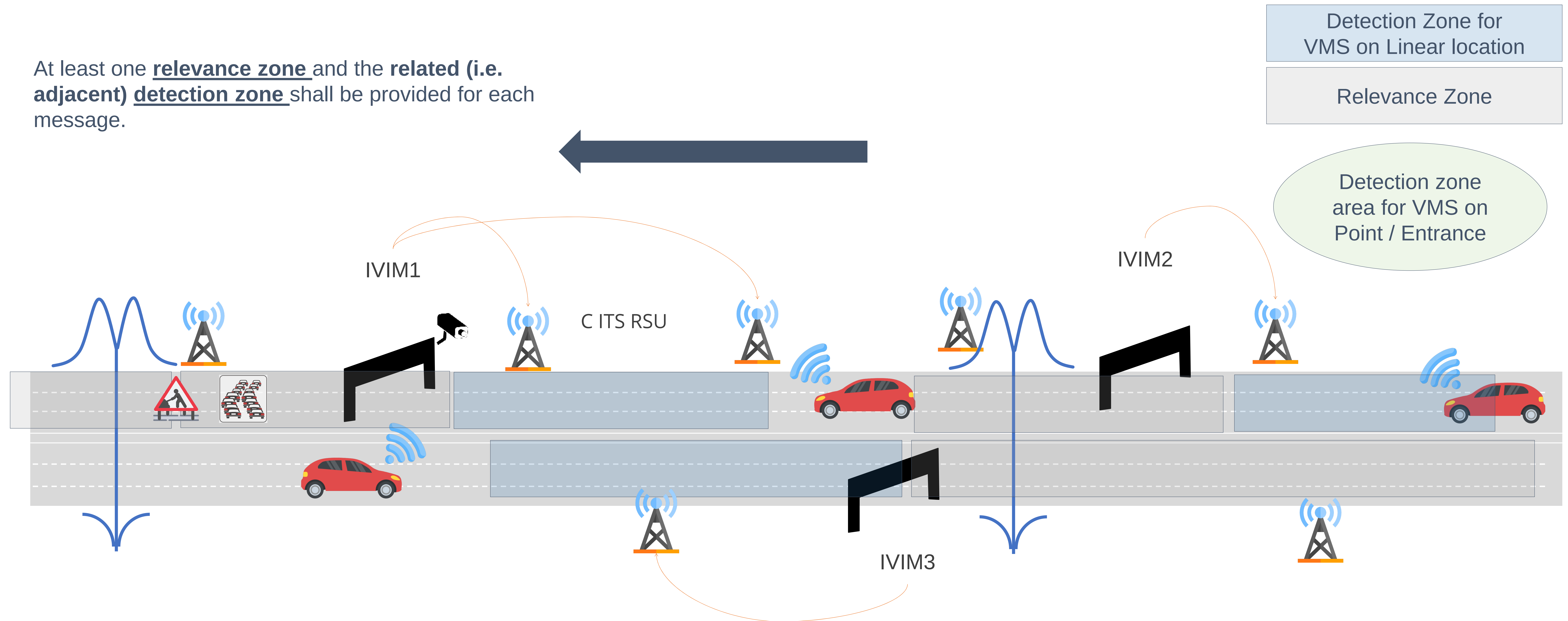
C-ITS Event Position / Event Zone is equivalent to DATEX II Situation Location, but has some spatial length constraint **

