IOT BZH

From Sensor to Cloud
Automotive Architecture

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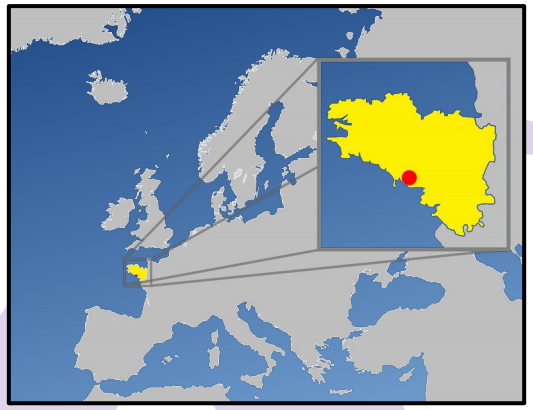
Who Are We ?

- 2nd contributor to AGL *(Automotive Grade Linux)*
- Work in Open http://github.com/iotbzh
- Based in South Brittany



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Lead Architect

Stéphane Desneux
Release Engineer

Manuel Bachmann
Graphic/Multimedia

Yannick Gicquel
Kernel & QA

José Bollo
Security

A Fast Moving Target

Fast Moving Market
- 100% of cars connected by 2025
- 75% of cars autonomous by 2035

Fast Moving Technologies
- Today 60-80 ECU is not uncommon
- Grouping by function already started

Opening to the outside world
- Connection with the cloud
- Connection with smart city
- Connection with near by vehicles

Lot money on the table
- 20 million of connected cars by 2020
- Prevision added $152B to car market in 2020

Customer Perceptions

Widely Unaware

- 86% have no or very little idea about what a connected car could be.

Very Conventional Desires

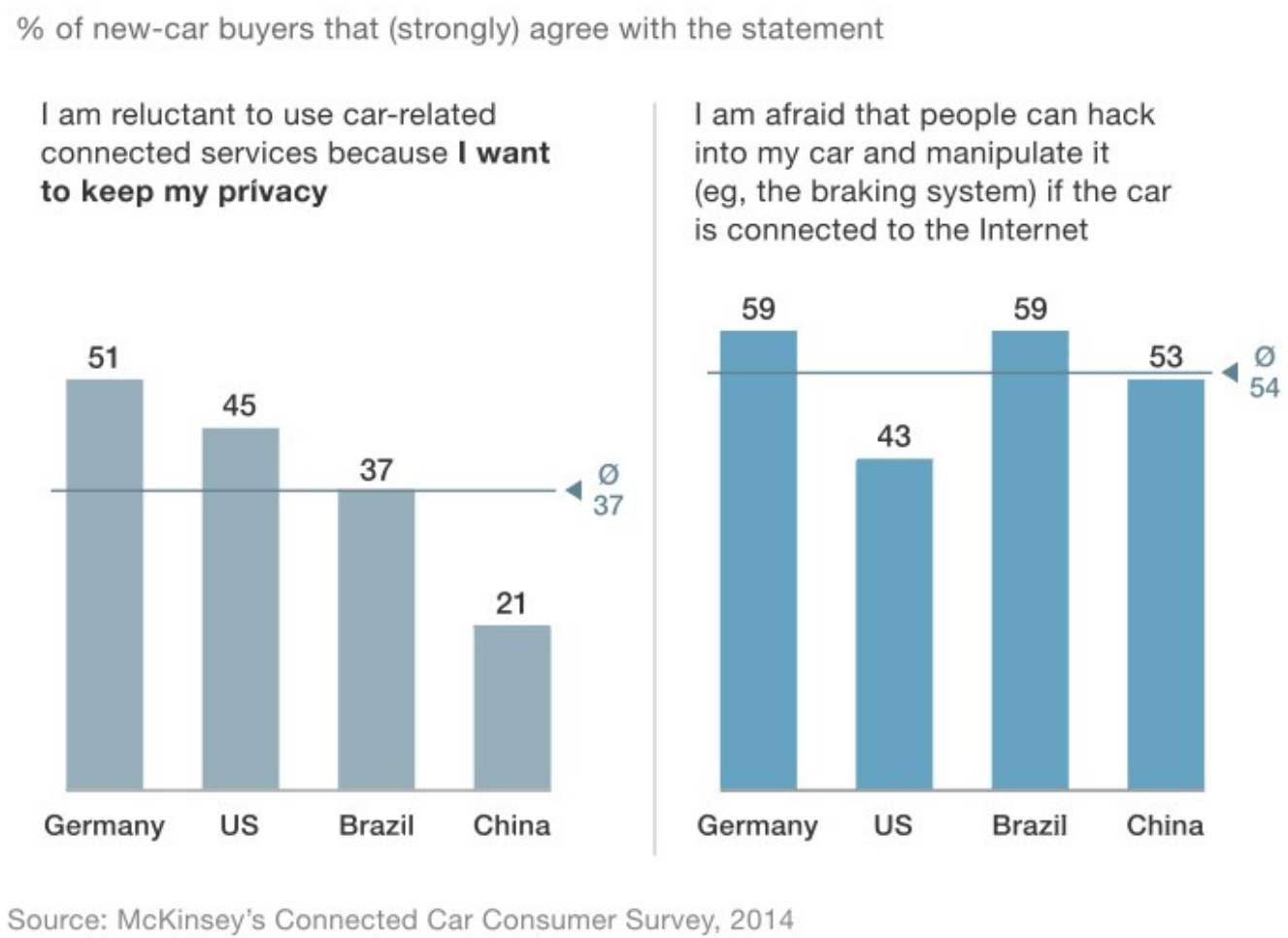
- 1st Streaming music and Internet access
- 2nd Traffic info
- 3rd Security helpers (collision warning, night vision, Fatigue warning,…)

