

Final Event
24-25th of May 2022

Physical Demos

Cloud-based HiL Testing of batteries



Powerful Advanced N-Level Digital Architecture
for models of electrified vehicles and their components

Ronan GERMAN
Salma FADILI

Theodoros KALOGIANNIS

Florian TOURNEZ
Alain BOUSCAYROL



www.project-panda.eu



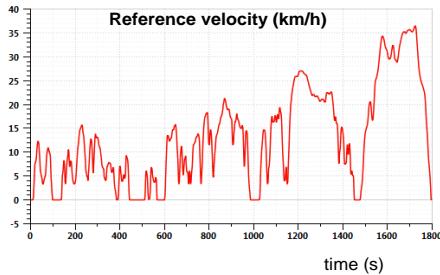
Why testing the battery compatibility with a vehicle ?



Operation limits have to be respected for batteries



For a driving cycle



For a studied vehicle

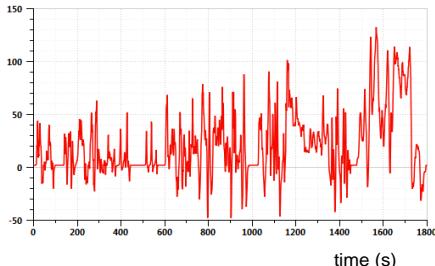


For a battery

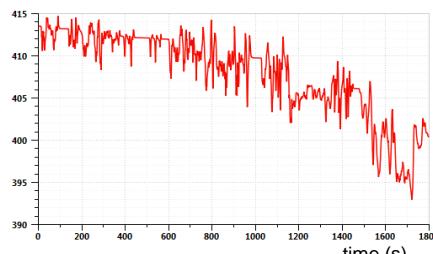


Follow the battery:

