# Opal-Sigiri: Software as a Service on PRAGMA Testbed

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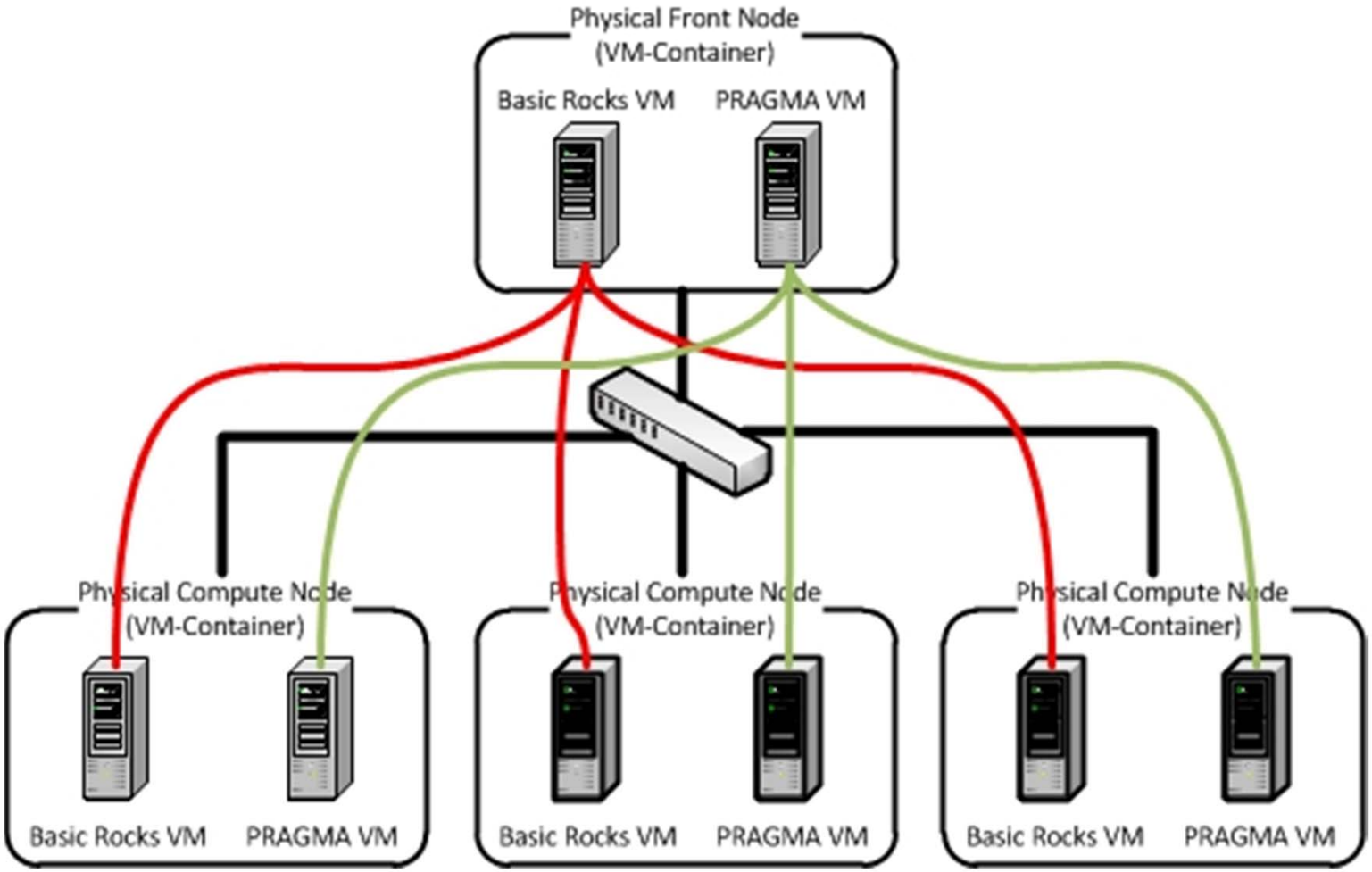
# D2I PRAGMA Testbed

