



DIVE on the Internet

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Abstract

This dissertation reports research and development of a platform for Collaborative Virtual Environments (CVEs). It has particularly focused on two major challenges: supporting the rapid development of scalable applications and easing their deployment on the Internet. This work employs a research method based on prototyping and refinement and promotes the use of this method for application development. A number of the solutions herein are in line with other CVE systems. One of the strengths of this work consists in a global approach to the issues raised by CVEs and the recognition that such complex problems are best tackled using a multi-disciplinary approach that understands both user and system requirements.

CVE application deployment is aided by an overlay network that is able to complement any IP multicast infrastructure in place. Apart from complementing a weakly deployed worldwide multicast, this infrastructure provides for a certain degree of introspection, remote controlling and visualisation. As such, it forms an important aid in assessing the scalability of running applications. This scalability is further facilitated by specialised object distribution algorithms and an open framework for the implementation of novel partitioning techniques.

CVE application development is eased by a scripting language, which enables rapid development and favours experimentation. This scripting language interfaces many aspects of the system and enables the prototyping of distribution-related components as well as user interfaces. It is the key construct of a distributed environment to which components, written in different languages, connect and onto which they operate in a network abstracted manner.

The solutions proposed are exemplified and strengthened by three collaborative applications. The DIVE room system is a virtual environment modelled after the room metaphor and supporting asynchronous and synchronous cooperative work. WebPath is a companion application to a Web browser that seeks to make the current history of page visits more visible and usable. Finally, the London travel demonstrator supports travellers by providing an environment where they can explore the city, utilise group collaboration facilities, rehearse particular journeys and access tourist information data.