GRAM: GT's Job Submission Service
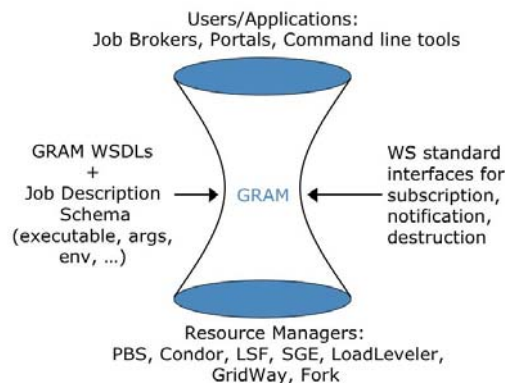
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The Globus Toolkit provides two separate service implementations for remote job execution: "Pre-WS GRAM" which is based on a proprietary protocol, and "WS GRAM" which uses Web Service standards. GRAM's purpose is to provide a single, generic interface for requesting and using remote computational resources for the execution of computation tasks or "jobs".

We designed GRAM to handle a range of jobs where reliable operation, stateful monitoring, credential management, and file staging are important. GRAM is not a cluster resource manager in itself, but rather a set of services and clients that provide a common interface for communicating with a range of different compute cluster resource managers.

Web Service (WSRF-compatible) GRAM provides remote job execution using industry standard protocols and service interfaces. This enables easier development of clients due to the availability of Web Service and XML tooling. Another goal of ours was to overcome limitations in Pre-WS GRAM. For example, we strive to provide improved scalability, reliability, and throughput.

The following diagram illustrates how GRAM acts as an intermediary between job submission clients of various kinds and proprietary computational resource managers:

Users/Applications:
Job Brokers, Portals, Command line tools

GRAM WSDLs
+
Job Description
Schema
(executable, args,
env, ...)

GRAM

WS standard
interfaces for
subscription,
notification,
destruction

Resource Managers:
PBS, Condor, LSF, SGE, LoadLeveler,
GridWay, Fork

WS GRAM also integrates functionality from other Globus Toolkit components:

- RFT and GridFTP for file staging and cleanup
- Delegation service for credential management
- C WS Core for it's command line client (globusrun-ws)
- MDS4 for publishing information about the compute cluster and resource manager

Organizations creating a "Grid" (an integrated, persistent, computational resource between multiple sites) use GRAM to provide a uniform interface for job submission and management to their heterogeneous computational resources. Some of the worlds largest Grids use GRAM: TeraGrid (www.teragrid.org), OSG (www.opensciencegrid.org), EGEE (www.eu-egee.org), PRAGMA (www.pragma-grid.net), UK NGS (www.grid-support.ac.uk).

Many Grids are deploying both WS GRAM and Pre-WS GRAM, but it is anticipated that Pre-WS GRAM will eventually be deprecated. We strongly encourage those creating new Grids to use WS GRAM.

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