Google Summer of Code Projects may help you with Fusion Physics Applications on Grid

S. Natarajan (CSU)
C. Martín (UCM)
J.L. Vázquez-Poletti (UCM)
A. Lorca (UCM)

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Why Fusion on Grid?

- **Fusion**
  - Clean
  - Alternative method for large scale energy production
  - No CO_2 – No Global Warming
  - No long lived radioactive waste
  - Fuels required are found in abundance
  - No chain reactions – No “metdown” - Inherently safe
- **Grid Computing (EGEE)**
  - Access to a great amount of computing resources
  - More simulations in less time
    - Increase effectiveness of real experiments
    - But…

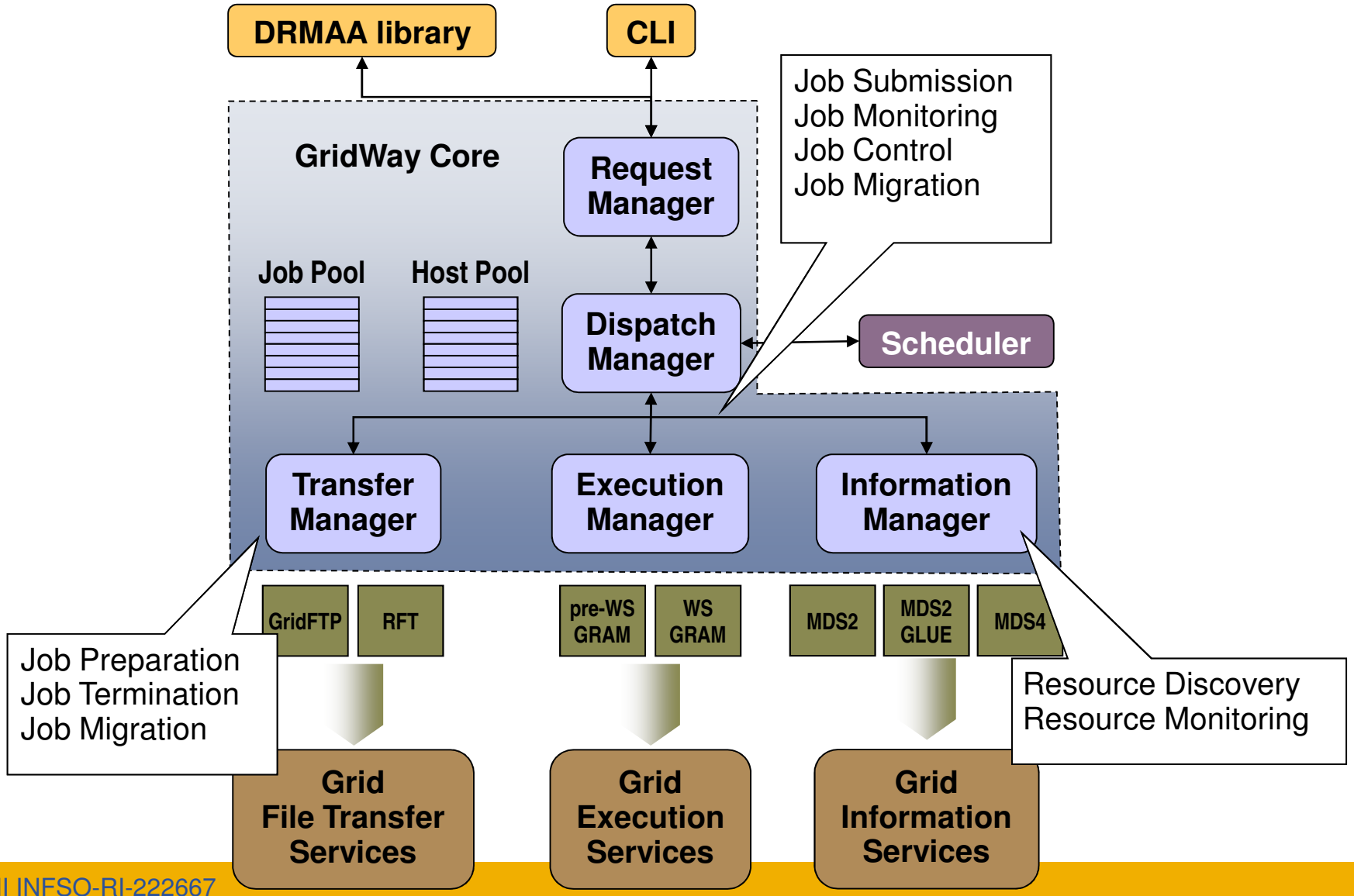
      How to port/use an application efficiently?

What all of this is about?

- **Our Experience**
  - Grid Metascheduler
    - GridWay: http://www.gridway.org/
  - Fusion applications
- **Our "2 cents" today**
  - Google Summer of Code Projects