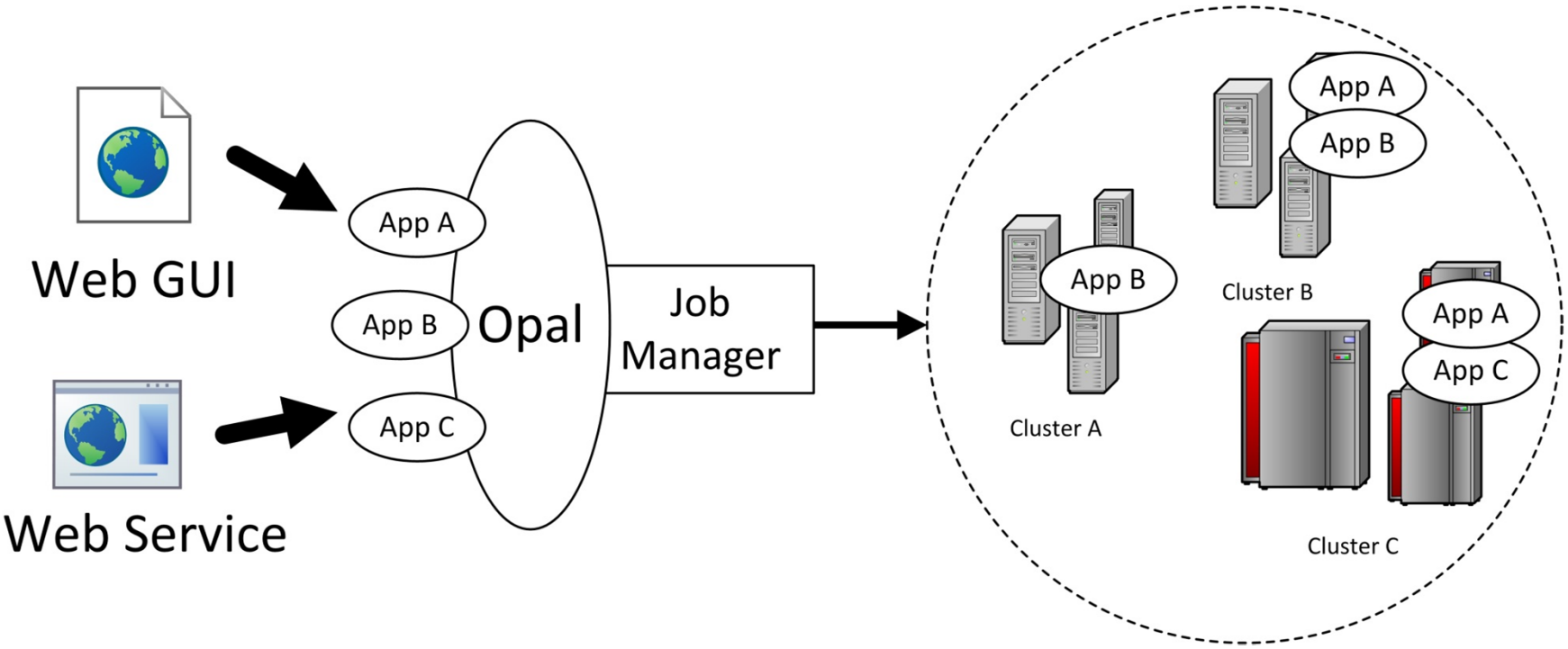
- Physical Cluster:
  - A 4-node quad-core Rocks Cluster as Virtual Cluster Host Server
  - Master node: pragma.cs.indiana.edu
- Virtual Clusters:
  - Rocks Virtual Cluster:
    - Front node + 3 compute nodes with SGE installation
  - PRAGMA Virtual Cluster:
    - Front node + 3 compute nodes
    - Front node: pragma-f1.cs.indiana.edu
    - Globus + SGE installation


Physical Front Node
(VM-Container)
Basic Rocks VM
PRAGMA VM
Physical Compute Node
(VM-Container)
Basic Rocks VM
PRAGMA VM
Physical Compute Node
(VM-Container)
Basic Rocks VM
PRAGMA VM
Physical Compute Node
(VM-Container)
Basic Rocks VM
PRAGMA VM

# Problem Addressed

- Legacy codes may be frequently wrapped as Web services to provide remote access to application services that are available across the Internet.
- Complexities in interacting with wide variety of computational resource become s a challenge due to non-standard job managers
- Scalability and reliability issue of grid job manager
- Access non-grid resources, e.g., departmental and community clusters
- Access to new platform for scientific job executions, e.g., Windows HPC Clusters

