

Final Event
24-25th of May 2022

Industrial Feedback

Renault feedback on PANDA



Powerful **A**dvanced **N**-Level **D**igital **A**rchitecture
for models of electrified vehicles and their components

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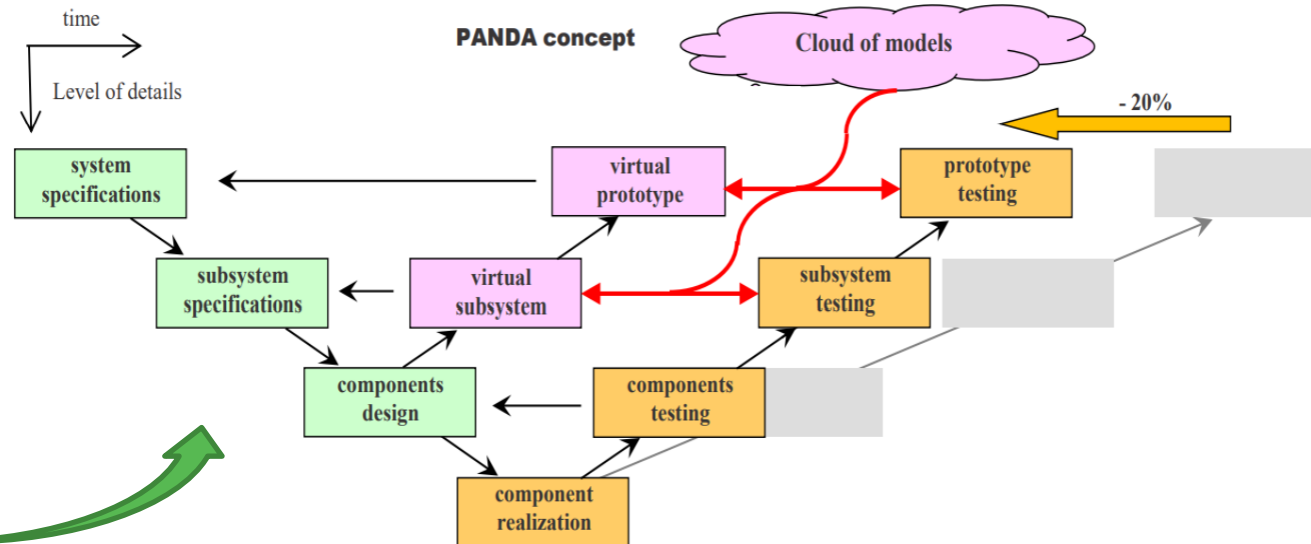
Context

- Automotive industry is under **high pressure to introduce new technologies** (e.g. electrified vehicles or connected cars)
- New regulations and market competition put pressure **to reduce the time to market and the entry ticket cost** for new vehicles



- Simulation is mandatory tool for design and optimization of a product (part, system, vehicle)
- More complex products -> more complex simulations

PANDA project proposes a general framework for integration of models for virtual and real testing of electrified vehicles → a **smart reuse of the models in the different parts of a W-model leading to reduce time and increase reliability.**



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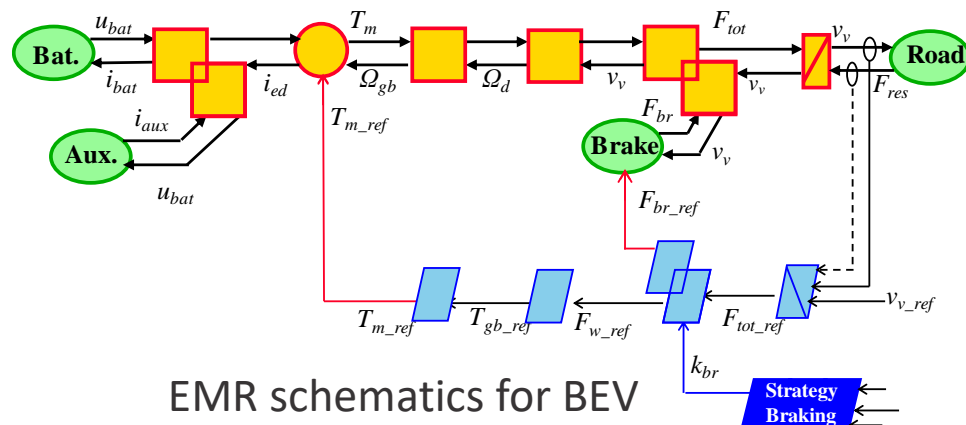


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- 🐼 A **multi-level model approach** is targeted to develop a N-level model organization
- 🐼 **Models** are developed **using a functional approach and fixed I/Os** for the different models of the same subsystem
- 🐼 The **EMR formalism** is selected for the unified models' organization