Nevertheless:

- 28% of new cars buyers prioritize car connectivity features over other features such as engine power or fuel efficiency.
- 13% would not even buy a car, if is was not connected.

Customer Fears

What could make then renounce to connected cars



Source: McKinsey's Connected Car Consumer Survey, 2014

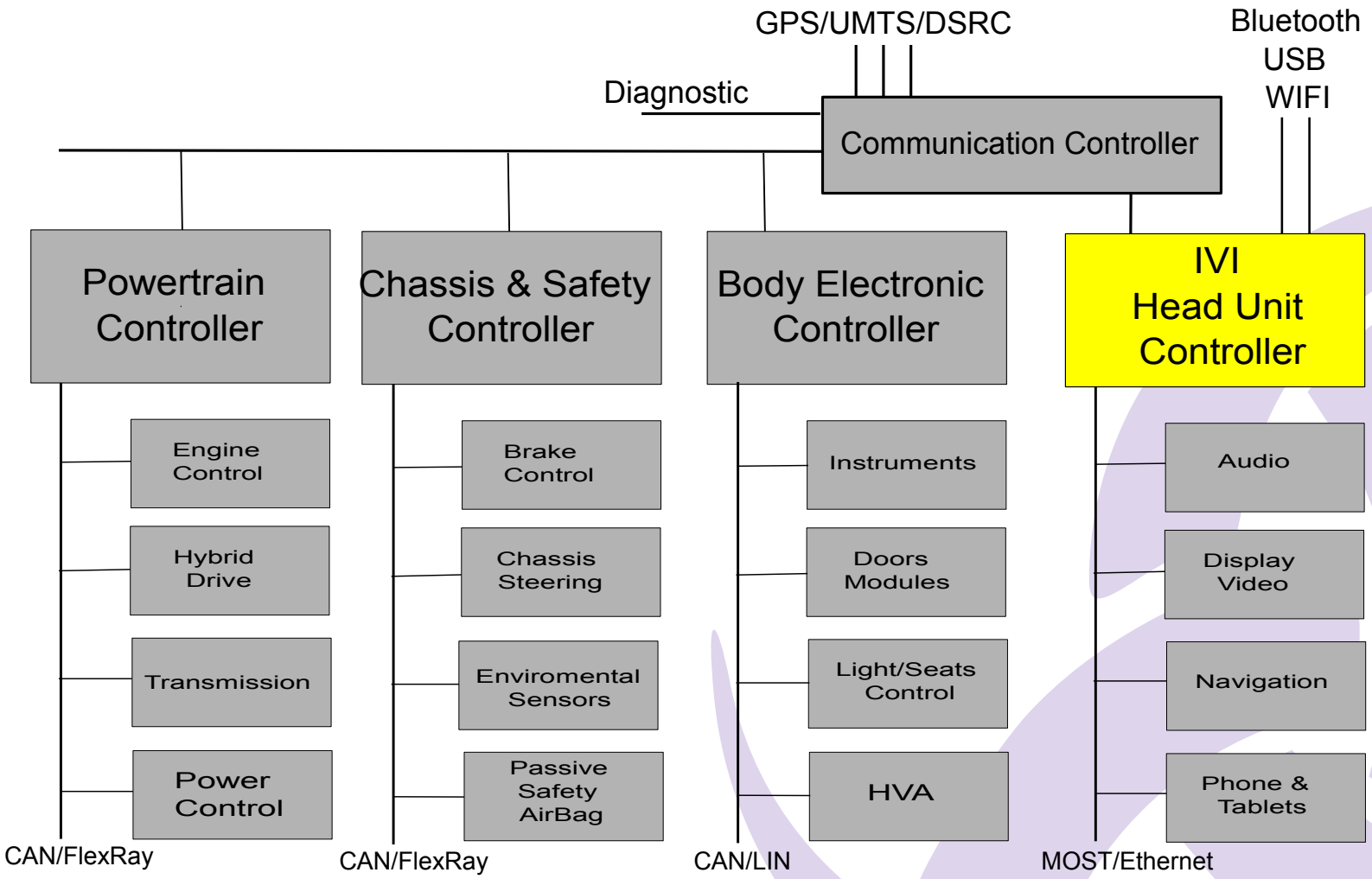
Many Open Challenges

- Mostly an Unknown World
  - New Technologies
  - New End-User Behaviours
  - New Surface of Attacks
- Electronic move much faster than Mechanic
  - How to deal with very long term maintenance
  - How to comply with 3/5 years car design cycles
- Business Model still to be invented
  - Any revolution has winner and looser

