CONNECTIVITY

BOSCH

Agenda

1. Overview
2. Benefits
3. Use Cases
4. Technology
5. Data Analysis

Figure. 1: Cloud, D. Fletcher, https://www.slideshare.net/AmazonWebServices/digital-transformation-empowering-people-to-adapt-to-the-cloud

OVERVIEW

Overview
Future mobility

costs hybrid e-motor
eBike power electronics

electrified

plug-in eScooter range
fun-to-drive battery
charging infrastructure

legislation driver assistance
emergency braking autopilot

automated

highway-pilot
redundancy
valet parking
sensors
electric steering

electronic horizon
smartphone integration

connected

eCall cloud
services fleet management
car2car augmented reality

Overview
Basics

- Car should communicate with:
  - Other cars (V2V)
  - Infrastructure (V2I)
  - Network (V2N)
  - Pedestrians (V2P)
  - Everything (V2E)
- Challenges: security, privacy, data analysis errors, communication technologies

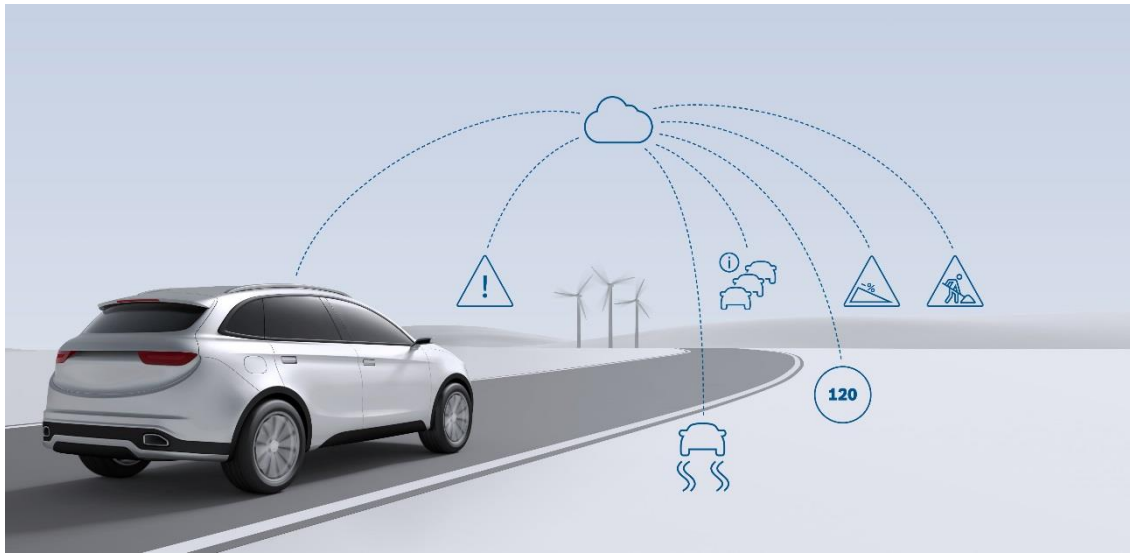

Figure 1: "Self Driving Cars", Jim Haas, 2014.
https://twitter.com/went1955/status/478807357154410496

BENEFITS

Benefits
Connected Car

- In-Car Experience
- Autonomous Drive Support
- Improved Safety
- Environmental Benefits
- Saves Time & Money
- Advanced Navigation

Figure 1: "Does your car have any idea why my car pulled it over?" - New Yorker Cartoon, Paul North, https://www.scoopnest.com/user/8artd/684983368274972672-does-your-car-have-any-idea-why-my-car-pulled-it-over-newyorker

