ICENI: A Next Generation Grid Middleware

Delivering e-Science

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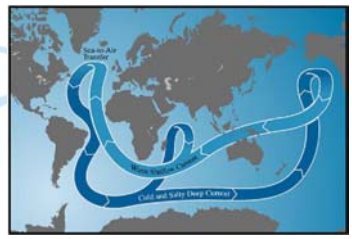
The problem: Thermohaline circulation

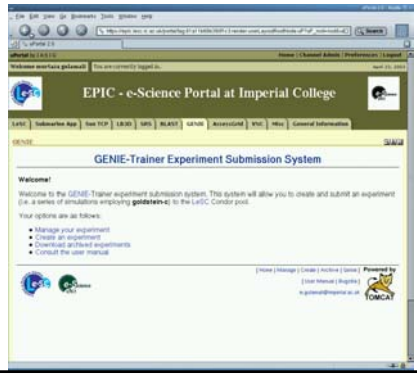
- Ocean transports heat through the "global conveyor belt."
- Heat transport controls global climate.
- Wish to investigate strength of model ocean circulation as a function of two external parameters.
- Use GENIE-Trainer.



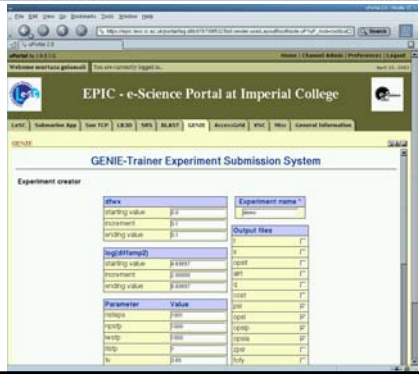
- Wish to perform 31×31 = 961 individual simulations.
- Each simulation takes ~4 hours to execute on typical Intel P3/1GHz, 256MB RAM, machine ⇒

time taken for 961 sequential runs ≈ 163 days!!!

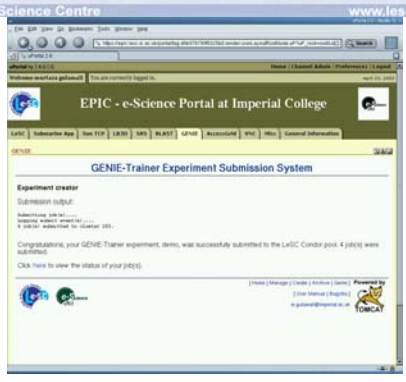
The GENIE channel within EPIC



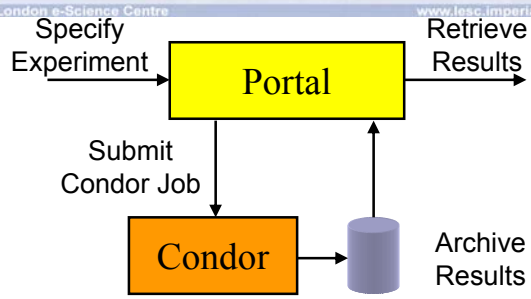
Create Parameter Search



Submit into Condor pool



Current Architecture



The Solution: Delivering Grid Computing Resources

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- Use flocked Condor pools between SReSC, DoC at Imperial College London, and LeSC (~200 Linux and Solaris nodes).
  time taken for 961 Condor runs ≈ 3 days!!!
- Advantages of Condor:
  - simulations are nearly parallel.
  - automatic check pointing and job migration.
  - Condor File Transfer Mechanism.
- Problems:
  - Firewalls! Overcame by designating and utilising port ranges specified by the Condor and firewall admin.

The Results: Scientific Achievements

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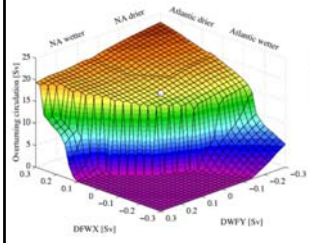
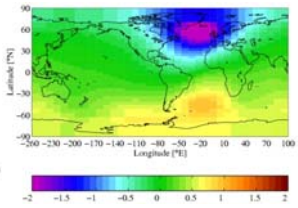


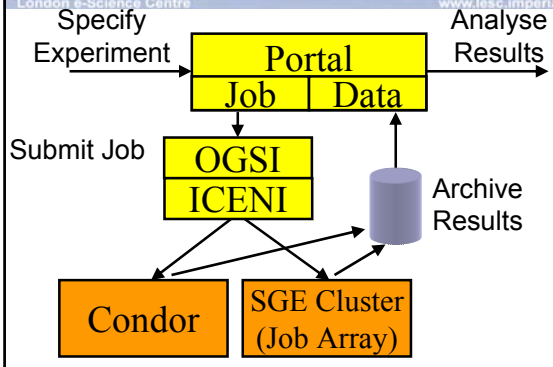
Intensity of the thermohaline circulation as a function of freshwater flux between Atlantic and Pacific oceans (DFWX), and mid-Atlantic and North Atlantic (DFWY).



