GSV-Forum Automatisiertes Fahren

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Automated Driving

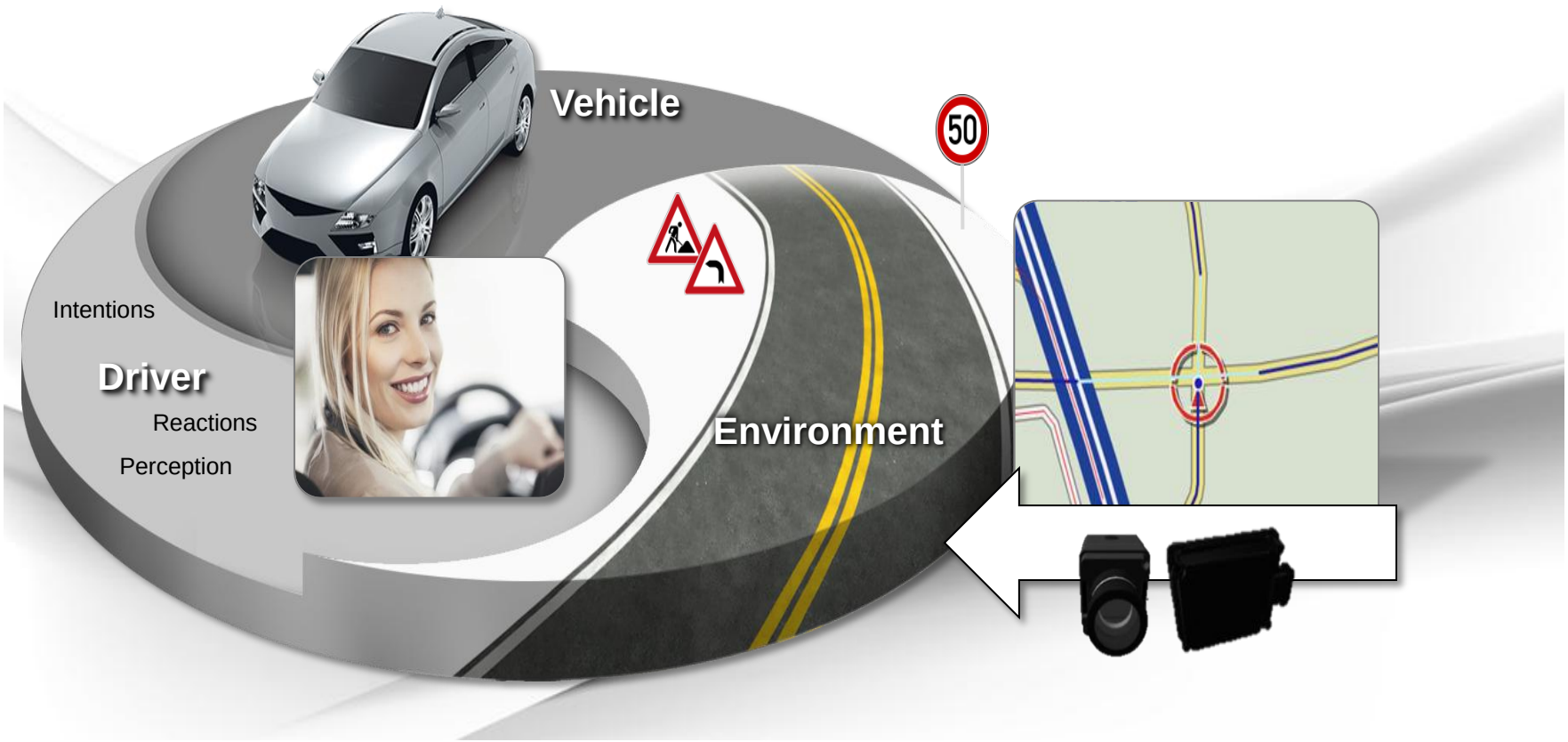
Close the Loop Between Driver, Vehicle & Environment

Visual Range 300m

Is this Really Enough?