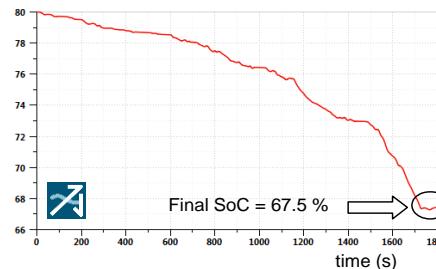
Current



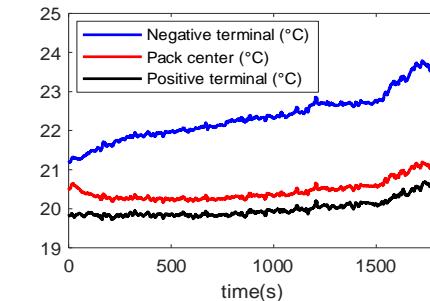
Voltage



SoC



Temperature



Everything OK?
the tested battery
and the vehicle are
compatible

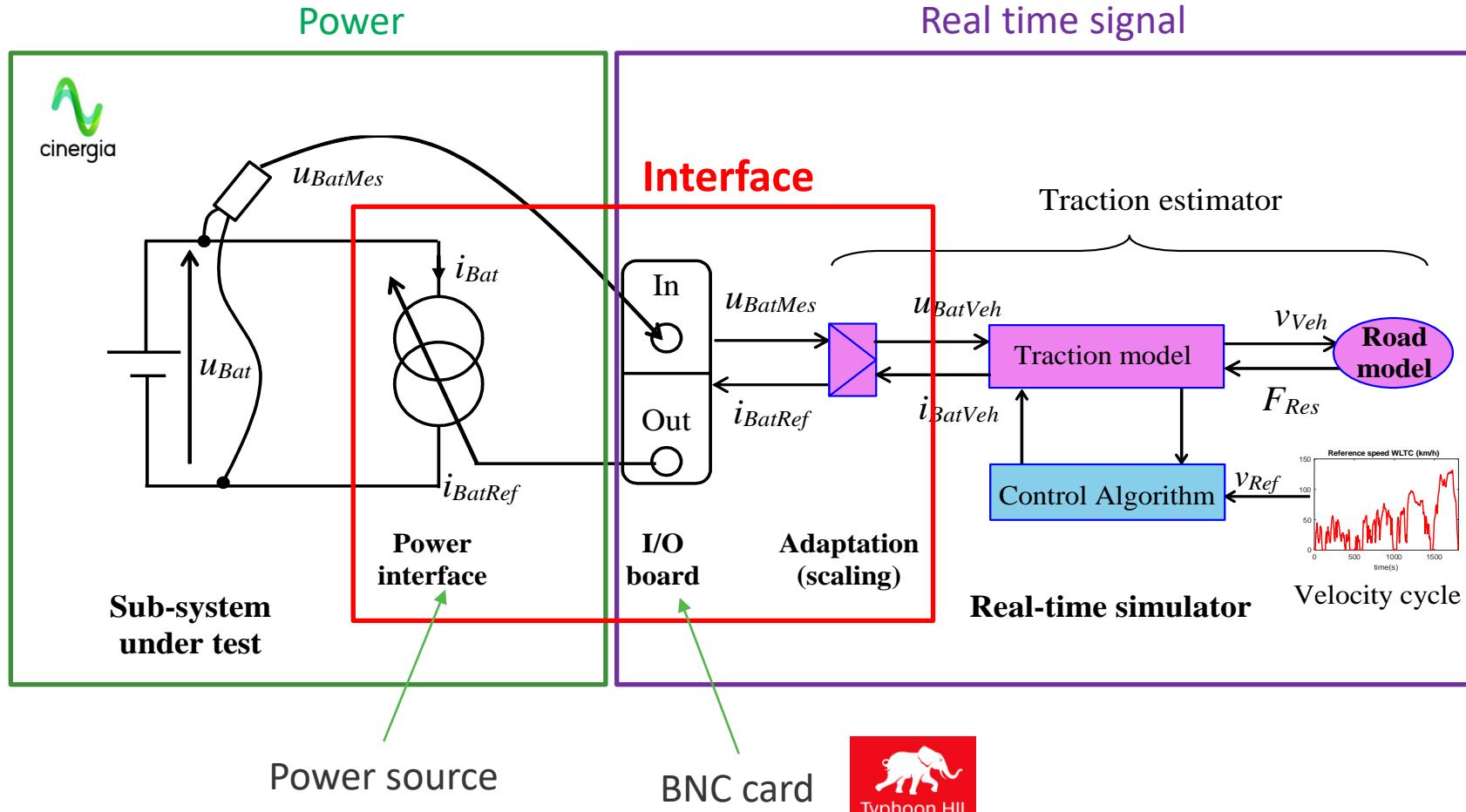
→ The battery HiL testing aims to validate this compatibility without building a vehicle prototype.

