



ELECTRIC VEHICLES INTERNATIONAL
CONFERENCE & SHOW



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

Workshop PANDA

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Powerful **A**dvanced **N**-Level **D**igital **A**rchitecture
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Workshop PANDA - Agenda

1. Welcome PANDA – SISW
2. Challenges in the Automotive Industry and eMotor Technology – RTR
3. Energetic macroscopic representation – SISW
4. Multi-level knowledge models of a permanent magnet synchronous machine – UTCN
5. Functional and structural representation under Simcenter Amesim – SISW
6. Conclusions



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



PANDA Objective: to provide unified organizations of digital models for seamless integration in virtual and real testing of all types of electrified vehicles and their components.

H2020 RIA, GV-02-2018
2018-2021, 3.5 M€,
11 partners (6 countries)





Complementary skills

- 4 Universities
 - Univ Lille: model organization (EMR) + HIL
 - Univ Belfort: Fuel-cell + FC vehicle (for test)
 - Univ Cluj-Napoca: electrical machines
 - Vrije Universiteit Brussels: Batteries + LCA
- 4 Industry
 - Renault Technologie Roumanie: electric vehicle + EV (for test)
 - Siemens Industry Software: simulation software + cloud computing
 - Valeo: electrical drive + P-HEV demonstrator (for test)
 - TUV-SUD: battery testing + certification
- 3 SMEs
 - UniResearch: H2020 project management
 - Typhoon: HIL ECU (3 dedicated Hardwares)
 - BlueWays: BMS+Batteries (2 instrumented batteries test benches)



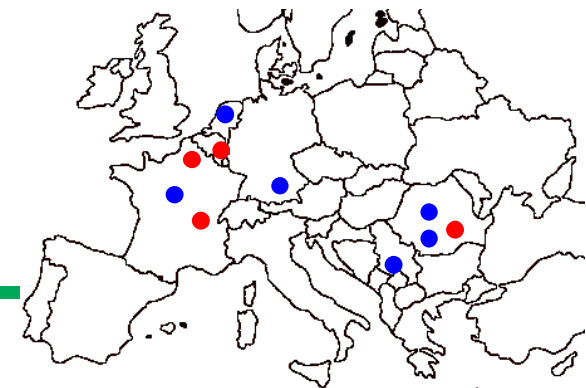
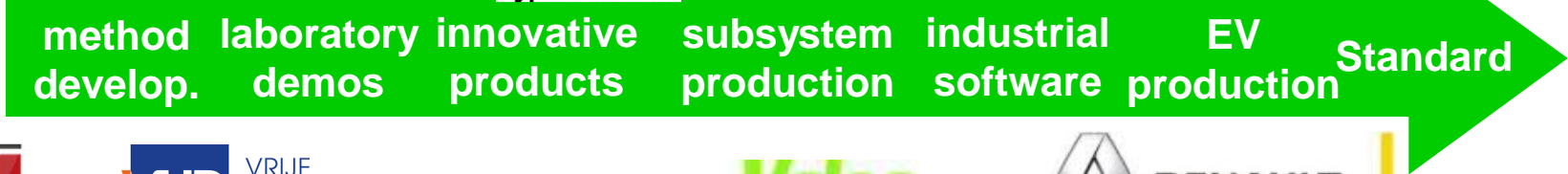
PANDA value chain



