

Orchestra Designer: An Open-source tool for scientific workflow modeling

Dou Sun, Zhuqing Li, Yongwang Zhao, Dianfu Ma
School of Computer Science and Engineering, Beihang University
Beijing 100083, P.R.China
{sundou, lizq, zhaoyw}@act.buaa.edu.cn, dfma@buaa.edu.cn

Abstract

Scientific workflow is a new special type of workflow that usually underlines in many e-science applications such as climate modeling, structural biology and chemistry, medical surgery or disaster recovery simulation. Although there are numbers of tools developed for scientific workflow modeling, two important problems have not been addressed very well. The first problem is how to provide an easy way for domain scientists to design a complex scientific workflow and make it runnable, considering they maybe actually do not know the detail about the workflow specification, such as BPEL. The second problem is how to meet the demand of scientific collaboration, which has become more and more important in current scientific research. A scientific workflow model needs to be shared among some scientists in different place. They want to discuss, create and modify the model together. In this paper, we present the architecture and implementation of Orchestra Designer, which is an open-source tool for scientific workflow modeling. Our contributions include: 1) we proposed an extensible domain model for scientific workflow modeling. This model can be mapped to BPEL code framework directly. 2) we proposed a service-oriented collaboration bus for scientific workflow modeling. This collaboration bus allows some scientists to operate one scientific workflow model by web browsers simultaneously.

Orchestra Designer is a flex-based online workflow modeling tools, which adopts MVC pattern to build the allocation architecture which can effectively reduce the coupling between components. It also makes the program easier to expansion and maintenance, and facilitates parallel development between the teams. We adopt the Cairngorm as the basis framework of Orchestra Designer and expand the events and command mechanism of Cairngorm framework to avoid some shortcomings. The Orchestra Designer Architecture can be separated into four discrete Layers: View、Model、Control and Service. As the following figure:

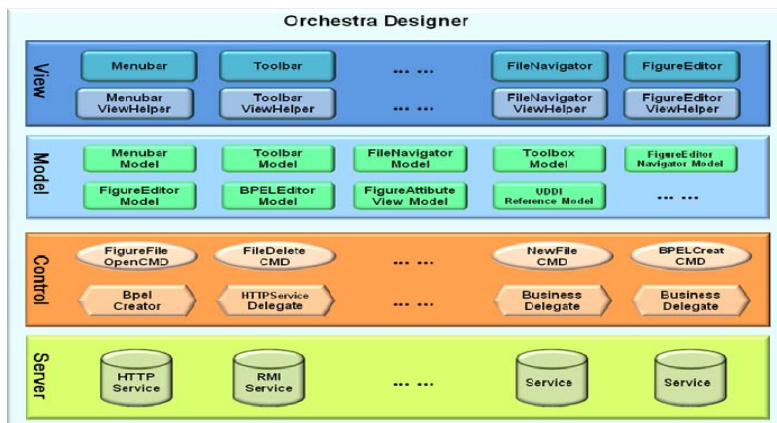


Figure 1. Orchestra Designer Architecture

The View Layer includes various components of the modeling tools, such as menu bar, toolbar, graphics editor zone etc. Model Layer preserves data information of the corresponding components in the View Layer, model information created by users, and state information of applications. Control Layer includes logics of application business and interaction with the server. These logics are packaged into different Command and Delegate classes. Server Layer preserves application data source in the server side.

An important goal of our work is to enable easy sharing the scientific workflow. A key component of our tool is the Collaboration Bus (CoBus). CoBus is the broker between users and workflow services. Without the CoBus, users access scientific workflow model directly and cannot collaborate with other scientists to share mind and modeling result. CoBus provides a common and transparent means to share scientific workflow model by mediating requests and sharing response from workflow services among all users. Users invoke services via sending SOAP messages to a workflow service endpoint which is a logical address on CoBus. The CoBus will transmit messages to physical service endpoint of scientific workflow. On CoBus there should be a mechanism to support service endpoint transformation from logical address to physical address. The Registry on CoBus is a service pool that manages service endpoint. Workflow services are registered in registry and CoBus republishes them to users. Registry acts as a service endpoint mapping table beside the service registry, and WSDL files of each workflow service are maintained in it. Fig. 2 shows the CoBus architecture.

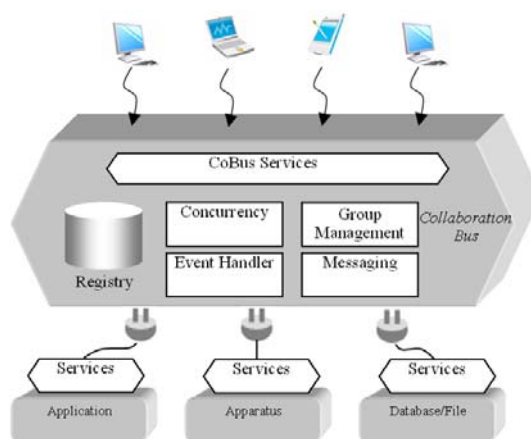


Figure 2. Collaboration Bus Architecture

Orchestra Designer is an open-source project from "Web 2.0 BPM editor" topic of 2009 OW2 Programming Contest. The objective of this project is to build an online workflow designer that generates BPEL processes. Those processes can be accepted by Orchestra, which is an open source BPEL engine released on OW2 platform.

The project Wiki: <http://www.trustie.net/projects/wiki/view/OrchestraDesigner/WebHome>