Update of NCHC Grid Computing Environment

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Agenda

- ✓Preface
- ✓General NCHC GCE Update
  - –GCE platform expansion
  - –NCHC GCE Portal update
  - –The Highlight – Graphic workflow
- ✓New Approach – EasyGrid
- ✓Works underway

How to use the Grid Resources?

GCE Software Stack

User Apps

- MPI Applications can be execute in GCE

Message-passing Library (MPICH-G2)

- Provide message passing interface among user MPI program

Grid Middleware (Globus Toolkit)

- Support job submission, scheduling, resource allocation in GCE
- Support secure access to remote resource

Queuing system (PBS)

- Provide priority-based job queuing and scheduling

Operation system (Linux)

- MPICH-G2 & Globus compatible with many platforms including Linux, FreeBSD, Solaris etc..
- We use GT4.0.X & MPICH-G2 1.2.6 on Linux system

Network Fabric

Grid Compution Environment

Site E

User Apps

Message-passing Library (MPICH-G2)

Grid Middleware (Globus Toolkit)

Queuing system (PBS)

Operation system (Linux)

Network

Site A

User Apps

Message-passing Library (MPICH-G2)

Grid Middleware (Globus Toolkit)

Queuing system (PBS)

Operation system (Linux)

Network

Site B

User Apps

Message-passing Library (MPICH-G2)

Grid Middleware (Globus Toolkit)

Queuing system (PBS)

Operation system (Linux)

Network Fabric

Site C

User Apps

Message-passing Library (MPICH-G2)

Grid Middleware (Globus Toolkit)

Queuing system (PBS)

Operation system (Linux)

Network Fabric

Site D

User Apps

Message-passing Library (MPICH-G2)

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Operation system (Linux)

Network Fabric

How to use the Grid Power

✓ Command Line

✓ Graphic User Interface

– Grid Service Access Point

- Three-tier approach (NCHC's Grid Portal)
- Two-tier approach (NCHC's EasyGrid)

GCE Update

Platform Expansion

- ✓ Testbed
  - – Keys
    - • Heterogeneous
      - ⇨ CPU, interconnection, OS, ...
    - • Different management strategy
    - • Community activity
    - • Small facility
  - – AMD MP2000+ cluster (8+1), Myrinet , 32-bit
  - – Intel EM64T cluster (8+1), IB, 32/64-bit
  - – AMD Opteron cluster (8+1), IB, 32/64-bit
  - – Intel Xeon cluster (12+1), GE, 32-bit
  - – Intel Itanium-II cluster (30), Quadrics, true 64-bit
  - – Taiwan UniGrid
    - • Alliance of universities
    - • 12 active members
    - • 13 additional participants
    - • Very diversed choices of systems

Platform Expansion

✓ **Production systems**
  – Keys
    • Geographically distributed, 100~200 KM apart
    • Different organizations
    • Different policies
  – NTU cluster (33/66), Myrinet, ready – Taipei
  – NCHC production systems
    • FORMOSA-II (96/192/384) , IB, ready – Tainan
    • FORMOSA-I (144/288), GE, half-ready – Hsinchu
    • Intel Itanium-II (192/384), Qd., underway – Hsinchu

✓ **New Alliance, new resources**
  – Initial agreement on collaboration
  – NCKU cluster to come by Nov. 2006
    • 2.16 TF, IB, dual core – Tainan
  – NCU plasma simulation cluster
    • Application specific

