



Electronic Horizon How the Cloud improves the connected vehicle

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The change in individual mobility

Automated Driving for more comfort, safety and efficiency

Comfort

Germans spend on average 36 hours p.a. in traffic jams



Safety

90% of all accidents depend on human error



Efficiency

The manner of driving has an impact on the fuel consumption up to 20%



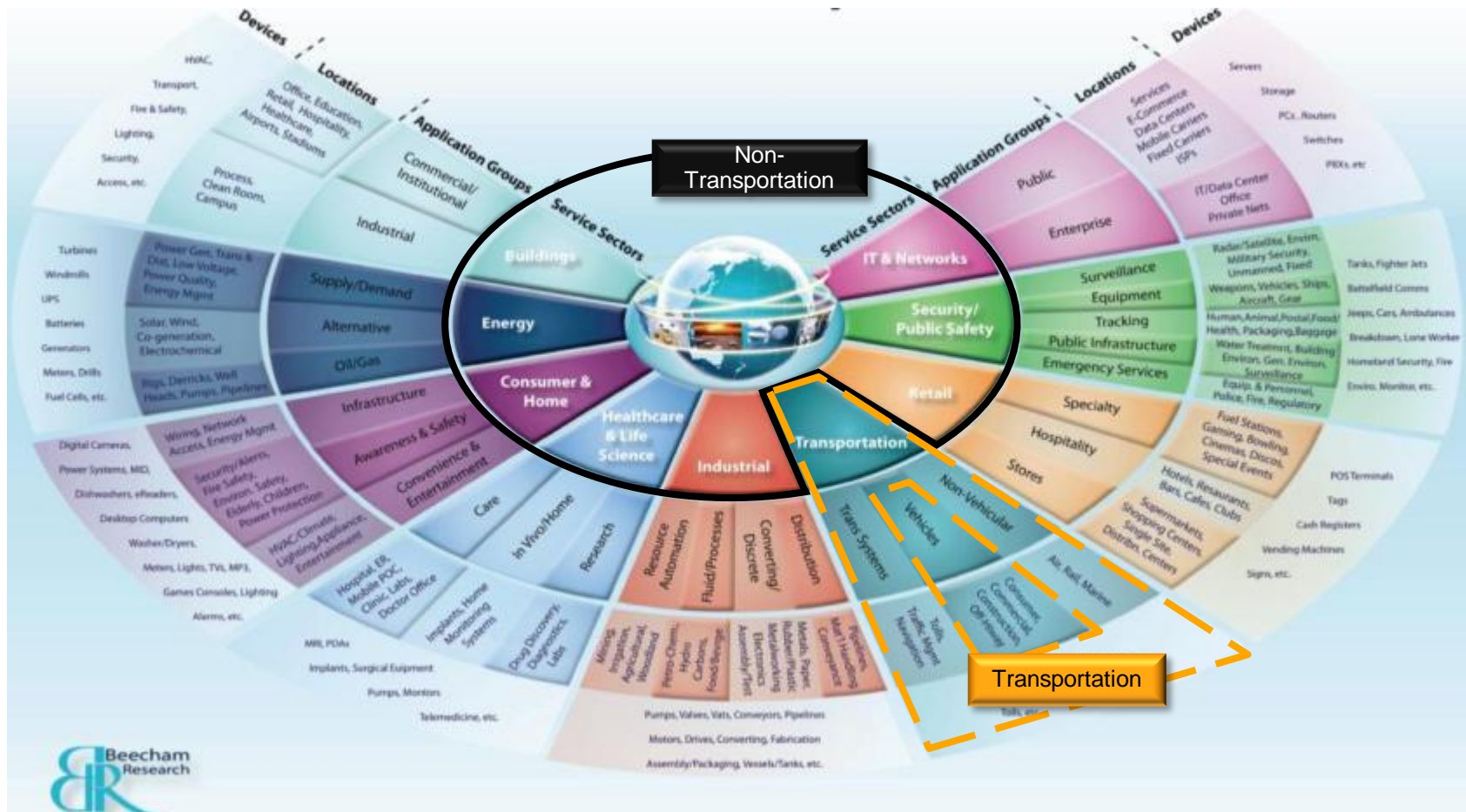
Internet of Everything

Transformation of Products, Markets and Enterprises



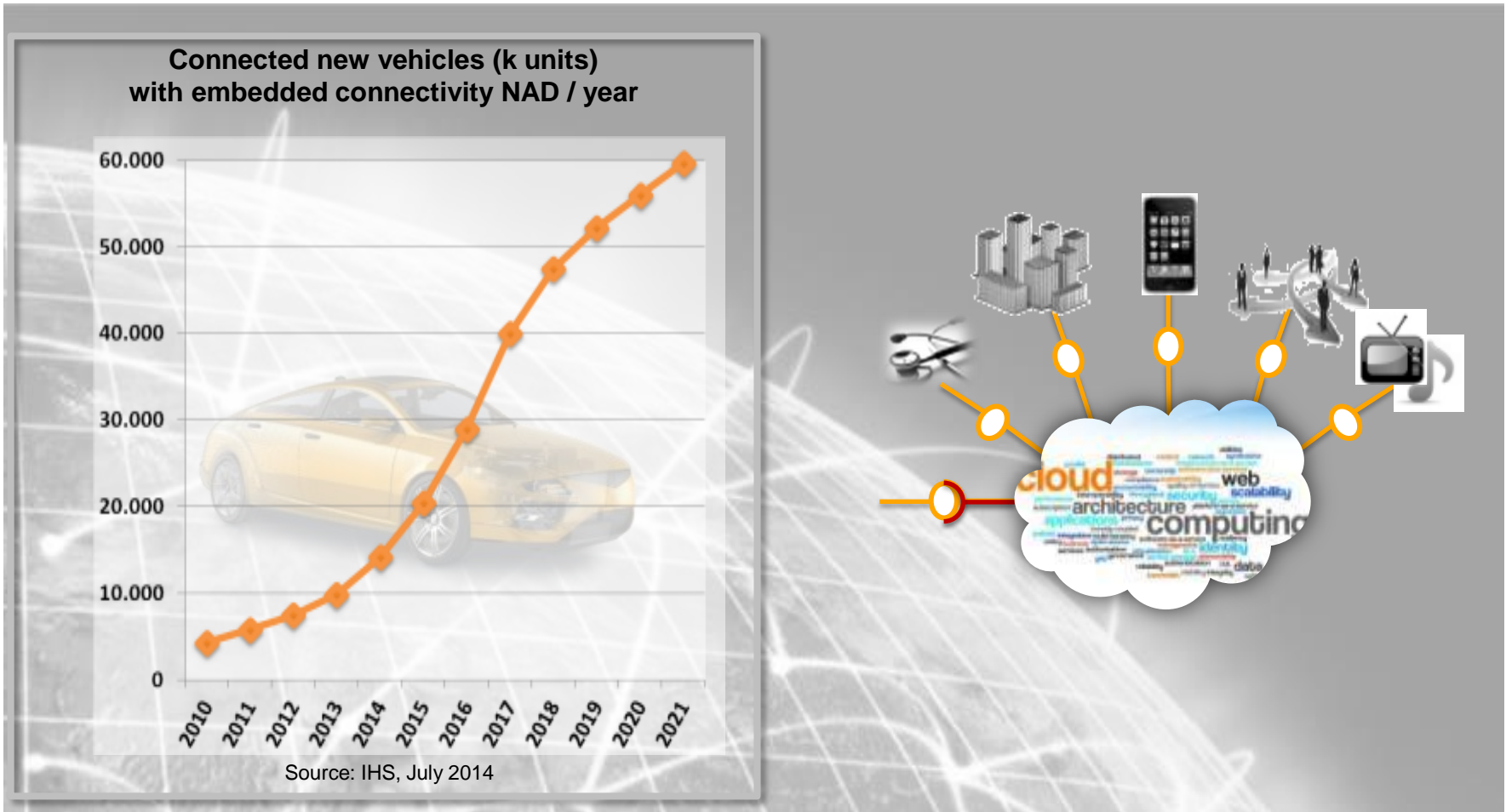
\$14.4 Trillion total value at stake in the upcoming 9 years