USE CASES

Use Cases
Map based services

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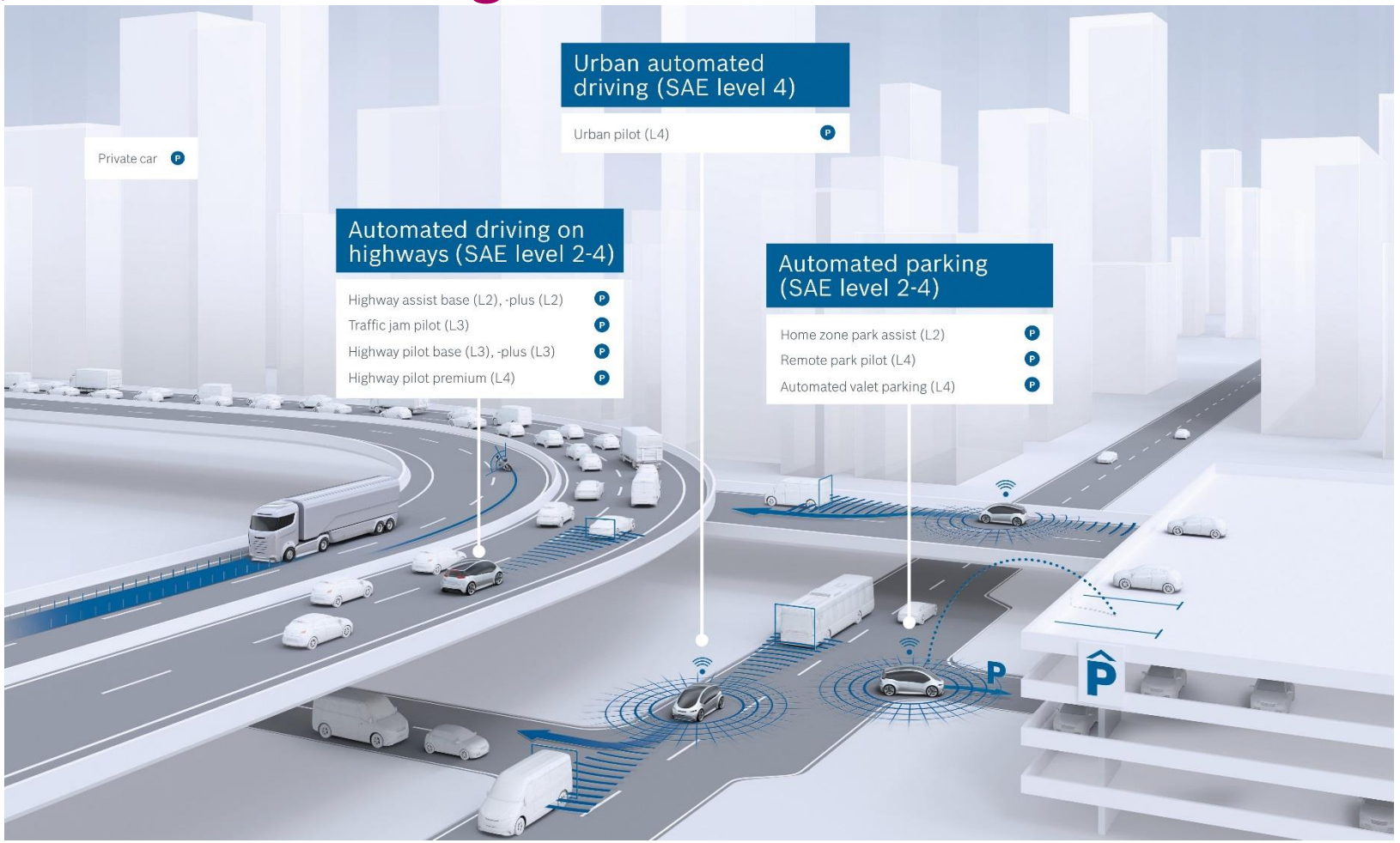
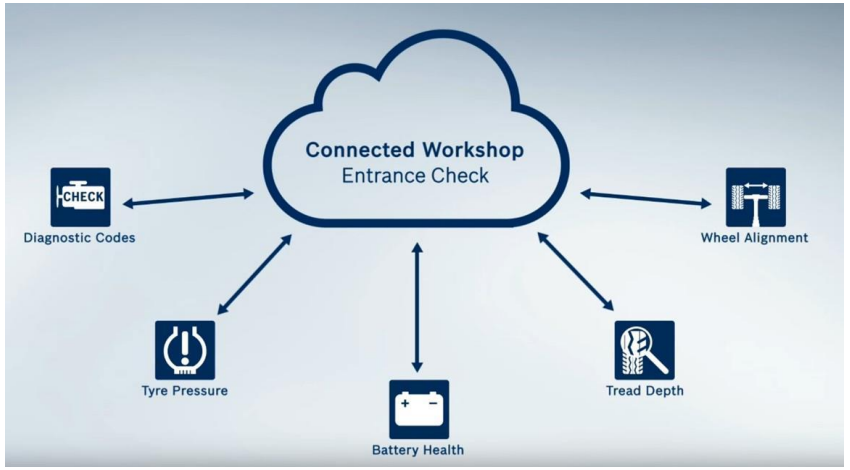
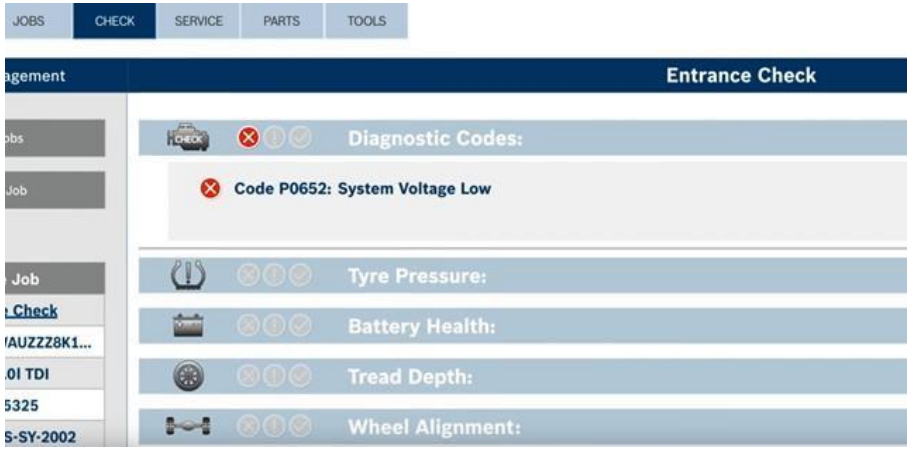
Use cases
Highway, Urban & Parking Pilot



