Automotive IoT Discussion

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April 21, 2020

Agenda for Part 1: IoT in the Automotive Industry

- Self intro
- Automotive networking
- Vehicle connectivity to the network
- What's being done with the vehicle data
- Data processing and data rates

My time in the automotive industry

Project Engineer

Worked on consulting projects
Worked on vehicle data buses
Worked on electric cars

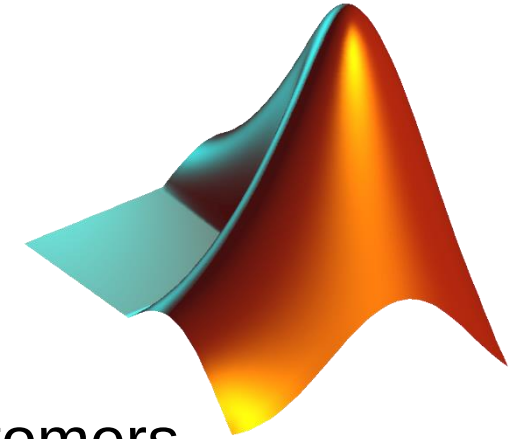
Transmission Control (3 years)

Core software
The software is used in every car but you never get to work in a car

Product team
Touching every part of software

Moving from using engineering tools to making them

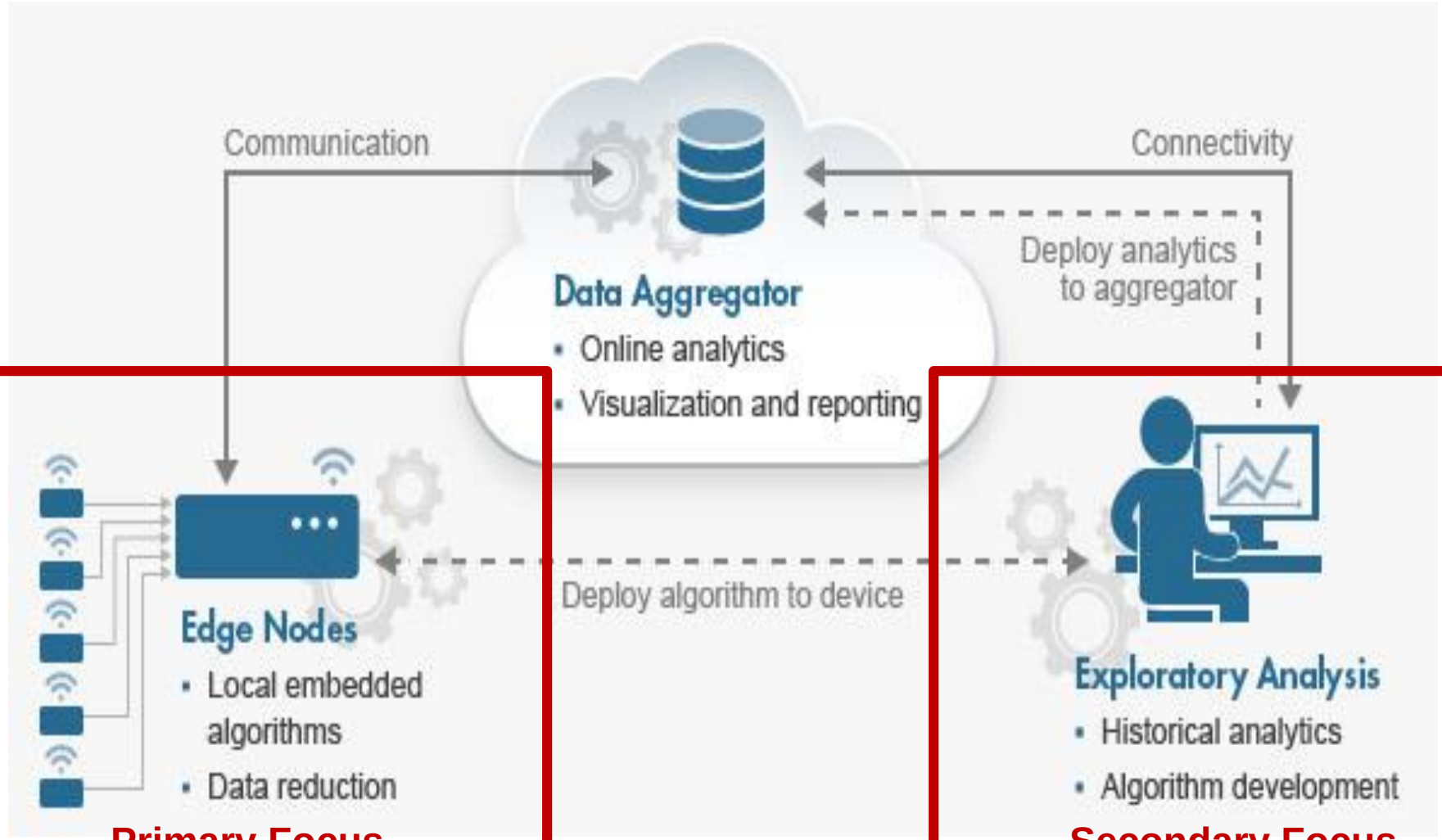
Working on engineering simulators



