Virtual Environments for Grid Applications

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The widespread dissemination of grid technology during the last decade has opened new expectations from both the technological and the applications perspectives. The well-known "technology push" and "application pull" paradigm reflects precisely the dynamic equilibrium that state-of-the-art in RTD is seeking. This equilibrium is still moving fast, and probably too fast for a majority of potential users.

The equilibrium varies along paths that experts try to predict to their best knowledge. But users often adopt technologies without foreseeable prediction. The outstanding example of this state of affairs lies in the worldwide expansion of the Internet. This now classical example of dedicated technology which has become the technological revolution of the 20th century's end exemplifies the trend that the Grid might expect.

However, the maturing of technology does not suffice to provide acceptable tools for the users. The seemingly reserved adoption of Grid technology by the industry today cannot be totally explained by the lack of tools and environments suitable for application design and deployment.

Among the ongoing RTD aspects are the security and Quality of Service items. But more simply is also the lack of seamless accessibility tools. Grid technology carries a technical complexity outlook that refrains the vast majority of its potential users.

Based on these assumptions, this project aims at providing simple tools to allow the application designers and users of the Grid to ease its use. It will thus contribute to the uptake of grid technology amongst its huge potential user community.

Building on the claimed virtualization of resources and Virtual Organizations concepts already worked out in the Grid community, the VEGA project proposes to develop user-oriented functionalities for application design, deployment and monitoring on the Grid.

It builds on existing Grid technology to enable application practitioners to seamlessly access and use it. This is far from being the case today, although struggling efforts are currently being undertaken on a large variety of items to mask the technicalities and intricacies of the Grid, in order to make it "transparent". But there is still a long way to go.

Loosely based on the notion of Virtual Organization (VO), the VEGA project offers the users of the Grid a specific concept that will facilitate the use of VO. More specifically, the project will implement, deploy and test the concept of Virtual Environments (VE), specifically aimed at providing the application designers and users with a dedicated set of tools, protocols and services to support seamlessly their applications in the dynamic grid environments.

Virtual Environments are not specific to any single middleware, although their deployment and testing on realistic applications will be tuned to operational grid infrastructures. They are not specific to any application domain either, and testcases are provided in scientific and business areas. In contrast with VOs, they don't mimic any working organizations: there are

no roles, membership and groups in VEs. They are application-centric, not user-centric services. The generic nature of Virtual Environments allows for easy adaptation to specific hardware infrastructures, operating systems software, middleware and applications.

Of particular interest are multidiscipline applications in engineering, environmental monitoring applications and peta data management application in citizens' life. These will be used as testcases for the validation of the VEGA project and will involve both European and Chinese partners.

Because it draws on the existing technology and fast moving grid expertise, the VEGA project will keep a close attention to other tools such as the Virtual Workspaces proposed for Globus. It will also closely follow the ongoing technology and it will use the WSRF and GT4 as a basis for its implementation. However, the impact of cooperation with China leads also to guarantee its compatibility with Chinese projects like ChinaGrid and the European Unicore and gLite middleware.

International forums and standardization bodies like GGF and EGEE users groups will be invested for close discussions on this fundamental topic.

Because interesting research has been carried out on the virtualization concepts, an innovative and fertilizing approach is followed concerning the Virtual Environments proposed.

Indeed, Grid Portals, Grid Application Toolkits, Virtual Workspaces, Dynamic Virtual Environments, Virtual Organizations, Runtime Environments, virtual users accounts, on demand computing and virtual data centers and clusters have been proposed recently in various projects to support the access to the Grid. Much of these important studies and tools have been aimed at single sign-on, authentication, authorization, end-to-end QoS support, and, last but not least, at facilitating the uptake of grid technology by the users. These fundamental bricks are currently being developed, deployed, tested and sometimes marketed on existing infrastructures and middleware.

There still remain however niches that are yet unexplored. The VEGA project proposes to invest a new functional enabling layer that will be deployed on top of existing middleware and their extensions in order to increase the ease of access and manipulation of applications and data on the Grid. In order to achieve this, the applications designers and the users require high-level services to define the applications easily, based on existing runtime components and already deployed applications in order to build, deploy, run and monitor new applications possibly based on existing software and already tested components and services, in order to incrementally construct and upgrade them.

This will be based on new services compliant with WSRF that will be supported by a specific software layer on top of existing middleware. This new software layer, called the "upperware", will be implemented on gLite.

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