Use Cases
Connected Workshops

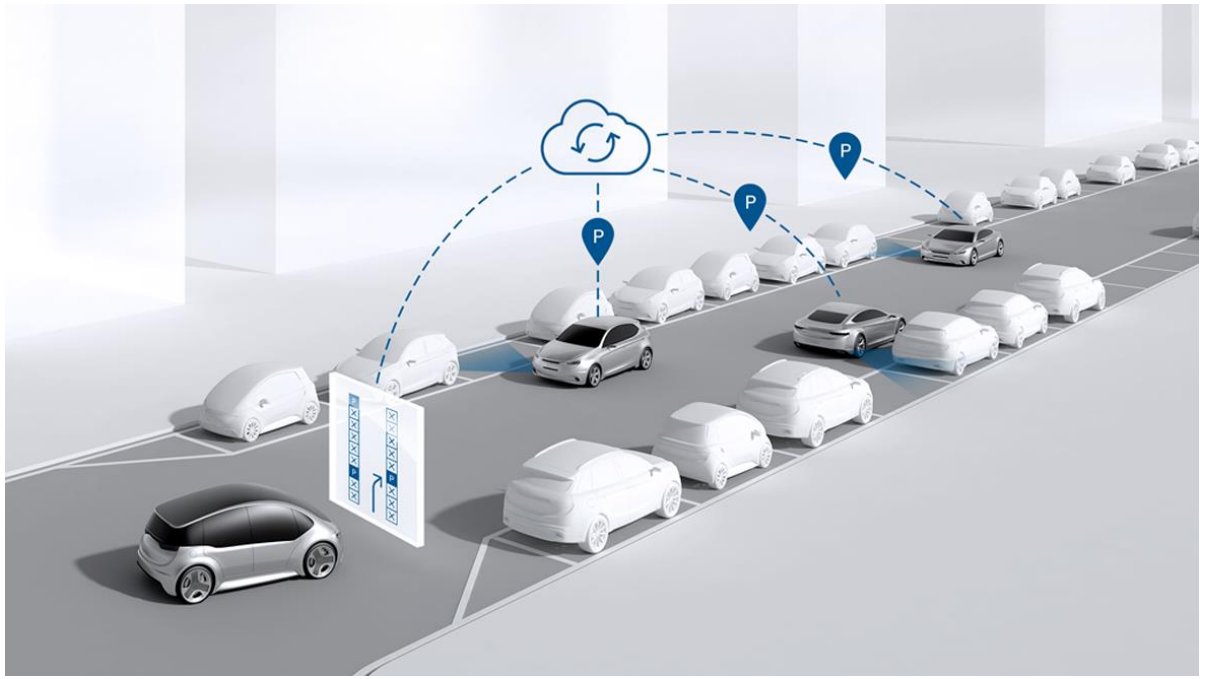
- Increased customer satisfaction & customer retention
- Customer care



