



# 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!

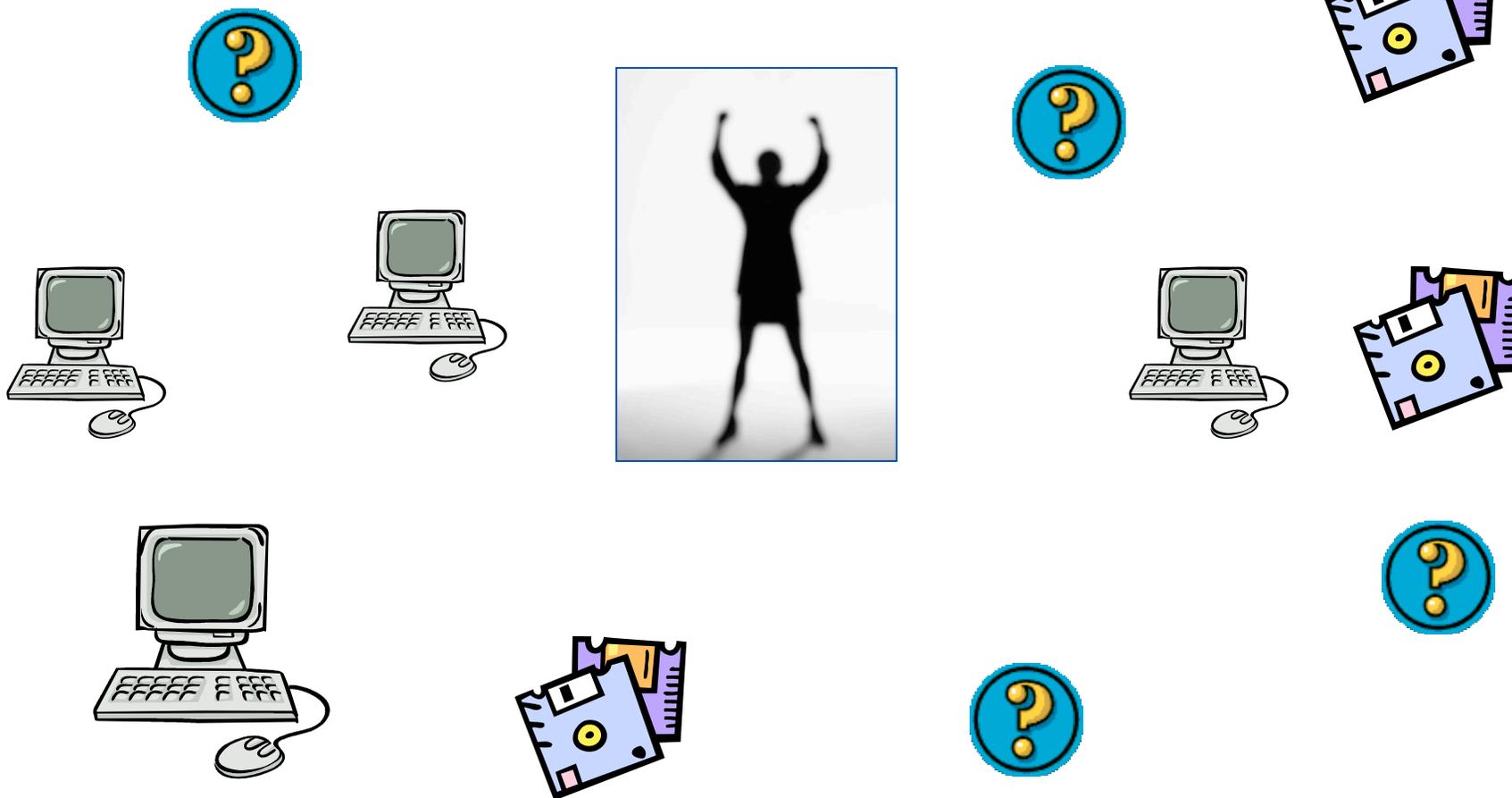


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[www.globus.org](http://www.globus.org)

# Discovering a grid resource

## 1. Which resources are relevant?





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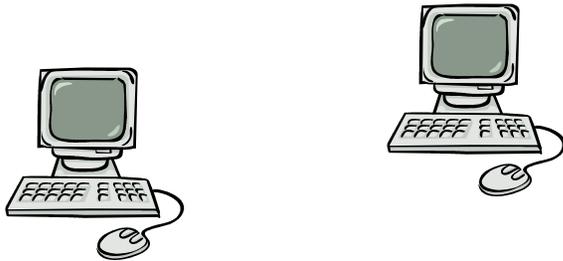
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# Discovering a grid resource

