

Delivery of C-ITS Services by DATEX II coded information

DATEX II

Napcore

Mobility Days 2023

Budapest

Digital Infrastructure principles to deliver C ITS Services

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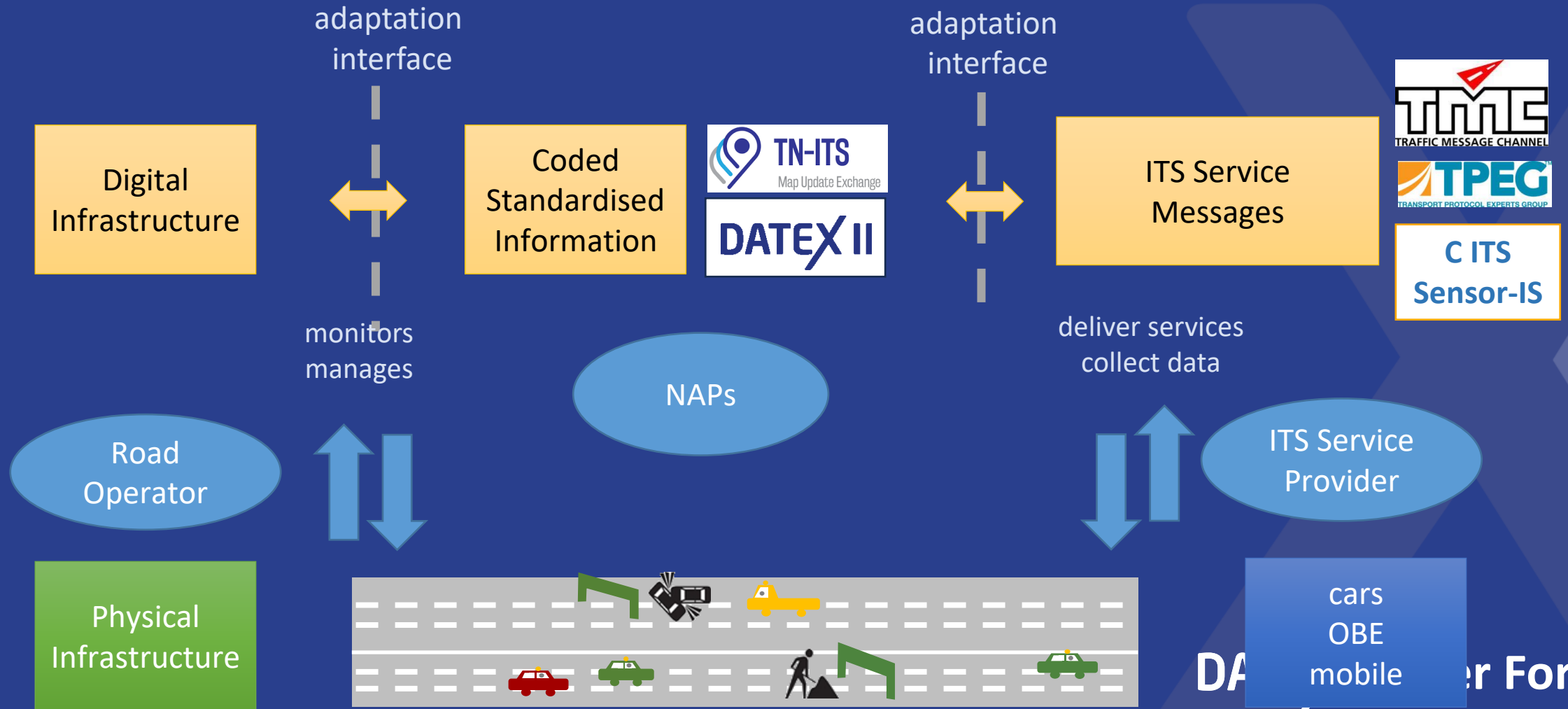


