When SDV meets reality

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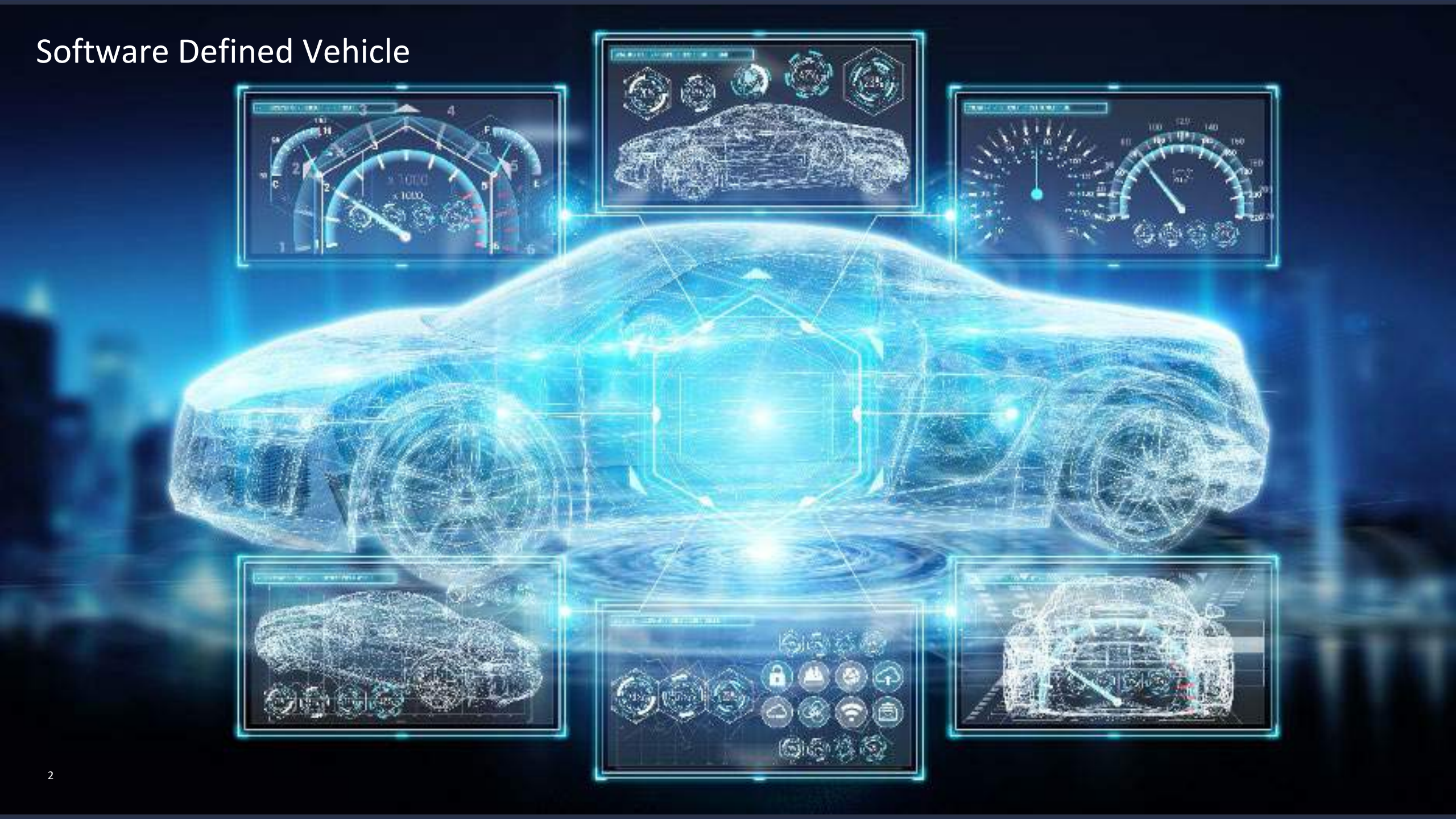
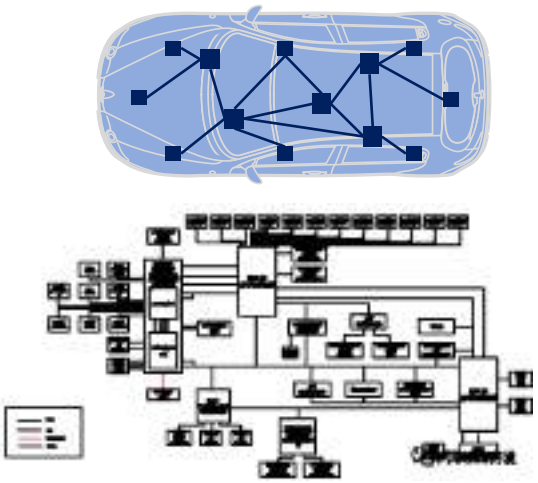
AutoCore.ai