Transport. Business Covers Only a LTD Share of Total Market



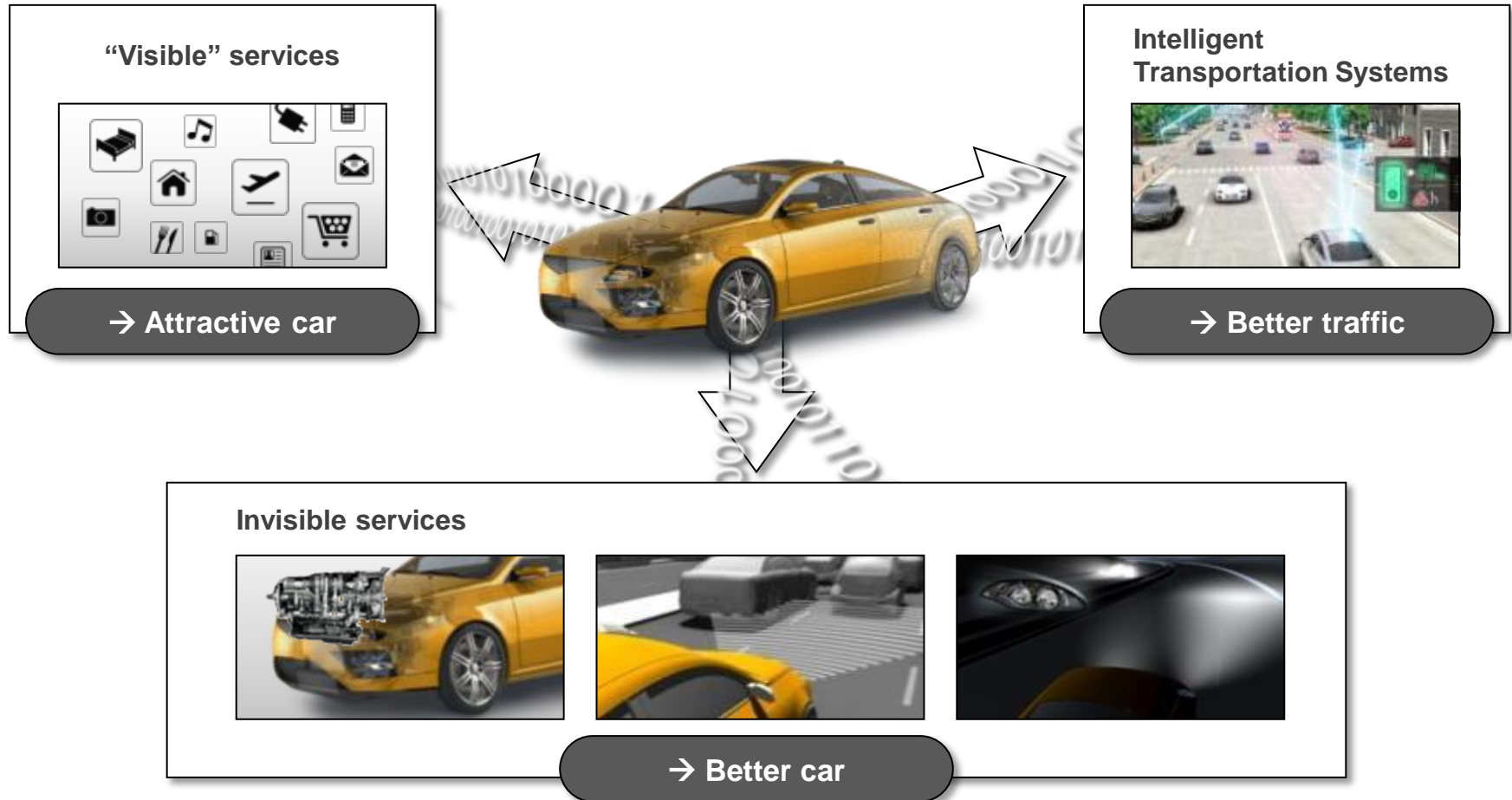
The Connected Vehicle

Part of the Internet of Everything



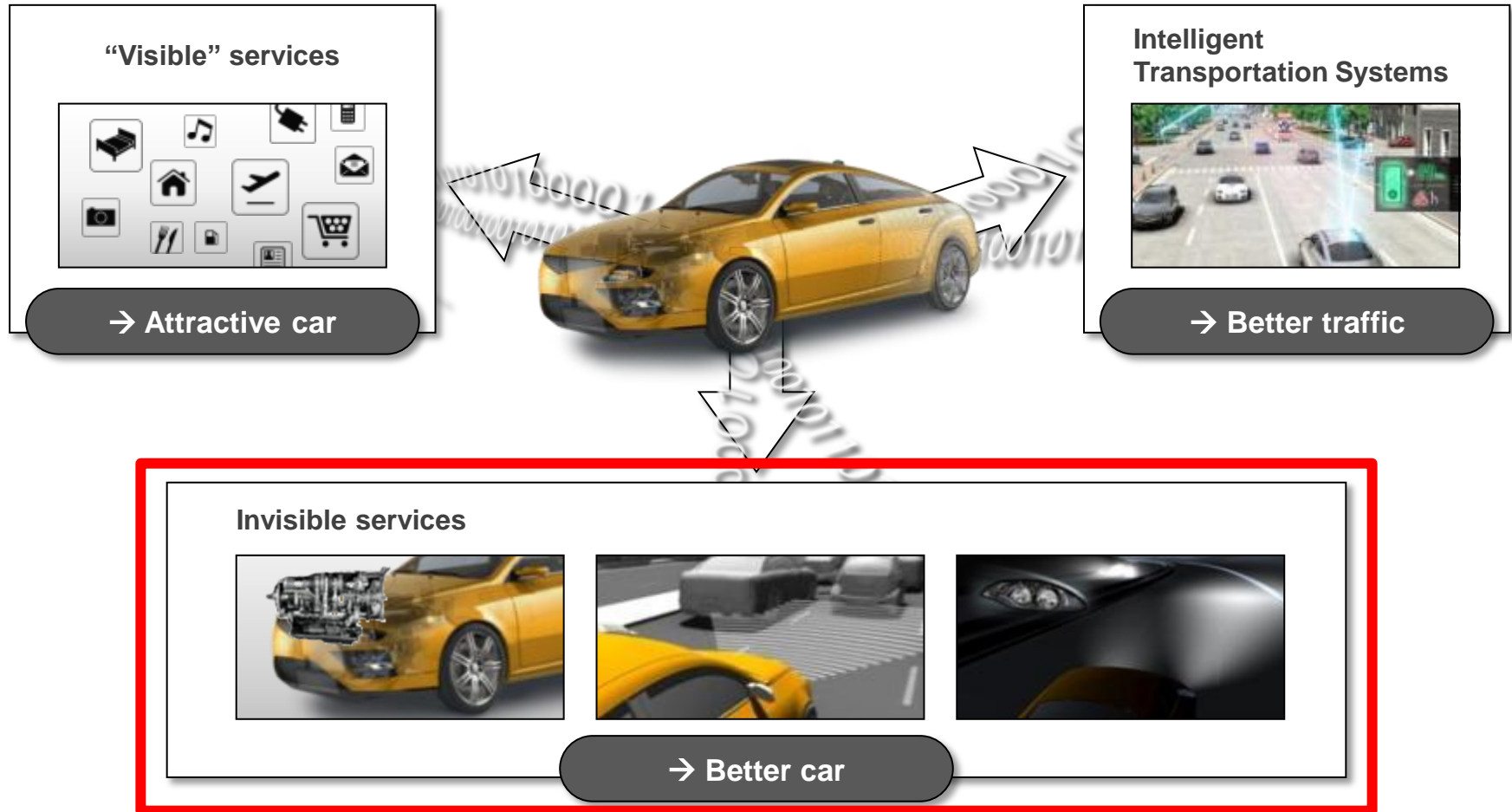
The Connected Vehicle

Additional Value to the Vehicle and beyond



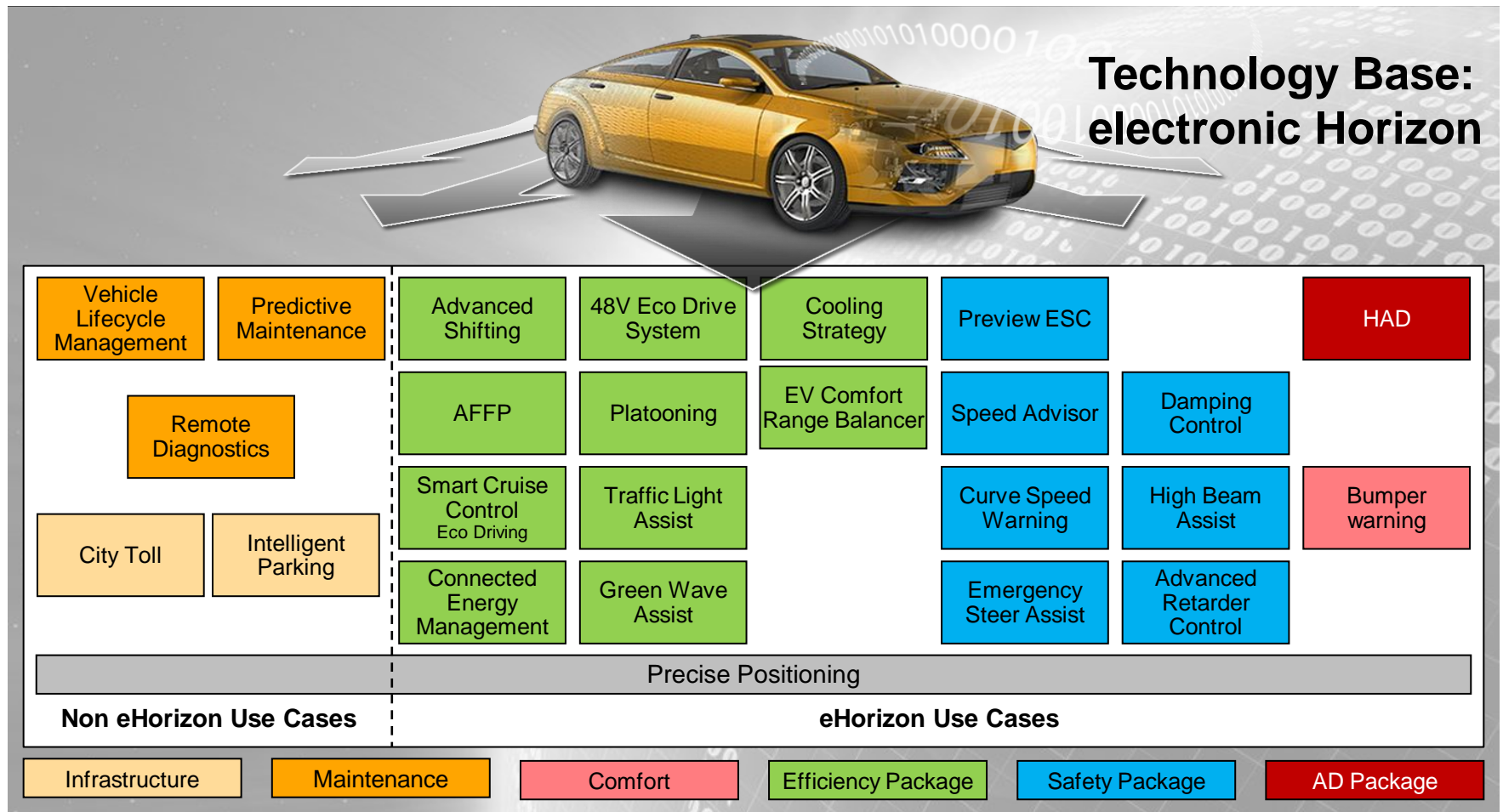
The Connected Vehicle

Additional Value to the Vehicle and beyond



“Invisible Services”

Reference Use Cases