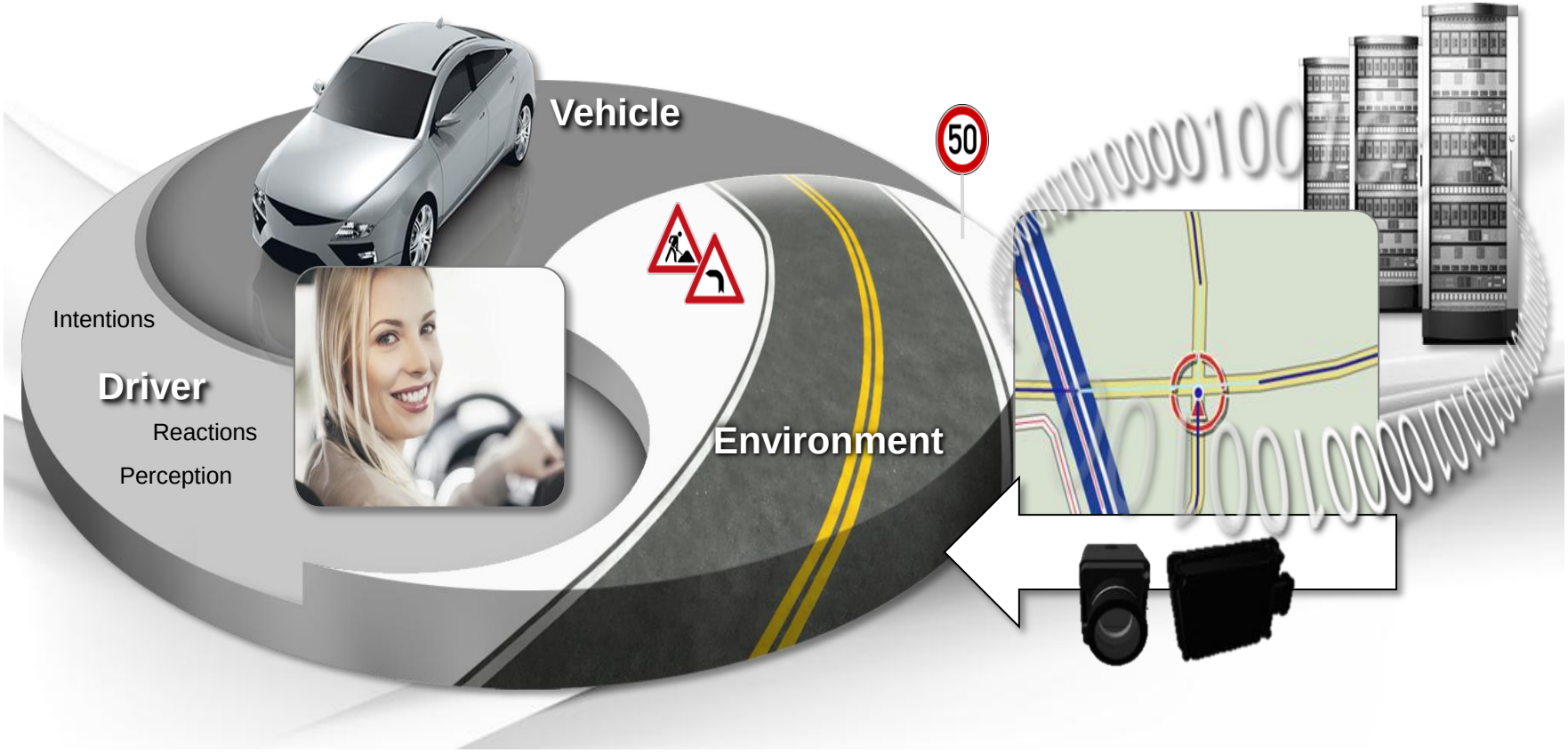
Environment Detection

Digital Onboard Maps:Provide Information Beyond the Line of Sight – eHorizon



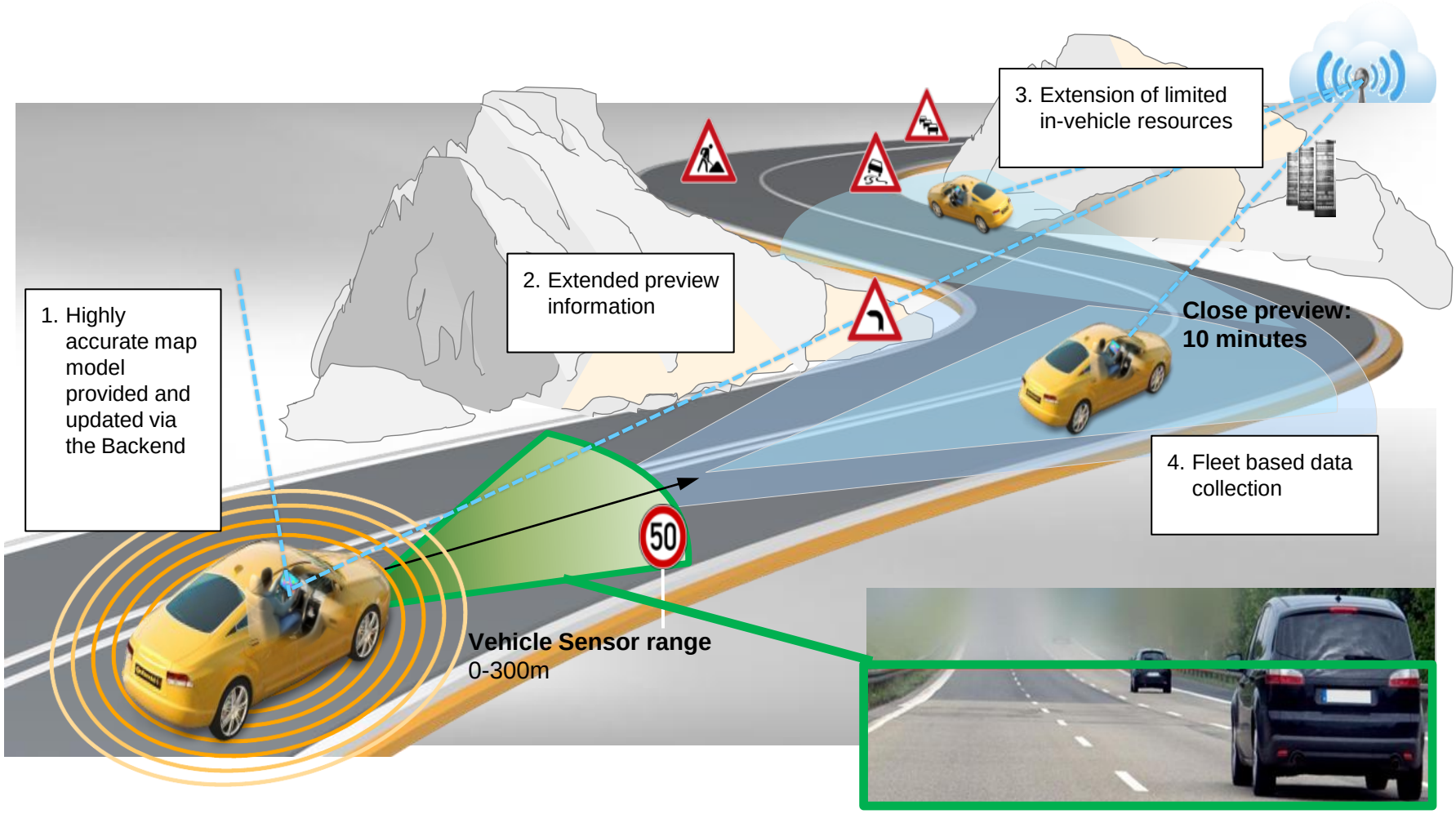
