# The GridWay Meta-Scheduler
## *Globus Execution Services Session*

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**dsa-research.org**

## *Open Source Grid & Cluster*

Oakland CA, May 2008

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# What is GridWay?

> *The GridWay meta-scheduler is a scheduler virtualization layer on top of basic Globus services (GRAM, MDS & GridFTP)*

## For the user

- A LRM-like environment for submitting, monitoring, and controlling jobs

## For the developer

- An standard-base development framework for Grid Applications

## For the sysadmin
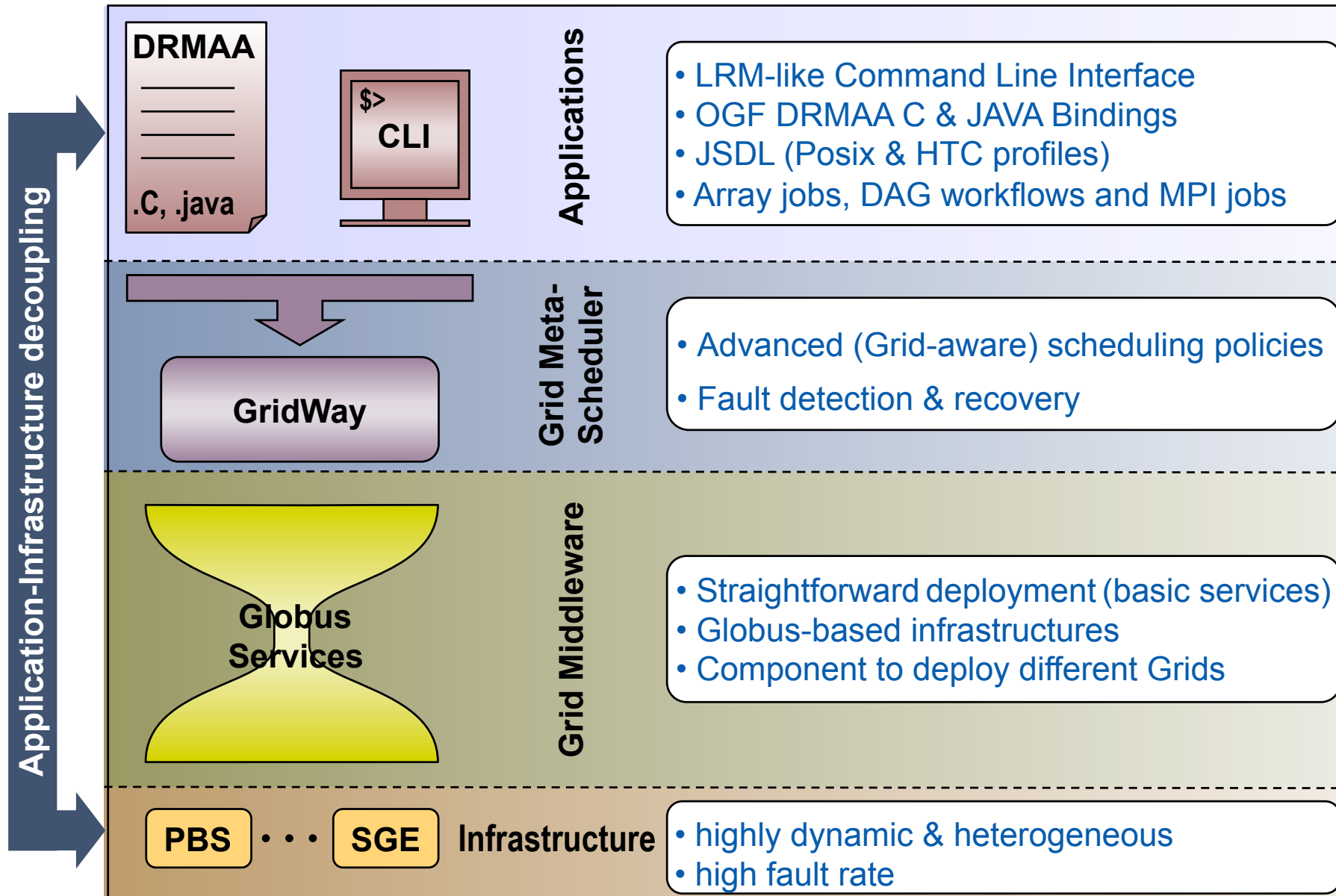
- A policy-driven job scheduler
- User-side Grid Accounting

## For the Grid architect / solution provider

- A modular component to use different infrastructures