Highly 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) - based on Traffic Management Information



Lanes Closure



Traffic Sign



Traffic Jam ahead



Construction assistant



Electronic Horizon Based Use Cases

Why Cloud / Backend for “Fresh Data”

1

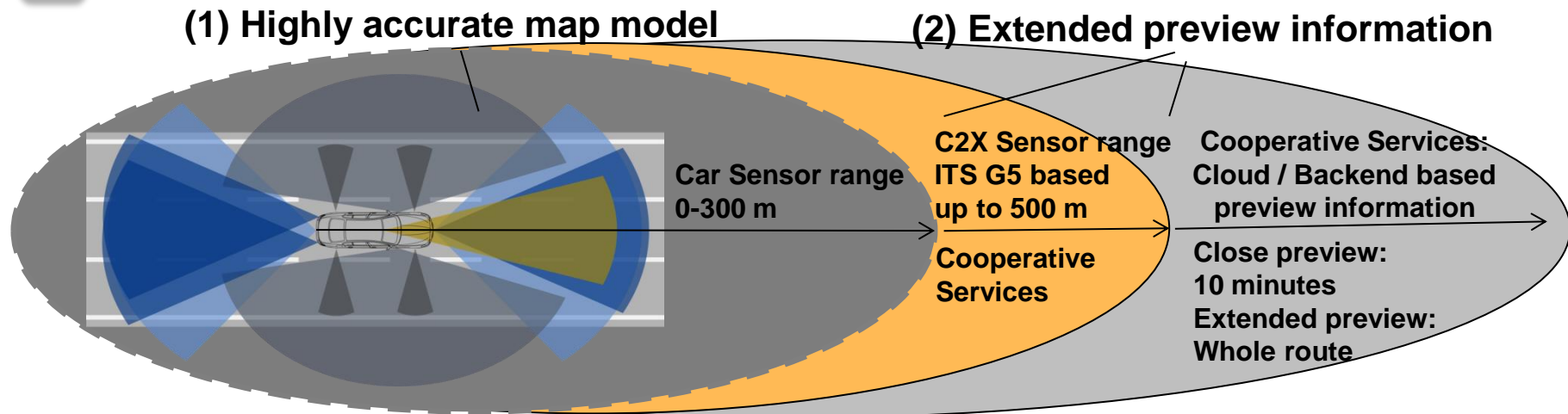
Highly accurate & up-to-date digital map model: for self-localization & environment interpretation

2

Extended preview information: physical limitations of in-car sensors extended through backend

