GridWay: Open Source Meta-scheduling Technology for Grid Computing

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Open Source Grid & Cluster

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Introduction

- **Resource selection:** Where do I execute my job ?
- **Resource preparation:** What do I need?
- **Job submission:** How do I submit my job?
- **Job monitoring:** How is my job doing?
- **Job migration:** Is there any better resource?
- **Job termination:** How do I get my output?

Introduction

- **Meta-scheduler:** Job to resource (**other schedulers**) matching (*execution management*).
- **Goal:** Optimize the performance according to a given metric (performance model):
  - Global Throughput
  - Resource usage
  - Application (ALS) – Stand-alone, HPC, HTC and self-adaptive
  - User usage
- **Grid characteristics**
  - Heterogeneity (job requirements)
  - Dynamism (high fault rate, load, availability, price)
  - Site autonomy

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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

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What is GridWay?

Globus Projects

GridWay

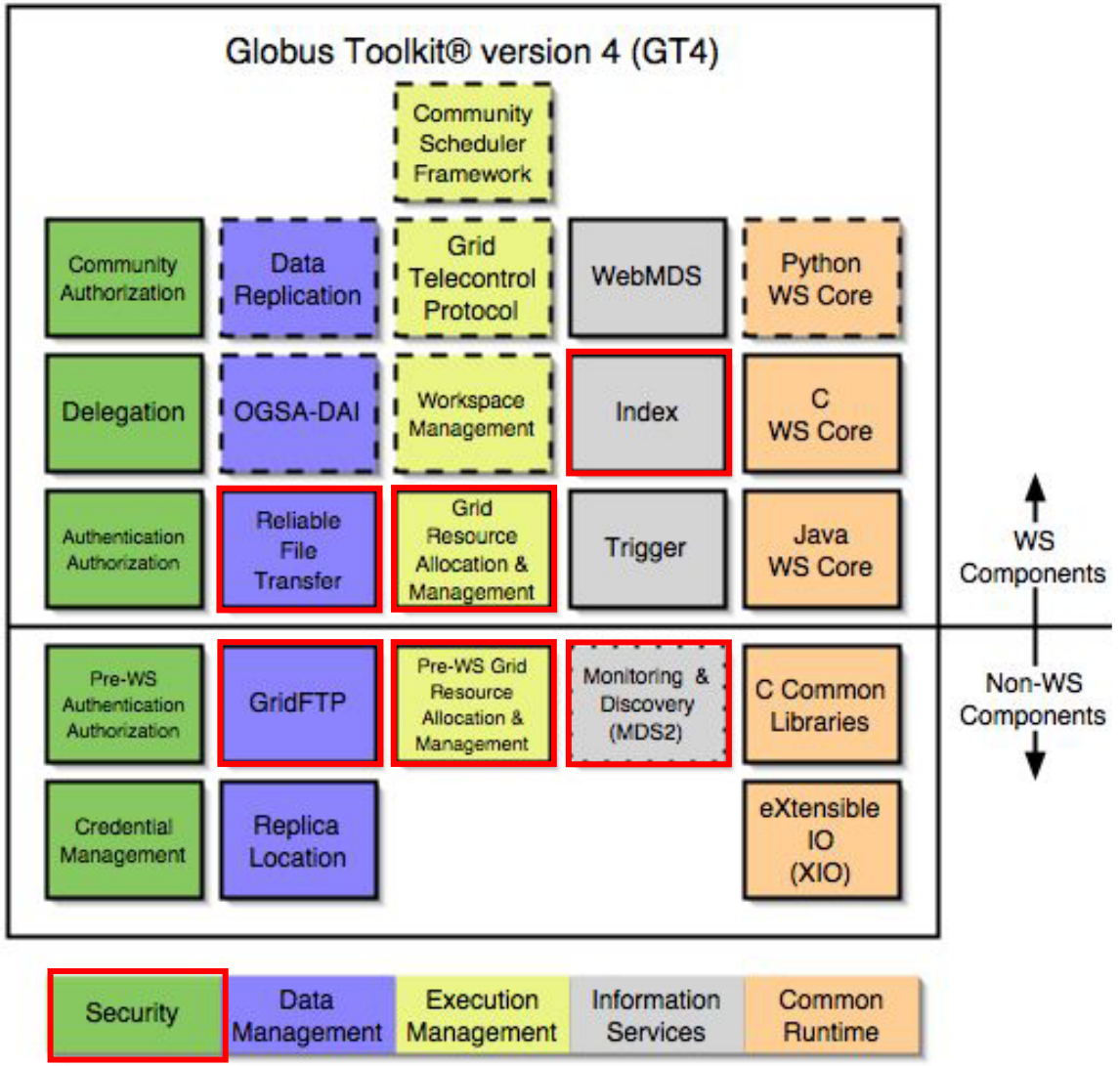
Globus Incubator Projects

Gridshib | DDM | LRMA

GRAADS | Falkon

. . .

and many many more!



