AN ARCHITECTURE TO SUPPORT FUTURE BUSINESS

SOME EXPERIENCE FROM VOLVO CARS
Current estimates state that a typical (high-end) car today contains between 50 000 000 and 100 000 000 lines of code.

Automotive software is comparable in size (and thus complexity) to the most advanced aeronautical systems.

- **Space Shuttle**: 400 000
- **ISS**: 2 300 000
- **Orion**: 2 300 000 (in dev.)
- **Boeing 787**: 14 000 000
- **F-35 Lightning II**: 24 000 000
- **Airbus A380**: 100 000 000

XC90: 60 000 000 (rough estimate)
Over the past 20 years, the number of ECUs has grown from around 20 to more than 100.
Over the past 20 years, software size has grown by a factor of 10 every 5-7 years.
Over the past 20 years, the number of bus signals has grown from 100’s in P2 to ~7000 in SPA (~14 000 in our AD prototypes).
OUR FUTURE BUSINESS...

- Autonomy
- Electrification
- Connectivity
- Sharing

Multiple brands multiple segments
System of systems
Crowd sourced data
Machine learning
Third party access

Personalization
Product evolution after original sale
Decreasing time to market
Increasing OEM control over OEM concerns
Unknowns
REQUIRED CORE ABILITIES OF THE SOLUTION

- Safety & Security
- Manageability & Controllability
- Updatability & Upgradability
- Robustness & Reliability
- Evolvability & Adaptability
- Scalability & Flexibility
“The Architecture is that which will ensure that the Product System can fulfill its Business Goals, together with its Functionality”
ARCHITECTURAL TACTICS

Scalability & Flexibility

Manageability & Controllability

Updatability & Upgradability

Evolvability & Adaptability

Robustness & Reliability

Safety & Security

Business driven

Product Modularization

Central Computational Cluster

Sharing

Evolvability

System of systems

Decision Based Hierarchy

Safety & Security

Guarantees on Interfaces

Service Capability on Interfaces

Deciding on Interfaces

Multi brands, multiple segments

System of systems

Security domains for Information access

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ARCHITECTURE TRANSFORMATION
HOW DO WE DO IT?

We are Lean and Agile...
...and we work with 3 important artifacts

1. Architecture Description
   ⇒ The Documentation of the Architecture

2. Architecture Description Framework
   ⇒ How to Document the Architecture

3. Knowledge driven Architectural Tactics
   ⇒ The essence of the Architecture
   ⇒ Short increments & Risk & Trade-off driven
As a Workshop Engineer I want to update small part of the Software in a used Vehicles and I want to be sure that the Vehicle every time fulfil our System Safety.
THANK YOU 😊 QUESTIONS?