Cooperative ITS
Impact to Electronic Horizon and Automated Driving

Workshop on Connected and Automated Driving Systems
Tokyo, Nov 17th and 18th, 2014

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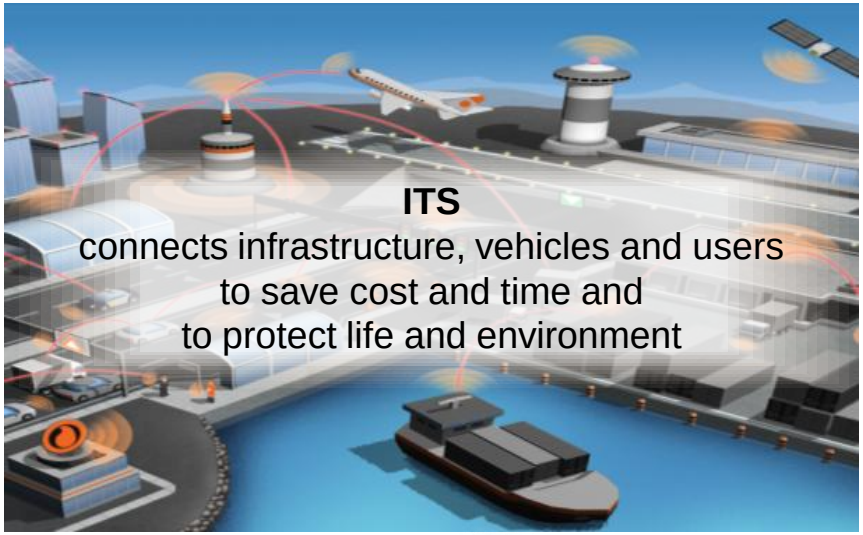
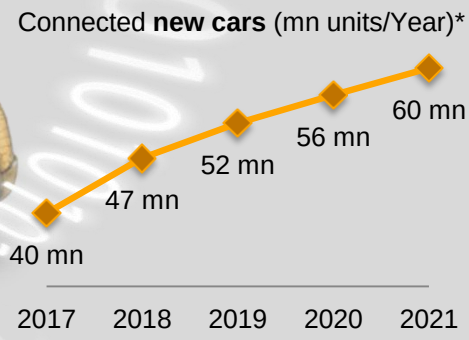
Intelligent Transportation System
Connected Vehicles Enable New Services



The vehicle of the future is connected

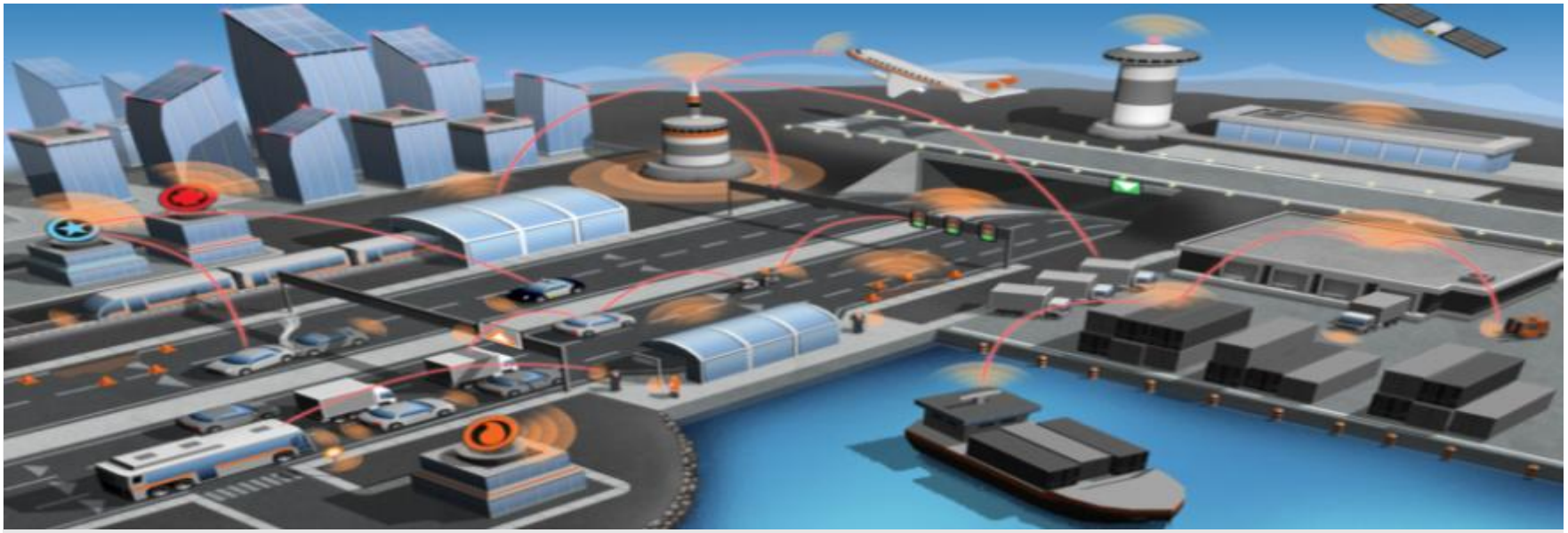
- 210mn connected vehicles in 2016,
- 40mn new connected cars in 2017



*Source: IHS, July 2014

Intelligent Transportation System Definition

Data is the Oil of the 21st Century and Basis of ITS Value Chain



Intelligent Transportation System (ITS) Definition*

ITS is the creation of a **data network** between **transport infrastructure, vehicles and users** by using information and communication technology.