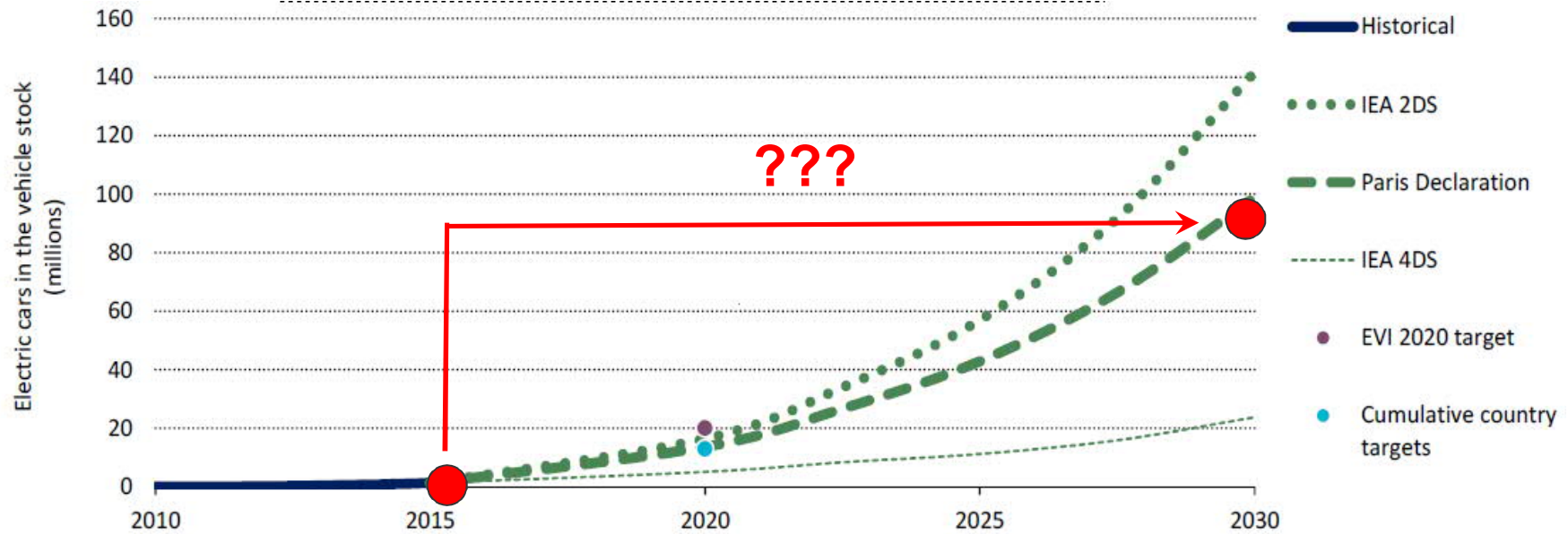
Universities

SMEs

Industries



Context



Note: 2DS = 2°C Scenario; 4DS = 4°C Scenario.

From 1 M to 100 M of EVs in 15 years to limit global warming to +2° C

+ innovative EVs: longer range, shorter charging time, reduced cost, etc.

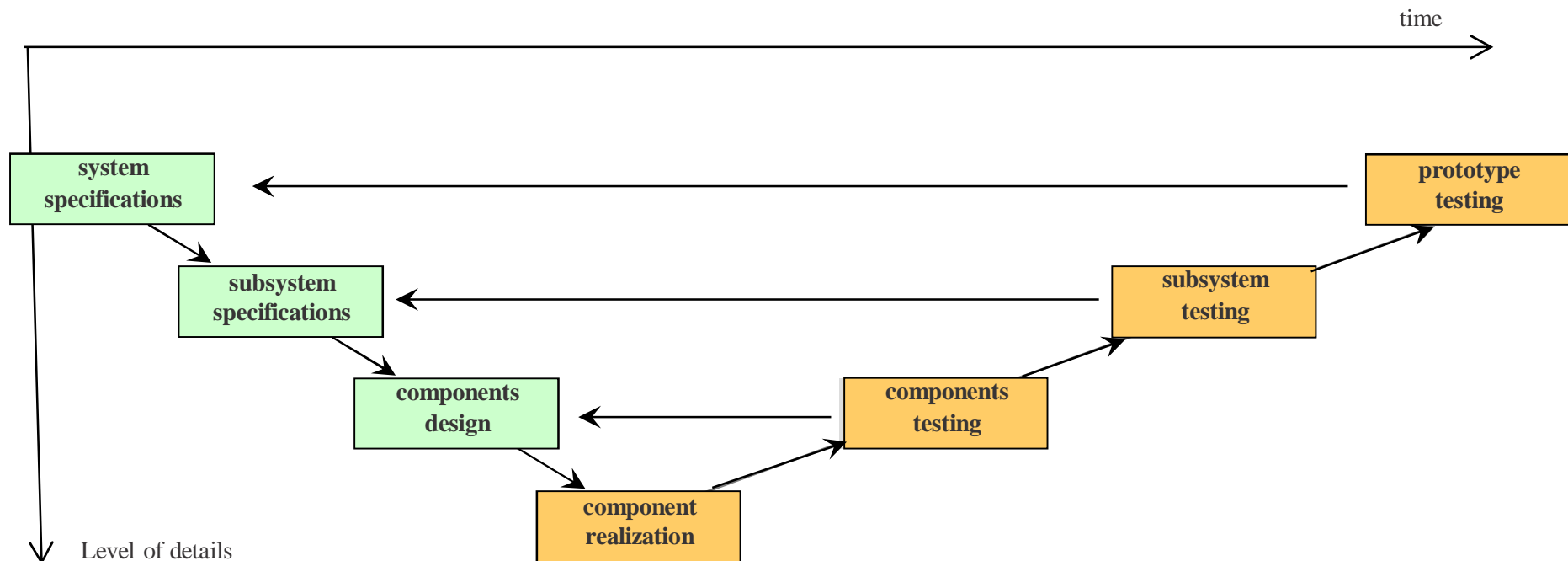
“Global EV outlook 2016, beyond one million electric cars”, International Energy Agency, 2016



