

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

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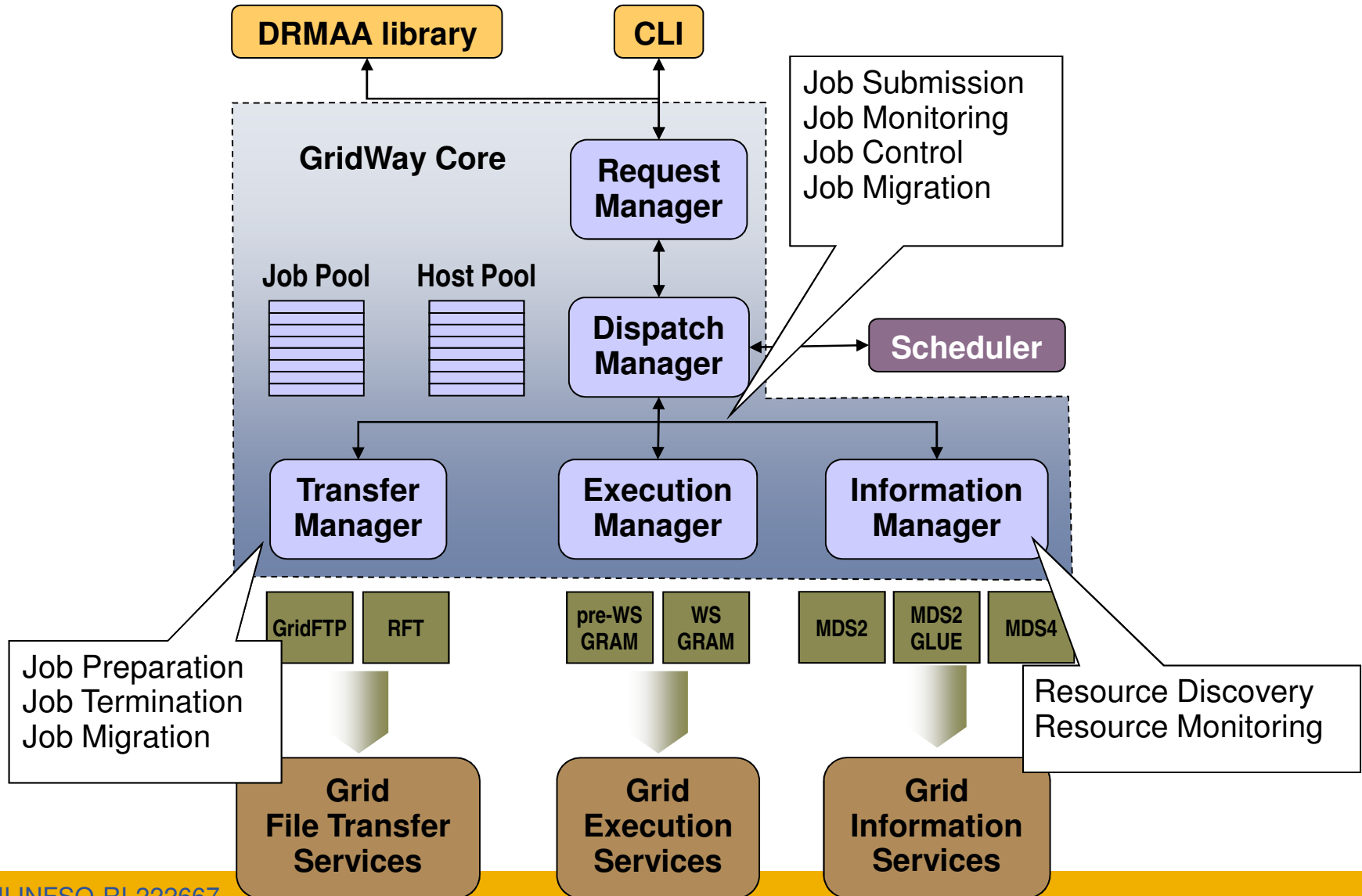
EGEE'09 Conference (Barcelona)
21-25 September 2009

- **Fusion**
 - Clean
 - Alternative method for large scale energy production
 - No CO₂ – 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...

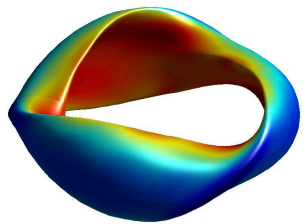
How to port/use an application efficiently?

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

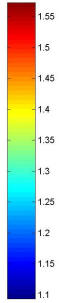
GridWay Internals



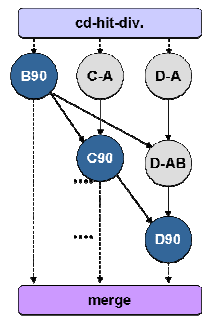
GridWay is being used on EGEE for...



