Road Traffic of the Future: Urban Challenges and Perspectives

Global Forum for Road Traffic Safety (WP.1)
87th Session,
25-29 September, 2023

Universal Autonomy

Two key themes

1. Cities are complex socio-technical systems. Predicting change is hard, yet there are trends which will influence the future of road traffic.

2. Let's all speak the same language! Why cities and road traffic need a common language for the Connected, Cooperative, Automated Mobility (CCAM) future.

Cities as complex socio-technical systems

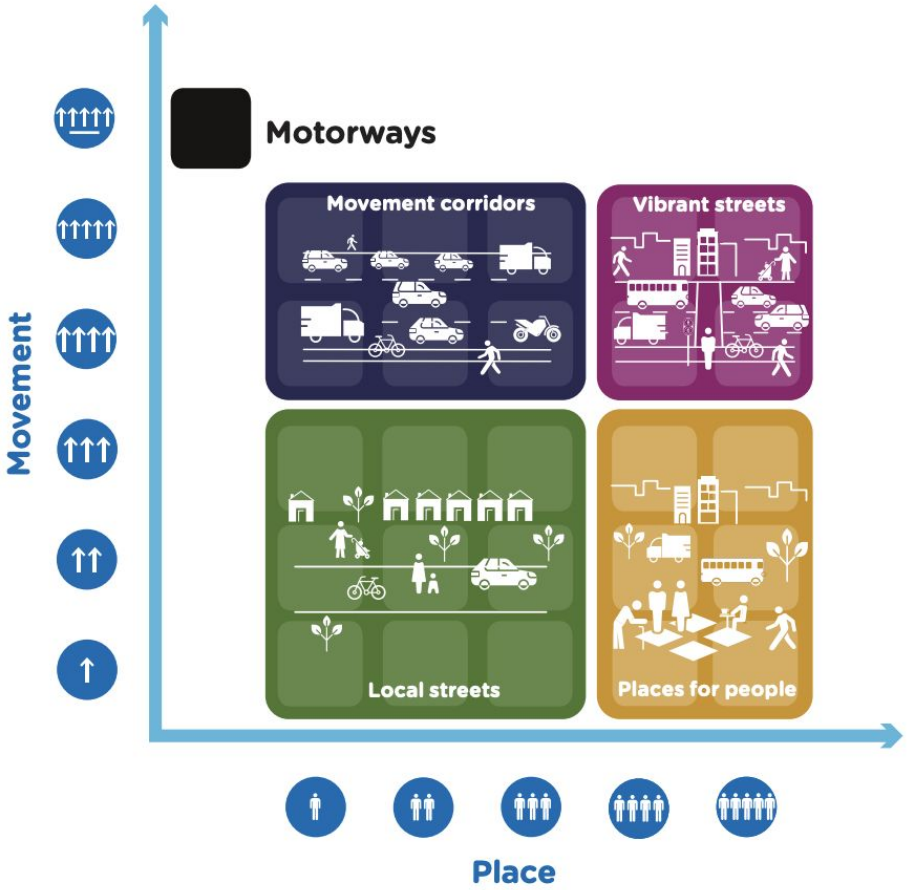
On the face of it, cities as complex systems are made of (at least) two subsystems:
a **physical subsystem**, made up of *buildings* linked by *streets, roads and infrastructure*; and a **human sub-system** made up of *movement, interaction and activity*.