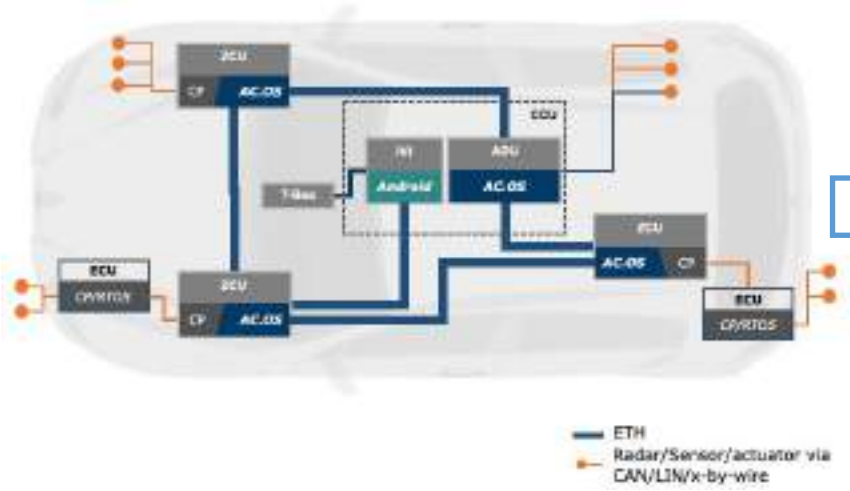
Software Defined Vehicle



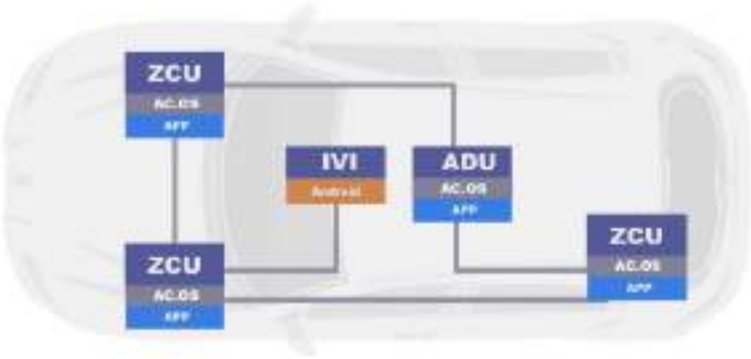
E/E Architecture Evolution

Traditional EE Architecture





Zonal Centralised Computing EEA



What we think we are getting

- **Personalised** experiences for every car owner

- Fully programmable vehicle and always **new**

- **Faster product development cycle**

- **New revenue streams for OEMs**

What we are really getting

- **Personalised experiences is very Difficult**

- **Update and Upgrade is prone to Error**

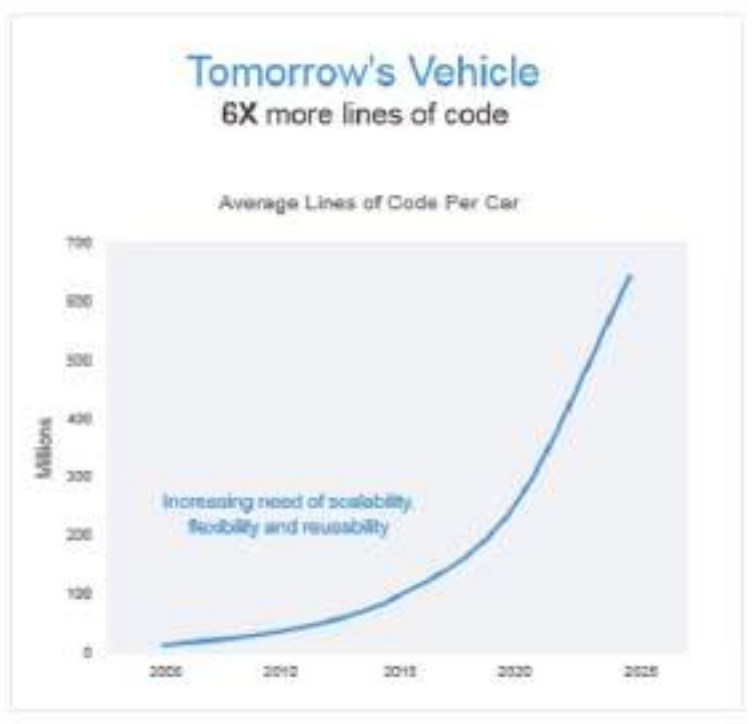
- **Delayed product launch due to software**