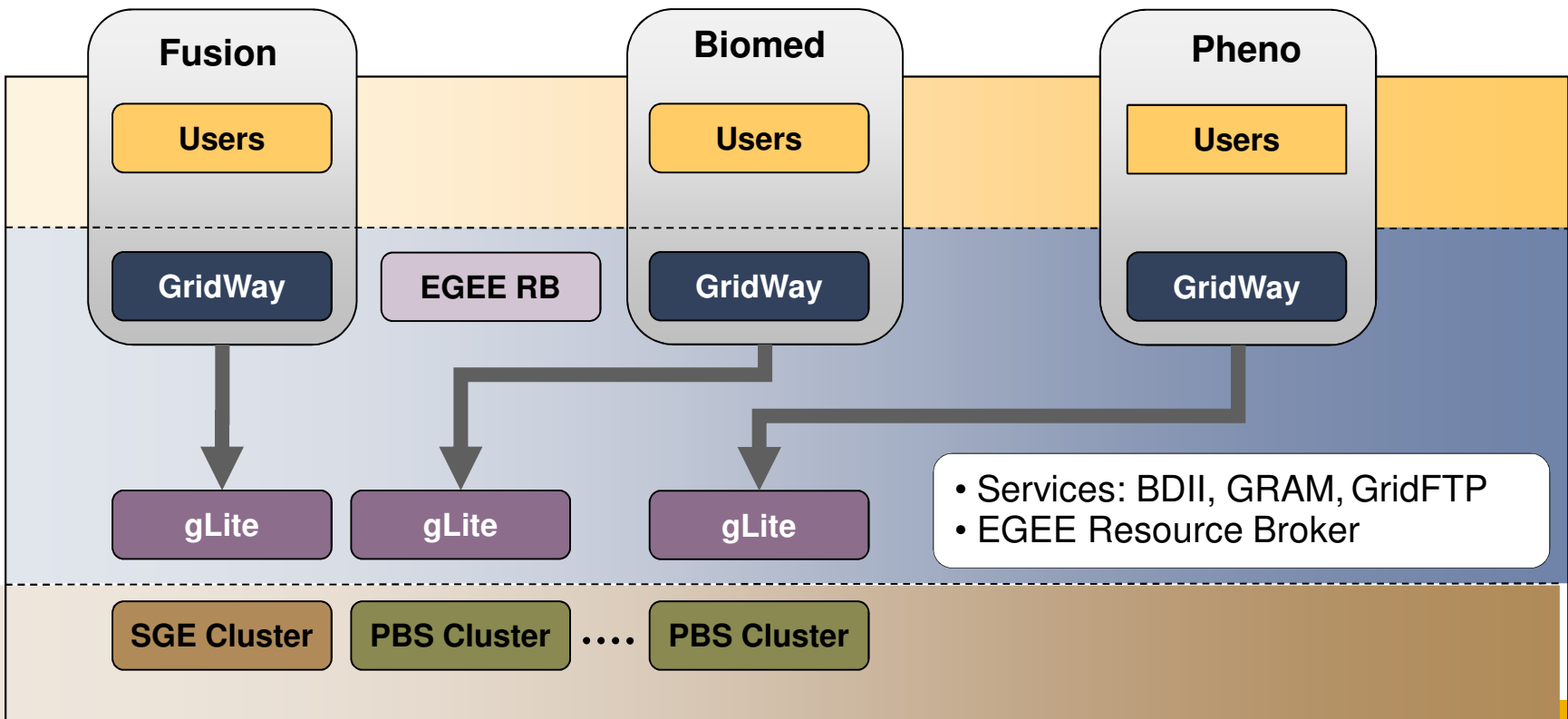
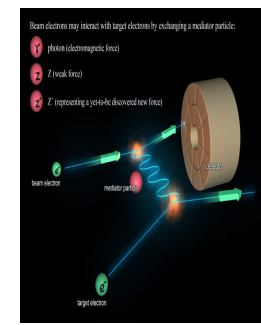
Massive Ray Tracing



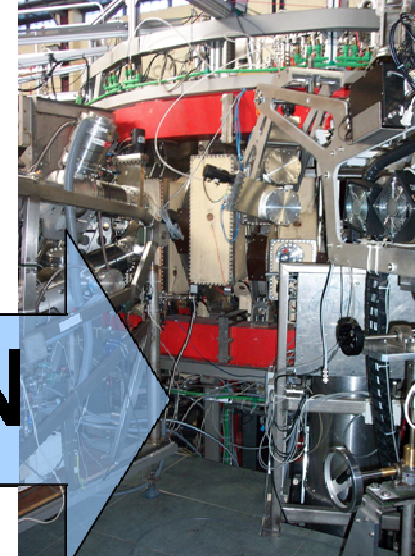
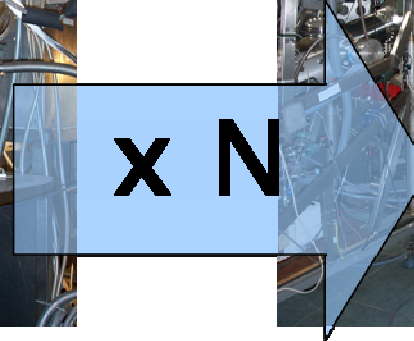
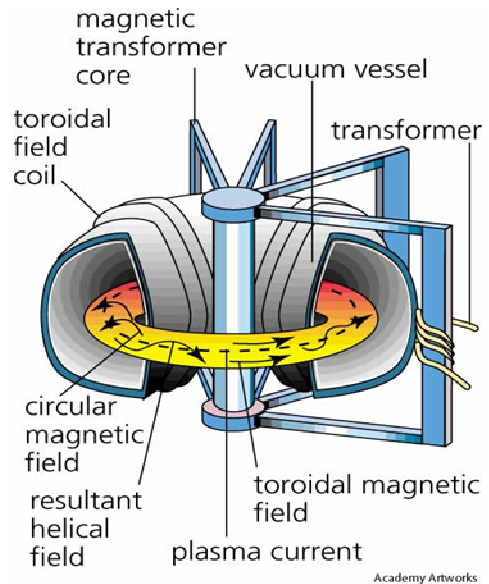
CD-HIT workflow