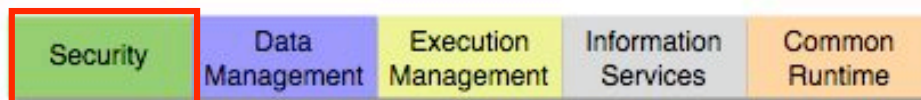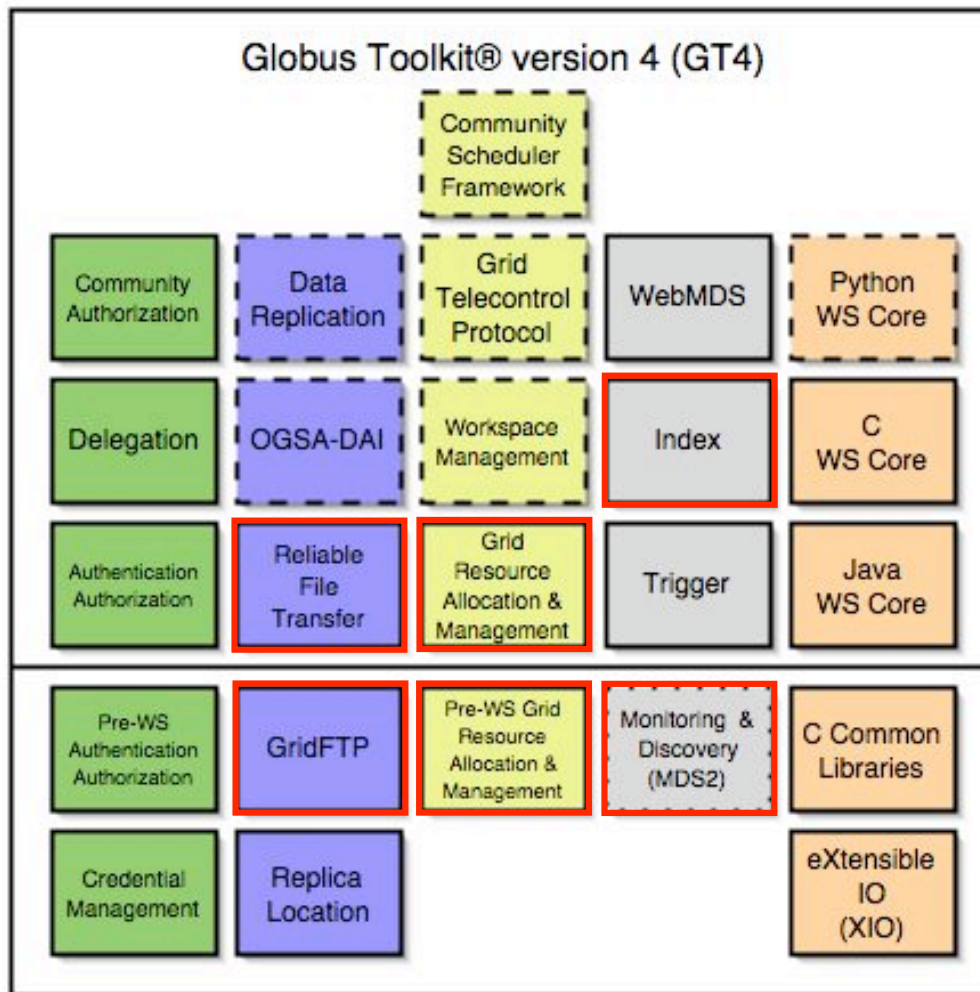- A key component to deploy different Grids

# What is GridWay?



**Applications**

**DRMAA**
.C, .java

**CLI** $>

- LRM-like Command Line Interface
- OGF DRMAA C & JAVA Bindings
- JSDL (Posix & HTC profiles)
- Array jobs, DAG workflows and MPI jobs

**Grid Meta-Scheduler**

**GridWay**

- Advanced (Grid-aware) scheduling policies
- Fault detection & recovery

**Grid Middleware**

**Globus Services**

- Straightforward deployment (basic services)
- Globus-based infrastructures
- Component to deploy different Grids

**Infrastructure**

**PBS** · · · **SGE**

- highly dynamic & heterogeneous
- high fault rate

**Application-Infrastructure decoupling**

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# What is GridWay?