- + **Seamless replacing of a model** of a component with a different complexity allows the **use of the same architecture along the development process** of the vehicle
- + Reduce the architecture complexity -> **reduce the number of people** involved in architecture design and simulation.
- + **Speed up the simulation process** at vehicle level as the functional models are faster.
- High effort to **rebuild and validate models** according to the formalism proposed



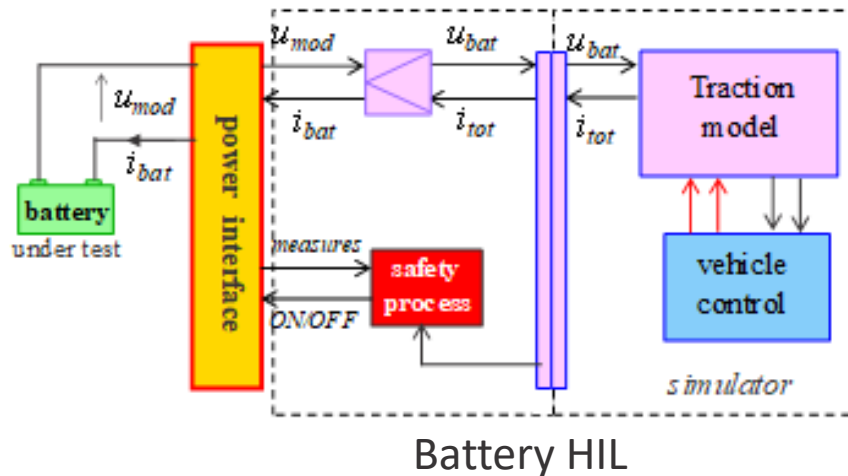
EMR schematics for BEV

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- 🐼 **Models** are developed provide **fast and reliable simulations** with reduce order ODE numerical methods
- 🐼 The proposed method enables **accurate real-time models for both virtual and real testing** - on the Hardware-in-the-Loop (HIL) bench.



Feedback

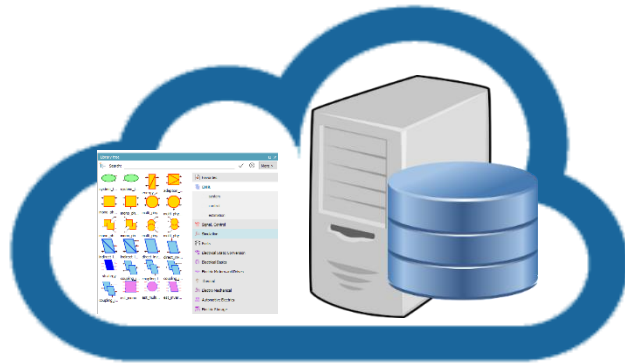
- + Very good performances for models in terms of **precision (<6%)** and **simulation speed (-15%)** also **adapted to HIL testing**
- + **Models** of systems **can be easily replaced for HIL testing** during the development of the project.
- + The portability of the models **facilitates the transfer between virtual and real testing** to reduce time and costs.
- Renault HIL models are complex = simulation all functions managed by an ECU → high effort to rebuild these models.

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- 🐼 PANDA project propose a **Cloud-Computing solution** of **for sharing models** and running simulations using the proposed simulation architecture
- 🐼 The **Cloud-Computing solution** successfully tested on real time test **on the Hardware-in-the-Loop (HIL) test benches** for several systems.



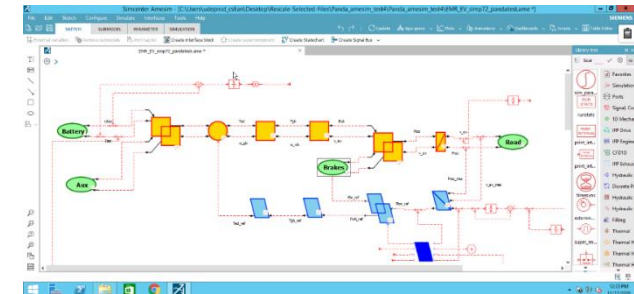
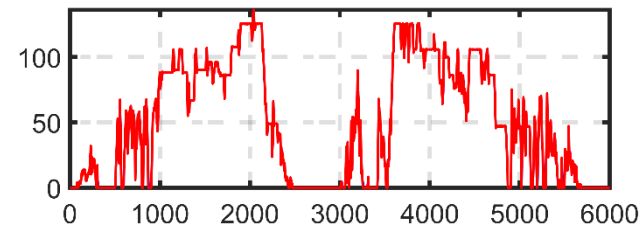
Feedback

- + Cloud-Computing solution for simulation propose a tool for **sharing models and simulations between different business partners.**
- + Good results for **HIL testing using Cloud-Computing solution** → possibility to run such tests in collaboration between partners
- + Solution for using **confidential models as black boxes** as it guarantees the interconnection.
- A **new business model** between suppliers and vehicle developer **needs to be developed.**



Thanks for your attention!

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