- **Additional Revenue streams yet to be seen**

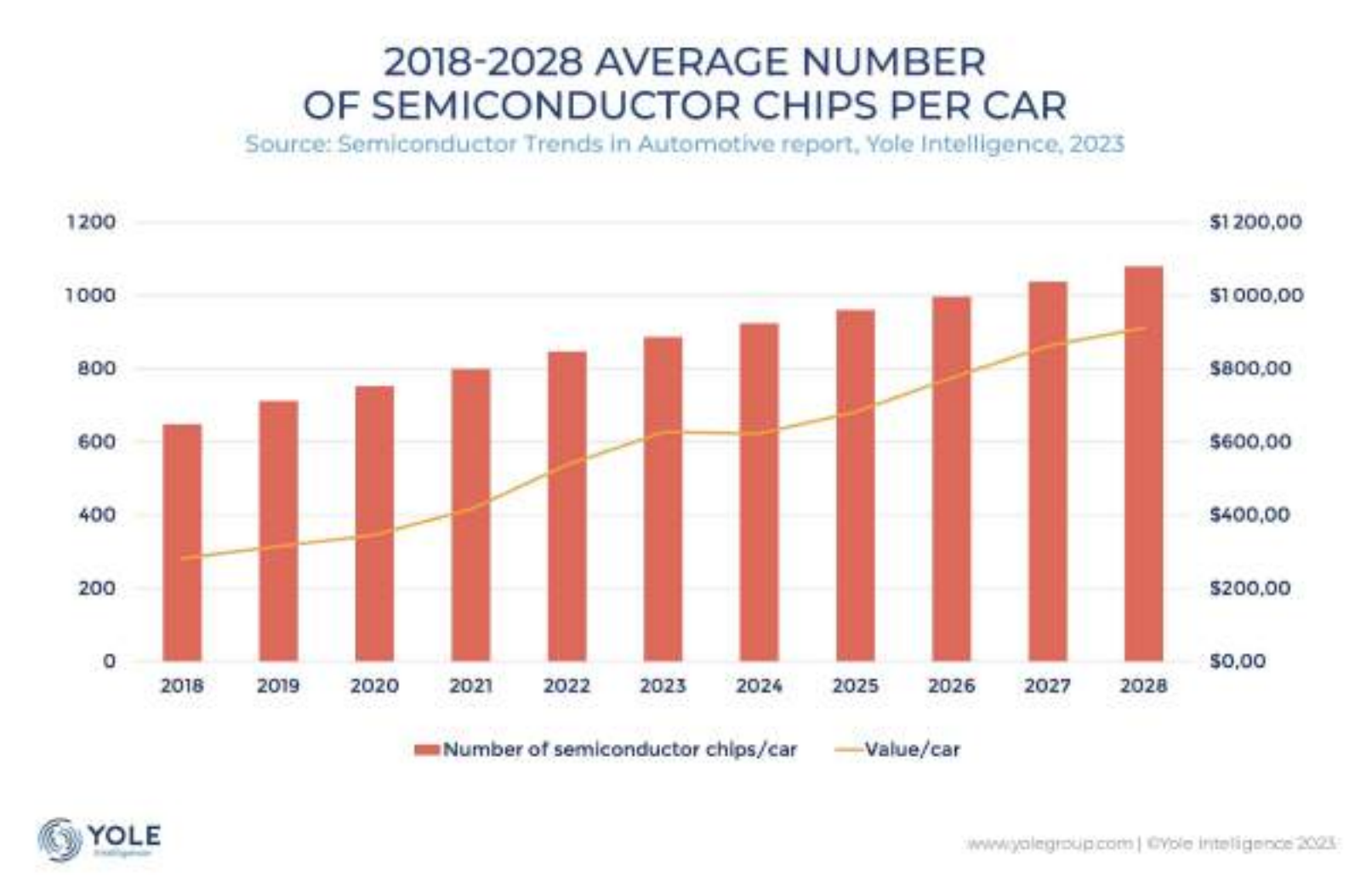
- **Pushbacks from supply chains**


SDV
SDV
SDV
SOFTWARE-DEFINED VEHICLES

Reality Check



* Credit - NXP



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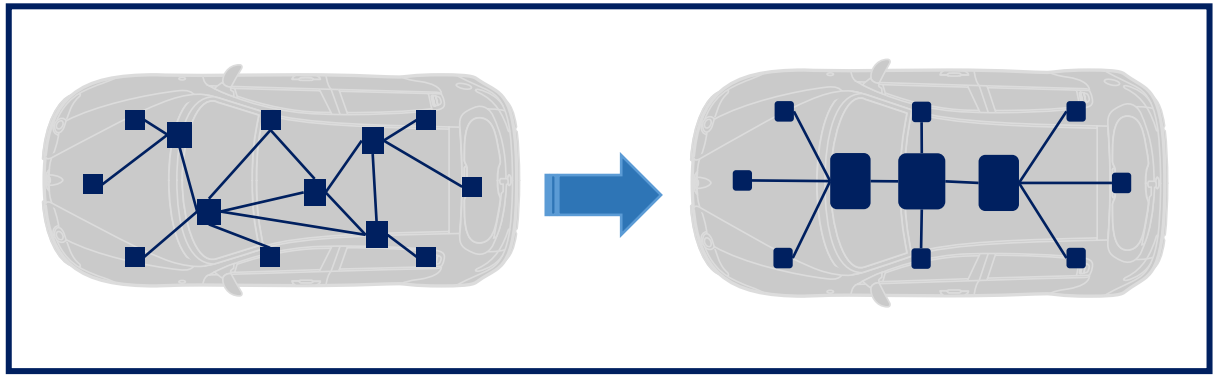
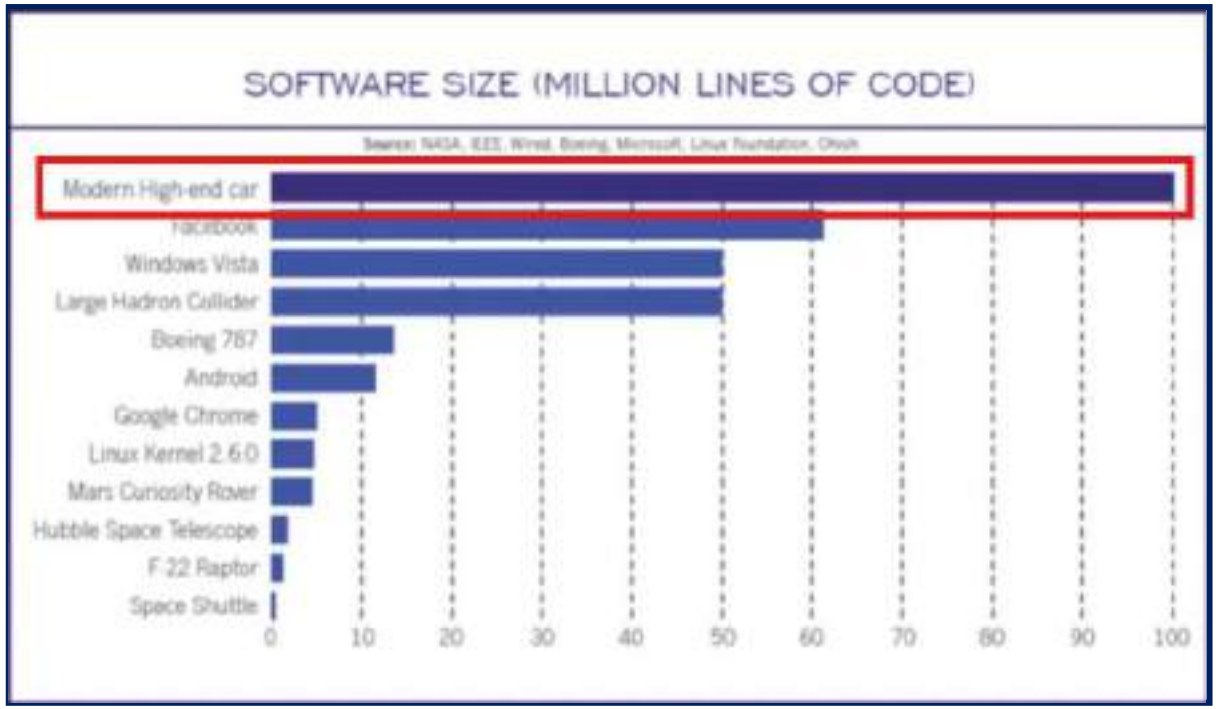
Dilemmas

- Reduction of hardware vs increase software complexity