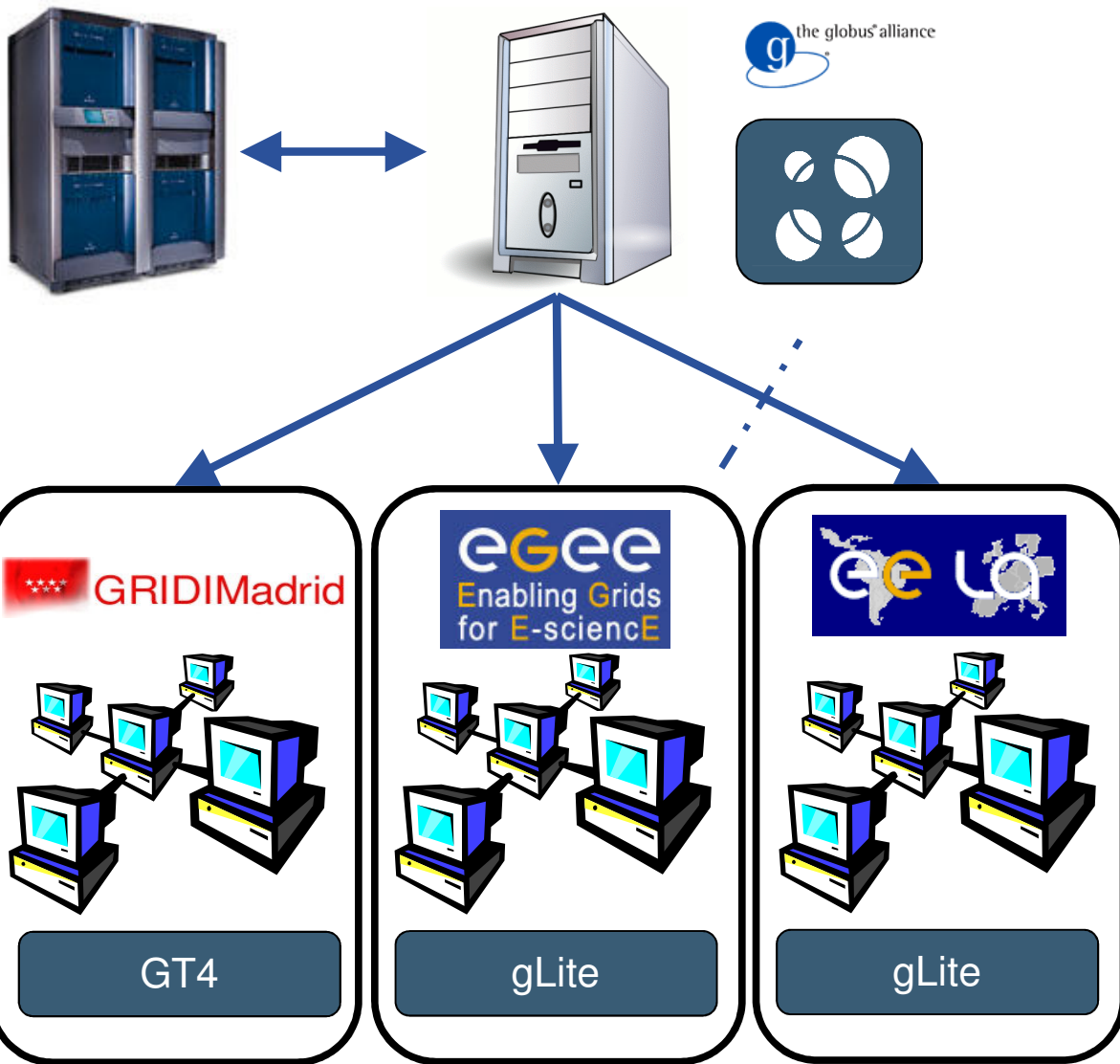
AITALC code Bhabha



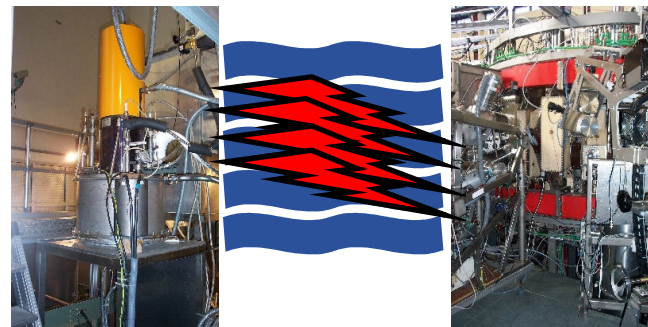
- Services: BDII, GRAM, GridFTP
- EGEE Resource Broker



