ELECTRONICS R&D

@ UNIPV - Incontro Studenti
29/05/2018

MTA
Advanced Automotive Solutions

Product example

ALFA ROMEO 4C

LAMBORGHINI HURACÁN

STANDARDS

Process compliant with level 3

Principal (top level) Assessors
permanent support

FUNCTIONAL SAFETY
ISO 26262 (road vehicles)
ISO 25119 (agricultural machinery)

1. Vocabulary

2. Management of functional safety

| 2-5 Overall safety management | 2-6 Safety management during item development | 2-7 Safety management after release for production |

3. Concept phase
- 3-5 Item definition
- 3-6 Initiation of the safety lifecycle
- 3-7 Hazard analysis and risk assessment
- 3-8 Functional safety concept

4. Product development: system level
- 4-5 Initiation of product development at the system level
- 4-6 Specification of the technical safety requirements
- 4-7 System design
- 4-11 Release for production
- 4-10 Functional safety assessment
- 4-9 Safety validation
- 4-8 Item integration and testing

5. Product development: hardware level
- 5-5 Initiation of product development at the hardware level
- 5-6 Specification of hardware safety requirements
- 5-7 Hardware design
- 5-8 Hardware architectural metrics
- 5-9 Evaluation of violation of the safety goal due to random HW failures
- 5-10 Hardware integration and testing

6. Product development: software level
- 6-5 Initiation of product development at the software level
- 6-6 Specification of software safety requirements
- 6-7 Software architectural design
- 6-8 Software unit design and implementation
- 6-9 Software unit testing
- 6-10 Software integration and testing
- 6-11 Software verification

7. Production & Operation
- 7-5 Production
- 7-6 Operation, service and decommissioning

8. Supporting processes
- 8-5 Interfaces within distributed developments
- 8-6 Overall management of safety requirements
- 8-7 Configuration management
- 8-8 Change management
- 8-9 Verification
- 8-10 Documentation
- 8-11 Qualification of software tools
- 8-12 Qualification of software components
- 8-13 Qualification of hardware components
- 8-14 Proven in use argument

9. ASIL-oriented and safety-oriented analyses
- 9-5 Requirements decomposition with respect to ASIL tailoring
- 9-6 Criteria for coexistence of
- 9-7 Analysis of dependent failures
- 9-8 Safety analyses

10. (Informative) Guidelines on ISO 26262

Core processes Management

Support

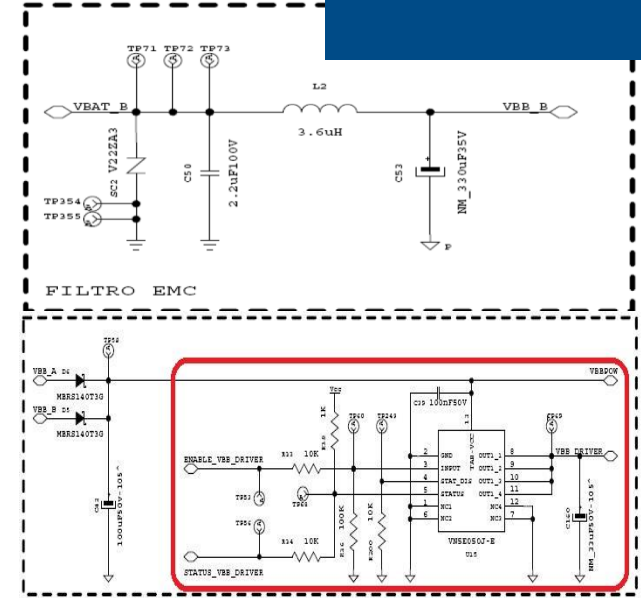# HARDWARE DESIGN

DESIGN PROCESS

Architectural design
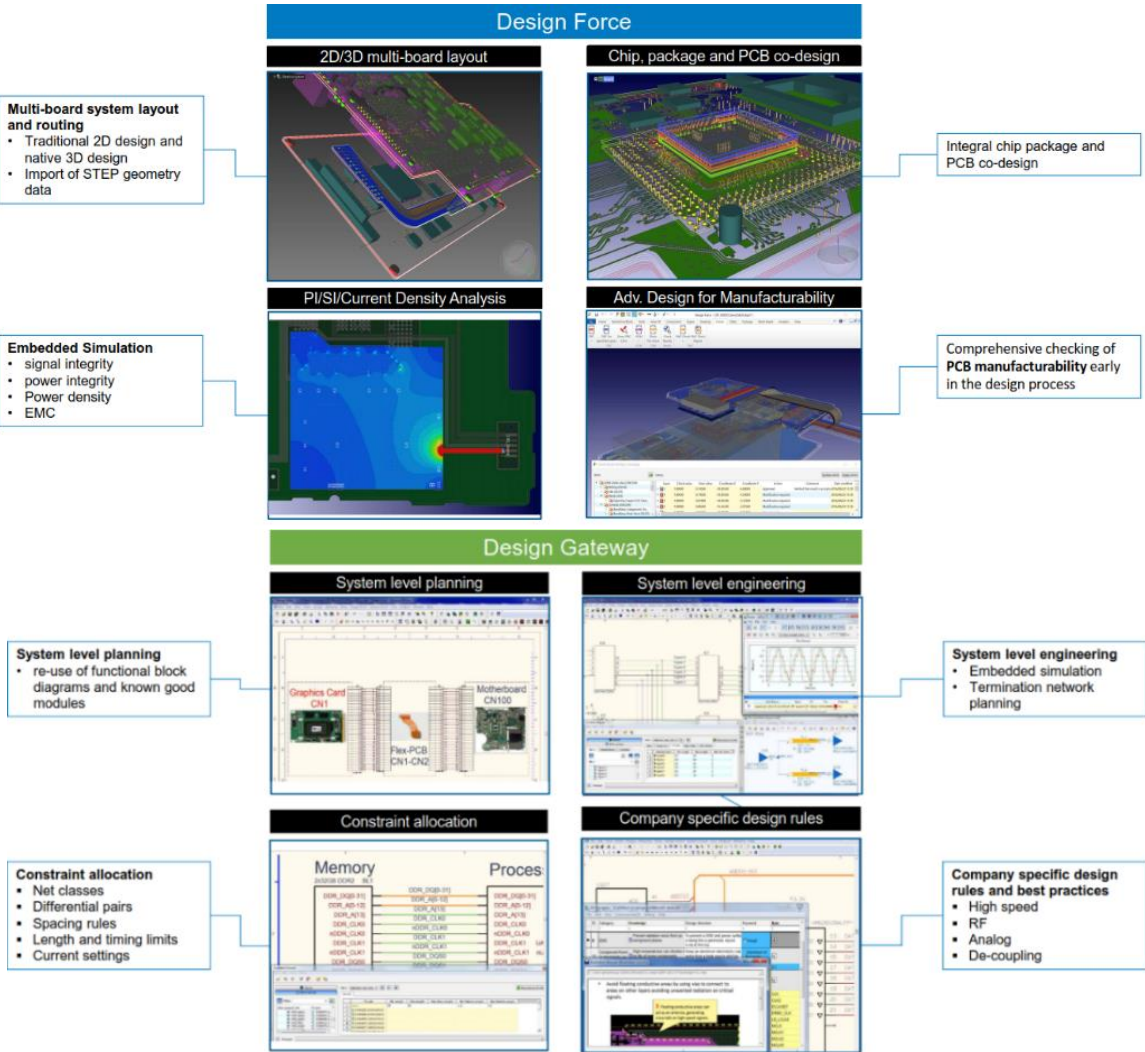and requirements allocation