Traces added to trigger information into vehicles driving through the roads

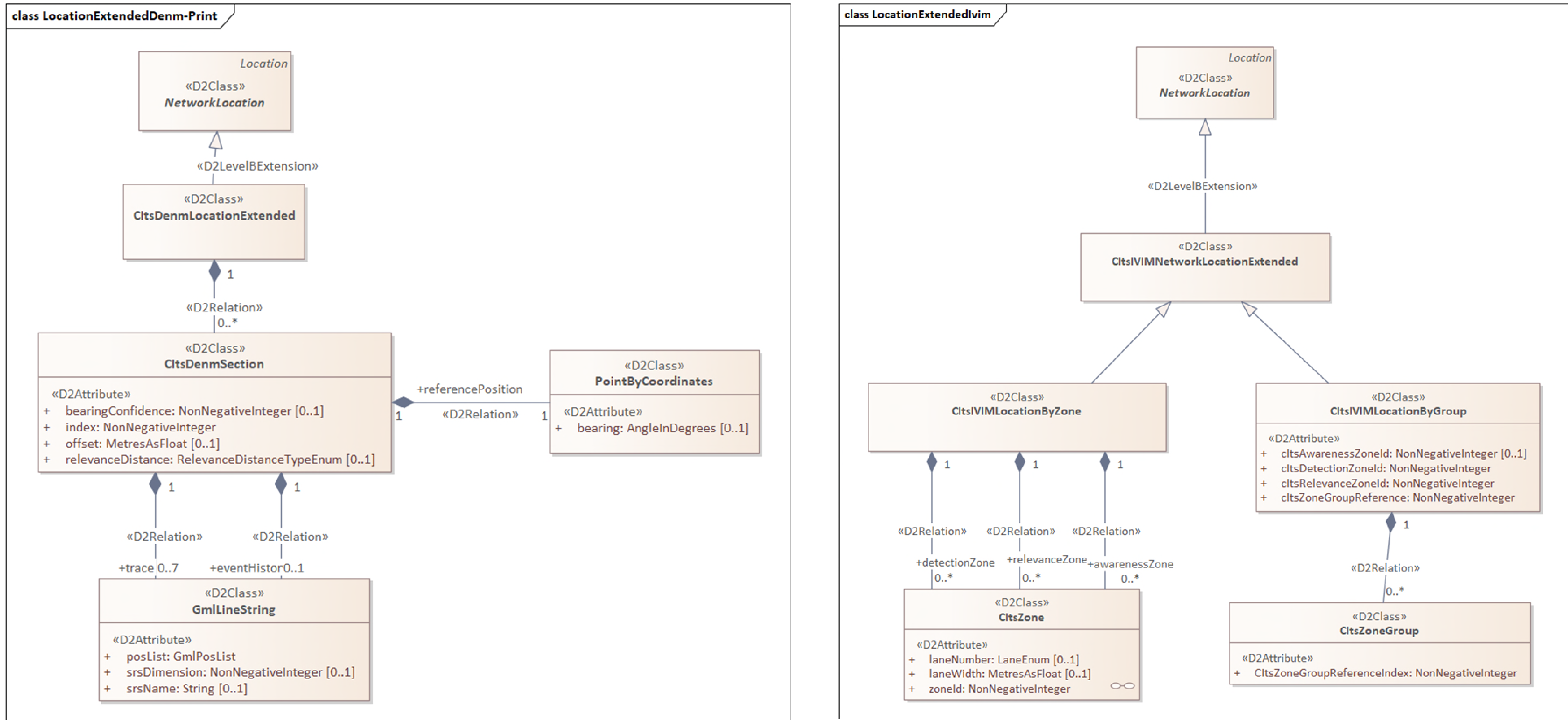
NOTE: Multiplicity of DENM needed for C-Roads Specifications up to 2.1.10
Current revision allows traces not leading to start of event / event position
Multiplicity to be consider for additional use cases

IVIM Relevance Zone definition for DATEX II VMS

At least one **relevance zone** and the **related (i.e. adjacent) detection zone** shall be provided for each message.



DENM and IVIM Multiplicity



C-ITS extension model by NAPCORE DATEX II group

Conclusions

- **DATEX II is the official standard for road information in Europe**, enabling the encoding of various content types of information for ITS Services.
- **C ITS Services delivering information to vehicles from TCC**
- **DATEX II can be used to ensure fully interoperable services** through equivalency mapping tables developed in EU-funded projects.
- **The DATEX II C ITS Extension model** developed by NAPCORE project WG4.1 bridges the gap between C ITS Message delivery and DATEX II publication content, ensuring understanding of different encoding standards.
- **C ITS Extension model enhances understanding of differences among DATEX II and C ITS Services Messages** and allows for the development of interfaces that support full C ITS enabled DATEX II content, facilitating easier gateway adaptation.
- **Information integrity, ownership, authorship, and trust are critical** and addressed within the NAPCORE project, with solutions planned for full deployment in future NAPCORE X project work.

THANK YOU!



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