Member of automotive industry team since 2007

- Industry analysis, technology planning, working with key customers
- Launched new products: vehicle modeling, automated driving

Focuses of the discussion today
based on my knowledge, looking from the vehicle perspective



Automotive networking

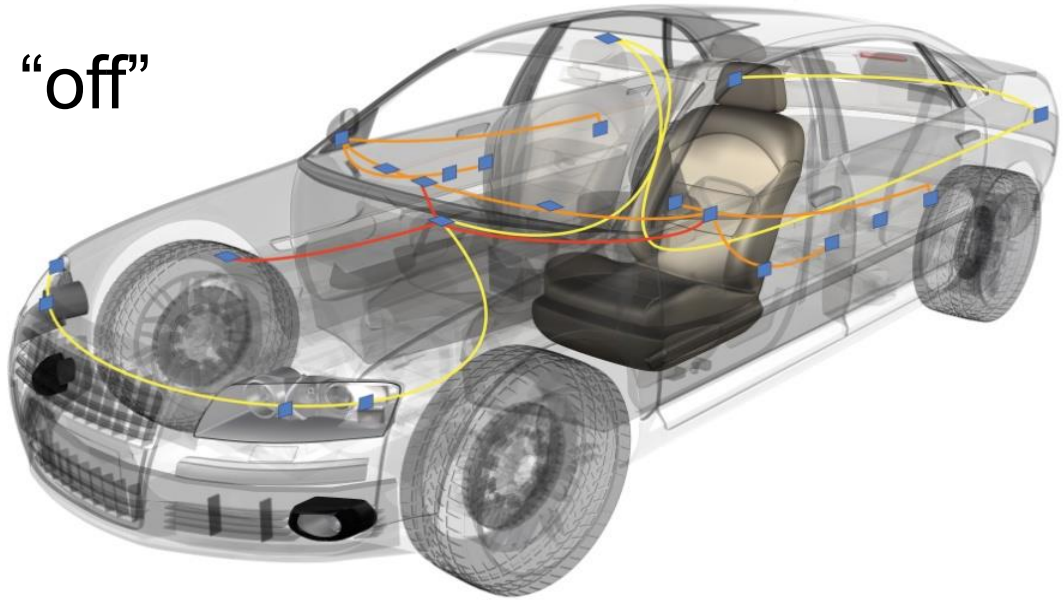
On-vehicle network and off-vehicle network

History: focus going from “off” to “on” to “off”

Driving forces:

- Legislative & emission
- feature & cost
- Technology and business models

Both on & off vehicle networks are critical for IoT



On-vehicle network

How many sensors are there in a car?

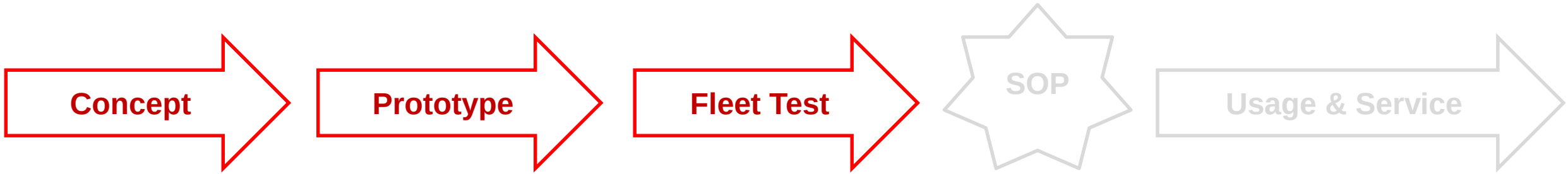
How to shuttle information around: data bus speed, topology and technology

