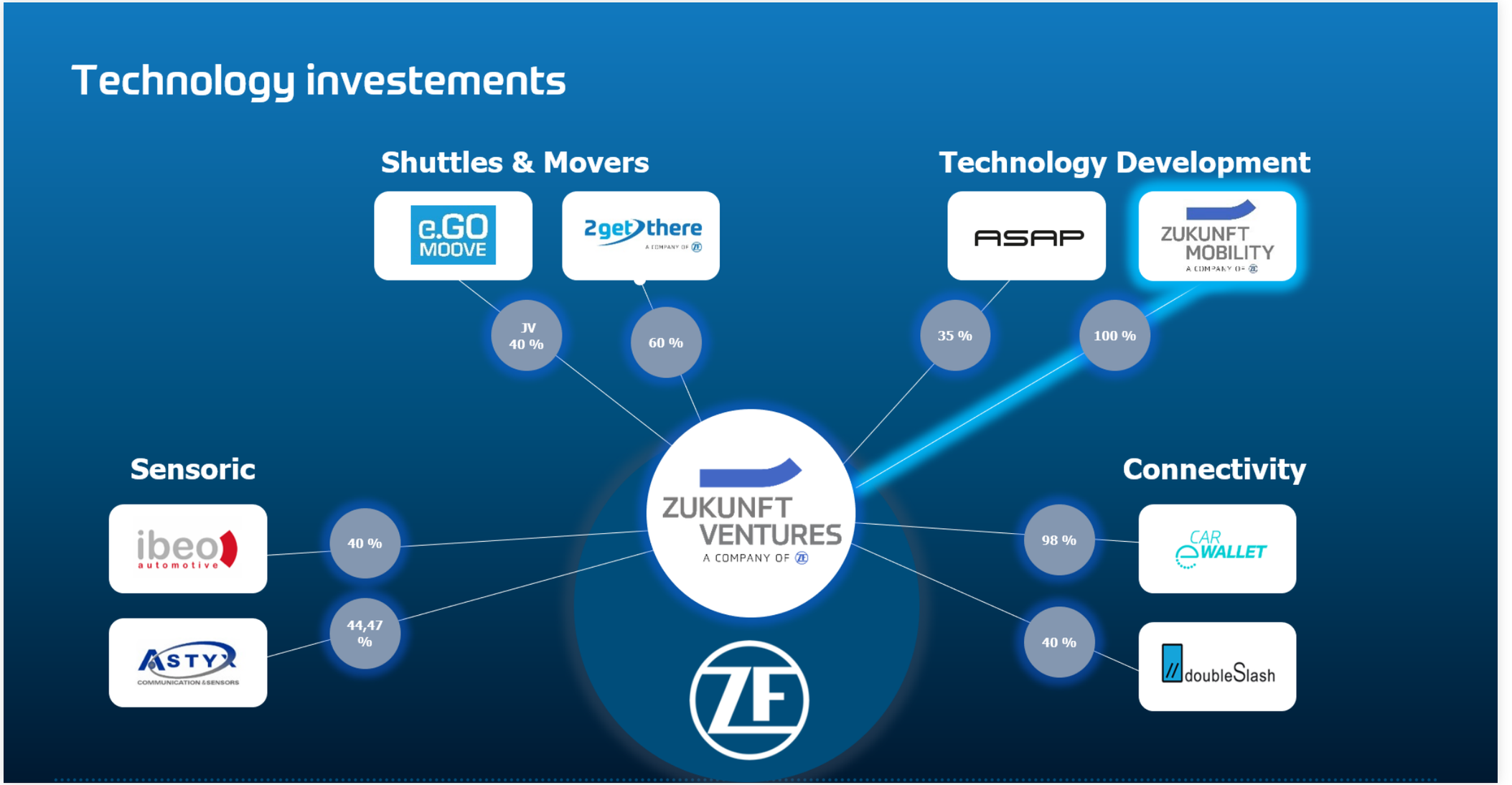
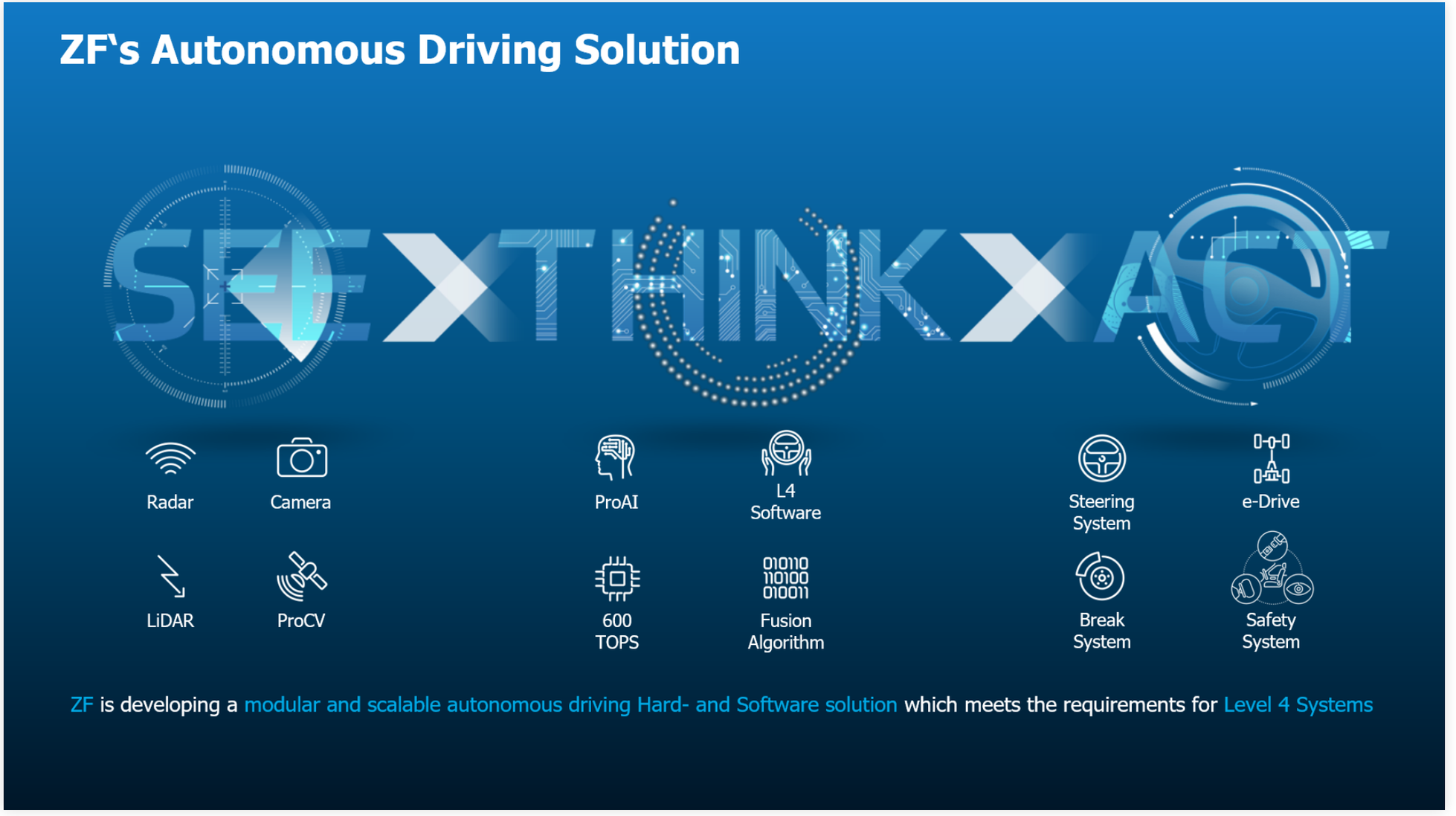
APPLICATION OF CARMAKER-HIL WITH A ZF AD SYSTEM SENSOR SET ON A NI HARDWARE-IN-THE-LOOP TEST-RIG FOR VALIDATION PURPOSES

