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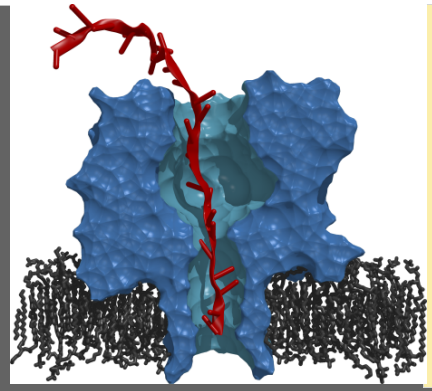
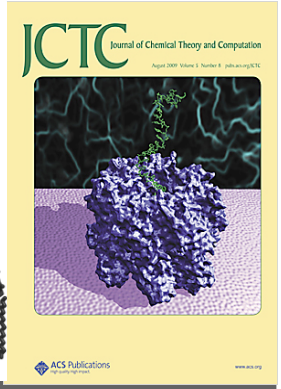


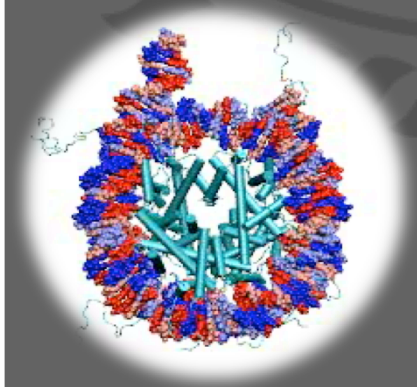


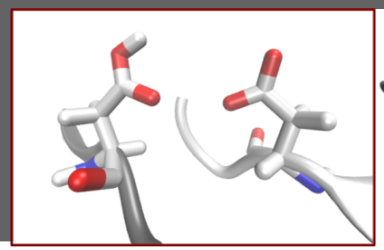
DARE: A Standards-based Middleware for Science Gateways

