

Technology Enablers for vehicle automation to defragment and extend ODDs

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Francesco Bellotti, University of Genova
Luisa Andreone, Stellantis-CRF

Technology Enablers for vehicle automation to defragment and extend ODDs

Select, implement, test **Technology Enablers** for CAD vehicles to operate in defragmented ODDs:

"Beyond vehicles' sensing we apply Communication, Localization, Trust and Context Learning"



VEHICLES COMMUNICATION
"The sixth sense beyond sensors"



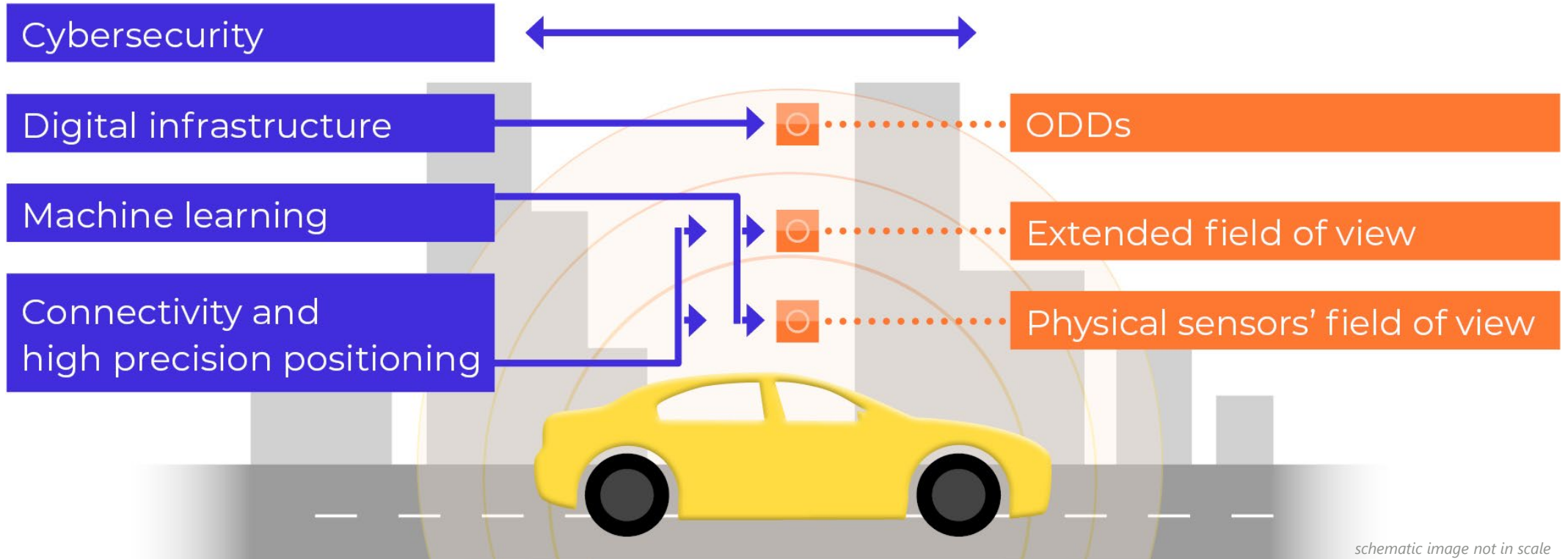
VEHICLES HIGH PRECISION POSITIONING & LOCALIZATION
"Precise positioning always available"

VEHICLES COMMUNICATION CYBERSECURITY
"Trust is the thumb up or down"



VEHICLES MACHINE LEARNING
"Learning from Experience and Reasoning is growth"