Standards and NAPs role in Digital Infrastructure and ITS Services delivery



General understanding



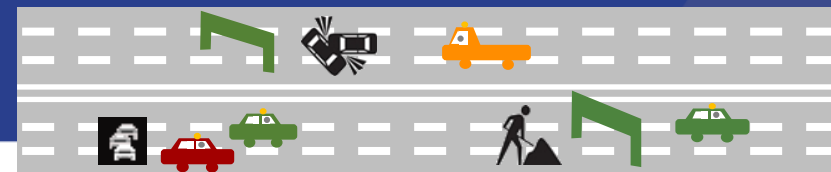
Data Driven ITS Services and Standards



Information Encoding for Application

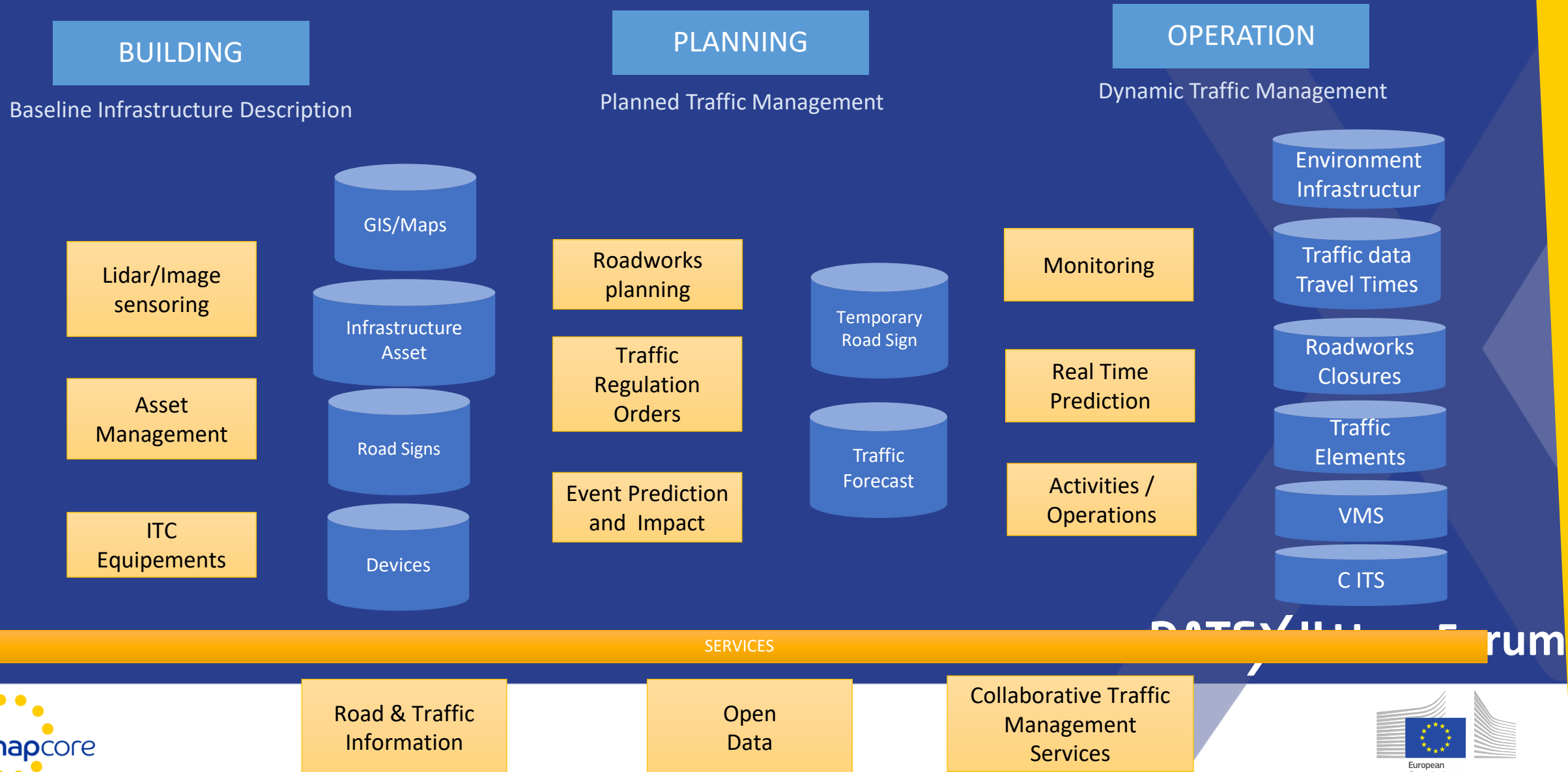
Different views to structure data	Information	Goals	Standardised Interface
Road operator	road conditions, accidents, traffic regulation items along the road network	Safe and sustainable road Traffic Management Level of Services	 
Traveller	origin to destination, multiple path choices, best itinerary based on travellers specific goals	Safe comfortable travel Cost awareness Green and Sustainable travel	 
Automated Vehicle	driving condition along the roadway based on the chosen itinerary.	safe, secure, efficient, sustainable travel	C ITS Sensori-IS

