

Software and Hardware Tools for Driver Assistance & Automated Driving

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Competitive Edge



Simplifying
Testing/Validation

Reducing Expenses

Obtaining Reliable
Data



HAD Testing Challenges

Key success factors for ADAS and HAD projects:
Reliable and seamlessly integrated tools and methodologies for validation and verification

- ▶ Due to increasing complexity, automated driving requires intensive testing with billions of miles driven
- ▶ Development and update cycles must get shorter

HAD Testing

Pain Points

- ▶ Huge set of SW components based on complex input data from various sources
- ▶ Validation of HAD functions → high level of test coverage
- ▶ Various driving scenes (real or virtual) for testing = huge amount of data
- ▶ Structured driving scenes database with efficient search and access methods

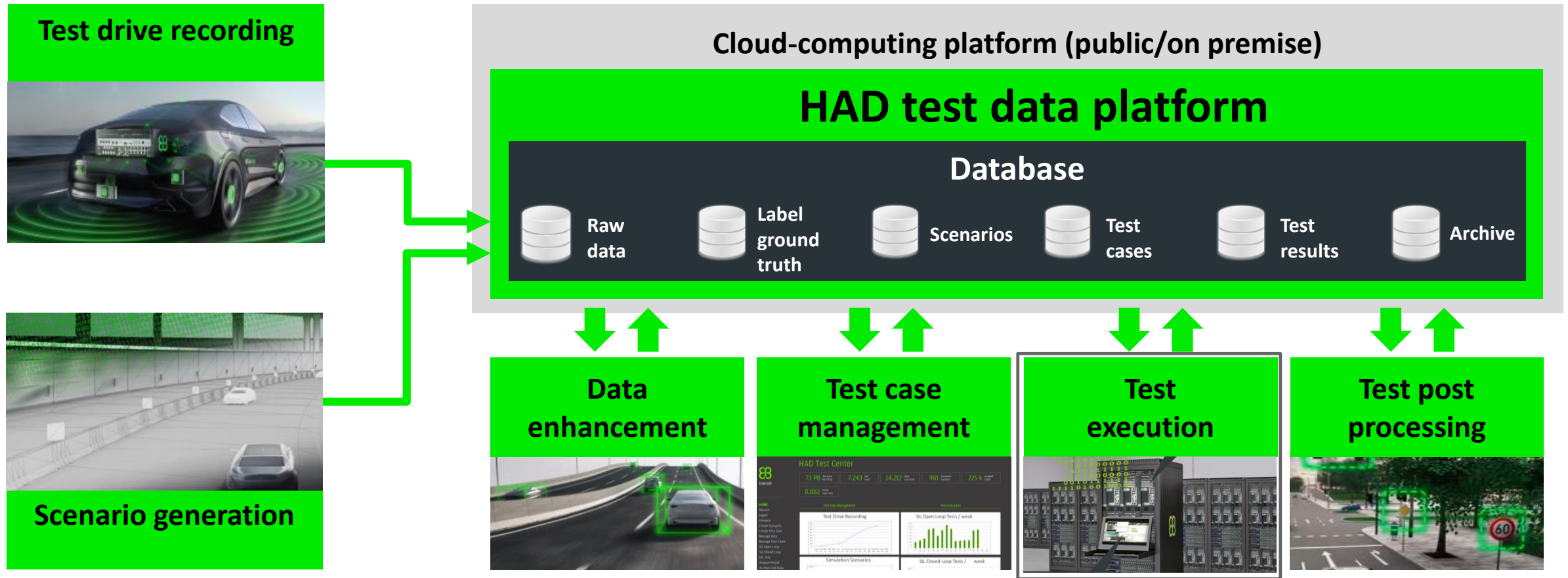
Tool solutions

Drive Scene Data capturing device

- ▶ Support different sensor interfaces and vehicle bus communication
- ▶ Synchronize incoming data
- ▶ Time stamp with high resolution