- Mix-criticality workloads share same hardware platforms
- Security and Safety needs to be the first and last line of defence
- Domain fusion or not?
- Standardization vs customisation
- Determinism across entire vehicle, multiple ECUs
- Is non-connected vehicle still a vehicle?
- How/What/When/Where to update?

TCO challenge due to E/E architecture evolution



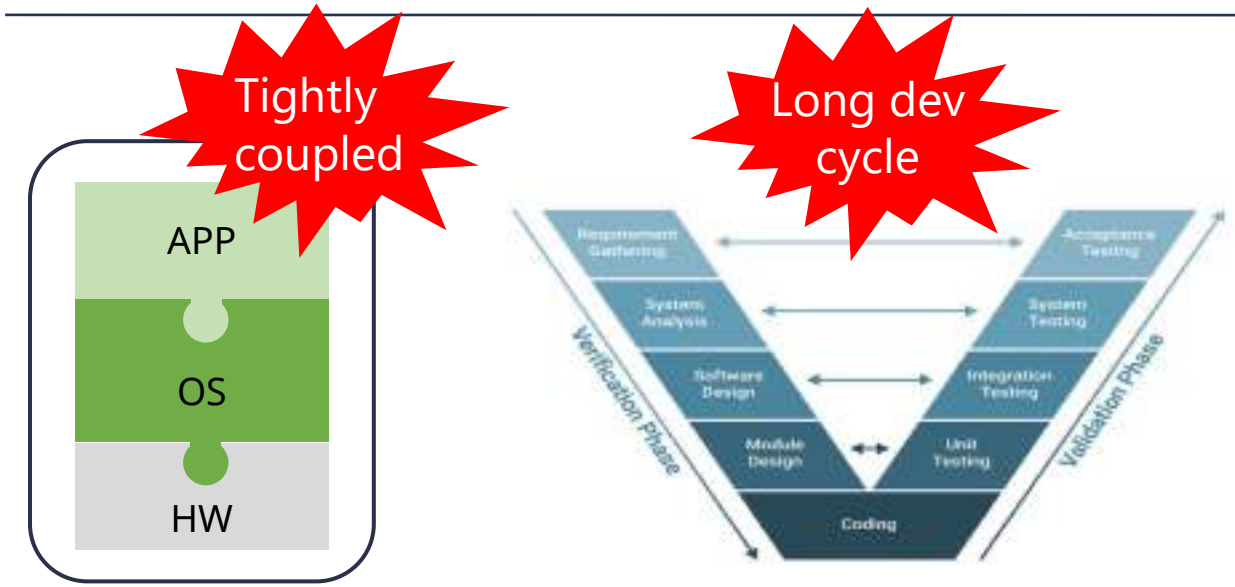


Reduced HW Cost

TCO=$$$?

