RESTful web service to build loosely coupled web based simulation of human physiology

Tomáš Kulhánek[*,1,2], Filip Ježek[1,3], Marek Mateják[1], Jan Šilar[1], Pavol Privitzer[1], Martin Tribula[1] and Jiří Kofránek[1]

Abstract— This work introduces a concept based on RESTful web service bringing a new layer into the architecture of web based simulation for the domain of modeling and simulation of physiological systems. The result is growing set of models and simulation application controllable by less powerful client devices but allowing long term simulation or identification of physiological system on remote servers or high performance computing centers.

I. MODELLING

Hester at al. published Hummod - a large scale physiological model, constructed from empirical data obtained from peer-reviewed physiological literature[2]. The Hummod model was translated and is mantained in the standardized Modelica language which may be more understandable[1][3]. Modelica language tools offer simulation environment itself and the model can be exported into a package conforming standard FMI[5].

II. SIMULATION

We propose an architecture with independent RESTful web service that is loosely coupled with simulation on the server and visualization on the client. Byrne et al.[4] call that architecture as hybrid architecture for simulation and visualization. Compared to most used "client-side" simulation and visualization it brings some benefits as well as consequences.

III. CONCLUSION

Only lightweight integration via HTTP and JSON data format is needed when changing or introducing new type of visualization technology. The client application was introduced in HTML (version 5) with Javascript and in environment for mathematical computing (MathWork's MATLAB, Wolfram's Mathematica). The same lightweight integration is needed on the simulation side for different types of simulation. In the case of identification of physiological systems, high performance computing may boost it when high number of simulation must be computed. The simulation packages can be deployed within national scientific computing centers or European Grid Iniciative (EGI)[6]. Application needs to be online and some delay caused by network overhead may disturb fluency of application.

[*]corresponding author `tomas.kulhanek@lf1.cuni.cz`
[1]Institute of Pathological Physiology, First Faculty of Medicine, Charles University in Prague, Czech Republic
[2]CESNET z.s.p.o.
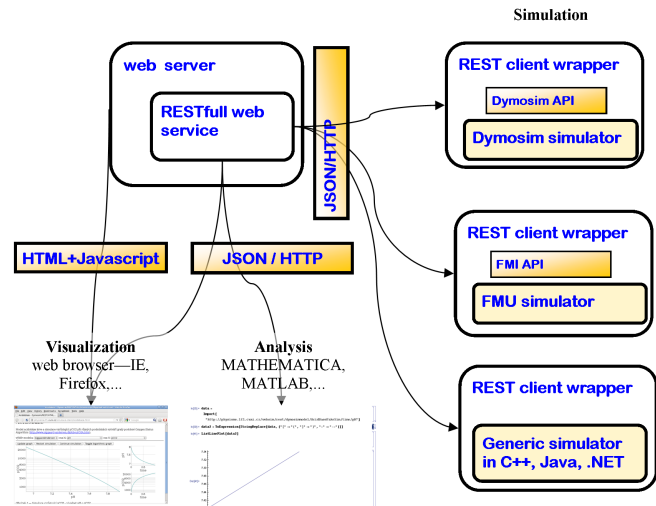[3]Faculty of Electrical Engineering, Czech Technical University in Prague

Fig. 1. Proposed architecture utilizing architectural style REST

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[6] European Grid Infrastructure `http://www.egi.eu`