Next Step:Digital Maps and Online Data

Provide real-time Information – dynamic eHorizon



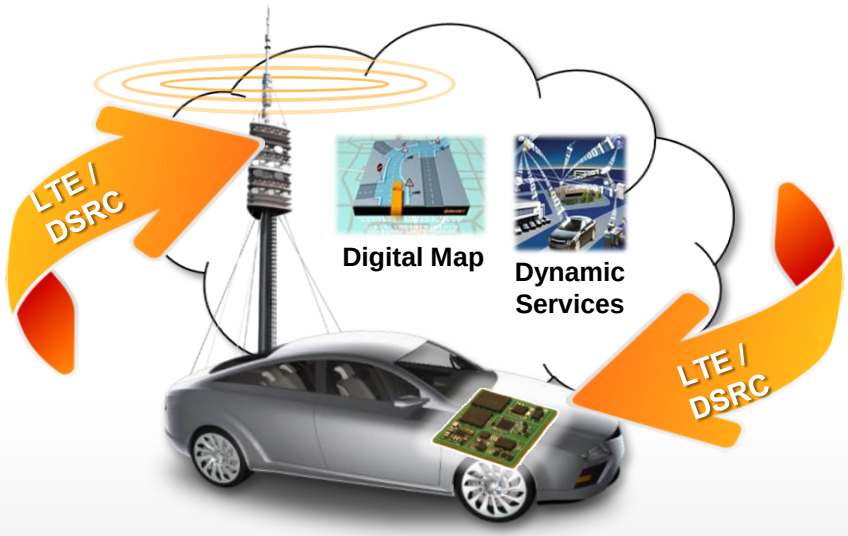
Tomorrow's Situation: Sensors, Maps and Online Data

