

Towards an adaptive framework for customized civil engineering platforms

Michael Polter, Raimar Scherer
Technische Universität Dresden, Germany
Michael.Polter@tu-dresden.de

Abstract. Monolithic software tools still dominate the everyday work of civil engineers. Complex, collaborative workflows demand repeated input and data exchange operations. Furthermore, the accuracy of computation results often is still restricted by the limitation of desktop PCs. We introduce the BIMgrid, a work in progress to develop an innovative, adaptive framework for the implementation of customized civil engineering applications. It is a tool for software developers, which allows the flexible extension of existing applications and platforms with various functionality and their customization to the specific needs of engineering companies. We illustrate the architecture of the BIMgrid, the interface concepts for the integration of external tools and the utilization of their functionality by third party applications. We also present our reference implementation, which not only demonstrates the utilization of the framework but also can be used as a blueprint for the creation of a customized tool and hardware adaptation platform.

1. Introduction

Nowadays, engineers are faced with a large number of different computation and collaboration tools as well as database implementations, which have to be utilized in combination to solve complex, cross-domain tasks. Often this involves much effort in data management and manual input, especially when collaboration with external partners results in multiple iteration loops. Although some integration solutions for the connection of tools and workflow automation emerge, in general they miss a certain flexibility regarding to the established practice in companies. Usually users get tied to the products of a vendor and if they don't provide a specific feature or a single tool exceeds the capabilities of the local machine, a manual switch between applications is again inevitable. With the upcoming hype of cloud computing, big vendors increasingly offer integrated solutions that completely outsource the engineer's workstation to the cloud. However, these pay-per-use products don't consider the investments of companies in hard- and software which were made so far and tend to cause running costs that are difficult to control. In addition, they come along with problems in data security and privacy. In 2010 over 90 % of SMEs (small and medium-sized enterprises) in construction industry did not have a powerful IT infrastructure (Kumar and Cheng, 2010). Even though this percentage may have been decreased, the problem of optimal resource usage is still present. Studies show that in SMEs available resources often are not used to their capacity with idle times up to 95 % (Klitz, 2004). Existing middleware for the connection of computers to a private grid are generally designed for big data centers. They are mostly limited to UNIX-based networks, rarely offer a graphical user interface and hence are inappropriate for a direct application in engineering offices.

The development of software solutions from the scratch, which address all the aforementioned problems, usually exceeds the financial capabilities of SMEs. In this paper, we introduce the BIMgrid, a framework for the customized connection of applications, integrated data management as well as combined utilization of private grid and public cloud computing power. We also present our reference implementation, called the BIMgrid Core, which provides a stub for software developers to implement a platform or enhance existing applications, customized to the specific needs and practices of a civil engineering company. Our concept provides interfaces for the transparent integration of tools and technologies from