5.4.1 Application of requirements

5.4.1.1 The requirements of Clause 5 shall apply to each item and element developed according to ISO 26262, except for off-the-shelf hardware parts, if either of the following applies:

a) there are no specific hardware safety requirements allocated to the hardware parts, or

b) the off-the-shelf hardware parts are qualified according to well-established procedures based on worldwide quality standards (e.g. AEC standards for electronic components), and the qualification of the ___ with regard to the intended application.

Component selection
according to AEC standard

Multi-board design.
Conventional 2D and 3D design.
Design to manufacturing checks.

HARDWARE DESIGN
DRAWING & ROUTING

Signal and power integrity simulation.

HARDWARE DESIGN

ELECTROMAGNETIC SIMULATION

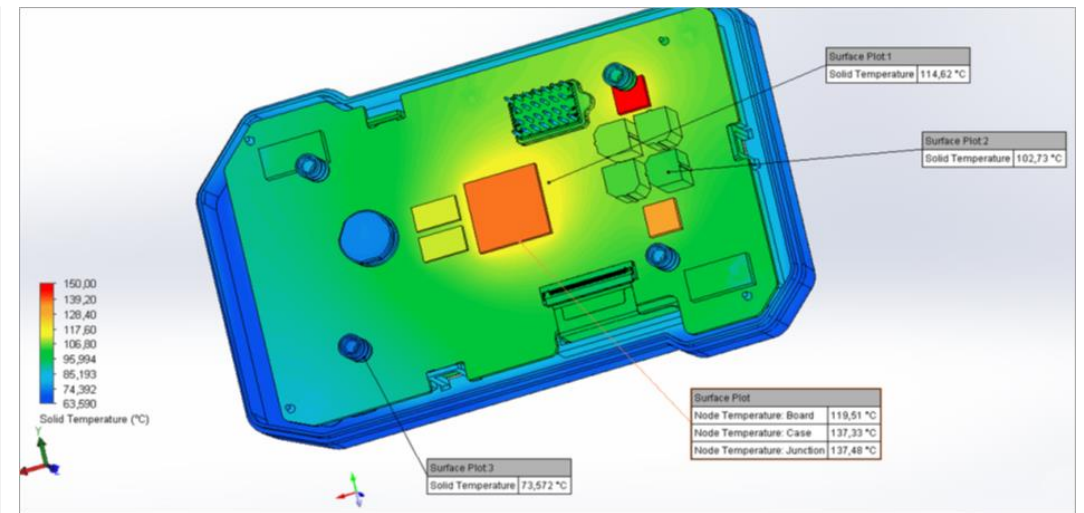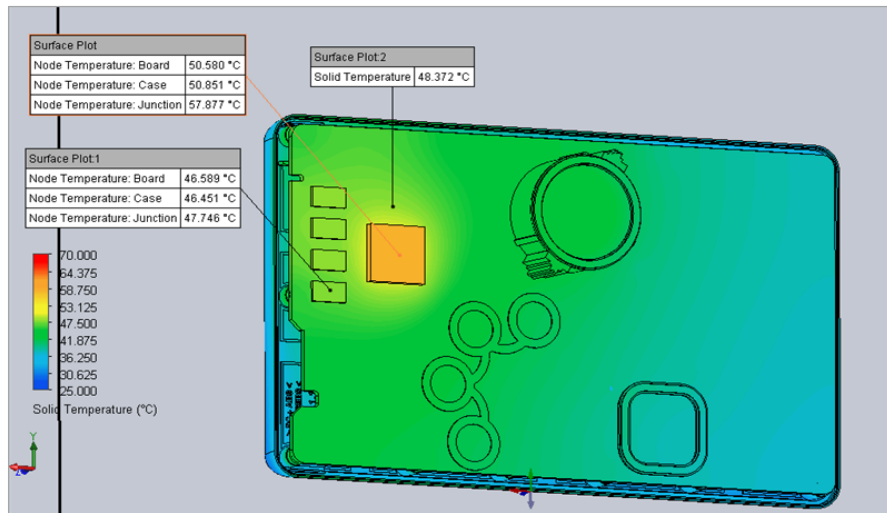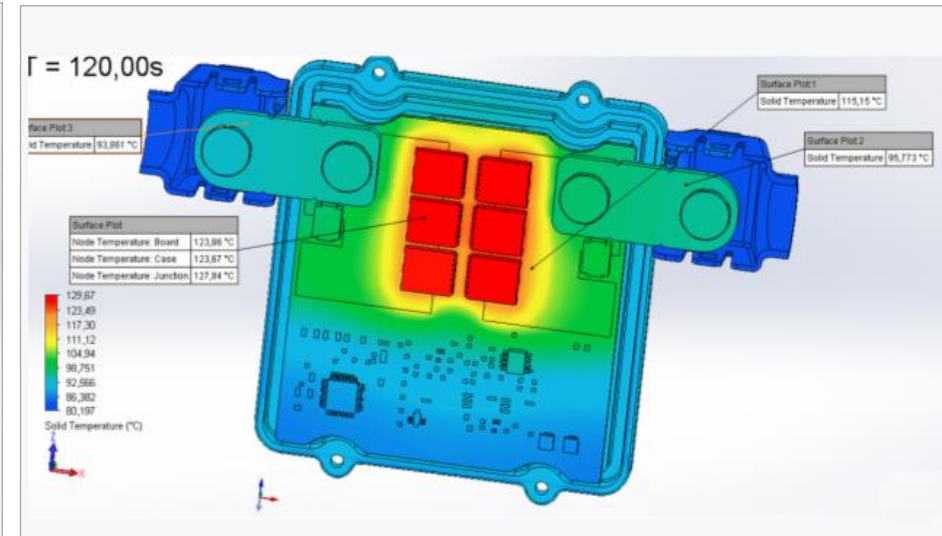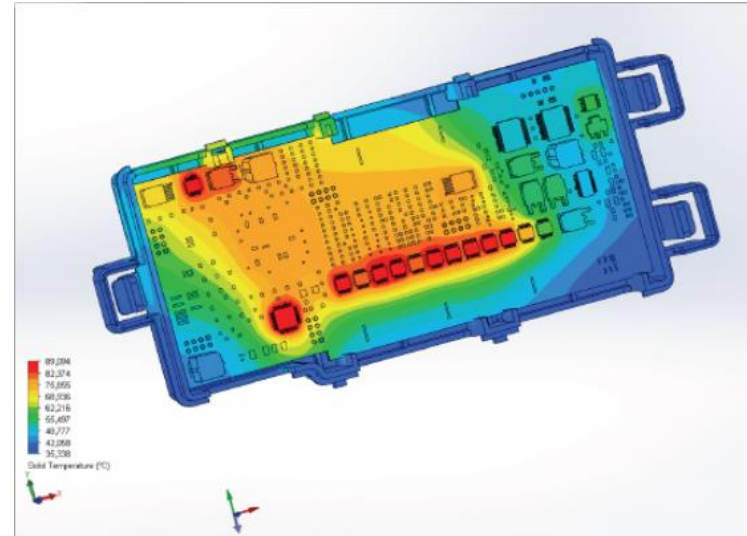Tools for simulating and optimizing electromagnetic systems for EMC on printed circuit boards (PCB).

