EZ-Grid Project

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Major Objectives of the Project

To realize easier setting up / managing and effective usage of Grid environments through the following services:

- Generic brokerage services EZ-Grid Broker Kernel (Matchmaker)
- Usage policy management frameworks that allow precise control over grid resources EZ-Grid Policy Engine
- User interfaces for easier and intuitive interaction with grids EZ-Grid Interface for job submission / Resource info viewing
- Implement services that address the deficiencies in existing systems (dynamic information mgmt)
  EZ-Grid Information Server & Register

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Overview of the system

- Existing work
  - User interfaces for job submission/monitoring, info viewing
  - Basic brokerage services, Policy enforcement
  - Information services [Register, EZ-Grid Server…]
  - GridFTP and GASS based transparent file transfer
- Work in Progress
  - Tighter integration with Grid Engine software
    - Enable direct job submission
    - Information gathering, Load/queue length prediction
    - **Working closely with Raytheon**
  - Brokerage algorithm examination and experimentation
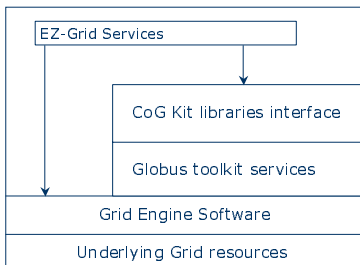 - Campus Grid activities, Sun Center Of Excellence work

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System details

- Implemented in Java for platform independence
- XML for all information representation
- Globus for middleware services (GSI, Data)
- Interfaced with Globus thro CoG kit
- Services offered:
  - Resource management
  - Matchmaking
  - Information
  - Security
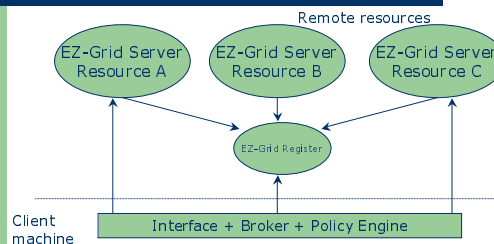 - Job submission and monitoring

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Interaction with other tools

EZ-Grid Services

CoG Kit libraries interface

Globus toolkit services

Grid Engine Software

Underlying Grid resources

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System Architecture

Remote resources

EZ-Grid Server
Resource A

EZ-Grid Server
Resource B

EZ-Grid Server
Resource C

EZ-Grid Register

Client machine

Interface + Broker + Policy Engine

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Brokering

- Brokering phases examines:
  - Resource sufficiency (use resource information gathered)
  - Resource usage policy evaluation (Policy Engine)
  - Run-time prediction based on History Info (algorithms exist!)
  - Network latency and bandwidth (NWS)
  - Queue load prediction (interfaces with schedulers like GE), Building upon Shannon's work ☺
- These tasks should ultimately result in ranking of resources (indicating suitability for "this" job submission)

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Current work in Brokering

- Algorithms for history-based predictions, refining
- Services for queue load prediction, study related algorithms
- Ranking of resources and "normalizing" ranks for evaluating resources comparatively
- Iterating and evaluating the various algorithms based on our experiences with Campus grid and the Center of excellence

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EZ-Grid User Interface

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EZ-Grid User Interface

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Information Server and Register

- Existing information services do not address all dynamic information gathering and mgmt issues (critical to brokerage)
- EZ-Grid Info Server supports:
  - Application Profile information, User Profiles
  - Information on history of job submissions
  - Queue status information (Queue length, loads…)
    - Interfaces with local schedulers like GEEE
  - Network bandwidth information (Planned)
- EZ-Grid Register
  - No existing mechanism for automated resource discovery
  - Register keeps track of availability information about Grid resources
  - EZ-Grid servers are configured to send periodic "alive" messages
  - On-demand, EZ-Grid users and broker can query for a list of "available" grid resources

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Interaction with Grid Engine

- We intend to tightly integrate the EZ-Grid system with the Grid Engine software
- Major benefits include the following:
  - Dynamic Queue information gathering
  - Queue length and Load prediction
  - Direct Job submission interfaces to circumvent GRAM where possible
  - Precise job control and monitoring
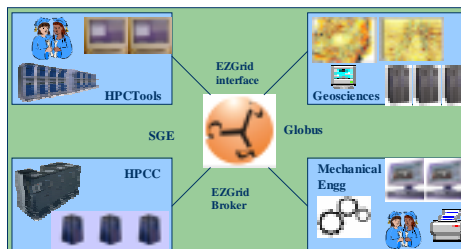 - Checkpointing and migration across clusters??

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Globus-GE interaction
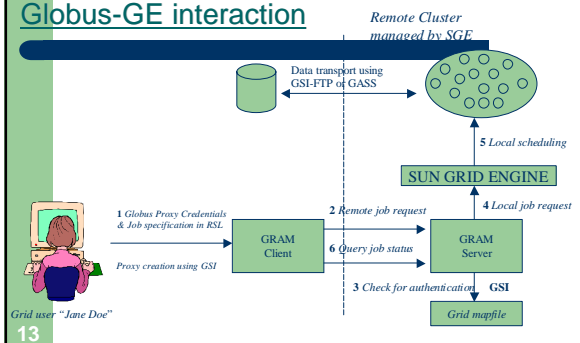
Campus Grid Activities

Sun COE Hardware

- 3 Sun Fire 6800s (1 x 24 CPUs, 2 x 12 CPUs)
  - Ultra Sparc III 750 Mhz, Compute servers
- 2 Sun Fire V880s (4 x 8 CPUs, 7 x 4 CPUs)
  - Ultra Sparc III 750 Mhz, Compute servers
- 11 Sun Blade 1000s (2 CPUs)
  - Ultra Sparc III 750 Mhz, Compute servers
- SunBlade 1000 login node, SunBlade 100 Admin node
- StorEdge Disk array of 4 TB storage
- Myrinet and Gigabit networking

Future work

- Web access to EZ-Grid and web services
- User Interface to be updated based on feedback from pilot users
- Full Integration with Grid Engine software
- Brokering for better history, network and queue analysis

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Conclusions

- Setting up, managing and accessing Grids must be made easier
- Generic resource brokers will be of immense help for efficient use of Grid resources
- Grid Engine software provides a powerful tool for building campus grids such as the one at UH
- "Bottom-up" approach towards Grids is good, campus grids, state-wide grids, national grids..

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For more information…

- www.cs.uh.edu/~ezgrid

- www.cs.uh.edu/~hpctools

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