Surface air temperature difference between extreme states (off - on) of the thermohaline circulation.

North Atlantic 2°C colder when the circulation is off.

Next Steps



ICENI: Imperial College e-Science Network Infrastructure

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- **Interoperable and Integrated Grid Middleware**
- **Service Oriented Architecture (SOA) with rich Metadata Description**
- **Augmented Component Programming Model**
- **Service Federation govern by Usage Policy and Service Level Agreement**
- **Foundation for higher-level Services and Autonomous Composition**

Contract (SLA) Specified Services within ICENI

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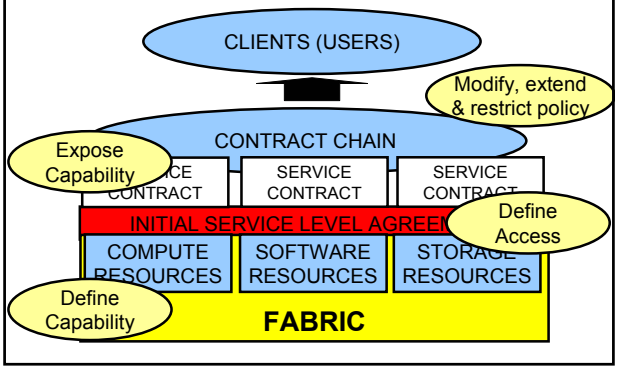

Current Service Implementations

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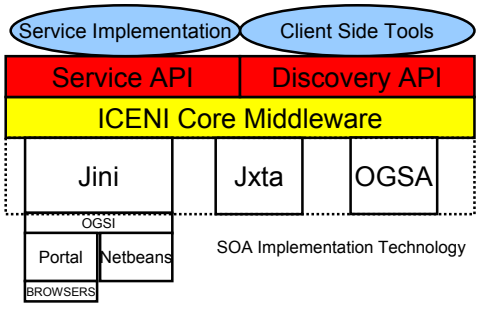
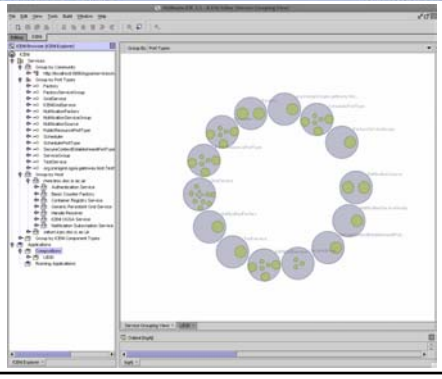


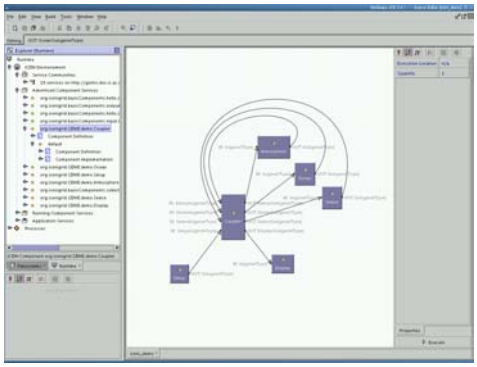
Netbeans ICENI Service Browser



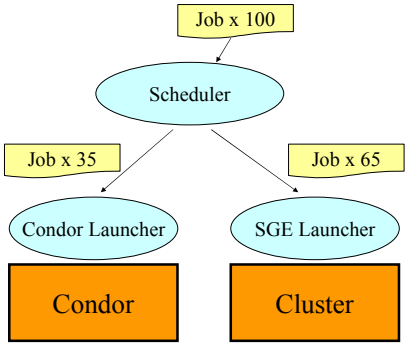
ICENI Portal
Specify location of service community

ICENI Portal
View available services

Composing and Submitting an ICENI Application

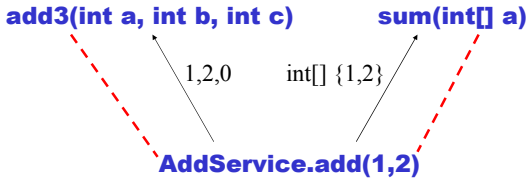


Scheduling job over Resources



ICENI Semantic Service Adaptation Framework

- Semantic Matching Service performs service discovery based on Requirement of the Client and Capability of Available Services
- Adaptation Service adapts requirement interface to service implementations.



Prototype Implementation

- Semantically annotate Services with RDF and OWL (ontology)
- Semantically matching Services using the Euler inference engine
- Service Adaptation using graph transformation rules

Demonstration

- The movie of the demonstration is available at:

http://www.lesc.ic.ac.uk/iceni/demos.html
Item “Semantic Matching Service”

ICENI: An integrated Grid Middleware

http://www.lesc.ic.ac.uk/iceni/

ICENI Release 1.0 available !!!

- ICENI Open Source licence (extended SISSL)
- Project website & mailing lists
- Daily builds, regression & automated deployment tests
- Documentation, manuals & user guide

Acknowledgements

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