ELECTRICAL SIMULATION

DUT
Filter + 3D model of the diff. pairs

BCI fixture
3D Model

BR Media Converter - Input filter
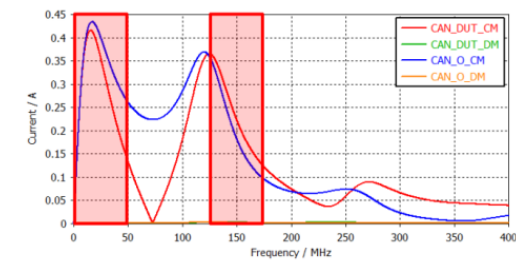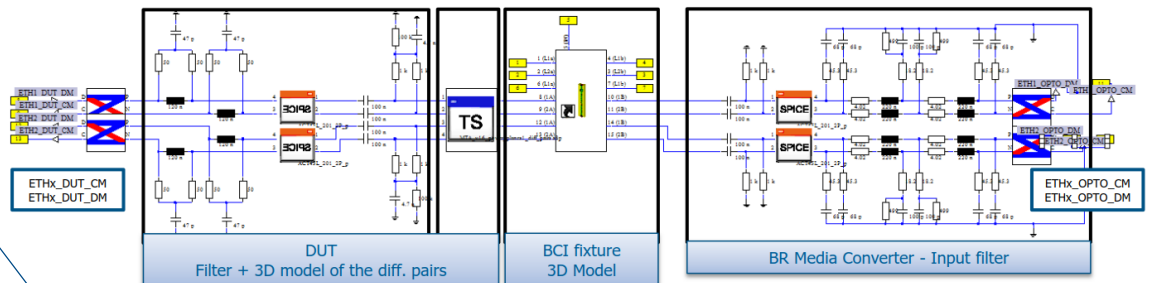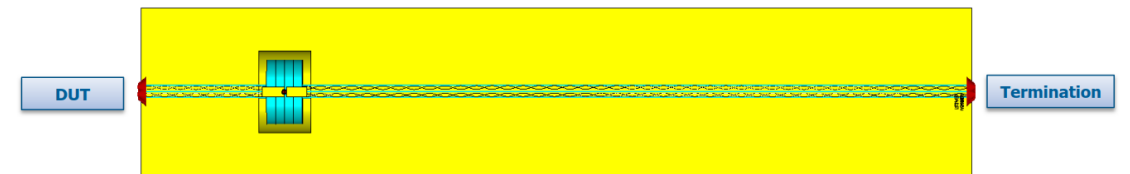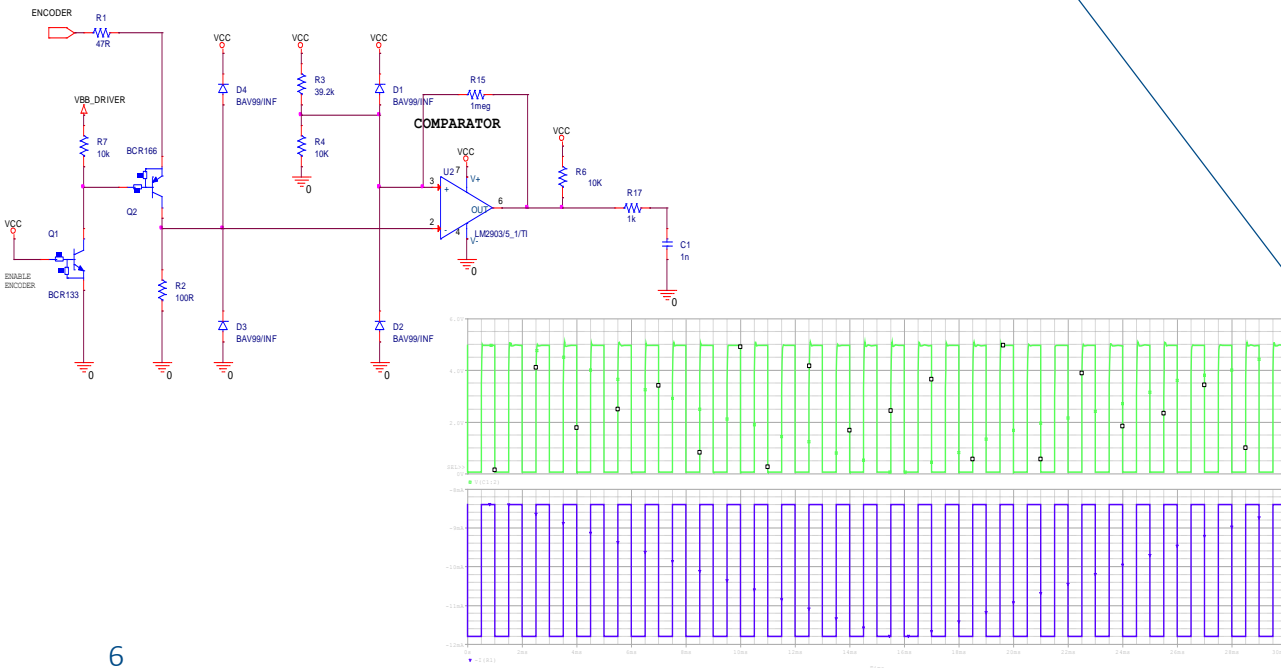
HARDWARE DESIGN

