Discovering a grid resource

- Start with a task
  - Eg. Want to perform some computation
- Resource Discovery
  - “Which resources are relevant to my task?”
- Resource Status Inquiry
  - “Which resource is best to use (now)?”
- Resource Control
  - Use the resource
    - submitting a job
  - Not part of MDS!
Discovering a grid resource
1. Which resources are relevant?
Discovering a grid resource

1. Which resources are relevant?
Discovering a grid resource
2. Which resources are best for task?

- **128 slow CPUs**
  - Low load

- **16 fast CPUs**
  - 500Gb disk
  - High load

- **2 CPUs**
  - 100Gb disk
  - Medium load
Discovering a grid resource

2. Which resources are best for task?

128 slow CPUs
Low load
Discovering a grid resource
3. Try to use chosen resource

Job submission with GRAM
NOT part of MDS
What makes this difficult on the grid?

- **Distributed users and resources**
  - Sometimes unreliable network

- **Variable resource status**
  - Resources come up and go down without any centralised co-ordination

- **Variable grouping**
  - Different people belong to different groups *(Virtual Organisations)*
  - The grid is not cleanly partitioned
What does this look like to users?

ServiceGroup Overview

This WS-ServiceGroup is an Aggregating ServiceGroup, part of MDS4, a component of the Globus Toolkit.

This WS-ServiceGroup has 13 direct entries, 27 in whole hierarchy.

<table>
<thead>
<tr>
<th>Resource Type</th>
<th>ID</th>
<th>Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>GRAM</td>
<td></td>
<td>1 queues, submitting to 0 cluster(s) of 0 host(s).</td>
</tr>
<tr>
<td>ServiceGroup</td>
<td></td>
<td>This WS-ServiceGroup has 2 direct entries, 2 including descendants.</td>
</tr>
<tr>
<td>RFT</td>
<td></td>
<td>0 active transfer resources, transferring 0 files, 0 bytes transferred in 0 files since start of database.</td>
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<td>Aggregator entry with no content from <a href="https://ned-6.isi.edu:9000/wsrf/services/ManagedJobFactoryService">https://ned-6.isi.edu:9000/wsrf/services/ManagedJobFactoryService</a></td>
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<td>RFT</td>
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<td>28 active transfer resources, transferring 4 files, 150840396 bytes transferred in 8032 files since start of database.</td>
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Examples of Useful Information

● Characteristics of a compute resource
  ◆ Software available, networks connected to, load, type of CPU, disk space

● Characteristics of the Globus infrastructure
  ◆ Hosts, resource managers, service availability
Grid Information: Facts of Life

- Information is always old
  - Time of flight; changing system state
- Distributed snapshot of state hard to obtain
- Components will fail
- Scalability and overhead
- Many different usage scenarios
MDS in a VO
Flow of information

- Resource Inquiry via Info. Protocol
  - Query from index
    - Do not need to know about each resource
    - Information is older
  - Query from resources directly
    - Information more recent
    - Higher load on resources and on requestor
MDS in a VO
Constructing a hierarchy

- Resources registered into Indexes
- Soft-state registration
  - Keeps index clean
  - Old entries disappear
- Registrations configured at index or at resource

*VO-specific indexes*
MDS in a VO
Constructing a hierarchy

- Indexes can be registered to other indexes
MDS components

- MDS services
  - Index
  - Trigger
- Component-specific information
  - Queue status information for GRAM
- GT4 WSRF core provides underlying layer
Index Service

- Maintain set of registered Grid Resources
  - Track incoming live registrations
  - Indexes can be registered hierarchically
- Cache of monitoring data for each Grid Resource
- Akin to web search engines
- “Which compute resources have 32 or more processors?”
Publishing new information

1. Decide what information to publish into MDS and where
2. Define XML schema
3. Write code to publish info
   1. As part of a new service
   2. As part of existing implementation