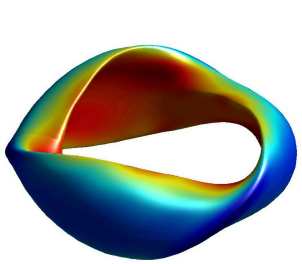
GridWay in a Glance

GridWay Internals

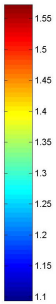


GridWay in a Glance

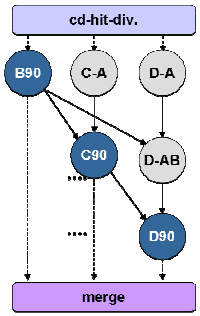
GridWay is being used on EGEE for…



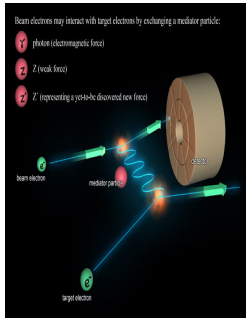
Massive **Ra**y **Tra**cing

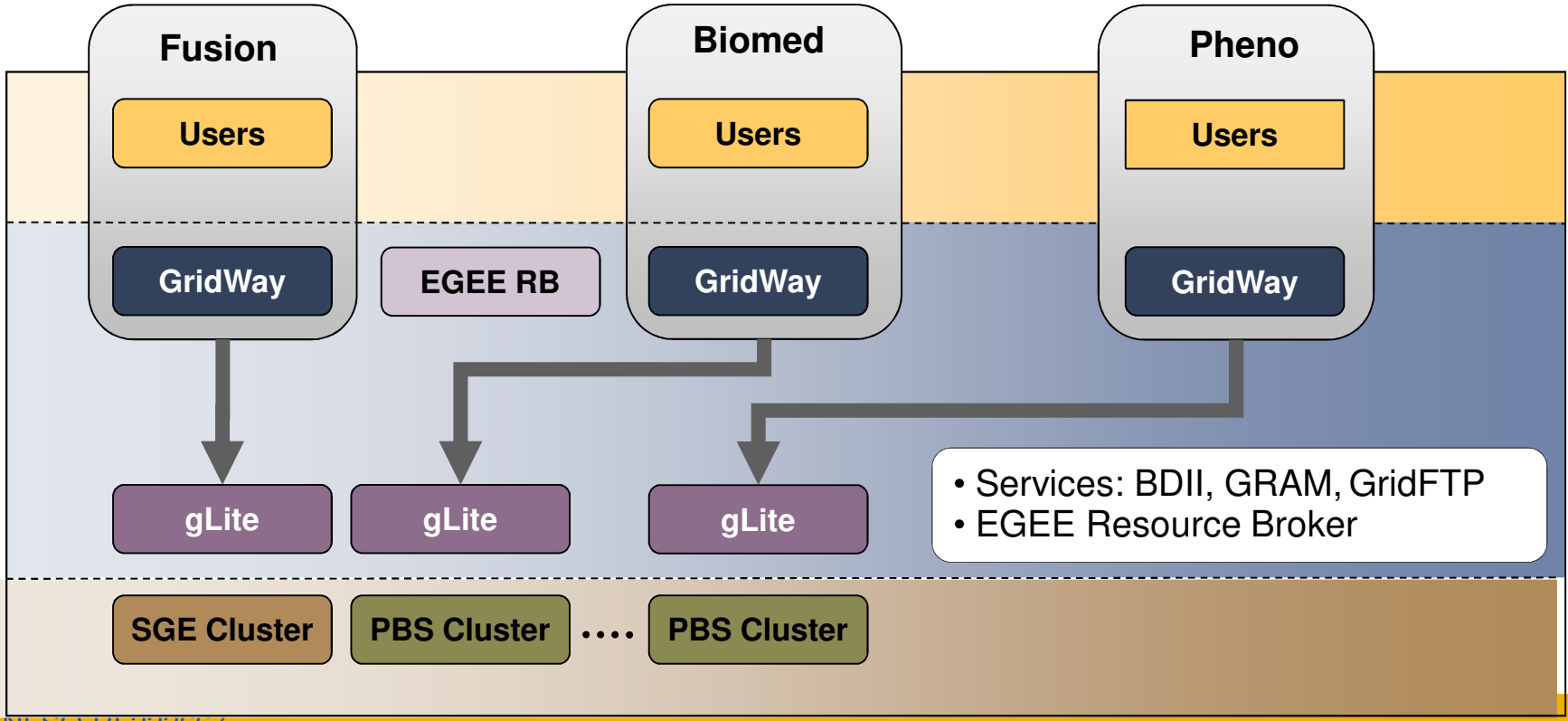


CD-HIT workflow

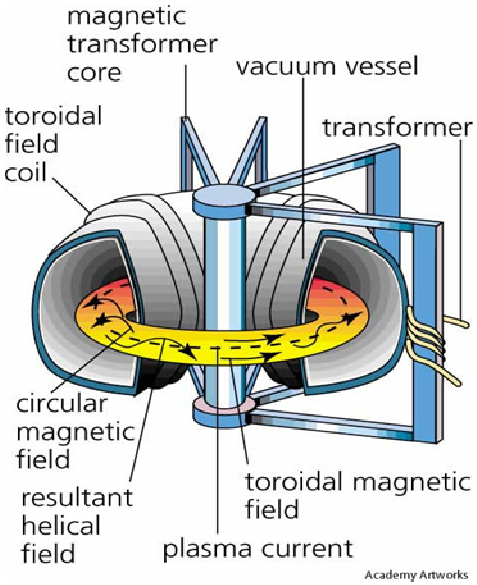


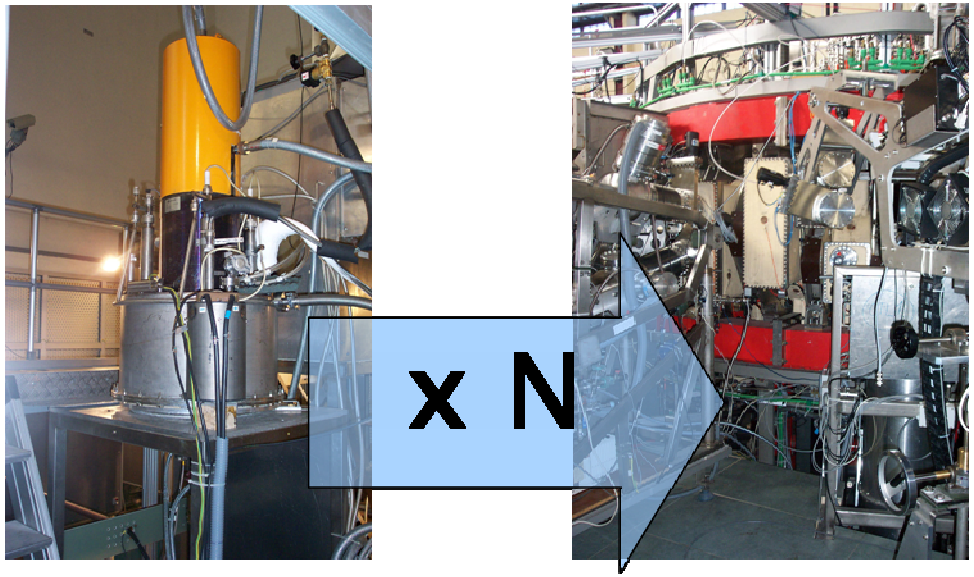
AITALC code
Bhabha





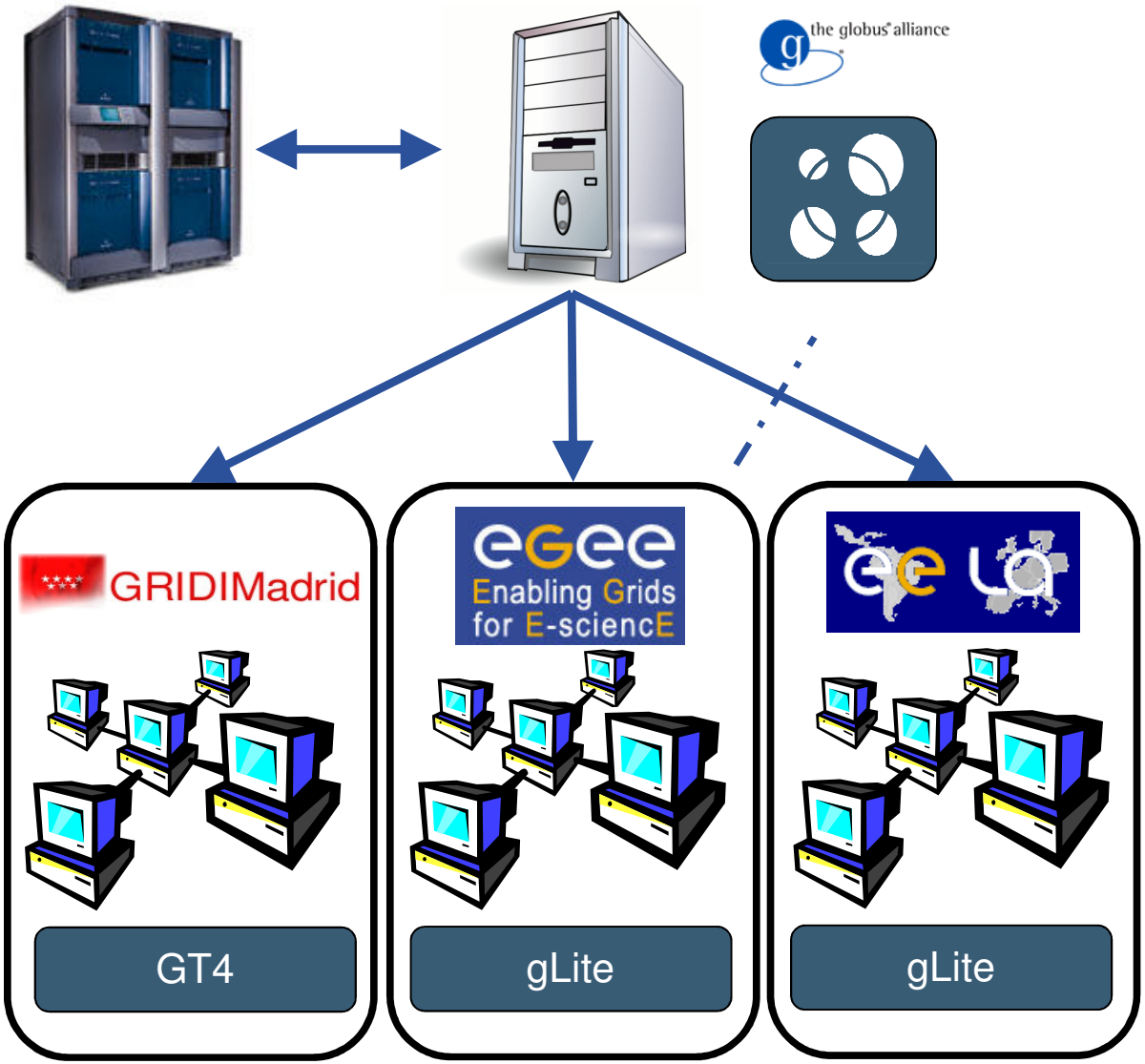
Application: MaRaTra



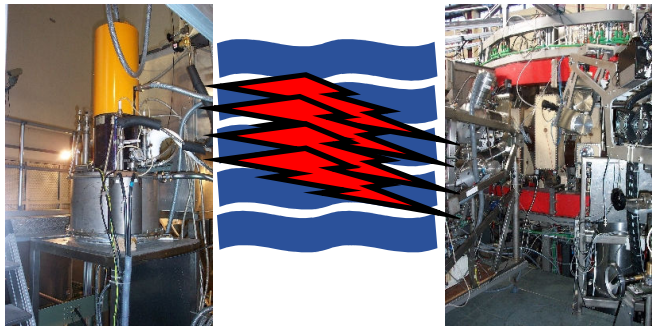


- **Massive Ray Tracing in Fusion Plasmas**
- **Executable: *Truba* (traces 1 ray of the microwave bunch)**
  - 1.8 MB – 9' (Pentium 4 3.20 Ghz)
- **Input files =~ 70 KB**
- **Output files =~ 549 KB**

Application: VASHRA-T



- **Local Machine**
  - SGI ALTIX 3700
  - 64 + 128 CPUs 64 bits
  - LSF
- **Local Communications**
  - scp and ssh
  - User ssh keys exported
- **Grid machine**
  - Globus Toolkit 4
  - Globus GridWay 4.2.1
  - Access to 30 sites



Google Summer of Code Project #1

GridWay Graphical User Interface

About Google Summer of Code

- 4th Edition – http://code.google.com/soc/
- Three-month projects to develop and learn free open source code
- 1,000 Students around the world – 150 mentoring organizations
- **2 accepted projects within the Globus Alliance**

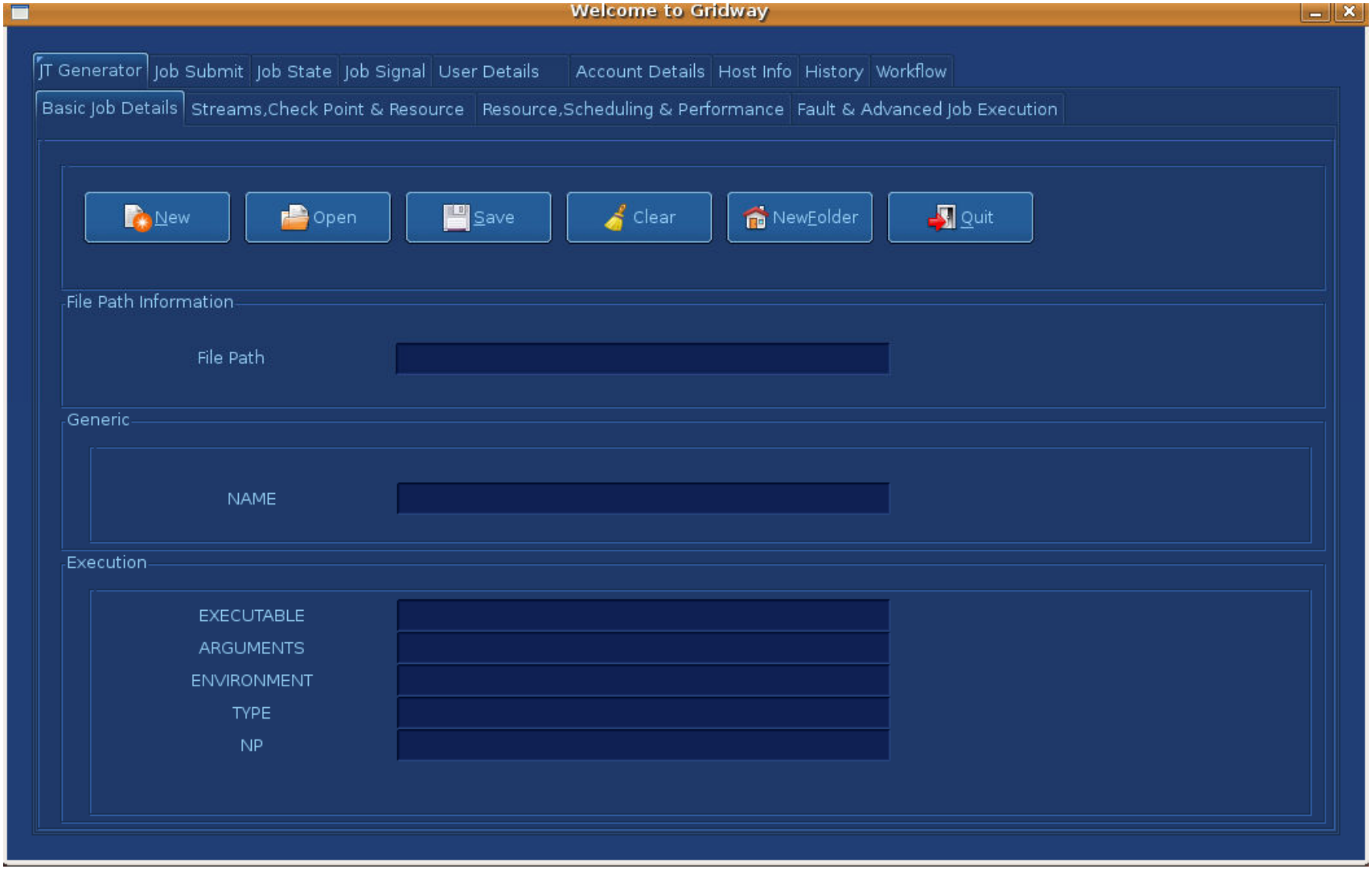
About the Developer

Srinivasan Natarajan
srini.msnm@gmail.com
Graduate Student, Computer Science
California State University
Sacramento (USA)