CFD THERMAL DESIGN AND ANALYSIS

Thermal simulation tool.

MECHANICAL DESIGN
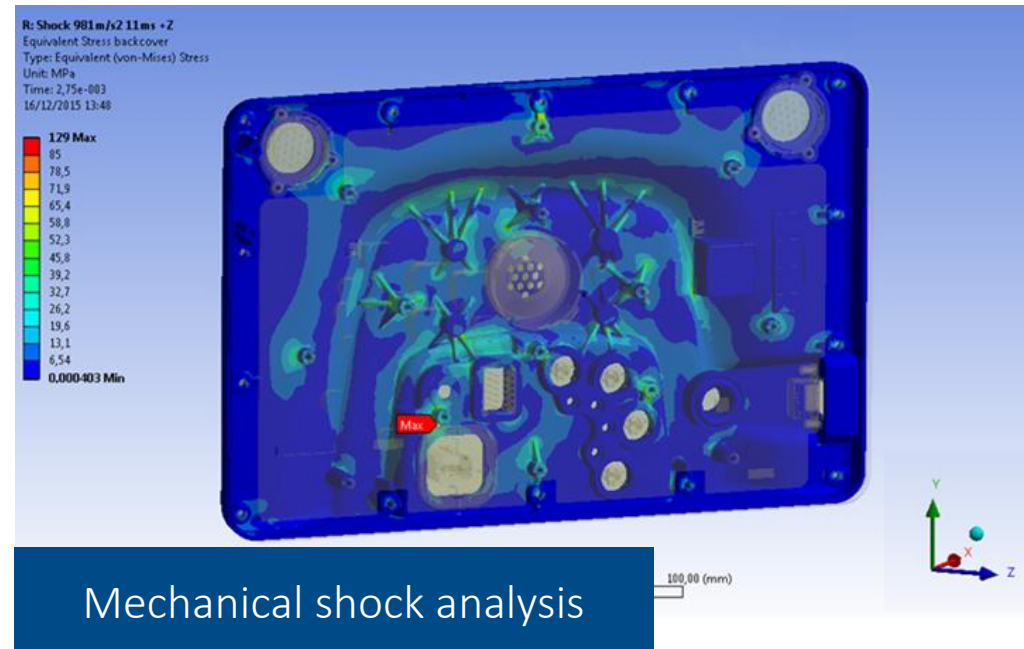
DESIGN PROCESS **–** 3D Modelling Tools
and CAE Tools
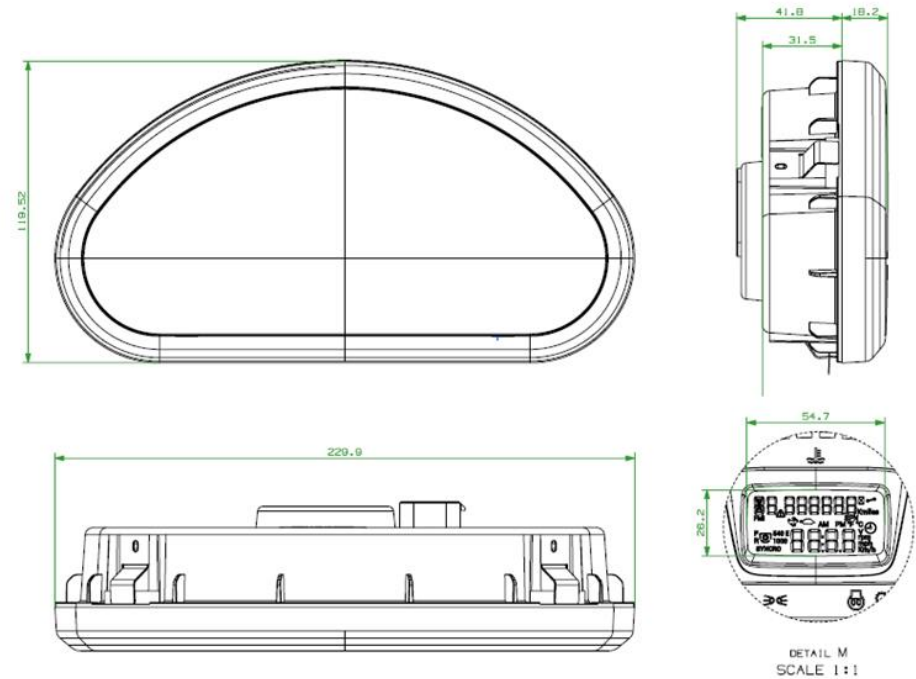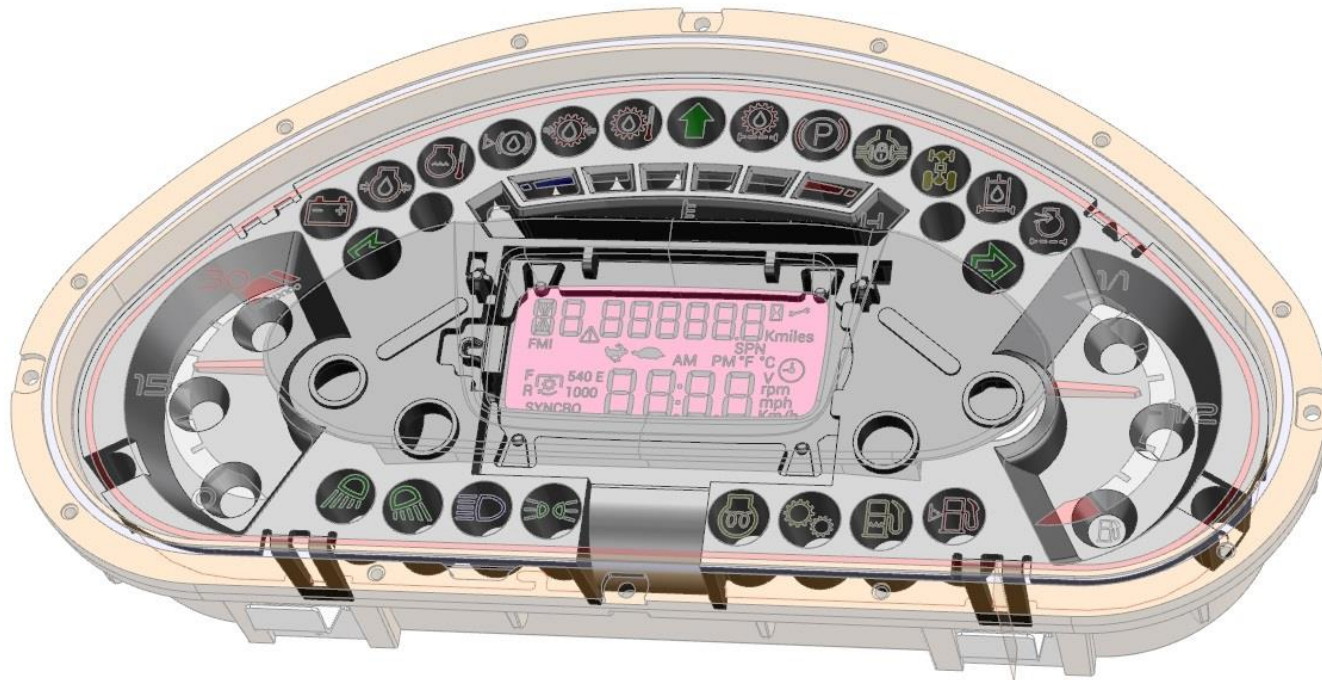
MECHANICAL DESIGN
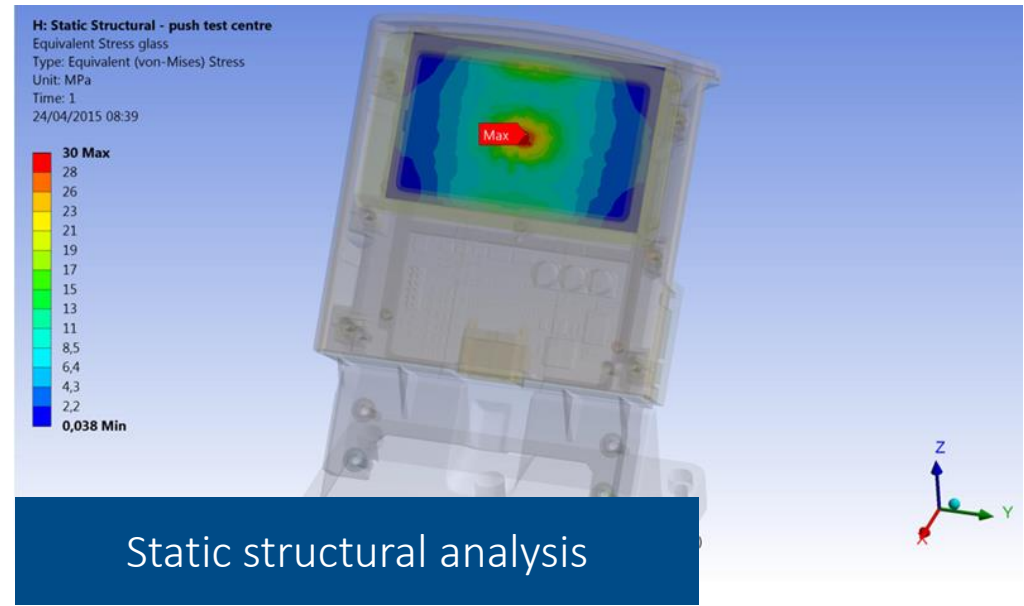
CAE ANALISYS