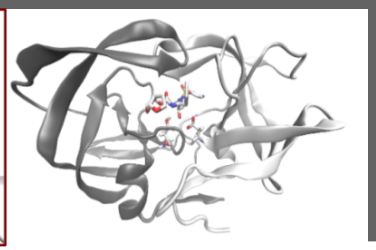
http://radical.rutgers.edu

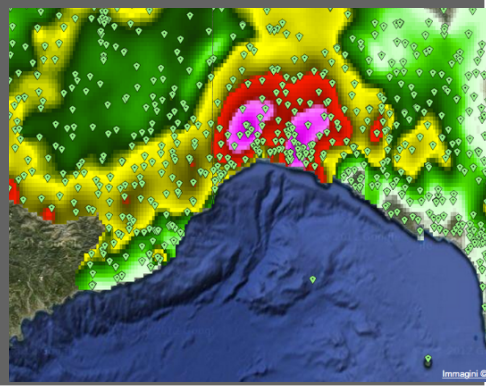
EGI Manchester

09th April , 2013





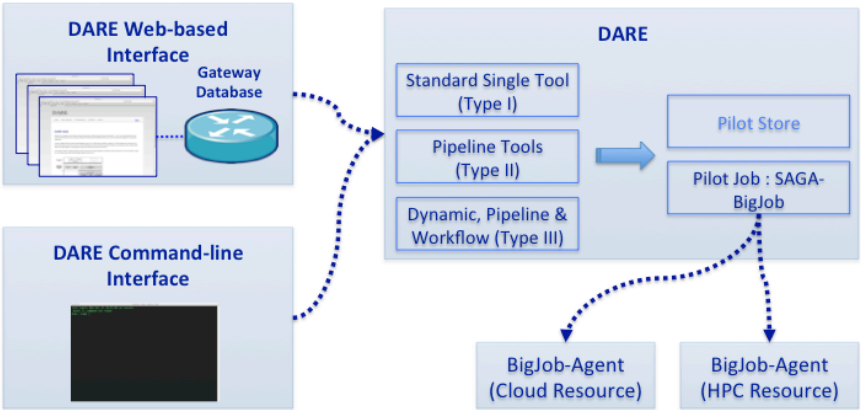




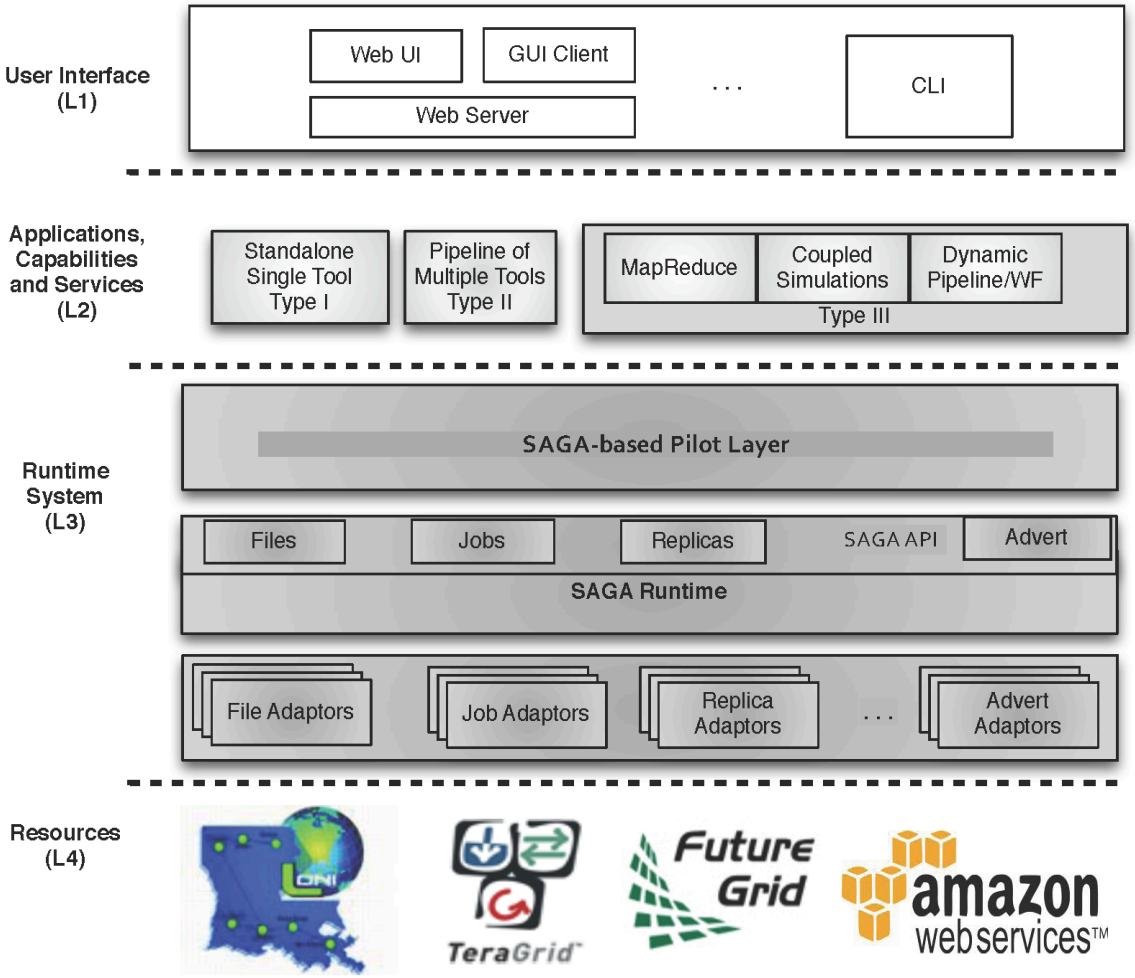
Distributed Application Runtime Environment (DARE)

Design Objectives:

- Separation of Concerns:
  - Agile, flexible user customization versus resource management
- Use standard-based access layer
  - SAGA and SAGA-based Pilot Job (BigJob)
  - Pilot-Job as a flexible execution environment