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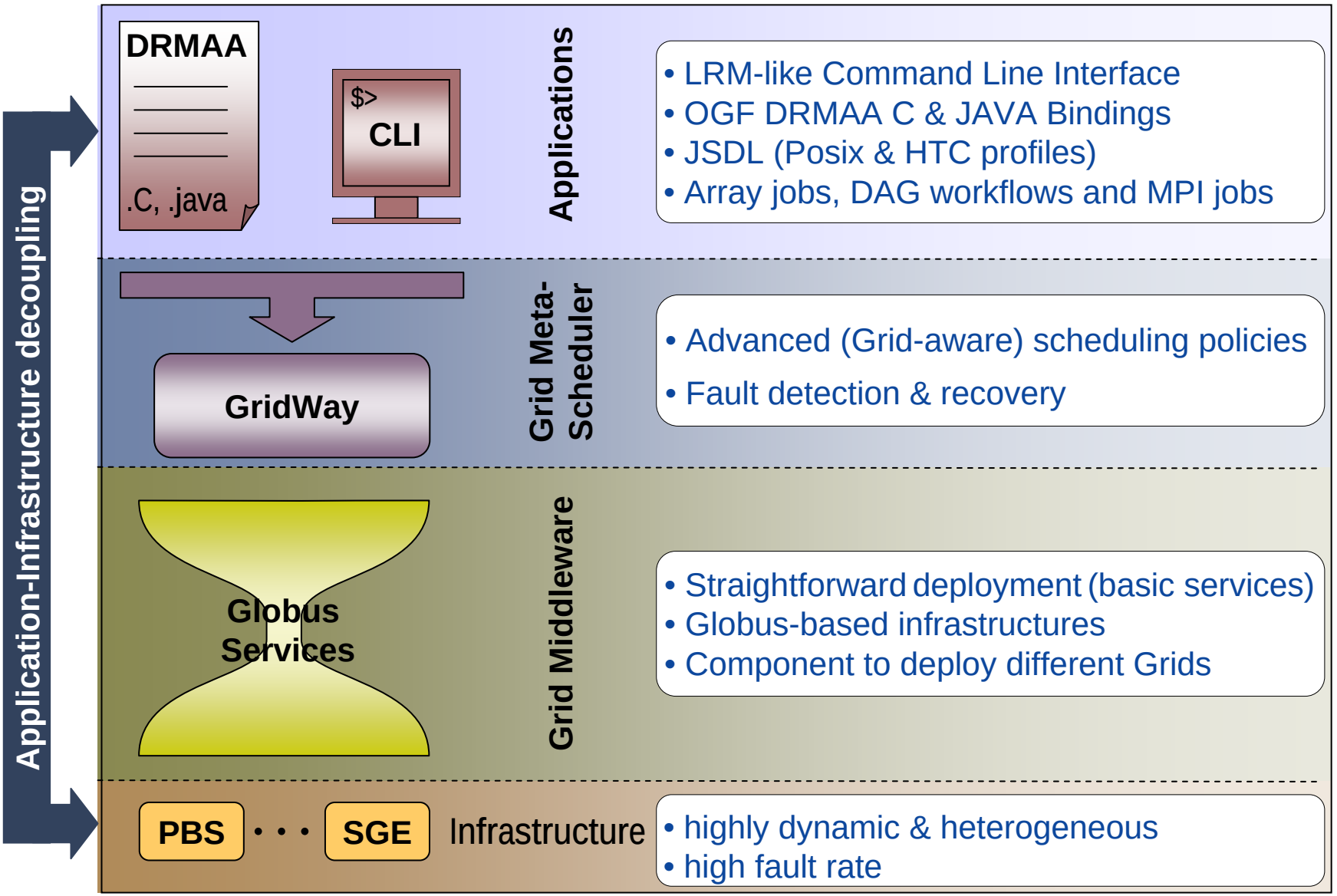
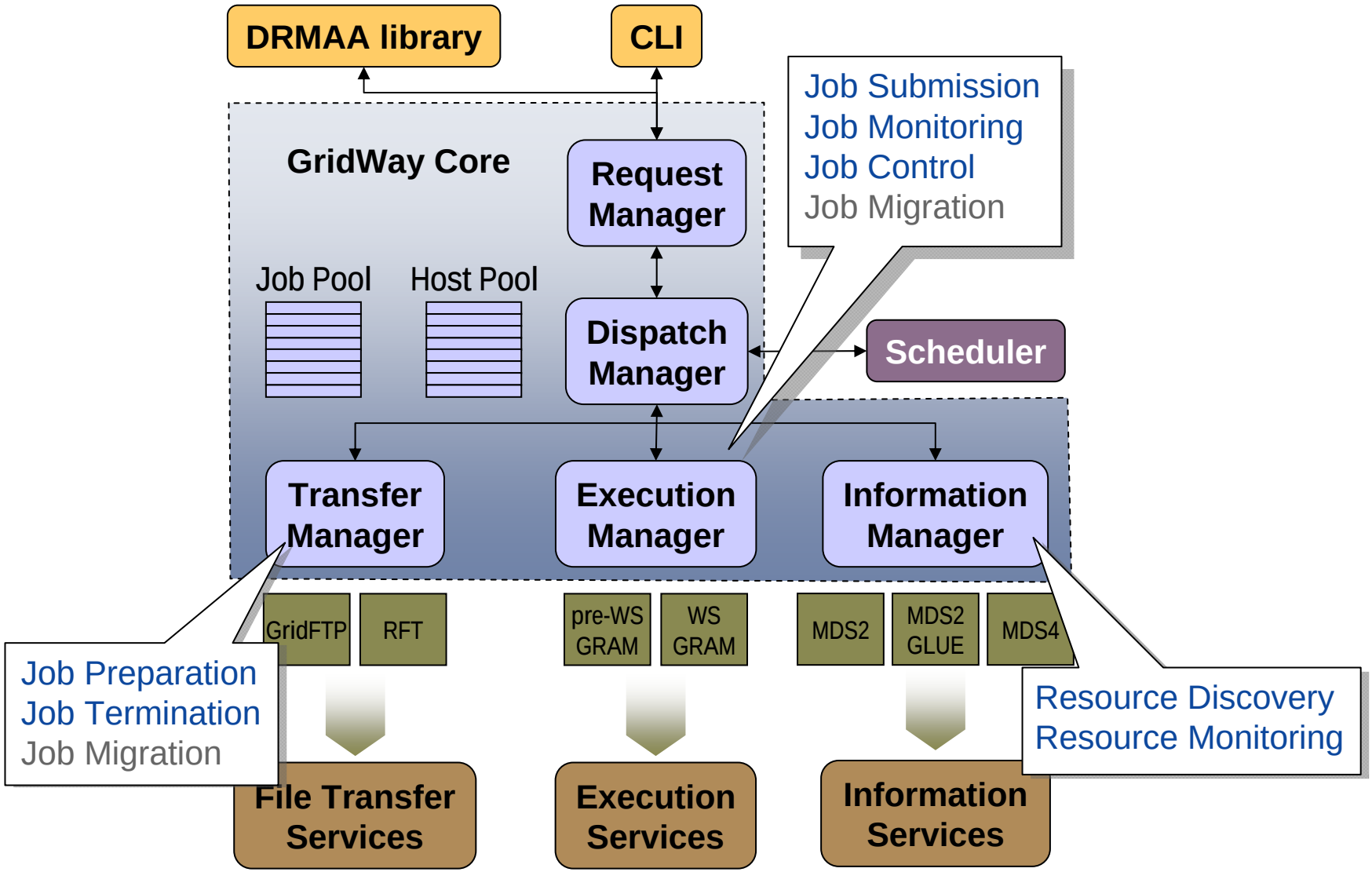
Architecture