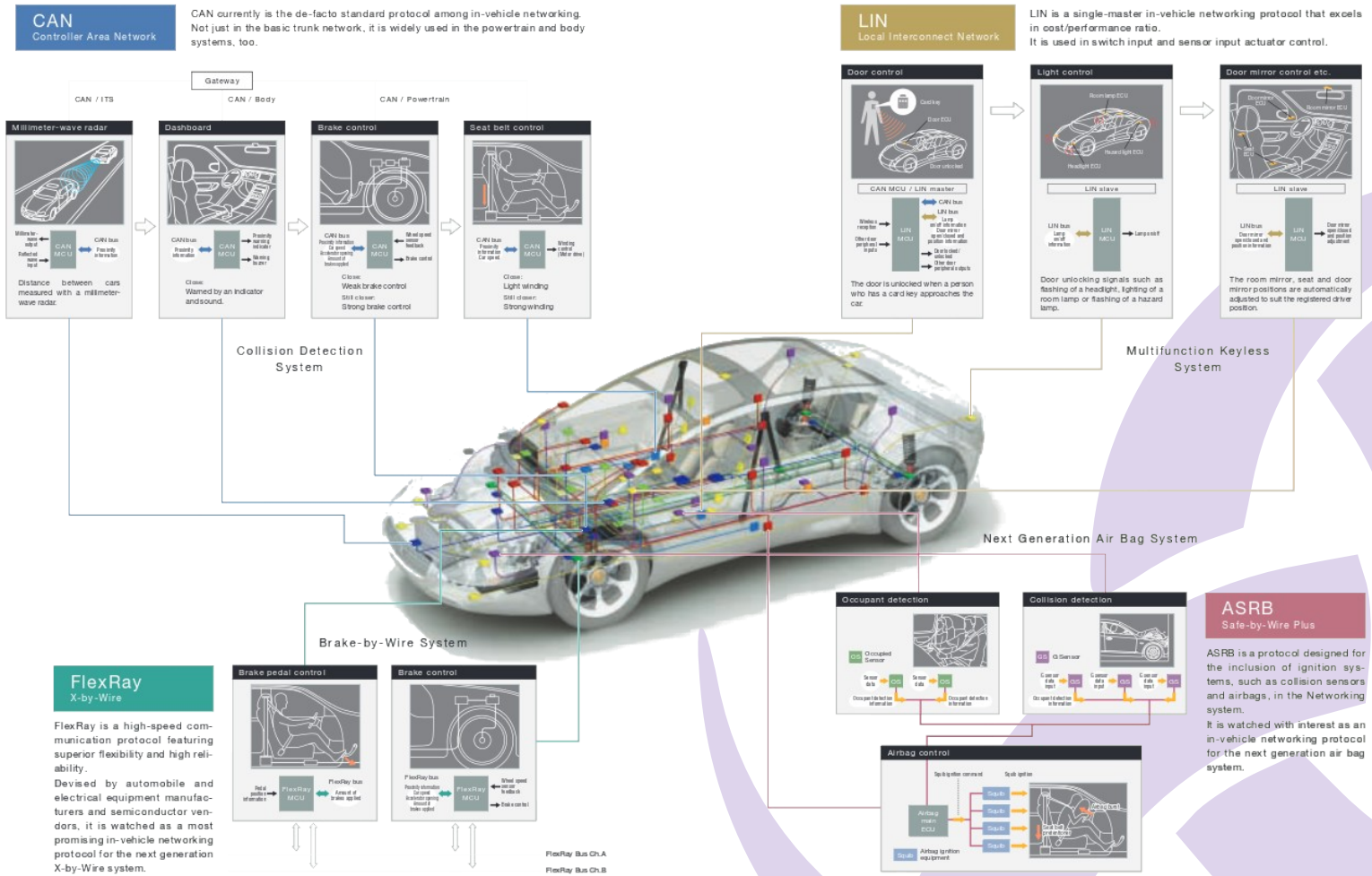
Key Building Blocks

- Entertainment
  - Streaming Music
  - News services
  - Games
- Mobility management
  - Traffic info
  - Parking assistance
- Vehicle Management
  - Remote operations
  - Data usage
  - Usage supervision
- Driver assistance
  - Autopilot in traffic
  - Parking
  - Full efficiency
- Safety
  - Collision prevention
  - Hazard warning
  - Emergency functions
- Communication
  - Hands-Free Calling
  - Text to Speech
  - WLAN, Wifi HotSpot