Off-vehicle network

Vehicle connectivity to internet: the driver path and the vehicle path

The “war” between in-car modem and phone

What's being done to the data from vehicles



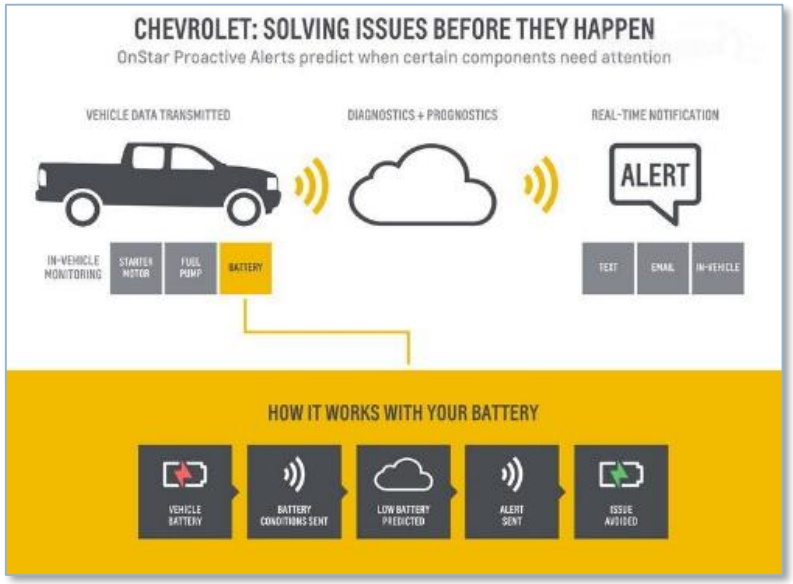
Questions being asked at each phase and relevance to IoT

- Concept: what features do I need to add to this vehicle design
  - Electric vehicle example: size battery based on mission profile
- Prototype: does the feature work, how can I make it better?
  - Focus is often on a single car, but the result applies to millions
  - Automated driving example: making AEB and ACC features robust
- Fleet test: does the feature work at scale - # cars, duration, condition

Data rate and data processing

Engineering IoT Example

Develop New Features

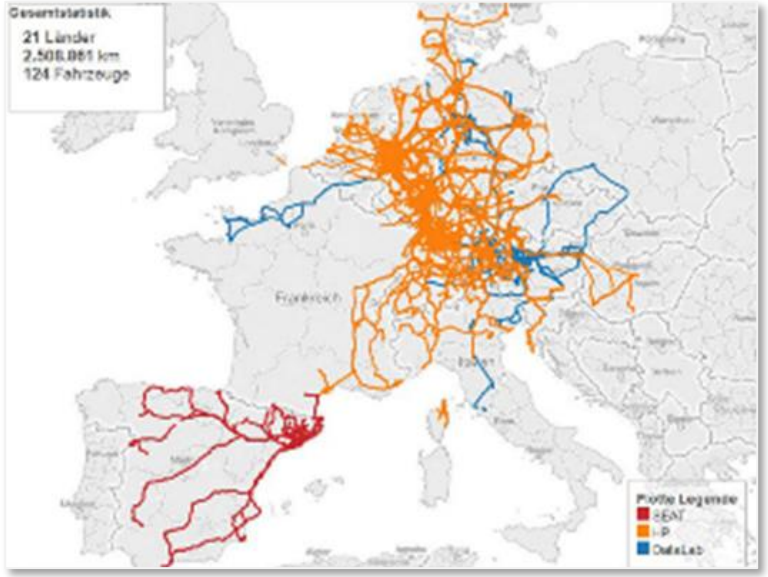


GM
OnStar Prognostics Algorithm Design

Improve Product Robustness

Caterpillar
Autonomous Driving Algorithm Validation

Mine Requirements from Data



VW
Driver Behavior Identification

Caterpillar big data (and IoT) infrastructure for autonomous driving design and verification

Challenge

We Were Spending
Too Much Time
On Ground Truth
and Managing Training and Testing Data

