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## Scenario based web system for numerical computations

**Abstract.** Modern computer modeling environments are characterized by high heterogeneity. Typical simulation environment consists of several software systems satisfying different scientific, engineering and non-professional staff needs. The paper presents an architecture of a system integrating different software simulation environments and serving its computational resources as a web based system of cloud computing computations. The main application of the system is providing computational resources, through easy to use interfaces, for medical staff and electromagnetic safety engineers which are not particularly familiar with simulation methods.

**Streszczenie.** Artykuł przedstawia architekturę i koncepcję implementacji systemu pozwalającego na integrację heterogenicznych systemów do symulacji numerycznych. Głównym obszarem zastosowania jest udostępnienie zaawansowanych narzędzi obliczeniowych i środowisk symulacyjnych do niewykwalifikowanych informatycznie użytkowników z dziedziny medycyny i inżynierów zajmujących się bezpieczeństwem elektromagnetycznym. (Rozszerzalny, oparty na scenariuszach system do numerycznych obliczeń zleconych)

**Keywords:** numerical modeling, electromagnetic fields, image recognition, web services

**Słowa kluczowe:** modelowanie numeryczne, pole elektromagnetyczne, rozpoznawanie obrazów, usługi sieciowe

### Introduction

Modern simulation environments consist of several software systems satisfying different scientific, engineering and non-professional staff needs. To compute a complex problem one usually needs to use several software systems which does not necessarily cooperate painlessly with each other. The goal of the authors research was to develop an effective architecture of a system, which would allow to cooperate them easily and provide a web based, Internet, standardized service which would serve the computational resources. The web based services can be then consumed by any system capable of interacting over Internet: a web client or a desktop client application.

The authors utilize the services for creating an easy to use system for medical staff and electromagnetic safety engineers which allows to quantify the exposition to electromagnetic fields through medical stimulation or staying in dangerous environment.

It is obvious, that the typical simulation environment requires specific professional skills and the end users (eg. medical staff) need another interface specialized to their needs. The long way between those two must be effectively shortened. This is achieved with the help of configurable scenarios. The typical scenario contains a series of steps which are usually performed by the end user to obtain the desired result, eg. compute the power absorbed by the human body during the electromagnetic field exposition. The scenarios are configured by specialized technicians, but execution of scenarios is available to domain staff which is not required to have the knowledge about simulation methods. The user interface, which major goal is to be as easy to use as possible, can be a web application and has been presented by the authors in [1].

The architecture of the authors system is based on three layers. The client interface layer which is responsible for graphical presentation of results and this can be any application which is capable of communication using web services. The second layer is a central system which is called the Coordinating system. The purpose of this layer is to provide a common way to serve the computational resources to the web clients. This part of the system contains a scenario execution environment (Scenario handler) and a set of specialized plugins which can be invoked from scenarios, each for a specific computational environment or a program. These plugins cooperate with programs and simulation systems which are called processors and they build the third layer of the system.

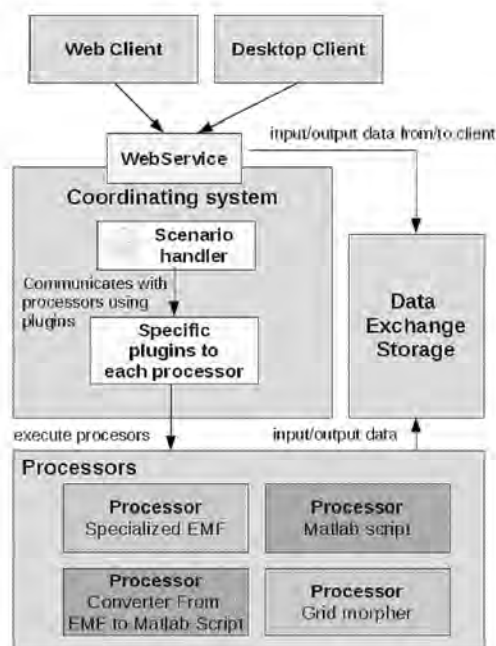


Fig. 1. System architecture concept

### Conclusion

The system is based on a predefined, precise scenarios helping a domain user not familiar with numerical modeling methods to solve realistic simulations using state-of-the-art simulation environments. The system is highly modular and can be easily extended with new functionalities provided by independent modules using a dedicated hardware platform.

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