Components


DRMAA library
CLI
GridWay Core
Request Manager
Job Pool
Host Pool
Dispatch Manager
Scheduler
Transfer Manager
Execution Manager
Information Manager
GridFTP
RFT
pre-WS GRAM
WS GRAM
MDS2
MDS2 GLUE
MDS4
File Transfer Services
Execution Services
Information Services
Job Submission
Job Monitoring
Job Control
Job Migration
Job Preparation
Job Termination
Job Migration
Resource Discovery
Resource Monitoring

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Scheduling Policies

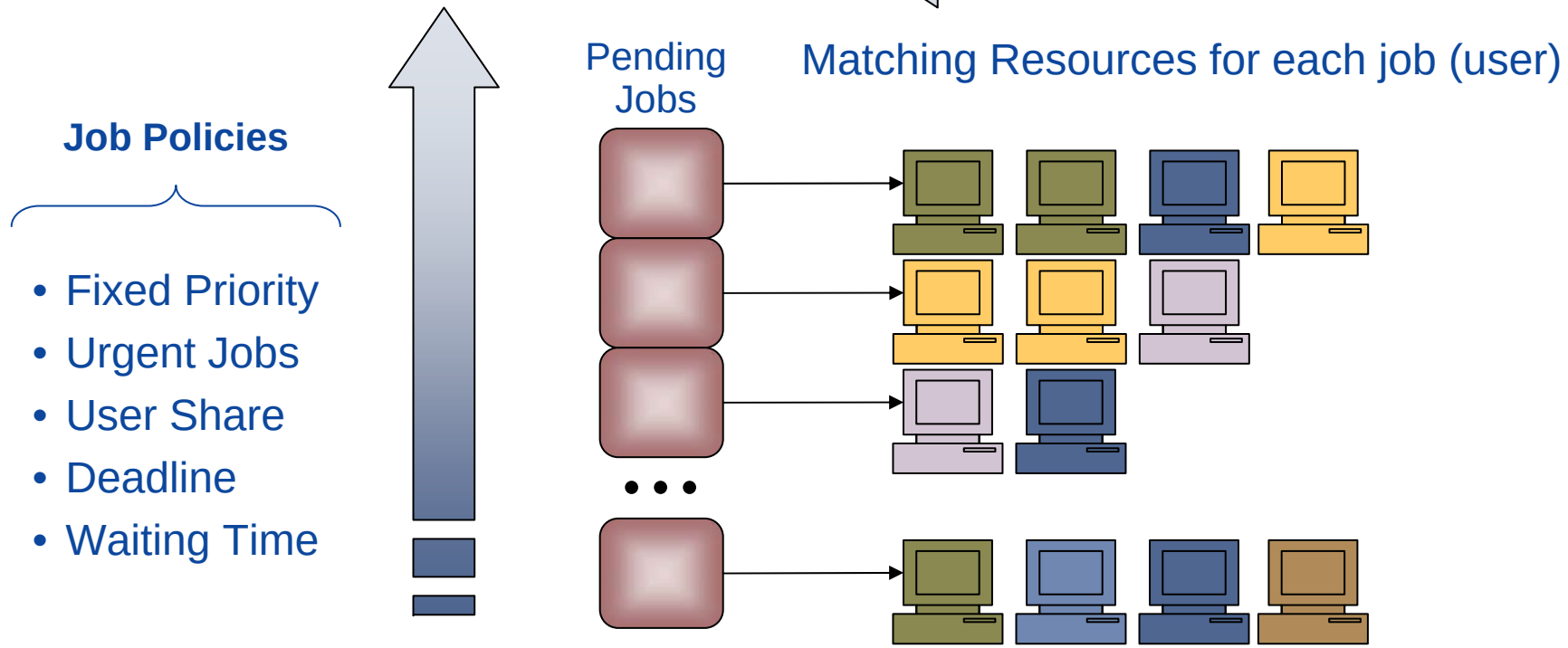
Resource Policies

- Rank Expressions
- Fixed Priority
- User Usage History
- Failure Rate

Grid Scheduling = Job + Resource Policies

Job Policies

- Fixed Priority
- Urgent Jobs
- User Share
- Deadline
- Waiting Time



Enterprise Grids

Characteristics

- "Small" scale infrastructures (campus/enterprise) with one meta-scheduler instance
- Resources within the same administration domain that may be running different LRMS and be geographically distributed

Goal & Benefits

- Integrate heterogeneous systems
- Improve return of IT investment
- Performance/Usage maximization

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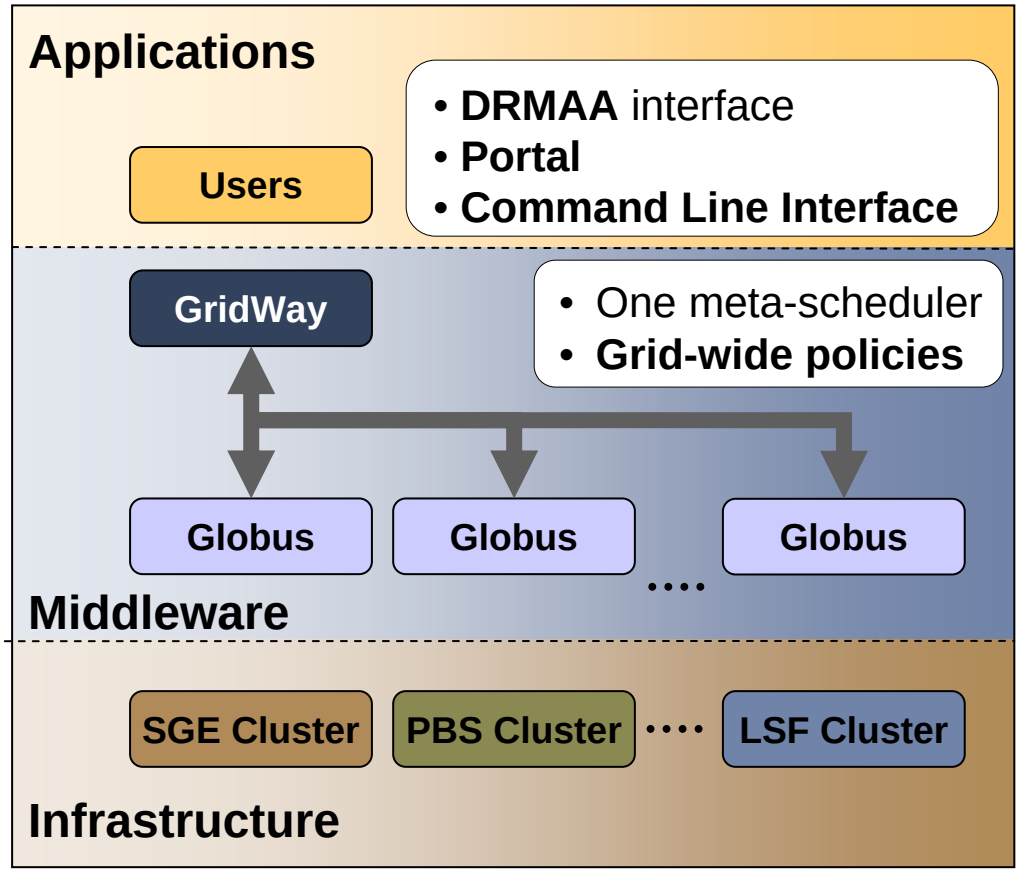
Enterprise Grids