Increased SW Cost

Heterogeneous Distributed Network

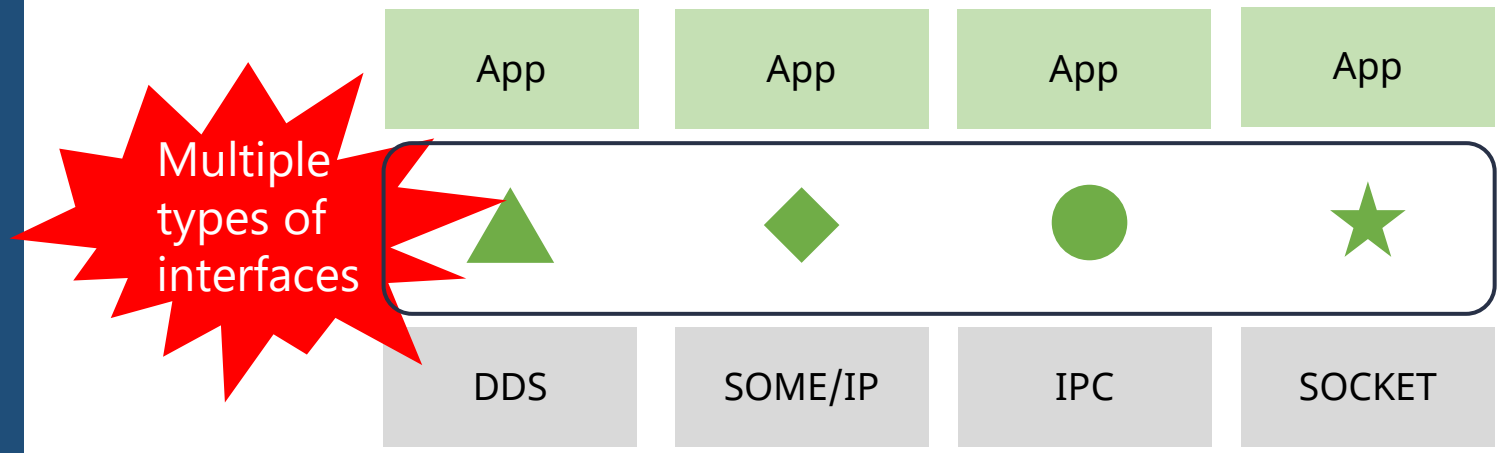


#1 – Tightly coupled SW/HW which leads to:

- Increased development **cost** due to difficult to reuse SW modules
- Increased **Time-to-Market** due to legacy waterfall fashion v-model process

#2 – Heterogeneous systems interconnection which leads to:

- Increased development **complexity** due to multiple types of interface
- Unpredictable **integration risks** due to interoperability issues



From Signal to Service Oriented Architecture

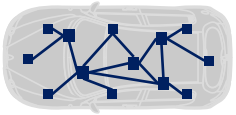
- Use case study
- Functional requirement & architecture design
- Logical architecture design
- Service design (architecture and interface)
- Sub-system technical specification (SSTS)
- Support multiple domains design or their integration on HPC, incl. Body, ADAS, Connectivity and IVI.

Use Case

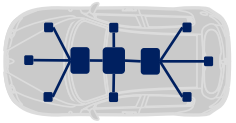
HMI

Function Arch.

Logic Arch.



Legacy Distributed System



Centralized System

Service definition
(single & cross domain)