Static structural analysis

Modal/vibrational (sine or random) analysis
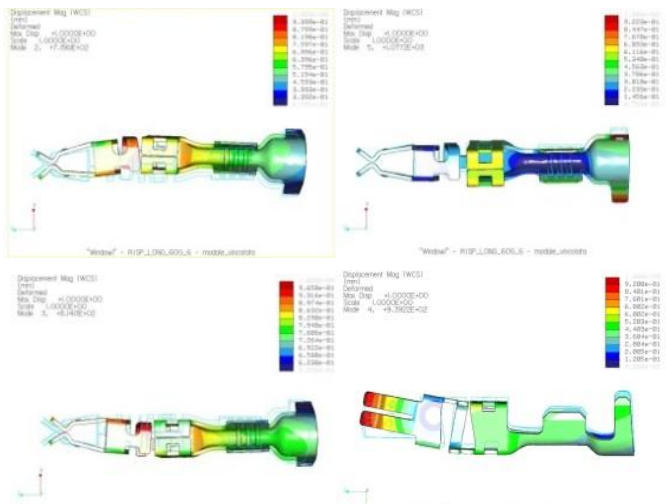
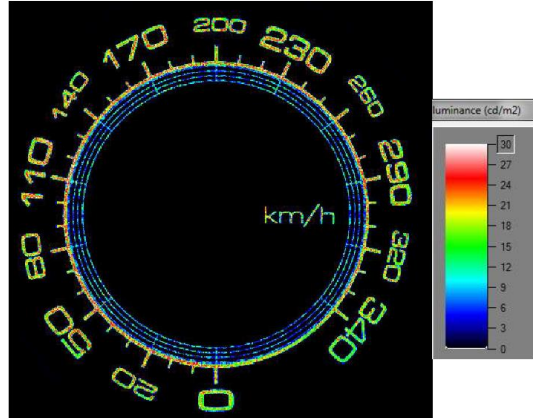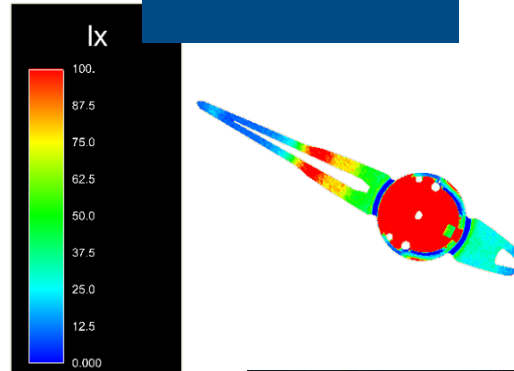| Mode	Frequency [Hz]
1	106,03
2	158,31
3	200,83
4	243,89
5	279,22