Architecture



Examples

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

UABGrid, University of Alabama
- Bioinformatics applications

Partner Grids

Characteristics

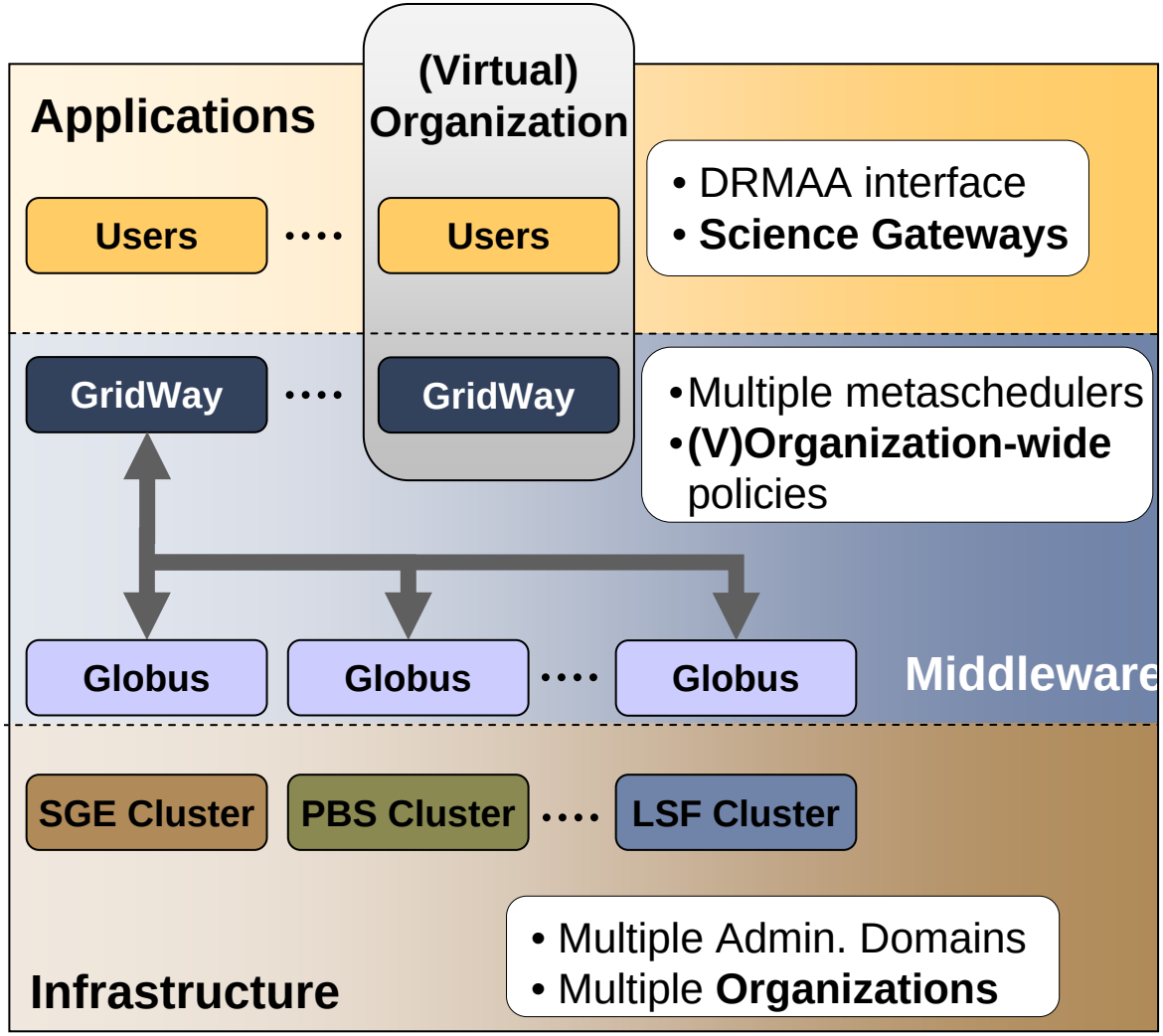
- “Large” scale infrastructures with one or several meta-schedulers
- Resources belong to different administrative domains

Goal & Benefits

- Large-scale, secure and reliable sharing of resources
- Support collaborative projects
- Access to higher computing power to satisfy peak demands

Partner Grids

Architecture



Examples

EGEE-II

- gLite-LHC interoperability
- Virtual Organizations

  Fusion: Massive Ray Tracing

  Biomed: CD-HIT (Worflow)