It is more than in-vehicle products. The intelligent transportation system is only possible if a **representative quantity of data is collected, linked and processed.** Hence a high quality information is provided as a service in real-time.

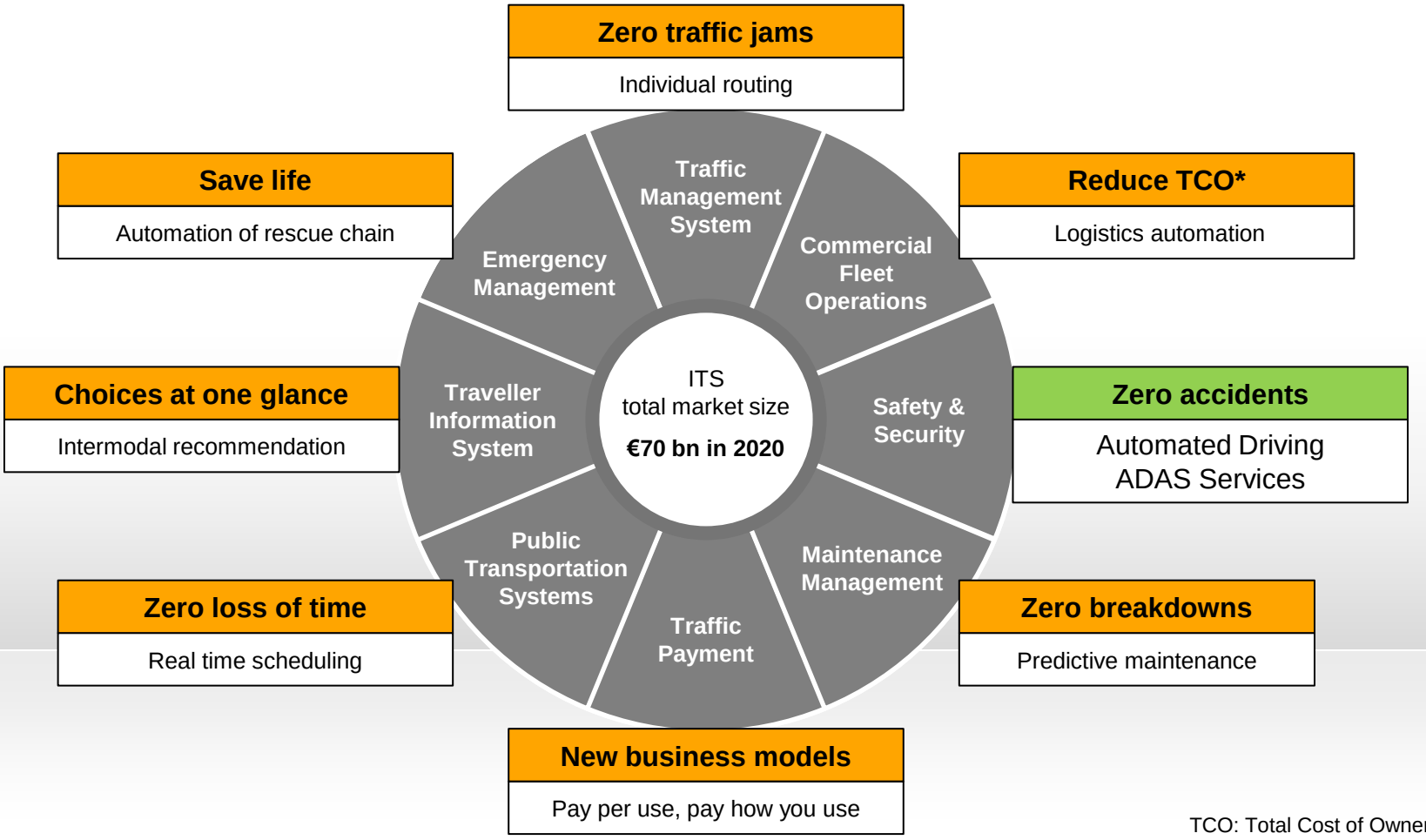
ITS Targets

- **Save Costs**
- **Save Time**
- **Protect Life**
- **Protect Environment**

*Source: European Telecommunications Standards Institute (ETSI)