Mechanical shock analysis

MECHANICAL DESIGN

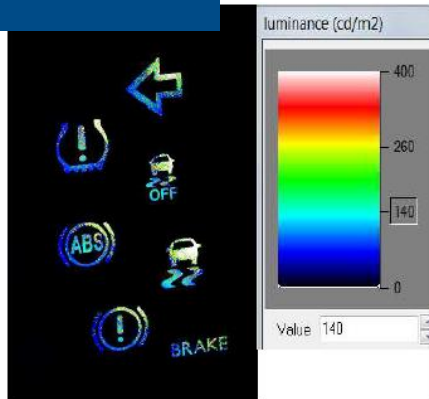OPTICAL ANALISYS – Telltales, Dial plates, Display and Head-Up

Head-Up
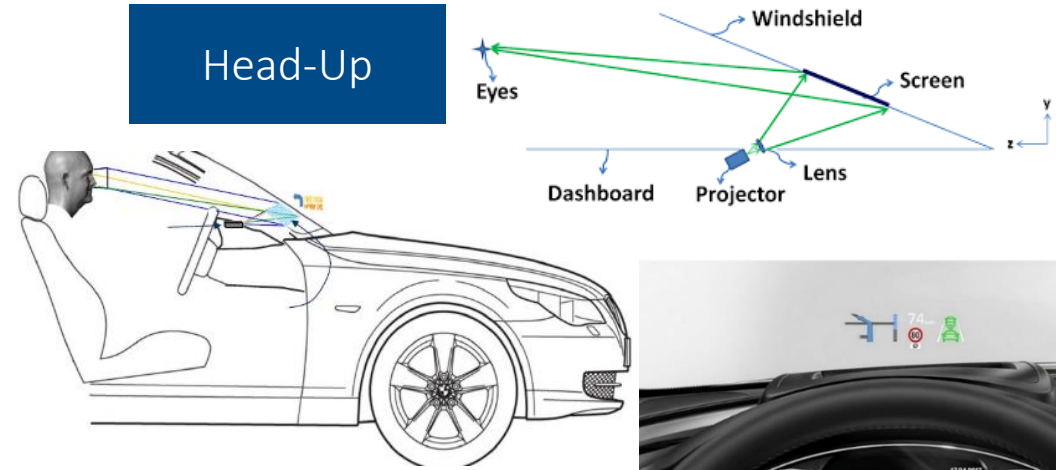
Pointers

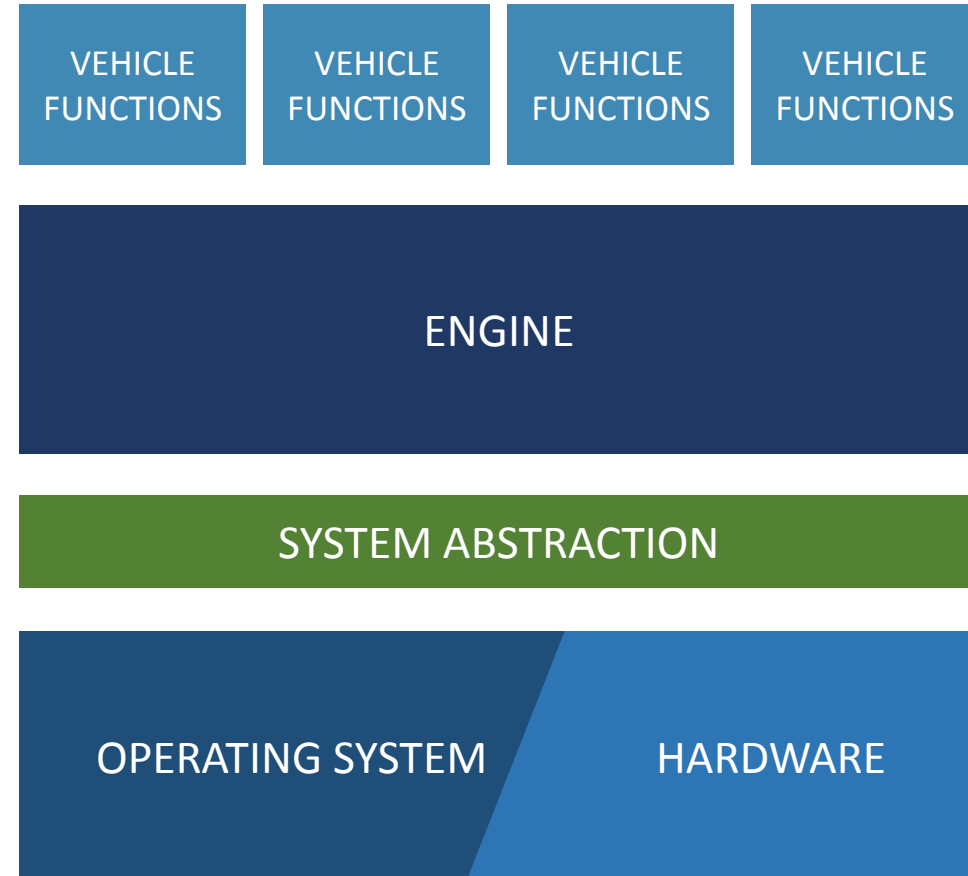
Displays

Dial plates and telltales

SOFTWARE DESIGN

MTA CORE

MTA Core is a software package that contains general purpose libraries plus an engine that manages all typical functional states of automotive application.