## 2. Which resources are best for task?

128 slow  
CPUs  
Low load



2 CPUs  
100Gb disk  
Medium load



16 fast CPUs  
500Gb disk  
High load



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## Discovering a grid resource

### 2. Which resources are best for task?

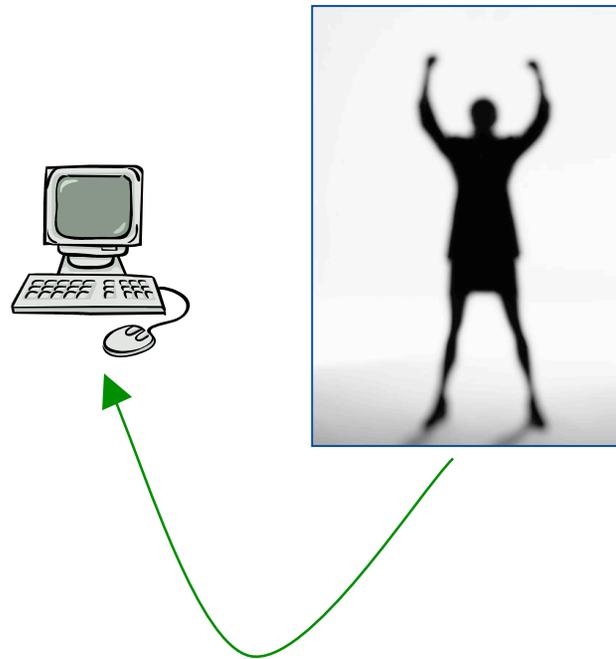
128 slow  
CPUs  
Low load





## 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.

Resource Type	ID	Information	
GRAM		1 queues, submitting to 0 cluster(s) of 0 host(s).	<a href="#">detail</a>
ServiceGroup		This WS-ServiceGroup has 2 direct entries, 2 including descendants.	<a href="#">detail</a>
RFT		0 active transfer resources, transferring 0 files. 0 bytes transferred in 0 files since start of database.	<a href="#">detail</a>
Unknown		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>	<a href="#">detail</a>
Unknown		Aggregator entry with no content from <a href="https://viz-login.isi.edu:9000/wsrf/services/DefaultIndexService">https://viz-login.isi.edu:9000/wsrf/services/DefaultIndexService</a>	<a href="#">detail</a>
Unknown		Aggregator entry with no content from <a href="https://dc-user2.isi.edu:9000/wsrf/services/DefaultIndexService">https://dc-user2.isi.edu:9000/wsrf/services/DefaultIndexService</a>	<a href="#">detail</a>
ServiceGroup		This WS-ServiceGroup has 2 direct entries, 2 including descendants.	<a href="#">detail</a>
Unknown		Aggregator entry with no content from <a href="https://ned-4.isi.edu:9000/wsrf/services/ManagedJobFactoryService">https://ned-4.isi.edu:9000/wsrf/services/ManagedJobFactoryService</a>	<a href="#">detail</a>
RFT		0 active transfer resources, transferring 0 files. 0 bytes transferred in 0 files since start of database.	<a href="#">detail</a>
ServiceGroup		This WS-ServiceGroup has 2 direct entries, 2 including descendants.	<a href="#">detail</a>
Unknown		Aggregator entry with no content from <a href="https://ned-7.isi.edu:9000/wsrf/services/ManagedJobFactoryService">https://ned-7.isi.edu:9000/wsrf/services/ManagedJobFactoryService</a>	<a href="#">detail</a>
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Unknown		Aggregator entry with no content from <a href="https://devrandom.isi.edu:9000/wsrf/services/DefaultIndexService">https://devrandom.isi.edu:9000/wsrf/services/DefaultIndexService</a>	<a href="#">detail</a>
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RFT		0 active transfer resources, transferring 0 files. 0 bytes transferred in 0 files since start of database.	<a href="#">detail</a>
Unknown		Aggregator entry with no content from <a href="https://ned-2.isi.edu:9000/wsrf/services/ManagedJobFactoryService">https://ned-2.isi.edu:9000/wsrf/services/ManagedJobFactoryService</a>	<a href="#">detail</a>
ServiceGroup		This WS-ServiceGroup has 2 direct entries, 2 including descendants.	<a href="#">detail</a>
RFT		0 active transfer resources, transferring 0 files. 0 bytes transferred in 0 files since start of database.	<a href="#">detail</a>
Unknown		Aggregator entry with no content from <a href="https://ned-5.isi.edu:9000/wsrf/services/ManagedJobFactoryService">https://ned-5.isi.edu:9000/wsrf/services/ManagedJobFactoryService</a>	<a href="#">detail</a>
RFT		28 active transfer resources, transferring 4 files. 158848396 bytes transferred in 8032 files since start of database.	<a href="#">detail</a>
ServiceGroup		This WS-ServiceGroup has 2 direct entries, 2 including descendants.	<a href="#">detail</a>
Unknown		Aggregator entry with no content from <a href="https://ned-1.isi.edu:9000/wsrf/services/ManagedJobFactoryService">https://ned-1.isi.edu:9000/wsrf/services/ManagedJobFactoryService</a>	<a href="#">detail</a>
RFT		0 active transfer resources, transferring 0 files. 0 bytes transferred in 0 files since start of database.	<a href="#">detail</a>



