Final Event
24-25th of May 2022

Key innovations

Unified organization of models

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

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Common organization formalism

Energetic Macroscopic Representation

(graphical formalism, developed in 2000, worldwide use)

EMR is a **causal functional** formalism for model and control organization

- Exclusive integral causality
- Interaction principle

⇩

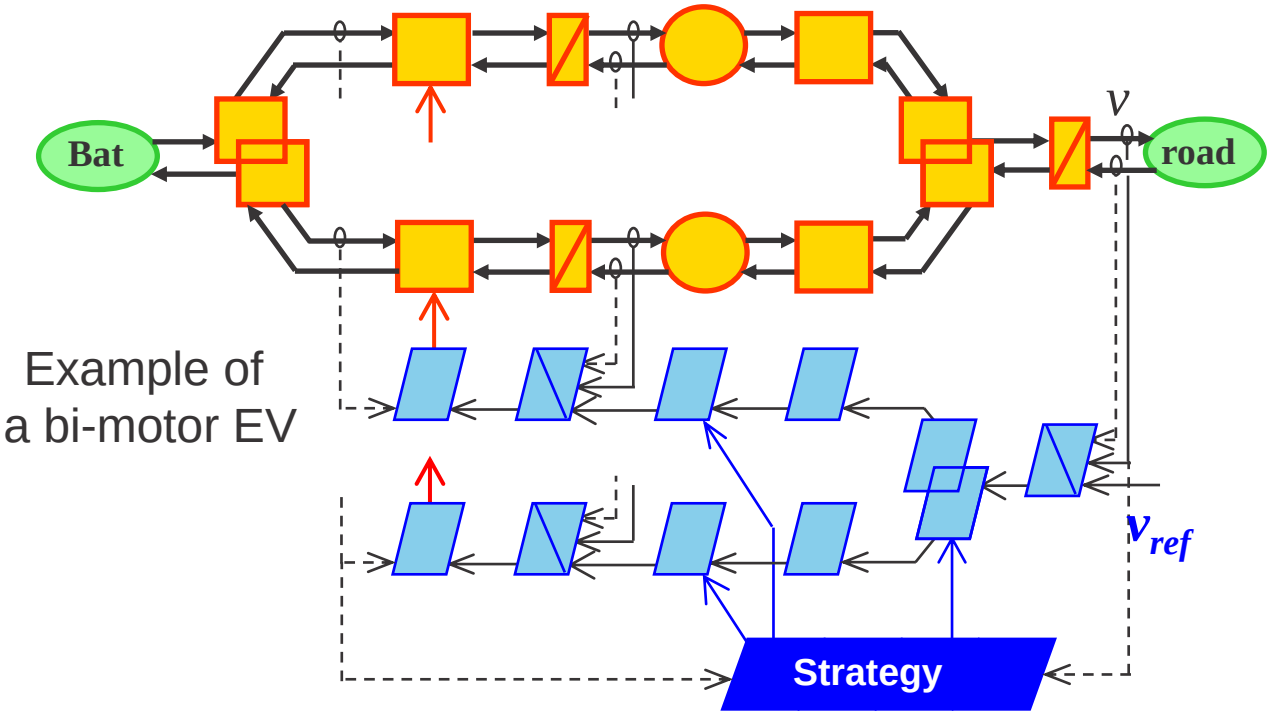
- Control structure deduced by inversion

and

Fixed I/Os of subsystems:
- Seamless interconnection
- Model interoperability (multi-level model)