Main features:
- OS independent
- hardware independent
- layered and modular approach
- small footprint
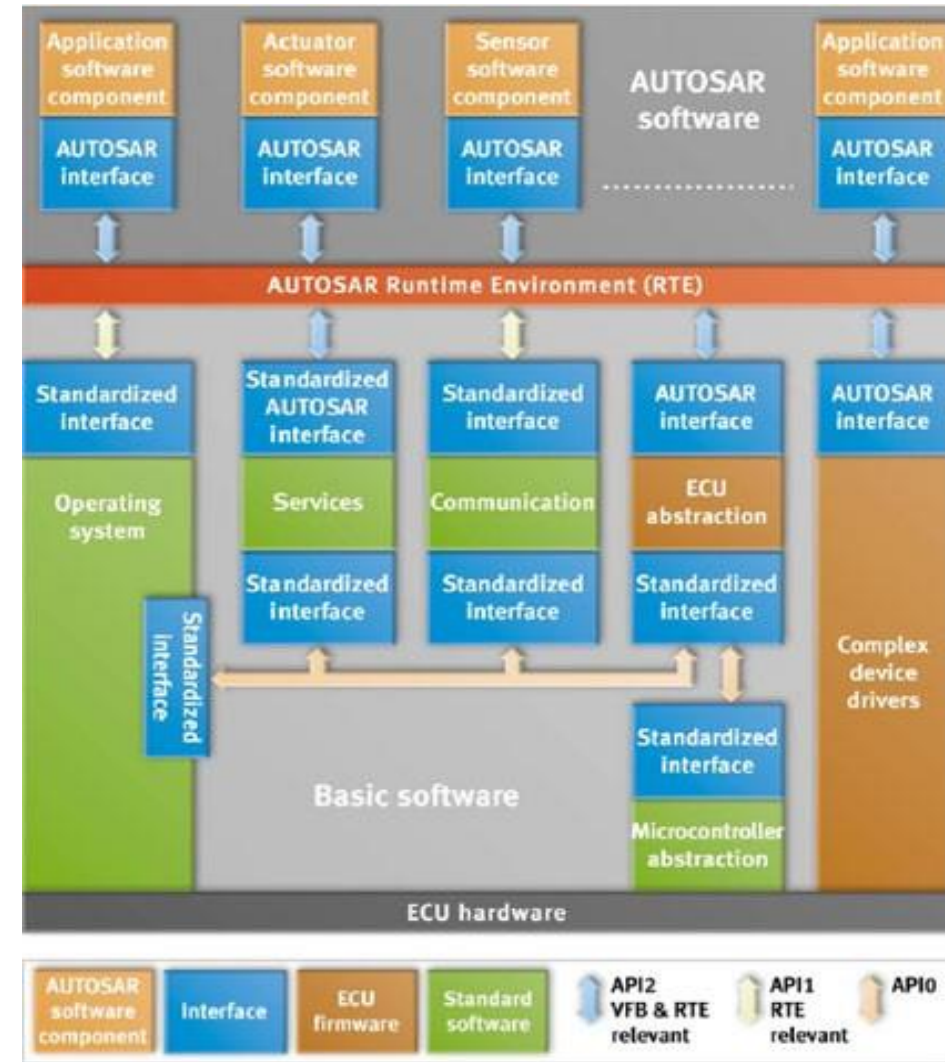- optimized
- code reuse oriented

VEHICLE FUNCTIONS	VEHICLE FUNCTIONS	VEHICLE FUNCTIONS	VEHICLE FUNCTIONS

ENGINE

SYSTEM ABSTRACTION

OPERATING SYSTEM | **HARDWARE**

SOFTWARE DESIGN

AUTOSAR

Since 2010 MTA develops its projects using the Autosar (3.1/4.X) environments which are certifiable at different ASIL levels (ISO 26262/25119):

Examples of complex drivers developments:
- motor DC/DC control
- motor brushless control
- stepper motor control
- power driver
- board protection system
- TFT/LCD displays
- sound generator

SOFTWARE DESIGN

LINUX

Linux optimization by MTA.

- Linux for **instrument cluster**
    - Quick Boot in milliseconds
        - 50ms CAN messages
        - graphics in less than 1 sec
    - fast and complex graphics
        - 2.5D, 3D at 60fps
        - multi-display

- Linux for **infotainment**
    - multimedia (radio, audio/video)
    - connectivity (cellular, BT...)
    - positioning (navigation)