COMPANY INTRODUCTION AND BIGPICTURE OF THE PROJECT

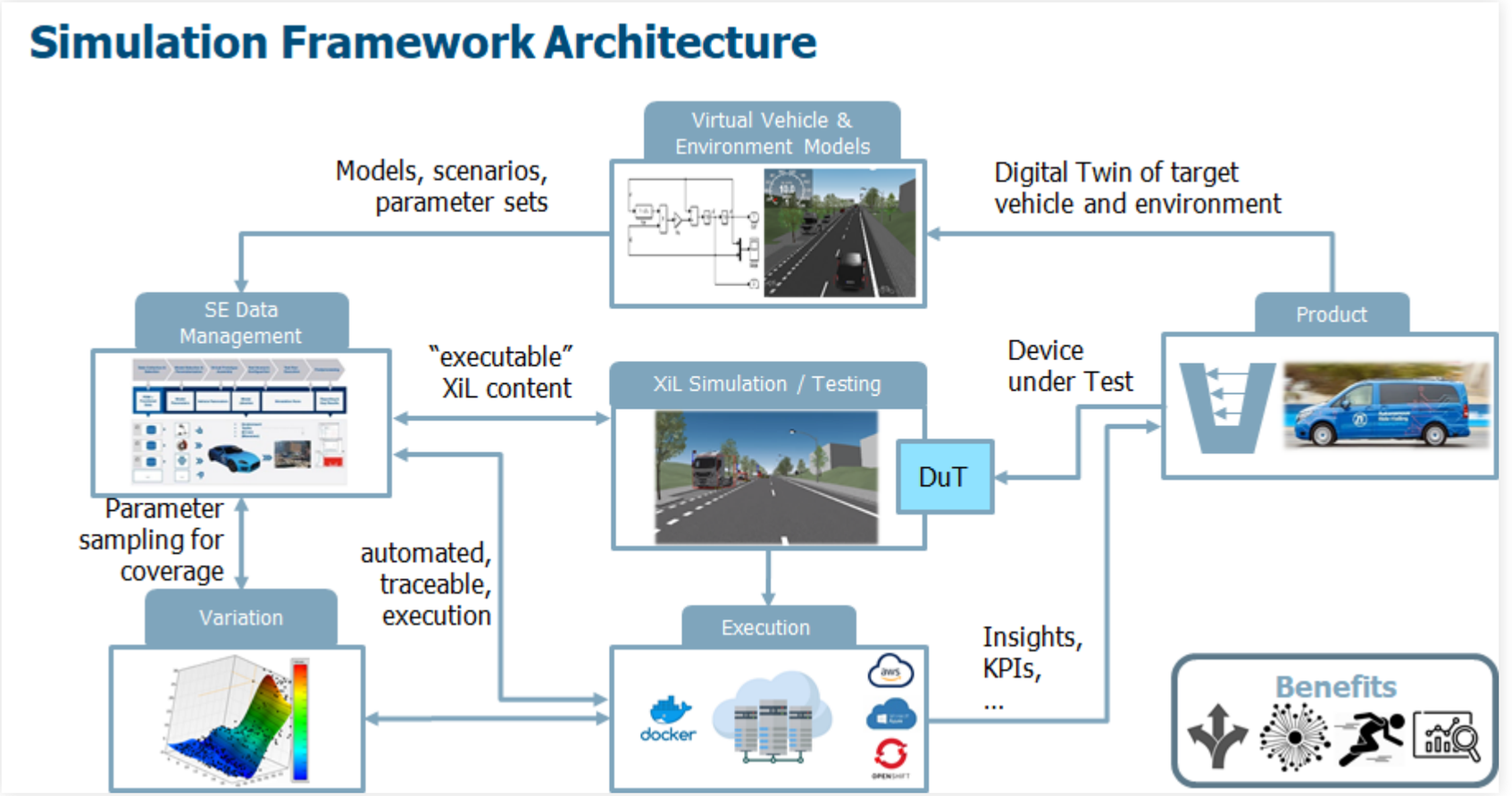
COMPANY INTRODUCTION



PROJECT INTRODUCTION OF THE ZF AD-SYSTEM DEVELOPMENT & VALIDATION

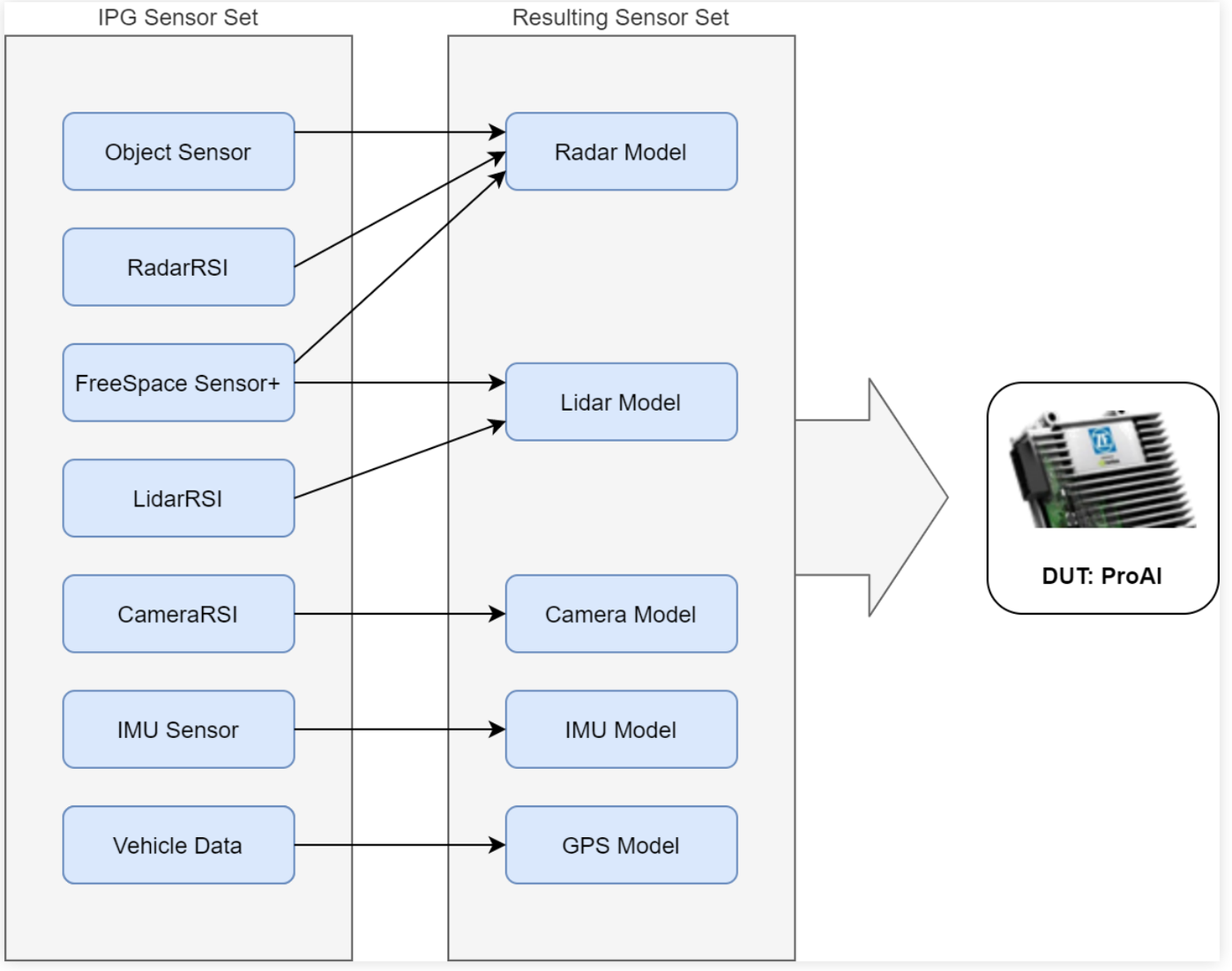


Simulation Framework Architecture



MEASUREMENT BASED APPLICATION AND INVESTIGATION OF HW AND SW REAL-TIME BOTTLENECKS OF A ZF SENSOR SET IN A CARMAKER-HIL SIMULATION FOR AUTONOMOUS DRIVING

