Abstract

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Web Service Based Framework for the Coupling of Simulation Models in Heterogeneous Environments

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This thesis presents a new distributed simulation framework that is able to couple simulations in heterogeneous environments by using web service pipelines.

Simulation is a tool that allows to model real-world processes by abstracting relevant factors, without affecting any physical systems. It is therefore advantageous to employ it in many contexts, as it safely allows to optimize performance. Distributed simulation has the benefit of allowing the design and operation of those models to take place from different geographical locations and working on different platforms, which is almost a prerequisite for many modern enterprises where the necessary expertise isn’t centralized in one location. However, simulations and especially their distributed development and execution can prove to be rather complex and cost intensive, which is why their long time benefit to corporate operations tends to still be overlooked.

In an effort to promote the use of distributed simulations in a civilian setting in the future, a novel distributed simulation framework has been planned that uses very common and widespread service-oriented technologies. The first prototype was implemented and used in the "Airport2030" Cluster of Excellence Project. One work package of this project was to develop a simulation that is able to reflect all the processes involved in and around an airport during the transportation of passengers. It allowed three research partners that separately developed their respective models for the transit connection to the airport, the airport terminal and it’s apron, to couple their work into an overarching composite simulation.

The prototype was then later fleshed out to allow for feedback events in between the composing models and a non-centralized utilization through a web-GUI. The actual framework was then implemented to automatically create the web services that serve as interfaces for generic models created by external modeling programs, the pipelines coupling these models into more complex simulations, and their corresponding web-GUIs.

That framework was then later used to couple the models of an existing distributed simulation, which uses the established High Level Architecture. The results of both simulations were analyzed and compared to confirm that the novel framework is able to build viable simulations. While the original simulation performs better, it does so at the expense of a highly complex and time consuming implementation. The model pipeline simulation was proven to produce the same output with a lot less effort on the developer’s side.