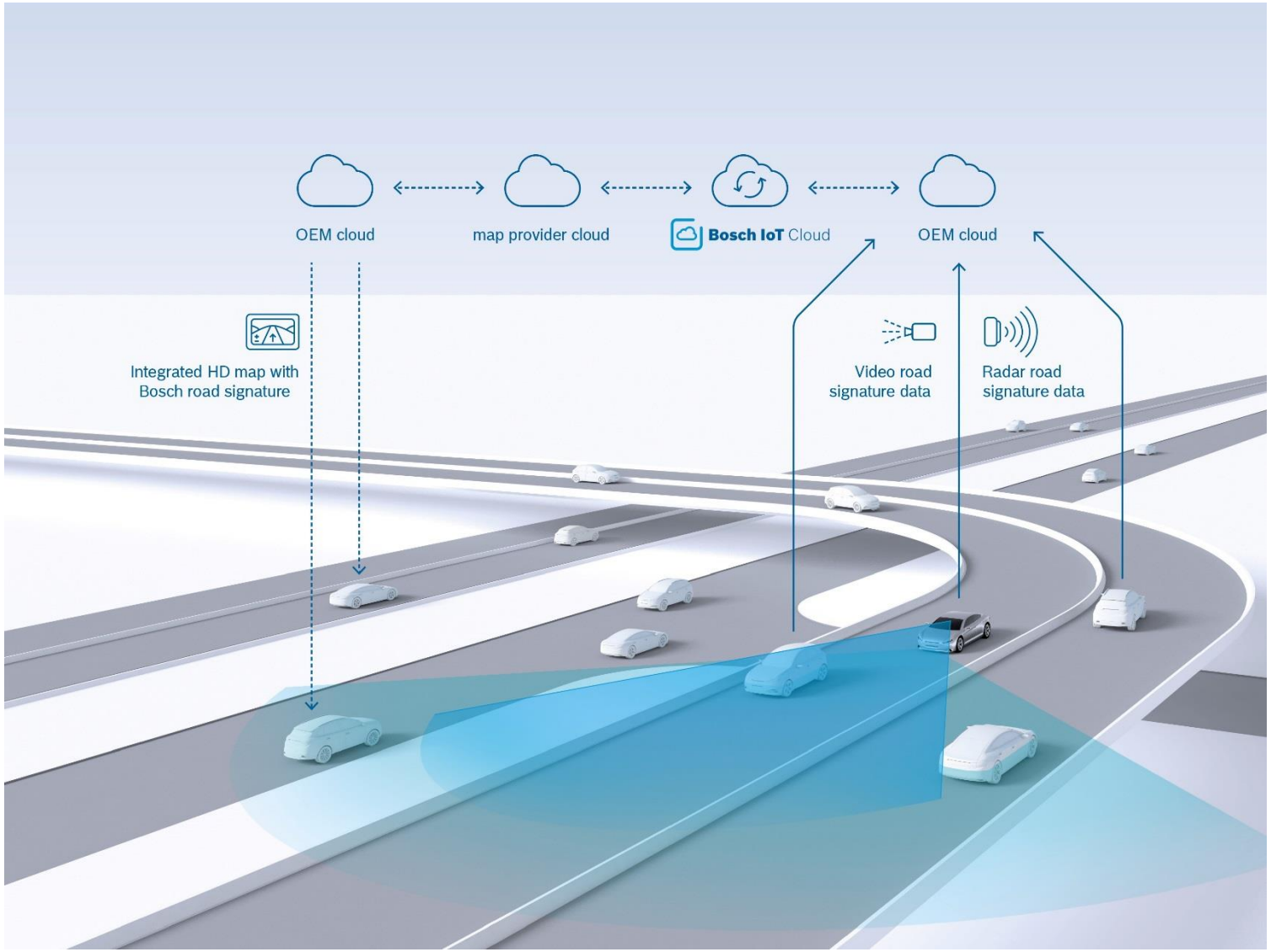


Use Cases
Parking Seekers

- Reduce parking searches by up to **30 minutes**
- ~ **4.5 km saved** per parking search
- Up to **500 euros** less cost each year