- **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**



- **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

- 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**



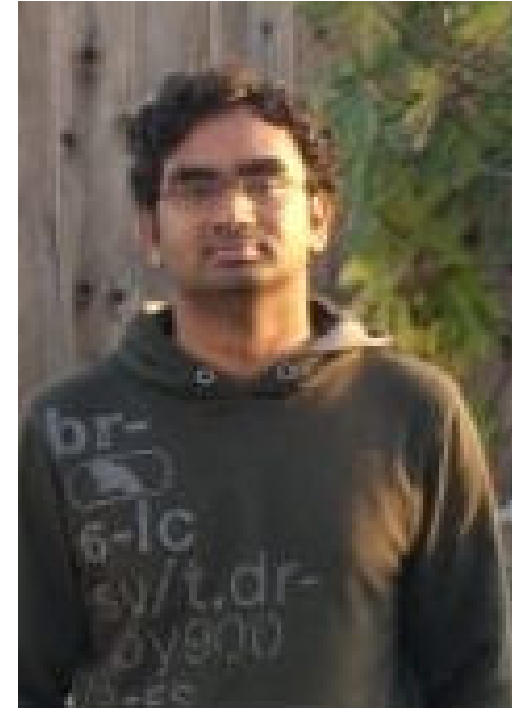
Srinivasan Natarajan

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Graduate Student, Computer Science

California State University

Sacramento (USA)



➤ **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

Welcome to Gridway

JT Generator | Job Submit | Job State | Job Signal | User Details | Account Details | Host Info | History | Workflow

Basic Job Details | Streams, Check Point & Resource | Resource, Scheduling & Performance | Fault & Advanced Job Execution

File Path Information

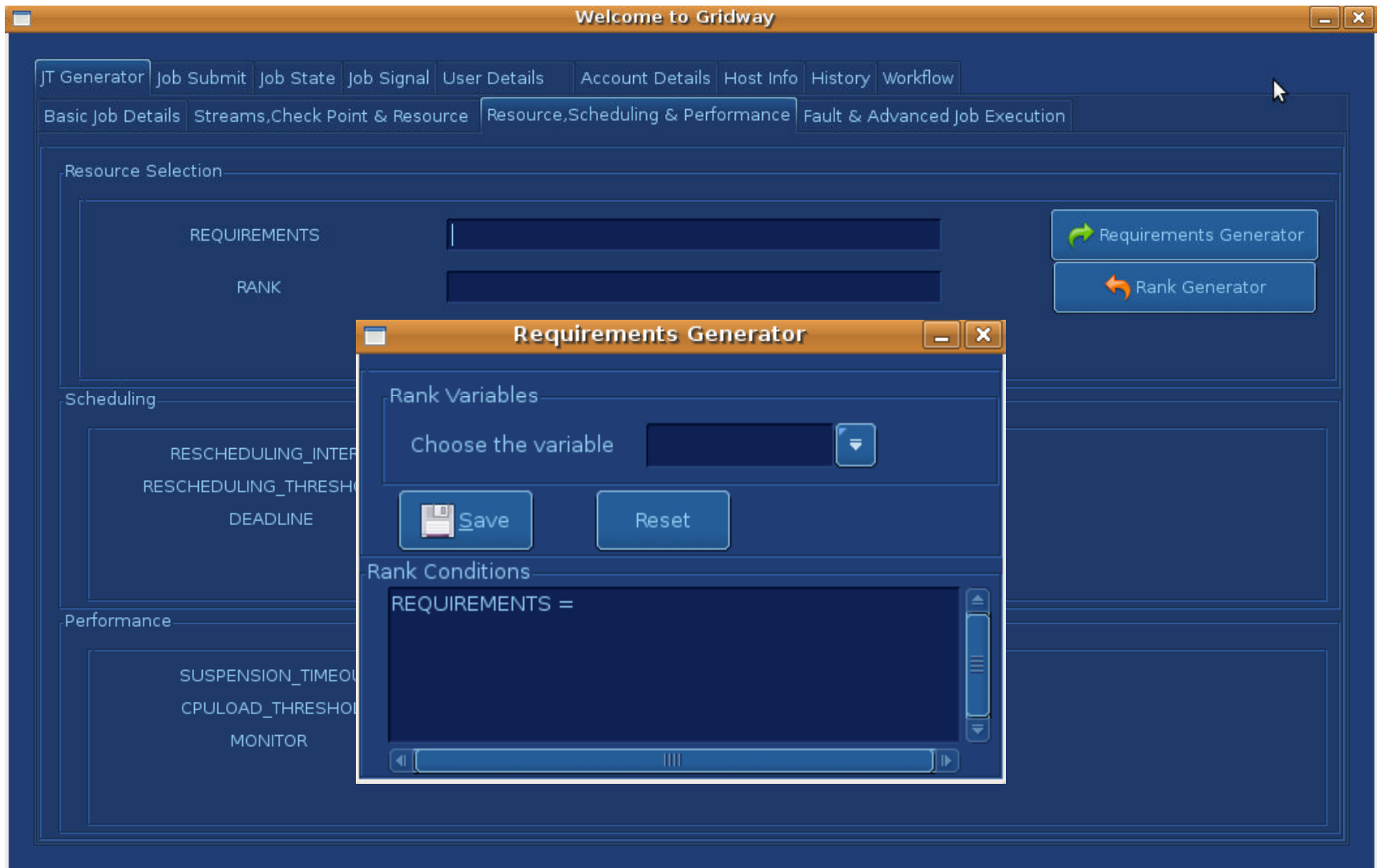
File Path

Generic

NAME

Execution

EXECUTABLE	<input type="text"/>
ARGUMENTS	<input type="text"/>
ENVIRONMENT	<input type="text"/>
TYPE	<input type="text"/>
NP	<input type="text"/>