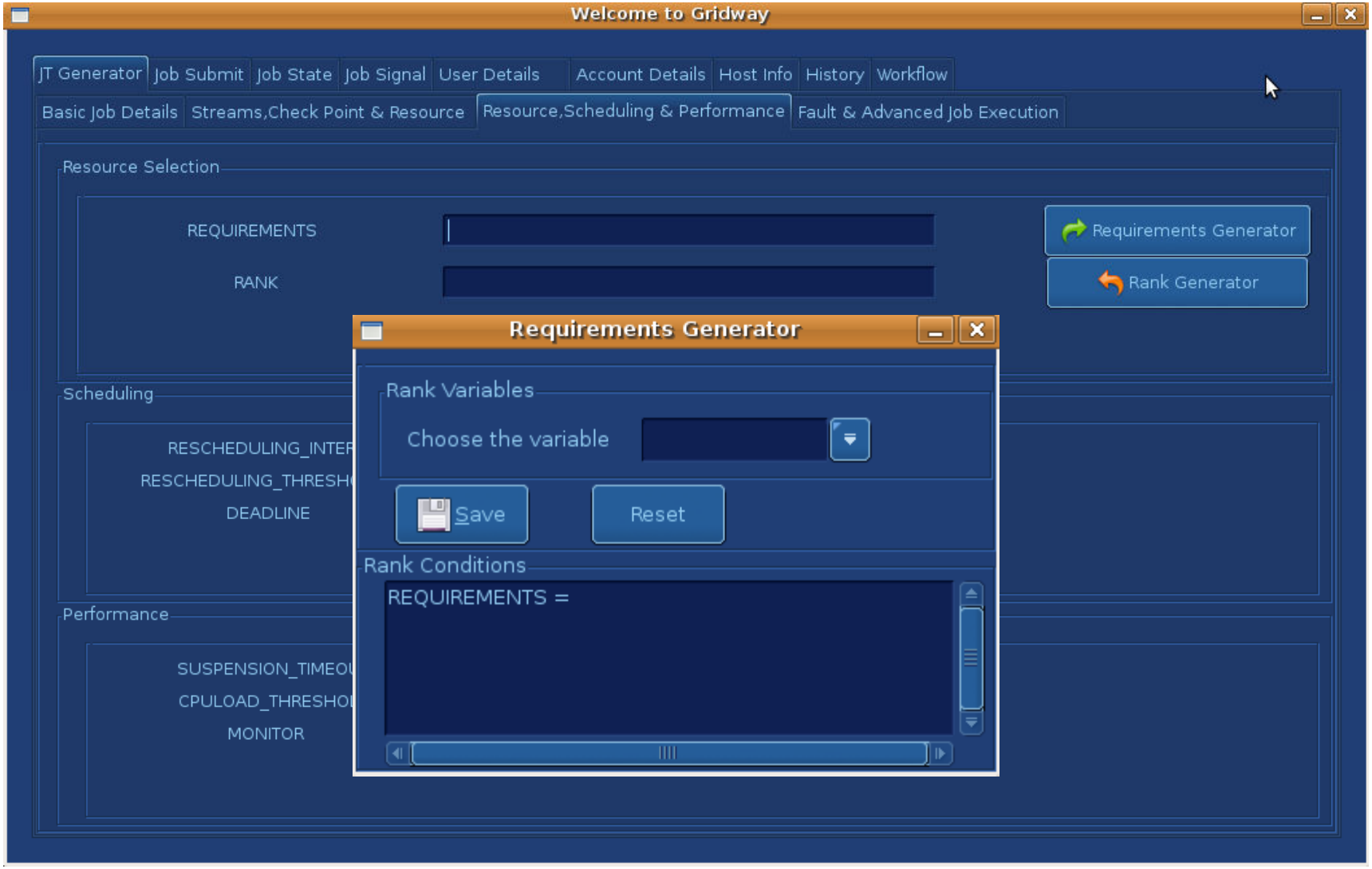
The Idea behind the GridWay GUI

- **To help users**
  - compose, manage and control their jobs
  - not using command line interface.
- **Enables**
  - host and user monitoring
  - filtering account statistics and execution history information
- **Supports DAGMAN workflow**
  - compose the DAG file
  - visualize dependencies between the jobs
  - pass the DAG file to GridWay