GCE Update

- ✓ **Software version**
  - Globus 4.0.X
  - Liferay 4.0.0
  - Tomcat 5.5.17
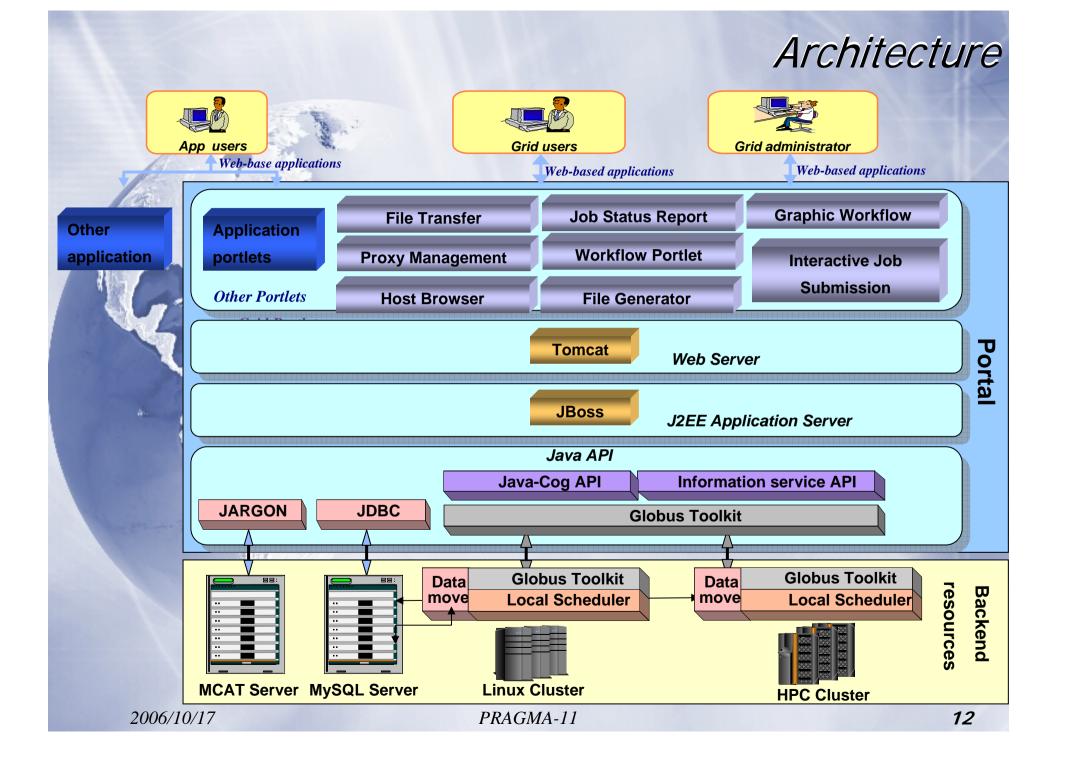 - JBoss 4.0.4
  - Java-cog 4.1.4
  - MySQL 4.0.21
- ✓ **Meta-computing**
  - MPICH-G2
  - MOAB evaluated for advanced reservation