AstroGrid-D, German Astronomy Community Grid

- Supercomputing resources
- Astronomy-specific resources
- GRAM interface

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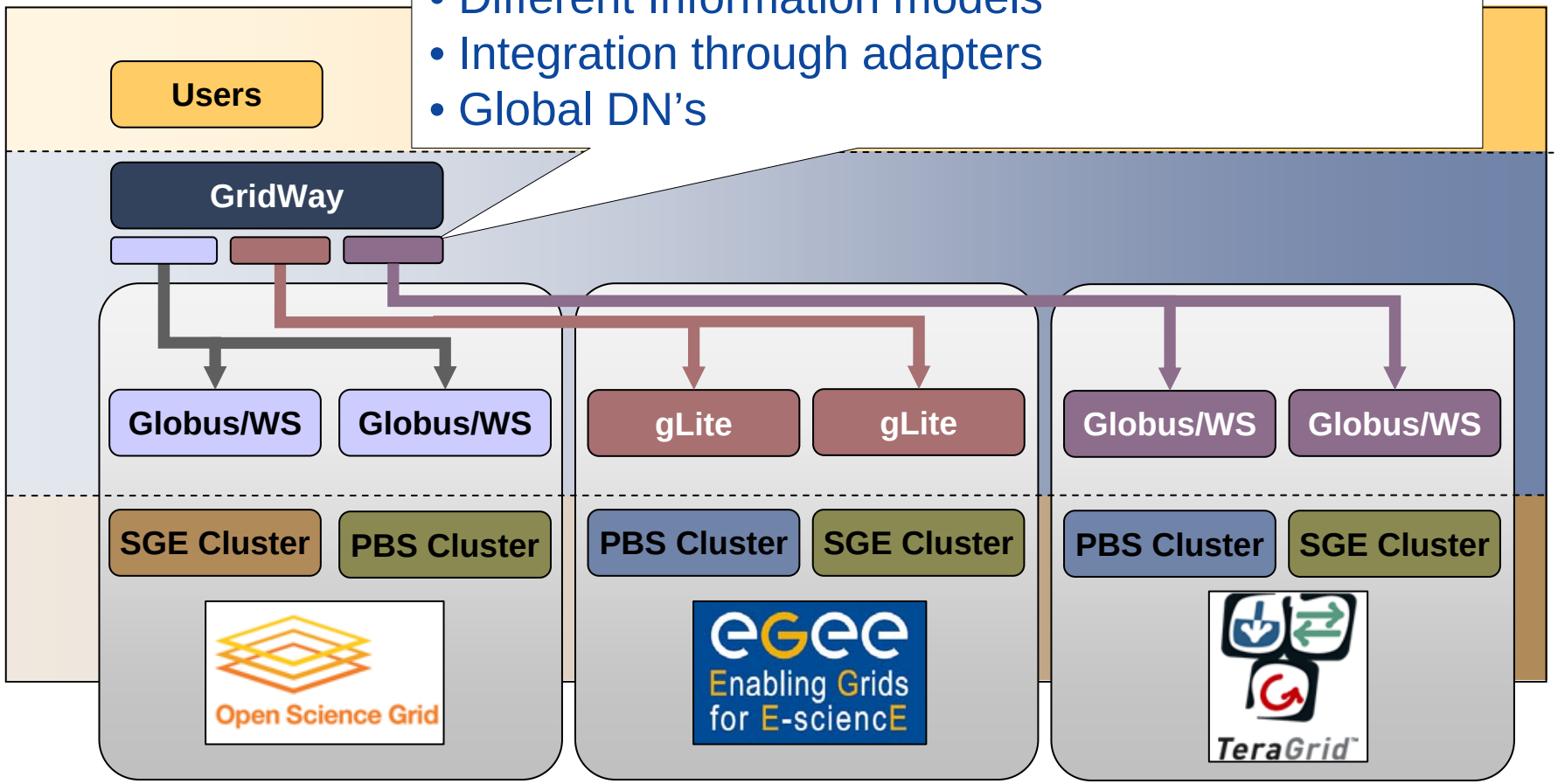
Globus Interoperability