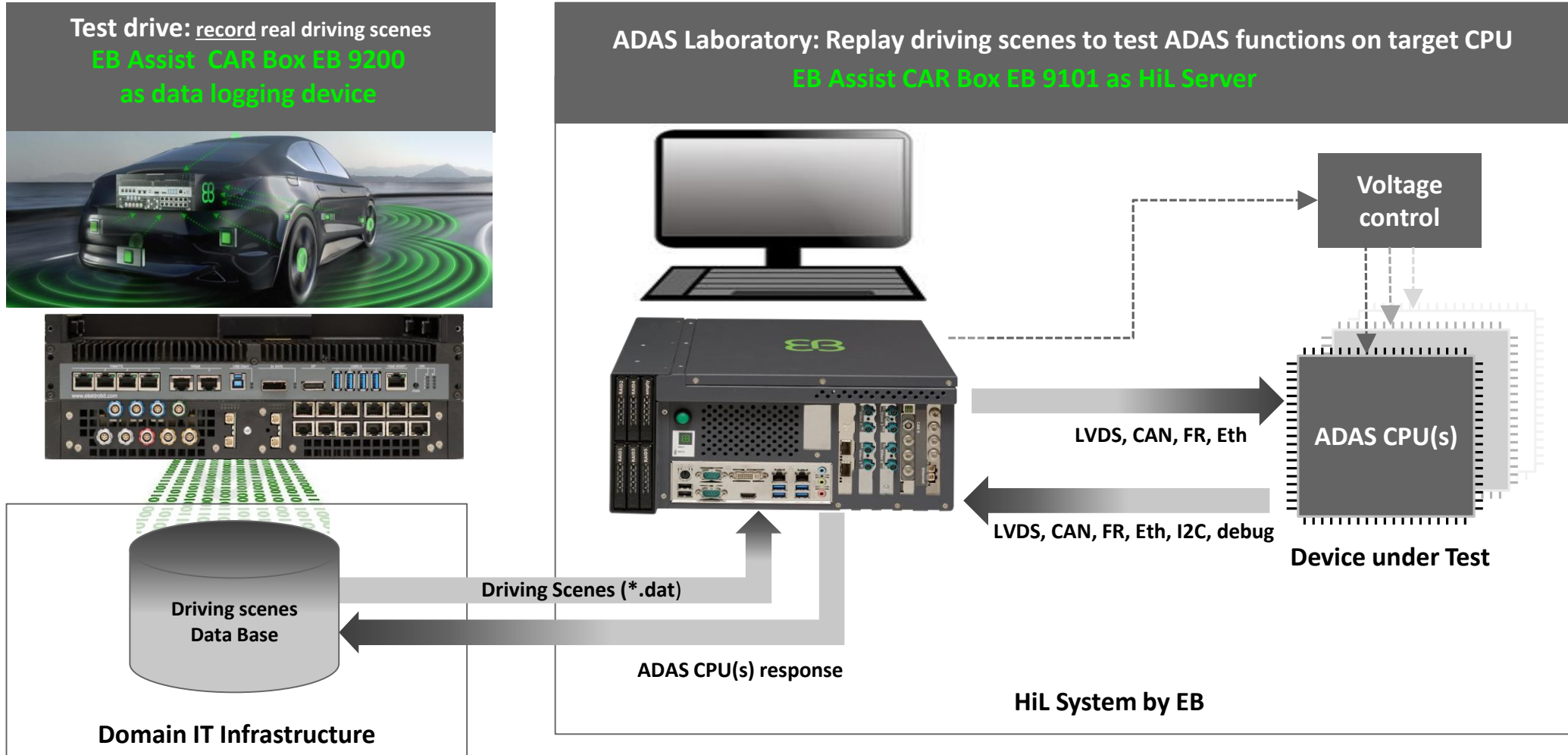
Laboratory environment to utilize drives scenes to increase test coverage