The Vehicle Looks beyond 300m and Around the Corner



Automated Driving: “Fresh Data” from the Cloud

Highly Precise Map and Dynamic Data – Crowd Sourced



Digital Map

Functions

- Static Basic Map
- HD 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

Digital Infrastructure Requirements for AD

Provision of up-to-date digital map

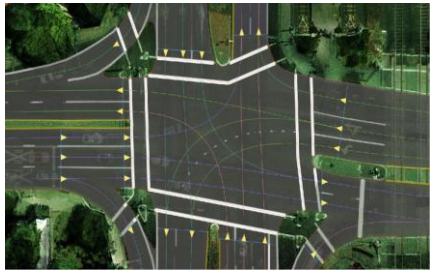
Key feature: Cloud based digital map – always up-to-date and precise

Always up-to-date

- tile based approach
- learning map (e.g. gantries)
- versioning
- Predictive tile download to the vehicle (based on eHorizon MPP)

precise

- lane accurate information
- precise map matching (lane specific)



CHALLENGE: HD Road Model

- What kind of information? → landmarks, lane info, what else?
- how to get initial model
- how to run updates / maintenance
- how to ensure self localization and precise positioning?

Digital Infrastructure Requirements for AD

Support of Landmark concept

Key feature: precise landmarks along the highway

Absolute Positioning

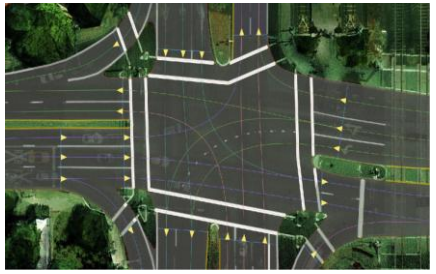
- based on GNNS technology
- in addition with correction mechanisms

Relative Positioning

- via landmarks
- via Camera based solutions (option: radar based)

CHALLENGE: Life cycle

- Update mechanism of landmarks



Digital Infrastructure Requirements for AD

Provision of up-to-date dynamic events / traffic information

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

Support of speed adjustment:

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

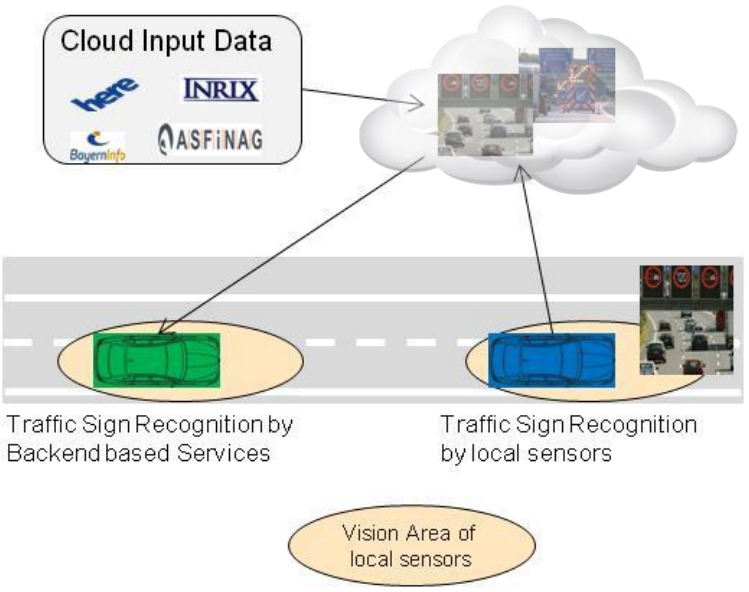
Support of lane changing strategy

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

Support to evaluate the road features

- Recommendation of AD release (Road/Link Blacklist)