Intelligent Transportation System

Automate the Transport Industry and Individualize our Mobility



TCO: Total Cost of Ownership

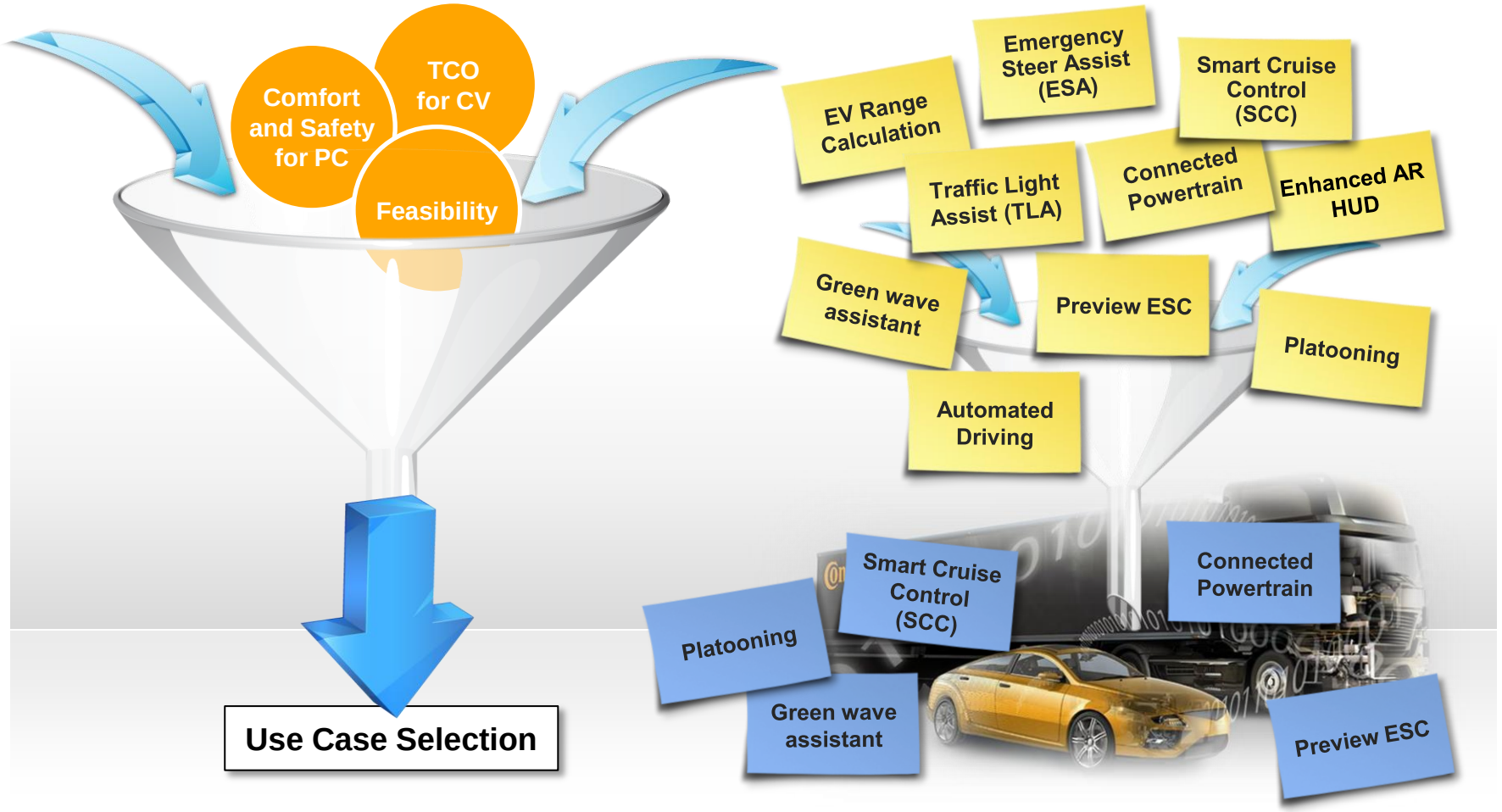
Continental Mobility Study 2013

Majority of motorists expect partially automated vehicles to be available after 2020

Industry experts trust the reliability of automated driving, and see freedom to make decisions as a prerequisite for market success

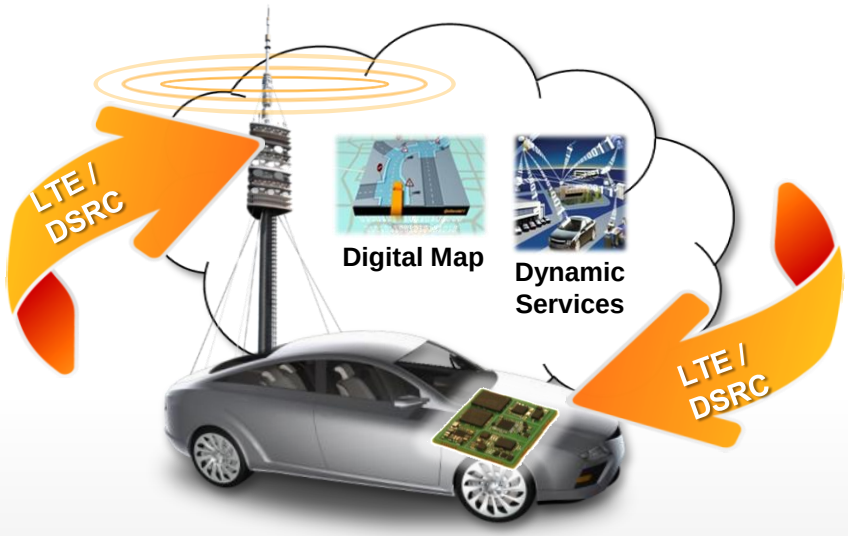
Reference of Connected Car Use Cases

Consumer Value Add based on C-ITS



C-ITS for Automated Driving: “Fresh Data” from the cloud

Highly Precise Map and Dynamic Data – crowd sourced



Digital Map

Functions

- Static Basic Map
- HAD Map Extension (lane, landmark, …)
- Dynamic Events (Speed Limit, …)