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



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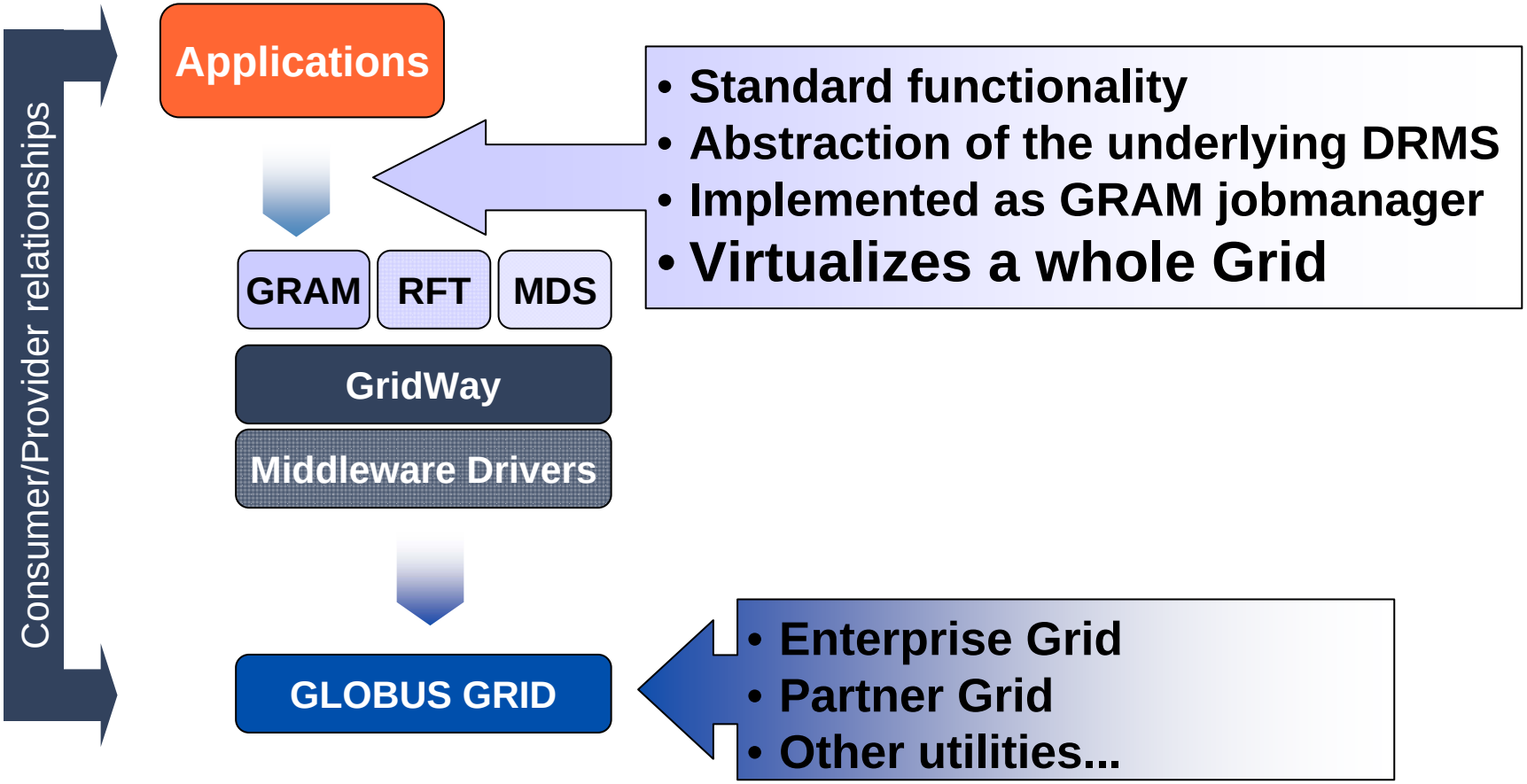
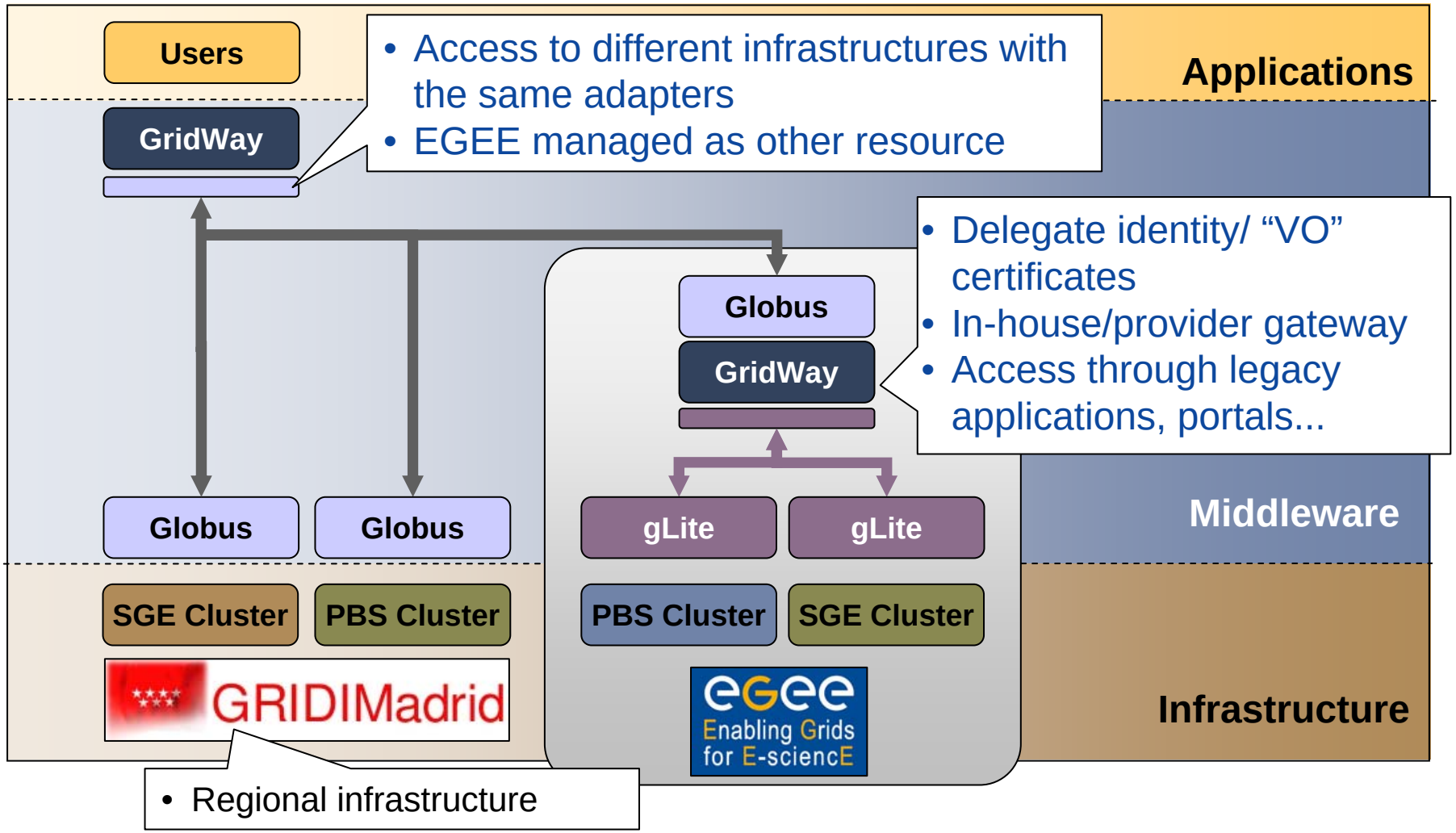
WSRF Interface for Utility Computing