1. ZF SENSORSET FROM SIL SIMULATION



2. FIRST TRIALS WITH SIL INCL. RT-FACTOR-MEASUREMENTS

Cores / Instances

2 → 3 → ... → 12

	2	3	... 12
CPU-Load	16% / 97%	22% / 97% / 85%	?
GPU-Load	18%	25%	?
RT-Factor	0,211	0,291	> 1

Used Hardware

Intel Xeon Gold 6128

Nvidia Quadro RTX 6000

3. ARCHITECTURE WORKSHOP WITH NI& IPG INCL. PROOF-OF-CONCEPT WITH MEASUREMENTS OF VDS STREAMS - FINAL HIL-ARCHITEKTUR

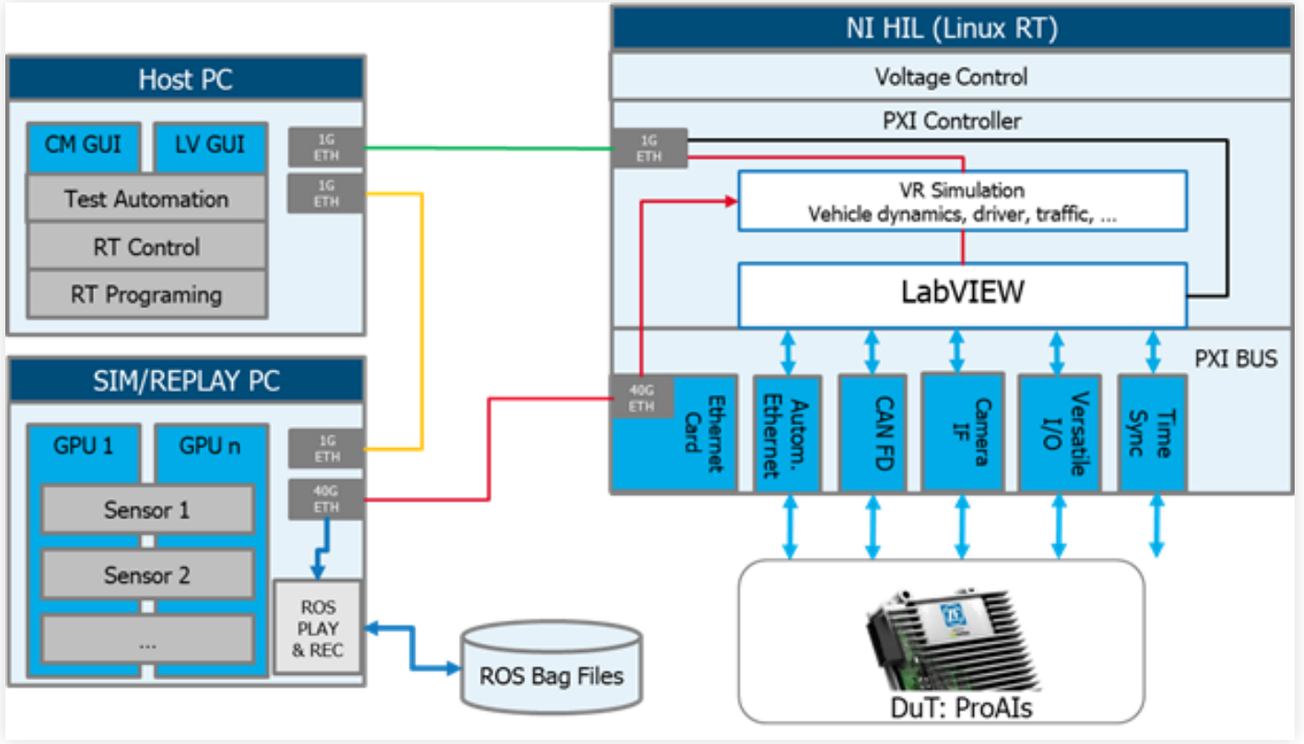
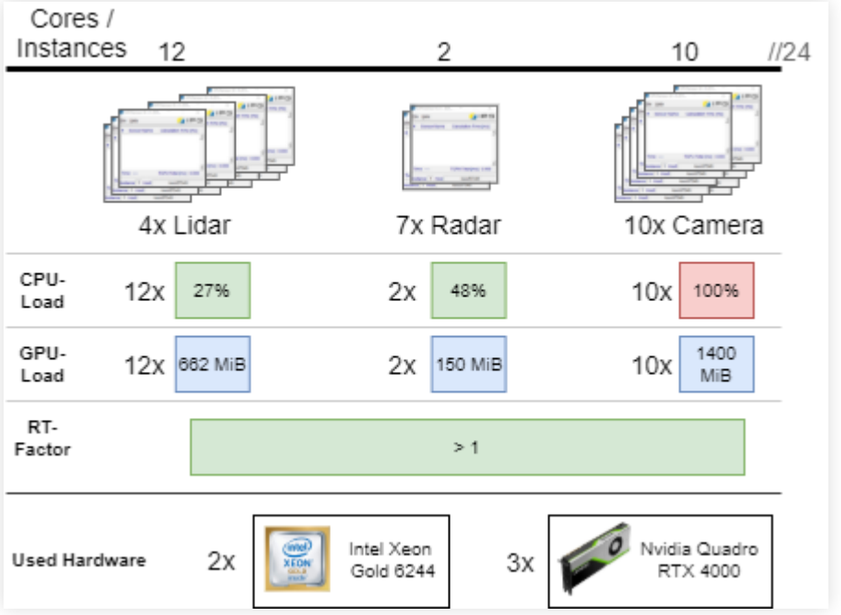


