Business Grid: Grid Computing Infrastructure for e-Business Solutions

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Agenda

- Introduction
- OGSA
- Grid Solution Architecture
- Business Grid
- Summary and Resources
Grid computing provides a framework and deployment platform that enables resource sharing, accessing, aggregation, and management in a distributed computing environment.

- Based on system performance, users' quality of services (QoS)
- Based on emerging open standards, such as Web services.

The Grid on Steroids is happening fast.
Grid Powered by Technology Suite

- Timely, Reliable, Sophisticated, Technologies
- Huge Talent Pool
- Developing Standards
- Driving Innovation
  - UDDI
  - XML
  - Globus
  - Linux
  - SOAP
  - HTTP
  - Java
  - TCP/IP
  - HTML
  - WSDL
Web Services and Grid Computing

- Web Services is a generic solution for addressing interoperability in distributed environments (e.g., WSDL, SOAP, XML)
- Grid is the natural extension of Web services for solving REAL problems in the business and scientific computing domains
- Open Grid Services Architecture (OGSA) is a distributed interaction and computing architecture
  - It is based around the Grid service, assuring interoperability on heterogeneous systems.
  - It leverages the emerging Web services to define the Web Services Definition Language (WSDL) interfaces for Grid service.
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Service Oriented Architecture (GRID+Web Services+Toolkit)

All the services (persistent or transient) are built on Globus Toolkit.
Invocation of Grid Service

1. Generate a proxy from a WSDL definition that is manually created by developers or automatically generated by Globus Toolkit.
2. Get a GSH from a service supporting the portTypes used in Step 1 from a Grid service registry such as WSIL document or UDDI registry.
3. Invoke HTTP Get with the WSDL option on the GSH to get the GSR, and extract the endpoint URL.
4. Pass in the endpoint URL found in Step 3 to the proxy generated in Step 1, and start making invocations on the service.
Deployment and Publishing

Deployment

Invocation Request

SOAP RPC Servlet

Real Services

- EJB
- Java Class
- others

Grid Services

Grid Service Implementation

Grid Service Implementation

Grid Service Implementation

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Grid Services Interfaces

Registry

Private UDDI

Public UDDI

WSIL

WSIL

Grid Services

UDDI

UDDI

Grid Services
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Challenging Issues of Building Grid Solutions

- Need comprehensive administration
- Need resource provisioning
- Need adaptive application integration
- Need flexible data sharing and access
- Need activity monitoring
- Need policy-based Grid management mechanisms
Our proposed OGSA-based Grid solution architecture

Grid Solution Sphere includes both logical Grids and physical Grids

- The physical Grid refers to computer power and other hardware resources that can be shared over a distributed network. This is a predefined configuration for a specific task.

- The logical Grid refers to software and application sharing, as well as higher level business process sharing. A logical Grid can be dynamically configured based on customer requirements.

Next: **Business Grid** is a typical collaborative logical Grid solution for business process integration.
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Enable Grid computing for business process outsourcing

Business Grid example

Local Grid

Enterprise A

Business Processes

ERP

CRM

Customer

Partners

WSIL

UDDI

ASP

Web Services

Soap/XML

Business Grid

Admin Portal

- Service outsourcing

Local Grid

Enterprise B

Business Processes

Credit Checking

PO Creation

Shipping

Suppliers

External

OMG WS Workshop

Local Grid
Business Grid components

- Comprehensive administration for business entities and users on-boarding
- Grid service provisioning for external
- Dynamic Grid services composition based on business requirements
- Utilities like Grid services discovery and capability matching
- Adaptive business process driven application integration
- Flexible and secure data sharing and access
- Business activity monitoring and policy-based management mechanisms
Integration of Grid Services and Web Services

- One Grid service interface for integrating one or more Web services
- The implementation of Grid service invokes one or more Web services
- Web services get the real job done
OGSA Grid service browser

Part of Globus Toolkit

<table>
<thead>
<tr>
<th>Stock Grid Service</th>
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<tbody>
<tr>
<td>Sample Basic Counter Factory Service</td>
</tr>
<tr>
<td>Sample Delegation Counter Factory Service</td>
</tr>
<tr>
<td>Sample Logging Counter Factory Service</td>
</tr>
<tr>
<td>Sample Secure Counter Factory Service</td>
</tr>
<tr>
<td>Sample Notification Counter Factory Service</td>
</tr>
<tr>
<td>Sample Sink Listener Factory Service</td>
</tr>
<tr>
<td>Sample Weather Service (Gateway to Live Service)</td>
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<tr>
<td>Sample Stock Service (Gateway to Live Service)</td>
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</table>
Grid service instance creation

MyStockGridService
Stock Grid service invocation

(10:00AM on August 17, 2002).
Towards Autonomic Computing

- Self-protecting
  - System designed to protect itself from any unauthorized access anywhere

- Self-optimizing
  - System designed to automatically manage resources to allow the servers to meet the enterprise needs in the most efficient fashion

- Self-configuring
  - Systems designed to define itself "on the fly"

- Self-healing
  - Autonomic problem determination and resolution
Autonomic Computing

Manage the infrastructure

- Autonomic elements are functions in a system that monitor activities and adjust the system to accomplish system wide policy.
- Provisioning is a task that needs to be instrumented in all applicable autonomic elements. The element provides appropriate sensors for sending resource utilization status, and effectors for re-allocation of the resource.
Open Grid Services Architecture & Autonomic Computing

Meta-OS Services

- Resource Access
- Topology
- Policy
- Logging
- System Wide

Management Services

- Autonomic Management Tools
  - Access to resources
  - Access to system wide information

Distributed Resource Services

- Enable system wide autonomic capabilities

Web Services Programming Model

- Distributed topologies
- Heterogeneous
- Dynamic Binding
- Adaptive

QoS Enablers/Optimizers

Web Application Platforms

Source: IBM AC Seminar
Next Generation E-Business Integration

Dynamic e-Business
- Build Infrastructure Using Web Services and OGSA
- Share and Access business services using Grid Computing
- Manage Infrastructure using autonomic computing

Business Grid

Business Process Integration and Management

Web Services
Grid Computing
Autonomic Computing
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Research Topics

- Business Process Execution Specification for Grid Services
- Dynamic Grid Services Flow Composition
- Federated Grid Services Discovery
- And others …
Resources

- **The Open Grid Service Infrastructure Working Group** of the Global Grid Forum (GGF) is defining the OGSA.
- **The Globus Project**
- Developing Grid computing applications, IBM developerWorks (Part 1 and Part 2)
- Service Domain (part of WSTK)

**Conference Invitation**
- 2003 International Conference on Web Services (ICWS’03)
  - [http://tab.computer.org/tfec/icws03](http://tab.computer.org/tfec/icws03)
  - June 23 - 26, 2003, Las Vegas, Nevada, USA