Security and Safety in Embedded Applications

Use Case : Instrument Cluster

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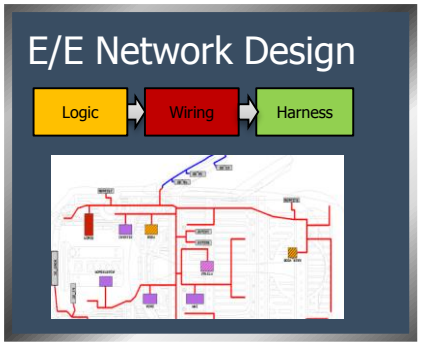
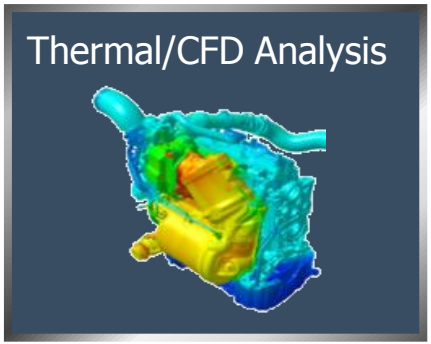
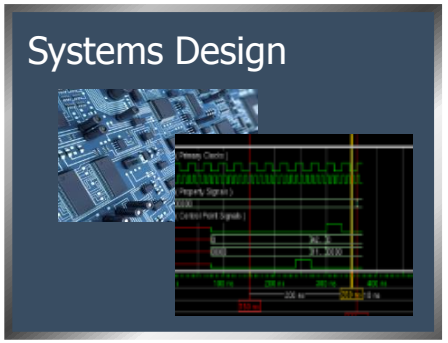
Mentor Automotive

- Part of Mentor Graphics (EDA Tool Supplier)
- Broad Portfolio of solutions : Mechanical, Thermal
- E/E Systems Design, and Embedded Software



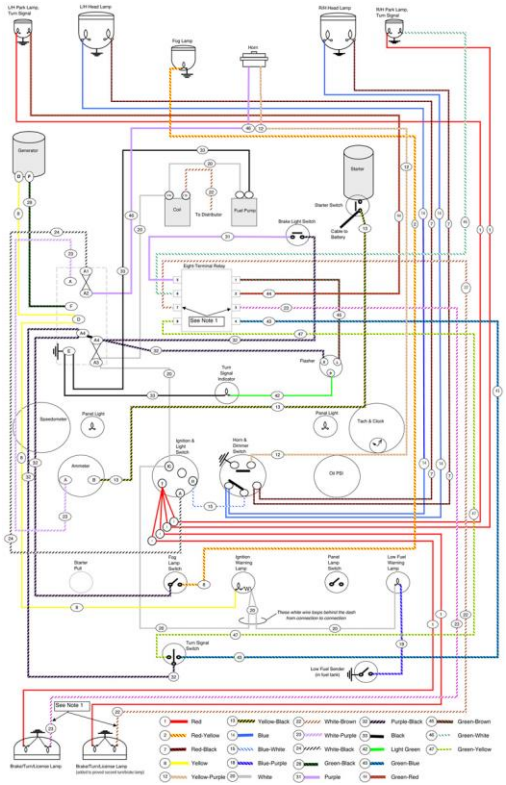




Connectivity and Networking . In-Car Experience . Subsystems and Technology

Safety & Security in 1969..

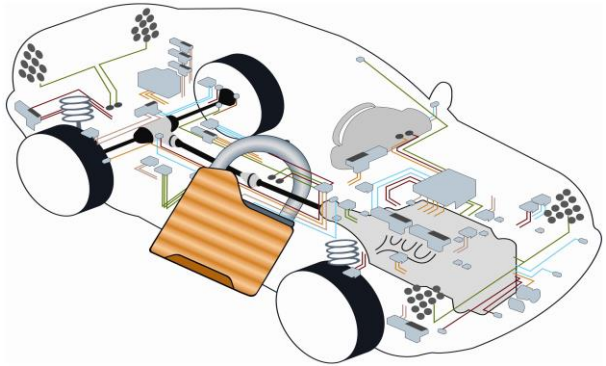
- Simple Wire Harness – one wire for each vehicle function
- Simple to repair !
- No ECUs. No embedded software