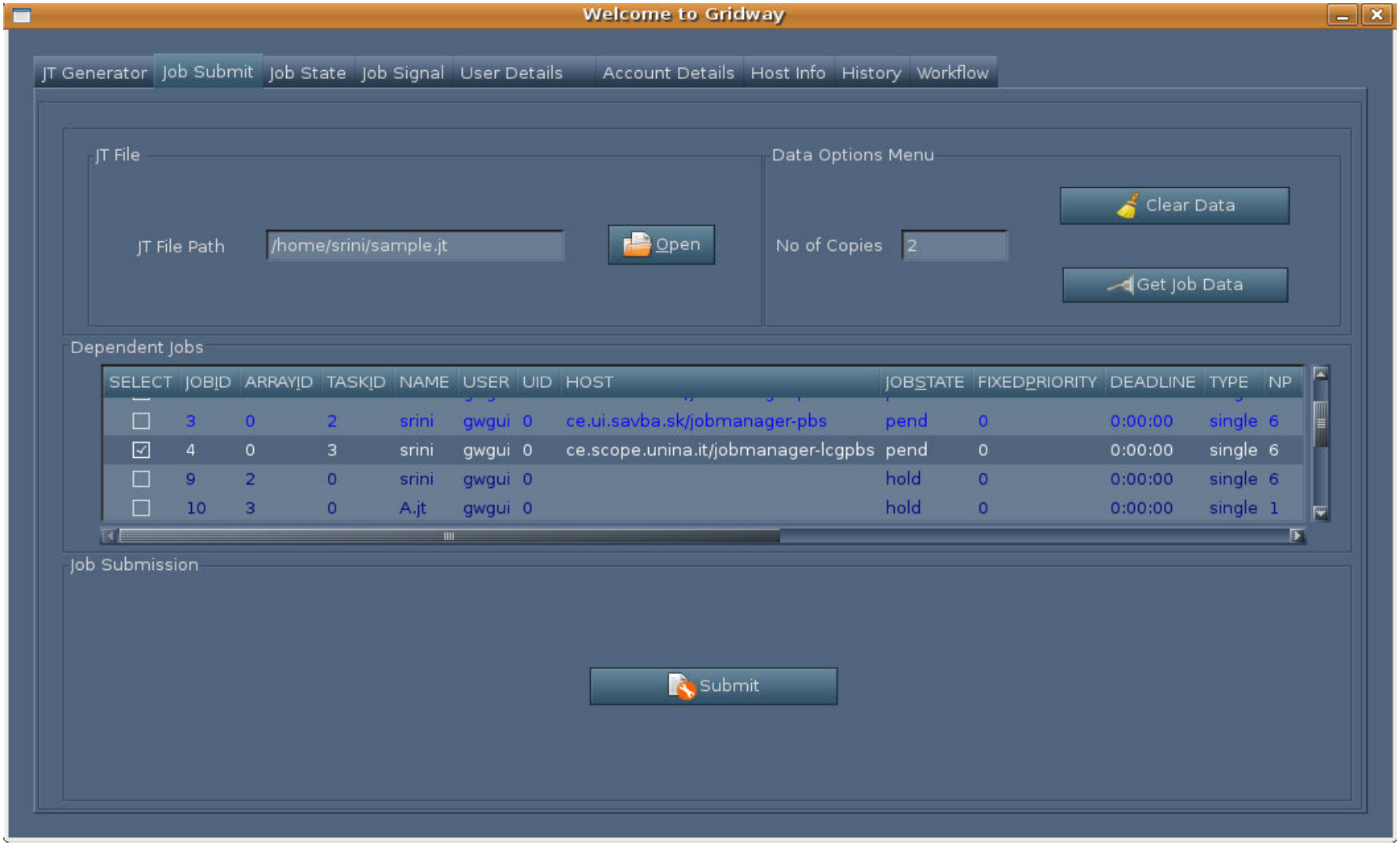
JT Generator



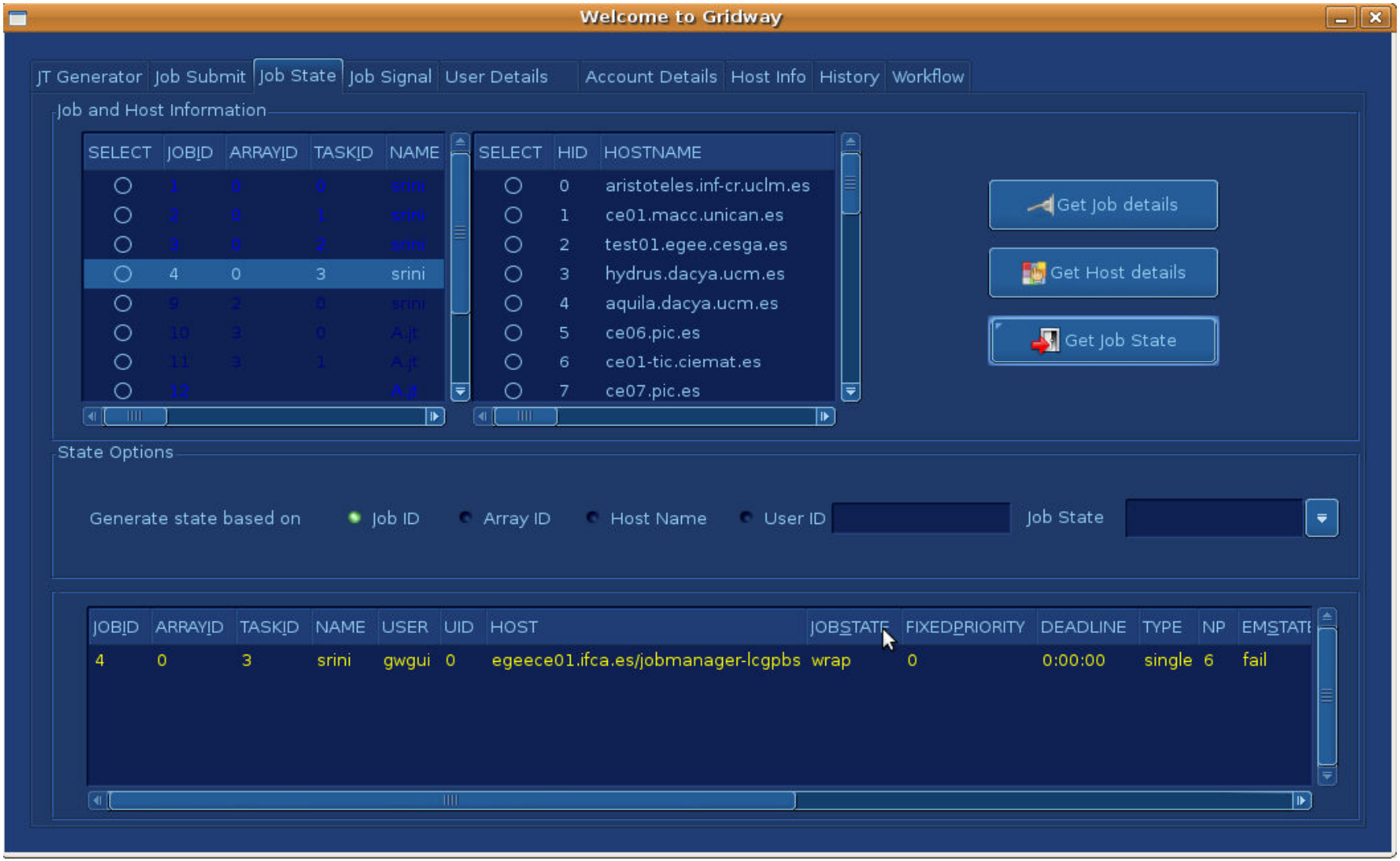
JT Generator



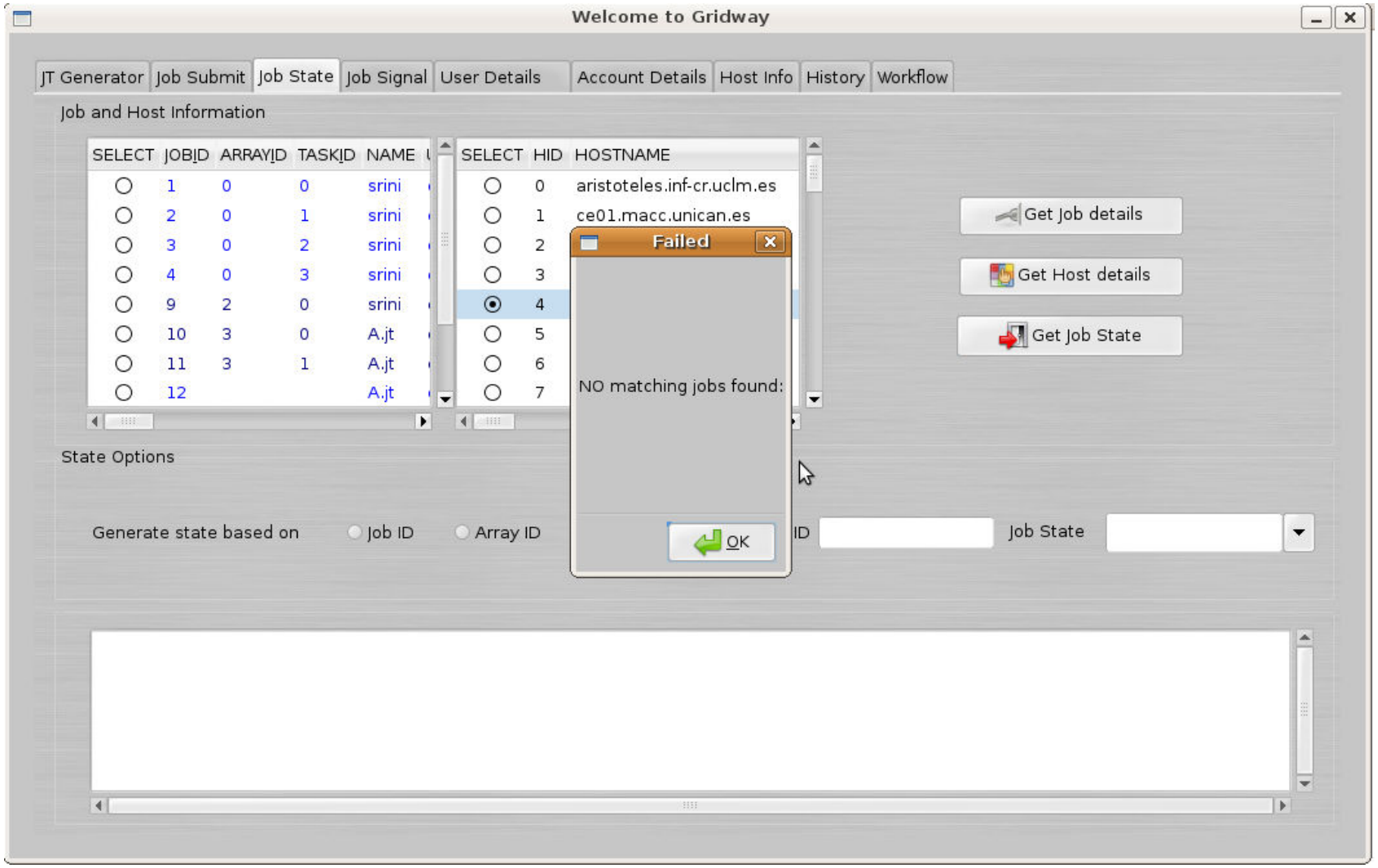
Job Submission



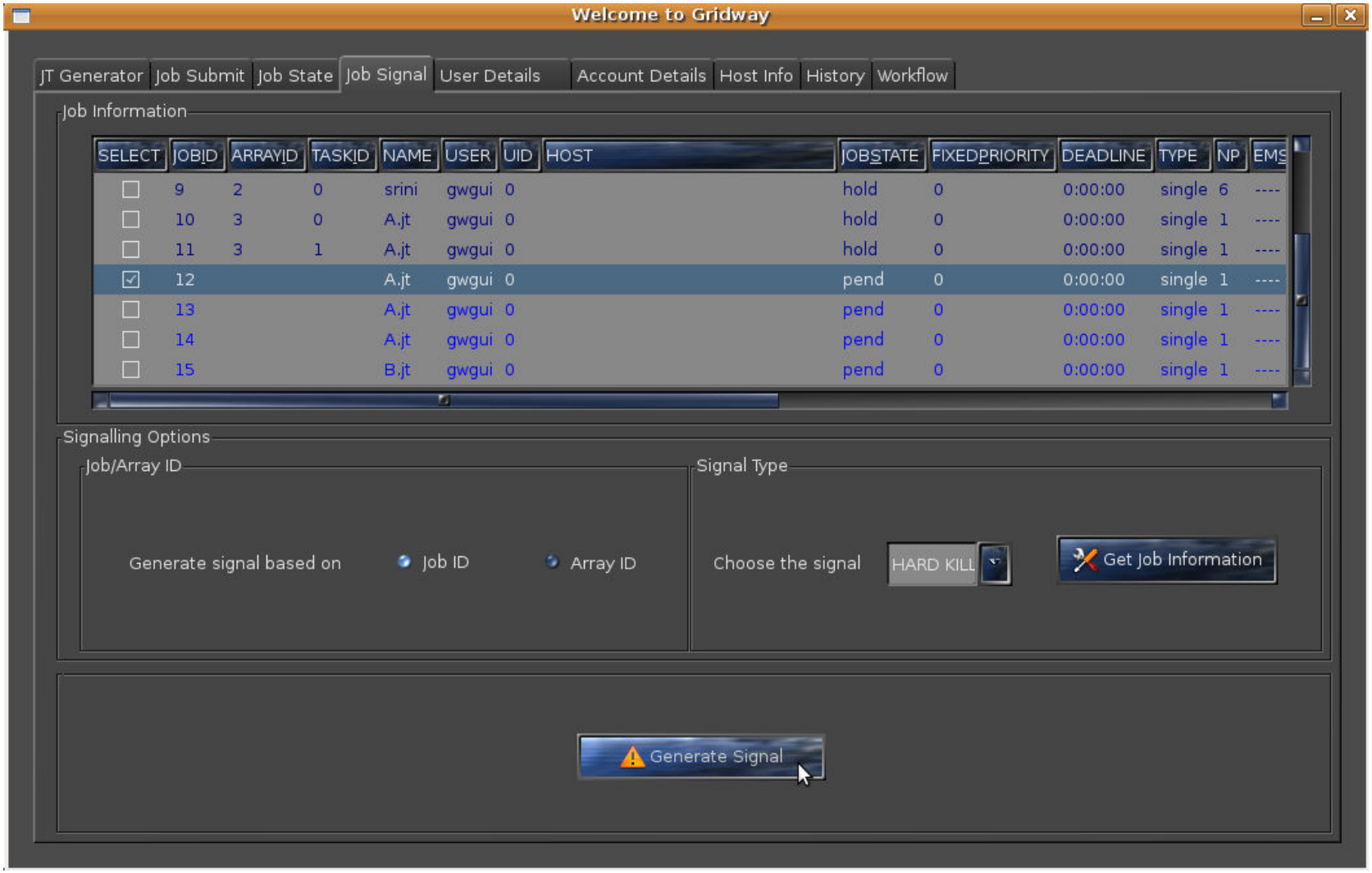
Job State Information



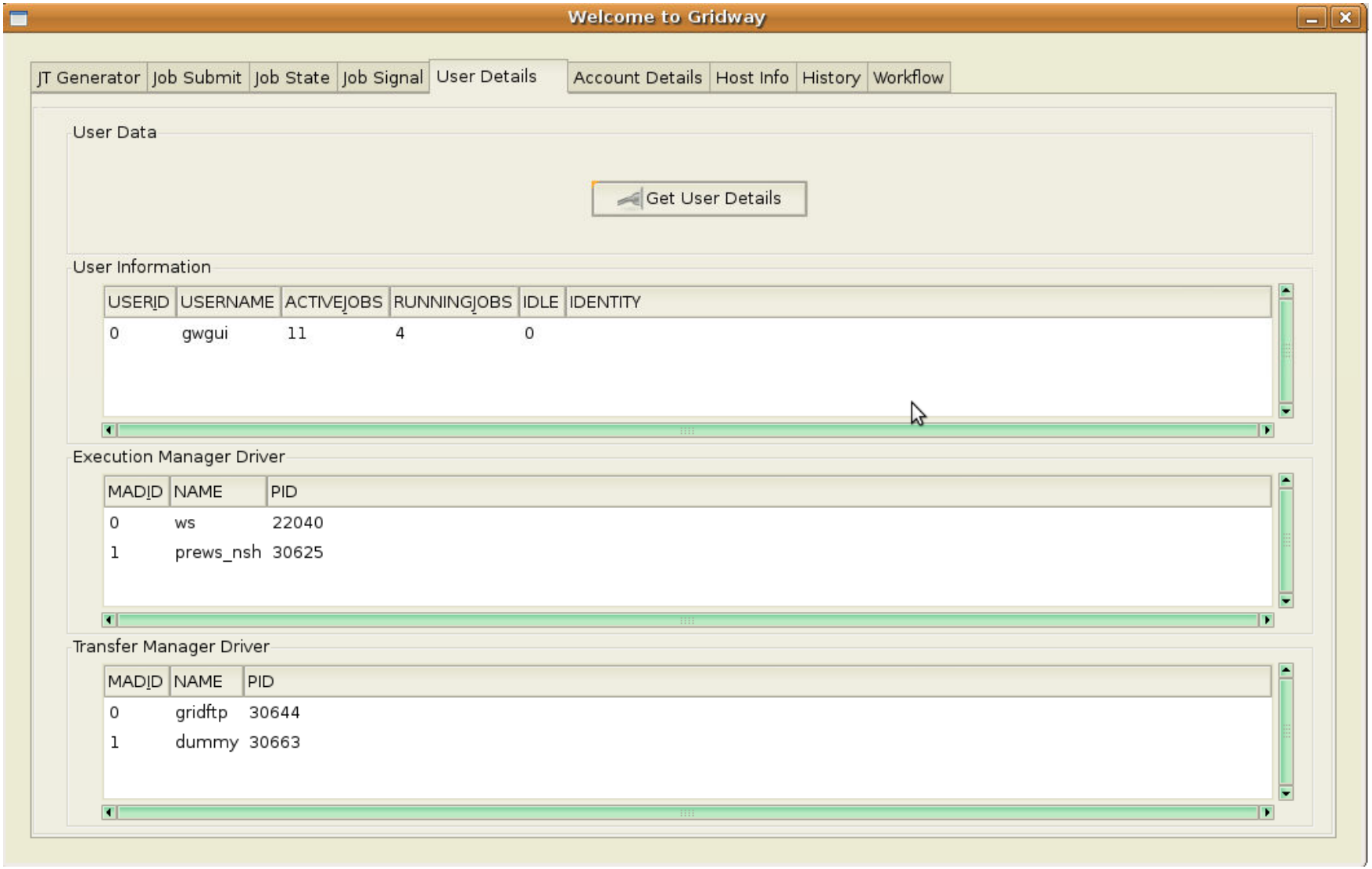
Job State Information



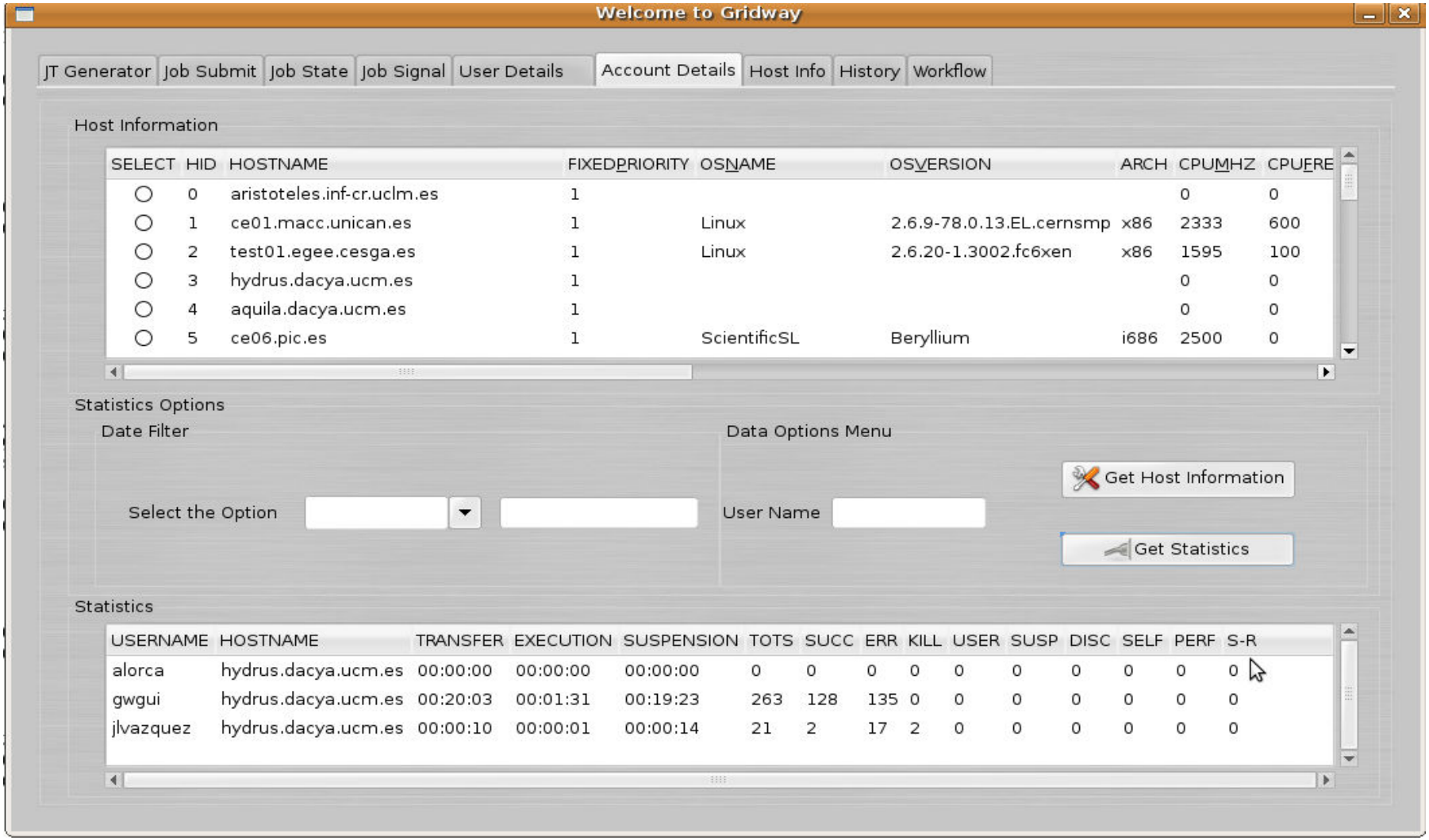
Job Signalling



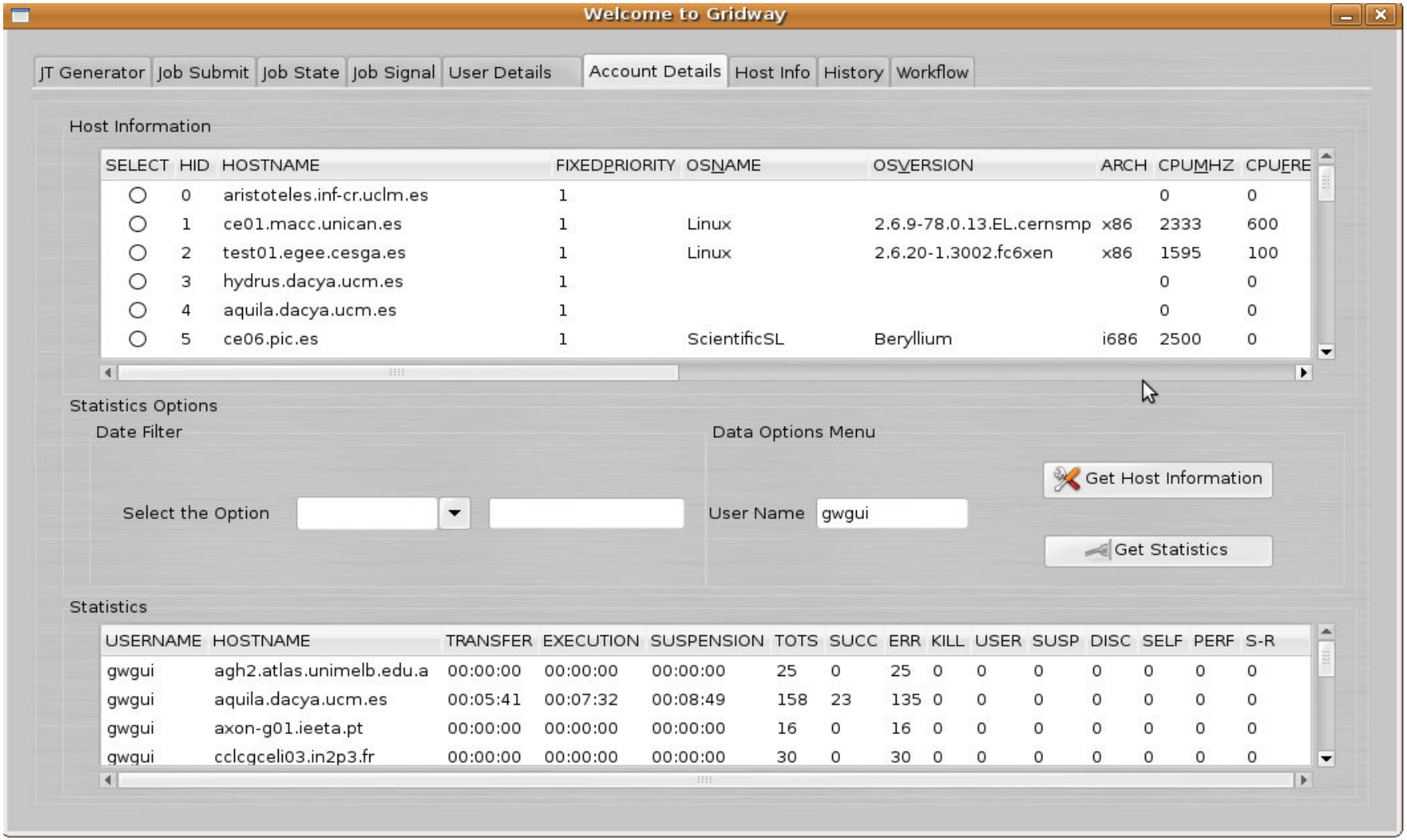
User Information



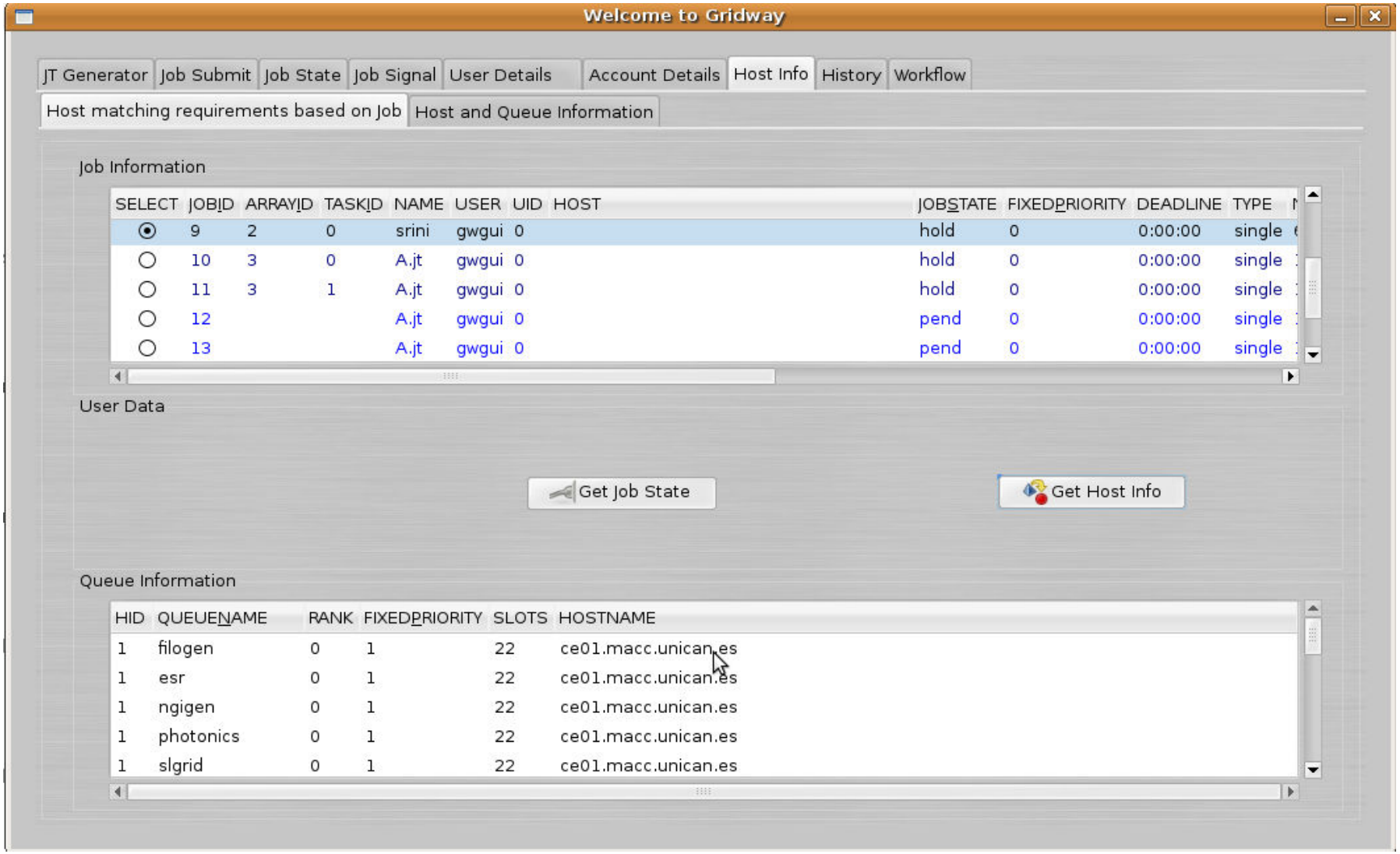