# Opal Web Service Toolkit



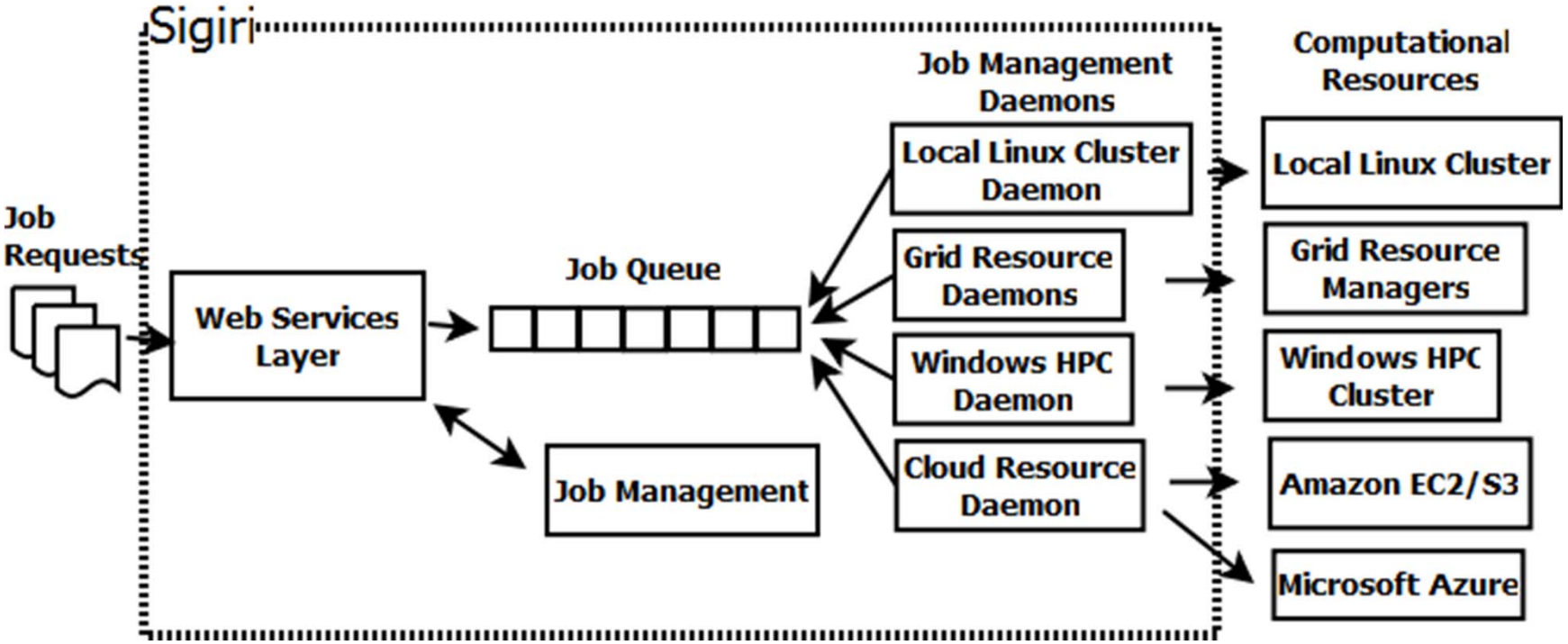

- Submits jobs to back end resources
- Emphasis on ease of deployment of existing applications as web services.