Features

- Highly precise (location, time)
- Highly up-to-date (real-time)
- Learning map (via crowd sourcing)

Dynamic Services (Reference List)

Lane Closure

Traffic Sign

Traffic Jam ahead

Construction Assistant

C-ITS for Automated Driving

Why Backend/Cloud

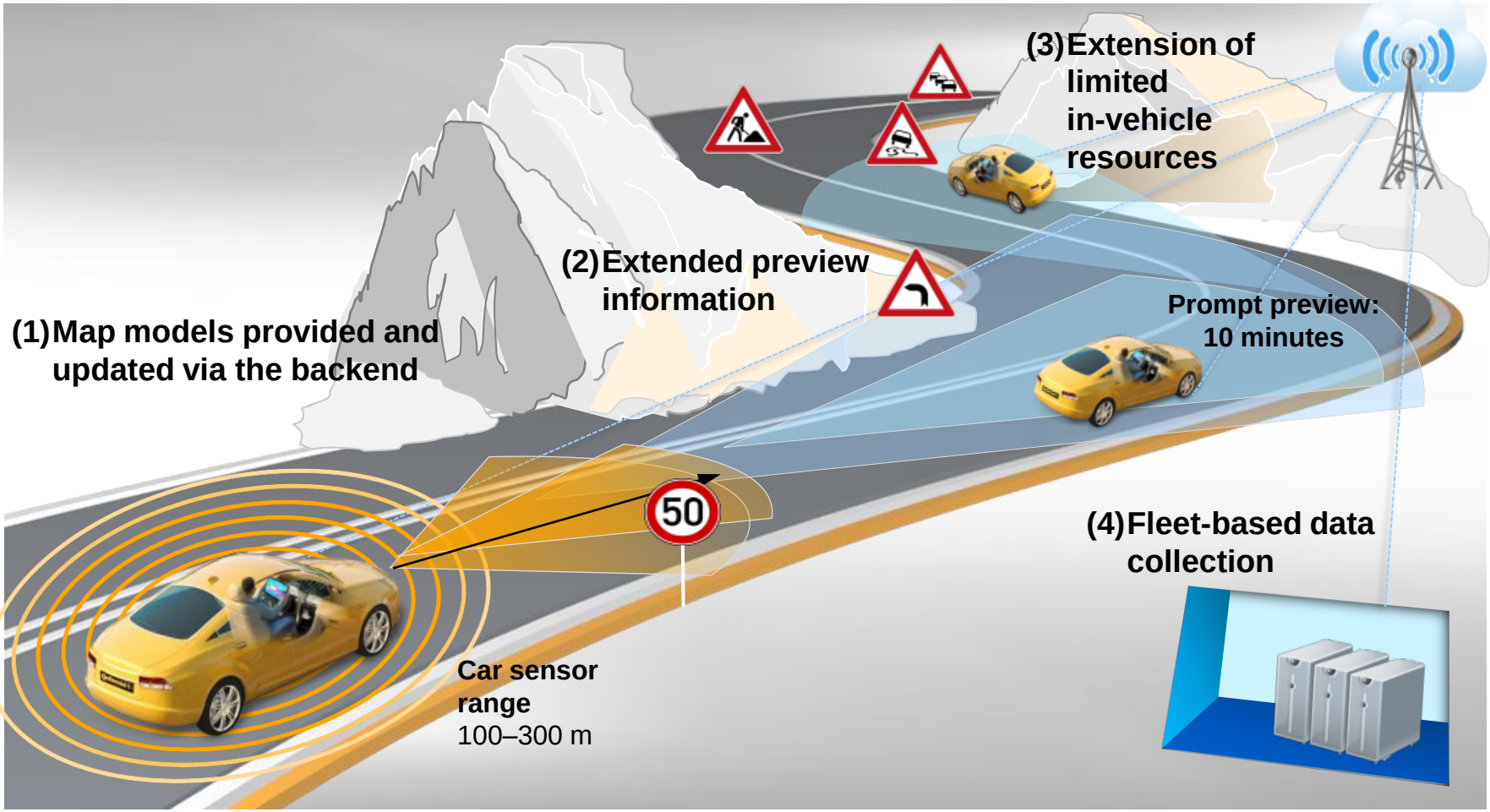
1	**Highly accurate & up-to-date digital map model:** for self-localization and environment interpretation
2	**Extended preview information:** physical limitations of in-car sensors extended through backend
3	**Extended Real-Time Data:** to support a smoother driving strategy

4	**Fleet based data collection:** highly accurate and validated data via crowd sourcing approach