Battery power test general architecture

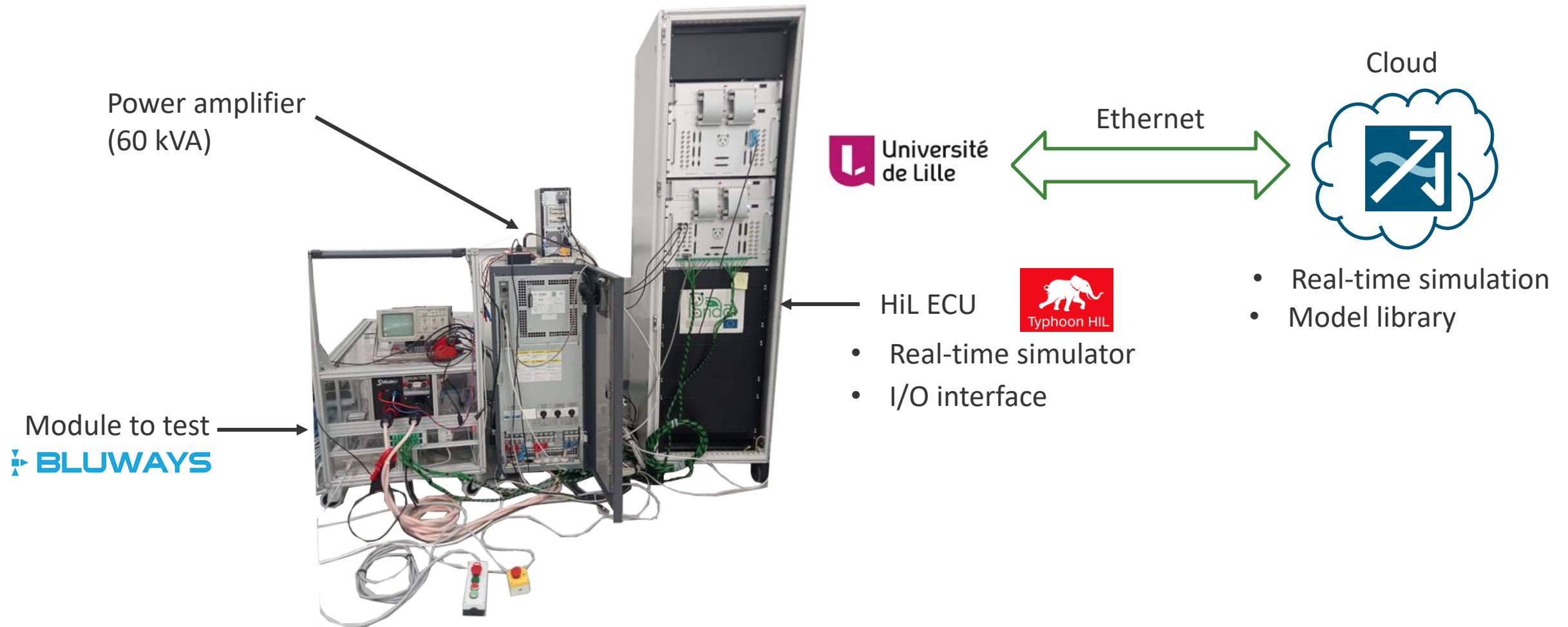


Battery is real

Rest of the vehicle is simulated



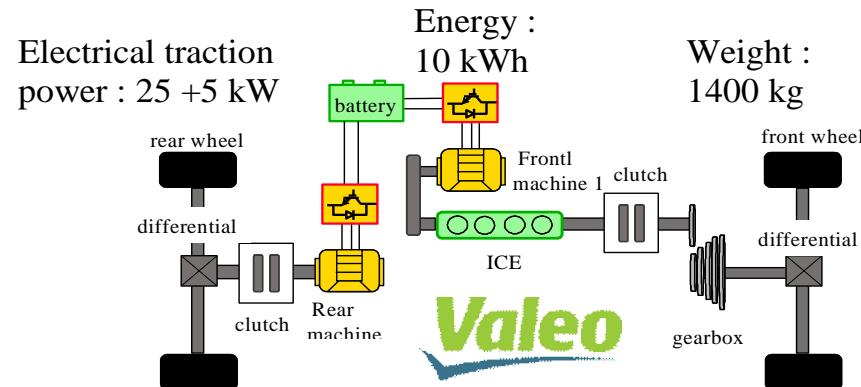
Flexible experimental test-bench



Studied P-HEV

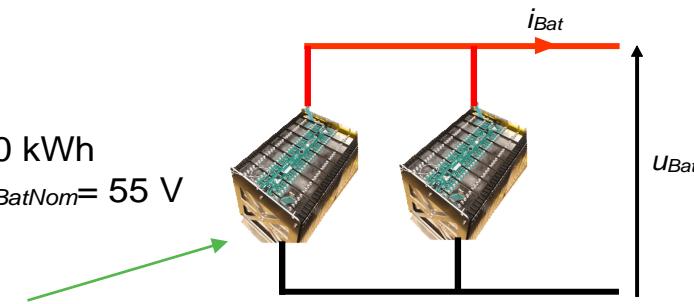


Simplified structure (p-HEV)