- ✓ **Resource Broker under implementation**
  - Gridway integration with MDS
  - Attach to local queuing system – PBS
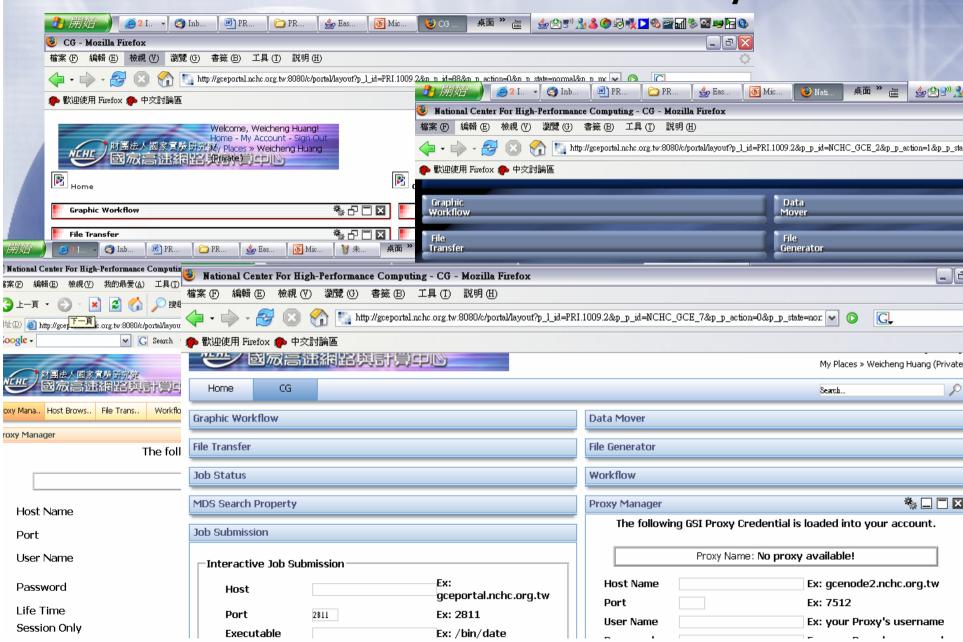 - Resource auto-selection mechanism for heavily loaded systems
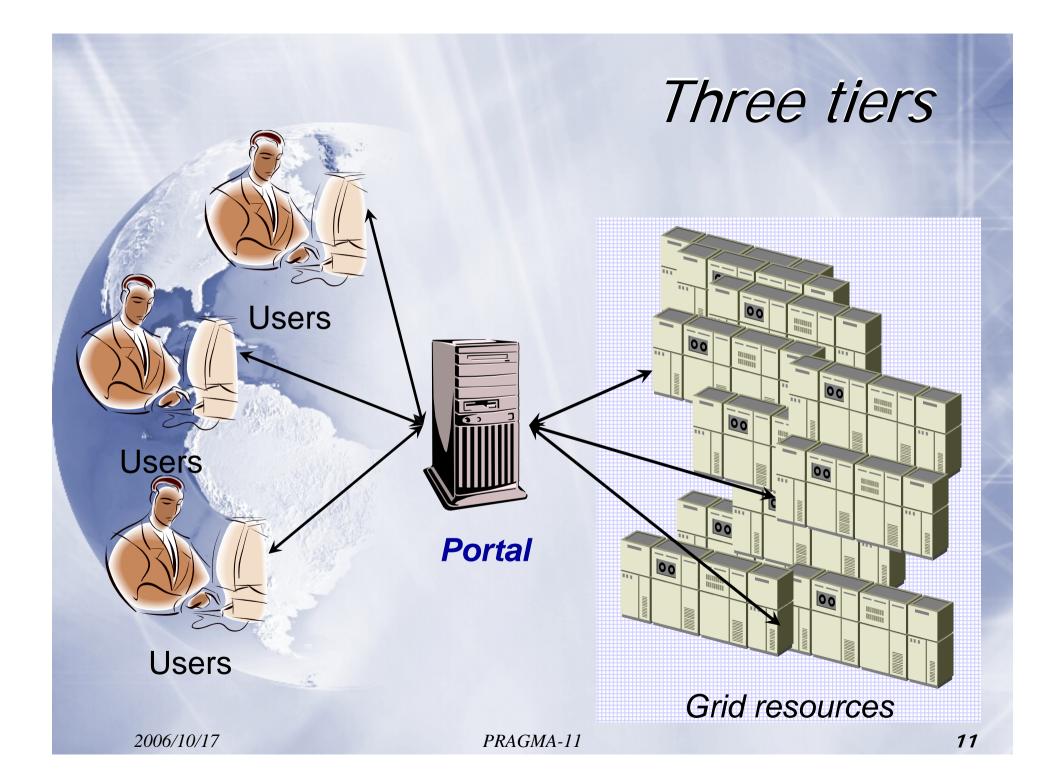
Three tiers

