

H2020RTR21

Powerful **A**dvanced **N**-level **D**igital **A**rchitecture for electrified vehicles and components


www.project-panda.eu


2018-2022, 11 partners (6 countries), 3.5 M€



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1. PANDA concept



Slide 2



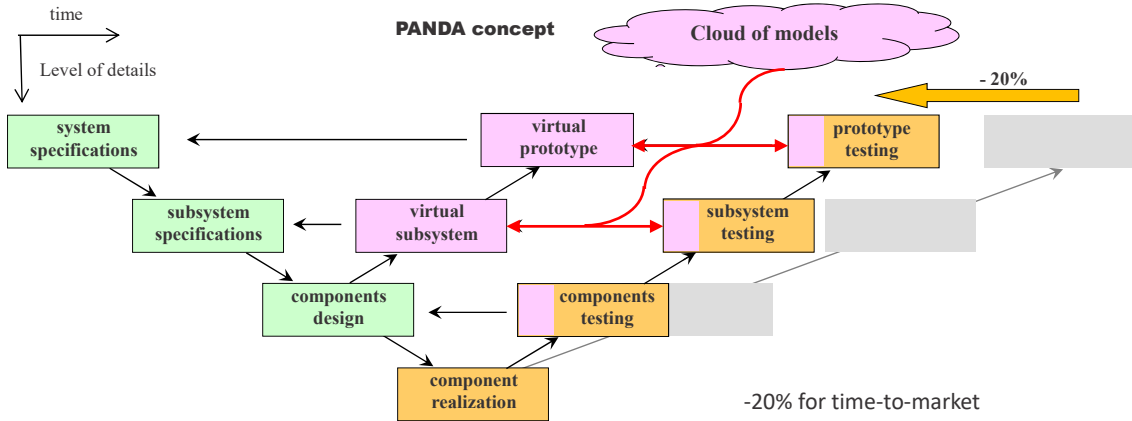
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PANDA objective



Disruptive and **open access model organization** in the development process for fast and efficient development of innovative EVs



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Unified organization using EMR formalism

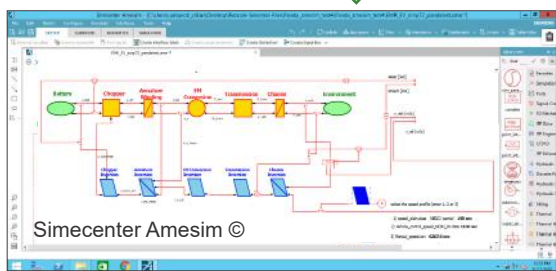
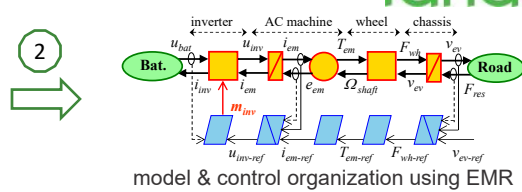


Tazzari Zero of Université de Lille

1

$$\begin{cases}
 J \frac{d}{dt} \Omega_{gear} = T_{dcm} - T_{gear} - f \Omega_{gear} \\
 L_{arm} \frac{d}{dt} i_{dcm} = u_{chop} - e_{dcm} - R_{arm} i_{dcm} \\
 \begin{cases} u_{chop} = m_{chop} V_{bat} \\ i_{chop} = m_{chop} i_{dcm} \end{cases} \quad \begin{cases} T_{diff} = k_{diff} T_{gear} \\ \Omega_{diff} = k_{diff} \Omega_{wh} \end{cases} \\
 \begin{cases} T_{dcm} = k_{dcm} i_{dcm} \\ e_{dcm} = k_{dcm} \Omega_{gear} \end{cases} \quad \begin{cases} T_{gear} = k_{gear} T_{dcm} \\ \Omega_{gear} = k_{gear} \Omega_{diff} \end{cases}
 \end{cases}$$

modelling equations



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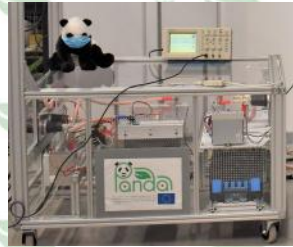


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2. PANDA results



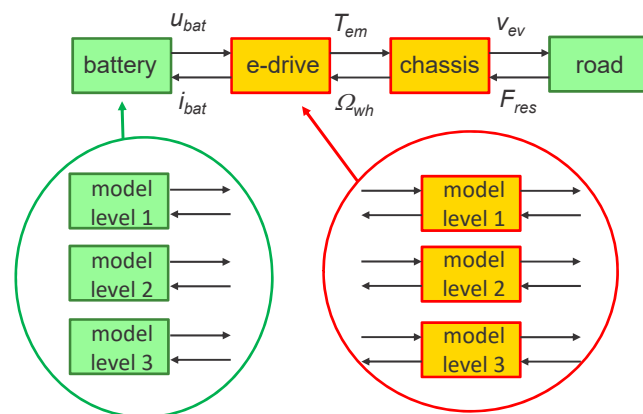
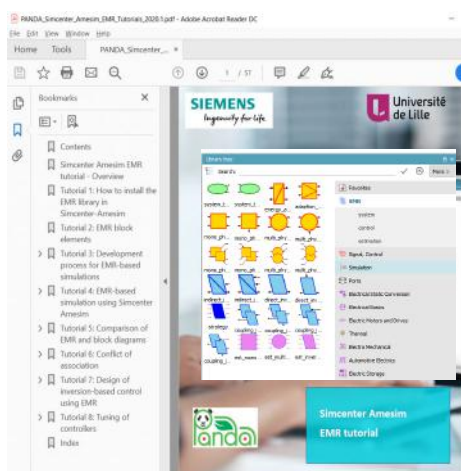
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New EMR library in Simcenter-AMESIM © for multi-level simulation