Professor Bill Hillier

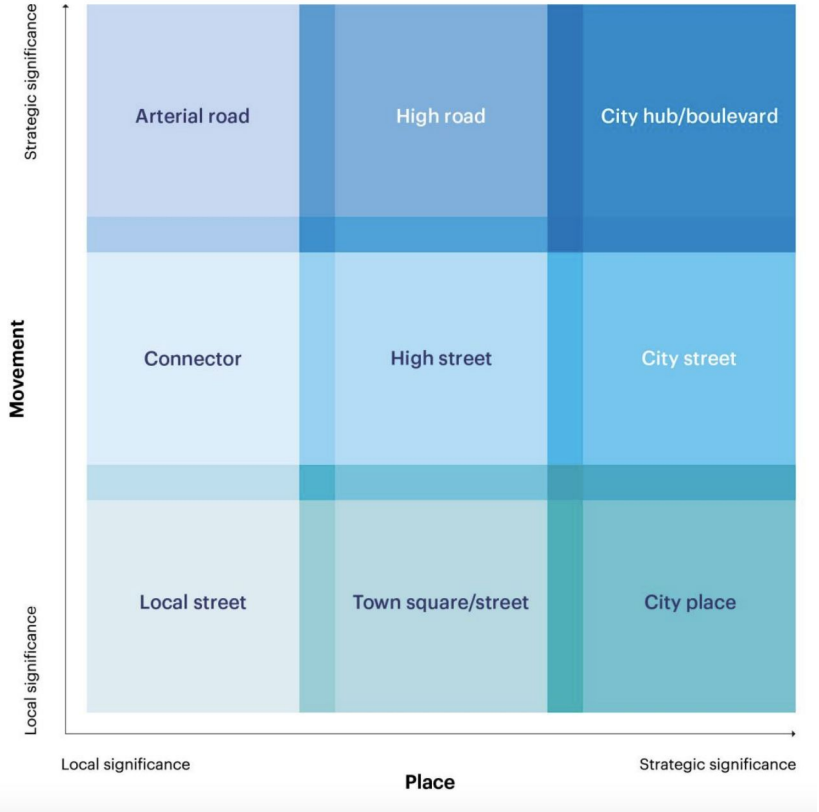
The city as a socia-technical system: a spatial reformulation in the light of the levels problem and the parallel problem - September 2009

Movement

Place



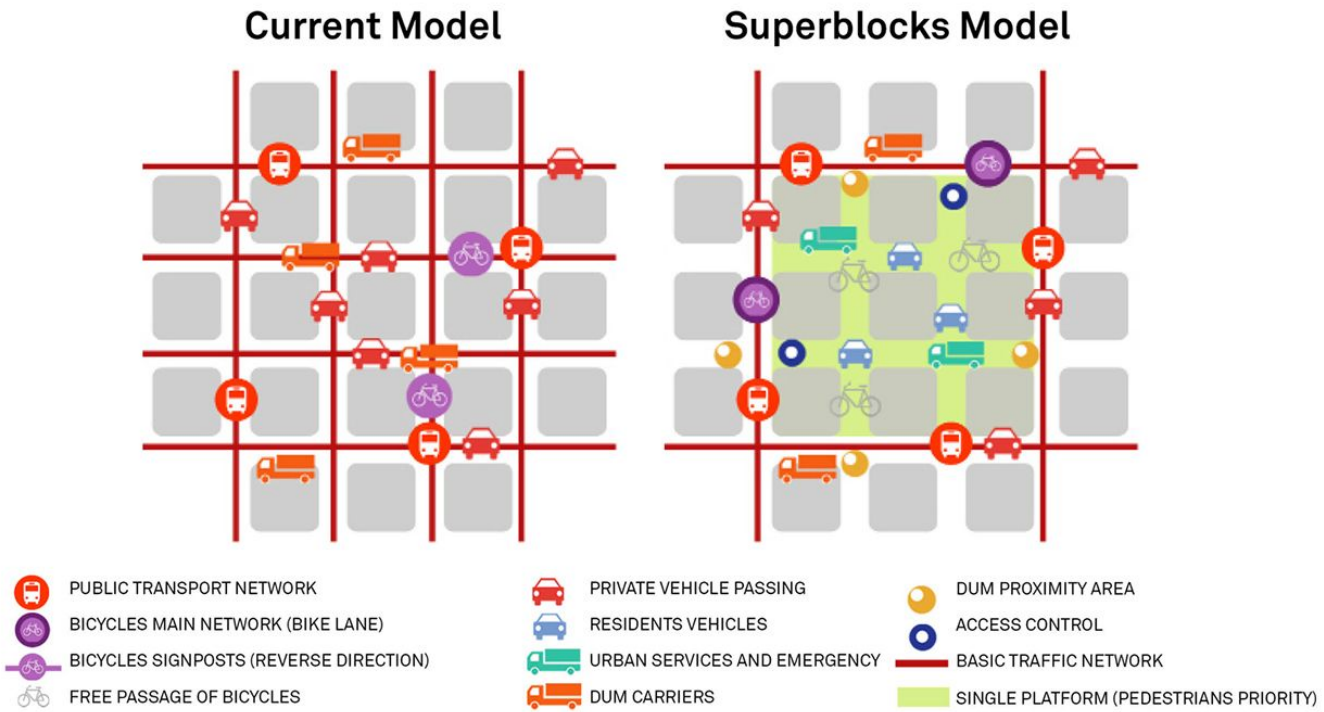
Transport for NSW Future Transport Strategy 2056