Typical Today Car Network

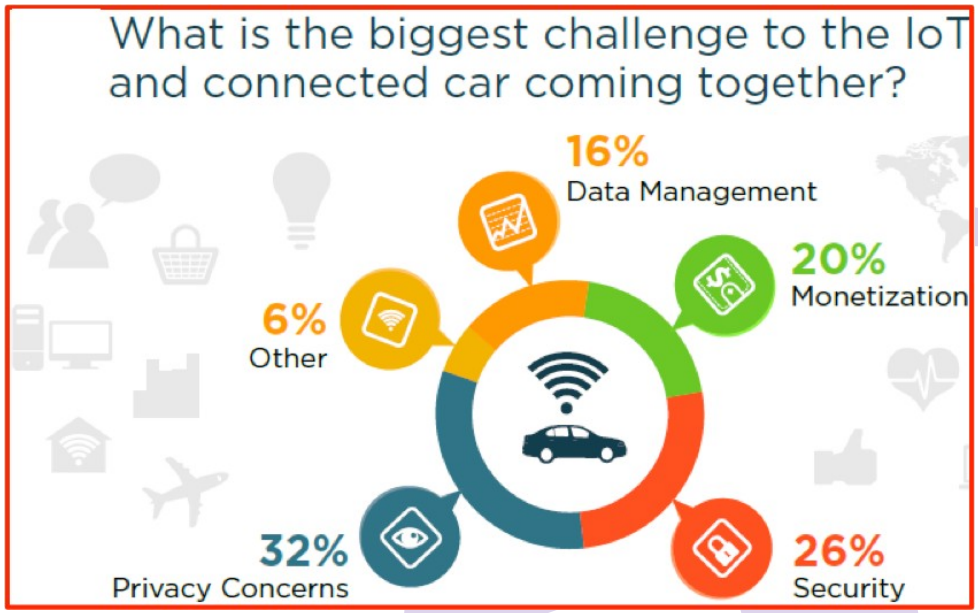


Not Complex enough
Let's add Internet Connectivity



Management Top Challenges

- Security
  - Reduction of surface of attack
  - Isolation by class of services
  - On line update
- Privacy
  - Who collects/owns the user data
  - How to control the personal data
- Business Model
  - Who pays for maintenance
  - How new services are funded
  - Which “non automotive” services will really provide value to end-users