One-Stop Solution for Testing & Validation



Focus of this presentation

Hardware in the Loop (HiL) System

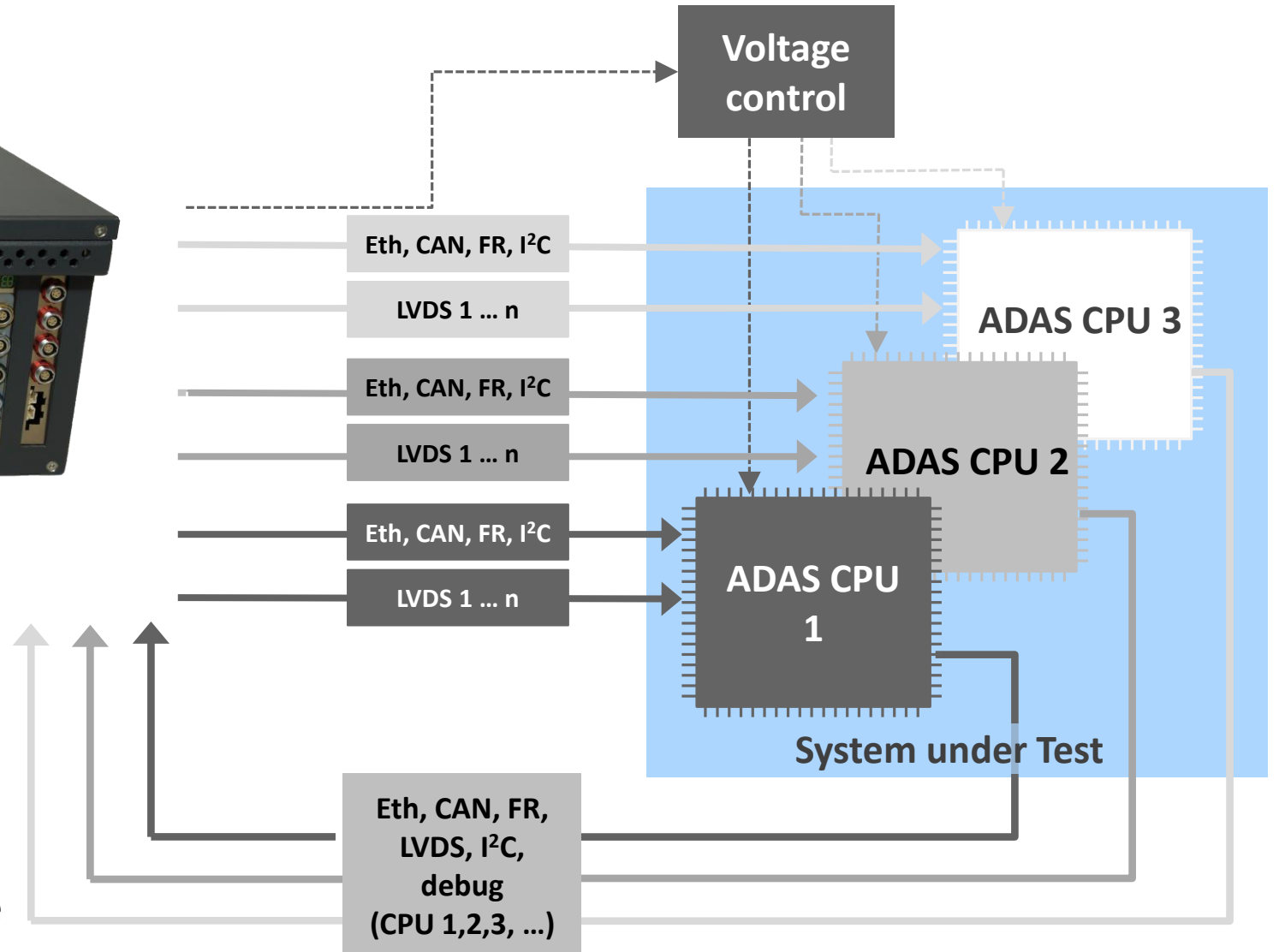


EB 9101 as HiL Server



HiL server EB 9101

- 24/7 operation
- High computing performance
- Automotive I/O interfaces
- High storage capacity
- High speed connection to data backbone



Technical Details: EB CAR Box 9101 as HiL Server

Hilo Server:

- Intel Xeon E3 CPU
- Intel C236 chipset
- 32 GB main memory
- 1 GB Ethernet
- 10 GB Ethernet SFP