PANDA objective



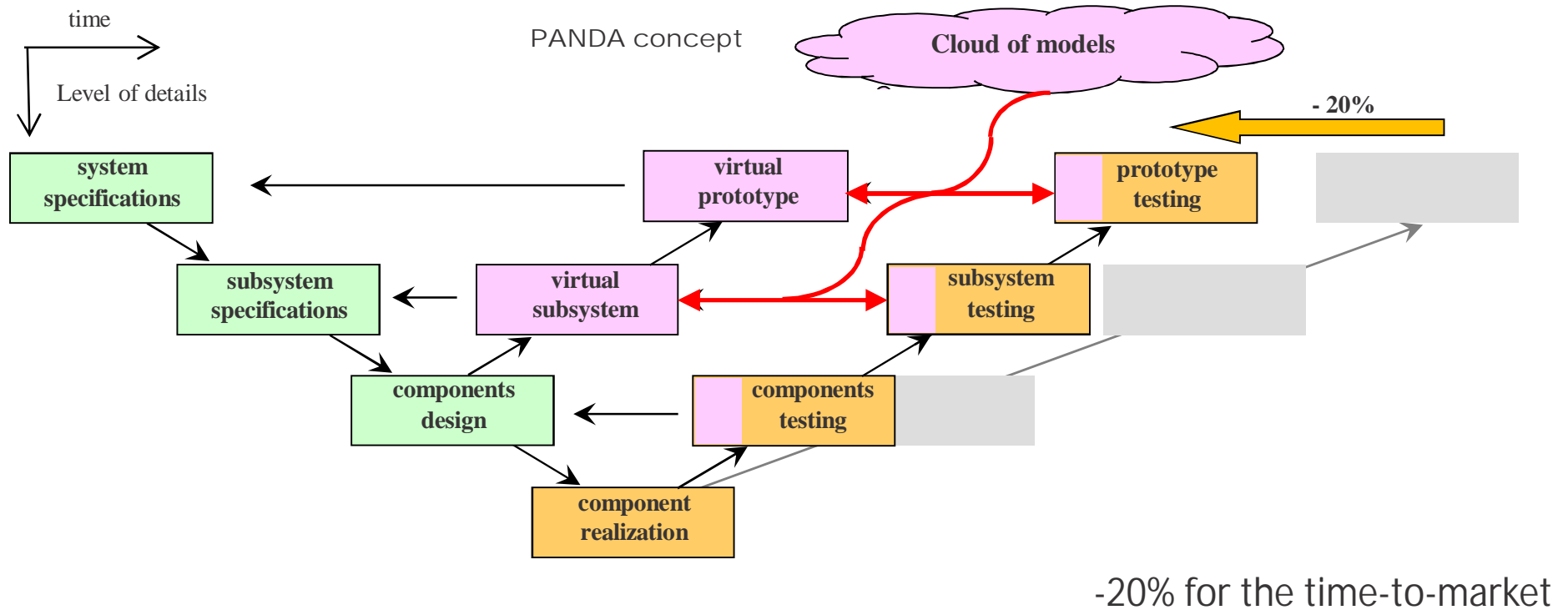
Classical development process in Automotive industry (V-model)