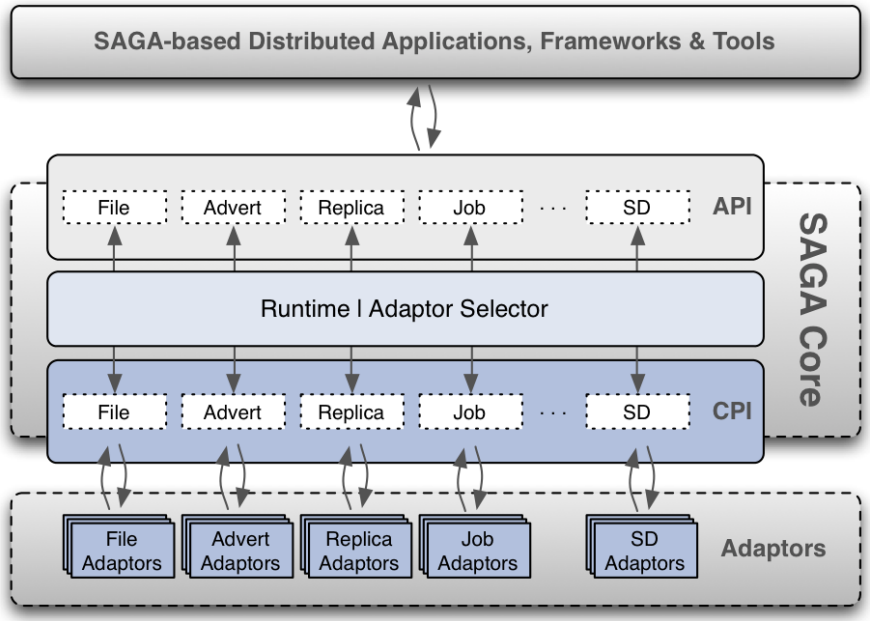
DARE: Standard-based Integrated Middleware