Same reality
Different perspectives
Views for Application optimisation

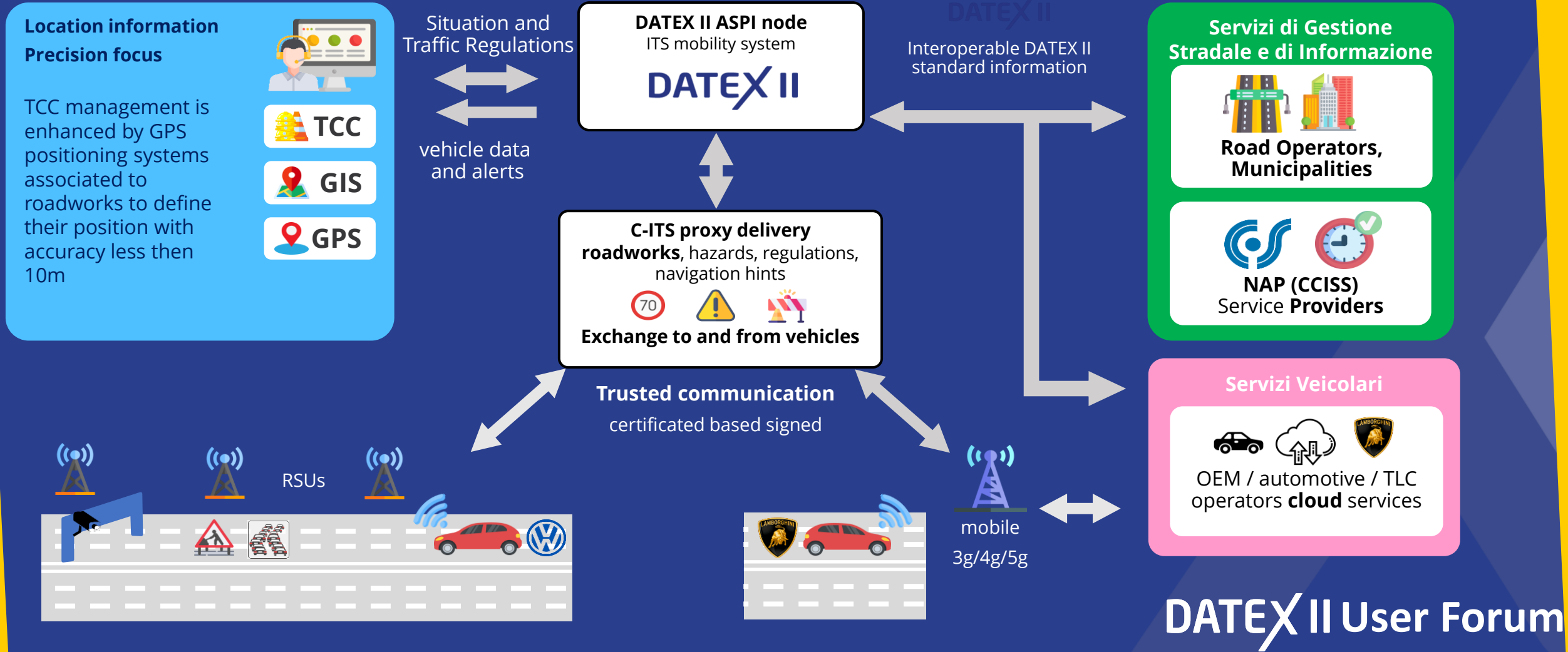


II User Forum

Digital Road Infrastructure / ITS Systems and Services



Data Delivery & ITS and C ITS Services Delivery in a road operator environment



Automated Driving vs operator requirements

- Compact information for bandwidth requirements,
- ready to process information, suitable to the direction and driving conditions
- Main information
 - Information Semantic → What ?
 - Road and traffic conditions
 - Traffic Regulations: speed limits, lane usage, driving behaviour.
 - Location referencing → Where ?
 - Related to vehicle position observation along the itinerary
 - Map based location referencing
 - pure GPS positioning: Traces
 - Information lifecycle updates → When ?