# Sigiri

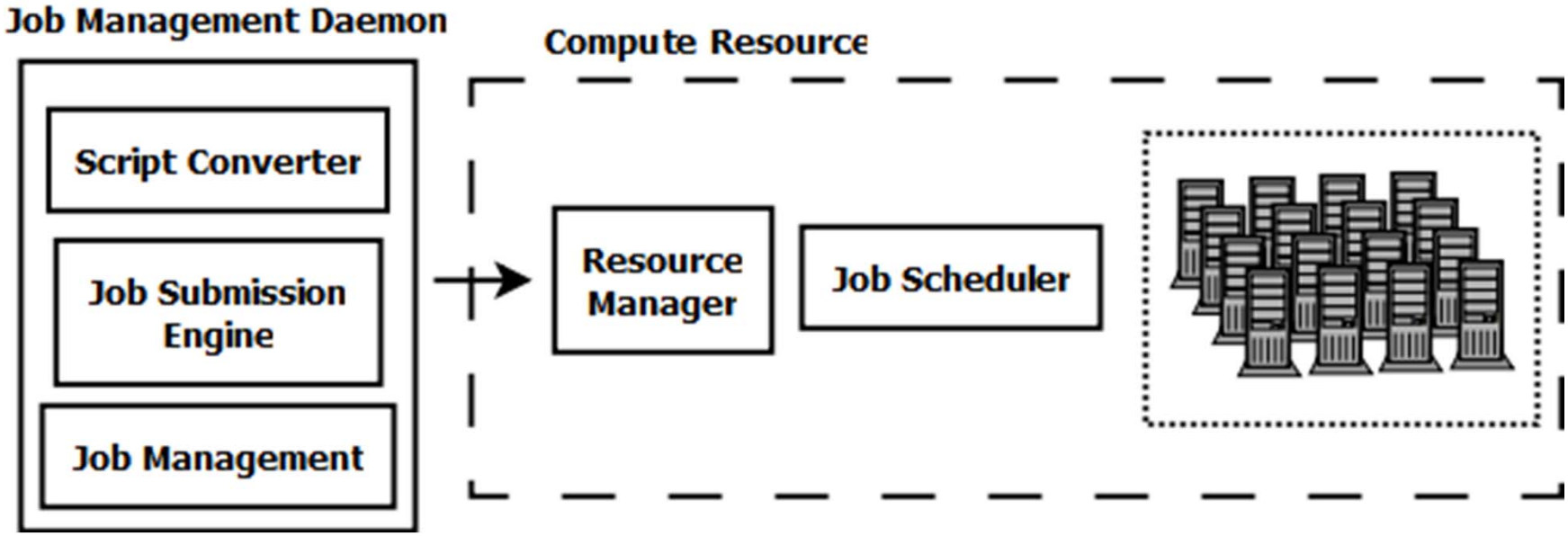
- A uniform abstraction layer over heterogeneous compute resources.
- Supports multiple Job Specifications:
  - Job Submission Description Language (JSDL)
  - Globus Resource Specification Language (RSL)
- Supports multiple compute resources:
  - Local Linux Machine
  - SGE, PBS, Loadleveler
  - Windows HPC Cluster
  - Amazon EC2, Microsoft Azure

Eran Chinthaka, Suresh Marru, and Beth Plale, Sigiri: Towards A Light-Weight Job Management System for Large Scale Systems, *Indiana University Computer Science Technical Report TR681*, Aug 2009.