PANDA objective



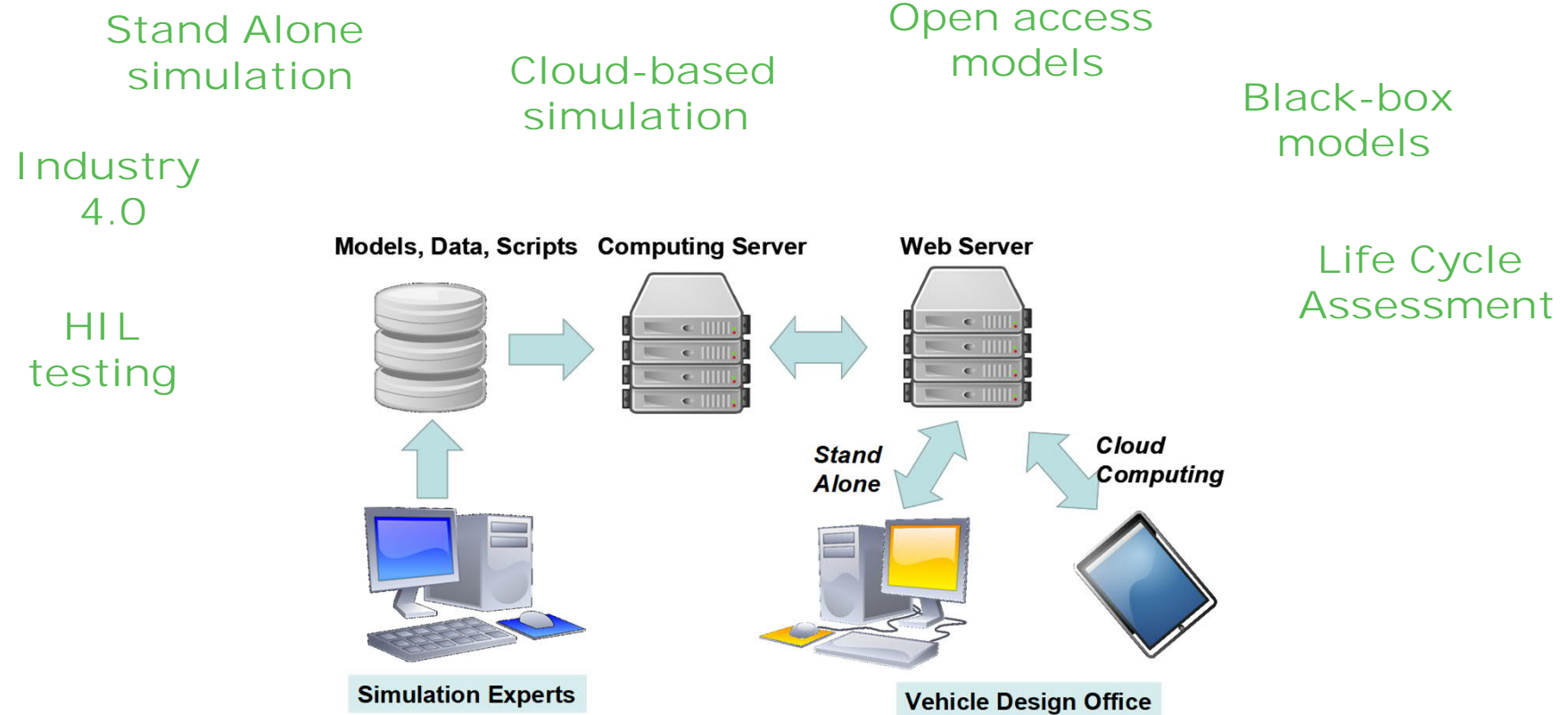
Disruptive and open access model organization
in the development process
for fast and efficient development of innovative EVs



PANDA outcome



Standard organisation for flexible simulation and testing of innovative EVs and components

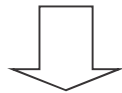


Different models



Many different models for:

- the different axes
(design, simulation, validation)
- the different levels
(system, sub-system, component)



Low interaction between axes and levels:

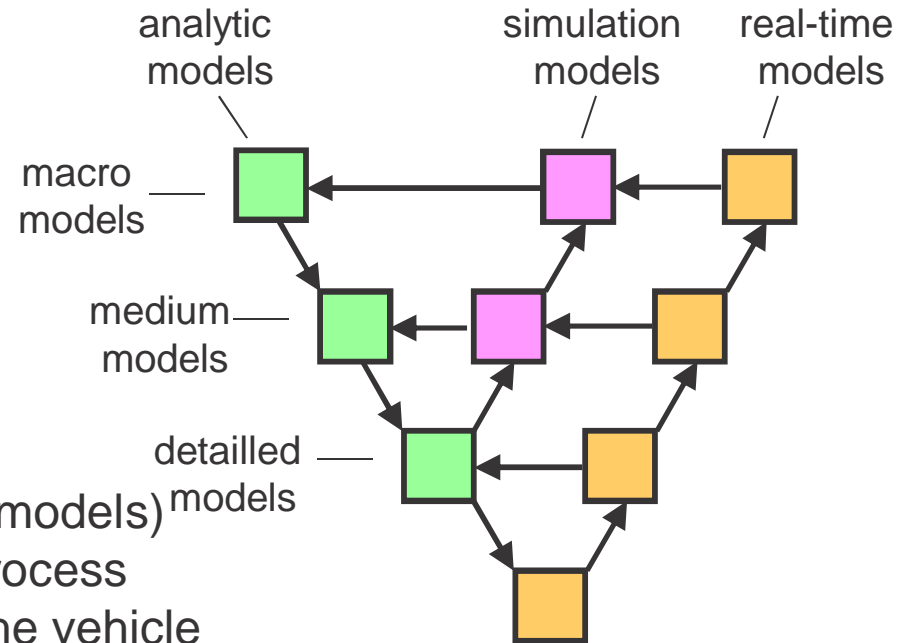
(low adaptability requires re-development of models)