## 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



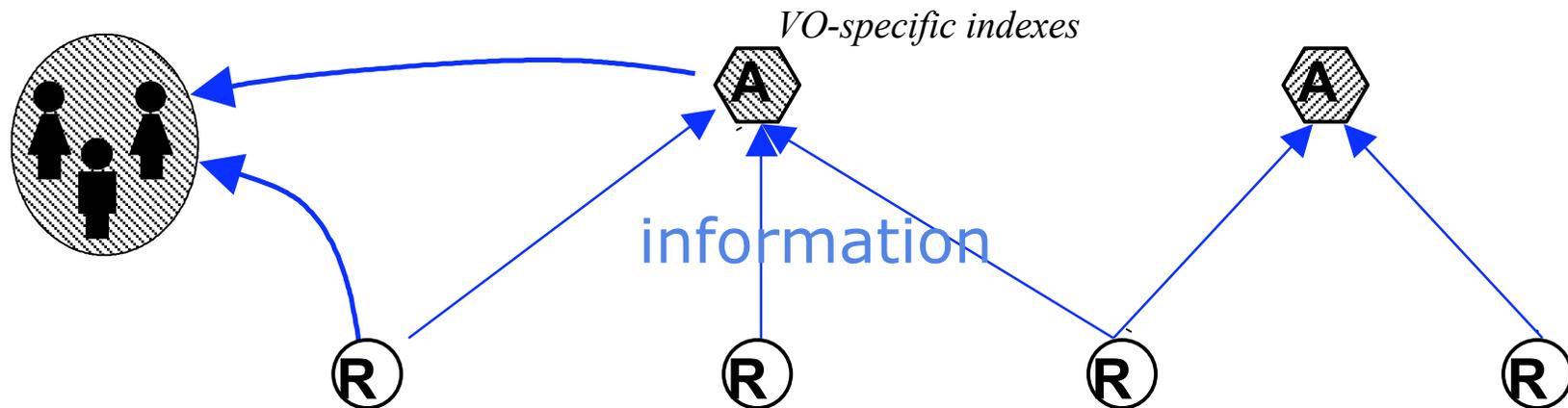
## Grid Information: Facts of Life

- 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



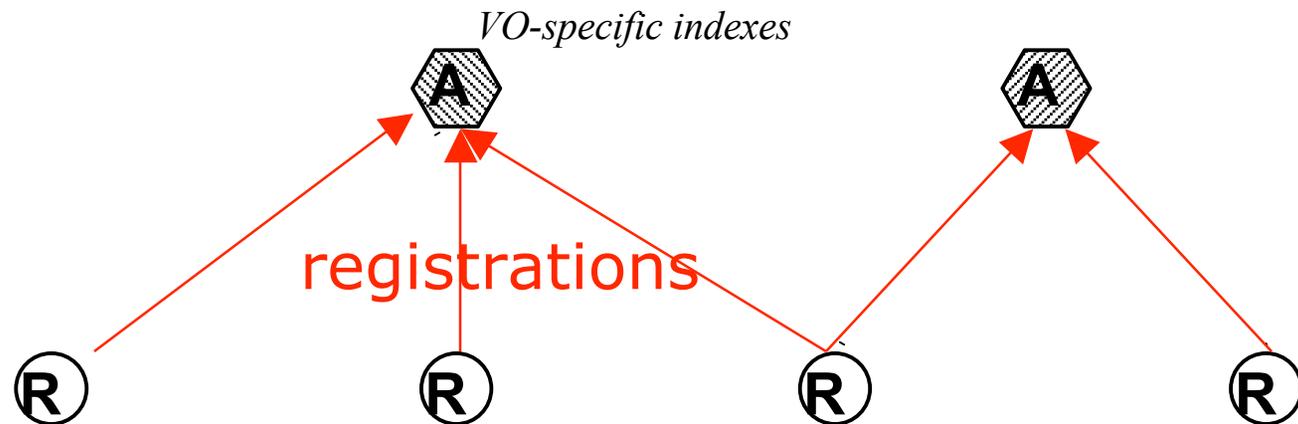
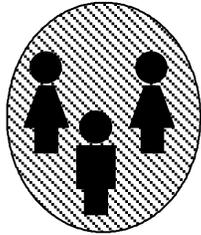