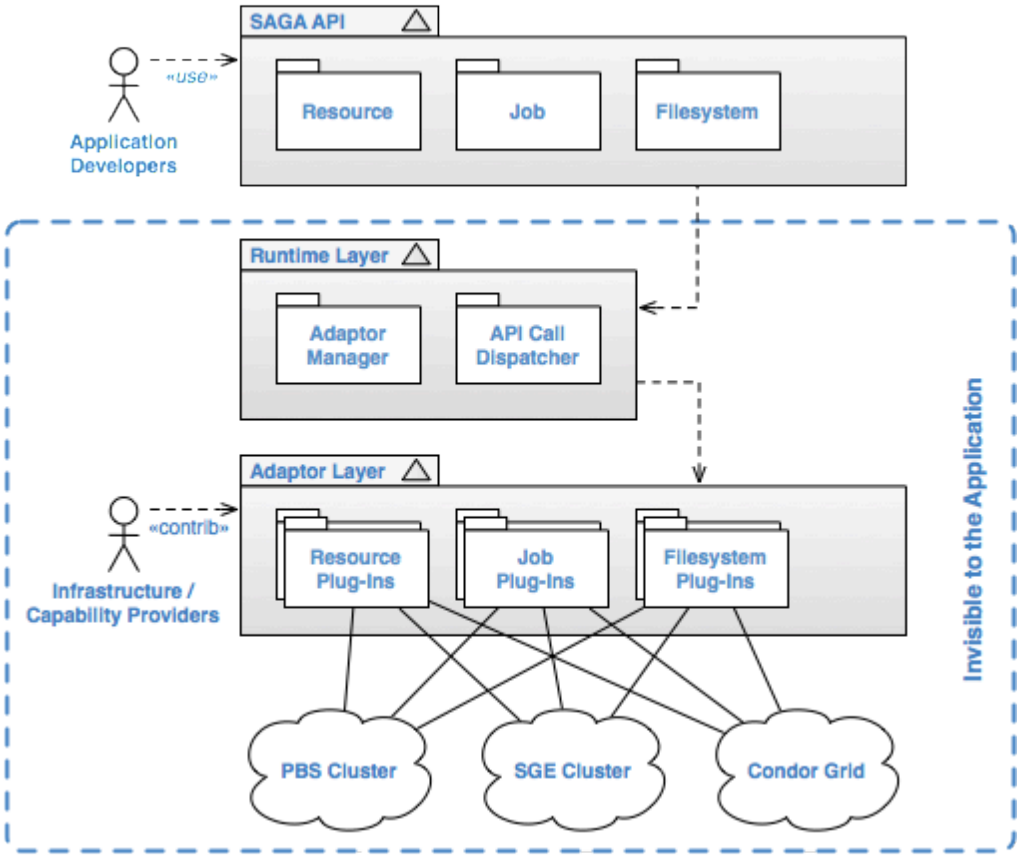


SAGA: Resource Interoperability and Standards-based Access Layer

http://saga-project.org

SAGA: Standard for Distributed Applications



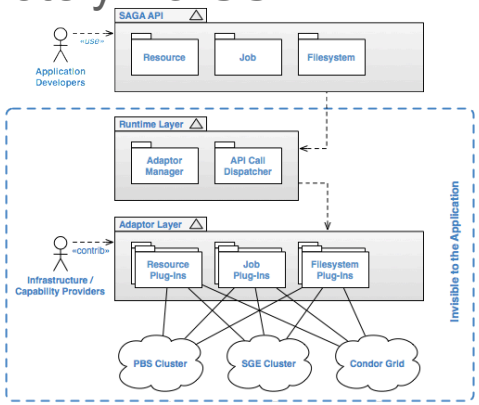


SAGA: Interoperability layer

- HOW SAGA is Used?
  - Uniform Access-layer to DCI
    - XSEDE, DATAONE, UK NGS and NAREGI/RENEKI and Clouds
  - Application "Scripting Layer" to DCI
    - Improved and enhanced HTHP ensembles
  - **Build tools, middleware services and capabilities that use DCI (e.g. Gateways, *Pilot-Jobs)***
    - ***One persons applications is another persons tool!***
- WHAT is SAGA Used for?
  - Support production-grade science and engineering
    - Aircraft design (Airbus), HEP (search for Higgs & neutrinos!)
  - Research tool to design, implement reason about distributed programming models, systems and applications