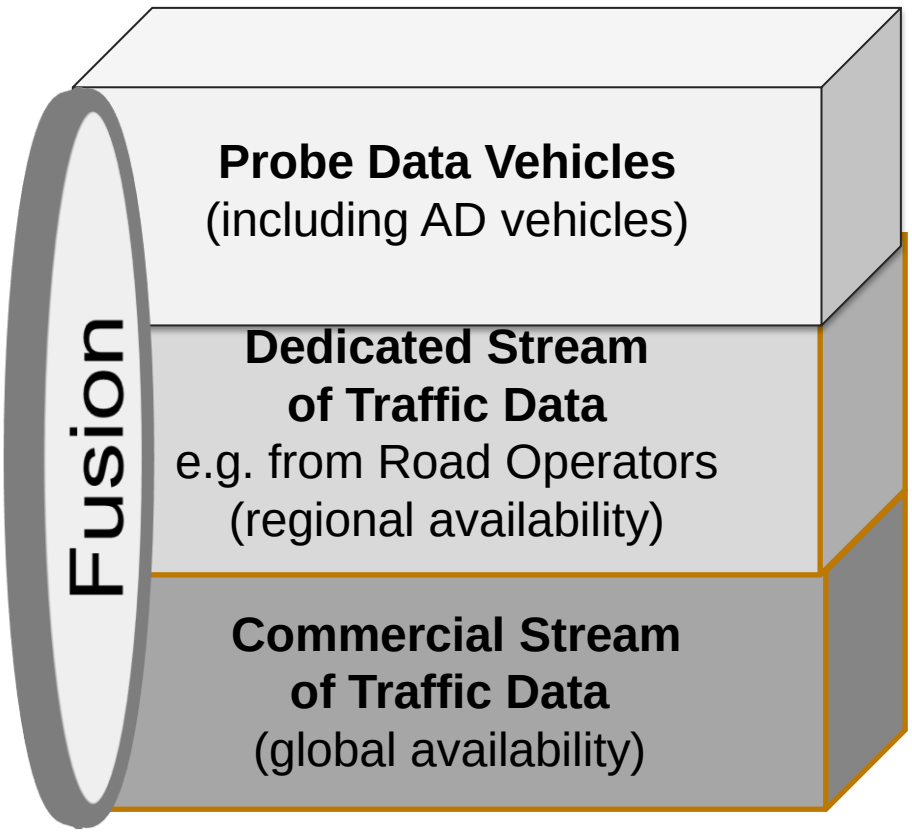
Support of controlled vehicle stop

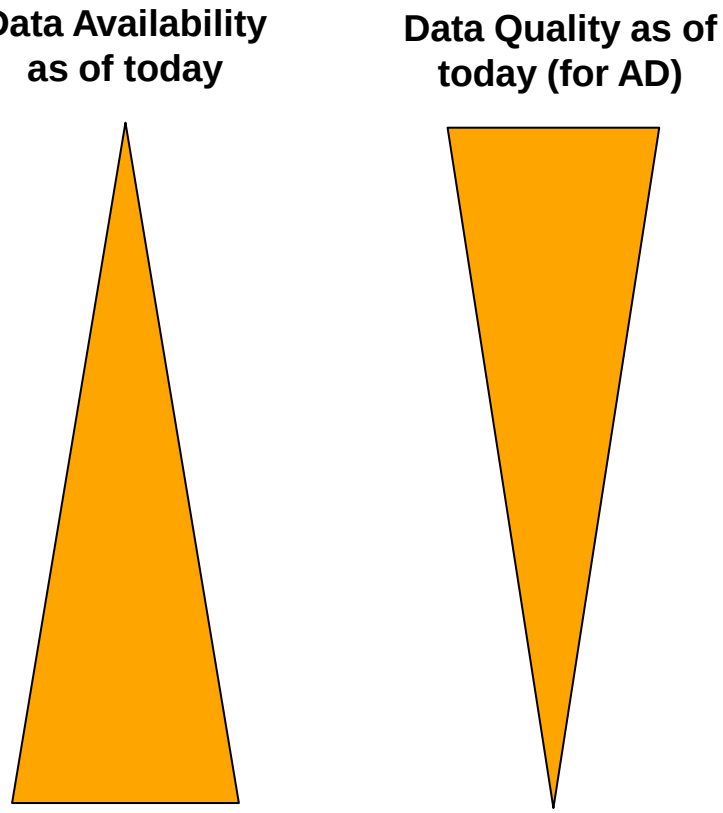


Digital Infrastructure Requirements for AD

Provision of up-to-date dynamic events / traffic information

Stepwise deployment of AD vehicles require dedicated data fusion strategy