Storage:

- System disk, SSD

Optional:

- RAID System

Connectivity (configuration depends on customer requirements):

- FR, Can, Eth, LIN, BroadR-Reach, Digi I/O
- Expansion
 - 2x PCIe x 16 (1 x 16 or 2 x 8 signal) (Gen3)
 - 2x PCIe x 4 (Gen3)
 - 1x M.2 M Key (2260/2280) (Optane Memory Support)
- Ethernet Controller
 - 3x Intel I211AT PCIe (10/100/1000Mbps)
 - 1x Intel I219LM PCIe

SW Licenses

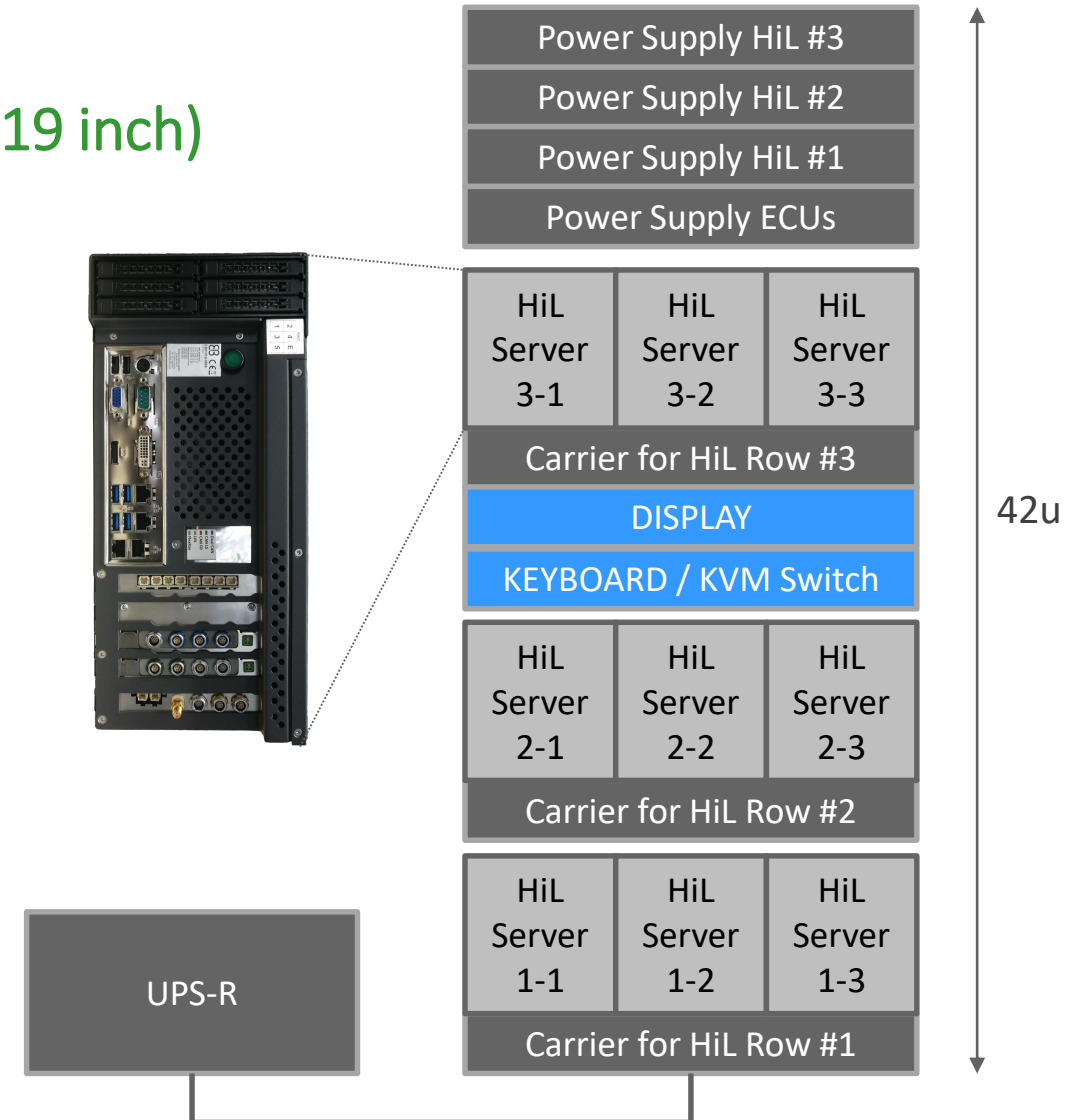
- EB Assist ADTF runtime license
- EB Assist Capture & Replay License
- EB Assist HiL Control Toolbox License