Battery

- 10 kWh
- $U_{BatNom} = 55 \text{ V}$

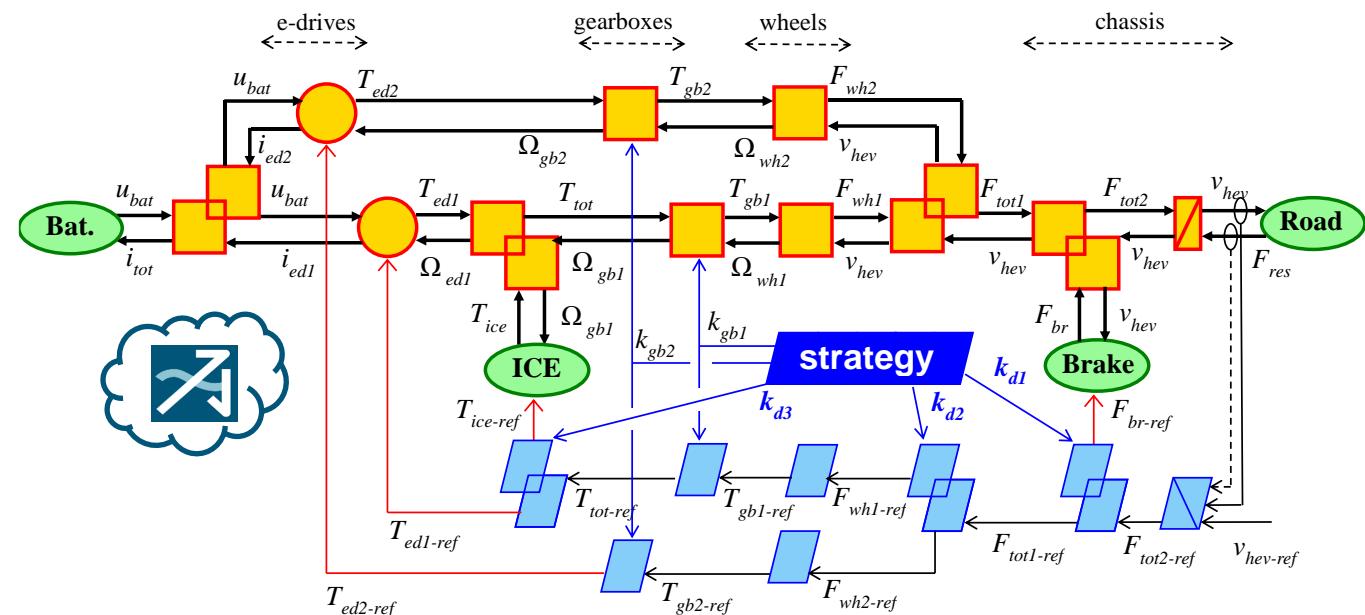


Module

BLUWAYS

Step 1- Simulation Study (pre-validation)