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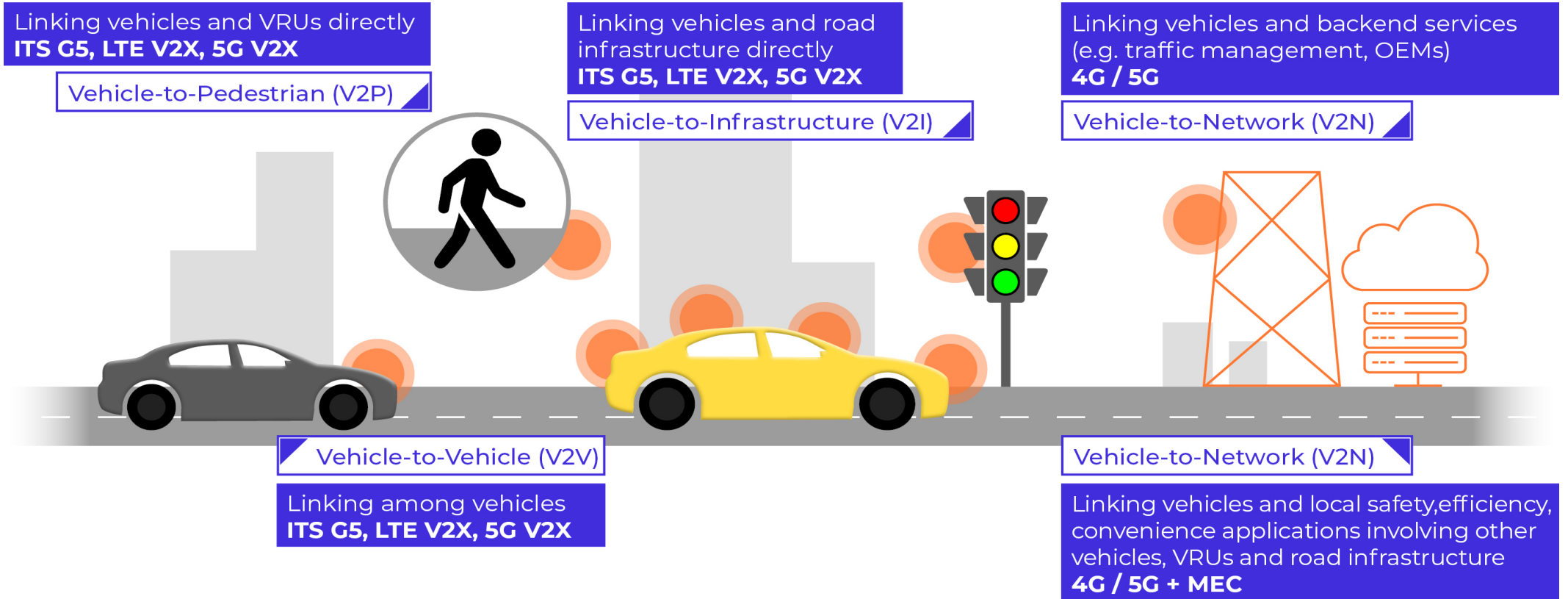
Technology Enablers - selection in 5 steps

- 1 - CREATING** a Tech Enablers concept to make vehicle automation grow with Enablers addressing ODDs':
 - Defragmentation "within vehicle sensors range"
 - Extension "beyond vehicle sensors range"
 - Awareness "of ODDs dynamic ranges"
- 2 - MAPPING** Enablers on their expected effects on vehicle automation
- 3 - GROUPING** Enablers per technology solutions
- 4 - DESCRIBING** Enablers in detail
- 5 - FORMULATING TECH KPIs** to measure the effects of the enablers on vehicle automation

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VEHICLES COMMUNICATION	VEHICLES HIGH PRECISION POSITIONING & LOCALIZATION	VEHICLES COMMUNICATION CYBERSECURITY	VEHICLES MACHINE LEARNING	Enablers mapped in 4 Thematic Areas TECH ENABLER AREA
 <p>4</p>	 <p>2</p>	 <p>2</p>	 <p>4</p>	Enablers grouped in 12 Tech Solutions TECH ENABLER SOLUTION
<p>10 TECH 1 METHOD 1 TOOL</p>				
 <p>22</p>	 <p>9</p>	 <p>8</p>	 <p>25</p>	64 Enablers described as Tech Implementations TECH ENABLER IMPLEMENTATION

CAD Connectivity based on direct and cellular communication



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CAD Connectivity based on direct and cellular communication

"The sixth sense beyond sensors"

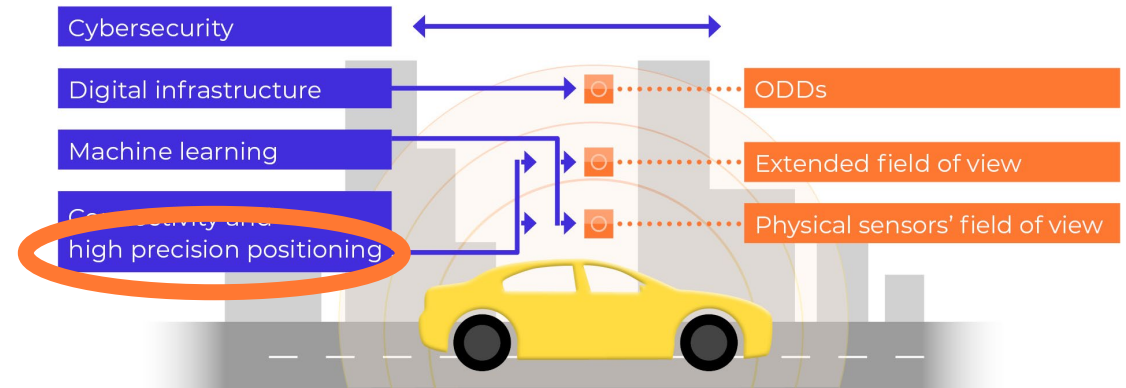
- **V2V VEHICLE TO VEHICLE COMMUNICATION** Cooperative sensing and awareness, maneuvering, merging, coordination, overtaking.
- **V2I VEHICLE TO INFRASTRUCTURE AND INFRASTRUCTURE TO VEHICLE COMMUNICATION** Cooperative sensing and awareness, hazard warnings, dynamic signage at junctions, Green Light Optimal Speed Adaptation.
- **VEHICLE TO CLOUD (EDGE AND CORE NETWORK)** Dynamic information on ODDs, Predictive QoSService.
- **VEHICLE INTENTION COMMUNICATION** V2Other Road Agents via lighting technology (e.g. vehicle's external display to communicate to a pedestrian «now you can cross the road»).