London's street family

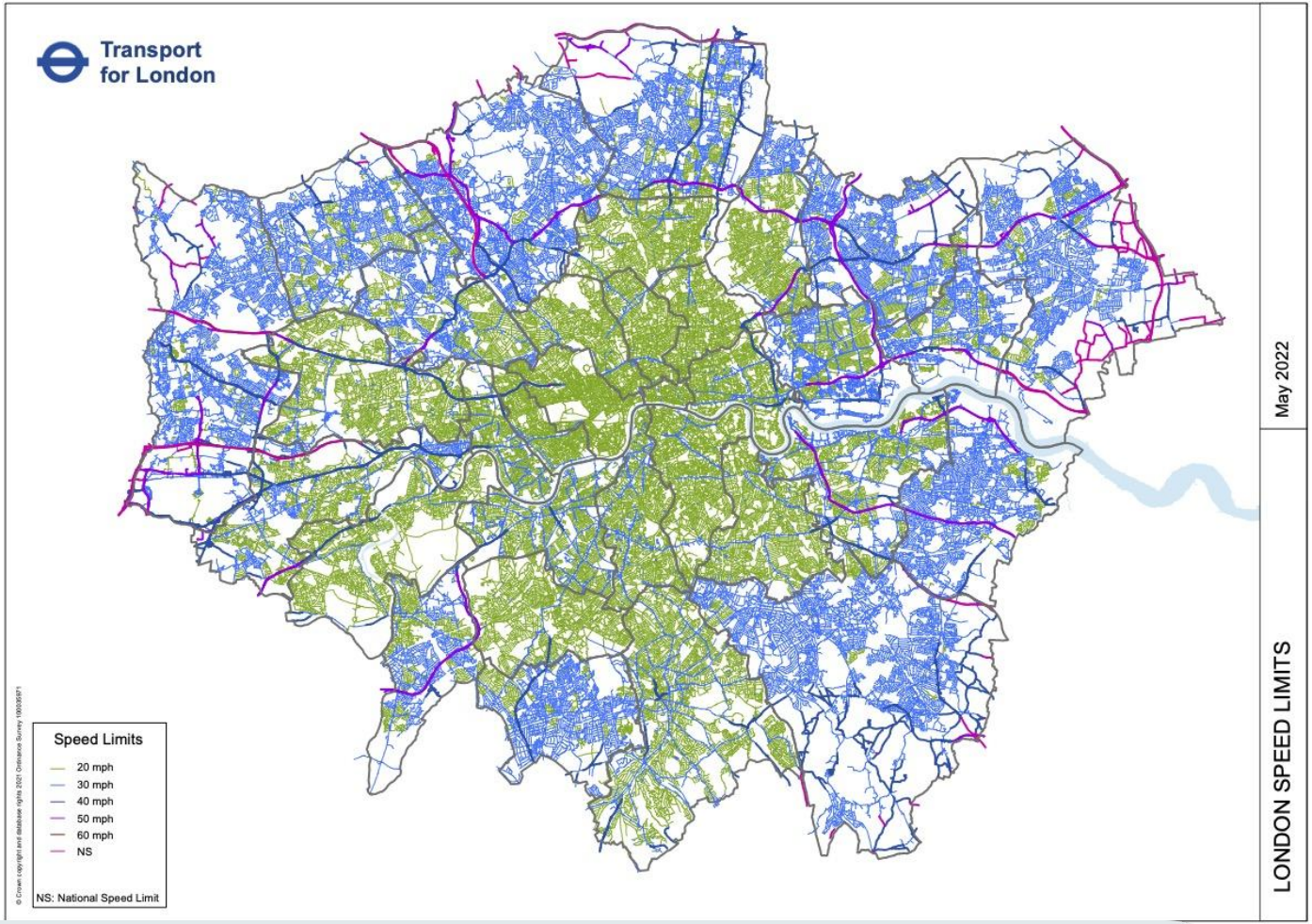
Movement **Place**

SUPERBLOCKS MODEL

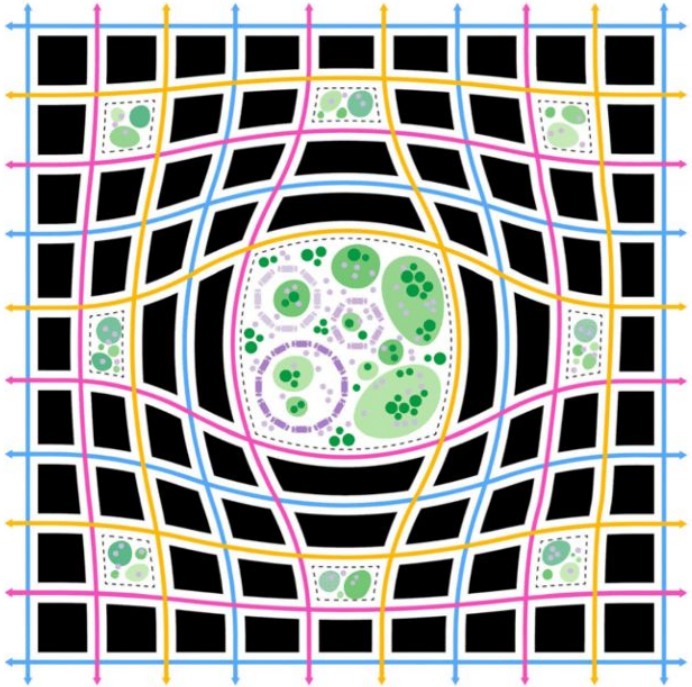


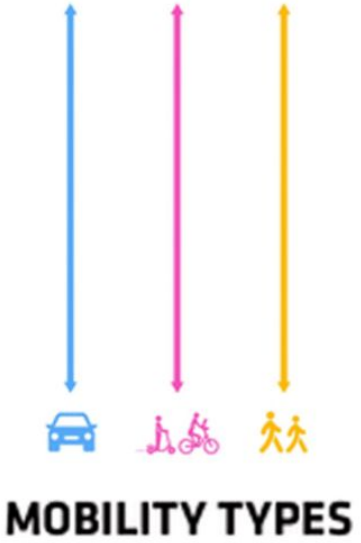
Urban Mobility Plan of Barcelona 2013-2018

Movement **Place**



TOYOTA
WOVEN CITY





oxa

A common language for the future of cities and road traffic

Vehicle-to-Everything (V2X) Deployment

Cooperative Intelligent Transport Systems (C-ITS) or a “common language”?

- V2X as a “system” increase safety and traffic efficiency through real-time communication and cooperation.
- Communication requires wireless technology.
- Cooperation requires a “common language” to exchange compatible digital representations of the world.
- Should automation be able to speak the same language?