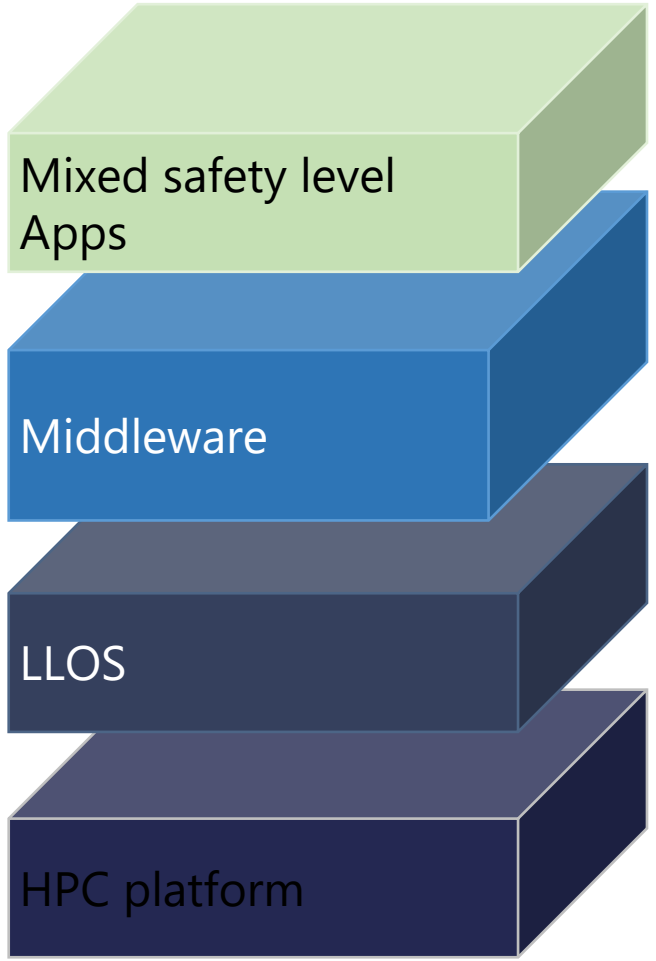
SSTS

Service Arch for multiple-domain integration

Safety challenges – Evolved E/E & SW architecture

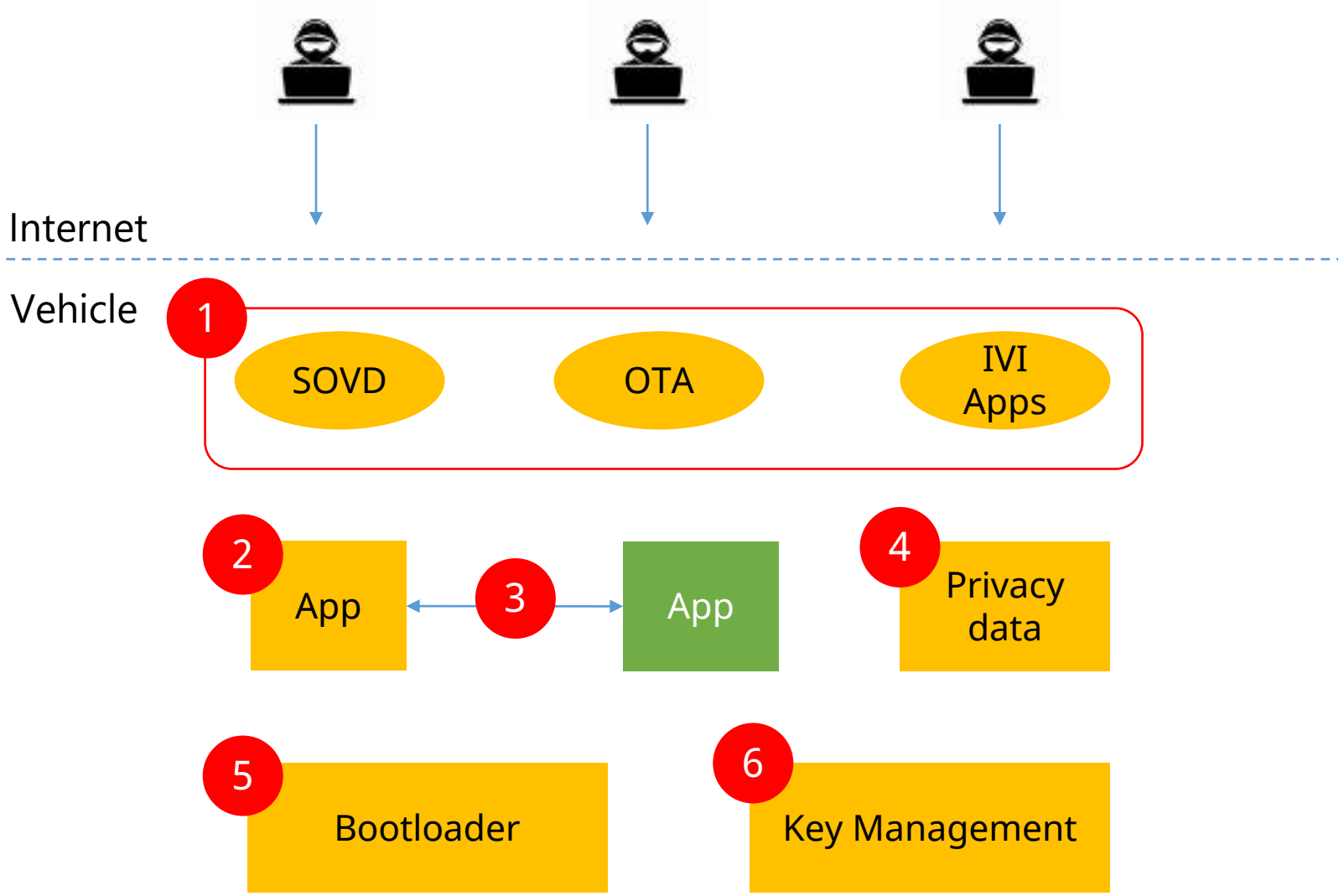
1. In-vehicle network infrastructure change: CAN/LIN -> Ethernet
2. Low level OS change: AutoSAR CP -> Linux/QNX/Android/CP
3. SW development change: AutoSAR CP based -> mixed & flexible app dev
4. SW deployment change: Static -> DevOps
5. App/Service high availability is imperative
6. The SW upgrade mechanism is changed: Offline -> Online

