HUBCAP
Digital Innovation HUBs and Collaborative Platform for Cyber-Physical Systems

Newsletter 6 June 2022

HUBCAP Newsletter: Special Feature 2/2

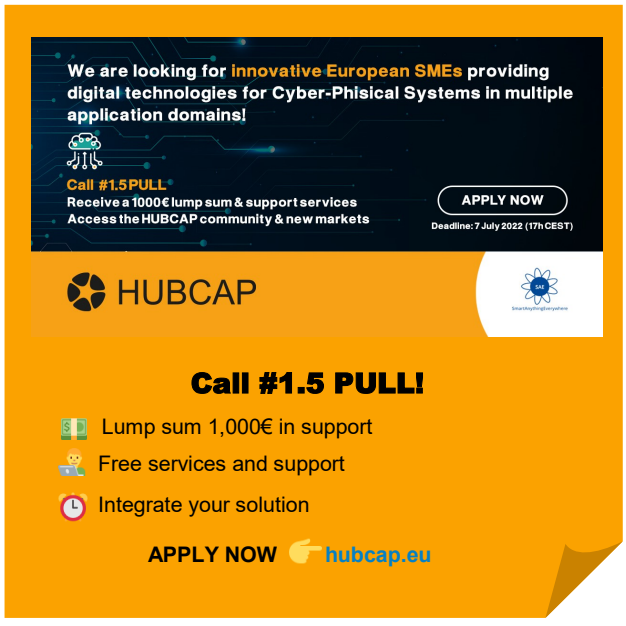
PULL Call #1.5 now Open!

HUBCAP brings together Digital Innovation Hubs to support SMEs embracing digital innovation. Our focus is on model-based technologies and solutions to design and develop Cyber-Physical Systems (CPSs). **HUBCAP** has developed an open, cloud-based **Collaboration Platform**. This innovation portal enables businesses to contribute and access digital assets needed to undertake Model-Based Design (MBD) for building Cyber-Physical System solutions on the scale required for SMEs. Assets include both models and services, and they are made available to allow businesses to manage their investment in MBD technology and to promote experimentation.

HUBCAP has run three open calls, PULL, EXPERIMENT and INNOVATE. PULL attracts and engages individual SMEs to join and to integrate existing CPS and MBD tools in the HUBCAP platform to enlarge the HUBCAP ecosystem. EXPERIMENT stimulates SMEs towards the adoption or improvement of CPS products & services by applying assets from the HUBCAP platform in a two-SME consortium. INNOVATE funds the deployment of new products and demonstrations of highly-innovative collaborations using the HUB-CAP platform.

The fifth and final iteration of our PULL Open Call #1.5 is now open! Are you a European SME working with MBD tools for CPSs? Do you have software tools or assets that could be integrated onto our cloud-based platform? Call #1.5 offers SMEs funding of €1,000 to support with the integration of HUBCAP assets. Call #1.5 will accept applications from until Thursday 7th July 2022. See our website for more details!

In this HUBCAP newsletter special feature we invite you to apply to our final PULL open call #1.5, as well as present the next set of outcomes of our experiment calls!



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More EXPERIMENT #2.1 Success!

Our first wave of projects enabling SMEs to experiment with Model-Based Design methods and tools for Cyber-Physical Systems ended recently. Following on from the stories in our last newsletter, we are proud to announce a further set of outcomes in domains including smart energy devices, healthcare, industrial automation and more. If you would like to find out more contact info@hubcap.eu.

Scubadive

The experiment's aim was to use the D-RisQ Kapture® tool to express Software High Level Requirements (HLRs) for a medical device used in the preservation of organs for transplant. The software for the organ preservation device must be high integrity to meet regulations and will be subject to independent scrutiny. As part of this process, ScubaTx became familiar with the way in which software requirements needed to be expressed in order to use them as the basis for future verification and for presentation to the medical device regulator. D-RisQ provided the tool and relevant documentation and where necessary, some consulting support.

Figure 1—ScubaTx medical device

Output included manually updated system requirements for the ScubaTx medical device and a set of software requirements developed from the system requirements using the D-RisQ Kapture tool. Exploration into software design of an automated version has already begun with exciting results!

"The funding provided through HUBCAP enabled the early engagement of ScubaTx with the D-RisQ tools." - Scubadive Team

OPTICITY

The introduction of renewable energy sources (RES) in the grid has posed several challenges to energy producers and consumers. Effects such as intermittency, "duck curve", the growing complexity of stimuli regulations and the calculation of energy consumption, require that these challenges be approached in an intelligent way.

Vodéna integrated into HUBCAP platform a new asset tool, Opticity, a comprehensive energy management tool that completely automates finding an optimal pattern in energy consumption and production in case of facilities with RES and energy storage capabilities. Employing this tool Noleko developed digital twins of solar installations, and streamlined and optimized electric energy production-consumption process. OPTICITY is involved in the domains of renewable energy sources, automated machine learning and machine learning operations.

Figure 2—OPTICITY Software User Interface

The key impact of this experiment is to lower the barrier for European SMEs to use CPS in energy optimization. Using digital twin of solar power plant, Noleko has demonstrated that using optimal patterns in electricity generation and consumption can improve profitability up to 15%

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Opticity provides end users with a powerful optimization utility that does not require any knowledge in the areas of predictive analytics, machine learning or optimization procedures, and does not require investment in computational infrastructure.