Users

Users

Users

Portal

Grid resources

App users

Grid users

Grid administrator

Web-base applications

Web-based applications

Web-based applications

Other application

Application portlets

Other Portlets

File Transfer	**Job Status Report**	**Graphic Workflow**
Proxy Management	**Workflow Portlet**	**Interactive Job Submission**
Host Browser	**File Generator**	

Tomcat   *Web Server*

JBoss   *J2EE Application Server*

Java API

Java-Cog API   **Information service API**

JARGON   **JDBC**   **Globus Toolkit**

Portal

Data move   **Globus Toolkit**   **Local Scheduler**

Data move   **Globus Toolkit**   **Local Scheduler**

Backend resources

MCAT Server   **MySQL Server**   **Linux Cluster**   **HPC Cluster**

Portal Update

✓ Portal setup
  – Public setup
    • all the portlets are provided
    • Every functions available are included
  – Personal setup
    • Personalized portal environment
    • Place ONLY the functions/portlets you choose

✓ More flexible layout

✓ Miscellaneous
  – Multiple themes to choose from
  – Various background colors
  – Multi-lingual
  – Provided by Liferay itself
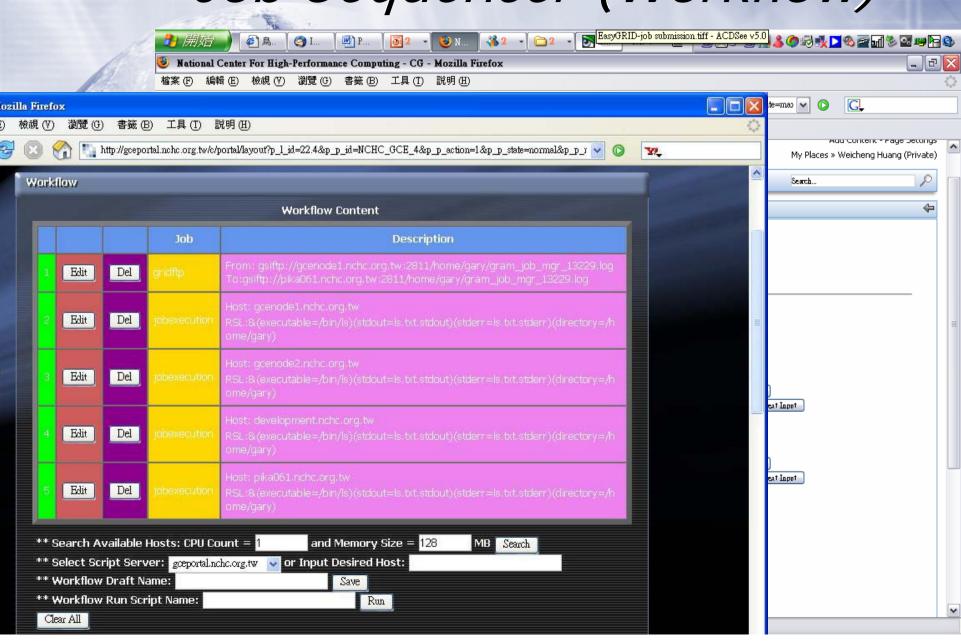
Different flavors of portal

Portal Update

✓ New portlets

– Interactive job submission portlet
  - Immediate results from the run
  - Example of BLAST
  - Done in 3 hours
    ⇨ Walk through the whole portal with the user
    ⇨ Go to precise location and build the job in minutes
    ⇨ Further customization needed
  - Call for the needs for individual "personal workspace" in MyPlace

– Graphic workflow
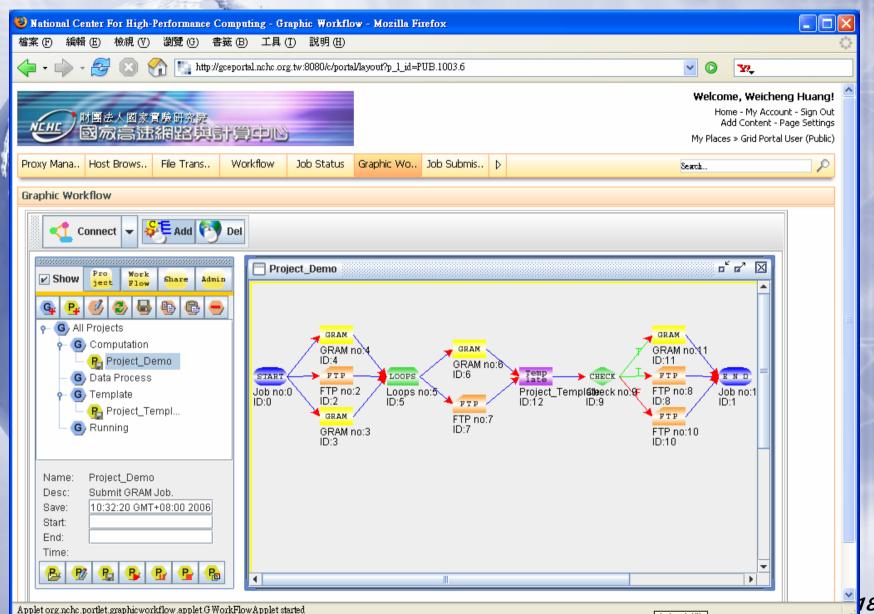
Graphic Workflow

- ✓ Different from the job sequencer
  - – More flexible workflow nodes dependency
- ✓ Suitable for collaboration of multiple participants
- ✓ Trying to add a bit more fun on it
    - ⇨ Real time demonstration for construction a workflow/project