BUT: Final decision on driving strategy remains with the car

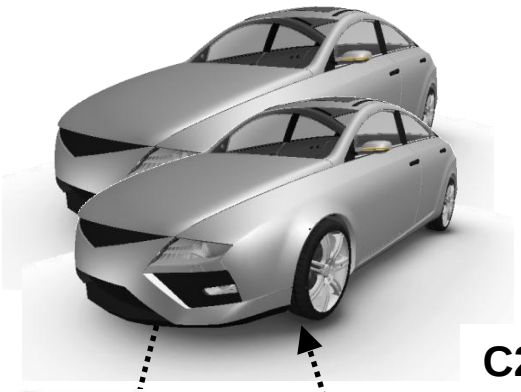
C-ITS for Automated Driving

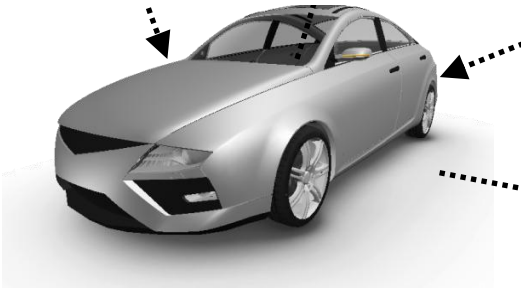
Why Backend /Cloud

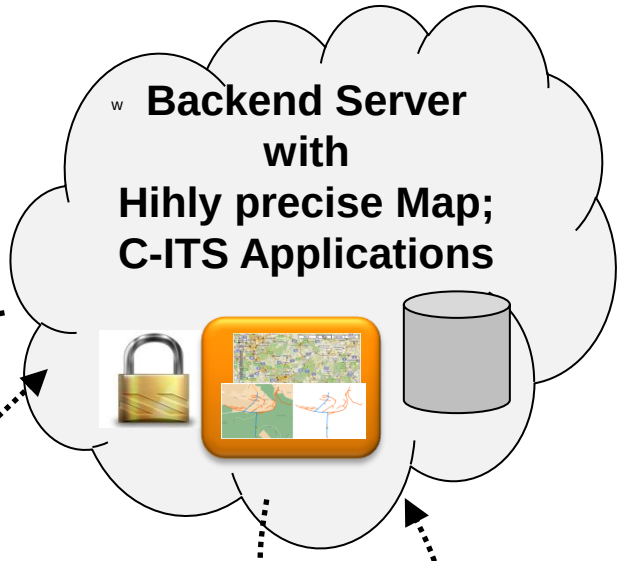


C-ITS Deployment Strategy

Different Modes of Communications







cellular network

Other Cars (C2C)