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CAD High precision positioning techniques

"Precise positioning always available"

- **HIGH PRECISION POSITIONING**
sub-meter absolute positioning also in challenging situations (e.g. urban-canyon)
- **LOCALIZATION SENSOR FUSION**
HD Maps, HD Positioning, Camera, Radar, Lidar

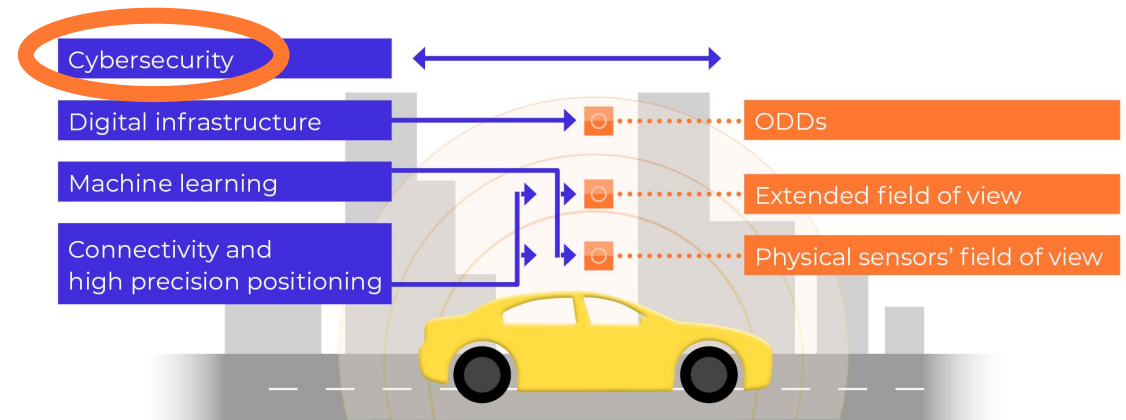


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CAD Cybersecurity: shielding from V2X cyber-attacks

"Trust is the thumb up or down"

- **THREAT ANALYSIS AND RISK ASSESSMENT**
catching vulnerabilities in case of attacks via V2X
- **RECOMMENDATIONS FOR CYBERSECURITY BY DESIGN**
on V2X cyber-risks mitigation techniques for V2X & in-vehicle network data exchange

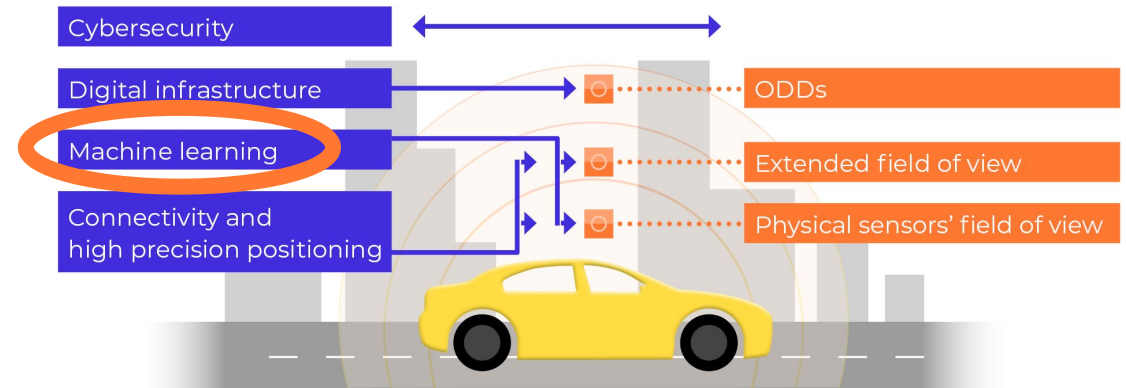


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CAD Machine Learning Technology Enabler Groups

Learning from experience and reasoning is growth

- **MACHINE LEARNING TOOLKIT**
semi-automatic annotation of road agents
- **PERCEPTION of road agents**
traffic scenario and road agents' detection, free area estimation
- **VEHICLE DECISION MAKING**
for manoeuvres and trajectory planning
- **DRIVER MONITORING**
postures and distraction



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***“Technology Enablers Athletes
joining Sensor Technology Athletes
to win together the Decathlon:
High Automation in
defragmented ODDs”***





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THANK YOU FOR
YOUR KIND ATTENTION.

Francesco Bellotti
Enablers Machine Learning
Leader
University of Genova
franz@elios.unige.it

Luisa Andreone
Enablers Leader
Stellantis-CRF
luisa.andreone@crf.it

www.Hi-Drive.eu [Twitter@_HiDrive_](https://twitter.com/_HiDrive_) [LinkedInHi-Drive](https://www.linkedin.com/company/Hi-Drive)

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