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Resource Selection

REQUIREMENTS

RANK

Requirements Generator

Rank Generator

Scheduling

RESCHEDULING_INTER

RESCHEDULING_THRESH

DEADLINE

Performance

SUSPENSION_TIMEOU

CPULOAD_THRESHO

MONITOR

Requirements Generator

Rank Variables

Choose the variable

Save

Reset


Rank Conditions

REQUIREMENTS =


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JT File

JT File Path:  Open

Data Options Menu


No of Copies:  Clear Data

 Get Job Data

Dependent Jobs

SELECT	JOBID	ARRAYID	TASKID	NAME	USER	UID	HOST	JOBSTATE	FIXEDPRIORITY	DEADLINE	TYPE	NP
<input type="checkbox"/>	3	0	2	srini	gwgui	0	ce.ui.savba.sk/jobmanager-pbs	pend	0	0:00:00	single	6
<input checked="" type="checkbox"/>	4	0	3	srini	gwgui	0	ce.scope.unina.it/jobmanager-lcgpbs	pend	0	0:00:00	single	6
<input type="checkbox"/>	9	2	0	srini	gwgui	0		hold	0	0:00:00	single	6
<input type="checkbox"/>	10	3	0	A.jt	gwgui	0		hold	0	0:00:00	single	1

Job Submission

 Submit

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Job and Host Information

SELECT	JOBID	ARRAYID	TASKID	NAME
<input type="radio"/>	1	0	0	srini
<input type="radio"/>	2	0	1	srini
<input type="radio"/>	3	0	2	srini
<input type="radio"/>	4	0	3	srini
<input type="radio"/>	9	2	0	srini
<input type="radio"/>	10	3	0	Ajt
<input type="radio"/>	11	3	1	Ajt
<input type="radio"/>	12			Ajt

SELECT	HID	HOSTNAME
<input type="radio"/>	0	aristoteles.inf-cr.uclm.es
<input type="radio"/>	1	ce01.macc.unican.es
<input type="radio"/>	2	test01.egee.cesga.es
<input type="radio"/>	3	hydrus.dacya.ucm.es
<input type="radio"/>	4	aquila.dacya.ucm.es
<input type="radio"/>	5	ce06.pic.es
<input type="radio"/>	6	ce01-tic.ciemat.es
<input type="radio"/>	7	ce07.pic.es

State Options

Generate state based on:
 Job ID
 Array ID
 Host Name
 User ID
 Job State:

JOBID	ARRAYID	TASKID	NAME	USER	UID	HOST	JOBSTATE	FIXEDPRIORITY	DEADLINE	TYPE	NP	EMSTATE
4	0	3	srini	gwgui	0	egeece01.ifca.es/jobmanager-lcgpbs	wrap	0	0:00:00	single	6	fail

Welcome to Gridway

Job and Host Information

SELECT	JOBID	ARRAYID	TASKID	NAME
<input type="radio"/>	1	0	0	srini
<input type="radio"/>	2	0	1	srini
<input type="radio"/>	3	0	2	srini
<input type="radio"/>	4	0	3	srini
<input type="radio"/>	9	2	0	srini
<input type="radio"/>	10	3	0	A.jt
<input type="radio"/>	11	3	1	A.jt
<input type="radio"/>	12			A.jt

SELECT	HID	HOSTNAME
<input type="radio"/>	0	aristoteles.inf-cr.uclm.es
<input type="radio"/>	1	ce01.macc.unican.es
<input type="radio"/>	2	
<input type="radio"/>	3	
<input checked="" type="radio"/>	4	
<input type="radio"/>	5	
<input type="radio"/>	6	
<input type="radio"/>	7	

State Options

Generate state based on Job ID Array ID

ID Job State

Failed

NO matching jobs found:

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Job Information


SELECT	JOBID	ARRAYID	TASKID	NAME	USER	UID	HOST	JOBSTATE	FIXEDPRIORITY	DEADLINE	TYPE	NP	EMS
<input type="checkbox"/>	9	2	0	srini	gwgui	0		hold	0	0:00:00	single	6	----
<input type="checkbox"/>	10	3	0	A.jt	gwgui	0		hold	0	0:00:00	single	1	----
<input type="checkbox"/>	11	3	1	A.jt	gwgui	0		hold	0	0:00:00	single	1	----
<input checked="" type="checkbox"/>	12			A.jt	gwgui	0		pend	0	0:00:00	single	1	----
<input type="checkbox"/>	13			A.jt	gwgui	0		pend	0	0:00:00	single	1	----
<input type="checkbox"/>	14			A.jt	gwgui	0		pend	0	0:00:00	single	1	----
<input type="checkbox"/>	15			B.jt	gwgui	0		pend	0	0:00:00	single	1	----


Signalling Options


Job/Array ID

Generate signal based on Job ID Array ID

Signal Type

Choose the signal HARD KILL 

 Get Job Information

 Generate Signal

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User Data

[Get User Details](#)