HiL System Farm

Grouping up to 9 EB HiLs in one HiL Rack (Standard 19 inch)

- **HiL Rack - 9 HiL systems**
 - 3 carriers, each with up to 3 HiL systems
 - Keyboard
 - Display
 - KVM switch to control each HiL server with one mouse/keyboard/display
 - 230 V power supply for each carrier (HiL systems)
 - 12 V power supply for up to 18 ECUs
 - Dimensions approximately (H x W x D): 42u x 600mm x 1200 mm
- **UPS-R: separate rack that contains optional uninterrupted power supply**
 - Battery package to keep alive HiLs for controlled shutdown



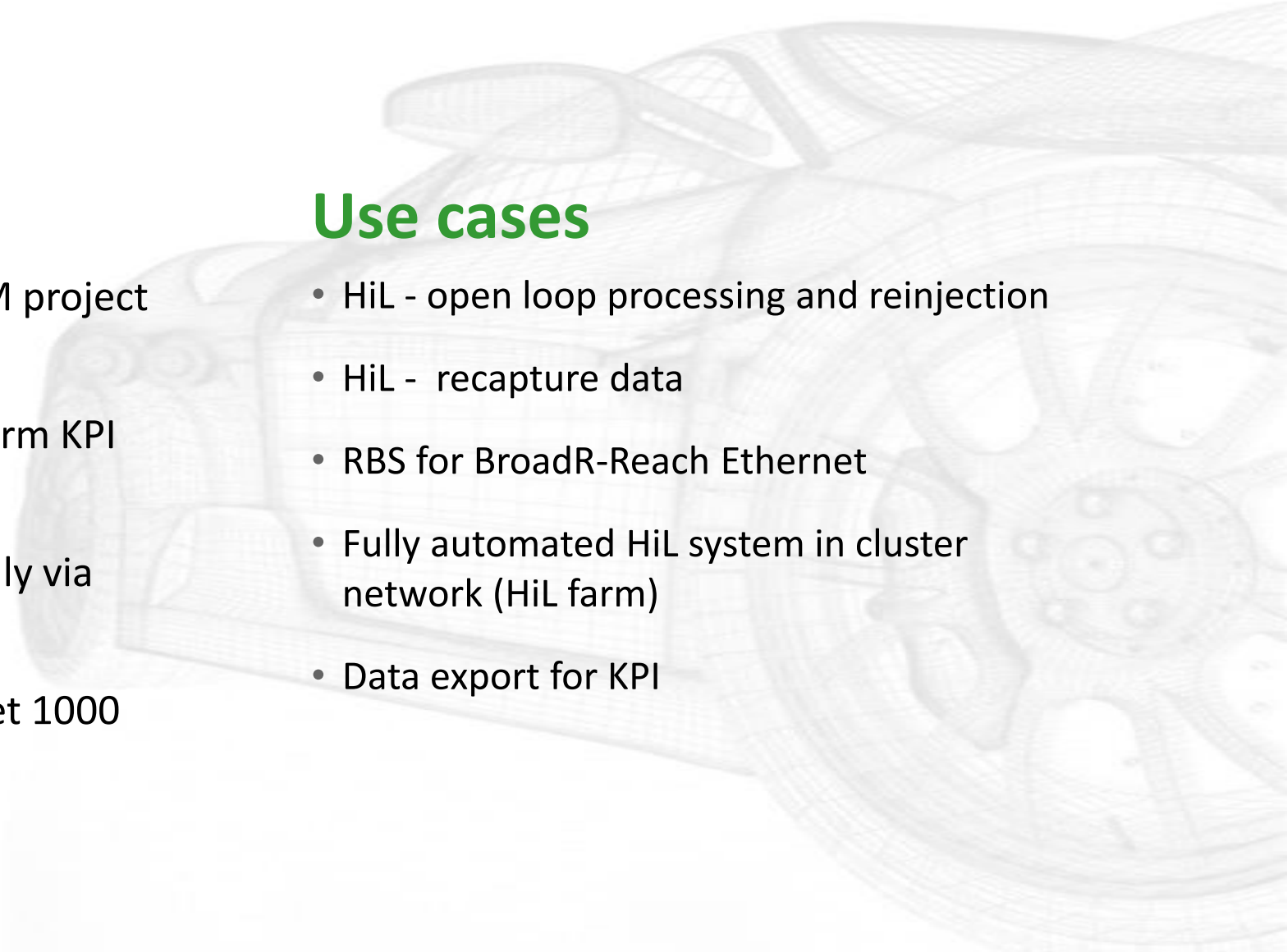
Scope of Project...