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Adaptation of DATEX II Modelling for C ITS Services Delivery



DATEX II information evolution

- Situation Publication EN 16157-3
 - Information coded based on what happens, grouped by cause/effect in narrow/related location
 - Situation → Accident, Traffic Blocked, Queues, Delays, Suggested Itinerary/Traffic Management actions to help Network Level of Services
- Traffic Regulation Publication TS 16157-11
 - Specific Information not organised in Situation
 - Specific Regulation operated with ad hoc described rules
 - Validity
 - Applicable to Several Location, streets, roads, areas

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C ITS IVIM information / messages

- IVIM messages to be supported
 - Which information IVIM messages conveys
 - **In Vehicle Signage IV-S service**
 - Data related to Road Signs
 - Static
 - Dynamic
 - **In Vehicle Information IV-I service**
 - Data related to VMS information messages (text + pictogram)
 - Mostly dynamic but not exclusively
- 2 main situation related to services
 - Standalone Signs or single composite VMS on entrance or motorway location
 - Combined VMS in a structure as Dynamic Lane Management use cases by usage of Lane Control System



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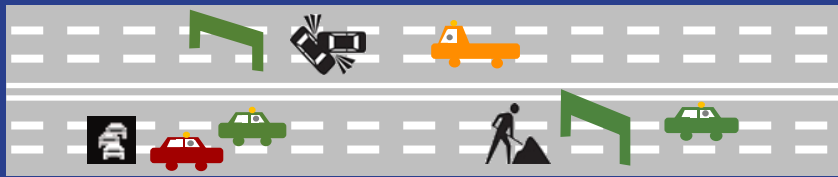
Lane and Carriageway Management Data Model proposed

- Information view «along the road»
 - Vehicle Experience

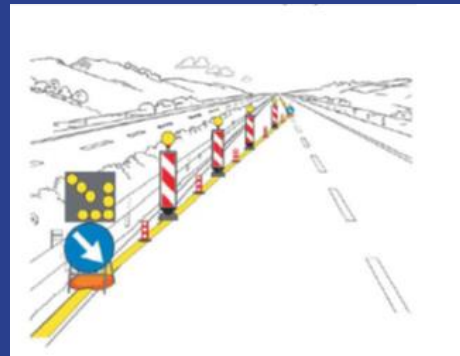


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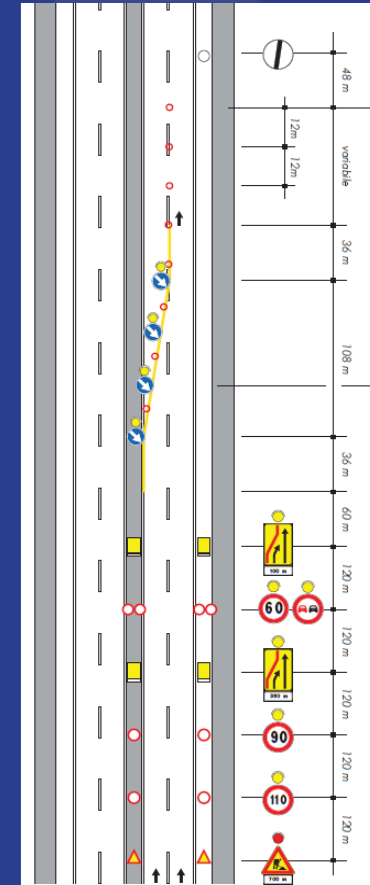
Lane & Carriageway Management in Roadworks



Roadwork A22 km 324+400,
overtaking lane closed



- RoadWorks as basic information lacks of precise lane management details
- Vehicle automated / assisted driving need precise information about:
 - Location of specific regulations
 - Lane usage
 - Speed regulation per lane
 - Lanes restriction per vehicle categories



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Roadworks Lane Carriageway Management

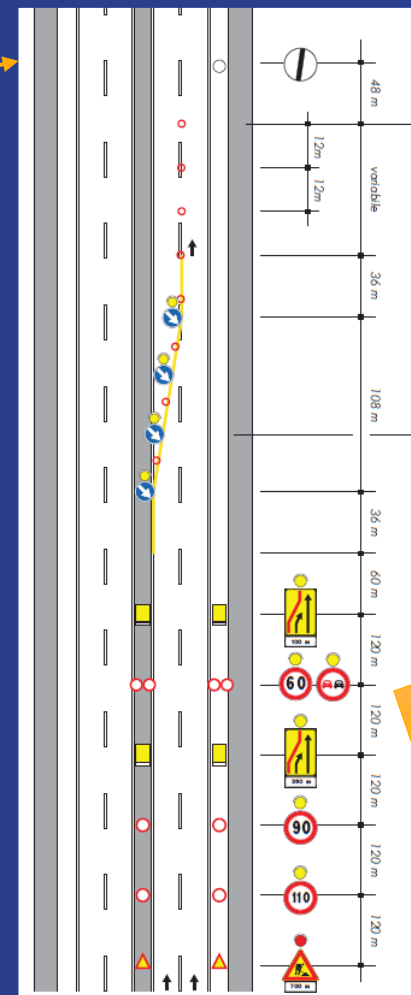
DATEX II situation Publication EN 16157-3