C2B2C vehicle-to-backend-to-vehicle communication

Infrastructure-to-backend communication

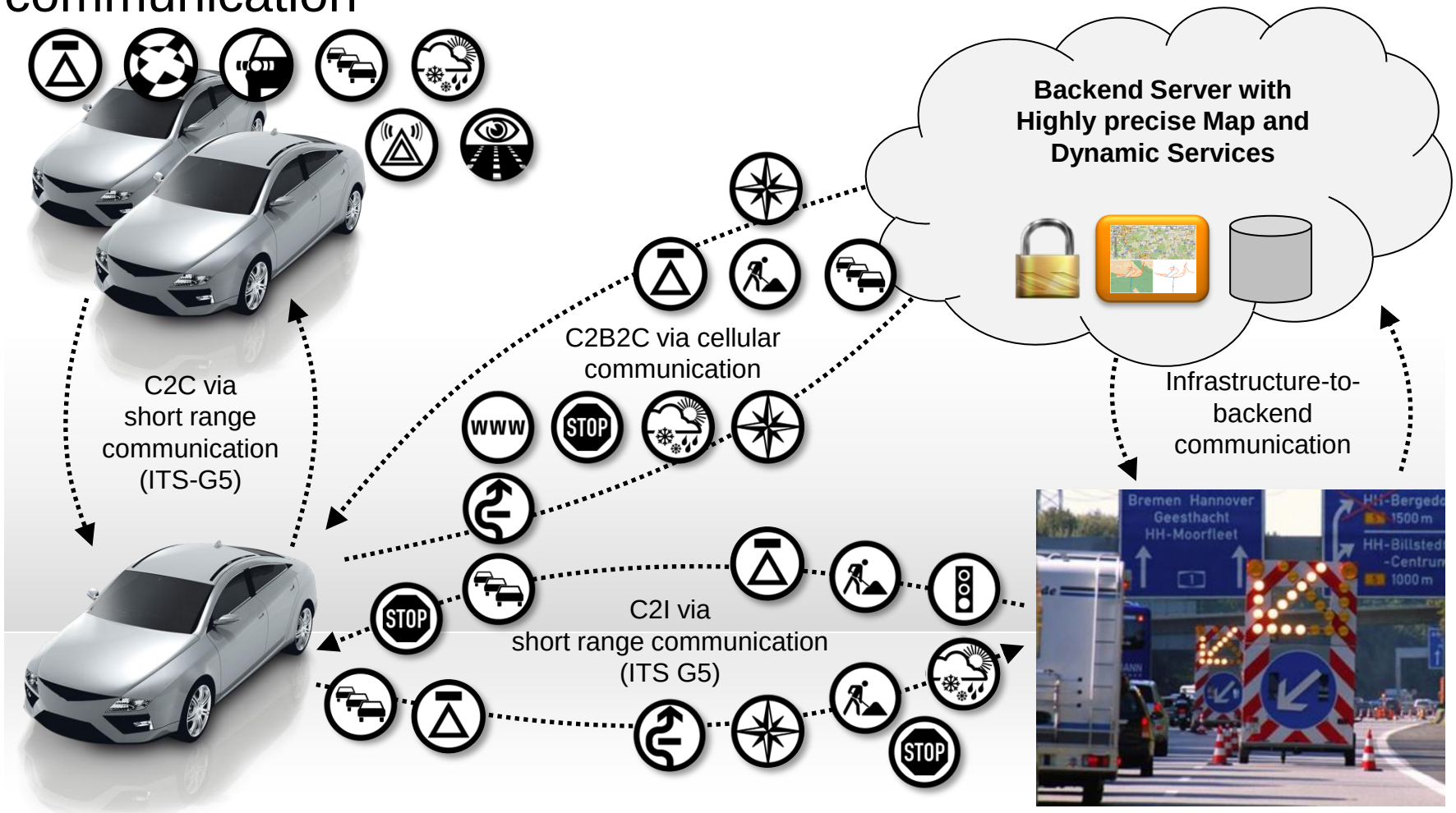
C2X vehicle-to-vehicle communication

C2X vehicle-to-infrastructure communication

IRS (C2I)

C-ITS Deployment Strategy

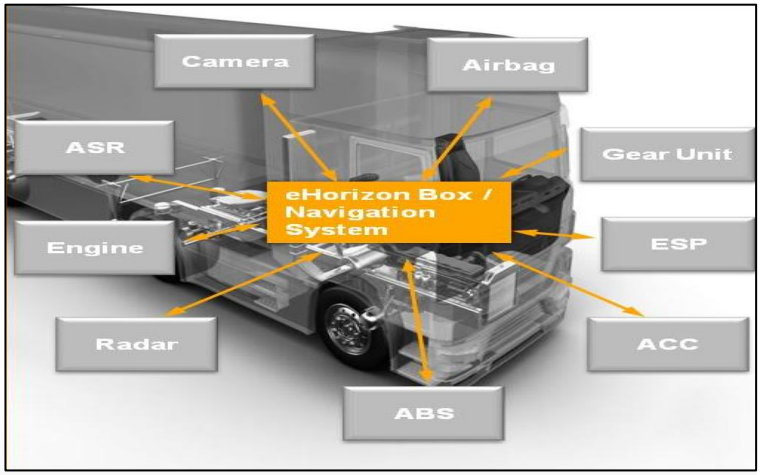
Services: same application – different sources and modes of communication

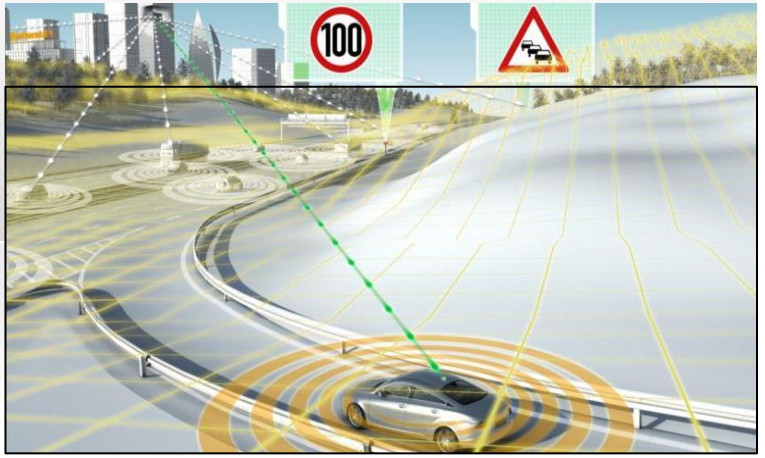


Electronic Horizon:
the technological basis for C-ITS Applications:

Definition: eHorizon (Electronic Horizon)