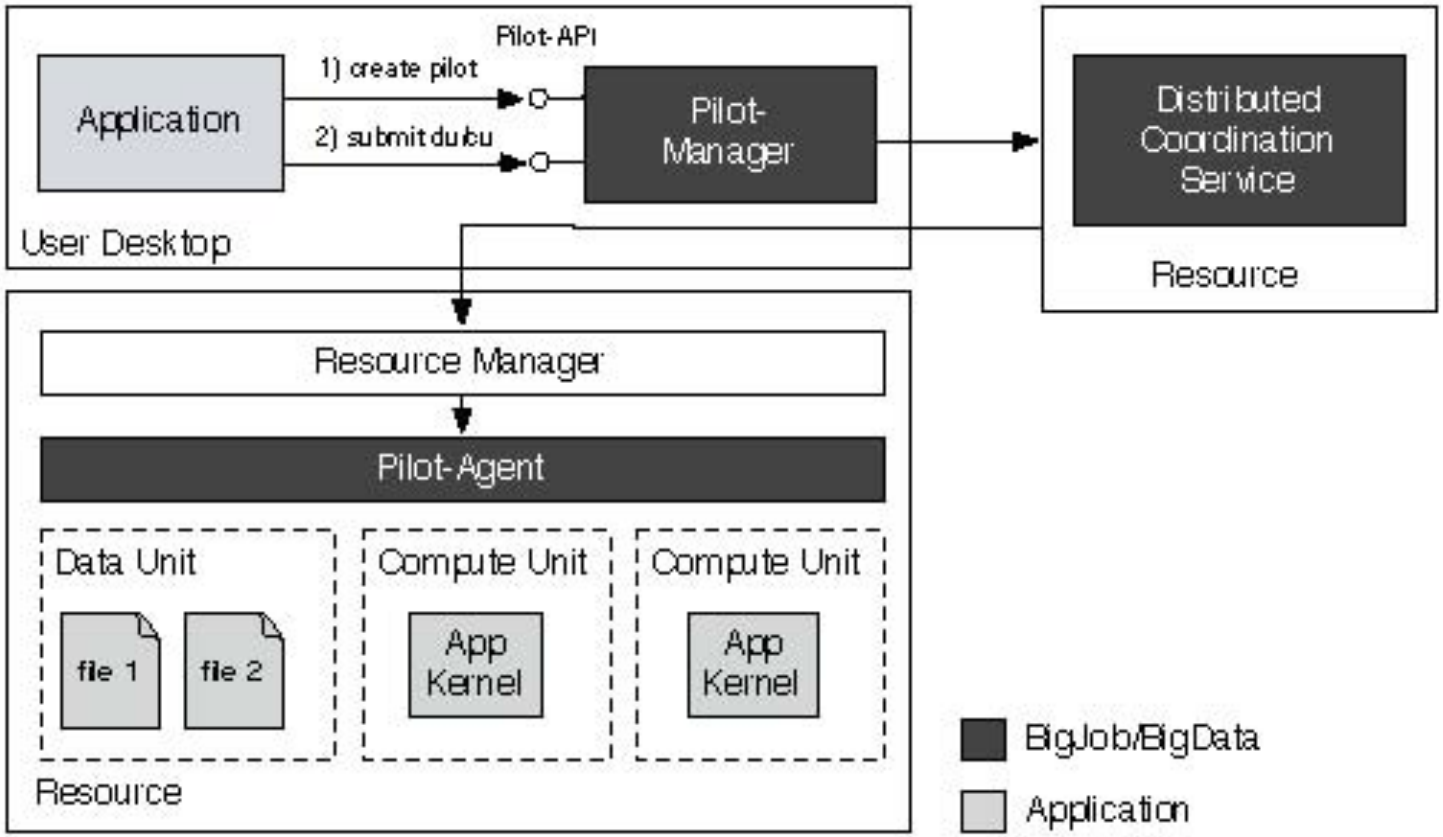
SAGA-Python

- Re-architected implementation of saga (BlisS) that provides
  - support for bulk optimization
  - support for callbacks
  - support for asynchronous operations
- Implements ‘official’ OGF python language bindings
- Implements the job, file, replica and resource APIs
- Supports multiple backends:
  - PBS, TORQUE, SGE, SLURM, Condor, SFTP, iRODS, (GSI-)SSH
  - *local* schedulers (PBS, SGE, ...) can be accessed remotely via SSH tunnels
- Website:
  - http://saga-project.org
  - http://saga-project.github.com/saga-python/
  - https://github.com/saga-project/saga-python