#### ● Resource Inquiry via Info. Protocol

- ◆ 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

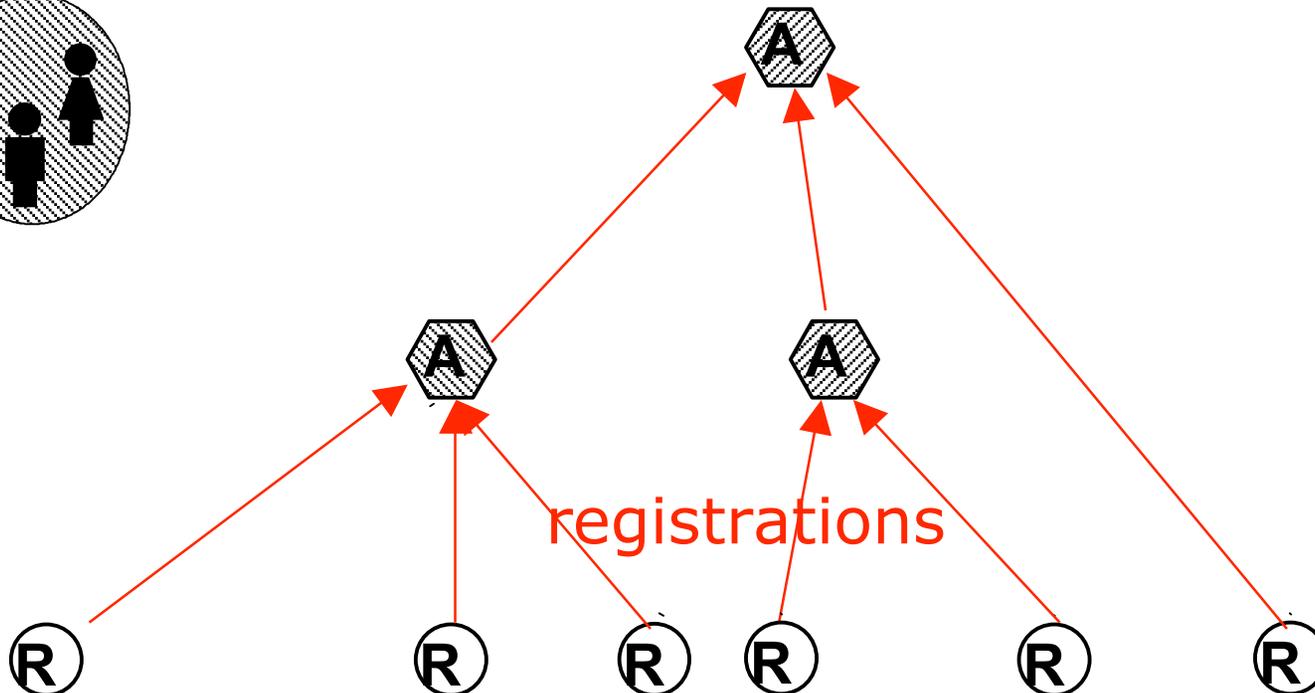
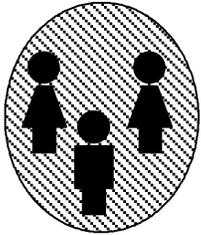
## Constructing a hierarchy



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

# 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