Job Sequencer (Workflow)
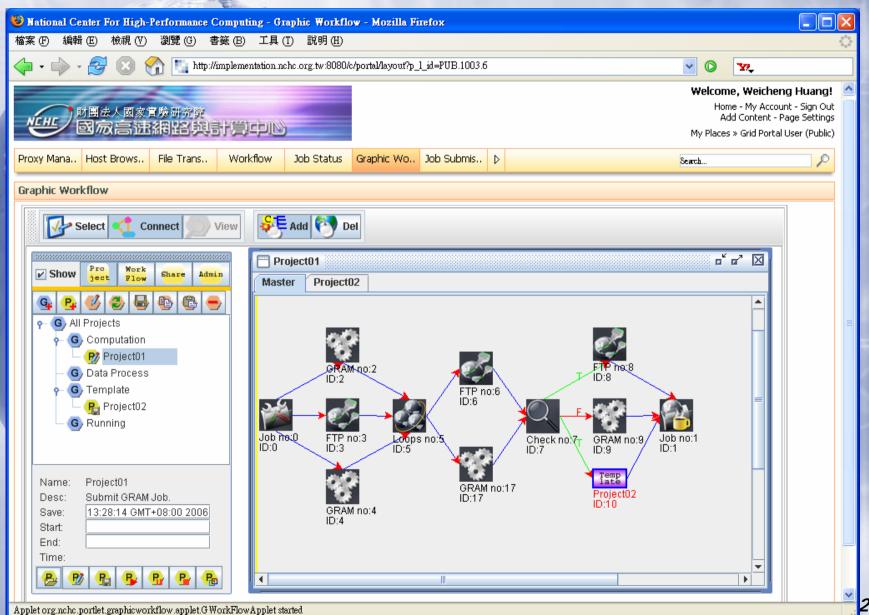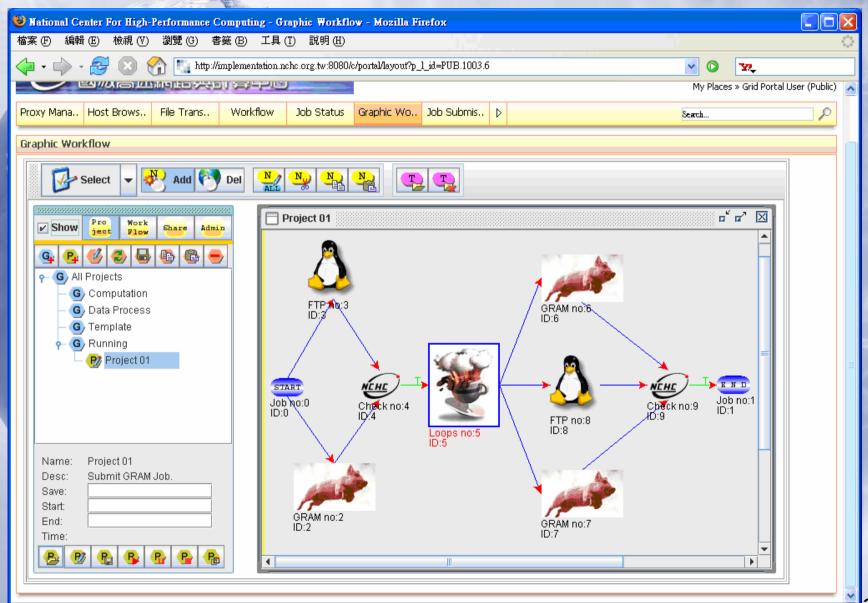
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Graphic Workflow

Graphic Workflow

Graphic Workflow

✓Features
- Straightforward presentation of workflow
- Grouping of projects & workflows
- Multiple workflows within a project
- Save and Reuse
- editable
- Sharable
- Template
- Simple looping capability
- Workflow can be replicated
- Auto-alignment for clean/organized look