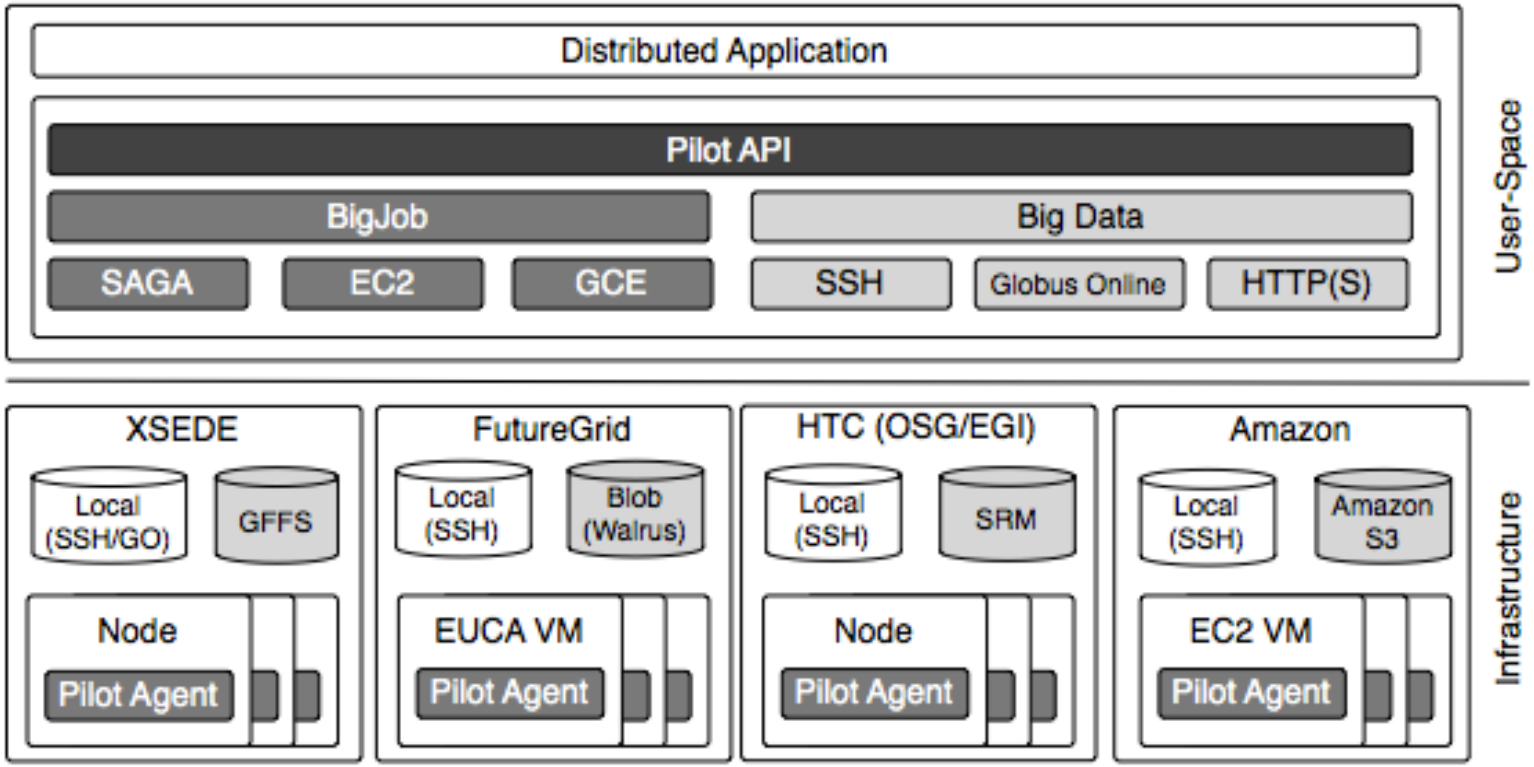


BigJob: A Reference Implementation of the P* Model

BigJob: Implementation of the P* Model



BigJob: Resource Interoperability



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DARE-BigJob: A Flexible and Extensible Gateway using Pilot-Abstractions

http://gw68.quarry.iu.teragrid.org:8080/

http://saga-project.org

DARE-BigJob: Motivation and Goals

- Intellectual Motivation: Gateways are usable but not very flexible
  - Best of both worlds?

- Aim: Provide compositional flexibility (a la command-line), whilst providing transparent (and powerful) resource management and managing the runtime complexity of DCI ?
  - To provide a lightweight extensible gateway that helps in supporting multiple and flexible usage modes on XSEDE and OSG

- Pilots are powerful paradigm for resource utilization.
  - Pilots don't have to be passive elements.
  - P* Model establishes Pilots as an active element

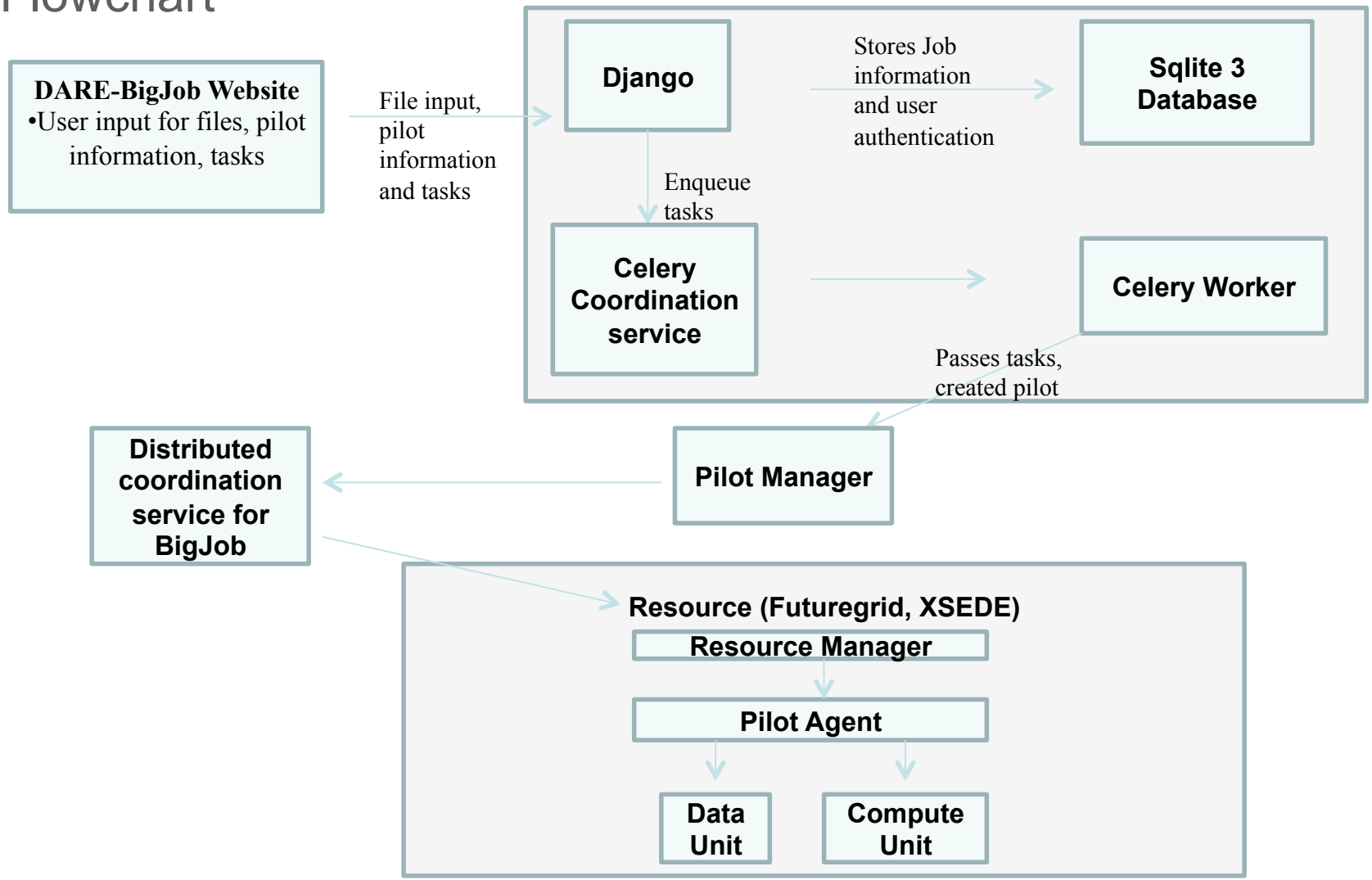
- BigJob used extensively on XSEDE. Lower the barrier for its uptake
  - Make it simple for the usage of Pilot-Jobs on XSEDE
  - Will extend to OSG and possibly to EGI