- Linux for **security**
    - security extensions
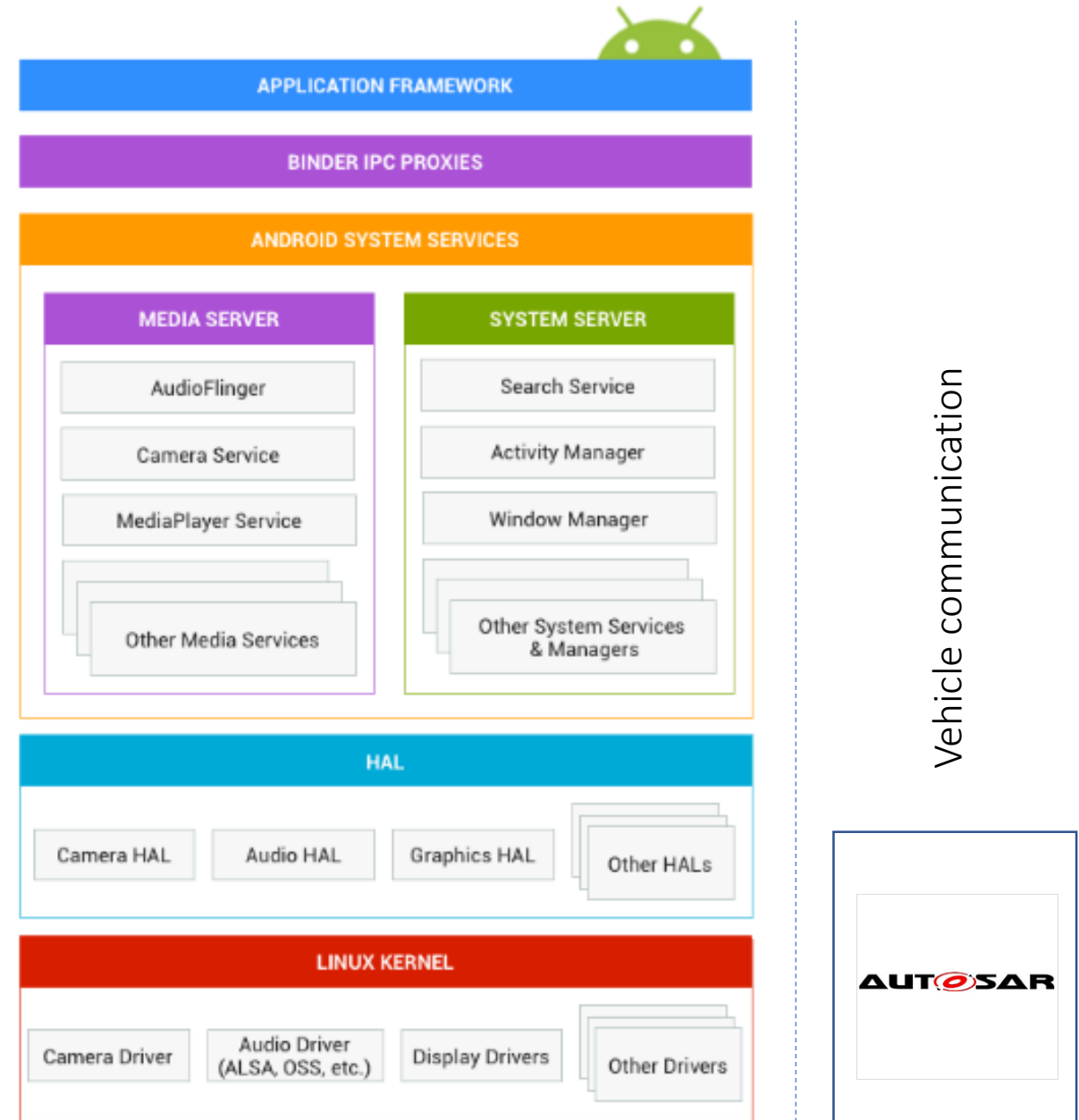   - firmware over the air
    - secure gateway
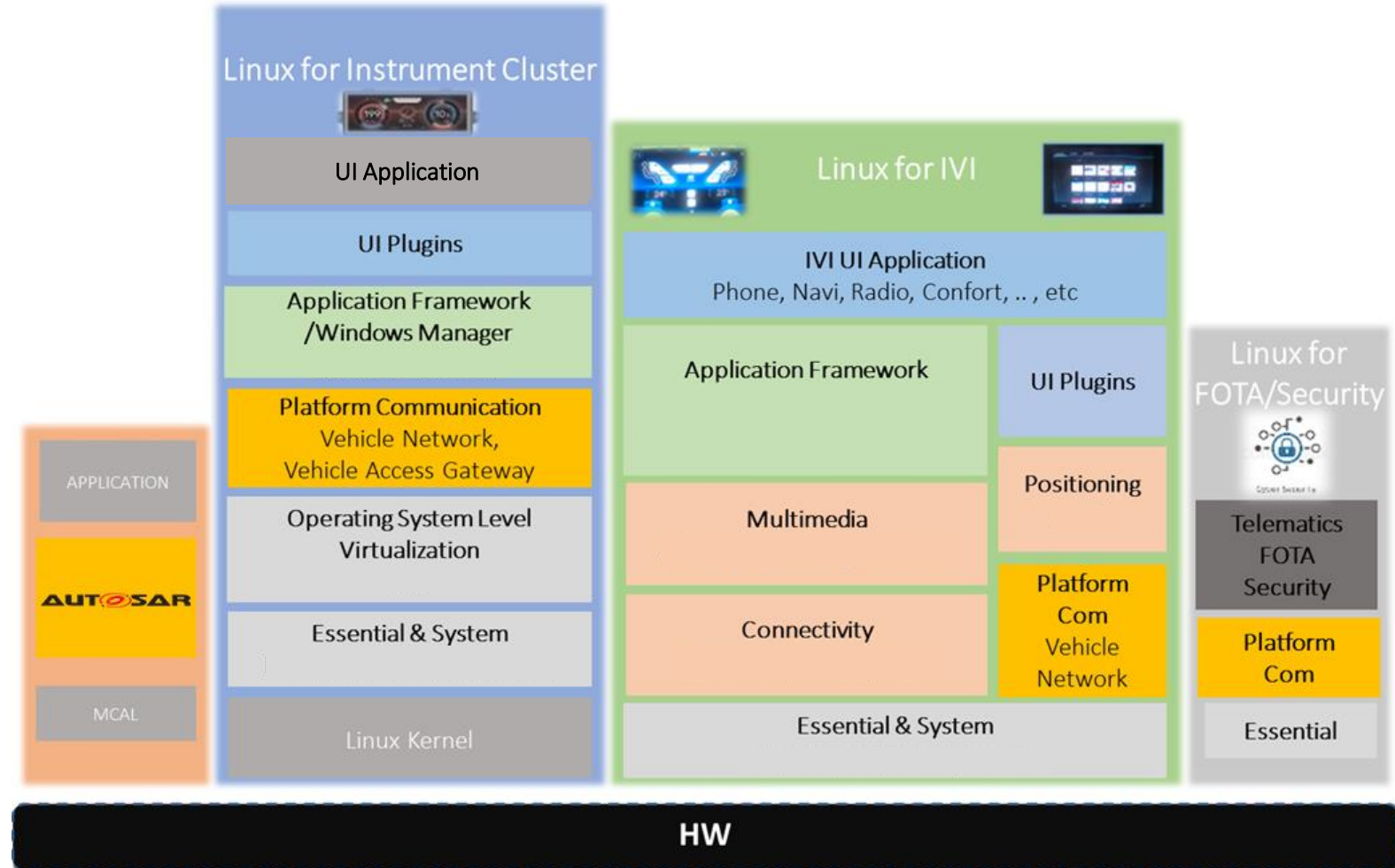
SOFTWARE DESIGN

ANDROID

Android optimization by MTA.

- Android Quick Boot in few seconds (< 4 sec)

- Widely automotive bus support:
  - CAN
  - LIN
  - BroadR-Reach

- Enable advanced functionalities:
  - multimedia
  - connectivity
  - apps
  - complex graphics

- Real-Time:
  - vehicle functionalities implemented in Autosar

Vehicle communication

AUTOMATION FOR VALIDATION & END-OF-LINE TEST

VISION

Camera image recognition for automatic verification of icons, graphics elements, alarms, messages and telltales.

HARDWARE IN THE LOOP

- Electrical test
- Input/output stress test
- Optical, audio, haptic tests (robots)
- Acquisition systems

THANK YOU

for your attention

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