User Information

USERID	USERNAME	ACTIVEJOBS	RUNNINGJOBS	IDLE	IDENTITY
0	gwgui	11	4	0	

Execution Manager Driver

MADID	NAME	PID
0	ws	22040
1	prews_nsh	30625

Transfer Manager Driver

MADID	NAME	PID
0	gridftp	30644
1	dummy	30663

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Host Information

SELECT	HID	HOSTNAME	FIXED_PRIORITY	OS_NAME	OS_VERSION	ARCH	CPU_MHZ	CPU_FRE
<input type="radio"/>	0	aristoteles.inf-cr.uclm.es	1				0	0
<input type="radio"/>	1	ce01.macc.unican.es	1	Linux	2.6.9-78.0.13.EL.cernsmp	x86	2333	600
<input type="radio"/>	2	test01.egee.cesga.es	1	Linux	2.6.20-1.3002.fc6xen	x86	1595	100
<input type="radio"/>	3	hydrus.dacya.ucm.es	1				0	0
<input type="radio"/>	4	aquila.dacya.ucm.es	1				0	0
<input type="radio"/>	5	ce06.pic.es	1	ScientificSL	Beryllium	i686	2500	0

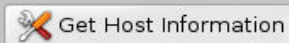
Statistics Options

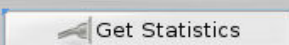
Date Filter:

Data Options Menu

Select the Option:

User Name:





Statistics

USERNAME	HOSTNAME	TRANSFER	EXECUTION	SUSPENSION	TOTS	SUCC	ERR	KILL	USER	SUSP	DISC	SELF	PERF	S-R
alorca	hydrus.dacya.ucm.es	00:00:00	00:00:00	00:00:00	0	0	0	0	0	0	0	0	0	0
gwgui	hydrus.dacya.ucm.es	00:20:03	00:01:31	00:19:23	263	128	135	0	0	0	0	0	0	0
jlvarez	hydrus.dacya.ucm.es	00:00:10	00:00:01	00:00:14	21	2	17	2	0	0	0	0	0	0

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Host Information

SELECT	HID	HOSTNAME	FIXEDPRIORITY	OSNAME	OSVERSION	ARCH	CPUMHZ	CPUPER
<input type="radio"/>	0	aristoteles.inf-cr.uclm.es	1				0	0
<input type="radio"/>	1	ce01.macc.unican.es	1	Linux	2.6.9-78.0.13.EL.cernsmp	x86	2333	600
<input type="radio"/>	2	test01.egee.cesga.es	1	Linux	2.6.20-1.3002.fc6xen	x86	1595	100
<input type="radio"/>	3	hydrus.dacya.ucm.es	1				0	0
<input type="radio"/>	4	aquila.dacya.ucm.es	1				0	0
<input type="radio"/>	5	ce06.pic.es	1	ScientificSL	Beryllium	i686	2500	0

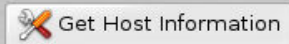
Statistics Options


Date Filter

Select the Option

Data Options Menu

User Name





Statistics

USERNAME	HOSTNAME	TRANSFER	EXECUTION	SUSPENSION	TOTS	SUCC	ERR	KILL	USER	SUSP	DISC	SELF	PERF	S-R
gwgui	agh2.atlas.unimelb.edu.a	00:00:00	00:00:00	00:00:00	25	0	25	0	0	0	0	0	0	0
gwgui	aquila.dacya.ucm.es	00:05:41	00:07:32	00:08:49	158	23	135	0	0	0	0	0	0	0
gwgui	axon-g01.ieeta.pt	00:00:00	00:00:00	00:00:00	16	0	16	0	0	0	0	0	0	0
gwgui	cclcgceli03.in2p3.fr	00:00:00	00:00:00	00:00:00	30	0	30	0	0	0	0	0	0	0

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Host matching requirements based on Job [Host and Queue Information](#)

Job Information

SELECT	JOBID	ARRAYID	TASKID	NAME	USER	UID	HOST	JOBSTATE	FIXEDPRIORITY	DEADLINE	TYPE
<input checked="" type="radio"/>	9	2	0	srini	gwwgui	0		hold	0	0:00:00	single
<input type="radio"/>	10	3	0	A.jt	gwwgui	0		hold	0	0:00:00	single
<input type="radio"/>	11	3	1	A.jt	gwwgui	0		hold	0	0:00:00	single
<input type="radio"/>	12			A.jt	gwwgui	0		pend	0	0:00:00	single
<input type="radio"/>	13			A.jt	gwwgui	0		pend	0	0:00:00	single

User Data

Queue Information

HID	QUEUENAME	RANK	FIXEDPRIORITY	SLOTS	HOSTNAME
1	filogen	0	1	22	ce01.macc.unican.es
1	esr	0	1	22	ce01.macc.unican.es
1	ngigen	0	1	22	ce01.macc.unican.es
1	photonics	0	1	22	ce01.macc.unican.es
1	slgrid	0	1	22	ce01.macc.unican.es

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Host matching requirements based on job **Host and Queue Information**