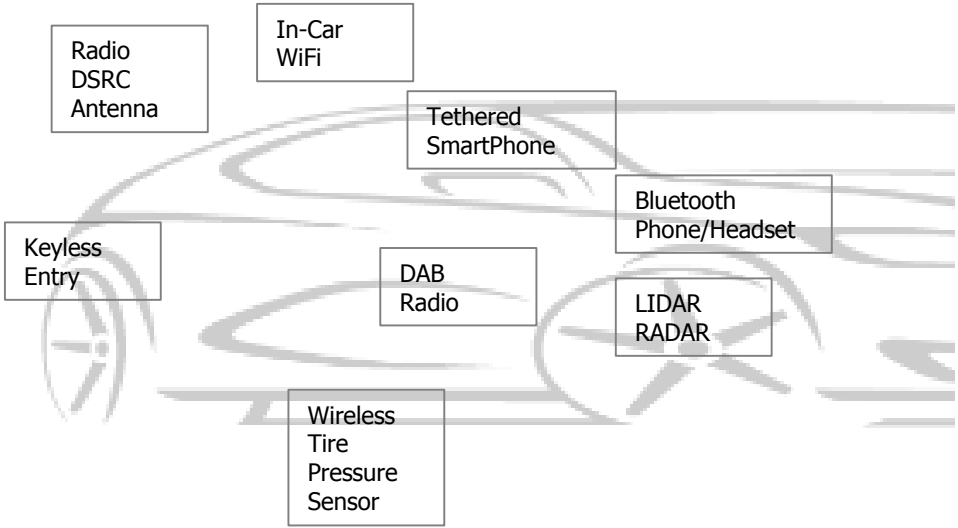
Wiring Diagram :
MG Sports 1969

Automotive MegaTrend : Embedded Security

Traditional vehicle : Closed



New “attack surfaces”



90% of Automotive Innovation now based on Software

Instrument Cluster / DIM

RTOS & Linux

Autonomous Connected Car

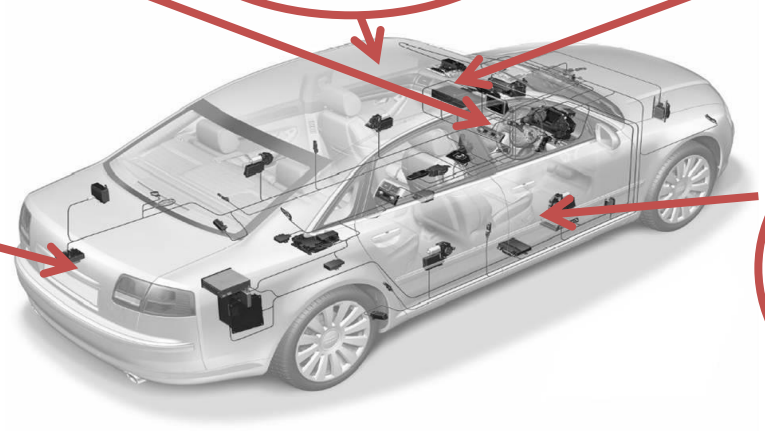
RTOS

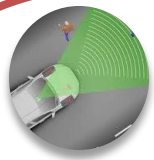
Infotainment Head Unit

Linux

GENIVI

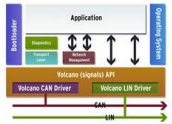
AUTOMOTIVE GRADE LINUX





Advanced Driver Assistance Systems

RTOS



AUTOSAR

ECU Design

OSEK

ISO26262

Application Example : Instrument Cluster

- Traditional Analog

- Today's mass-market

- Hybrid

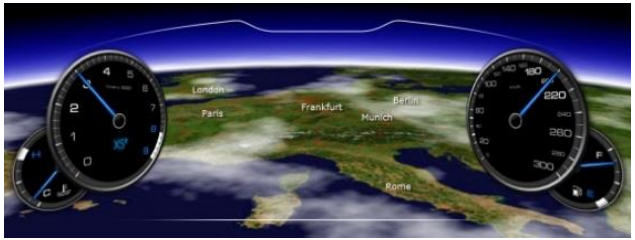
- Mechanical dials
- Embedded Digital Display
- Market Segment growing

- Fully Digital

- TFT / LCD Panel
- Premium Vehicles

Complex Digital Cluster : What's Inside

HMI Design and Features



Tier 1 & OEM Responsibility

HMI Application

CGI STUDIO
Socionext
RIGHTWARE
altia
Qt

HMI Partner

Embedded Software Platform

Graphics Interface
Middleware
Operating System
Safety Architecture
Comms / AUTOSAR
Fastboot / IBC