- reduction of the efficiency of the V-model process
- reduction of the efficiency/performance of the vehicle
- increase of the development time



Unique model organization to enable better interactions:

- flexible multi-level model (from component to system)
- flexible simulation (virtual validation)
- flexible validation (real validation)

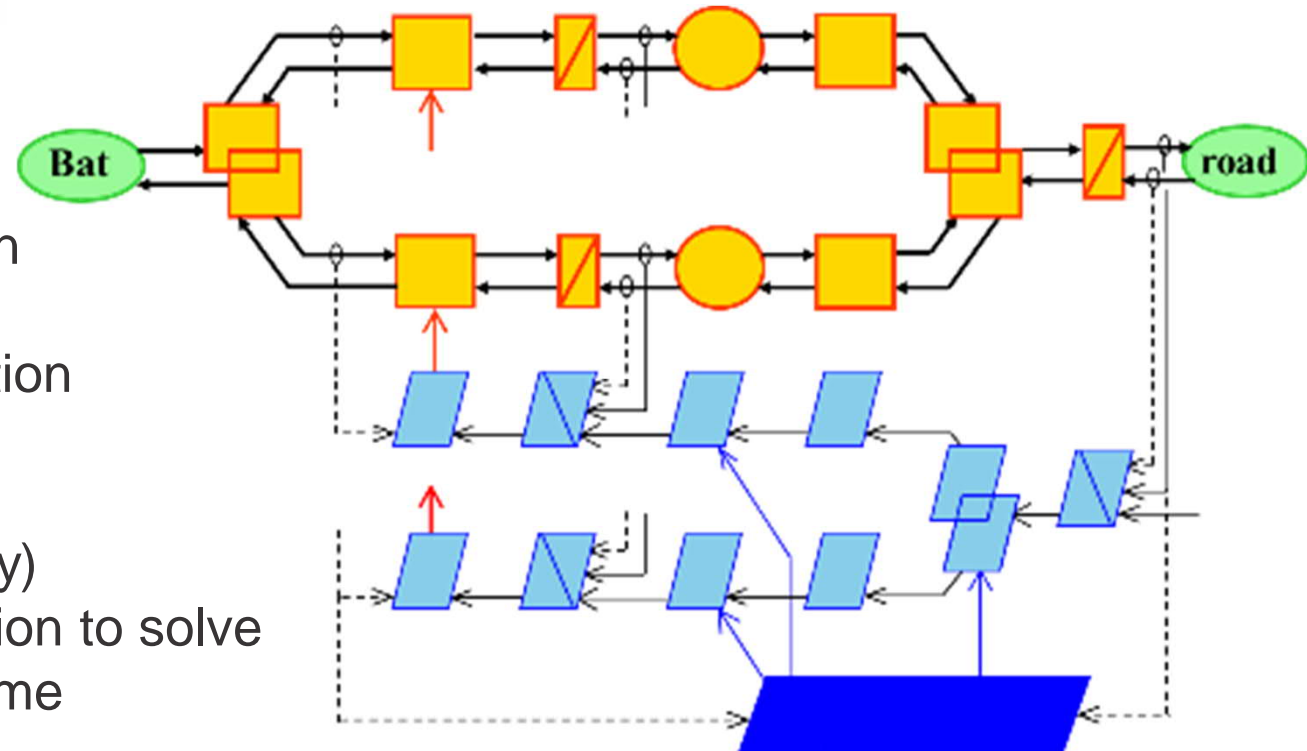


PANDA model organisation



EMR formalism

- model organization
 - causal description
 - functional description
- ↓
- fixed I/Os (causality)
 - conflict of association to solve
 - fast computation time