DARE-BigJob: Practical Information

- DARE-BigJob: Latest in the family of gateways built upon DARE
  - Passive E.g., DARE-HTHP, DARE-NGS, DARE-Cactus
- It is written in Python --- from top to bottom, front to back
- BigJob is a SAGA based general purpose pilot-job framework. SAGA based BigJob acts as a intermediary in submitting jobs from DARE to a heterogeneous Computing resource.
- Django is a high level python web framework to support clean, pragmatic design.
- Celery is an asynchronous task queue based upon distributed message passing and scheduling as well.

DARE-BigJob: Control Flow

Flowchart



DARE-BigJob: Scripting Example (1)

- Scripts to generate a single task

```
def tasks():
        compute_unit = {
       "executable": "/bin/echo",
       "arguments": ["Hello", "$ENV1", "$ENV2"],
       "environment": ['ENV1=env_arg1', 'ENV2=env_arg2'],
       "number_of_processes": 4,
       "spmd_variation": "mpi",
       "output": "stdout.txt",
       "error": "stderr.txt"}
          return compute_unit
```

DARE-BigJob: Scripting Example (1)

- Generating multiple tasks

```
def tasks(NUMBER_JOBS=10):
    tasks = []
    for i in range(NUMBER_JOBS):
        compute_unit_description = {
        "executable": "/bin/echo",
        "arguments": ["Hello", "$ENV1", "$ENV2"],
        "environment": ['ENV1=env_arga’ + i,
'ENV2=env_argb’ + i],
        "number_of_processes": 4,
        "spmd_variation": "mpi",
        "output": "stdout-%s.txt” %i,
        "error": "stderr-%s.txt” % i}
        tasks.append(compute_unit_description)
    return tasks
```

DARE-BigJob

- Registration
  - Request for an Invite
    - http://gw68.quarry.iu.teragrid.org/invite/request/
  - Once approved by admin you will receive invite to join to the email you submitted
  - Using that link we can complete Registration through Google/Yahoo and login.
- Authentication
  - Use Google/Yahoo Accounts to login.
  - Separate password to login is not required

DARE-BigJob

- Login
  - http://gw68.quarry.iu.teragrid.org/log-in/ (dareuser, password)
  - Note to self: Remove the username and password before posting!!
- Create and edit Tasks
  - http://gw68.quarry.iu.teragrid.org:8080/my-tasks/
  - Click on button “Add a Task” and add necessary scripts.

- Starting Pilots
  1. http://gw68.quarry.iu.teragrid.org/job/bigjob/
  2. Click Start-Pilot button for lonestar. it submits pilot (pbs+ssh) to queue from predefined account on lonestar (smaddi2).
  3. Select task you want to run and hit “Add Task”

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- CDI NSF-CDI (NSF CHE 1125332)
- ExTENCI (NSF OCI)
- SCIHM NSF-OCI (OCI-1235085)
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- NSF TeraGrid TRAC award TG-MCB090174
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Recent Past:

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