OS and Middleware

Hardware

Semiconductor Vendor

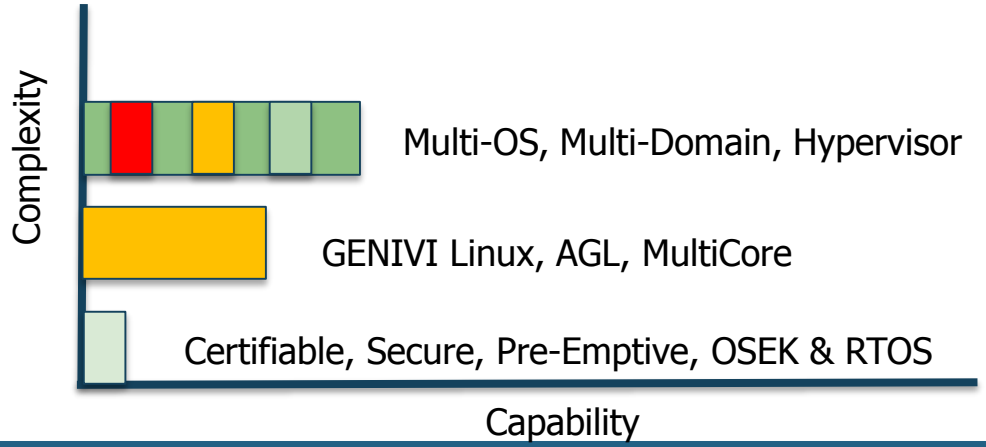
Security challenge with Complexity

- "Lines of Code" continues to increase *
  - 2012 Gateway ECU – 50,000 LOC
  - 2015 Gateway ECU 360,000 LOC
- S/W Problems Reported per annum : up 8x
- Validation and Testing is massively labour and cost intensive
  - Average cost $10 per LOC
  - Introduces project delay / SOP risks
- OEMs are expecting ISO26262 compliance, proof of testing, requirements traceability
- Meet ASIL requirements : Typically B or higher for Cluster

