Chapter XI
Grid Business Process: Case Study

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ABSTRACT

This chapter presents a “Case Study” based on the distributed market. The requirements of this Grid Business Process are more demanding than any typical business process deployed within a single organization or enterprise. Recently, different specifications built on top of Web service standards have originated from the Grid paradigm to address limitations of stateless Web services. These emerging specifications are evaluated in the first part of the chapter to capture requirements of a dynamic business process, that is, Business Process Grid. In second part of the chapter, a case study with different use cases is presented to simulate various scenarios. The abstract discussion and requirements of the case study is followed by the actual implementation. The implementation is meant for the proof-of-concept rather than fully functional application.
GRID SPECIFICATIONS AND STANDARDS

Web services architecture lacks support for the state, event and notification, and resource lifecycle management to share and coordinate diverse resources of real life in dynamic “virtual organizations” (Foster, 2002). Recent convergence between Web services and the Grid computing community (Czajkowski, Ferguson, Foster, et al., 2004) toward the refactoring and evolution of Grid standards aimed at aligning OGSI functions with the emerging consensus on Web services architecture (Booth, Haas, McCabe, et al., 2004). This effort has produced two important sets of specifications: WS-RF (WS-ResourceFramework, 2005) and WS-Notification (WS-Notification, 2005). These specifications essentially retain all the functional capabilities present in OGSI, and at the same time built on broadly adopted concepts of Web services.

Web Services Addressing

The WS-Addressing specification defines a standard for incorporating message addressing information into SOAP (SOAP, 2000) messages. SOAP does not provide a standard way to specify where a message is going, how to return a response, or where to report an error. WS-Addressing introduces two new constructs for Web services vocabulary: Endpoint References and Message Addressing Properties.

Endpoint Reference (EPR)

Endpoint References are a new model for describing the Web service destination and service-specific attributes within an address for routing the message to a service or for use by the destination service itself. An endpoint reference is a data structure that is defined to encapsulate all the information required to reach a service endpoint at runtime.

A significant aspect of an endpoint reference is the ability to attach data from any XML namespace via Reference Properties or Reference Parameters. Both of these elements are collections of properties and values used to incorporate elements from different XML namespace into the endpoint reference. The key distinction between a Reference Property and a Reference Parameter is not the format but the intended usage. The reference properties help to identify the resource to be used during service invocation. The reference parameters wrap the information required for successful invocation of the service, which is not required to identify the resource.

The following example shows an endpoint reference for a service that simulates the personal address book. The service’s URI is specified in the Address element. A reference property indicates the type of the resource, that is, family, friend, colleague, and so forth. A reference parameter specifies the information required, that is, address, home number, mobile number, and so forth:

Listing 1. Example of endpoint reference

```
<wsa:EndpointReference xmlns:wsa="..." xmlns:example="...">
  <wsa:Address>http://example.com/contact</wsa:Address>
  <wsa:ReferenceProperties>
    <example:contactType>Family</example:contactType>
  </wsa:ReferenceProperties>
  <wsa:ReferenceParameters>
    <example:detail>Mobile</example:detail>
  </wsa:ReferenceParameters>
</wsa:EndpointReference>
```

Message Addressing Properties

WS-Addressing introduces a set of message headers providing information about a message by incorporating delivery, reply-to, and fault handler addressing information into a SOAP envelope necessary to support a rich bidirectional and asynchronous interaction. Most of the fields are