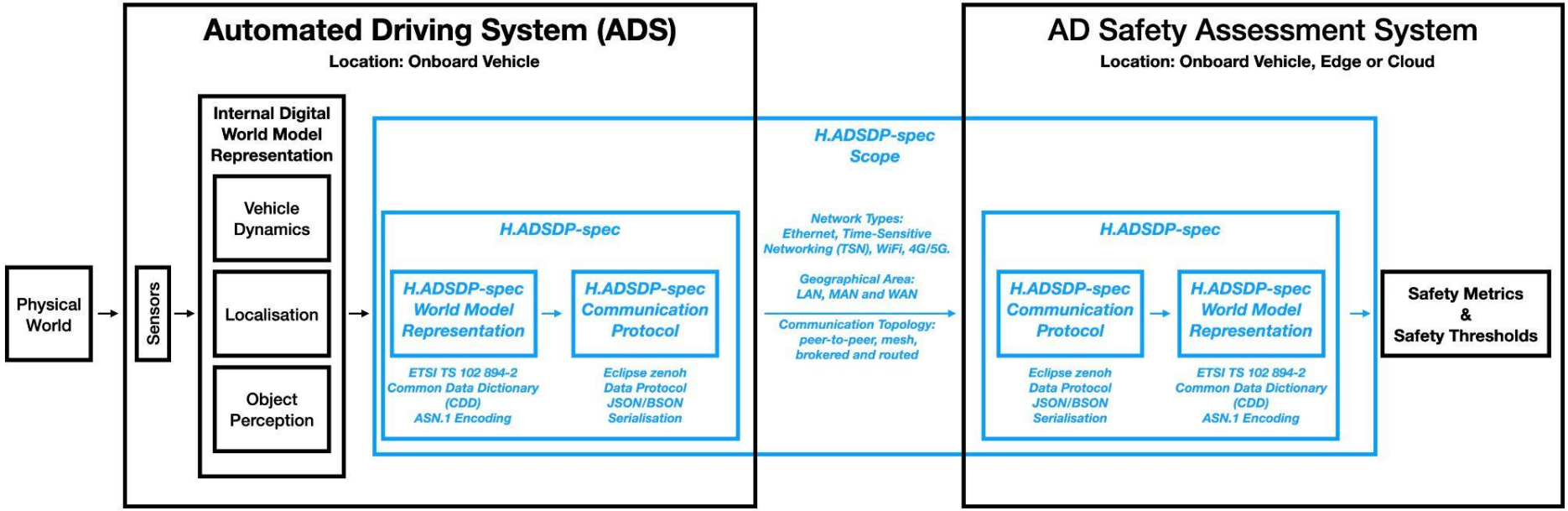
The 5Ws: What? Where? When? Who? Why?

- What was the event?
- When and where did the event take place?
- Who was involved in the event?
- Why did the event happen?

The Molly Problem for Self-Driving Vehicles

- *A young girl called Molly is crossing the road alone and is hit by unoccupied self-driving vehicle. There are no eye-witnesses.*
- ITU FG-AI4AD developed a automated driving safety data protocol specification to help answer the 5Ws.
- The protocol speaks the same “common language” allowing direct comparison with the world model captured by the city’s intelligent transport system.