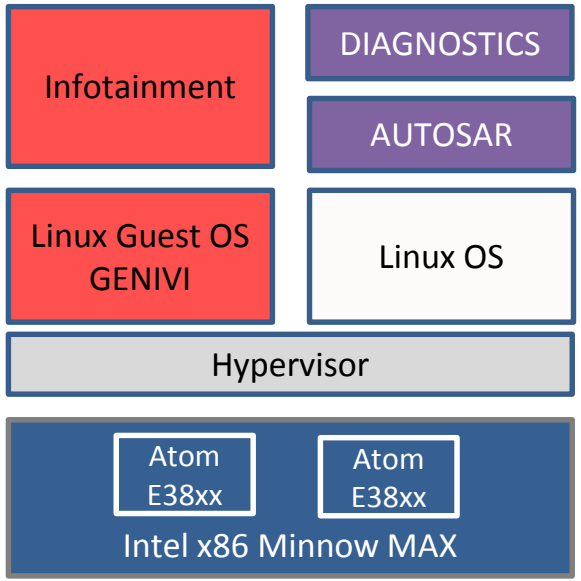
* Source : Continental, June 2016

Using Embedded Architectures to manage Security

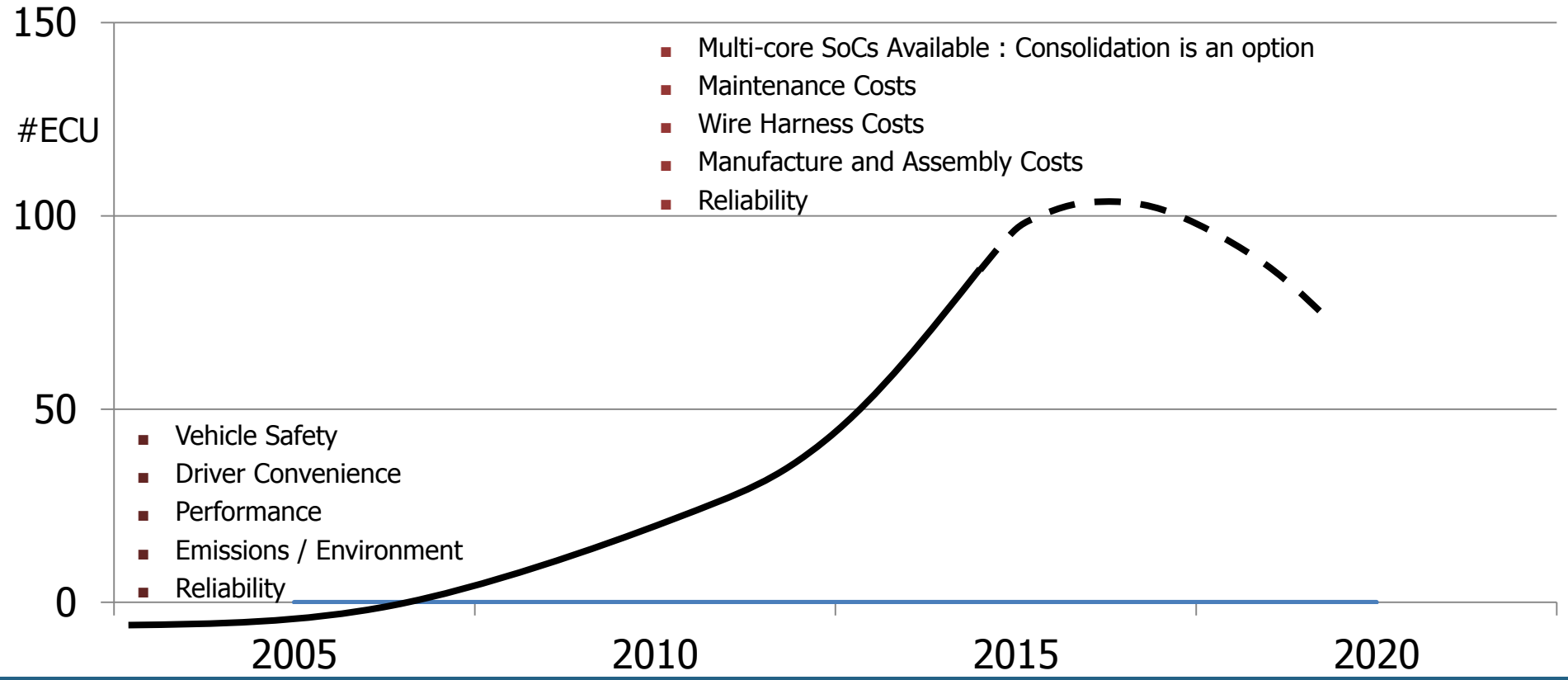
- Provide Scalable Operating Systems
- Overlays : FastBoot, Security



Multi-Domain Example :



Complex architectures are enabling ECU Consolidation



Instrument Cluster Market

Traditional Analog

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Hybrid

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Fully Digital

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- Premium Vehicles

Secure embedded cluster architecture

Certified Software

- Safe Instrument Logic
- Safe Graphics Rendering
- Safe Graphics Driver

Advanced Graphics

- Complex Instrument Logic
- 3D Graphics Render
- Linux Graphics Drivers

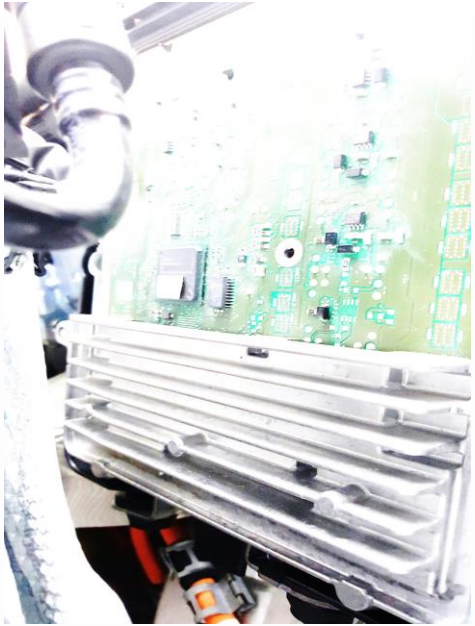
Single SOC

Certified RTOS (Nucleus CertOS)

Complex OS (Linux/Nucleus)

Summary

- The Automotive industry changed permanently
  - Innovation through embedded software will occur continuously through the life of a vehicle
  - Autonomous Vehicles evolving 2016-2025
- Secure architectures are needed to keep ahead of hackers and DOS attacks
- Problem decomposition allows safety and security requirements to be met / SEOOC approaches



Thank You

Questions?
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