THE CAR – A COMPUTER ON WHEELS

What Does it Mean for the Automotive Industry?

Ödgärd Andersson, Vice President Software and Electronics, Volvo Cars
SHIFT HAPPENS

Electric cars

Sharing/subscribing

Software & AI

Autonomous

Connected
Electric cars
• Happening now!
• Huge OEM investments
• New entrants - lower barriers
• Greener than fossil and cheaper to charge
  – secure green production of batteries and electricity
• Charging infrastructure impacts penetration
• 10-100x fewer moving parts – ”no maintenance”
• Consumer pull & Legislation push
Contradicting Trends:

- Rapid battery technology development - driving cost down
- Rapid increase in demand & limited availability of raw materials - driving cost up
AUTONOMOUS DRIVE
AUTONOMOUS DRIVE

- Approaching from 2 starting points
  - Evolution of ADAS systems from L2->3/4/5
  - Robot taxi aiming directly for L4/5
- New entrants: Waymo, Uber, Lyft, Baidu, Didi, Nutonomy, ...
- New partnerships
- Deep Learning & AI – massive computer power
- New sensors and sensor fusion – rapid development
- Cloud solutions, V2V+V2cloud, positioning - more computer power needed in car and/or in cloud
- Required redundancy and new levels of high availability
ALL CONNECTED

OTA
SHARING

• General trend from other industries
• Several parallel business models:
  • Subscribe to a car
  • Share your own car with others (like Air BnB)
  • Use on demand (MobilityaaS)
• Variable size per need
• Who owns the end user relationship?
  • OEM directly to end user - digital
  • New players – Turo, Waymo, ...
• Fleet management complex
• Autonomous drive and electrification as catalysts
• Uptime is king! - Design for low failure rate
MORE SW - IN CAR AND IN CLOUD
FROM MECHANICS - TO ELECTRONICS + SW

CURRENT STATE

Electronics are sourced with their SW from Tier 1
Unintended side effect - all the SW is changes when HW supplier changes
FROM MECHANICS -> ELECTRONICS + SW
CURRENT STATE - COMPLEX ARCHITECTURE

HW&SW dependencies – long change loops
COMPUTER ON WHEELS – CENTRAL BRAIN

Mechatronic Rim

Core System

Vehicle Integration Unit (VIU)

Network switch

Mechatronic node w/ slave nodes

2017-10-26

LINDHOLMEN SOFTWARE DEVELOPMENT DAY 2017 - NICLAS NYGREN, VOLVO CARS
SW ARCHITECTURAL EVOLUTION

• Distributed Logic -> Central Brain Computer
• OEM control SW and/or SW will be open sourced
• Tier 1 future role?
• Prepared for growth vs optimized for cost
• High availability and redundancy
• Deep Learning and AI
• Decoupling SW from HW – one track SW
  • Enabling agile SW development
• Continuous Integration as base
FLEXIBILITY / AGILITY – PLANNING FOR CHANGE

- X industry customer expectations
- Large technology steps
- Impossible to predict timing of change
- On board/off board
- Control of high value SW

Flexibility is key!
PARTNER FOR SPEED & GREATNESS

https://youtu.be/ogfYd705cRs?t=2160

https://www.youtube.com/watch?v=kKQ5T-OqU_8

https://www.youtube.com/watch?v=38aeJrs-mhg
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THANK YOU FOR YOUR ATTENTION