Account Details based on Date Filter



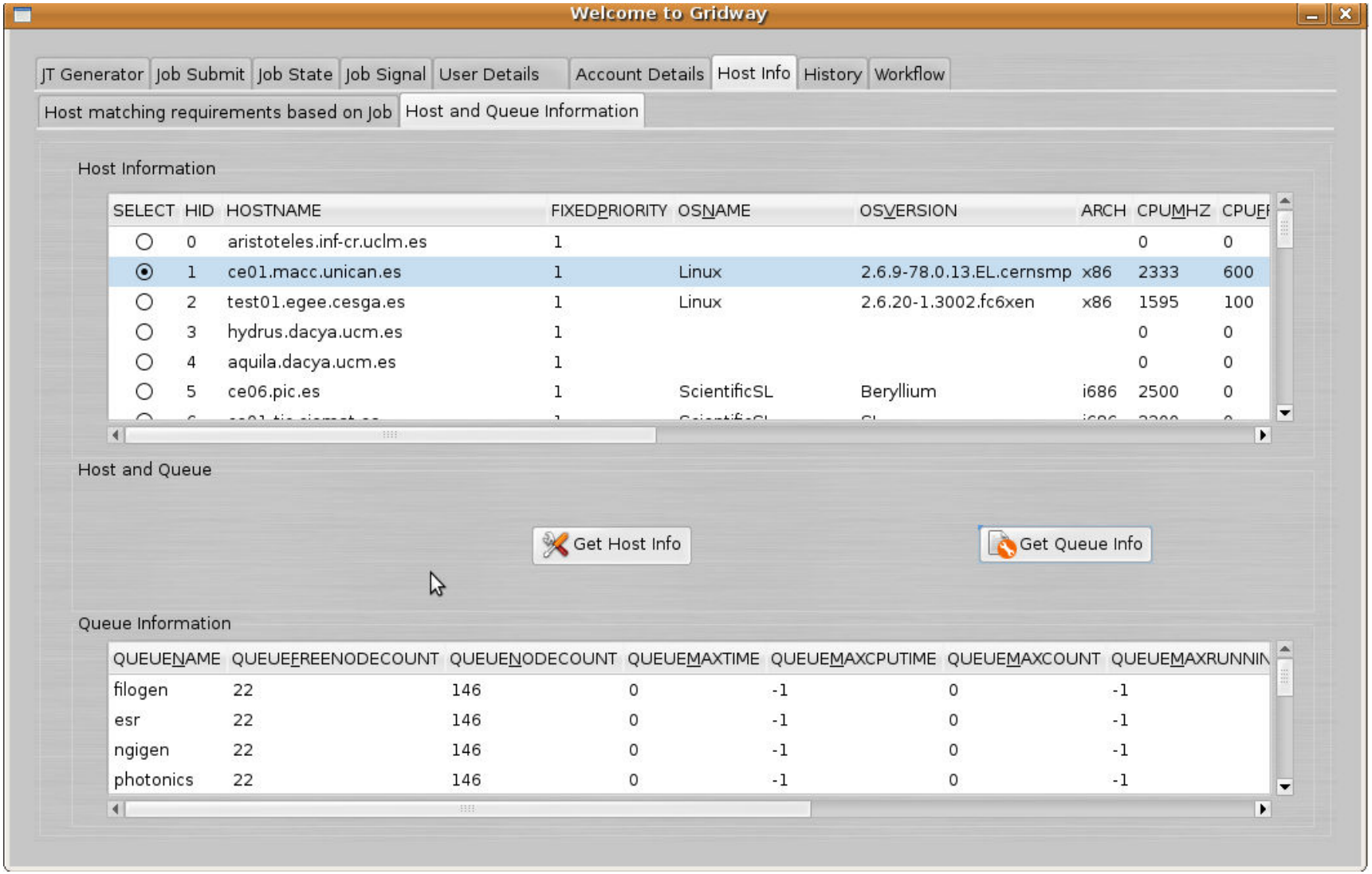
Account Details based on Username



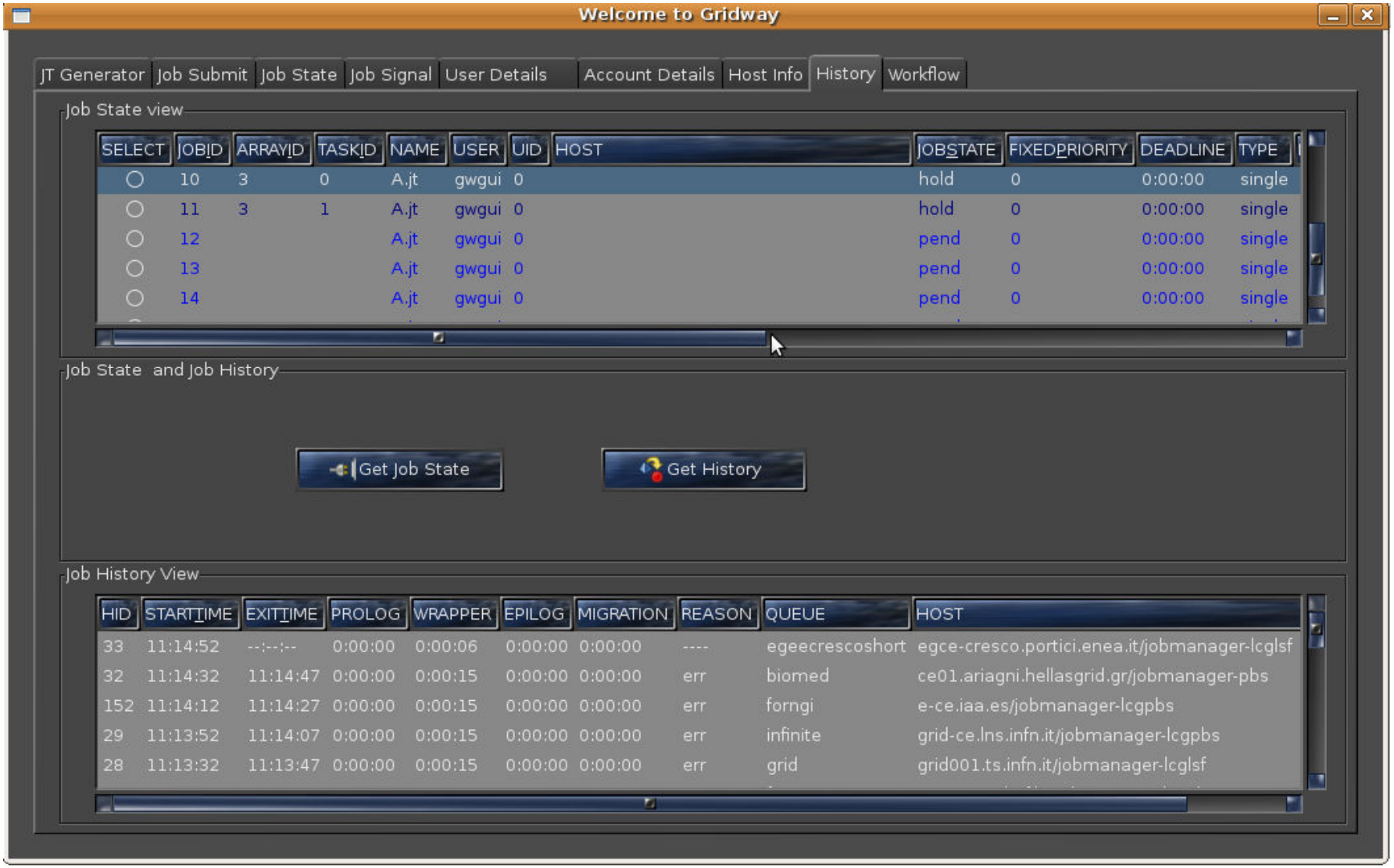
Host matching Job Requirements



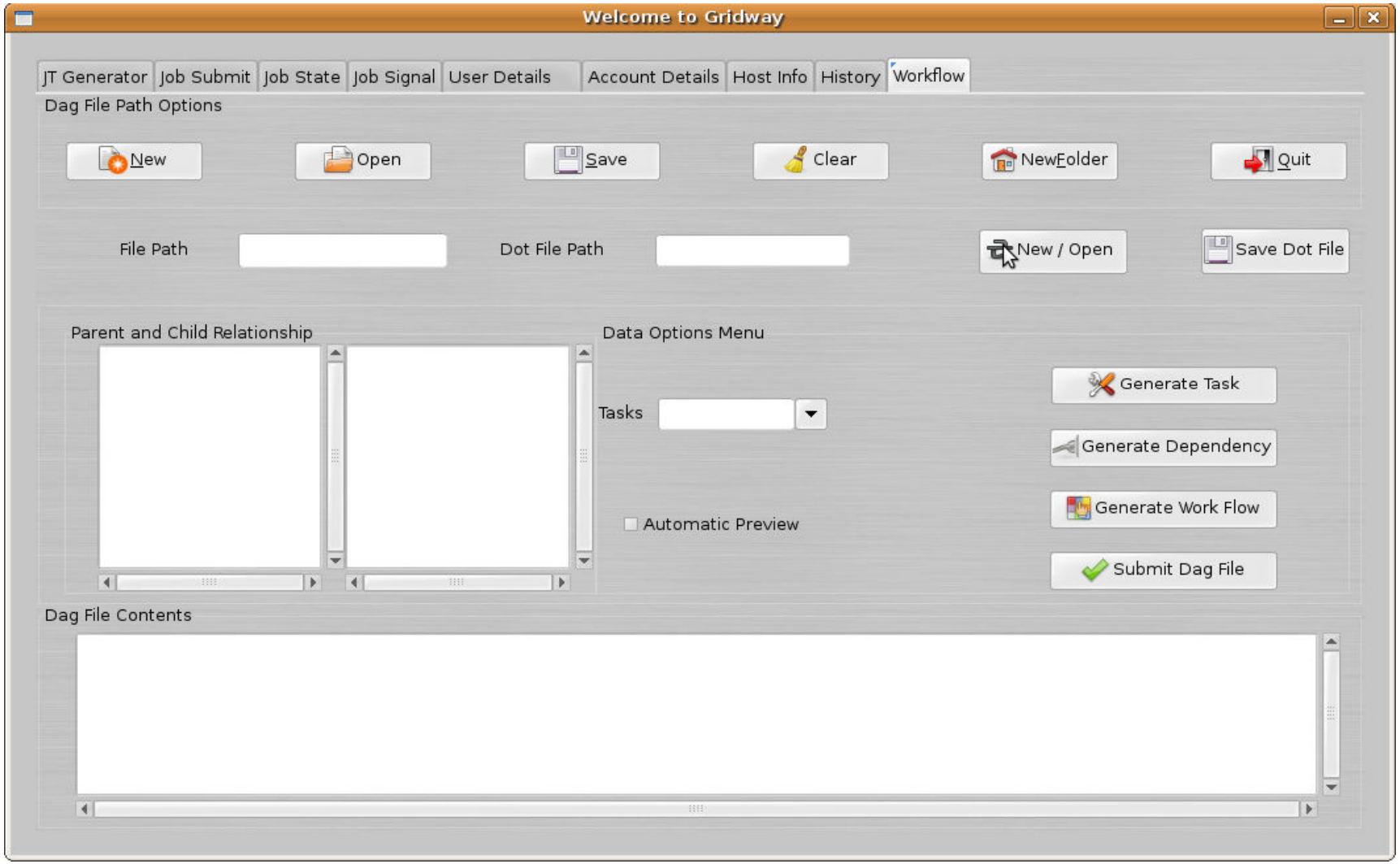
Host and Queue Information



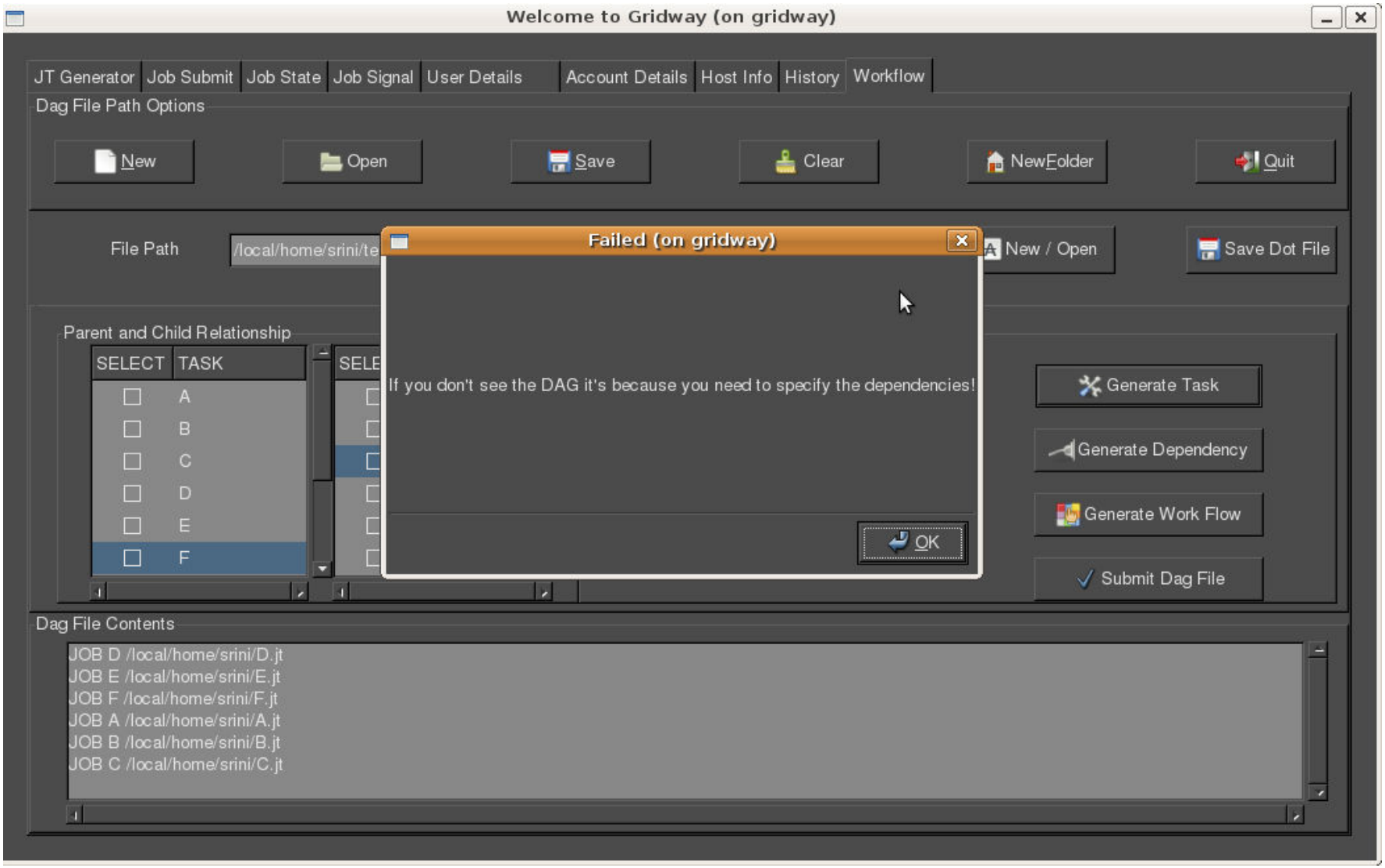
History Information



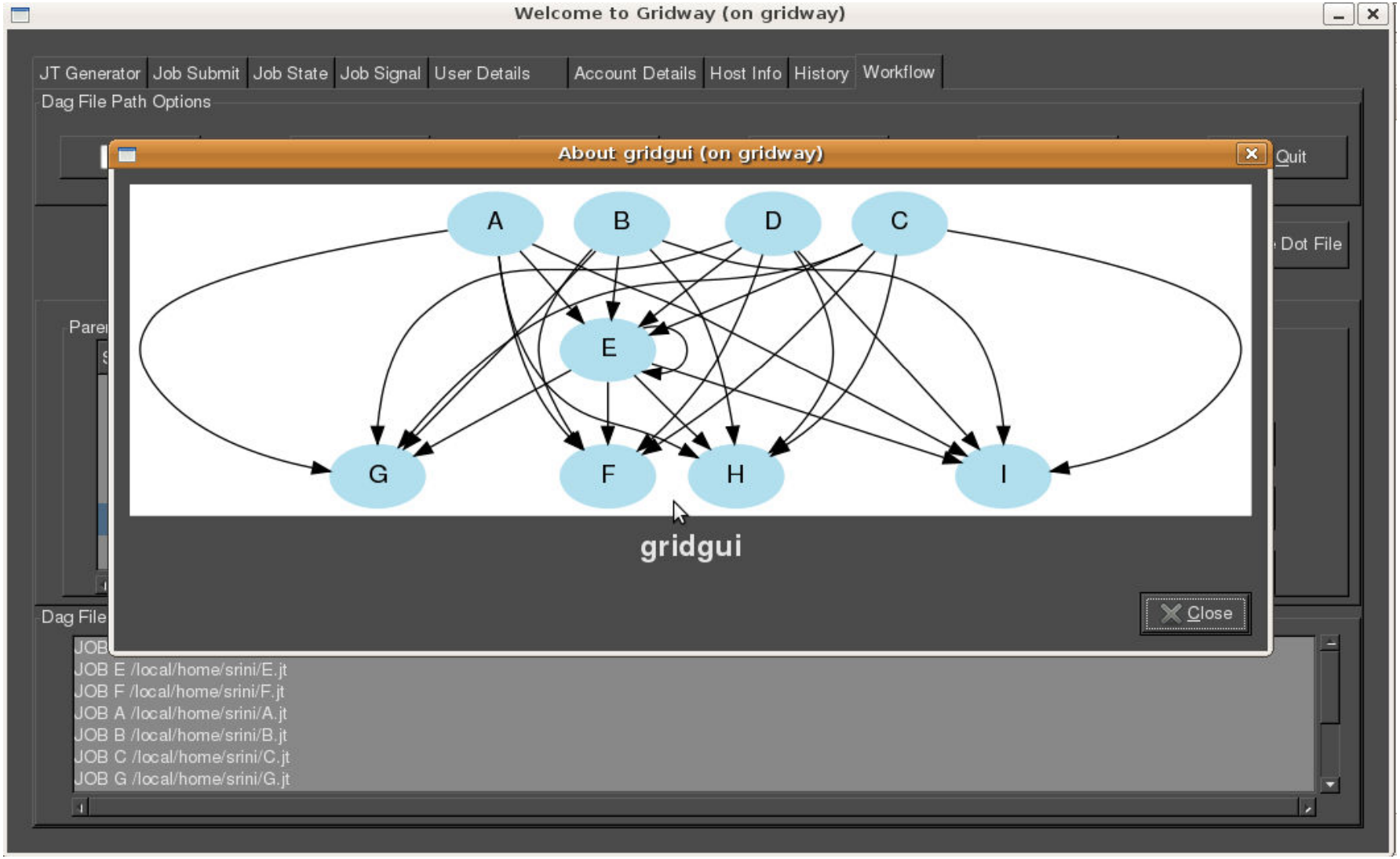
Workflow Composition



Workflow Composition



Workflow Composition



Google Summer of Code Project #2

