A Visual Resource Integration Environment for Distributed Applications on the ITBL System

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Abstract. TME, the Task Mapping Editor, has been developed for handling distributed resources and supporting the design of distributed applications on the ITBL. On the TME window, a user can design a workflow diagram, just like a drawing tool, of the distributed applications. All resources are represented as icons on the TME naming space and the data-dependency is defined by a directed arrow linking the icons. Furthermore, it is equipped with an important mechanism allowing integration and sharing of user-defined applets among the users who belong to a specific community. TME provides users a higher-level view of schematizing the structure of applications on the Grid-like environment as well as on the ITBL system.

1 Introduction

The progress of distributed processing is permeating successively with the rapid growth of Grid \cite{1} and the development of a grid middleware like the globus toolkit \cite{2}. On the Grid environment, geographically scattered resources, machines, huge and countable databases and experiments can be linked organically and uniformly with higher abstraction. Globus toolkit and other existing grid middleware support primitive functions to couple several components, however, it is believed difficult for a beginner to quickly master the functionalities. On the other hand, component programming is thought as one of prospective frameworks. Simplification of the interfaces, handling of any resources, and construction of the coupled services have become important issues for the next step of the Grid.
Generally, it is believed that the visual support that a GUI offers is more efficient than a script. GUI provides not only intuitive understanding but also the design of the combination of multiple components. In addition, it enables users to detect the structural bottleneck and errors via real-time monitoring of execution circumstance. There exist several projects implementing a GUI-based steering and monitoring on the Grid environment. WebFlow \[3\] is one of the pioneers in visual designing tools for distributed computing. GridMapper \[4\] is also a GUI tool, among several, which focuses on the monitoring of geographical network. The UNICORE project \[5\] intends to connect multiple computer centers and support illustration of the dependencies among data and jobs in order to realize a meta-computing facility. Triana \[6\] is also a graphical programming environment adopted as a test bed application in the GridLab project \[7\]. From the trends witnessed in the related works, common features, visual design, automatic execution, monitoring, and flexible integration framework can be considered as the key technologies for increasing the usability of the Grid.

This paper covers the concepts of Task Mapping Editor developed at the Japan Atomic Energy Research Institute (JAERI) and its implementation on the ITBL systems \[8\], also known as one of Grid environments initiated within the e-Japan strategy.

2 Task Mapping Editor

The Task Mapping Editor, hereafter ‘TME’, was originally developed as an execution environment in the STA (Seamless Thinking Aid) basic software project \[9\]. It was intended to facilitate a framework in distributed computing focused on a local area network and to support a user-friendly graphical interface (see Figure 1). The STA basic system is composed of three elements: development environments, communication infrastructures, and TME.

The main objectivity of TME was to provide application users as well as developer with a highly developed aspect to the structure of the application. At present, the STA project has shifted to become part of the ITBL (IT-Based Laboratory) project, one of e-Japan projects advanced among research institutes under the administration of the Ministry of Education, Culture, Sports, Science and Technology (MEXT). The TME has been restructured by using both security and communication infrastructures equipped on the ITBL. In the ITBL project, TME is prioritized as a core environment where users design and perform meta-applications. Due to the revisions made to run on the ITBL system, it is now possible to couple the computer resources located apart in various institutes with the help of the authentication mechanism introduced in the ITBL system. Such a feasible extension to its usability makes TME a prominent Grid software or toolset.

This section describes the software architecture of TME on the ITBL.