All models will be organized according to EMR



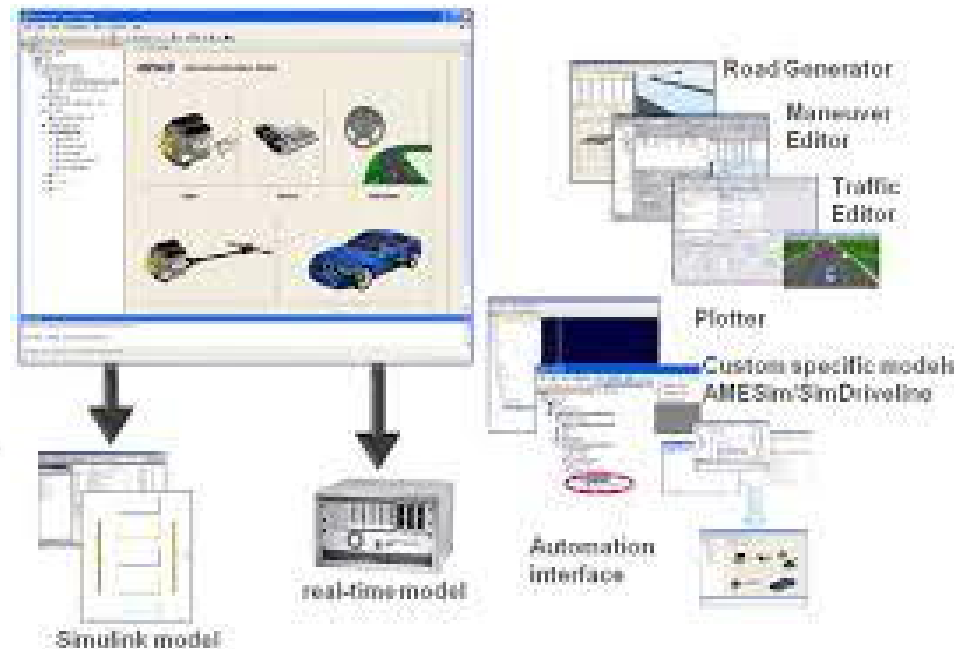
PANDA model capitalisation



An Industrial software to demonstrate the feasibility

Simcenter
Amesim

SIEMENS
Ingenuity for life



an EMR library will be developed in
Simcenter Amesim



