Web Service Interface and Workflow Mechanism for JVO

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URL: http://jvo.nao.ac.jp/

Abstract

Federation of astronomical data analysis services is one of main issues of JVO development in 2005. We employed the Web Services as an interface of analysis services, and designed the interface for various astronomical analysis tools that require efficient data transfer. We also designed a workflow mechanism for JVO on a basis of BPEL4WS, etc. This mechanism enables users to construct their data query and analysis sequences by combining multiple VO services.

Introduction

JVO aims at a federated system of distributed servers of catalog, image, spectrum and analysis services. As one of JVO science use cases, a study of QSO environment (see poster P.105) requires following steps:
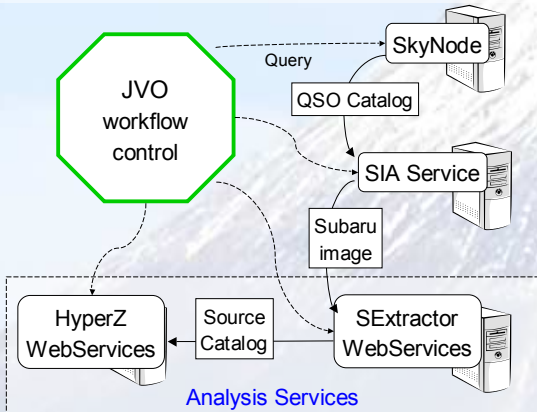
Previous JVO prototypes had "Scheduler" to construct workflows of parsed JVOQL. With such a mechanism, however, users cannot flexibly construct a workflow including analysis services. In the current JVO development, we design a Workflow Description Language in XML, and implement a control system to manage workflows.

Design of Workflow

The following items were taken into account:
- Described in XML. (or easier-to-write language?)
- Users can construct a workflow by
  - editing Templates, or
  - writing workflow from scratch.
- Available services are found from VOResource.
- Usage of a service is also found from VOResource.
- Service Provider can register their services easily.

Workflow Description Language

To achieve our requirement, we are designing a workflow language in XML. Its schema is based on other workflow systems such as BPEL4WS.

This language is capable of:
- Variable definition
- Controls (Loop, Condition)
- Parallel execution
- Invoke external services.
- Invoke built-in Java Classes

Diagram of Workflow Description Language
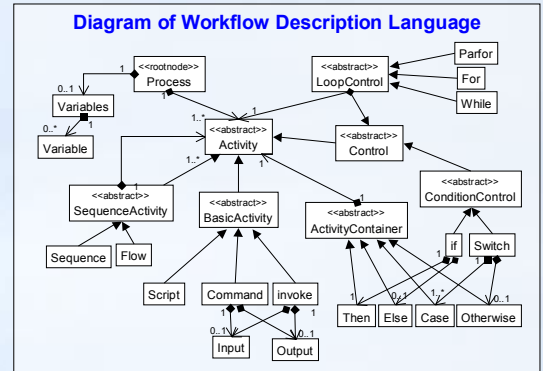
Interface Documentation

Usage description is necessary for exploiting Astronomical analysis tools. To include Usage description of Analysis Web Services in VOResource metadata, we extended VOResource schema. We also designed processes for service providers to register a documented VOResource to JVO Registry.
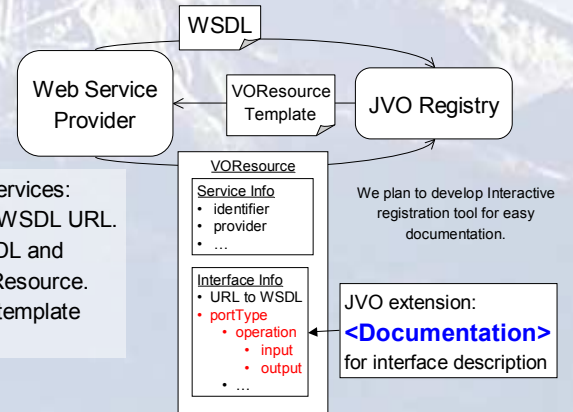
Processes to register Web Services:
1. Service provider registers WSDL URL.
2. JVO registry receives WSDL and generate template for VOResource.
3. Service provider edits the template and register it.

We plan to develop Interactive registration tool for easy documentation.

JVO extension: **<Documentation>** for interface description

Issues for Implementation

- **DII (Dynamic Invocation Interface)** of JAX-RPC is used for workflow executer.
  - Register new Web Services dynamically.
  - Avoid re-compilation of JVO System.
  - Restriction: Only primitive and pre-registered classes can be used for arguments.

- **HTTP or FTP Staging** is used for efficient file transfer.
  - Future option: VOSpace

- JVO Workflow control system is under development and its minimum set will be finished at the end of this year.