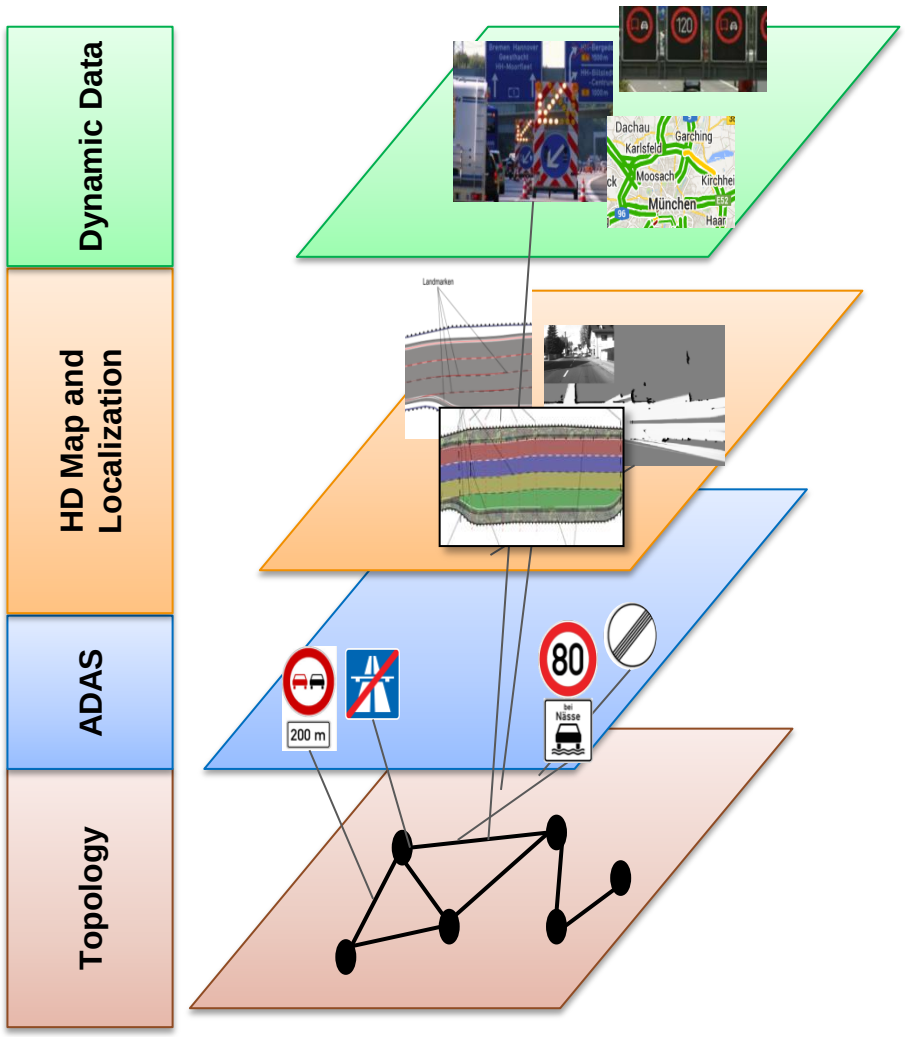
- **eHorizon** is a technology for transmitting ***map data*** and ***dynamic/environmental*** date to other ***in-car units*** in order to increase and improve vehicle functionalities.
- **extended eHorizon** is collecting vehicle date in the Cloud (Backend), improving the content via ***crowd sourcing*** and providing ***improved data quality to the vehicle***
- Through the use of eHorizon, driving is going to be more
  - economical,
  - secure and
  - **predictive.**





Extended eHorizon Layering (Reference Model)

extension of data planes for C-ITS



Information on **Dynamic Events** along the road (e.g. construction area, traffic jam, potholes, average speed)

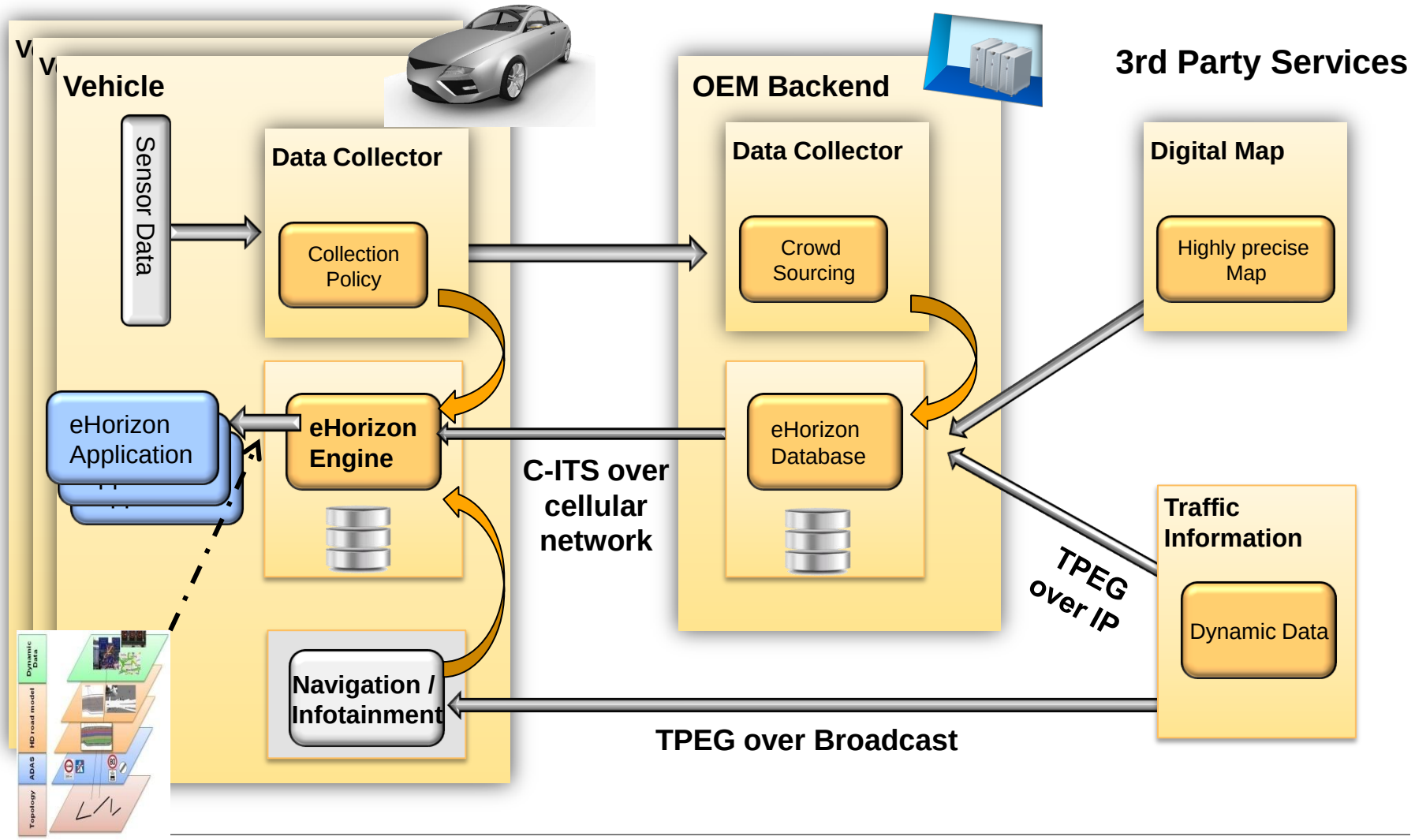
Self Localization and High Definition (HD) Map
Landmarks and camera based data,
high precision updates of landmarks on the map;
describes road including all lanes, occupied/non-occupied areas;
Highly precise lane information