Use Cases
Map Services



TECHNOLOGY

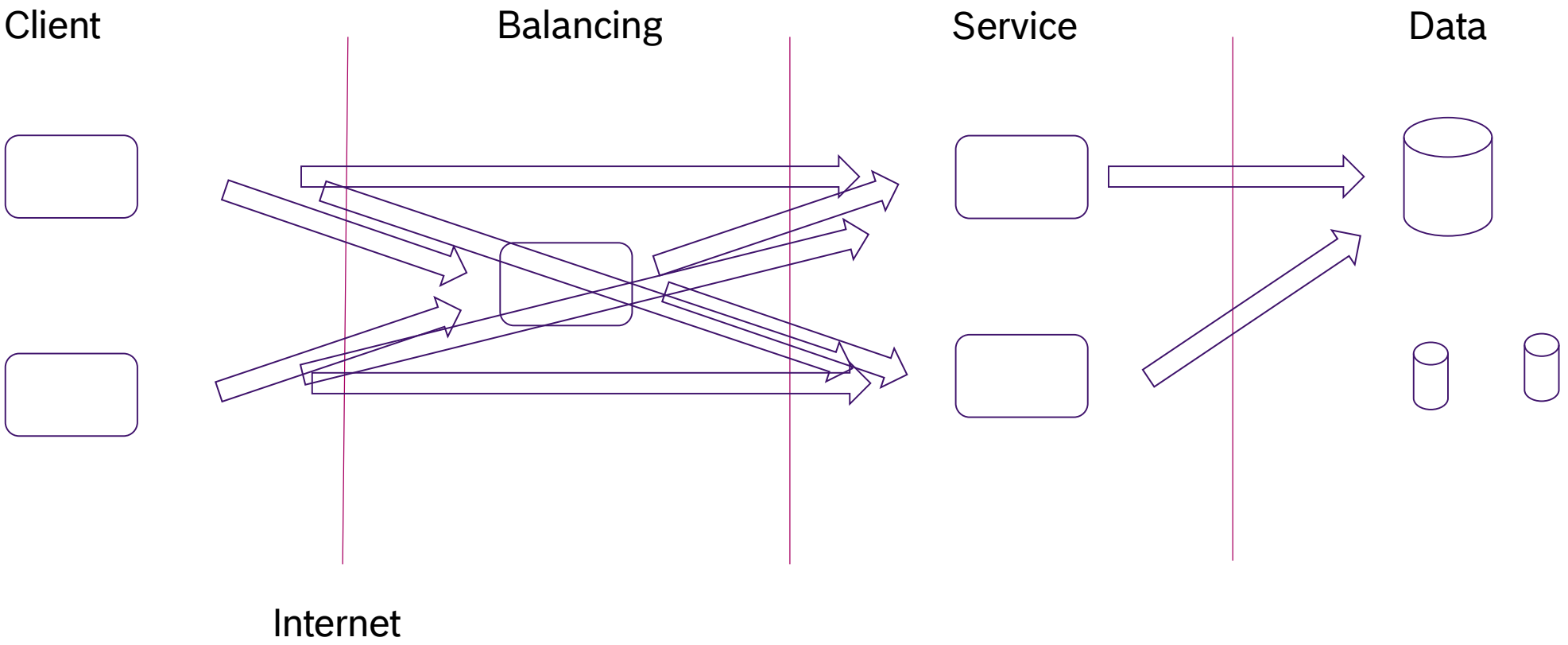
BOSCH

Technology
Means of communication

Protocol	Pros	Cons
Satellite (Iridium)	• Available anywhere sky is visible	• Extremely expensive
Mobile Technology (GSM/3G/4G, etc.)	• Stable connection • Universal compatibility	• No direct communication • High cost • High power consumption
LPWA (LoRa, NBIoT)	• Stable connection • Wide area • Low energy	• Needs new infrastructure
WiFi	• Universal compatibility • Affordable	• High power usage • Instability & inconsistency
Radio Frequency (ZigBee, ZWave)	• Low energy	• Not very used anymore
Bluetooth	• Maintained • Widely established & used	• Inconsistency • Security issues
NFC	• Low-speed connection with simple setup • Has a short range & supports encryption	• Short range might not always be feasible