Requested content

- **Tier1** – awarded front camera OEM project for mid and high-end modules
- **Tier1** – validate functionality, confirm KPI stats with HiL methods
- New concept for data capture – only via Ethernet – no LVDS
- BroadR-Reach Automotive Ethernet 1000 BASE T1

Use cases

- HiL - open loop processing and reinjection
- HiL - recapture data
- RBS for BroadR-Reach Ethernet
- Fully automated HiL system in cluster network (HiL farm)
- Data export for KPI



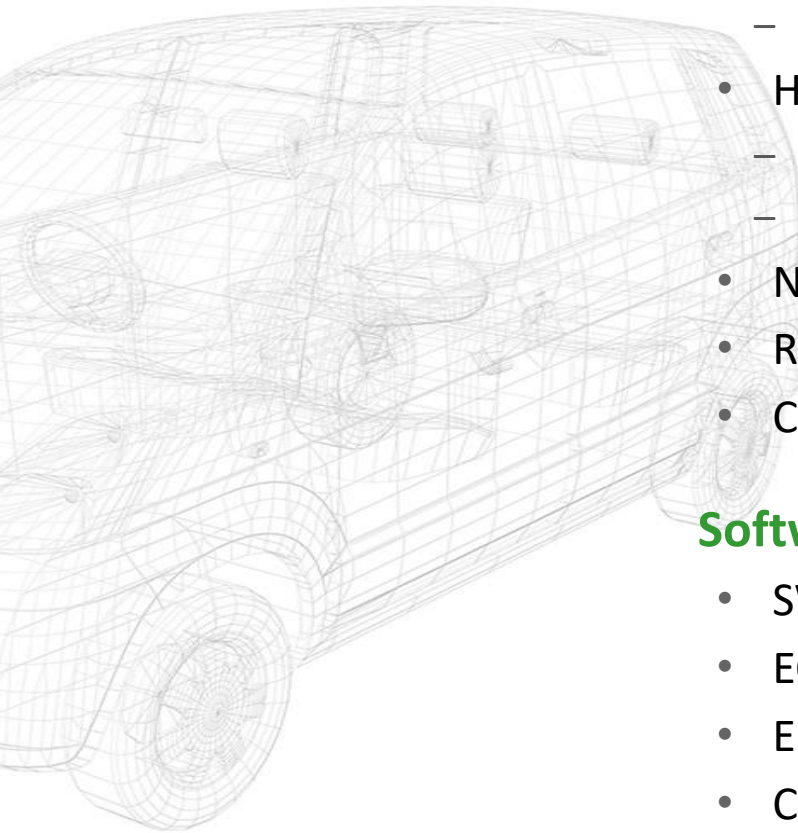
EB Assist ADTF 2 SW Framework & Measurement HW