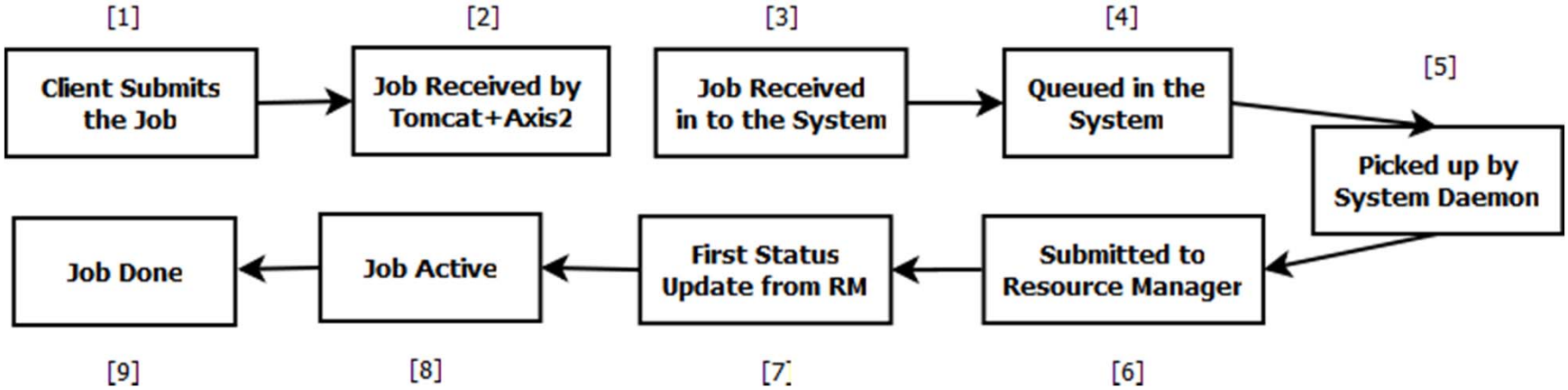
# Sigiri Architecture



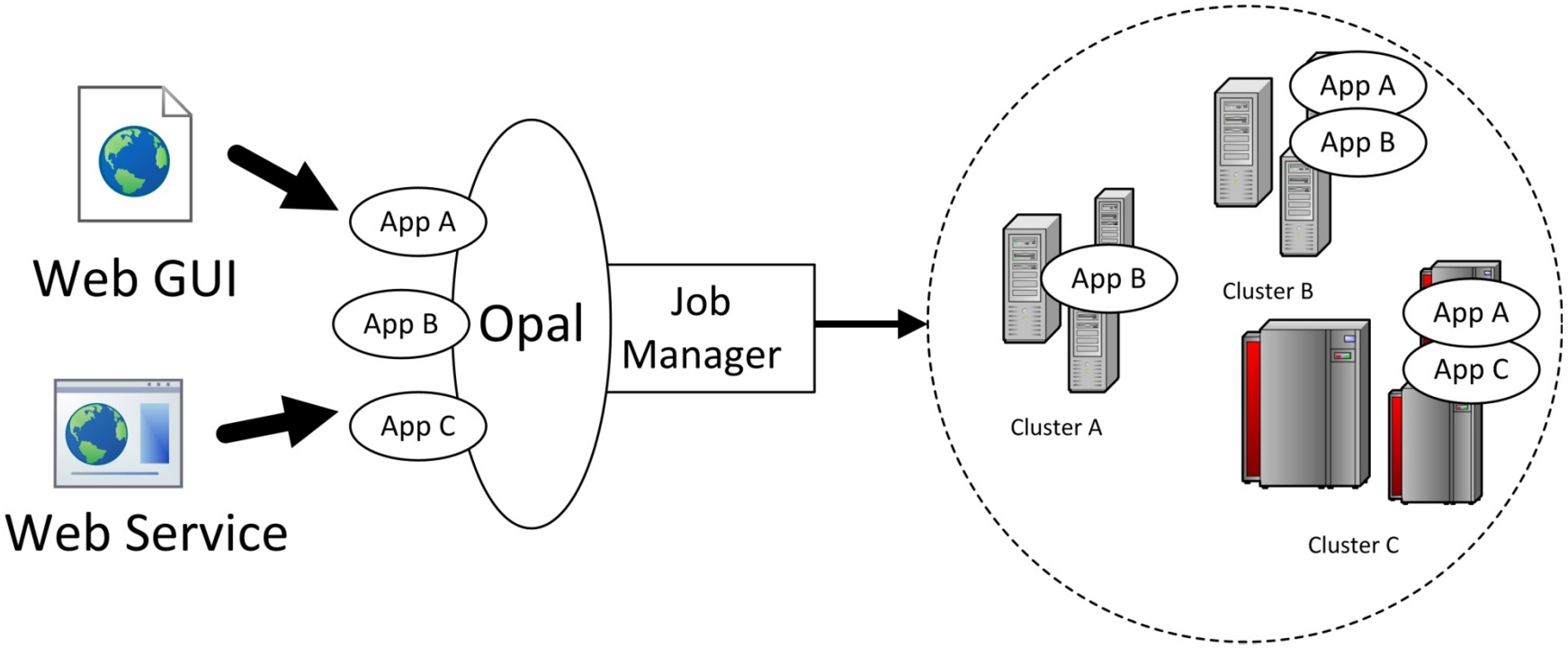
# Sigiri Daemon



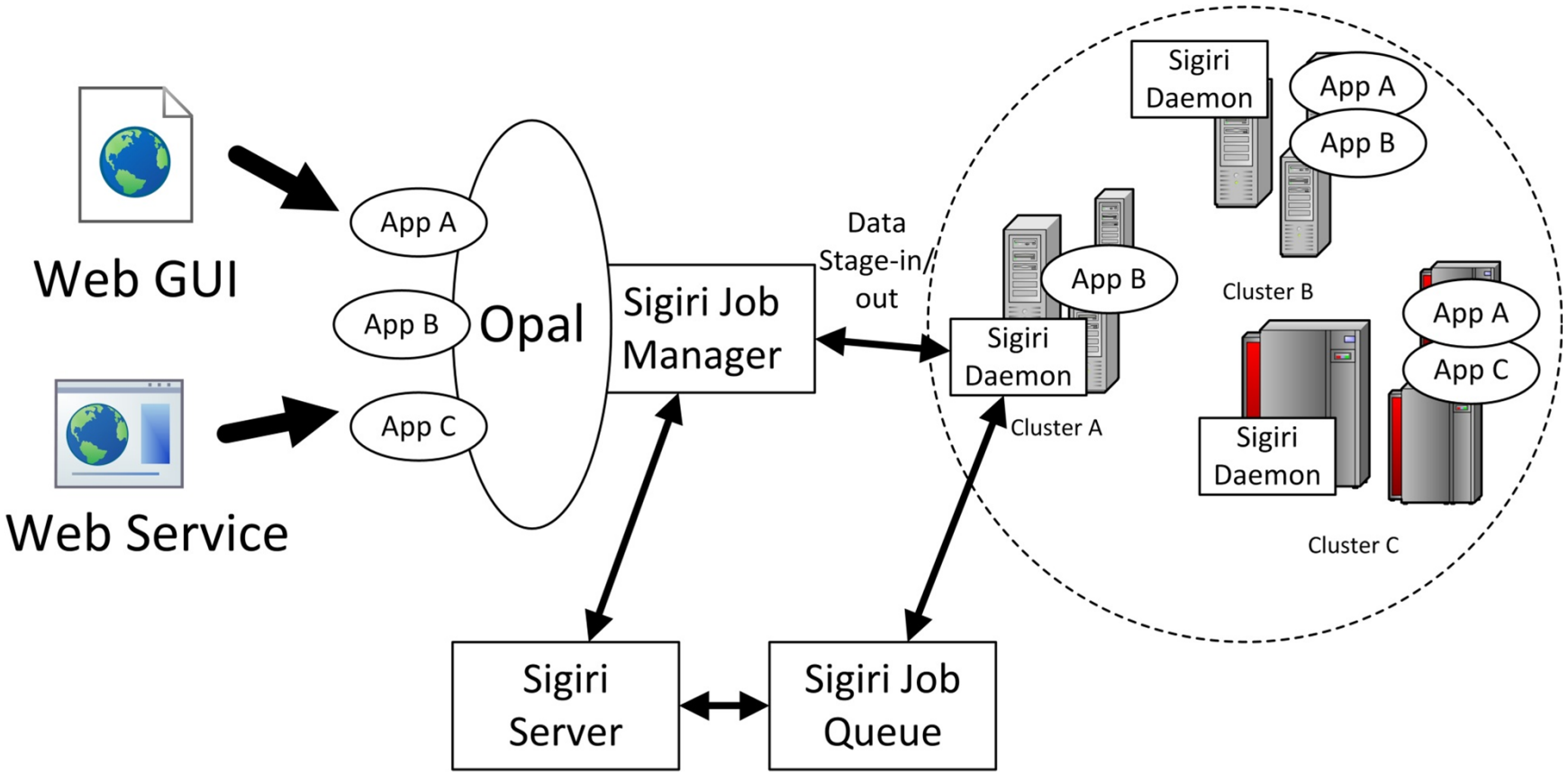
# Sigiri Job States



# Opal Architecture (revisit)



# Opal-Sigiri Integration



# Experiences

- Sigiri is more scalable and reliable than WS-GRAM
- Flexible resource selection

- Too many layers in the framework
  - Standalone Sigiri service co-exist with web service
- Redundancy
  - job status representation

# Opal-Sigiri Demo

Opal Service setup at D2I PRAGMA Testbed

http://pragma.cs.indiana.edu:8080/opal2

with SGE on 4-node Rocks Virtual Cluster

- Ongoing Work
  - Work with Jim Williams of IU to connect the D2I PRAGMA nodes to IU's fast switches
  - Extend hierarchical MapReduce* work to multiple PRAGMA clusters; Experiment evaluation of AutoDock based virtual screening.
- Future Work (still in idea stage)
  - Trident for deploying into PRAGMA testbed
  - Distribute LEAD II data catalog as resource on PRAGMA testbed
    - data catalog is web service crawler and indexer of meterology data
  - Provenance collection of MapReduce on Rocks clusters

* Yuan Luo et al. Hierarchical Framework for Cross-Domain MapReduce Execution. *2nd Emerging Computational Methods for the Life Sciences Workshop (ECMLS 2011), co-located with 20th Int'l ACM Symp on High Performance Parallel and Distributed Computing (HPDC 2011),* June 2011

# Thanks!

# Questions?

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