FG-AI4AD - Proposed H.ADSDP-spec



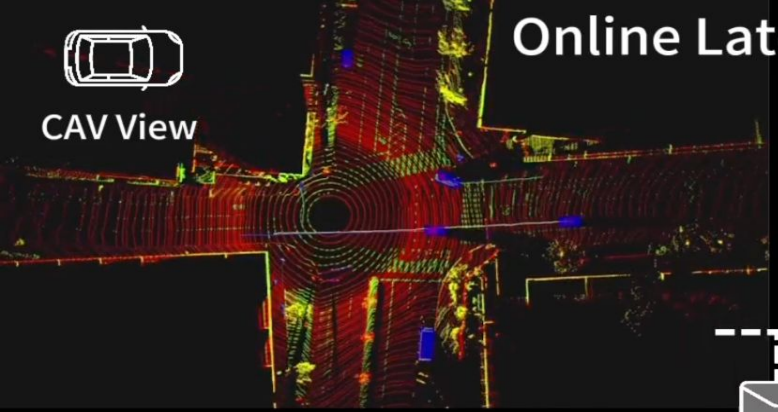
ITU FG-AI4AD

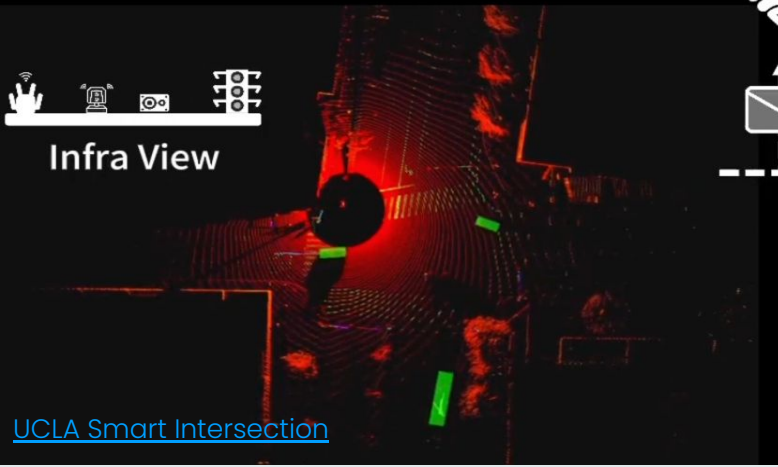
H.ADSDP-spec World Model Data

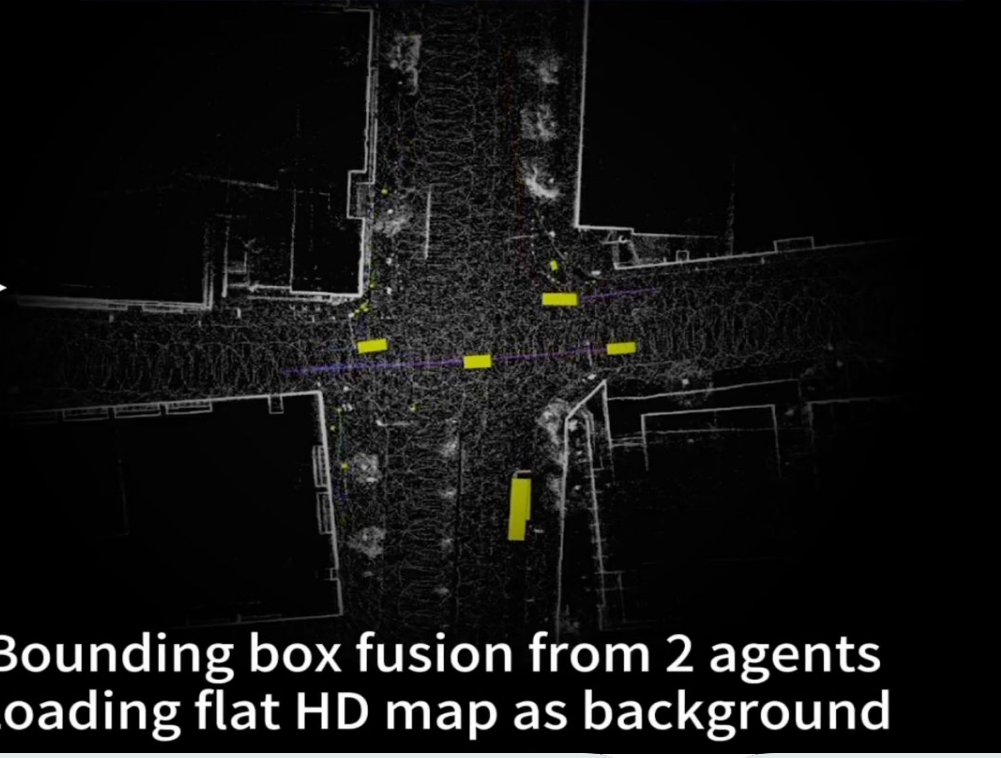
- Time (TIA);
- Location in a Global Coordinate System (WGS 84);
- Vehicle identification (ISO 3779:2009);
- Vehicle coordinate system (ISO 8855:2011)
- Vehicle types (ISO 3833:1977)
- Road User Types (ETSI TS 102 894-2)
- **Ego Vehicle Data (ETSI EN 302 637-3, ETSI TR 103 562)**
- **Other road user data (ETSI TR 103 562)**

- ***Ego vehicle high frequency data (Cooperative Awareness Message)***
- Heading, speed, driving direction, accelerations (longitudinal, lateral, vertical), vehicle dimensions (length, width), curvature, yaw rate, steering wheel angle, lane position.
- ***Other road user data (Collective Perception Message)***
- Object ID, Time, XYZ coordinate, XYZ velocity, XYZ acceleration, Roll/Pitch/Yaw (angle, speed acceleration), object dimensions, object ref point, object age, object confidence, classification

Online Late Fusion







Bounding box fusion from 2 agents
Loading flat HD map as background

[UCLA Smart Intersection]

Thank you

+44 (0)1865 433 998
bryn.balcombe@oxa.tech
oxa.tech

Universal Autonomy