1 Situation with 1 Situation record
Roadworks with 1 closed lane

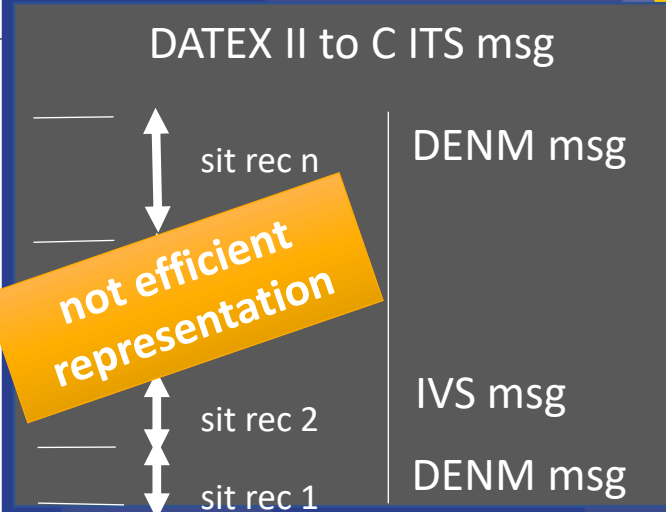
DATEX Situation / Situation Record
Operator Action Type : Roadworks
Extent Linear from A → B
Positive carriageway
1 closed lane: lane 2 = overtaking lane



lanes usage details



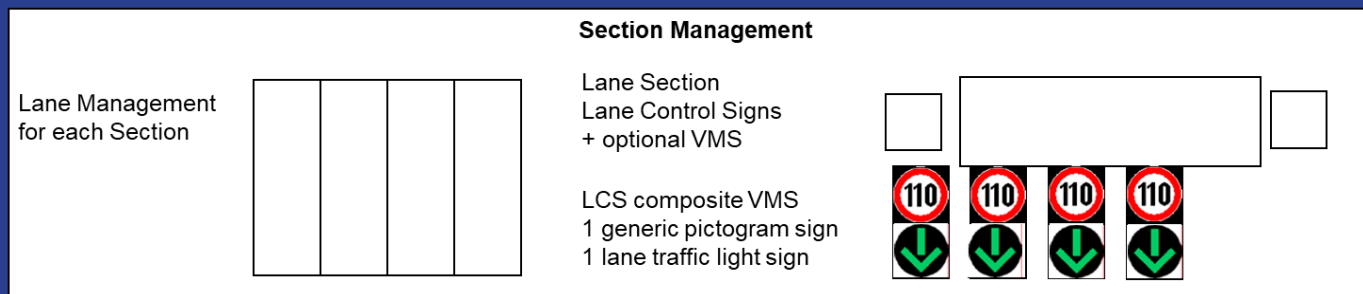
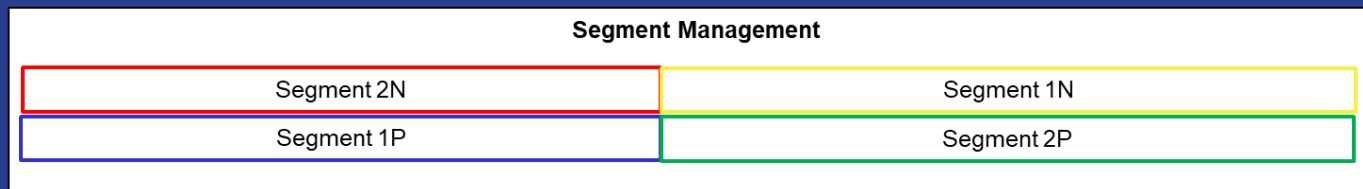
Uniform lane management sections to be represented separately when delivering information to vehicles



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Several distinct situation records in a roadwork situation

Lane Management Concepts



- **Zone**
 - «Bologna» Hardshoulder Management
- **Segments**
 - Segments has homogeneous hardshoulder management setting
- **Section and Lanes**
 - Any 500m-800m based on road morphology
 - LCS and VMS alternated on the road