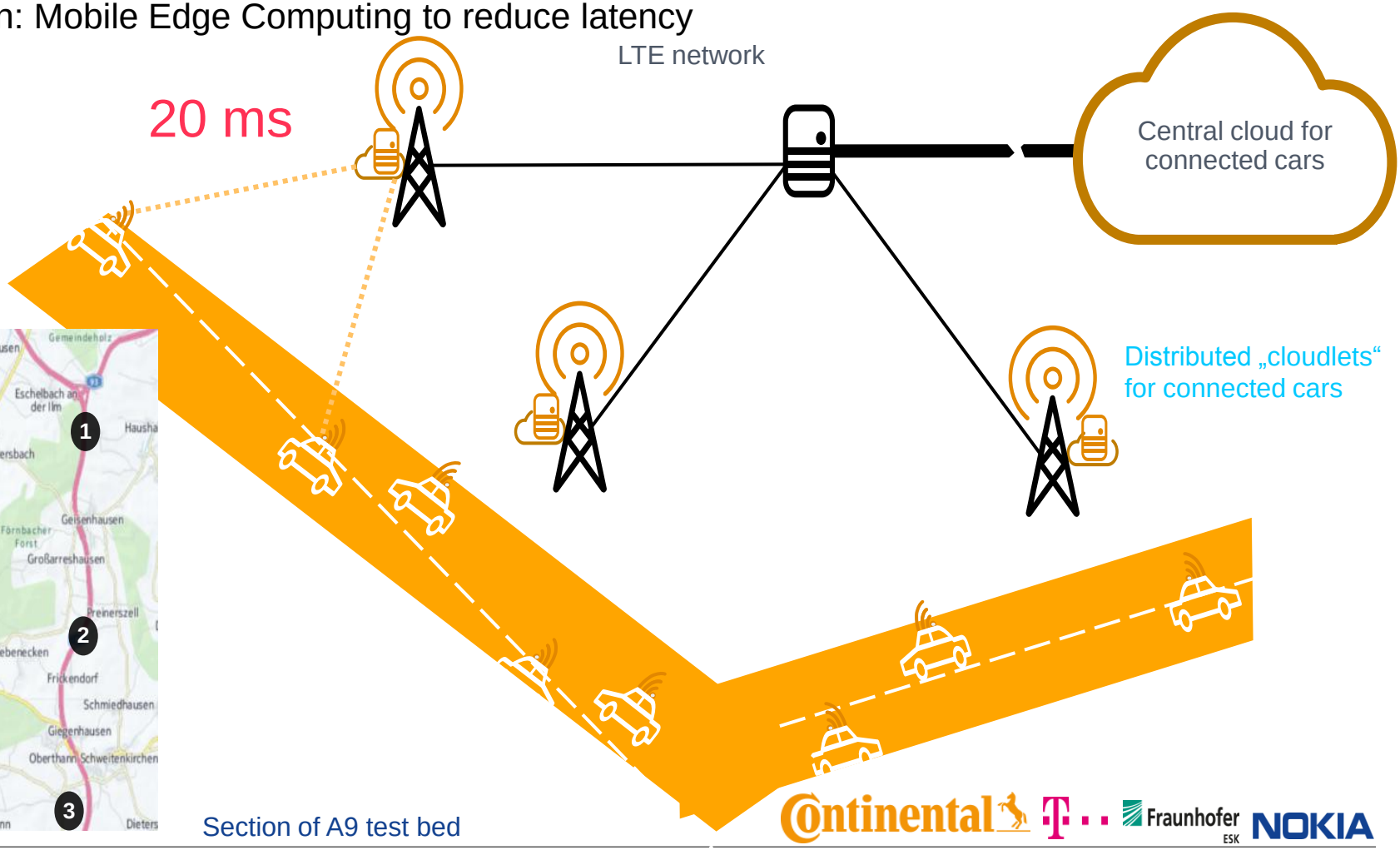




Digital Infrastructure Requirements for AD

Reliable hybrid telecommincations infrastructure

Option: Mobile Edge Computing to reduce latency



The Change has been Started

Automated Driving in Evolutionary Steps

Thank you!