🔄 Different models can be **interchanged by “plug & play”**


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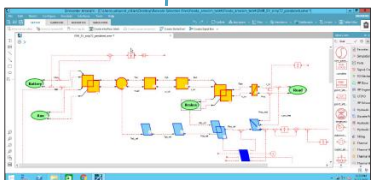



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Virtual testing of the reference vehicles






BEV (Renault Zoe)
Accuracy 97%


FCV (Mobipost)
Accuracy 95%





P-HEV (Valeo Demo Car)
Accuracy 97%

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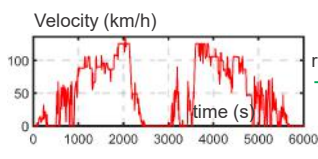
Example of Model validation





measurements

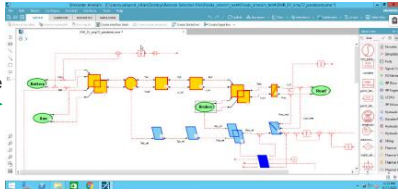
GROUPE RENAULT



Extra-urban real driving cycle

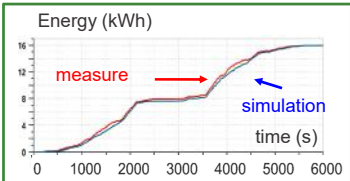
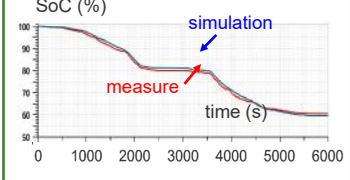
measurements

different real driving cycles from RTR track




reference

Université de Lille **SIEMENS**
Ingenierie for life.

results

Error on energy < 2% for different driving cycles

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Real testing of the P-HEV subsystems (Hardware-In-the-Loop testing)

Stand-alone HIL & cloud-based HIL

Real-time simulator

BLUWAYS

Typoon HIL


Valeo

HIL testing the battery

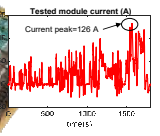
HIL testing the e-drive

HIL testing the e-subsystem

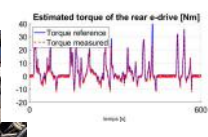
Cloud of models



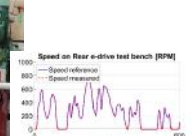
SIEMENS
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Tested module current (A)
Current peak=126 A



Estimated torque of the rear e-drive (Nm)



Speed on Rear e-drive test bench (RPM)

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Valeo

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Example of the HIL battery testing

Brussels

Real-time exchange

Paris


Stand-alone HIL & cloud-based HIL

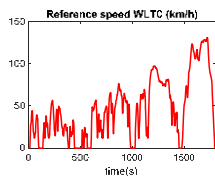
Real-time simulator

Power amplifier

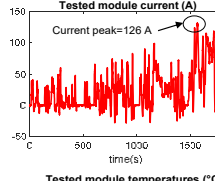
Battery under test

BLUWAYS

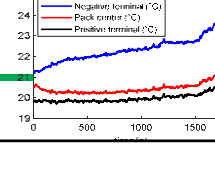





Reference speed WLTC (km/h)




Tested module current (A)
Current peak=126 A



Tested module temperatures (°C)



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3. PANDA perspectives



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Short-term: evaluation Group
(using the cloud of models)



EV charging station



retrofit gas-electric ship



new automatic subway

agreements in progress



Hydrogen train



new electric locomotive



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Mid-term perspectives



Business model for the EMR library in Simcenter AMESIM © and other softwares

- tutorials for the EMR library and Cloud of models
- education version and industrial version ?

Spin-off for helping companies to adopt the PANDA method

- from PhD students involved in PANDA ?
- contribution to speed-up the transition to e-mobility



New applications for the PANDA methodology

- other transport sectors, renewable energy conversion systems, positive energy building, etc.
- contribution to some submissions to Horizon Europe calls (interest in the method / cloud)

Extension to training of future European high-level scientists

- proposal of HE MSCA Doctoral Network under review (50% of PANDA members)

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

Final Event

24th + 25th of May 2022 | Lille, France | On location & online



Welcome!



Pre-registration: <https://project-panda.eu/>



PANDA Members



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

Our PANDA
Thanks you for your attention !



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

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