Host Information

SELECT	HID	HOSTNAME	FIXEDPRIORITY	OSNAME	OSVERSION	ARCH	CPUMHZ	CPUEF
<input type="radio"/>	0	aristoteles.inf-cr.uclm.es	1				0	0
<input checked="" type="radio"/>	1	ce01.macc.unican.es	1	Linux	2.6.9-78.0.13.EL.cernsmp	x86	2333	600
<input type="radio"/>	2	test01.egee.cesga.es	1	Linux	2.6.20-1.3002.fc6xen	x86	1595	100
<input type="radio"/>	3	hydrus.dacya.ucm.es	1				0	0
<input type="radio"/>	4	aquila.dacya.ucm.es	1				0	0
<input type="radio"/>	5	ce06.pic.es	1	ScientificSL	Beryllium	i686	2500	0
<input type="radio"/>	6	ce01.fis.siemat.es	1	ScientificSL	SL	i686	2333	0

Host and Queue

 Get Host Info
  Get Queue Info

Queue Information

QUEUENAME	QUEUEFREENODECOUNT	QUEUENODECOUNT	QUEUEMAXTIME	QUEUEMAXCPU	QUEUEMAXCOUNT	QUEUEMAXRUNNING
filogen	22	146	0	-1	0	-1
esr	22	146	0	-1	0	-1
ngigen	22	146	0	-1	0	-1
photonics	22	146	0	-1	0	-1

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Job State view

SELECT	JOBID	ARRAYID	TASKID	NAME	USER	UID	HOST	JOB_STATE	FIXEDPRIORITY	DEADLINE	TYPE
<input type="radio"/>	10	3	0	A.jt	gwgui	0		hold	0	0:00:00	single
<input type="radio"/>	11	3	1	A.jt	gwgui	0		hold	0	0:00:00	single
<input type="radio"/>	12			A.jt	gwgui	0		pend	0	0:00:00	single
<input type="radio"/>	13			A.jt	gwgui	0		pend	0	0:00:00	single
<input type="radio"/>	14			A.jt	gwgui	0		pend	0	0:00:00	single

Job State and Job History

Job History View

HID	STARTTIME	EXITTIME	PROLOG	WRAPPER	EPILOG	MIGRATION	REASON	QUEUE	HOST
33	11:14:52	--:--:--	0:00:00	0:00:06	0:00:00	0:00:00	----	eggeecrescoshort	egce-cresco.portici.enea.it/jobmanager-lcglsf
32	11:14:32	11:14:47	0:00:00	0:00:15	0:00:00	0:00:00	err	biomed	ce01.ariagni.hellasgrid.gr/jobmanager-pbs
152	11:14:12	11:14:27	0:00:00	0:00:15	0:00:00	0:00:00	err	forngi	e-ce.iaa.es/jobmanager-lcgpbs
29	11:13:52	11:14:07	0:00:00	0:00:15	0:00:00	0:00:00	err	infinite	grid-ce.lns.infn.it/jobmanager-lcgpbs
28	11:13:32	11:13:47	0:00:00	0:00:15	0:00:00	0:00:00	err	grid	grid001.ts.infn.it/jobmanager-lcglsf

Welcome to Gridway

JT Generator Job Submit Job State Job Signal User Details Account Details Host Info History Workflow

Dag File Path Options

New Open Save Clear NewFolder Quit

File Path Dot File Path New / Open Save Dot File

Parent and Child Relationship

Data Options Menu

Tasks ▼

Automatic Preview

Generate Task

Generate Dependency

Generate Work Flow

Submit Dag File

Dag File Contents

Welcome to Gridway (on gridway)

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Dag File Path Options

New | Open | Save | Clear | New Folder | Quit

File Path: /local/home/srini/te

Parent and Child Relationship

SELECT	TASK	SELECT
<input type="checkbox"/>	A	<input type="checkbox"/>
<input type="checkbox"/>	B	<input type="checkbox"/>
<input type="checkbox"/>	C	<input type="checkbox"/>
<input type="checkbox"/>	D	<input type="checkbox"/>
<input type="checkbox"/>	E	<input type="checkbox"/>
<input checked="" type="checkbox"/>	F	<input type="checkbox"/>

Failed (on gridway)

If you don't see the DAG it's because you need to specify the dependencies!

Generate Task

Generate Dependency

Generate Work Flow

Submit Dag File

Dag File Contents

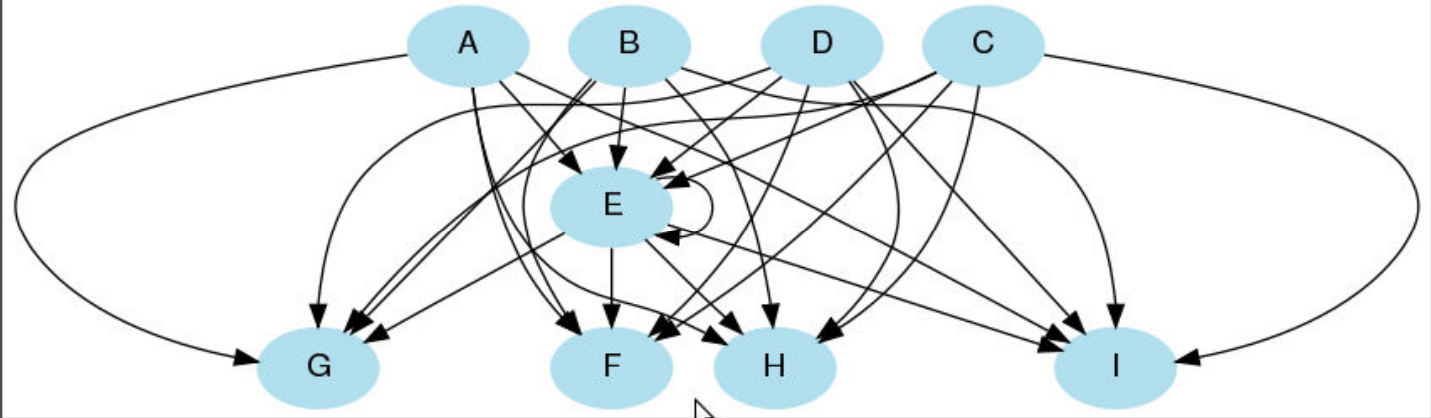
```
JOB D /local/home/srini/D.jt
JOB E /local/home/srini/E.jt
JOB F /local/home/srini/F.jt
JOB A /local/home/srini/A.jt
JOB B /local/home/srini/B.jt
JOB C /local/home/srini/C.jt
```