Energetic Macroscopic representation (EMR) for model organization

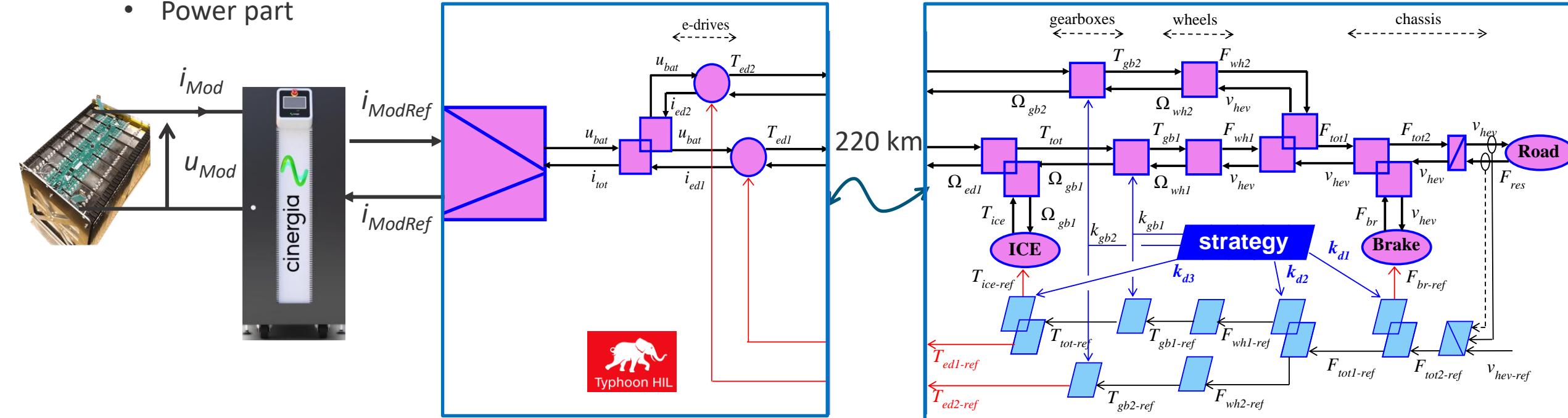


Cloud-based HiL testing of the Battery of the P-HEV



EMR allows to clearly connect the different parts

- Cloud real-time simulation
- Local real-time simulation
- Power part



Power part



Real-time simulation



Paris



Demo Time



Method flexibility



VRIJE
UNIVERSITEIT
BRUSSEL

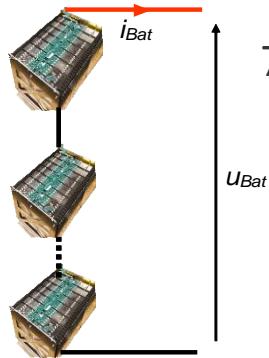


Cloud testing a new battery for the Renault Zoe

Renault Zoe



New battery to test



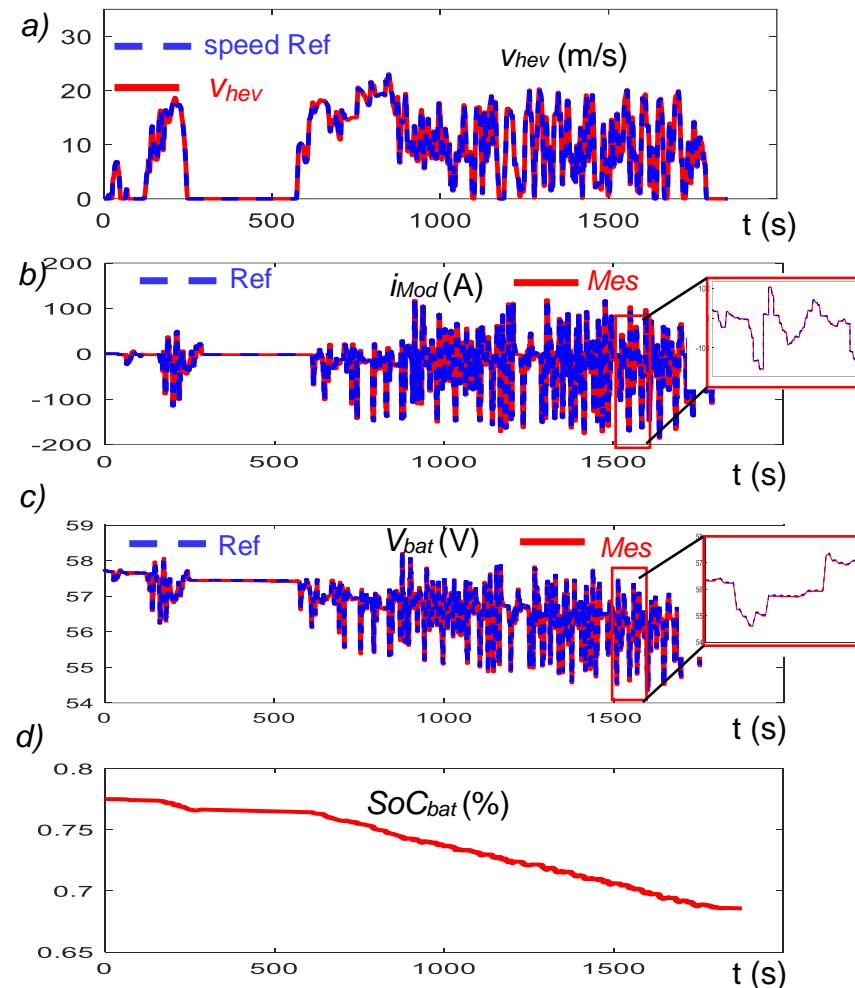
7 modules in series

BLUWAYS

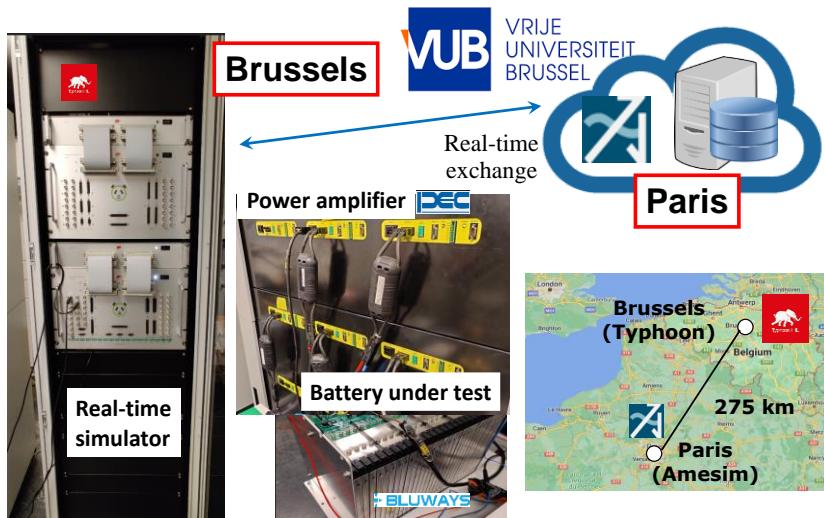
35 kWh

400 V

Power test results are obtained (1module)



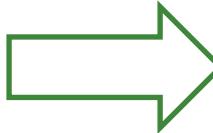
Same method is applied with an other test bench



Conclusion



- HiL testing of batteries for different vehicles
- on different experimental set-ups
- Using the same cloud and real-time ECU



EMR as guideline
for flexible cloud-based
HiL testing



SIEMENS

Valeo



BLUWAYS



Renault Group

