Building Collaborative Problem-Solving Environments as Shared Places

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Abstract

Shared Place technology allows construction of virtual places on the Web by merging collaborative tools with Web page content. It offers significant benefits to the Collaborative Problem-Solving Environments’ developers and users. By its support for synchronous and asynchronous collaboration it facilitates the exchange of ideas among remote users. Extensive customization is possible; different Places can be generated from the same set of components depending on user preferences, tasks to be performed and available resources. Moreover, it enables integration of problem-specific tools with virtual place content. The paper explains how these features are achieved in Shared Place using Internet technologies and standards. Also, the process of development of a collaborative component is presented with focus on the use of the Shared Place services. Finally, the construction process of a virtual place is described with emphasis on the customization of tools’ behavior and on the integration of the collaborative components with Web resources.

Keywords:
CPSE, virtual places, XML, software components, collaboration

1. Introduction

The problem-solving environments (PSE) field is developing rapidly. Many diverse products are available, for example, Extensible Computational Chemistry Environment [15] provides support in the domain of computational chemistry and AutoCAD [3] offers tools for the industry design. This trend is driven by steady progress in many branches of computer industry. Advanced distributed data storage and retrieval systems are available for archiving results of experiments or domain specific information necessary to solve complex problems. Computing facilities such as specialized hardware, mainframes or computers organized into clusters are used to provide significant computational power. Large suites of advanced, domain-oriented software modules are available. They encapsulate the algorithms relevant for a specific class of problems (for example, PELLPACK [11] offers comprehensive support for solving partial differential equations). Finally, visualization tools such as AVS [1] [17] are used to analyze and present complex data. All those developments enhance problem-solving capabilities of current software systems.

As far as collaborative PSEs are concerned, the research is still in progress. Such environments should provide the functionality of a PSE and, in addition, allow system users to work as a team in a manner independent of their location and the time they access the PSE resources. However, the problem is still far from being solved. The main reason for such a situation is the difficulty of building efficient collaboration environments in general, and merging them with problem-solving environments in particular. A collaborative application always has a form of a distributed system, which is not trivial to build. Also, in spite of significant research progress, social issues that arise in virtual groups are not addressed properly by the currently available collaborative environments. As a result, most of the on-line collaboration systems are difficult to use and offer limited functionality. Therefore, it is understandable that the designers of most PSEs concentrate on the problem-solving functionality, postponing implementation of the collaboration functionality till the mentioned difficulties are resolved.

Many of enumerated problems could be solved by applying available Web technologies and resources. Several systems such as Collaborative Research Environment (CORE) [18] and TANGO Interactive [5] make steps in this direction. As the Web infrastructure becomes more mature, as the browser platforms become more sophisticated, and as new Internet standards such as XML [20] emerge, new collaboration solutions become possible. XML offers standardized approach to data description, ability to create compact documents, and wide availability of software tools for creating and processing documents. Component technologies such as JavaBeans [19] and ActiveX [8] allow easy creation of Web-based collaboration tools, fast transfer over networks, and interoperability. Web browser platforms provide ability of dynamic gen-