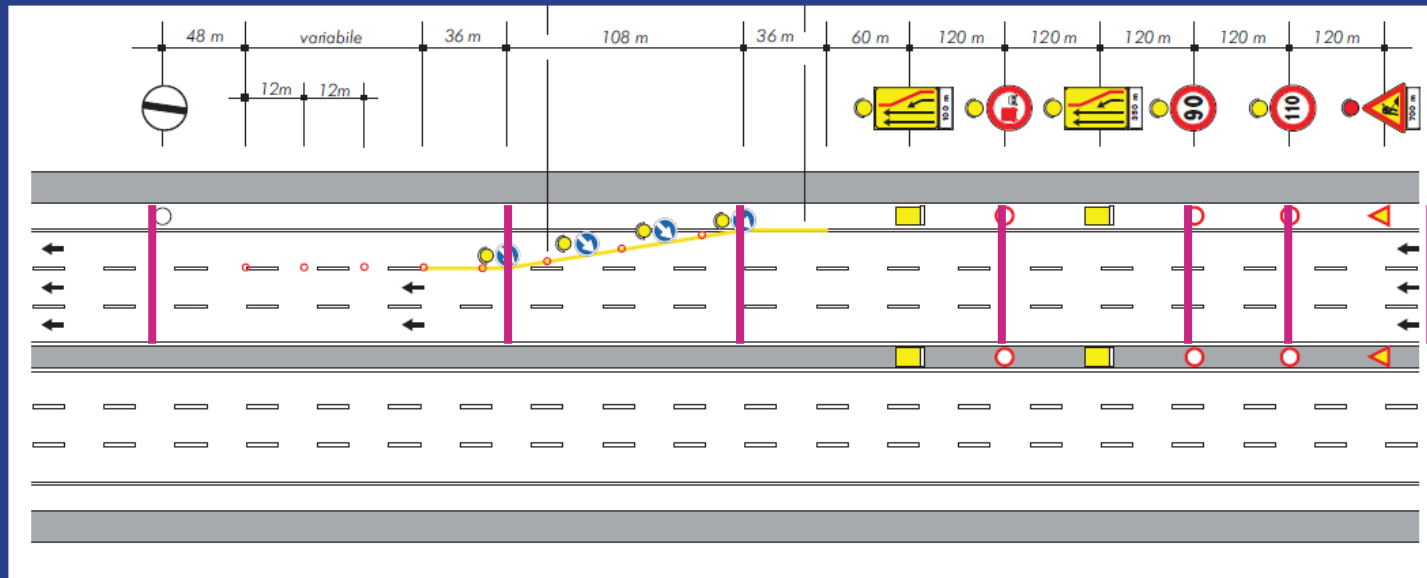
A section holds a specific lane management at a time, lane in a section has only one status

 - open
 - closed
 - deviated to left
 - deviated to right
 - reversed

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Sections Concept in Roadwork management

Easy parallel with DLM systems



mapping to C-ITS IVIM message structure **per section**



- **Roadwork Zone**
- **Sections** with homogenous management status
 - allowed speed / regulations
 - number of lanes
- **Lane status**
 - open
 - closed
 - deviated
 - Allowed speed
 - Overtaking ban

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What's next

Current NAPCORE developements
to support C ITS Service delivery



Current DATEX II NAPCORE WG4.1 developments

- **DATEX II v3.0 C ITS extension**
 - **Support to C ITS DENM delivery**
 - Traces embed in native DATEX II format
 - **Support to C ITS IVIM Messages delivery**
 - **In-Vehicle Signage service**
 - Road signs Dynamic and Static
 - TN ITS and DATEX II sources to be added
 - **In-Vehicle Free Text service**
 - Virtual VMS
 - **Dynamic Lane Management by Lane Control System LCS VMS**
 - Support of
 - Traffic Regulation Publication +
 - Carriageway and Lane Management new model publication

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C ROADS / NAPCORE collaboration tasks (tbd)

- **NAPCORE wide Digital Infrastructure Architectural vision**
 - for ITS and C ITS Service delivery
 - Hazard Location Notification, Roadworks Warning
- **Data Extension and Profiling DATEX II content for C ITS delivery**
 - Assess and Validate with C ROADS Message Profiling TF work
- **DATEX II Traffic Regulation / TN ITS Road Sign & GDD**
 - assessment of interoperability in C ITS Messages
- **Trust & Authenticity in DATEX II & C ITS trusted domain interoperability**
 - requirements collection and architectural view

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THANK YOU

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