3

Extended Real-Time Data: to support a smoother driving strategy



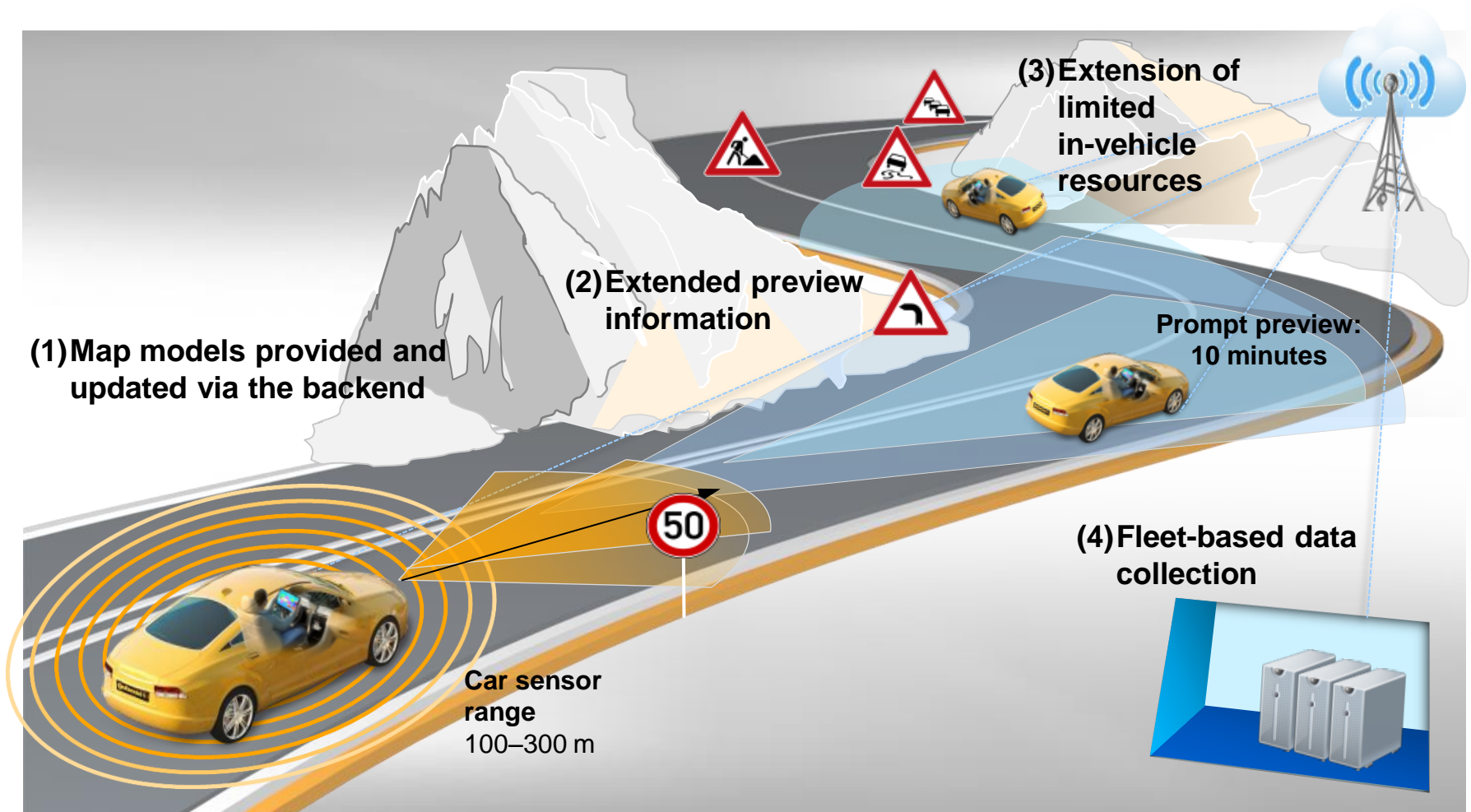
4

Fleet based data coll.: highly accurate & validated data via crowd sourcing approach

BUT: Final decision on driving strategy remains with the car