**Globus Projects**

GridWay

**Globus Incubator Projects**

Gridshib

DDM

LRMA

GRAADS

Falkon

**. . .**

**and many many more!**

Globus Toolkit® version 4 (GT4)

Community Scheduler Framework

| Community Authorization | Data Replication | Grid Telecontrol Protocol | WebMDS | Python WS Core |
|---|---|---|---|---|
| Delegation | OGSA-DAI | Workspace Management | Index | C WS Core |
| Authentication Authorization | Reliable File Transfer | Grid Resource Allocation & Management | Trigger | Java WS Core |
| Pre-WS Authentication Authorization | GridFTP | Pre-WS Grid Resource Allocation & Management | Monitoring & Discovery (MDS2) | C Common Libraries |
| Credential Management | Replica Location | | | eXtensible IO (XIO) |

WS Components

Non-WS Components

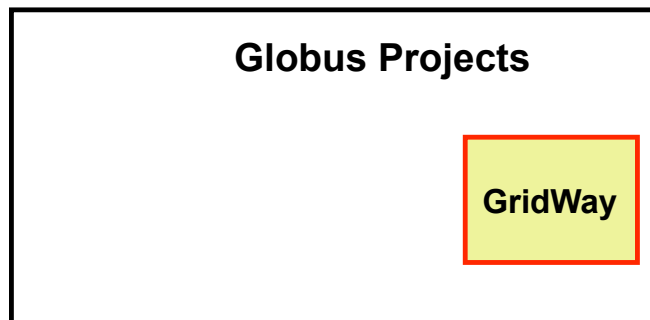| Security | Data Management | Execution Management | Information Services | Common Runtime |
|---|---|---|---|---|

# Scheduling Policies

**Resource Policies**
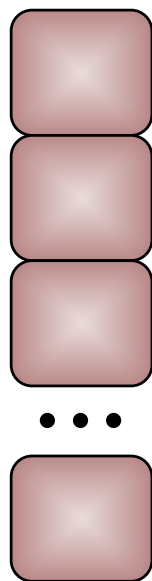- Rank Expressions
- Fixed Priority
- User Usage History
- Failure Rate
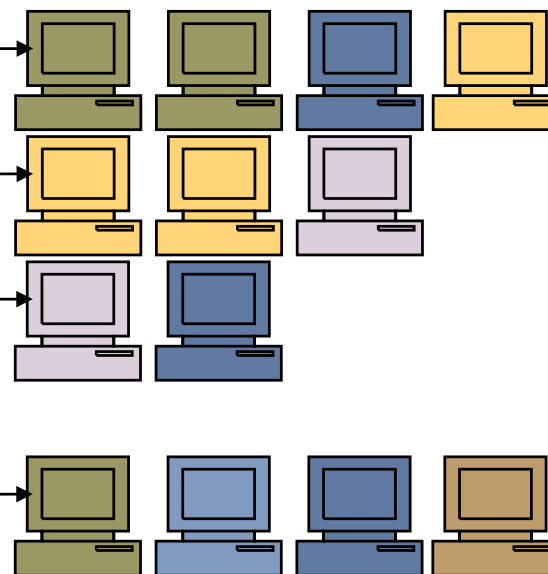
**Grid Scheduling = Job + Resource Policies**

Pending Jobs

Matching Resources for each job (user)

**Job Policies**
- Fixed Priority
- Urgent Jobs
- User Share
- Deadline
- Waiting Time

# Enterprise Grids

## Architecture

**Applications**

Users

- **DRMAA** interface
- **Portal**
- **Command Line Interface**

GridWay

- One meta-scheduler
- **Grid-wide policies**

Globus — Globus — Globus ....