ADAS
Semantics and Rules, e.g. Speed Limits, Non-Overtaking areas, conditional signs, slope info, curvature info

Topology and Basic layer like Routing
Enables referencing of information and further layering in relationship to a frame of reference

Evolution of the electronic Horizon

System Architecture: Integration of Cloud based “fresh” data



Dynamic Service in addition to the digital map
Why important for Automated Driving

Key feature: Backend based environmental prediction beyond the local vehicle sensors

Support of speed adjustment:

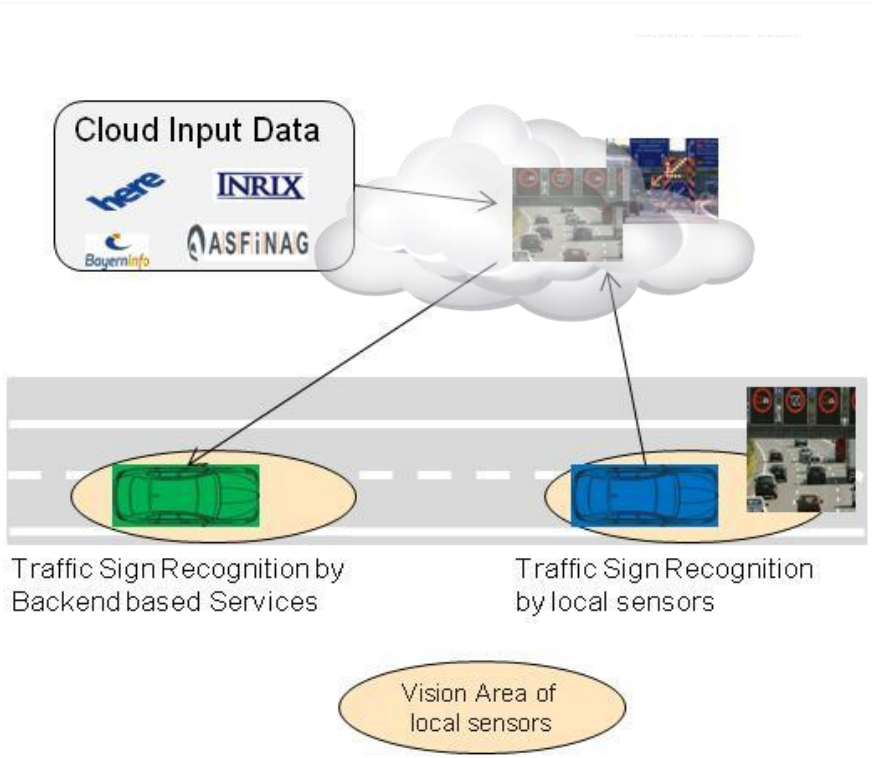
› Incident prediction (jam, dangerous objects, dangerous weather, …)

Predictive information about speed limits

› Support of lane changing strategy
› Prediction of closed lanes
› Prediction of no-passing areas

Support to evaluate the road features

› Recommendation of Road Clearance for ADAS/AD (Road/Blacklist)



C-IST for Automated Driving

Implications for ITS activities

Navigation Data Standard
PSF Physical Storage Format

- Highly precise digital map
  - Integration of ADAS data
  - Integration of Lane Data
  - Incremental update (near real time)
  - Crowd Sourcing
  - Self learning

TISA
Traveller Information Services Association

- Highly accurate dynamic data provision
  - Precise lane based data
  - Precise location referencing (map independent)
  - Extended and precise source of data (incidents, tunnels, …)
  - Short round trip time (low latency in data provisioning)
  - Improved data quality (e.g. via crowd sourcing – if possile)
  - Cause Code Adjustment for machine learning

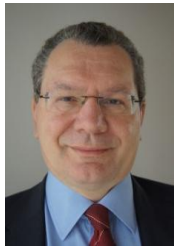
ADASIS
Advanced Driver Assistant Systems Interface Specifications

- Extension of ADASIS v2
  - Extended preview
  - Big data integration
  - Dynamic data integration
  - Lane info
  - Adopted distribution mechanisms (instead of CAN Bus)

The change is started

Automated Driving in evolutionary steps

Thank you
for your attention!



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