Google Maps + GridWay

About the Developer

- Carlos Martín Sánchez
- <carlos.martin.sanchez@gmail.com>

- Graduate Student, Computer Science

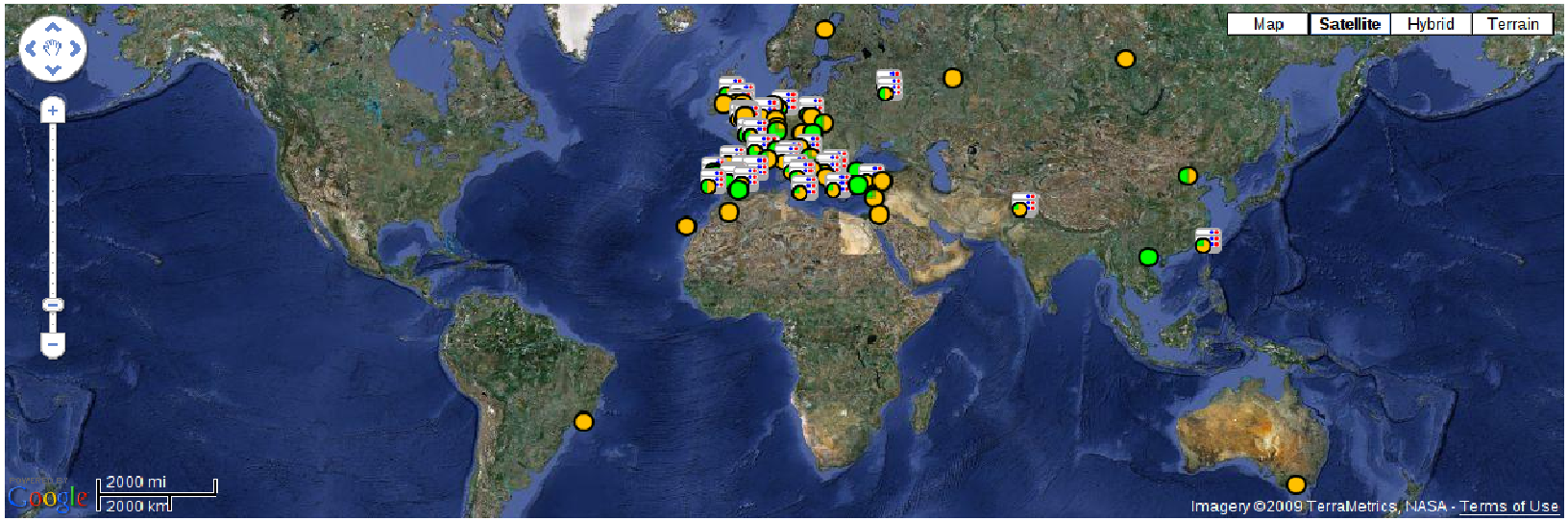
- Universidad Complutense
- de Madrid (UCM), Spain

Idea behind the GridWay GMaps

- **To help users, administrators, project leaders**
  - Control of hosts, jobs and users from a given instance
  - Not using command line interface
  - Fast check of experiment status
- **Enables Geolocalization**
  - Host, job and user monitoring
  - Filtering account statistics and execution history information
  - Real time (update minutely)
- **Provides a snapshot of the grid-health**
  - Different icons depending on % of free slots
  - Understand geopolitical issues, limitations
  - Identify problematic resources

Hosts Tab

Summary | Hosts | Jobs | Users | History | Options | About



Host | Group of hosts | Host with errors

Showing hosts in Gridway system.