**Middleware**

SGE Cluster — PBS Cluster .... LSF Cluster

**Infrastructure**
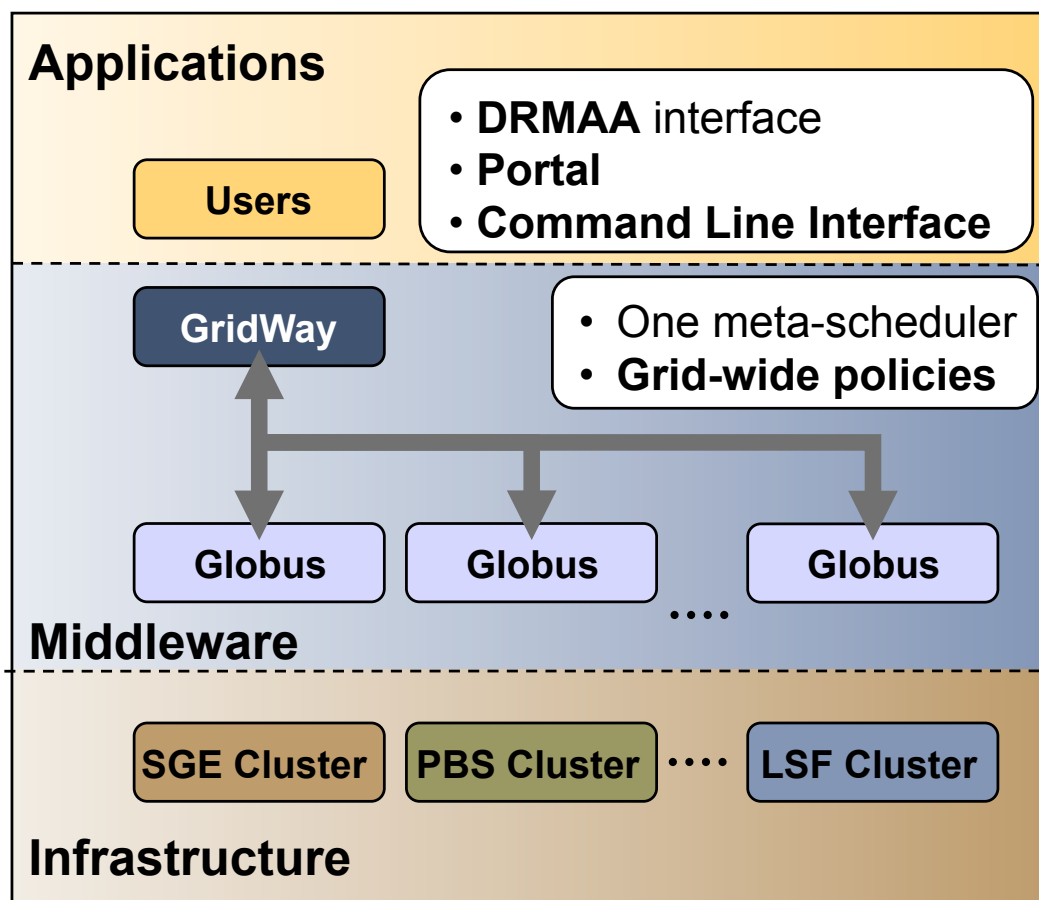
## Examples

**European Space Astronomy Center**
- Data Analysis from space missions
- DRMAA

**UABGrid, University of Alabama**
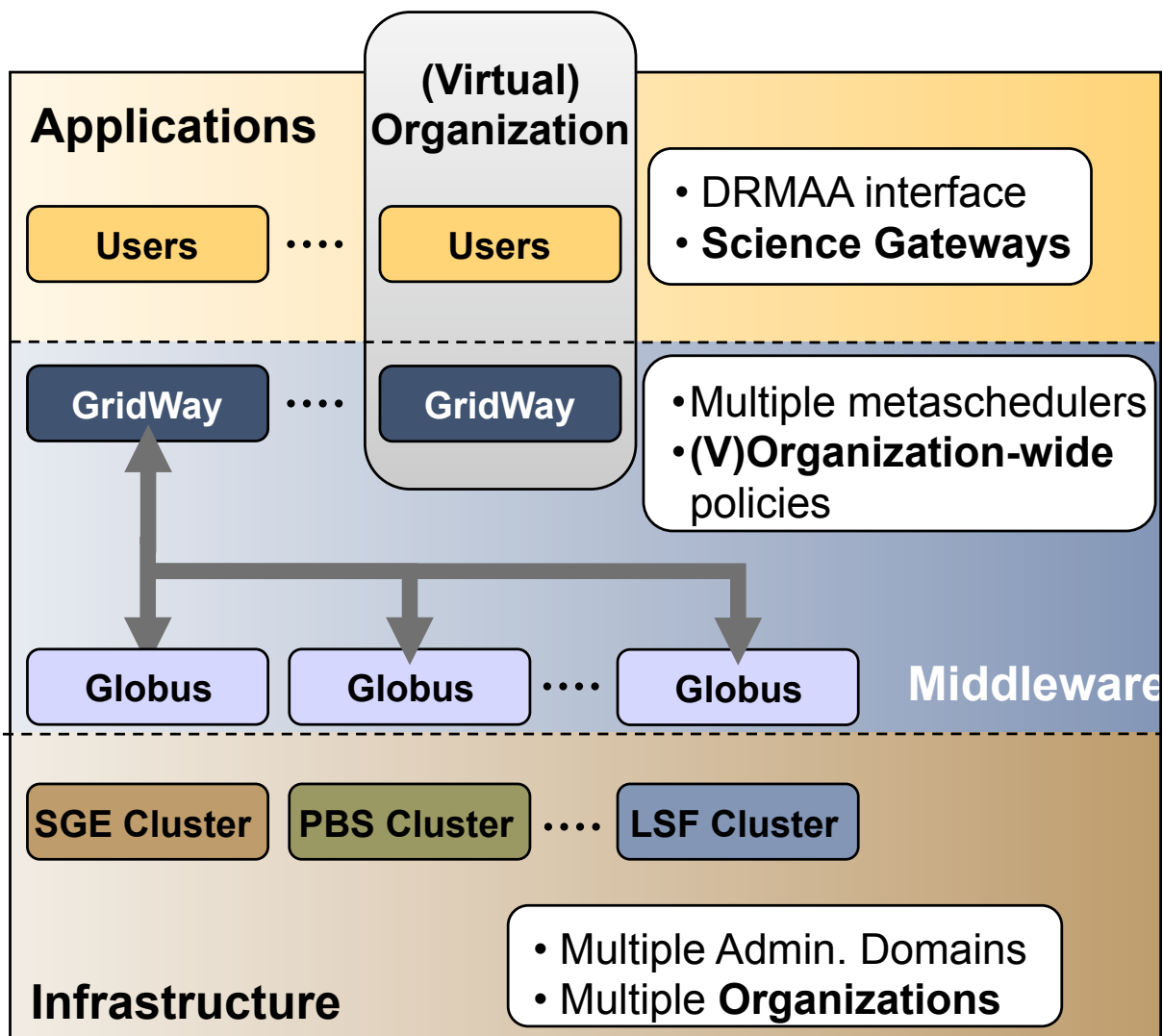- Bioinformatics applications

# Partner Grids

## Architecture

## Examples

**(Virtual) Organization**

**Applications**

| Users | ···· | Users |

- DRMAA interface
- **Science Gateways**

| GridWay | ···· | GridWay |

- Multiple metaschedulers
- **(V)Organization-wide** policies

| Globus | Globus | ···· | Globus | **Middleware**

**Infrastructure**

| SGE Cluster | PBS Cluster | ···· | LSF Cluster |

- Multiple Admin. Domains
- Multiple **Organizations**

**EGEE-II**
- gLite-LHC interoperability
- Virtual Organizations
  Fusion: Massive Ray Tracing
  Biomed: CD-HIT (Worflow)

