The Role of the Globus Toolkit

- The Globus Toolkit is a collection of solutions to problems commonly found in collaborative distributed applications
- Heterogeneity
  - A focus, in particular, on wrapping heterogeneity for application developers
- Abstractions
  - Supporting general-case patterns and interactions, not specific to a particular application domain
- Standards
  - Capitalize on and encourage use of existing standards (IETF, W3C, OASIS, GGF)
  - GT also includes reference implementations of new/proposed standards in these organizations
The Globus Toolkit: “Standard Plumbing” for the Grid

- Today the majority of the GT public interfaces are usable by application developers and system integrators
  - Relatively few end-user interfaces
  - In general, not intended for direct use by end users (scientists, engineers, marketing specialists)
- Not turnkey solutions, but building blocks & tools for application developers & system integrators
  - Some components (e.g., file transfer) go farther than others (e.g., remote job submission) toward end-user relevance
- Better to reuse than reinvent!
  - Plenty of interesting unsolved problems to work on
  - Compatibility with other Grid systems comes for free
Bridging the Gap: Grid Infrastructure

- **Service-oriented applications**
  - Wrap applications as services
  - Compose applications into workflows

- **Service-oriented Grid infrastructure**
  - Provision physical resources to support application workloads

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The Globus Commitment to Open Source

- To allow for inspection
  - for consideration in standardization processes
- To encourage adoption
  - in pursuit of ubiquity and interoperability
- To encourage contributions
  - harness the expertise of the community

http://dev.globus.org

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Globus Toolkit by Domain Areas

- **Core runtime**
  - Infrastructure for building new services
- **Security**
  - Apply uniform policy across distinct systems
- **Execution management**
  - Provision, deploy, & manage services
- **Data management**
  - Discover, transfer, & access large data
- **Information services**
  - Discover & monitor dynamic services

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Globus Toolkit by Protocol Type

- **Web service protocols**
  - WSDL, SOAP
  - WS Addressing, WSRF, WSN
  - WS Security, SAML, XACML
  - WS-Interoperability profile
- **Non Web service protocols**
  - Standards-based, such as GridFTP
  - Custom
GT2

Key Protocols

- The Globus Toolkit v2 (GT2) centers around four key protocols
  - Connectivity layer:
    - **Security**: Grid Security Infrastructure (GSI)
  - Resource layer:
    - **Resource Management**: Grid Resource Allocation Management (GRAM)
    - **Information Services**: Grid Resource Information Protocol (GRIP)
    - **Data Transfer**: Grid File Transfer Protocol (GridFTP)
  - Also key collective layer protocols
    - Info Services, Replica Management, etc.

OGSA and the Globus Toolkit

- Technically, OGSA enables
  - Refactoring of protocols (GRAM, MDS, GridFTP), while preserving all GT concepts/features!
  - Integration with hosting environments: simplifying components, distribution, etc.
  - Greatly expanded standard service set
- Pragmatically, Globus proceeded as follows
  - Develop open source OGSA implementation
    - Globus Toolkit 3.0; supports Globus Toolkit 2.0 APIs
  - Partnerships for service development
  - Also expect commercial value-adds

Globus Toolkit version 3 (GT3)
GT2 Evolution To GT3

- What happened to the GT2 key protocols?
  - Security: Adapted X.509 proxy certs to integrate with emerging WS standards
  - GRIP/LDAP: Abstractions integrated into OGSI as serviceData
  - GRAM: ManagedJobFactory and related service definitions
  - GridFTP: Unchanged in 3.0, but will evolve into OGSI-compliant service in 2004
- Also rendering collective services in terms of OGSI: RFT, RLS, etc.

GT Timeline

- GT 1.0: 1998
  - GRAM, MDS
- GT 2.0: 2001
  - GridFTP, packaging, reliability
- GT 3 Technology Preview: Apr-Dec 2002
  - Tracking OGSI definition
- GT3.0 Alpha: Jan 2003
  - OGSI Base, GT2 functionality
- GT3.0 Production: June 2003
  - Tested, documented, etc.
- GT3.2.1 Production: July 2004
- GT3.9.2 Development: Aug 2004
- GT4 Scheduled beta development: Dec 2004
- GT 3.9.5 (the GT4 beta release): Feb 2005
- GT 4.0: Mar 2005

4.0 is not a typical “.0” release, but the culmination of months of testing

GT Timeline

- GT 4.0: Mar 2005
- GT 4.0.1: Aug 2005
  - Adoption of Version 2 of the Apache License, without modification
  - Improved support for Apache Tomcat
  - Improved support for message-level security in CWS Core
  - An updated version of OGSA-DAI, containing the complete set of public interfaces
  - The addition of a new tech preview component, an early release of the SweGrid Accounting System (SGAS)
- Nov 2005
  - Rocks 4.1 Cluster Software Released, with Support for GT 4.0.1
  - Weka4WS: GT4-based distributed data mining
GT Timeline

- April 2006 **GT 4.0.2**
  - Support for Tomcat 5.5.x
  - Improved WSDL parsing and serialization of complex types in C WS Core
  - Improved performance and a new programmer’s tutorial for Python WS Core
  - Beta-quality integration between the SweGrid Accounting System (SGAS) tech preview and WS GRAM
  - Improved ODBC support in the Replica Location Service (RLS)
  - Improved resource management in OGSA-DAI WSRF
  - Scalability improvements to the Data Replication Service (DRS)
  - Job throughput improvements in WS GRAM

- Apr 2006 WSRF 1.2 approved as OASIS standard
- July 2006 New stable release of the GridWay Meta-scheduler
- Aug 2006 GT 4.0.3
  - Updated version of the CoG JGlobus library
  - Updated version of the Apache Axis library
  - Improved credential renewal support in MyProxy
  - Improved error reporting for WS GRAM multijobs