Hardware & FPGA

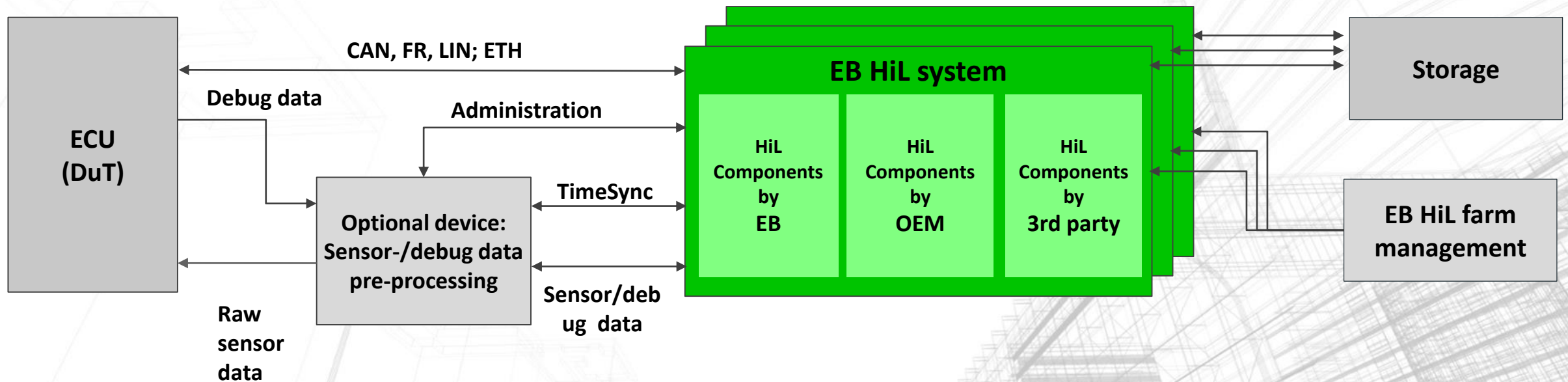
- Mid level Solution → HW HiL devices:
 - EB Assist EB 9101 HW device with EB 5200 measurement card for Automotive Ethernet (OABR)
- High level Solution → Additionally, based on SERVER Station:
 - EB 5200 measurement card for Automotive Ethernet (OABR)
 - EB7200 for 1000 Base T1
- New timing concept (PTP) for time synchronization of ECU and Adapter
- RBS for OABR adaptation
- Customization of HW according to Tier1/OEM demands

Software

- SW based on EB Assist ADTF HiL – Control Toolbox (SW)
- ECU – Flashing and calibration and process data
- Encapsulated data handling within Ethernet frames
- Customization of SW according to Tier1/OEM demands



Use case: Open loop HiL Processing (Re-injection)