Technology
Server side

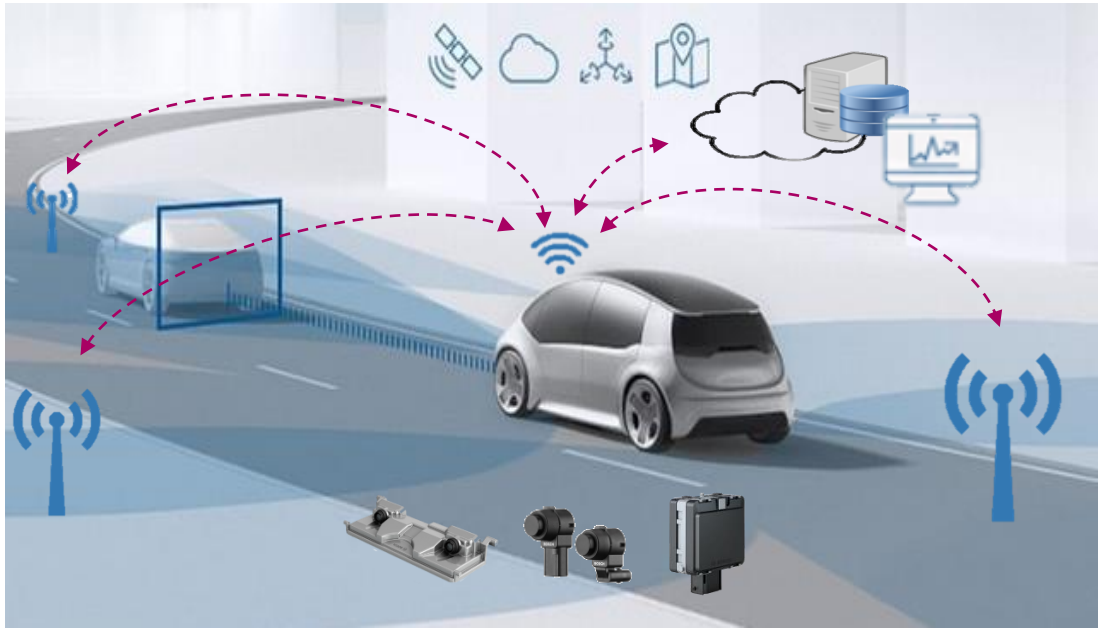
- Device initiated
- High Availability
- Scalability
- Asynchronous
- Distributed



DATA ANALYSIS

Data Analysis
Flow

- Some of the data collected by the car is sent to the cloud constantly
- The data is processed and analyzed
- Based on the data received, multiple use cases appear:
  - Fleet monitor
  - Search through the received data
  - Generate reports
  - Maps services (real time)
  - etc.



Data Analysis
Challenges

Figure 1: "Cloud Security"- D. Flecher
https://twitter.com/gdpr_coalition/status/883271820736122881

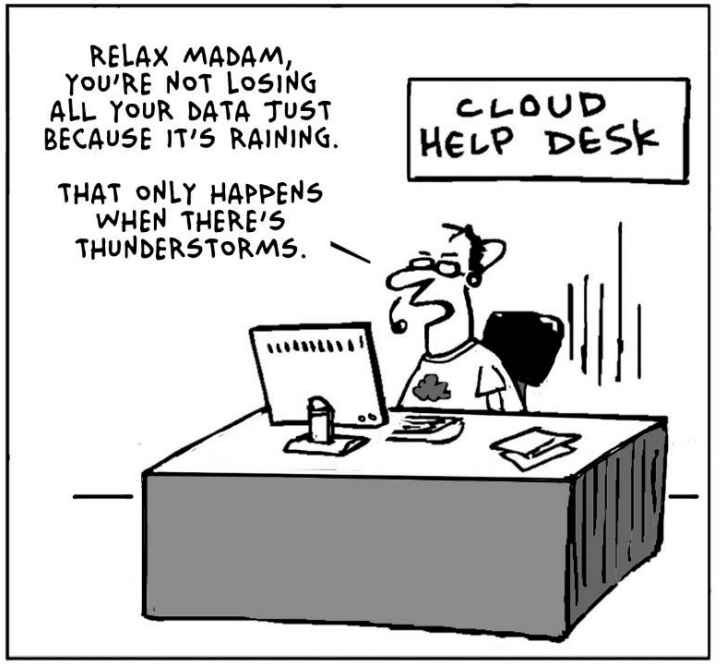


Figure 2: "The Cloud Help Desk"- D. Flecher
https://windowsinstructed.com/weekly-comic-the-cloud-help-desk/

