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Publishable Executive Summary

PANDA develops a uniform organization of models of electrified vehicles and a common cloud of models for virtual testing (pure simulation) and real testing (power hardware-in-the-loop - P-HiL - testing) of their components. In WP4, a BEV, a FCV and a P-HEV have been virtually tested using this method and the cloud of models. In WP5, these models have been used in real-time for the P-HiL testing of the battery, the e-drive, and the e-subsystems of the studied P-HEV. But these tests were achieved in stand-alone P-HiL, uploading the models in a local real-time ECU.

In this report, the cloud-based P-HiL testing of e-drives for the BEV and the P-HEV, reference vehicles of PANDA, is described. The same local real-time ECU (Typhoon) and the same cloud using Simcenter AMESIM © (SISW) are connected by an Ethernet connection to link the local real-time simulator and the Cloud.
An e-drive has been tested for the BEV at Cluj-Napoca with the experimental equipment of UTCN. And the 2 e-drives of the P-HEV have been tested at Lille with the experimental equipment of ULille. Despite the difference in the e-drives under test, power interfaces and vehicle models, the cloud-based P-HiL tests were successful using a common procedure. This point demonstrates the ability of the PANDA method to operate with different set-ups, and shows also the interest in sharing a cloud of models.

In Cluj-Napoca, the real-time simulator only contains the power adaptation and rest of the model of the BEV is simulated in a cloud server. In Lille, the real-time simulator contains a battery model and the power adaptation while the rest of the model of the P-HEV is simulated in the cloud.

It can be highlighted that both tests have been developed in parallel in a fast and easy way because of the PANDA methodology. First, the real-time ECU and the same cloud-based simulation are used that enables sharing experiences. Second, the EMR organization of the model enables a clear and fair decomposition of the models and different splitting solutions have been tested quickly thanks to the fixed I/Os between the different parts of the models and the control.

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Table 1: Project Partners

#	Type	Partner	Partner Full Name
1	UNIV	ULille	Université de Lille
2	IND	SISW	Siemens Industry Software SRL
3	UNIV	VUB	Vrije Universiteit Brussels
4	IND	VEEM	VALEO Equipement Electriques Moteur SAS
5	UNIV	UTCN	Universitatea Tehnica Cluj Napoca
6	SME	TY	Tajfun HIL d.o.o. (Typhoon HIL)
7			
8	UNIV	UBFC	Université Bourgogne Franche-Comté
9	SME	UNR	Uniresearch BV
10	IND	RTR	Renault Technologie Roumanie
11	SME	Bluways	BlueWays International bva
12	IND	TUV-BT	TUV SUD Battery Testing Gmbh

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