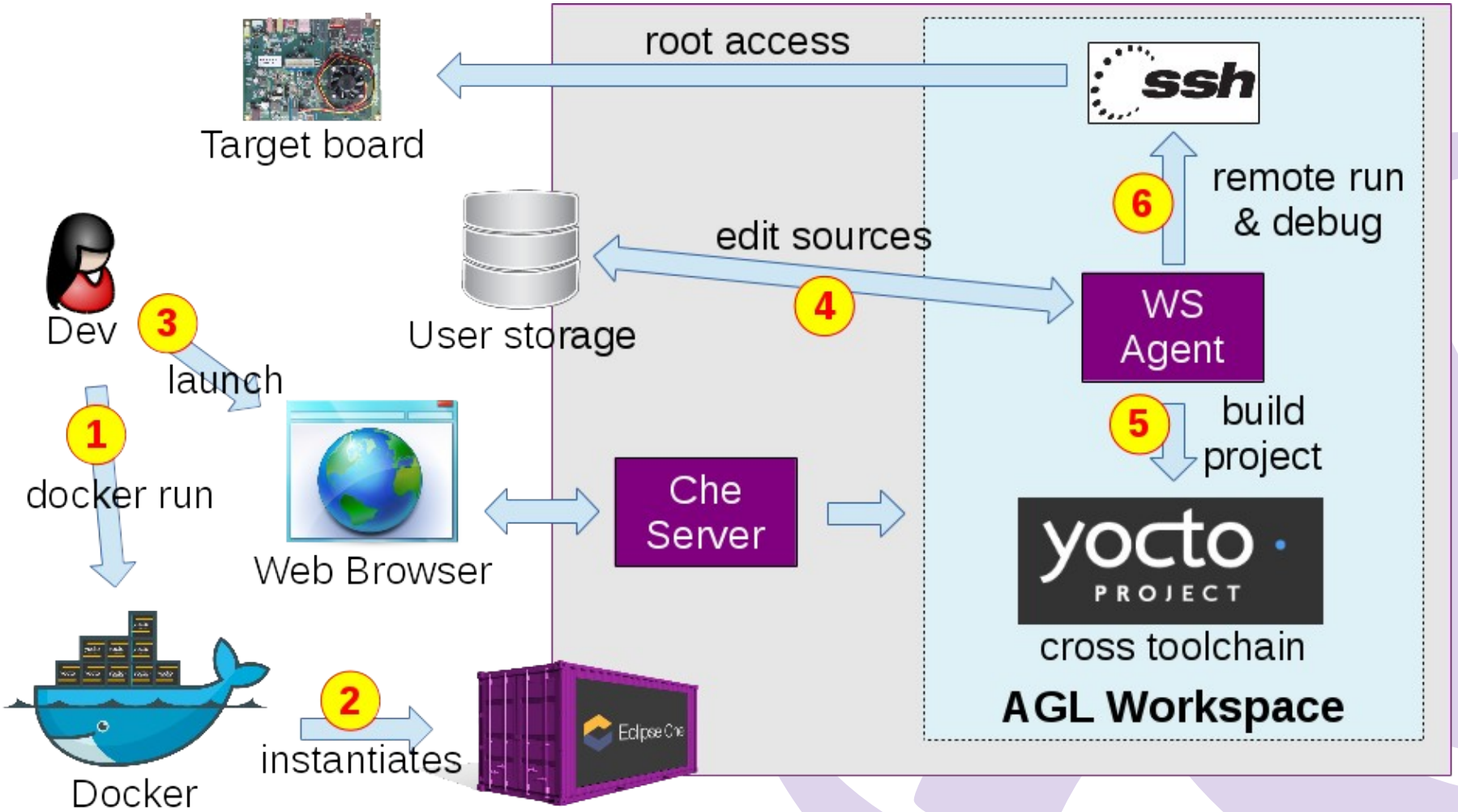


Top Technical Challenges

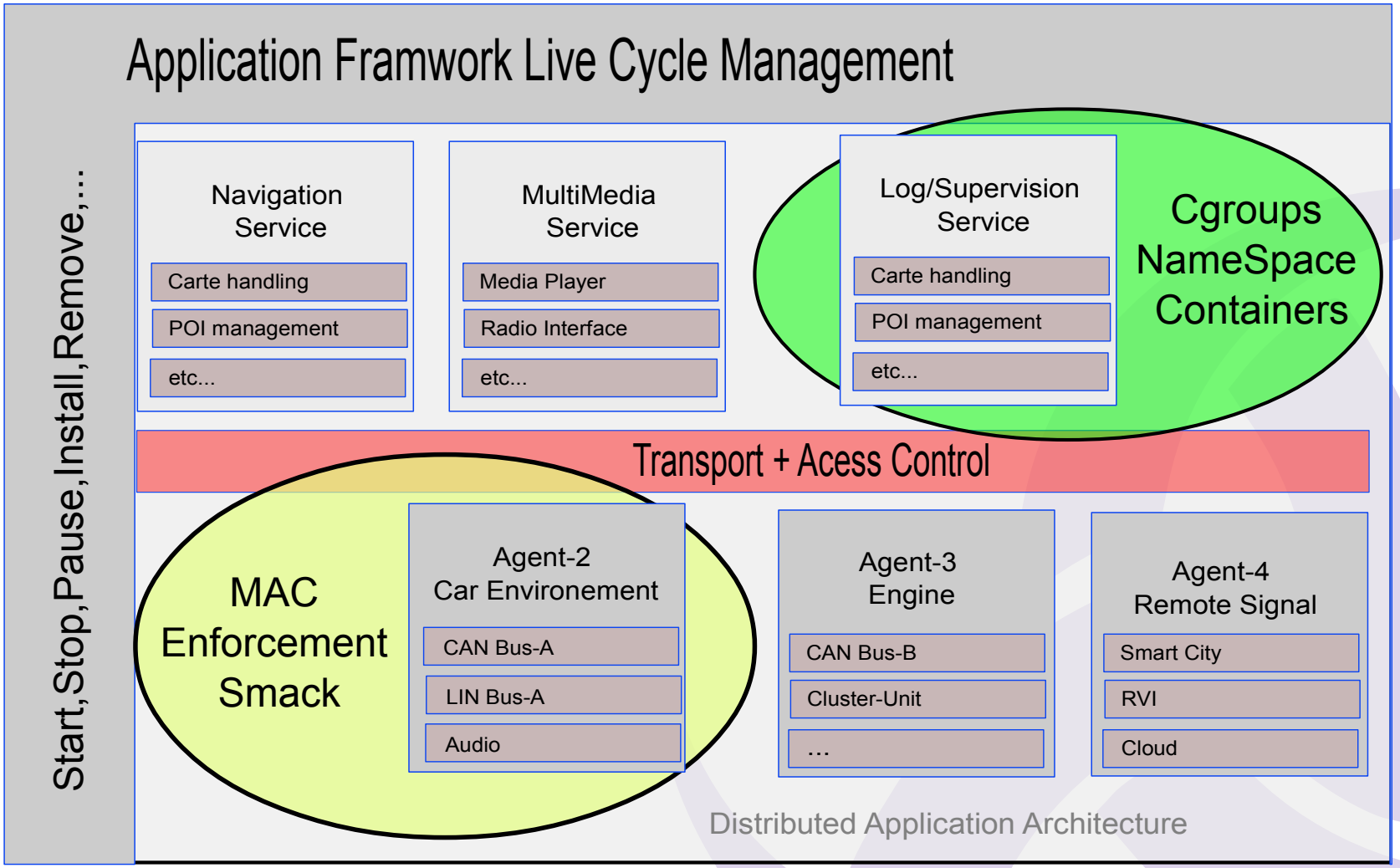
- Win Developer Community
  - Reduce the initial cost of adoption
  - Provide stable APIs & adequate documentation
  - Provide ready-to-go BSP with cheap development boards
- Reduce the overall complexity
  - Agree on a common AGL apps model
  - Agree on a set of core “mandatory” services & APIs
  - Limit the number of ECUs with hypervision
  - Leverage Internet existing technologies (oAuth2, OpenAPI, ...)
- Mitigate fast moving and long term maintenance
- Interface smartly with cloud services
- Reduce Cost