How to implement FuSa



Security challenges due to evolved SW architecture

1. Broader attacking surface due to more internet connectivity requirement
2. Untrusted software or malware risks
3. Risk of data security at transit
4. Risk of data security at rest, especially for privacy leakage
5. LLOS boot process must be secured to avoid untrusted image
6. A in-vehicle Key Management system is imperative



Get back to the basics

- BoM **Cost**
- Unprotected and inefficient R&D **Spending**
- Product development **efficiency**
- Cross functional feature **integration** and validation

Opportunities

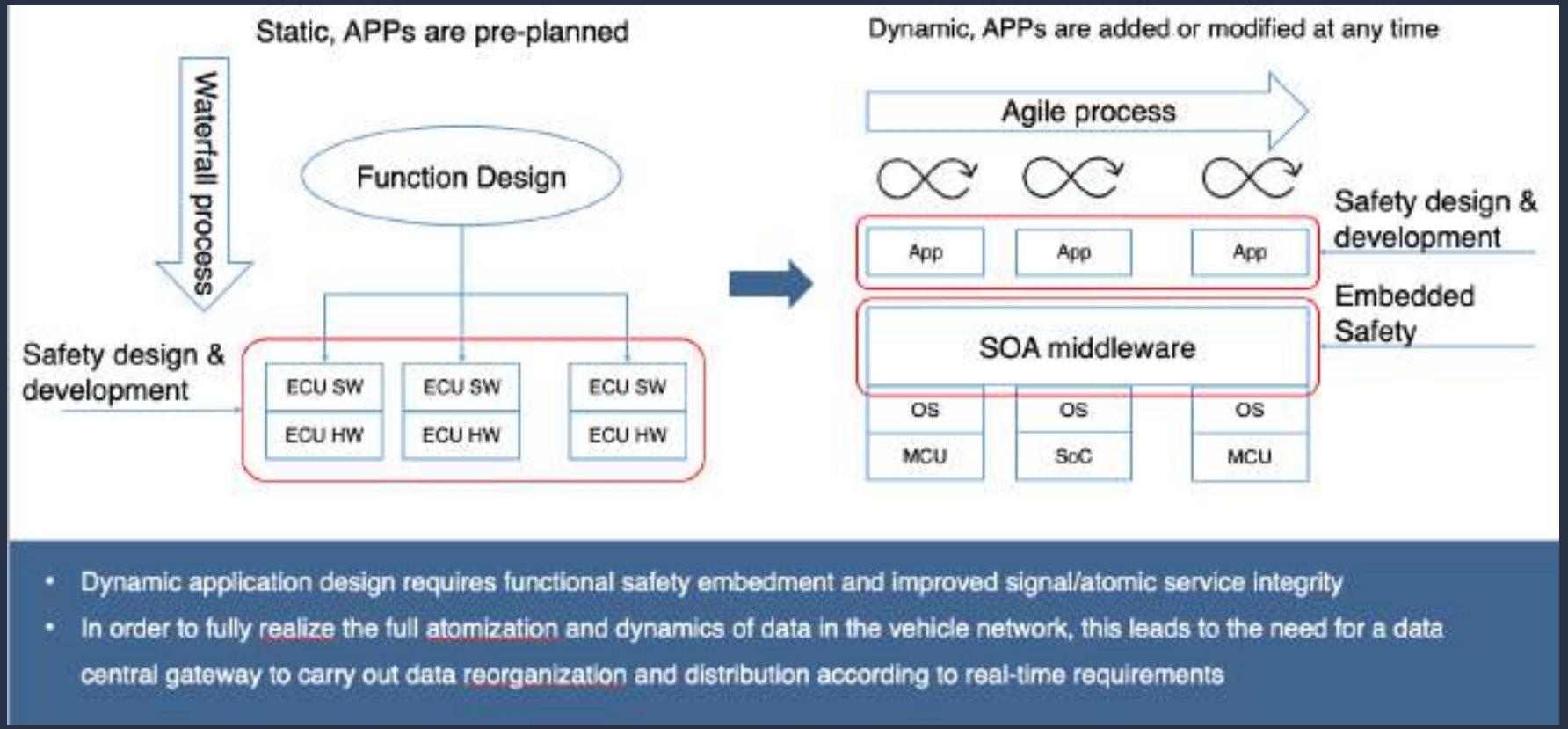
- **Significantly reduce vehicle BoM cost, by evolving E/EA and Software Defined capability**
  - Less wire, less ECUs, less power consumption
  - Protect R&D investment across generations of product development
  - Maximise reuse of assets across different form factor of products