PANDA reference vehicles



Electric Vehicle



Renault ZOE



Fuel Cell Vehicle



MobyPost



Hybrid Vehicle



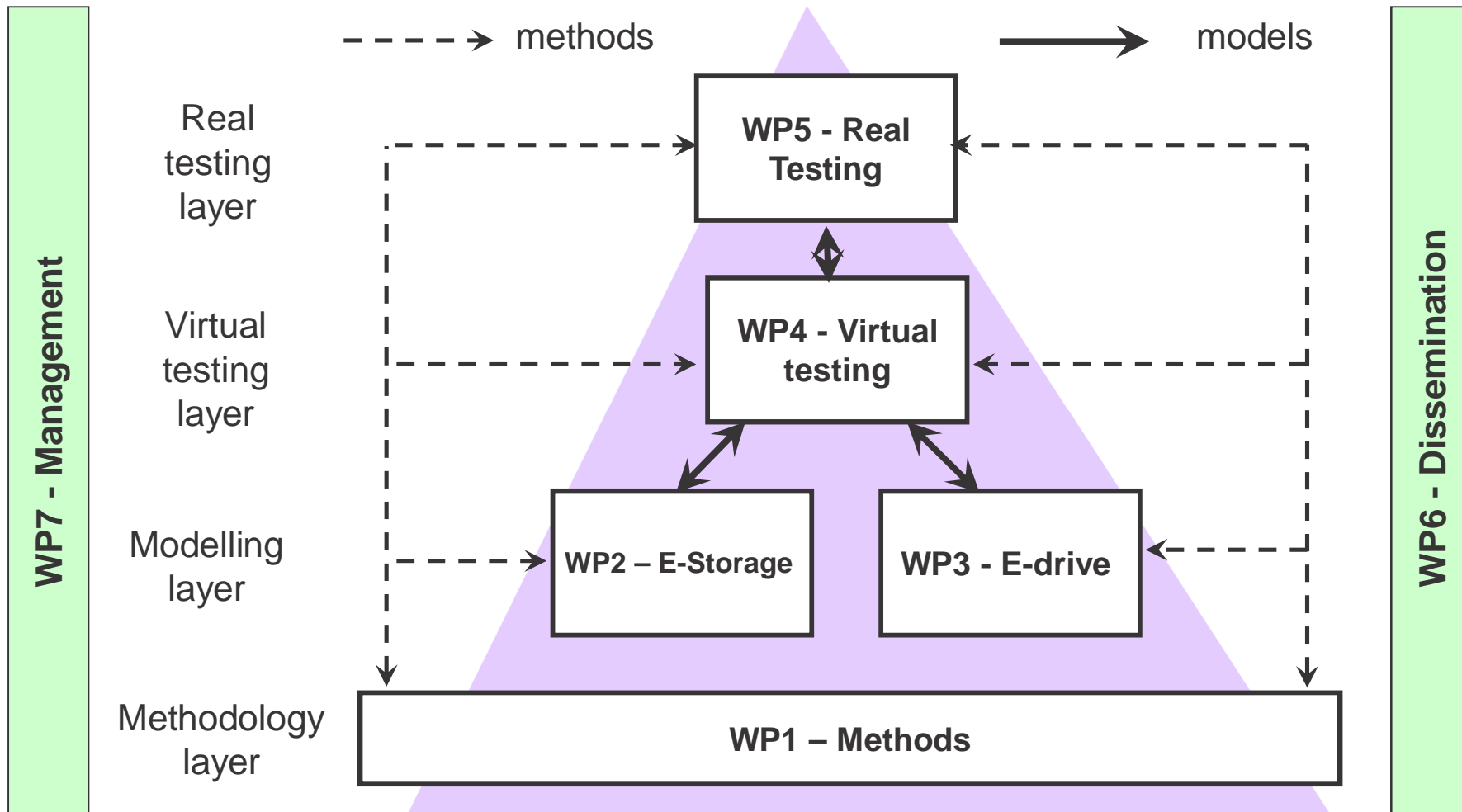
48V-based HEV



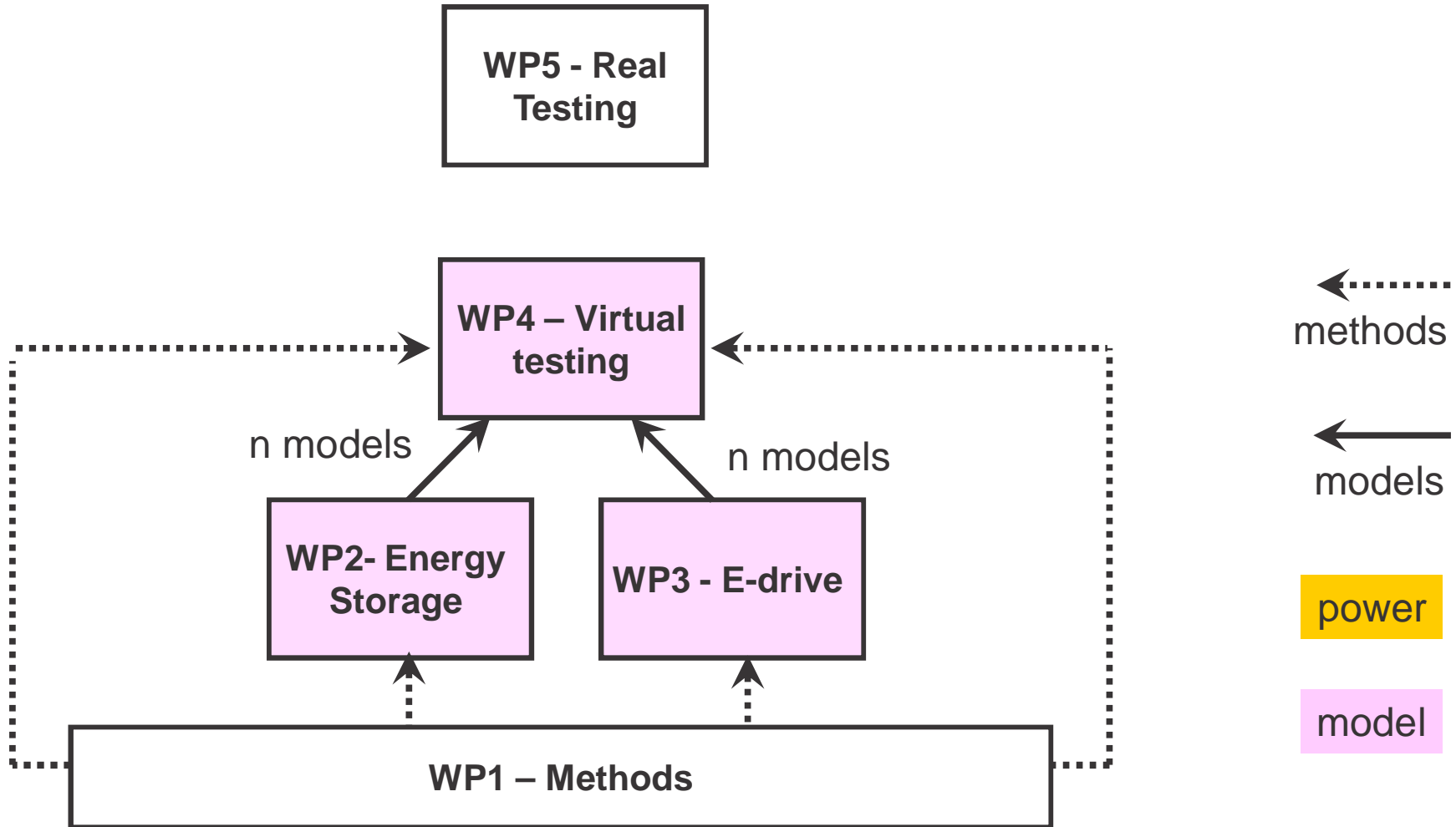
All vehicles will be simulated in real-time