Current Portlets

✓ MDS search property portlet
- – Source to generate available resources list

✓ Proxy management portlet
- – User authentication

✓ Host browser portlet
- – Available Grid resources

✓ File transfer portlet (gridftp)
- – Local upload
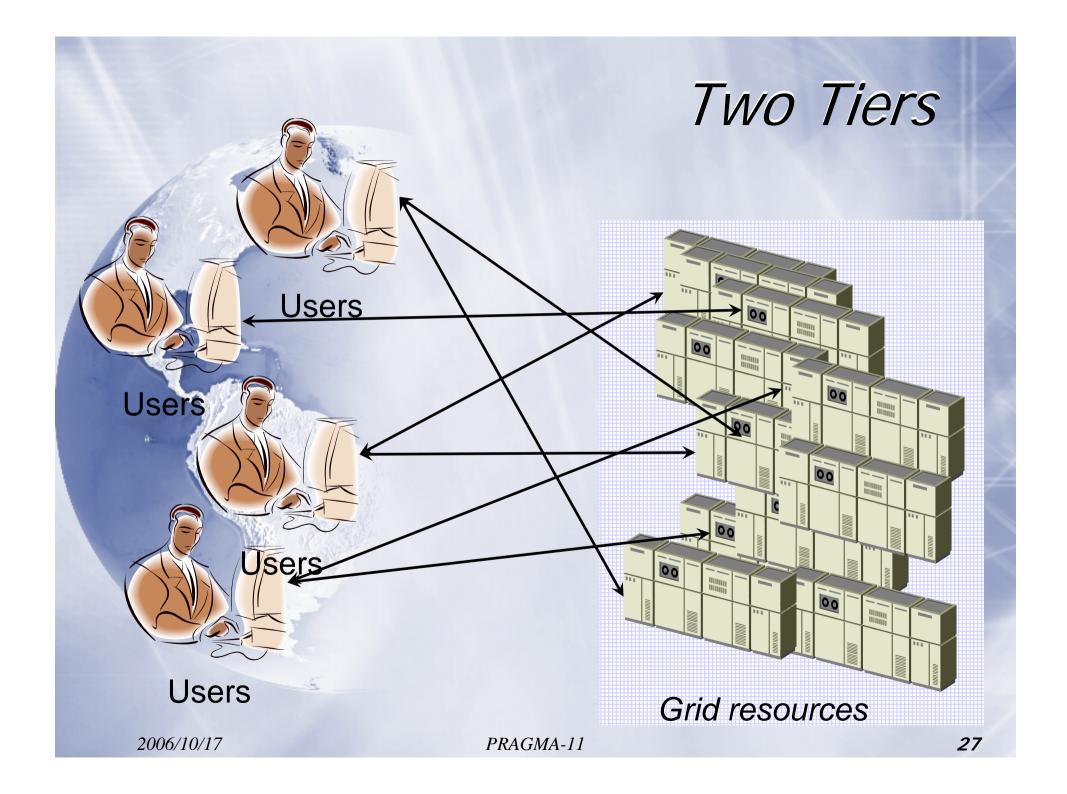- – File transfer between two hosts
- – Local download – still to come

Current Portlets

✓ Job sequencer portlet (workflow)
  – Original workflow
  – Batch jobs executed in sequence
  – Suitable for collaboration work between programs

✓ Job status portlet
  – Status of batch jobs

✓ Interactive job submission portlet
  – Job results reported immediately/interactively

Current Portlets

✓Workflow portlet (graphic workflow)

✓Parametric study portlet

  – Generation of files

  – Automatic jobs submission

   • RB is required

✓Grid monitor portlet

✓Network weather service

Easy Grid

Two Tiers

Users

Users

Users

Users

Grid resources

EasyGrid

✓ A different approach
- Portal
  - Users' point of accessing Grid system
  - Provides an problem solving environment (PSE)
  - Collaboration possibility
  - Bridge the gap between end-users and the grid
  - Hides much of complexities of accessing the grid
  - Minimum requirement on the users' system
  - Department store
    ⇨ you got the whole bunch functions
    ⇨ Bottle neck is possible
  - High Availability system needed for production