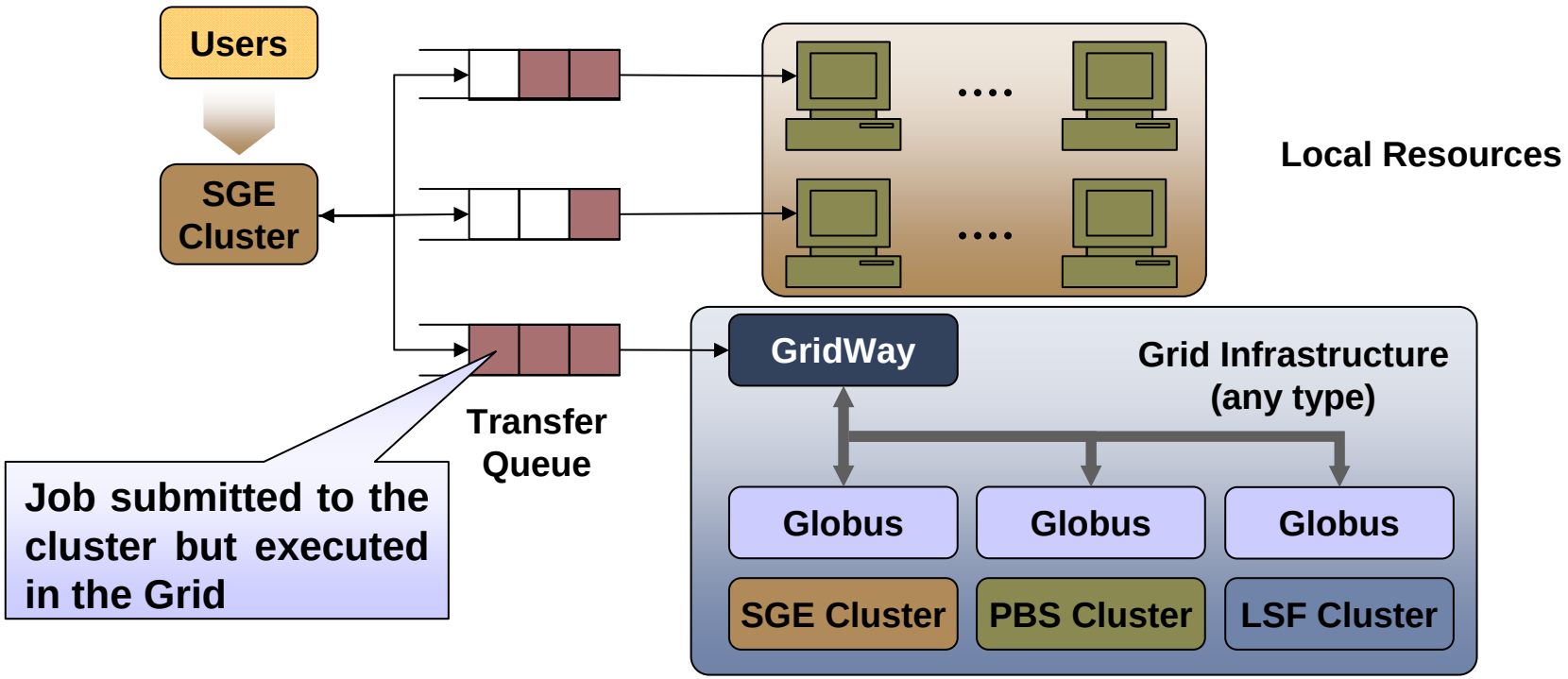


WSRF Interface for Utility Computing



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...)



THANK YOU FOR YOUR ATTENTION !!!

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

The GridWay Team

- Ignacio M. Llorente
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