HiL Server: EB Assist CAR Box with EB Assist bus tools

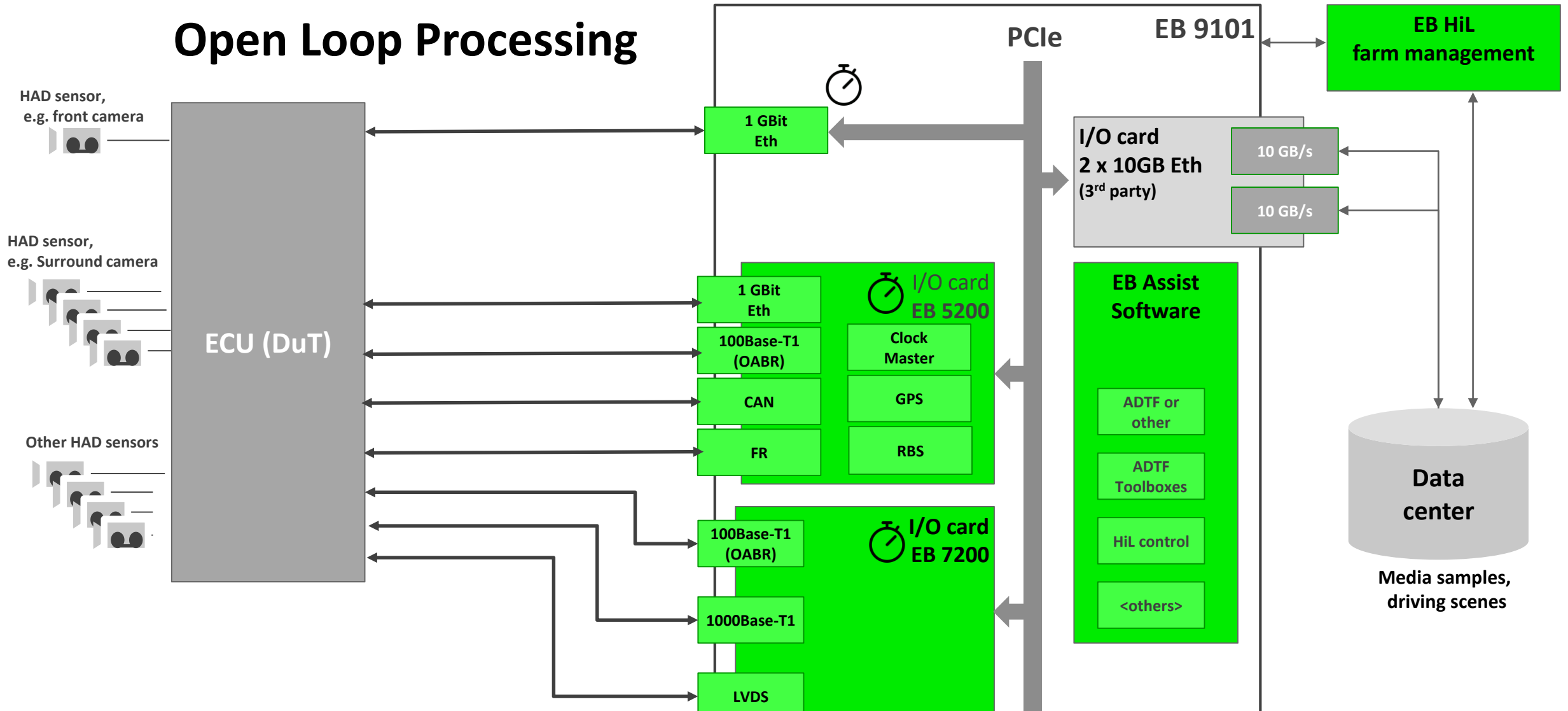


EB 9101
EB Assist CAR Box

EB 7200
EB Assist bus tools:
Modular I/O slot card for 100/1000Base-T1, LVDS

EB 5200
EB Assist bus tools:
Modular I/O slot card for LIN, FR, CAN, ETH

EB 9101 HiL Server – Open Loop Processing



EB Assist Products...

Hardware Products

EB Assist CAR Box

High-performant PC systems for **CA**pture and **Re**play



EB Assist bus tools

Modular I/O slot cards, and interfaces and simulation tools



Software Products

EB Assist Busmirror

Testing ECU software from implementation stage until end of line



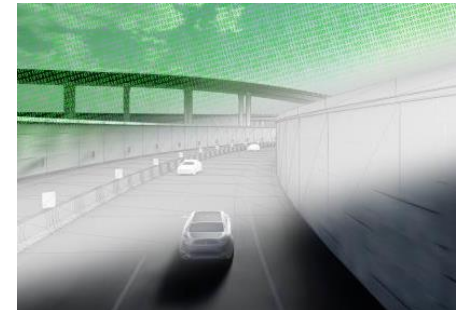
EB Assist ADTF

Tool for the development and validation of ADAS and AD systems



Test Lab

Comprehensive cloud based scene management, binding product along the workflow



Summary

Simplifying Testing/Validation

- ▶ Reusing recorded driving scenes for testing and validation instead of repetitive drives
- ▶ Solutions for recording and replaying sensor data based on real driving scenes

Reducing Expenses

- ▶ Reducing amount of devices for data-logging, replaying, and simulation
- ▶ Using a fully integrated solution that contains hardware and software

Obtaining Reliable Data

- ▶ Test environments which allow reliable and reproducible tests
- ▶ Using a solution from one single vendor/contact to ensure well-matched and reliable products

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