Participation in this experiment enabled Noleko to improve its business by embracing the principles of Industry 4.0, and thus become more competitive in the regional and European markets.

"Participation in this experiment boosted Vodéna's R&D capacities related to Model Based Design of Cyber Physical Systems. These newly acquired skills will enable Vodéna to expand its products and business models in the energy sector, as well as to expand it to other related areas, and contribute to the accelerated digitalization of SMEs in the region and Europe as a whole"- OPTICITY Team

PRO-CPS

Enabling remote automation technology training for higher education and continuing professional education requires suitable hardware–software platforms that leverage recent advances in cyberphysical systems and industrial internet of things. An acceleratend trend towards e-learning and virtual learning solutions, including for hands-on, resource-intensive fields such as industrial automation technology is observed. This situation, overlapping an already-existing underlying trend for digitalization of Industry 4.0 education, has led to hybrid or fully virtual training courses where the student can initially gain expertise on the automation of a process simulation followed by hands-on sessions in the laboratory.

The PRO-CPS experiment aimed to jointly develop the PROSIM platform, as state-of-the-art modelling and simulation environment for industrial automation application development and training.

This involved the development of a dedicated add-on pack of simulations for the process industries: pumping station, heat exchanger, measurement unit, smart metering, boiler control and tank level control, based on realistic end-user requirements, and a fully virtualised process simulation and training solution, running on the HUBCAP platform (Figure 2). The system integrates PLC-side development (B&R Automation Studio), industrial communication (OPC-UA) and front-end development for rich and immersive process visualisations (C#).

The successful implementation of the PRO-CPS experiment has supported both the development of the PROSIM product in a competitive education and training market as well as ongoing collaboration and knowledge transfer between Asti Automation and Energeia Technology. The newly updated system is provided both as a stand-alone product or through a collection of on-demand training services for industrial companies, automation technicians and engineers.

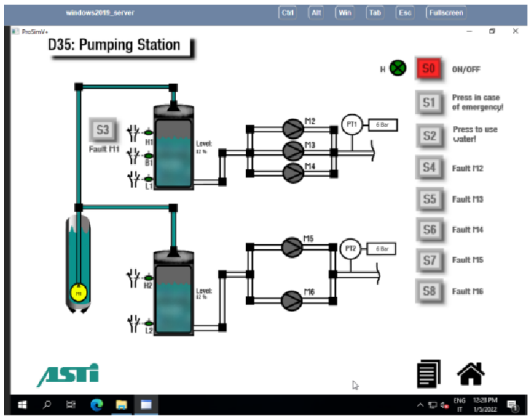

Figure 3—The PRO-CPS software in HUBCAP

"Energeia Technologies were very happy to be involved in this HUBCAP program, and as a development partner with ASTI Automation, for the development of PRO-CPS experiment. The process of development helped our engineers to learn the PROSIM solution. This will further enable us to employ PROSIM to develop industry solutions and further train current and future automation engineers." - PRO-CPS Team

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MedaPlus

The outcome of this project enabled MedaPlus to address the needs of hospitals, polyclinics, doctors, and non-physician staff by offering a fully digitized auscultation solution—auscultation is the action of listening to sounds from the heart, lungs, or other organs. Additionally, the outcome of this project has enabled MedaPlus to offer its services globally and to address use cases not sufficiently addressed today like remote patient auscultation (telehealth). Further impacts include:

(1) increase in the frequency of auscultation, progressively increasing to continuous monitoring, leading to an increase in the quality of the auscultation analysis

(2) increase in the number of patients that can be screened, leading to more patients that can be treated early, early intervention is essential to mitigate potential health risks

(3) efficiency gains for physicians who can outsource the auscultation process and analyses the data at a chosen time at a remote place

4) reduced risk for doctors, hospitals and insurances because auscultation results are automatically documented, and second opinions reduce the chance of mis-interpretation and thus legal cases

"HUBCAP created the opportunity for our two SMEs to build an end-to-end telehealth solution that addresses the needs of hospitals, polyclinics, doctors and non-physician staff."
- MedaPlus Team

ARC

The aim of this project was to develop and test a controller for active sprayer boom stabilization and control. In order to achieve this, we explored opportunities to reduce physical testing and we decided to utilise model-based engineering approaches. In collaboration with Danfoil we modelled a sprayer boom and developed an active roll axis controller specifically for the sprayer boom. While this model contains dynamics of movement in both heave and roll directions for multiple joints, the primary focus of the project is evaluation of the controller tracking in the roll direction.

The first step of the project was to create a model that depicted the roll and heave axis dynamics of the system. For validation of this model, multiple test datasets based on both manual step inputs with different actuation times were used, to make sure that the model was accurate for various actuation scenarios. In the second step, we developed a controller in order to keep the boom within the maximum allowed deviation when spraying. This would mean the sprayer would maintain the boom within a stable position with minimal variation. The controller performance was evaluated through the digital twin utilizing data from actual driving tests that cover the normal operation range of the boom during field spraying.

Using initial results from the evaluation, we were able to fine-tune the controller and adjust the underlying model in order to achieve the desired performance.

"Funding from the HUBCAP project enabled the consortium partners to hire additional personnel to develop an active controller for sprayer boom roll control. The developed controller was tested and evaluated in a digital twin setting in order to minimise development costs and physical testing."
- ARC Team