eGee
Enabling Grids
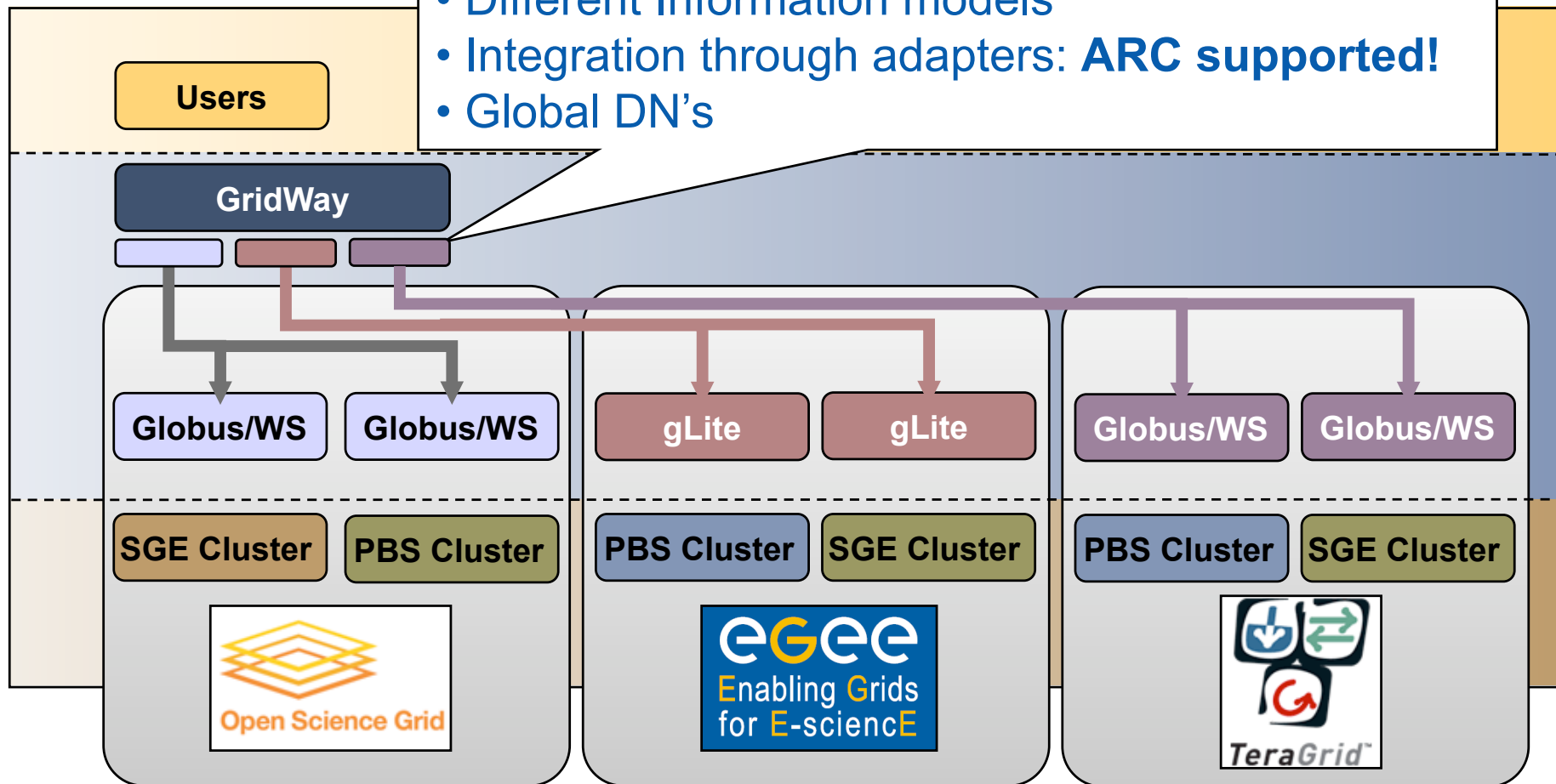for E-sciencE

**AstroGrid-D, German Astronomy Community Grid**
- Supercomputing resources
- Astronomy-specific resources
- GRAM interface
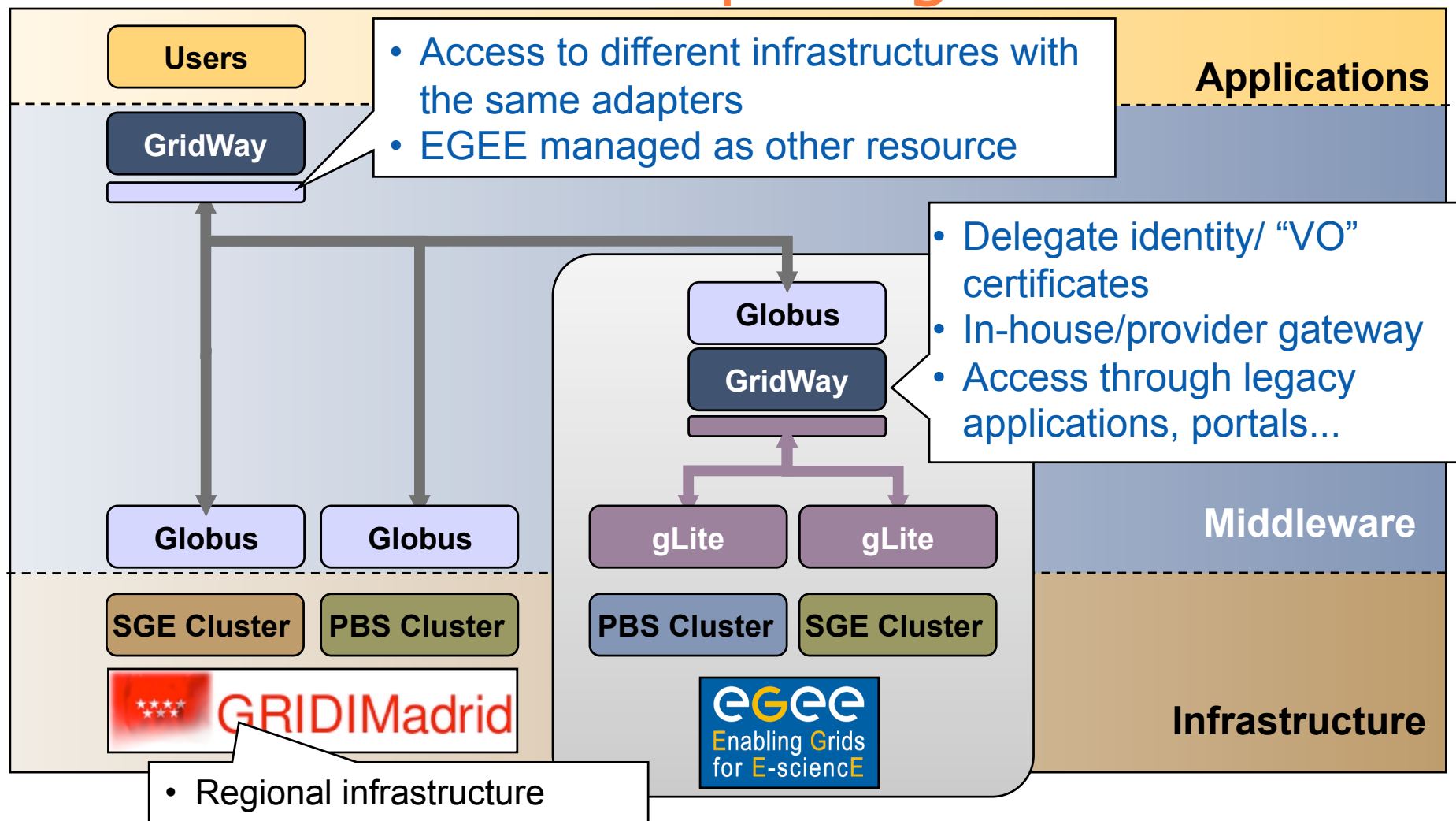
# GW in GT 4.2:Globus Interoperability

- Different Middlewares (e.g. WS and pre-WS)
- Different Data/Execution architectures
- Different Information models
- Integration through adapters: **ARC supported!**
- Global DN's

**Users**

**GridWay**

| Globus/WS | Globus/WS | gLite | gLite | Globus/WS | Globus/WS |

| SGE Cluster | PBS Cluster | PBS Cluster | SGE Cluster | PBS Cluster | SGE Cluster |

Open Science Grid

eGee
Enabling Grids
for E-sciencE

TeraGrid

# GW in GT 4.2: WSRF Interface for Utility Computing



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**Users**

**GridWay**

- Access to different infrastructures with the same adapters
- EGEE managed as other resource

**Applications**

**Globus**

**GridWay**

- Delegate identity/ "VO" certificates
- In-house/provider gateway
- Access through legacy applications, portals...