Developing a CAR application should not be more complex than developing for a Mobile Phone.

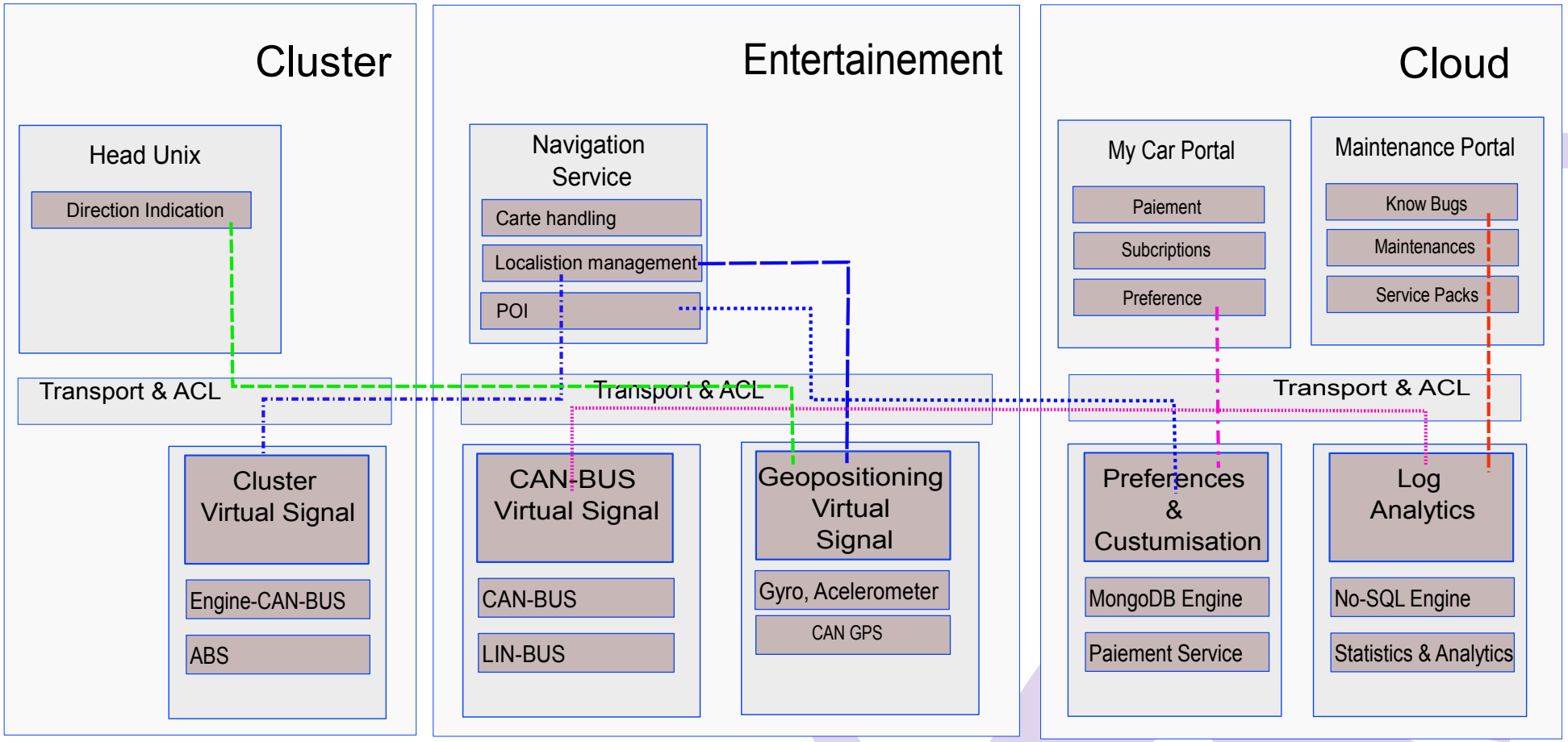
SDK for AGL & Applications



AGL Application Generic Model



Natively Distributed Architecture



Multi ECU & Cloud Aware Architecture

Virtualized Secure Architecture

Less Privileges

More Privileges

DomU Entertainment

Container

AGL App-1

AGL App-2

AGL App-3

AGL Extra Middleware

AGL Core Plateform Services

AGL Linux Kernel Guest Operating

DomU Cluster

App-1

App-2

AGL Mini Plateform Services

Linux-RT/Microkernel Guest Operating

DOM0 controller

Ressources Alloc/Porxy

Emergency Services

Diagnistics

AGL Linux Supervisor

Trusted Apps

PKI safe Store

Integrety control

Trusted Zone

Trusted Boot

Virt GPU

Virt Audio

Virt GPU

Virt Audio

Hypervisor

Hardware

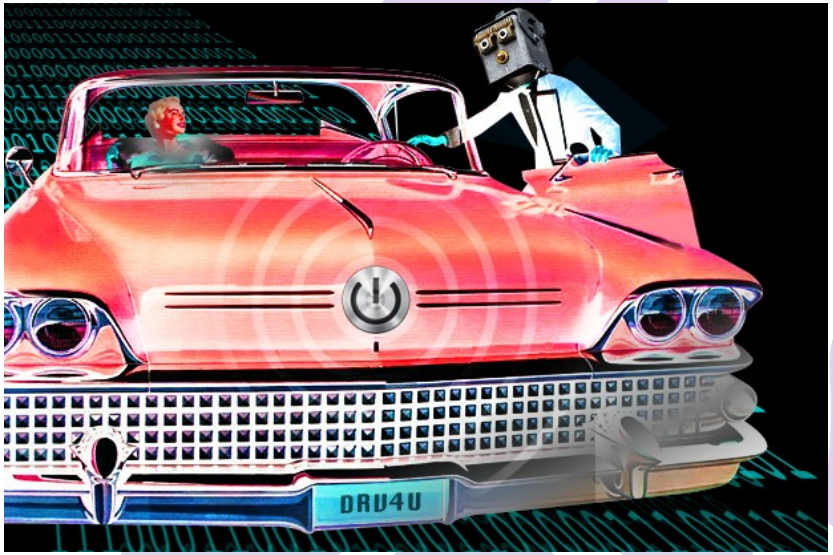
Virtualized Secure Architecture

On the Air Update

- Mandatory to secure the system
- Should imply trusted zone for integrity
- Should support partial update as well as factory reset
- Might run from Guest-OS, Dom0 or may be from trusted zone
- Should be fully integrated with Yocto
- Should separate platform services from applications

A Long To Do List

- Lack of Standardisation
  - Common Automotive Application/Service APIs
  - Standardize Vehicle to Vehicle protocols
  - Interface with the rest of the IoT world (smart city, smart home, …)
- Security
  - Fail safe architecture
  - Interface with the external world
  - Dealing with 3rd party providers
  - Long term update and maintenance
- Contractual
  - Existing and new to come legal constraints
  - Business model and revenue sharing
  - New customers behaviour as car sharing
  - End user data control/ownership



Last but not least: be ready for “Autonomous Cars”

Further Information

- http://iot.bzh/publications
- http://github.com/iotbzh
- https://www.automotivelinux.org/