Fig. 1 Hard- and Software architecture of AD System HIL

4. RESULTS OF PERFORMANCE EVALUATION ON FINAL HW SETUP AND FIRST SHOWCASE



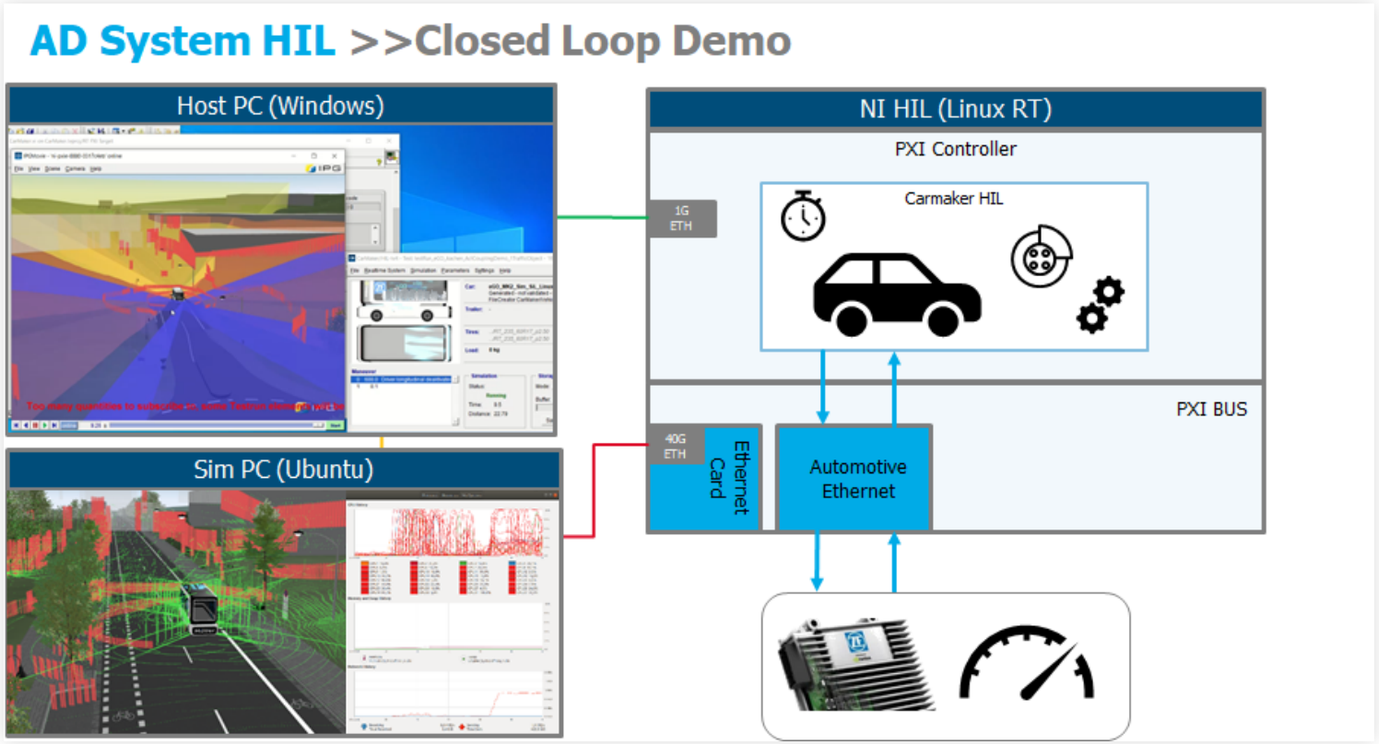
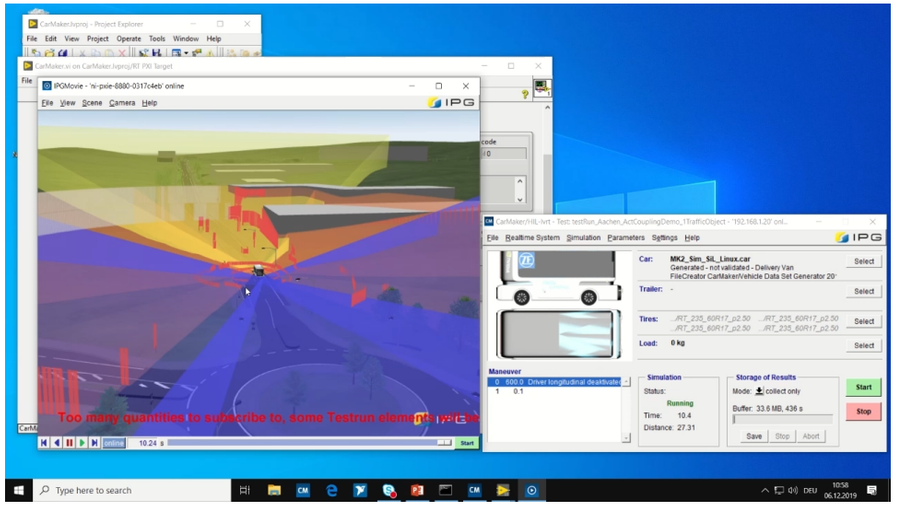


Fig. 2 Visualisation of Closed-Loop Simulation with CarMaker HIL and performance measurements parallely running


Too many quantities to subscribe to, some Testrun elements
Car:
MK2_Sim_SiL_Linux.car
Generated - not validated - Delivery Van
FileCreator CarMaker/Vehicle Data Set Generator 20
Trailer:
Tires:
Load:
0 kg
Select
Maneuver
Simulation
Status:
Running
Time:
10.4
Distance:
27.31
Storage of Results
Mode:
collect only
Buffer:
33.6 MB, 436 s
Save
Stop
Abort
Start
Stop
Type here to search

5. OUTLOOK

Measurement based and analytical studies to see if the QoS & RT-Requirements of the HIL-System are fullfilled!

- **Verify reliability and RT-capability of Ethernet Connection with Wireshark measurements**:
  - APO and UDP
  - TCP
  - DDS and UDP
  - Stresstesting with MitM or Spoofing attacks

- **SIL simulation to find out the real-time capabilites of a CarMaker scene before running on HiL**