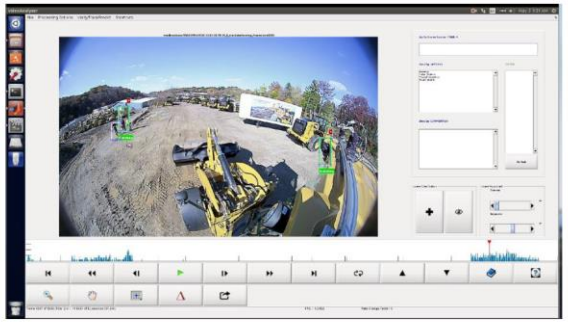
CATERPILLAR®

Caterpillar Big Data Infrastructure

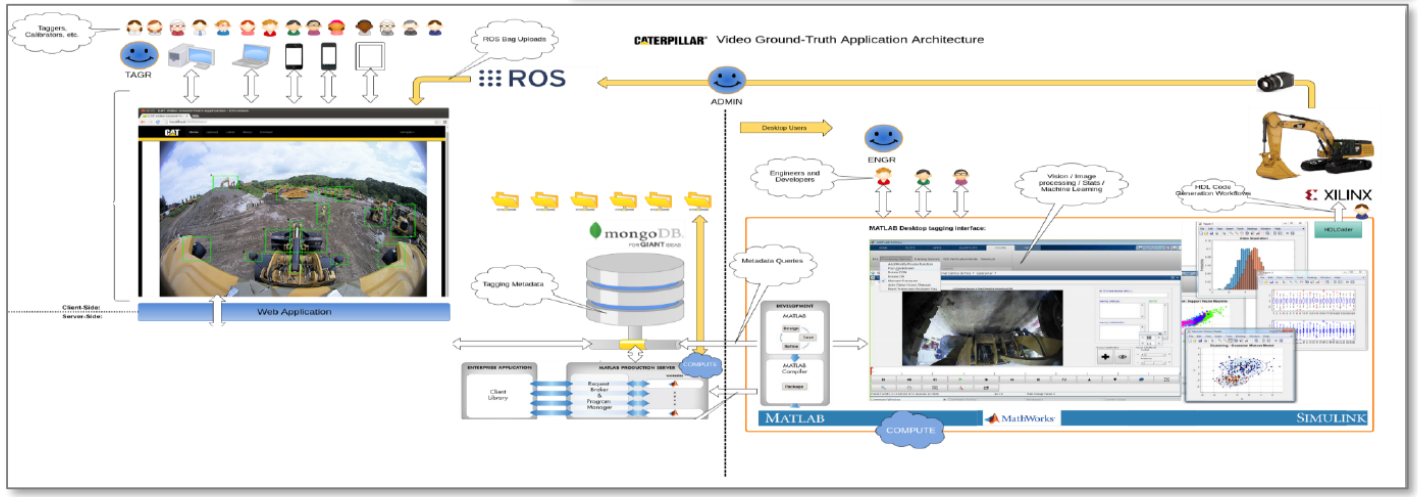
Big Data, Data Analytics, and Machine Learning

Solution

Automatic Labeling of Data



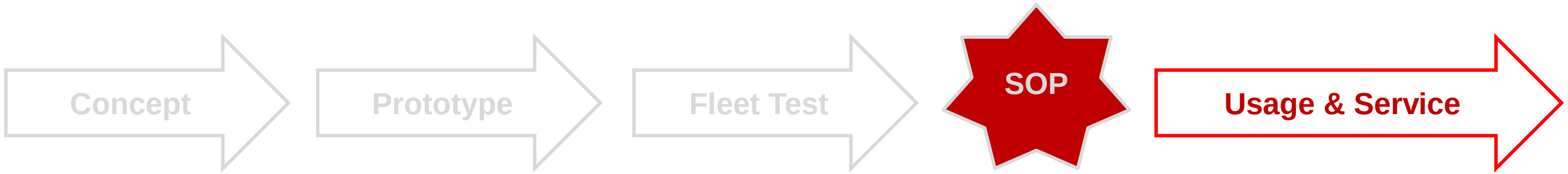
Automate labeling



Crowdsource label verification

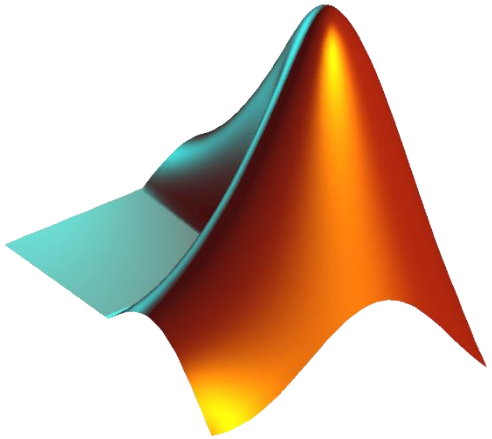
Workflow from data collection to algorithm implementation

What's being done to the data from vehicles



- Emerging area with many opportunities
- Engineering (and potentially compliance) applications: "flight recording"
- Operator centric features: routing, alerts, V2x based driver assistance
- Owner centric features: predictive maintenance

Thank you for your attention!



Questions?