Grid Standards

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Why Standards Matter

- Ubiquitous adoption demands open, standard protocols
  - Standard protocols enable *interoperability*
  - Avoid product/vendor lock-in
  - Enables innovation/competition on end points

- Further aided by open, standard APIs
  - Standard APIs enable *portability*
  - Allow implementations to port to different vendor platforms

- Internet and Web as exemplars
Grids and Open Standards

- Increased functionality, standardization

- Open Grid Services Arch
  - GGF: OGSI, ...
  - (+ OASIS, W3C)
  - Multiple implementations, including Globus Toolkit

- Web services

- Globus Toolkit
  - Defacto standards
    - GGF: GridFTP, GSI

- App-specific Services

- Custom solutions
  - X.509, LDAP, FTP, ...

- Time
Relevant Standards Organizations

- **GGF**: Grid services—OGSI, OGSA
- **W3C**: Web services: WSDL, SOAP
- **OASIS**: Web services security
- **IETF**: Internet protocols and security
- **Project Liberty Alliance**: Identity federation
- **DMTF**: Common Information Model (CIM)
OGSI
Open Grid Service Infrastructure

- Emerging standard that defines the Grid service
  - A Web service that conforms to standard behaviors and interfaces for distributed systems management
- GGF OGSI working group
- v1.0 specification has been released
Open Grid Services Infrastructure

- Introspection:
  - What port types?
  - What policy?
  - What state?
- Lifetime management:
  - Explicit destruction
  - Soft-state lifetime
- Other standard interfaces: factory, notification, collections

Grid Service

Implementation

Hosting environment/runtime
("C", J2EE, .NET, ...)

Client

Data access

Other standard interfaces:

Service data element

Service data element

Service data element

GridService (required)

Hosting environment/runtime

Grid Service Reference

Grid Service Handle

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Open Grid Services Architecture

Users in Problem Domain X

Applications in Problem Domain X

Application & Integration Technology for Problem Domain X

Generic Virtual Service Access and Integration Layer

Job Submission

Brokering

Workflow

Structured Data Integration

Registry

Banking

Authorisation

Structured Data Access

Data Transport

Resource Usage

Transformation

OGSI: Interface to Grid Infrastructure

Web Services: Basic Functionality

Compute, Data & Storage Resources

Structured Data

Relational

XML

Semi-structured

Distributed

Virtual Integration Architecture
OGSA
Open Grid Services Architecture

● OGSA refers to the collection of specifications that together define a complete architecture

● GGF OGSA WG is defining OGSA
  - Services must be OGSI-compliant
  - Coordination group: Specifications for the services will come from other working group
  - Will define requirements, scope activities, ...
  - This effort is just ramping up

GWD-R (draft-ggf-ogsa-platform-3)
Open Grid Services Architecture Platform
U.Chicago

Editors:
I. Foster, Argonne & U.Chicago
Other GGF Working Groups

- Numerous other GGF working groups related to OGSA
  - OGSA security
  - CIM based data models
  - Resource usage records and protocols
  - Agreement negotiation
  - Common management model
  - Data access and integration
  - Many more, and more to come...
1a. Request to Registry for sources of data about “x”

1b. Registry responds with Factory handle

2a. Request to Factory for access to database

2b. Factory creates GridDataService to manage access

2c. Factory returns handle of GDS to client

3a. Client queries GDS with XPath, SQL, etc

3b. GDS interacts with database

3c. Results of query returned to client as XML

Slide Courtesy Malcolm Atkinson, UK eScience Center
Common Management Model

- A manageable resource is a Grid service, thus
  - Global resource names: Grid service handles
  - State data modeling + access: SDEs
  - Lifetime management
  - Service Group for grouping resources
  - Interface definition language: WSDL
- Plus additional schema & operations
  - Standard manageable resource SDE schema
  - Interfaces for extensible lifecycle and relationship management
  ≥ BaseManageableResource interface
Base Manageable Port Types

OGSA port types
- GridService
- HandleResolver
- ServiceGroup

CRM port types
- Locate
- Relationship
- LifecycleModel

BaseManageableResource
lifecycleModel Port Type: A Container for Lifecycle States

- There may be multiple models, but only one for a given resource’s port type
- Example: Get/set resource’s lifecycle state
  - down, starting, up, stopping, failed
  - Each state has additional info, e.g.,
    - up state: idle, busy, degraded
W3C WSDL & SOAP

- **WSDL**: Web Services Description Language
- **SOAP**: Simple Object Access Protocol

- Foundation under OGSI
- Both are “W3C Notes”, with standardization in progress
- OGSI authors are on the WSDL working group, to ensure that OGSI requirements are met in WSDL v1.2
Security Standards

● Many core security standards are from IETF
  – PKI, Kerberos, etc.
● X.509 Proxy Certificates
  – Used by Globus Toolkit GSI
  – IETF PKIX RFC
Web Services Security

● A whole raft of Web services security specification are in play
  – Need to evaluate & perhaps extend for OGSA; still many holes to be filled

● GGF OGSA Security WG is coordinating security standards for OGSA applicability
  – Binding level & service definitions
  – E.g., standard authorization interfaces
IBM/Microsoft
WS Security Architecture

- Large set of specifications for doing Web services security, most of which should be appropriate for OGSA
- Announced April 2002
- Initial spec in July 2002 (WS-Security)
  - Submitted to OASIS
- New crop of specs arrived in December 2002
  - Not yet in any standards organization
WS Security
Current/Proposed WSS-specs

- WS-Secure Conversation
- WS-Federation
- WS-Authorization
- WS-Policy
- WS-Trust
- WS-Privacy

WS-Security

SOAP Foundation
OASIS SAML & XACML

- **SAML**: Security Assertion Markup Language
  - Good for asserting properties such as group membership, etc
- **XACML**: eXtensible Access Control Markup Language
  - For defining access control policies
Project Liberty Alliance

- V1.0 specifications for identity federation
- Based on SAML
Intellectual Property issues

- Ubiquitous adoption is likely only to happen if IP is licensed royalty free (RF)
  - Core specifications must be RF
  - Higher level service specifications may be RAND (Reasonable and Non-Discriminatory) or even proprietary
- OGSI authors have made RF commitment
  - Many of the key IBM/Microsoft WS-* specs are not (currently) RF
  - But WS-Security is RF, so hopefully…
Globus Toolkit and Standards

- GT continues to implement open standards as they emerge
- GT2
  - X.509 Certs and Proxy Certs, GridFTP, LDAP, GSS-API, GSS-API extensions
- GT3
  - GT2 + WSDL, SOAP, X.509, OGSI, WS-Security, etc.
Summary

- Standards are critical to Grid success
- A complex space, with much to be done and many stakeholders
- GGF is defining key Grid standards: OGSI, data, manageability, agreements, etc.
- Close coordination with W3C
- Uncertain status of security standards continues to be a source of concern
- Open source software as a secret weapon