Connected Vehicle

The eHorizon Allows to Have a Look around the Corner and more ...

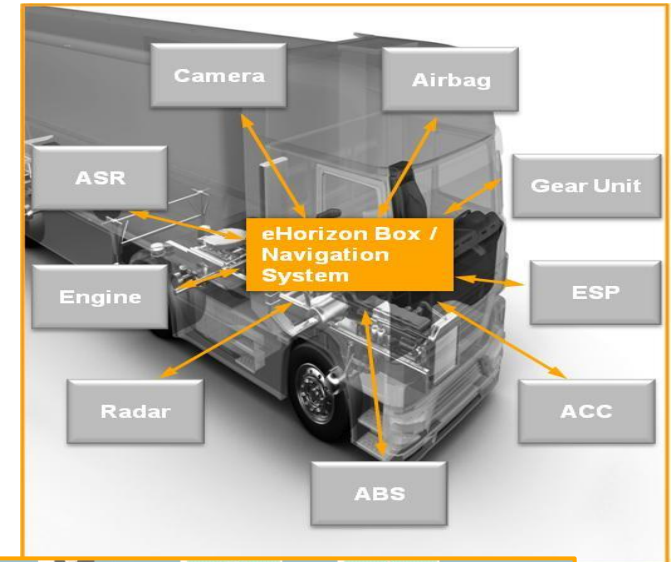


Electronic Horizon

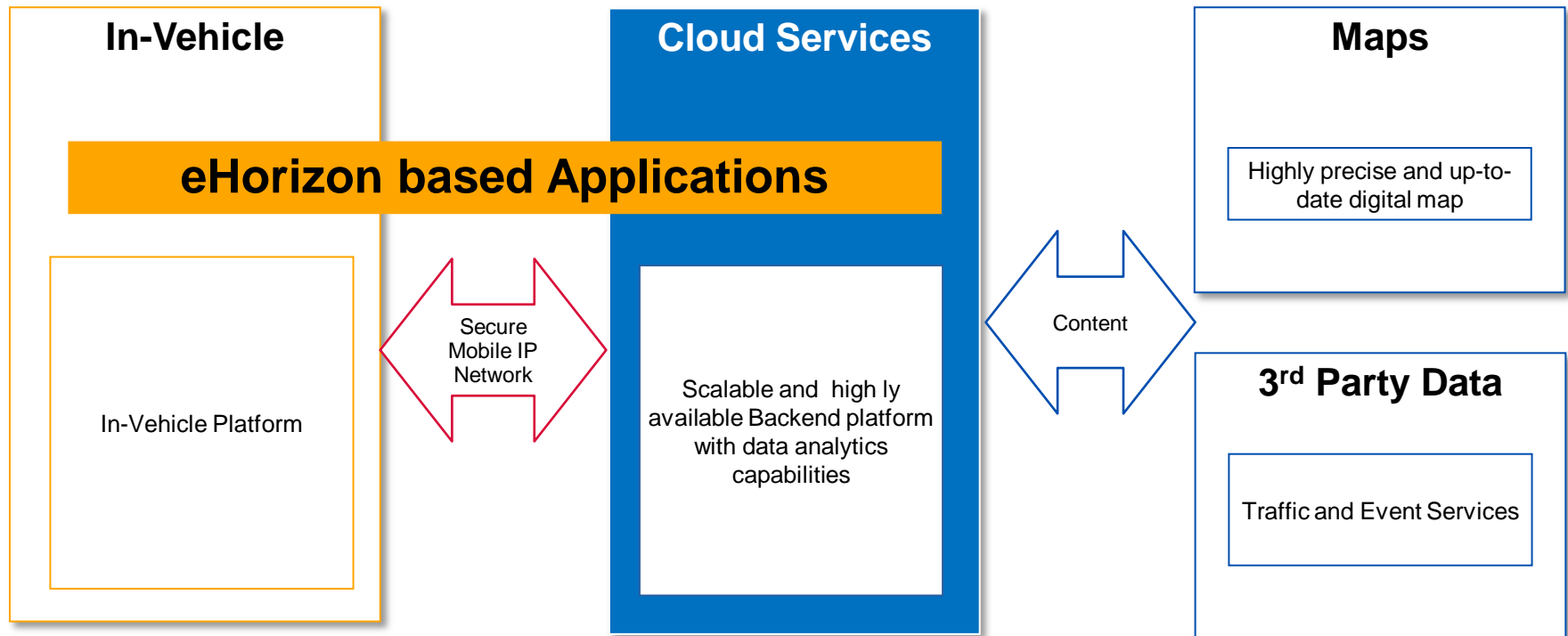
The Technological Basis for Connected Vehicle Applications