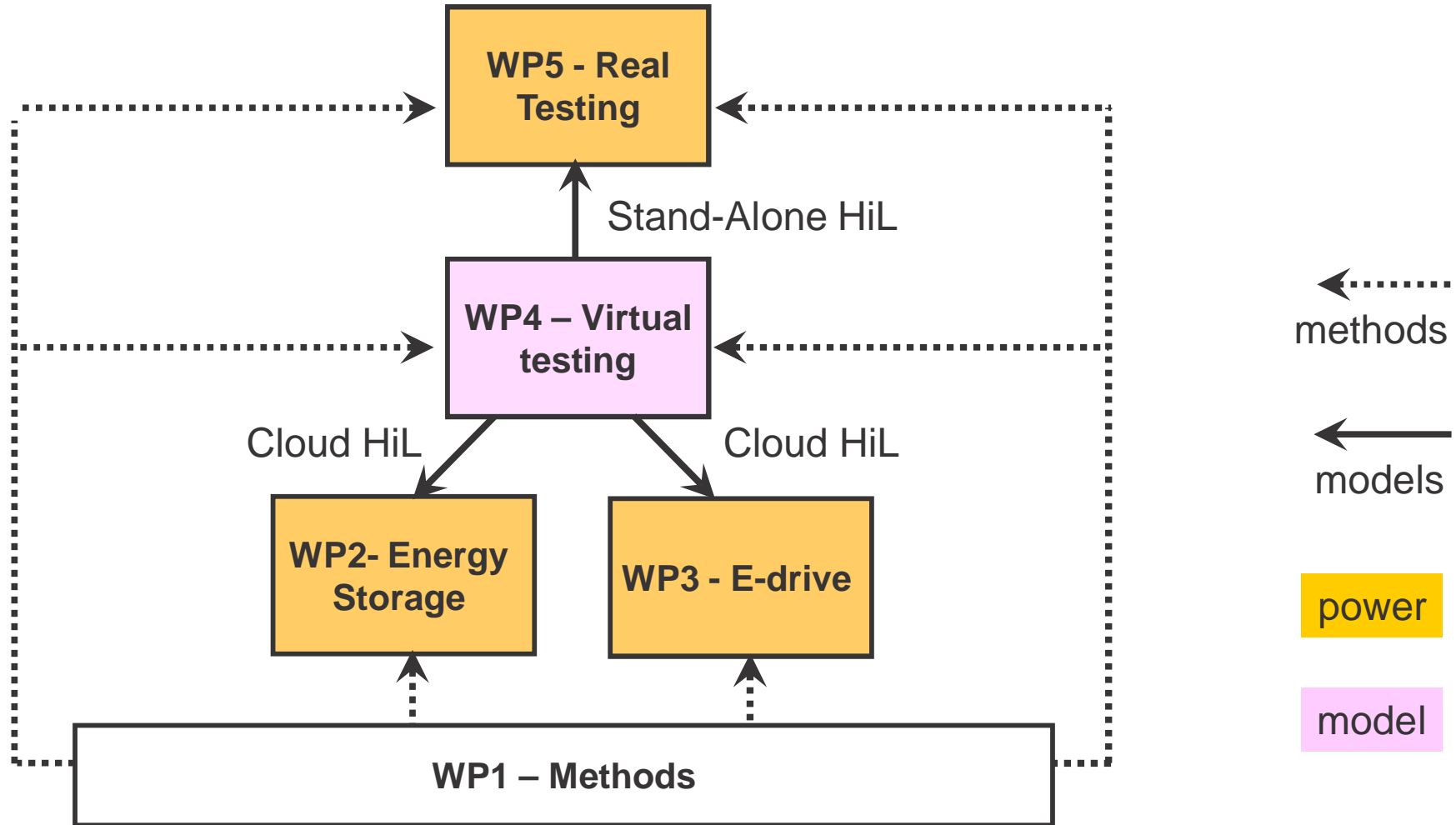
PANDA work packages



Phase 1 – Building models



Phase 2 – Using models





End of presentation

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