EasyGrid

✓ A different approach

– EasyGrid

- Provides easy access to the grid
- Dispatches a grid job quickly
- Offers only simple and independent functions
- Quick link between users and the grid
- Convenient store
  ⇨ take only what you want
  ⇨ No centralized bottle neck
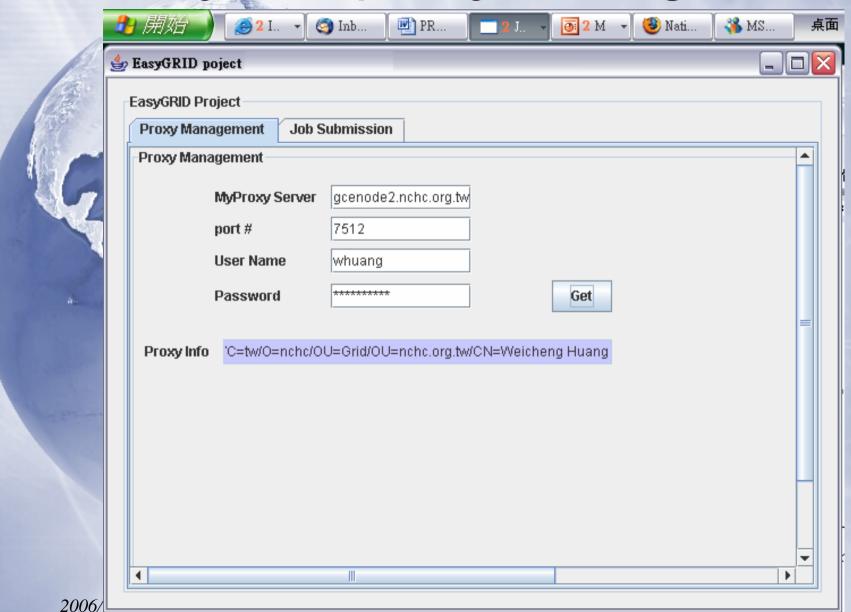- More load on the users' machine
- Distributed in nature

EasyGrid

✓ What are needed on users' machine ?
  – Java
  – Java-cog
  – Grid security
  – EasyGrid.jar
  – Public IP, for now

✓ How can it be used?

  – Install software stated above on your machine
  – Get access
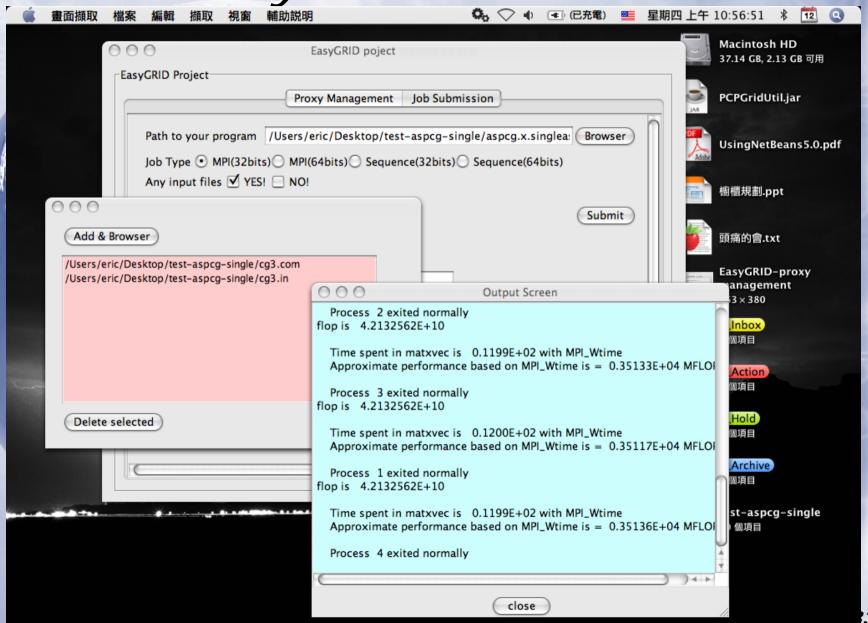   • Request proxy from Myproxy server
    • Send the files over and run

EasyGrid(grid service client)

✓ At its infant stage

✓ Currently, provide two services

  – MyProxy get delegation

  – Interactive(non-batch) job submission

EasyGrid-proxy Management

EasyGrid-Job Submission

Works underway

- ✓ Resource Broker
- ✓ HA system of portal service
- ✓ Integration of SRB as common virtual file system
- ✓ Eliminate the extra login for the users
  - Eliminate the login on the portal
  - Suggestions/Comments?
- ✓ EasyGrid
  - Batch mode job submission with status report
  - Gridftp client
  - ...
- ✓ Job status report as a widget

Access

- ✓ *URL*
  - http://gceportal.nchc.org.tw:/8080
  - http://freebsd.nchc.org.tw/wiki
- ✓ *Contacts*
  - eric6753@nchc.org.tw
  - gary@nchc.org.tw
  - serena@nchc.org.tw
  - yun@nchc.org.tw
  - whuang@nchc.org.tw