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A paper presented at the 11th International Workshop on Science Gateways, IWSG 2019, Ljubljana, Slovenia, 12-14 Jun 2019.

<http://www.iwsg2019.eu/>

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Abstract: A Cloud/HPC Platform and Marketplace for Manufacturing SMEs

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ABSTRACT

Information and Communication Technology (ICT) is essential for the digitalization of the manufacturing sector. However, less than 25% of manufacturing companies in Europe profit from ICT-enabled solutions. In order to boost the competitiveness of European manufacturers (especially Small and Medium-sized Enterprises – (SMEs), innovative solutions need to consider both technological and commercial scalability from the very early stages of the design process throughout the full implementation and utilisation of the solution. From this perspective, cloudification of services has become the ideal enabler in manufacturing digitalization. Successful previous European initiatives have already demonstrated the benefits of cloudifying engineering services, by combining High Performance Computing (HPC) resources, computational tools, and cloud computing platforms.

CloudiFacturing is an EU funded Innovation Action project that brings and progresses advanced ICT in the field of Cloud/HPC-based modelling and simulation, data analytics for online factory data, and real-time support to European manufacturing SMEs, contributing to their competitiveness and resource efficiency via optimizing production processes and producibility.

CloudiFacturing is developing a generic, workflow oriented platform (Figure 1) that enables secure deployment and execution of workflow-based Cloud/HPC applications. These applications are deployed in a central workflow repository (EMGREPO) that accommodates for various heterogeneous workflow/application types (e.g. Flowbster, SemWES, CloudBroker). Additionally, a central data transfer and browsing component (EMGDATA) facilitates data sharing between the various workflow engines at execution time. Workflows and applications are executed via the Workflow and Applications Mediator (EMGWAM) component that enables the execution of pre-prepared workflows as black boxes and also facilitates their combination into higher level meta-workflow pipelines. In order to facilitate commercial utilization, the CloudiFacturing Platform comes with a central billing systems (EMGBC) and advanced security solutions for single sign-on and user authentication/authorization (EMGUM). On top of the platform, the project also develops a Digital Marketplace (the EMGORA – Engineering and Manufacturing Agora) for manufacturing companies,

independent software vendors, and consultancy and training providers. The marketplace provides seamless access to the underlying services of the platform, enabling the publication, execution, billing and management of workflow-based applications for the manufacturing sector. Additionally, the marketplace also serves as a generic community hub where a wide range of activities, for example domain specific information exchange, value added services or training courses and material can be found.

CloudiFacturing demonstrates the technical and economic feasibility of its platform and marketplace on the basis of more than twenty cross-national application experiments involving manufacturing companies, independent software vendors, technology consultants, digital innovation hubs and resource providers, in three consecutive waves. The first wave of these experiments has just finished and the second wave kicked-off in February 2019 with seven new experiments. During the first wave, the 15 involved companies reported significant expected impact figures as a result of the implemented technological solution. Such impact measures included, for example, the creation of 18 new products or services within one year and 80 within five years, 1.9 million Euro turnover increase within one year and 8.5 million within five years, and the creation of 13 new jobs within one year and 60 within five years. Typical application areas include improving quality control and maintenance at manufacturing SMEs using big data analytics and digital twins, optimizing efficiency of truck components manufacturing processes via discrete event simulation, numerical modelling and simulation of heat treating processes in the aluminium industry, or optimizing design and production of electric drives.

The development of the CloudiFacturing Platform and Marketplace is currently ongoing. This presentation will provide a short overview of these components and it will also summarise the results of the first wave of application experiments.

Acknowledgement

This work was funded by the CloudiFacturing, Cloudification of Production Engineering for Predictive Digital Manufacturing project, Project No. 768892.

Keywords—*Digital Marketplace, manufacturing, workflows, cloud/HPC applications.*

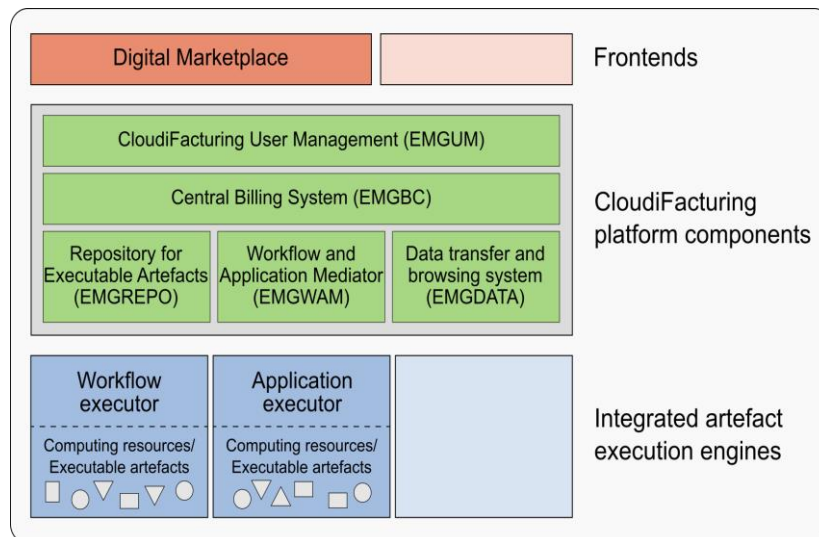


Figure 1 – Components of the CloudiFacturing Platform and Marketplace