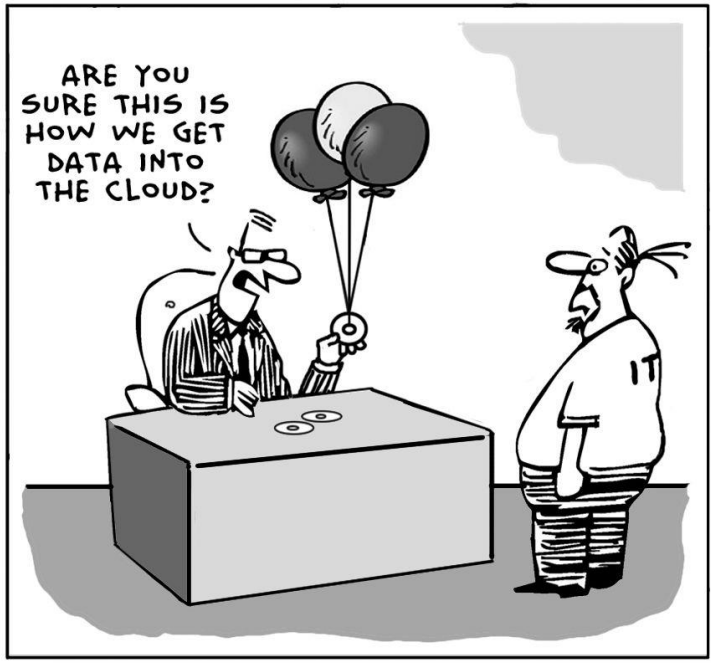
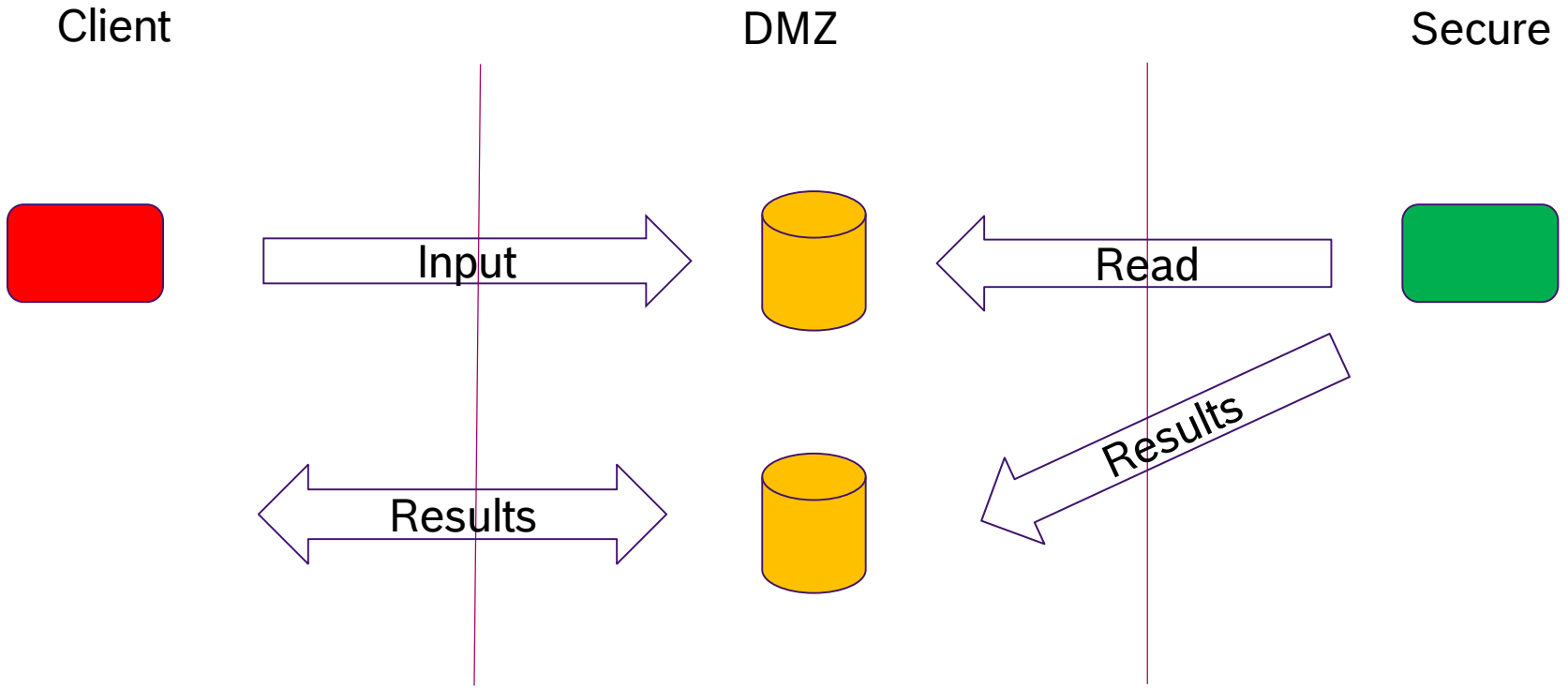
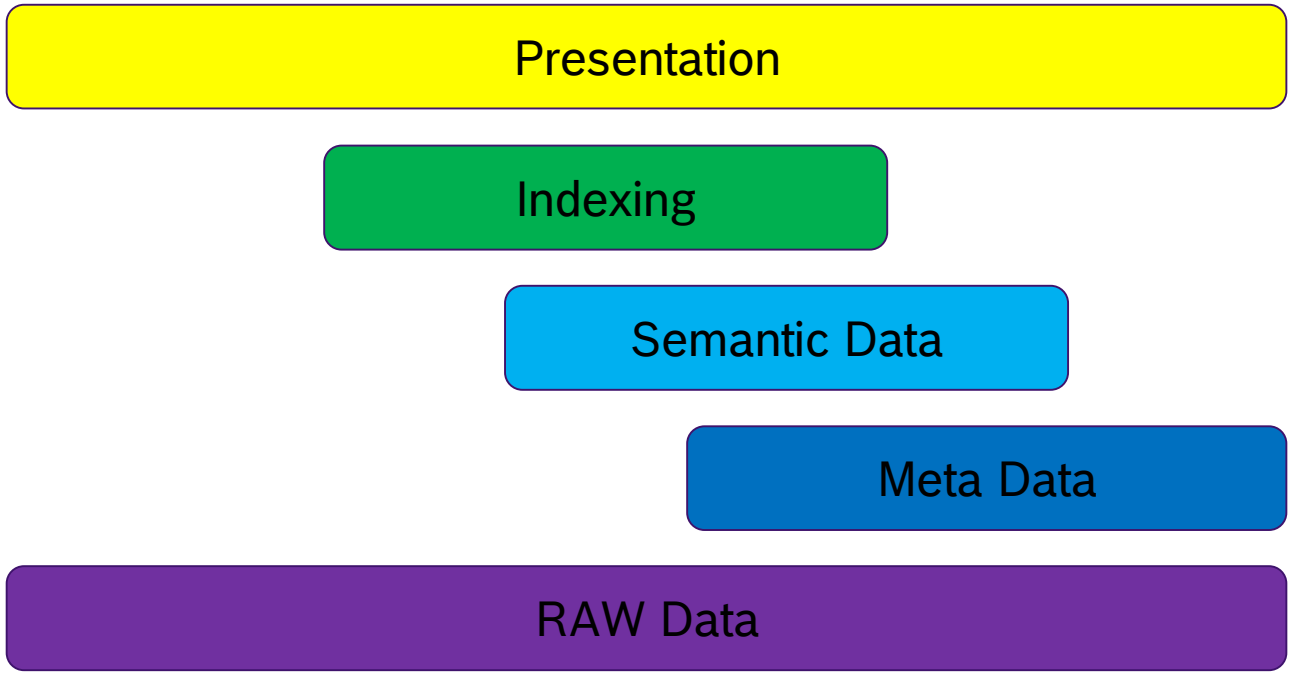


Figure 3: "The Cloud: A Place For You Stuff"- D. Flecher
http://uc3.co/2013/04/the-cloud-a-place-for-your-stuff/

Data Analysis
Challenges

- Security
- Big data management
- Unstable connection
- Sending data
- Fault tolerance





QUESTIONS?