Definition: eHorizon (Electronic Horizon)

- › **eHorizon** is a technology for transmitting *map data* and *dynamic / environmental* data to other **in-car units** in order to increase and improve vehicle functionalities
- › **Connected / dynamic eHorizon** is collecting vehicle data 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

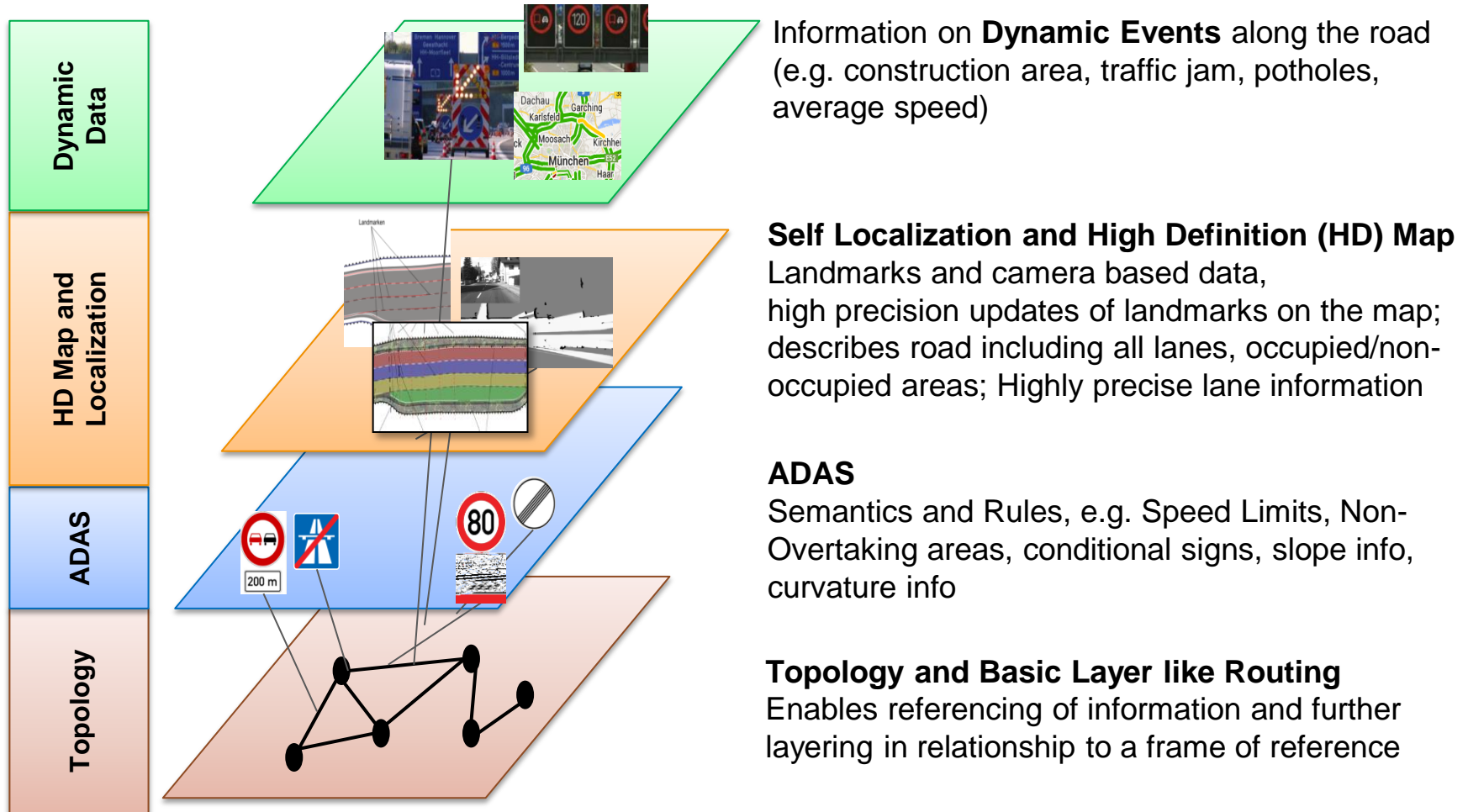


Electronic Horizon System Concept



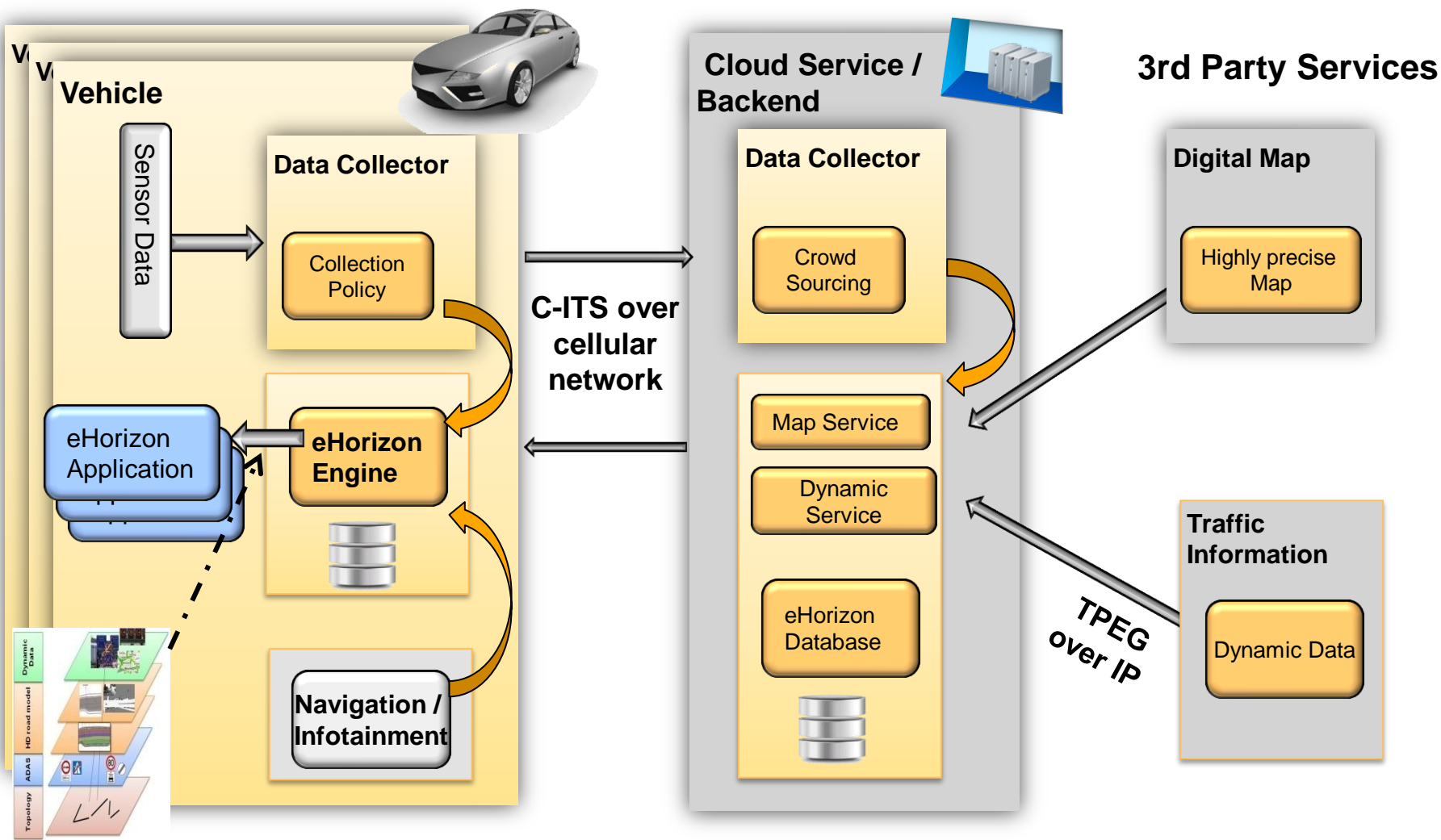
Electronic Horizon Layering (Reference Model)

Extension of Data Planes