Reference: Tesla's innovation of electronic and electrical architecture

	MODEL S	MODEL 3	Cybertruck
Harness length	3000 meter	1500 meter	500 meter
Harness num	854	490	155
Connected terminal num	286	273	368

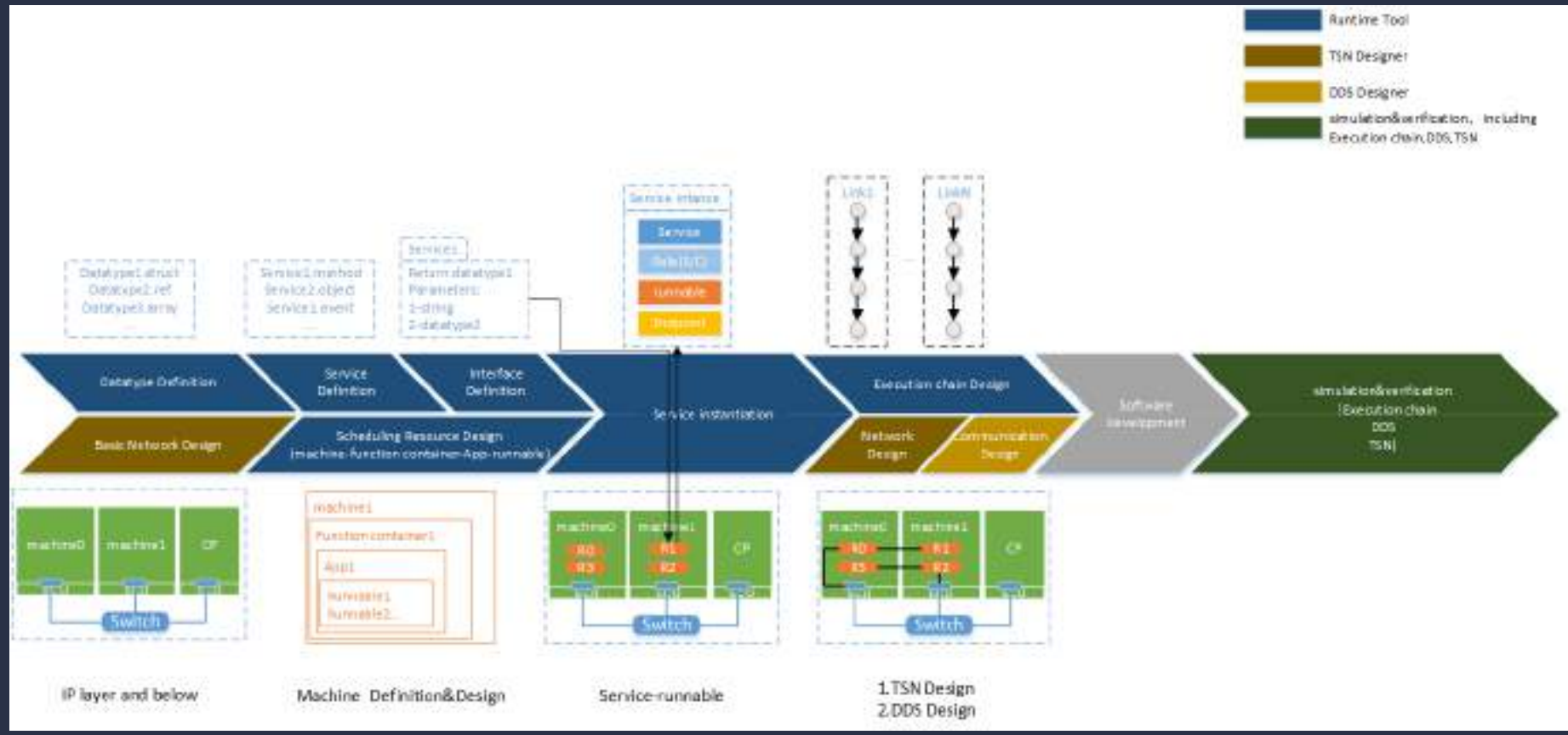
Opportunities

- **Unprotected and inefficient R&D Spending**
  - **Service Oriented Architecture across functional domains**
  - **Silicon-independent function design and development**



Opportunities

- **Product development efficiency**
  - **Advanced toolchain and flexible software platform**
  - **Enhanced Model based development**



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Get back to the basics

- **Cross functional feature integration and validation**
  - **OTA**
  - **Diagnostics**
  - **Services**

AutoCore's Attempt

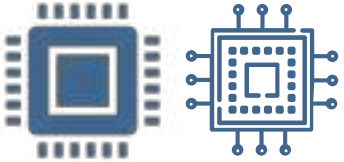
Pre-installed Apps & Services

Unified App platform

Modular design

ISO26262 ISO21434

Embedded FuSa & Security



Multiple chipset support

Multiple EEA support

We change how next generation intelligent mobility vehicle are built in a software defined era, with performance, safety and security.