**Globus**     **Globus**

**gLite**     **gLite**

**Middleware**

**SGE Cluster**     **PBS Cluster**

**PBS Cluster**     **SGE Cluster**

**Infrastructure**

GRIDIMadrid

eGee
Enabling Grids
for E-sciencE

- Regional infrastructure

# GW in GT 4.2:Application Support

**New DRMAA bindings**

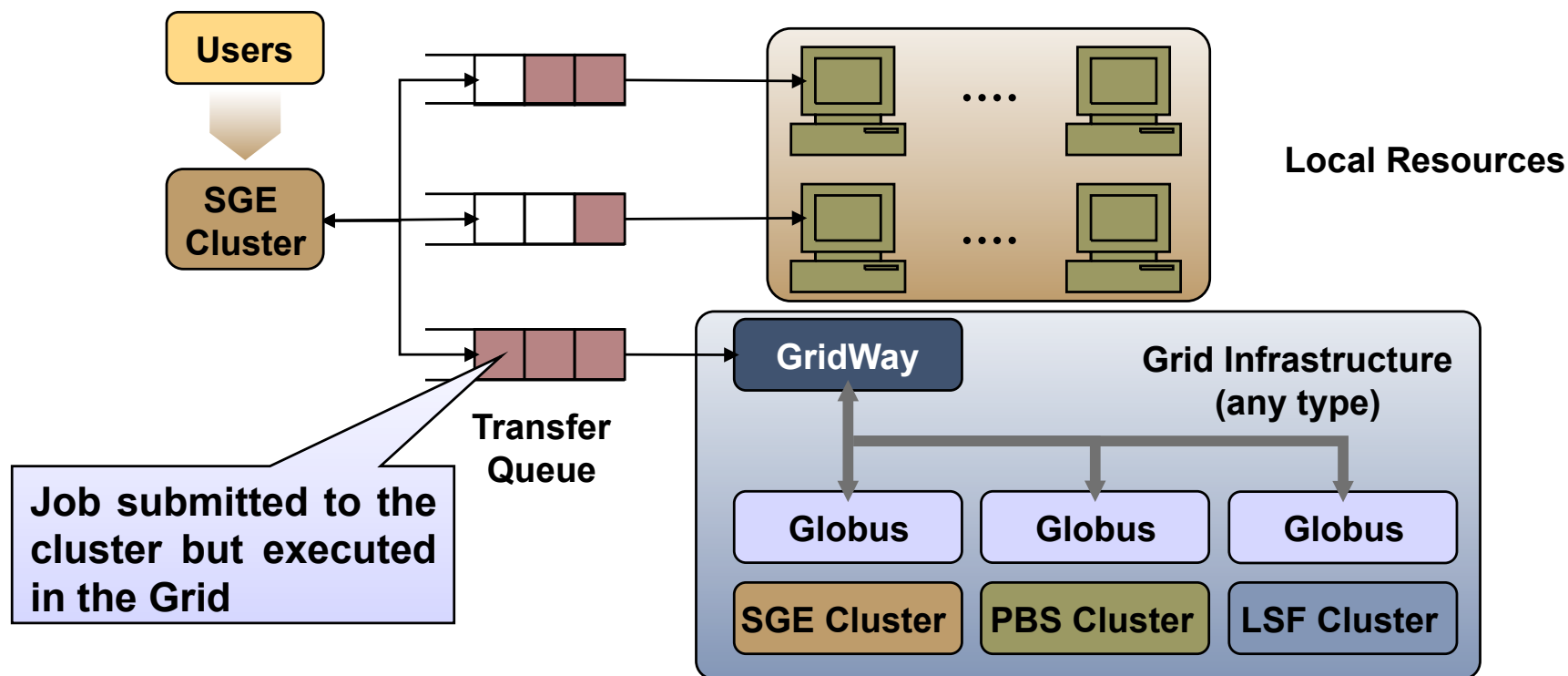- Scripting langauges Ruby, Python & Perl
- DRMAA 1.0 specification

**DAGMAN support**

- Submit DAGMAN files

# Transfer Queues

- Communicate LRM systems with meta-schedulers (the other way around)
- Users keep using the same interface, even applications (e.g. DRMAA, site scripts...)

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# THANK YOU FOR YOUR ATTENTION !!!

# Want to try it... TUTORIAL 11 (Thursday 13:30 – 15:00)

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