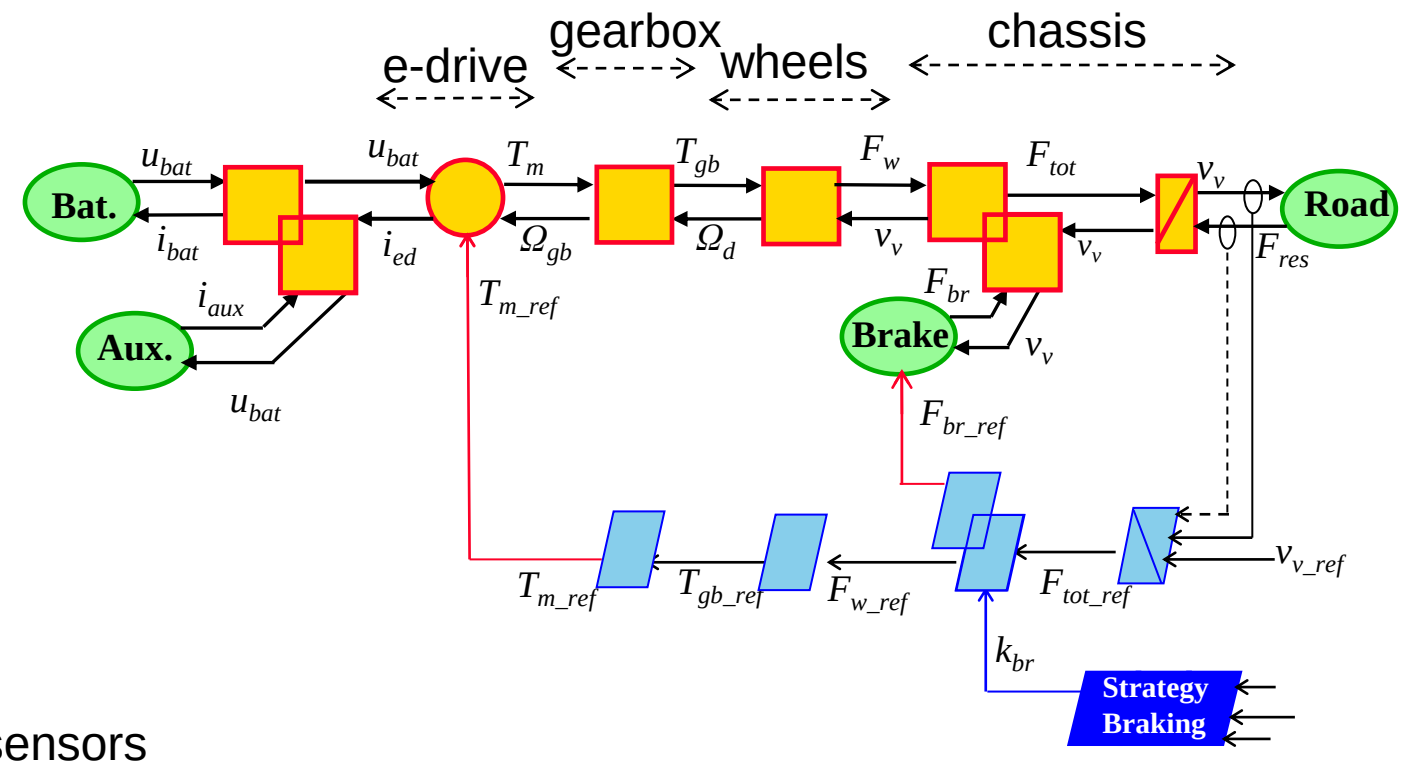
http://www.emrwebsite.org/

Example of a bi-motor EV



Systematic control organization

Renault Zoe



source

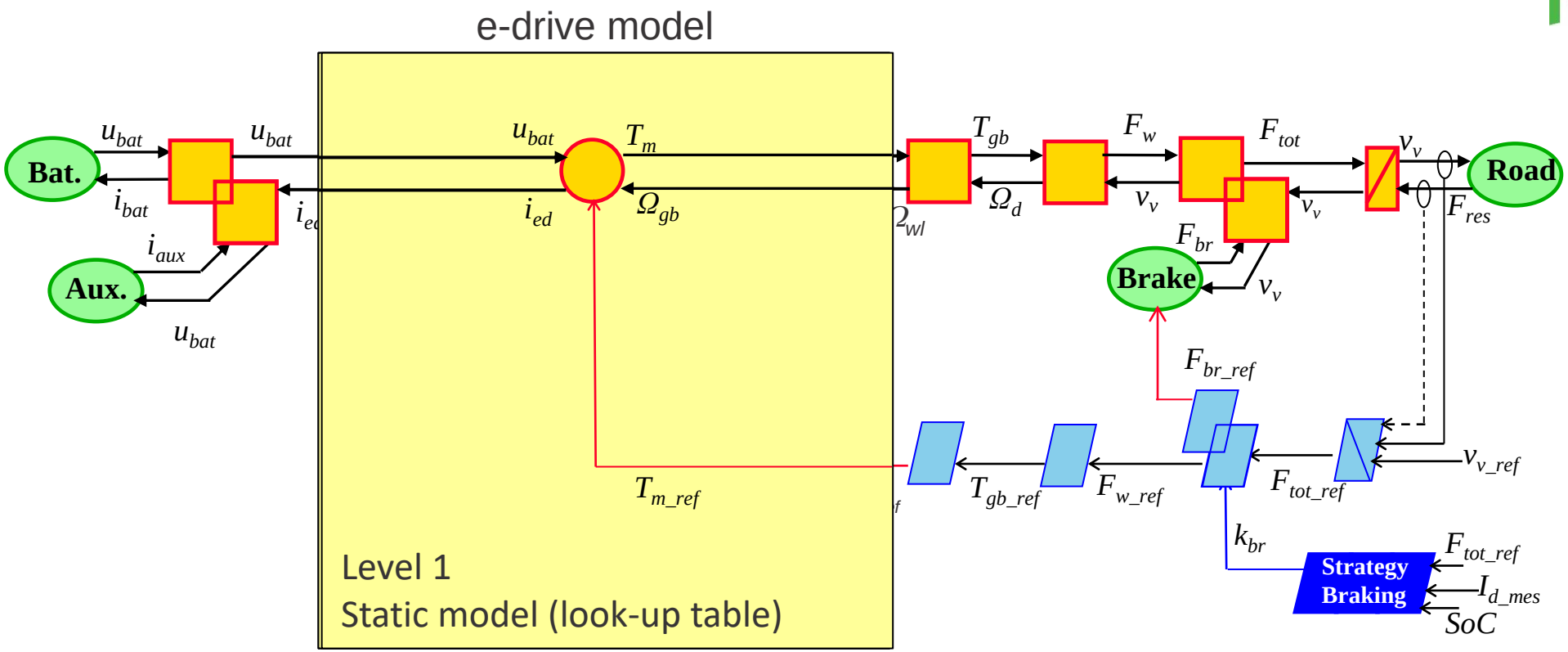
power

control

- location of sensors
- location of controllers
- Control and strategy levels

control schemes systematically deduced by mirror effect !

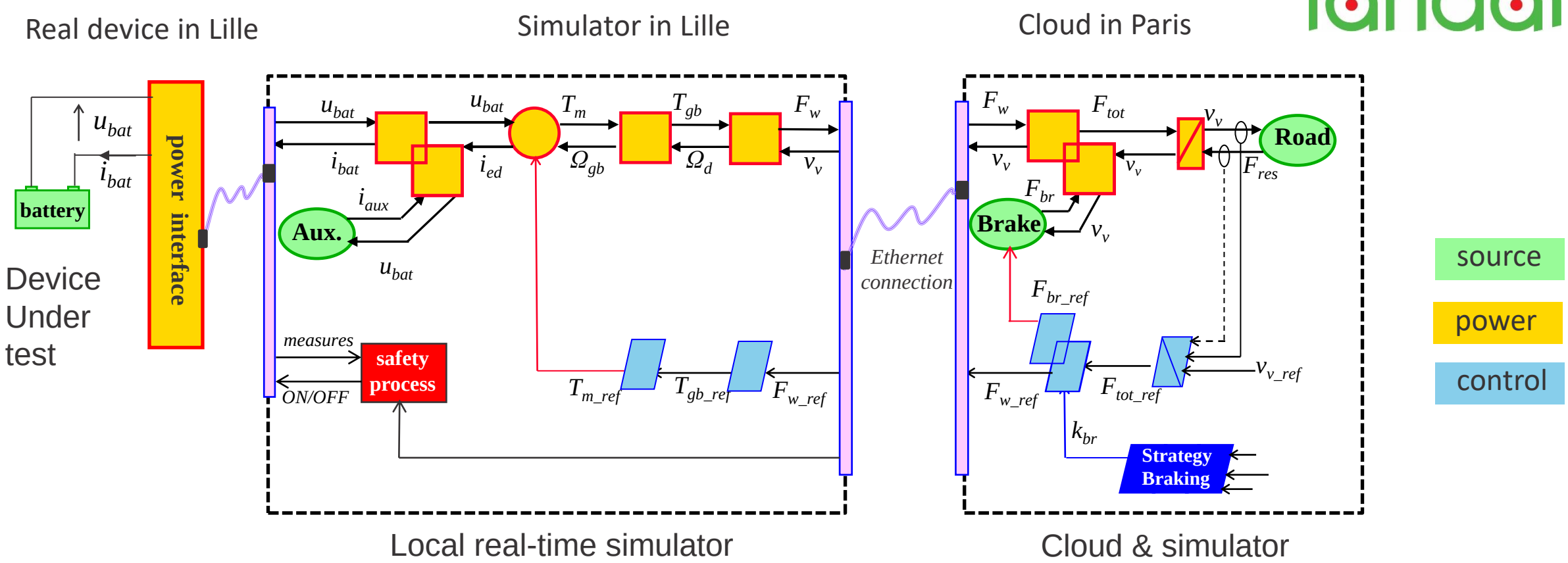
Multi-level simulation



- keep the same I/Os
- Plug & play for change

High interoperability for model change

Co-simulation / HIL testing / Cloud-based HIL



High flexibility for any simulation decomposition

PANDA - GA 824256

Conclusion- take home message

Energetic Macroscopic Representation is

- Is a graphical formalism to organize the modelling of systems
- Relies on physical integral causality rules
- Respects Interaction principle

With these properties, EMR

- Is adapted to real time simulation with low computing time
- Allows to deduce systematically the control structure by inversion
- Allows a unified organization of system modelling with
  - **Fixed I/Os: no FMI needed**
  - **High level of interoperability**

⇒ **Relevant answer to PANDA objectives!**

Our PANDA
Thanks you for your attention !

H2020 PANDA project

https://project-panda.eu/

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 824256.