Filters

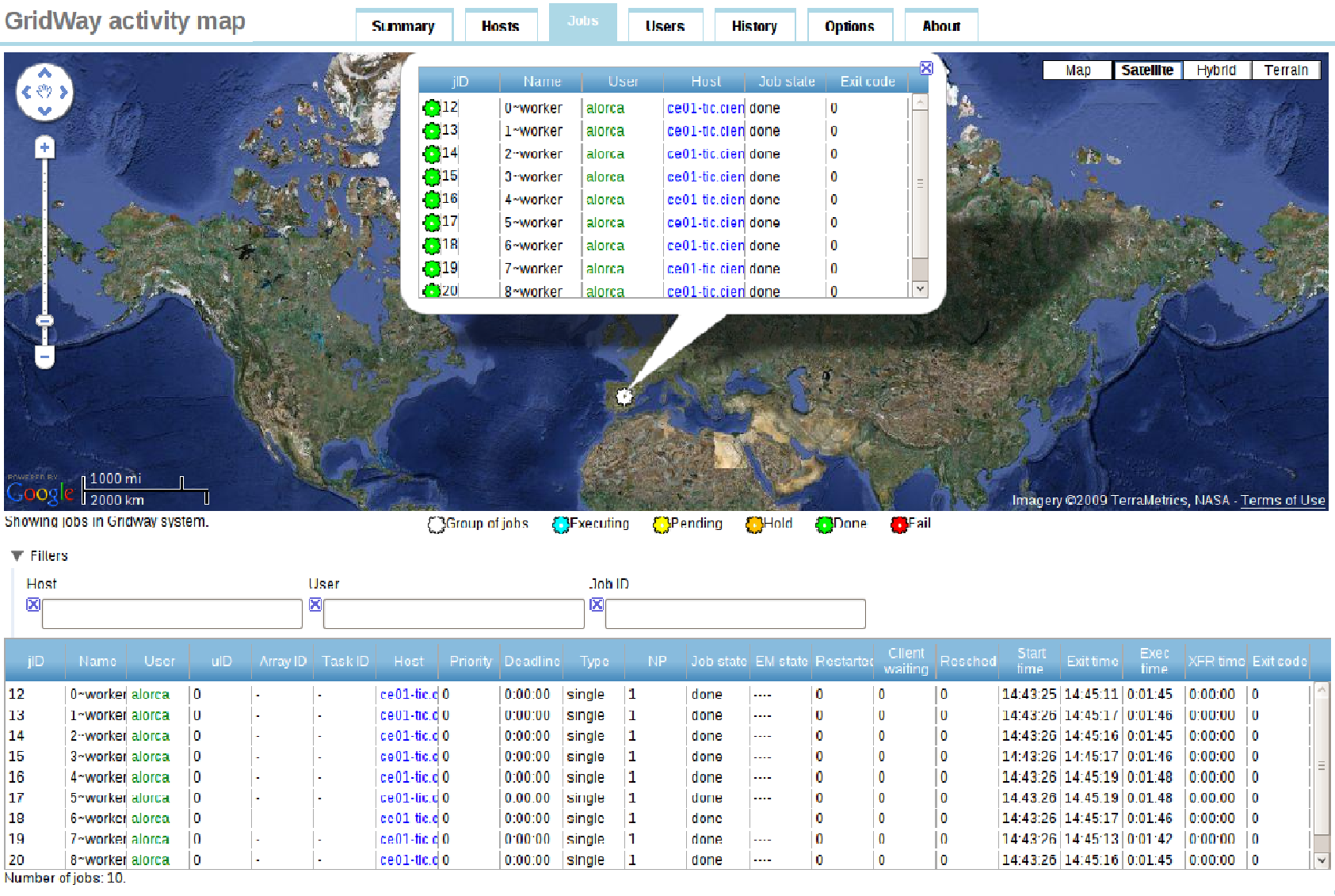
Host | User | Job ID | Virtual organization

Hosts | Queues

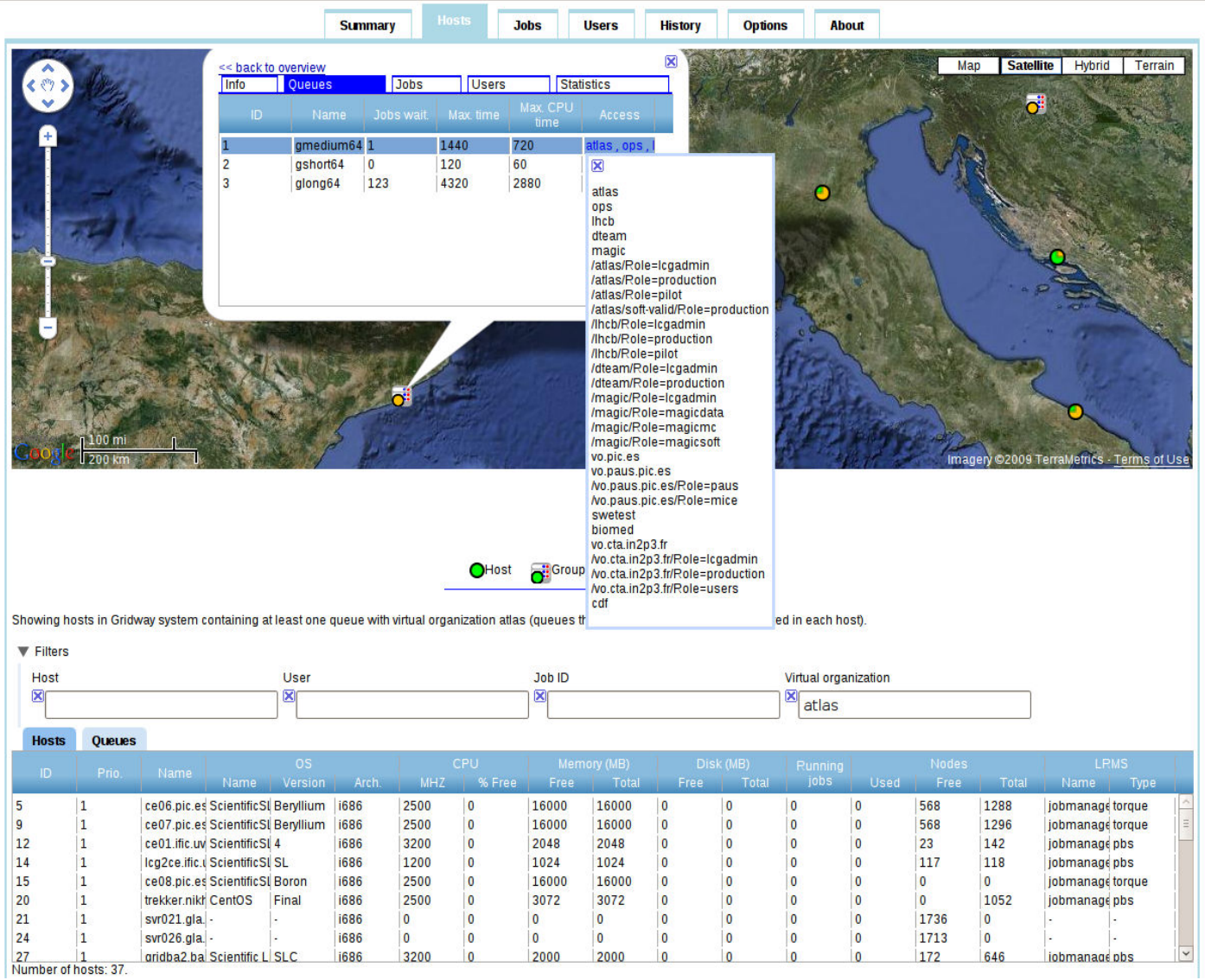
ID	Prio.	Name	OS			CPU		Memory (MB)		Disk (MB)		Running jobs	Nodes			LRMS	
			Name	Version	Arch.	MHZ	% Free	Free	Total	Free	Total		Used	Free	Total	Name	Type
0	1	hydrus.dac	-	-	-	0	0	0	0	0	0	0	0	0	0	-	-
1	1	aquila.dacy	-	-	-	0	0	0	0	0	0	0	0	0	0	-	-
2	1	aristoteles.	-	-	-	0	0	0	0	0	0	0	0	0	0	-	-
3	1	ce01.macc	Linux	2.6.9-78.0.1	x86	2333	600	2639	3951	18014	21643	0	0	22	146	PBS	pbs
4	1	test01.eger	Linux	2.6.20-1.30	x86	1595	96	5	765	7635	10822	0	0	340	340	SGE	sge
5	1	ce06.pic.es	ScientificSL	Beryllium	i686	2500	0	16000	16000	0	0	0	0	599	1296	jobmanage	torque
6	1	ce01-tic.cie	ScientificSL	SL	i686	3200	0	1024	1024	0	0	0	0	148	220	jobmanage	pbs
7	1	ce05.pic.es	ScientificSL	Boron	i686	2500	0	16000	16000	0	0	0	0	38	736	jobmanage	torque
8	1	gridce01.ifc	-	-	i686	0	0	0	0	0	0	0	0	130	729	jobmanage	torque

Number of hosts: 155.

Jobs Tab


GridWay activity map
Summary
Hosts
Jobs
Users
History
Options
About
Map
Satellite
Hybrid
Terrain
jID Name User Host Job state Exit code
12 0~worker alorca ce01-tic.cien done 0
13 1~worker alorca ce01-tic.cien done 0
14 2~worker alorca ce01-tic.cien done 0
15 3~worker alorca ce01-tic.cien done 0
16 4~worker alorca ce01-tic.cien done 0
17 5~worker alorca ce01-tic.cien done 0
18 6~worker alorca ce01-tic.cien done 0
19 7~worker alorca ce01-tic.cien done 0
20 8~worker alorca ce01-tic.cien done 0
1000 mi
2000 km
Imagery ©2009 TerraMetrics, NASA - Terms of Use
Showing jobs in Gridway system.
Group of jobs
Executing
Pending
Hold
Done
Fail
Fillers
Host
User
Job ID
jID Name User uID Array ID Task ID Host Priority Deadline Type NP Job state EM state Restarted Client waiting Resched Start time Exit time Exec time XFR time Exit code
12 0~worker alorca 0 - - ce01-tic.c 0 0:00:00 single 1 done ---- 0 0 0 14:43:25 14:45:11 0:01:45 0:00:00 0
13 1~worker alorca 0 - - ce01-tic.c 0 0:00:00 single 1 done ---- 0 0 0 14:43:26 14:45:17 0:01:46 0:00:00 0
14 2~worker alorca 0 - - ce01-tic.c 0 0:00:00 single 1 done ---- 0 0 0 14:43:26 14:45:16 0:01:45 0:00:00 0
15 3~worker alorca 0 - - ce01-tic.c 0 0:00:00 single 1 done ---- 0 0 0 14:43:26 14:45:17 0:01:46 0:00:00 0
16 4~worker alorca 0 - - ce01-tic.c 0 0:00:00 single 1 done ---- 0 0 0 14:43:26 14:45:19 0:01:48 0:00:00 0
17 5~worker alorca 0 - - ce01-tic.c 0 0:00:00 single 1 done ---- 0 0 0 14:43:26 14:45:19 0:01:48 0:00:00 0
18 6~worker alorca 0 ce01-tic.c 0 0:00:00 single 1 done 0 0 0 14:43:26 14:45:17 0:01:46 0:00:00 0
19 7~worker alorca 0 - - ce01-tic.c 0 0:00:00 single 1 done ---- 0 0 0 14:43:26 14:45:13 0:01:42 0:00:00 0
20 8~worker alorca 0 - - ce01-tic.c 0 0:00:00 single 1 done ---- 0 0 0 14:43:26 14:45:16 0:01:45 0:00:00 0
Number of jobs: 10.

VO-filtering and queue check



Conclusions

- **Fusion Physics is attracting much interest from Grid Application Porting Community**
- **Initial Grid solutions become mature and general**
- **Next generations**
  - Become attracted by Fusion Physics
  - Improve existing solutions
- **Fusion Physics Community benefits from new solutions**

¡Muchísimas Gracias!

Questions?