Evolution of the Electronic Horizon

System Architecture: Integration of Cloud based “Fresh Data”



Dynamic Services via Cloud / Backend

Value Add to Automated Driving (AD)

Support and improvement of predictive driving strategy Improvement of driving comfort of AD vehicles

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

Support of speed adjustment:

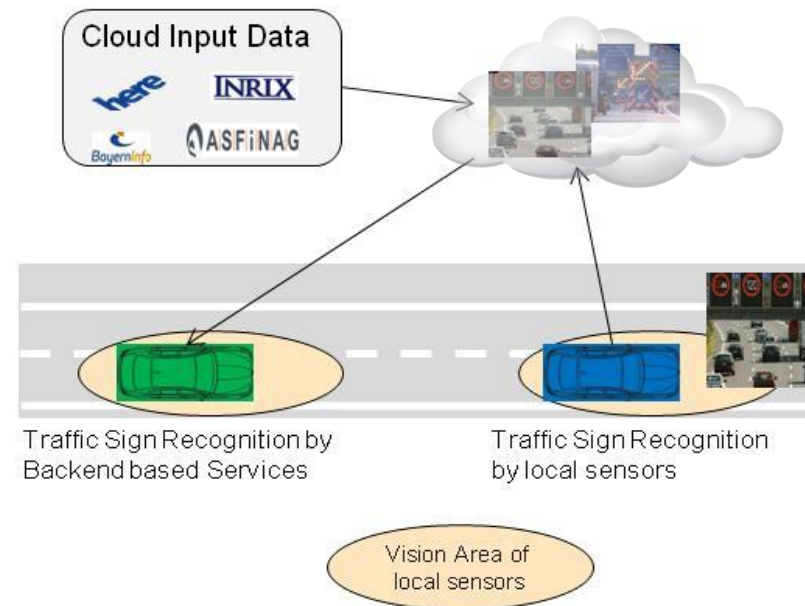
- Predictive information about speed limits
- Incident prediction (jam, dangerous objects, dangerous weather, ...)

Support of lane changing strategy

- Prediction of closed lanes
- Prediction of no-passing areas

Support to evaluate the road features

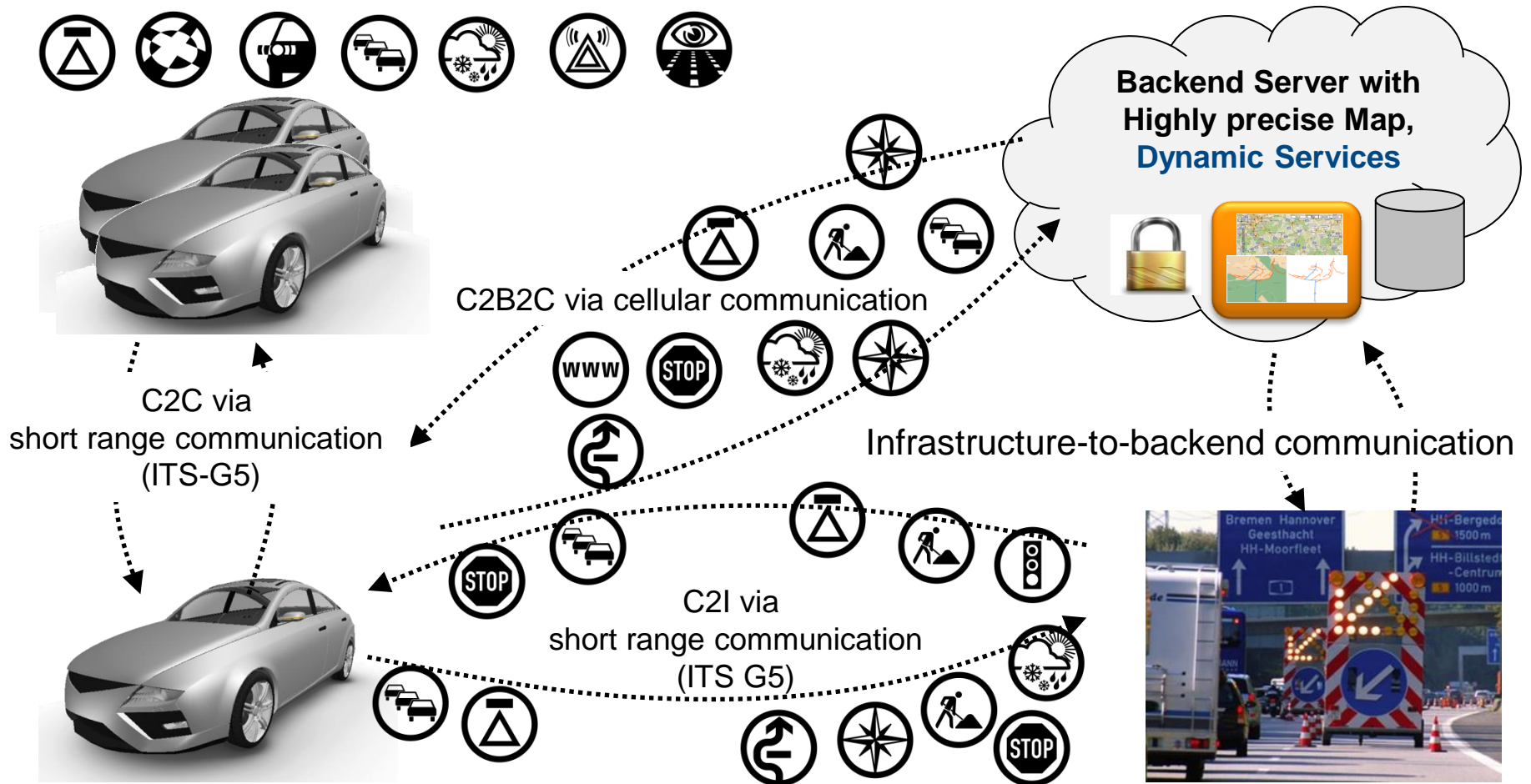
- Recommendation of AD release (Road/Link Blacklist)



Dynamic Services via Cloud / Backend

Use Case Examples:

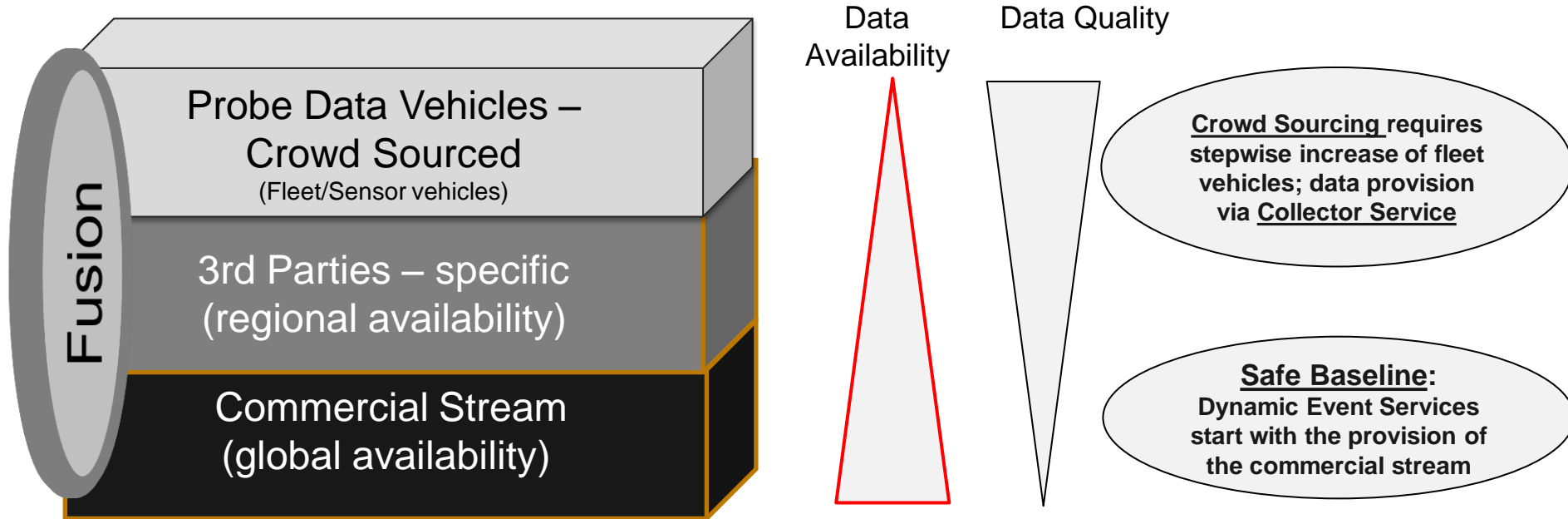
Same Application - Different Sources and Different Means of Communication



Dynamic Service via Cloud / Backend

Data Sources and Fusion Strategy

Stepwise deployment of Fleet vehicles require dedicated data fusion strategy



Dynamic Services for Automated Driving

Implications for Dynamic Traffic Management Tasks

- ▶ **TODAY:** Traffic Management Data are finally consumed by the Driver (via HMI)
- ▶ **TOMORROW:** Traffic Management Data are finally utilized for machine based driving

Implications to Road Operators

- ▶ Highly accurate dynamic data provision
 - ▶ Precise lane based data
 - ▶ Precise location referencing
 - ▶ Near real-time data provisioning
- ▶ Extended and precise source of data
 - ▶ E.g. Speed Limit Info, Gantry Info, Incidents, Tunnels, Road works, Tolling, Shoulder Information,
 - ▶ Predictive information : e.g. upcoming roadworks (incl. impacts on lane closure)
- ▶ Interface harmonization
 - ▶ E.g. based on DATEX II and/or TPEG



Continental and ASFINAG agreed on a joint project approach in order to address the current Traffic Management Challenges for Automated Driving

The Change Has Started

Automated Driving in Evolutionary Steps – Based on eHorizon



Thank you!