Welcome to Gridway (on gridway)

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Dag File Path Options

About gridgui (on gridway)



gridgui

Close

Quit

Dot File

Dag File

```

JOB E /local/home/srini/E.jt
JOB F /local/home/srini/F.jt
JOB A /local/home/srini/A.jt
JOB B /local/home/srini/B.jt
JOB C /local/home/srini/C.jt
JOB G /local/home/srini/G.jt
    
```

Google Summer of Code Project #2

Google Maps + GridWay

- **Carlos Martín Sánchez**
- **carlos.martin.sanchez@gmail.com**
- **Graduate Student, Computer Science**
- **Universidad Complutense**
- **de Madrid (UCM), Spain**



Universidad
Complutense
Madrid



- **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

Summary

Hosts

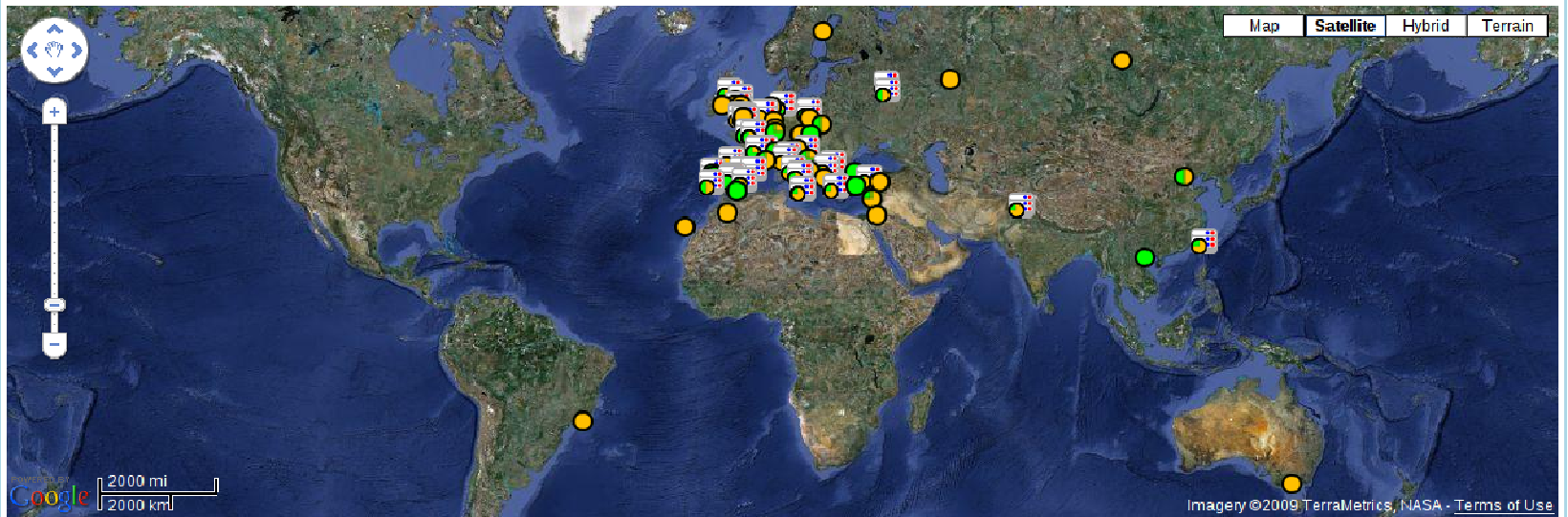
Jobs

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	Jobs	Used	Free	Total	Name	Type
0	1	hydrus.dac	-	-	-	0	0	0	0	0	0	0	0	0	0	-	-
1	1	aquila.dac	-	-	-	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	x86	2333	600	2639	3951	18014	21643	0	0	22	146	PBS	pbs
4	1	test01.egei	Linux	2.6.20-1.30	x86	1595	96	5	765	7635	10822	0	0	340	340	SGE	sge
5	1	ce06.pic.ee	ScientificSL	Beryllium	i686	2500	0	16000	16000	0	0	0	0	599	1296	jobmanag	torque
6	1	ce01.tic.cie	ScientificSL	SL	i686	3200	0	1024	1024	0	0	0	0	148	220	jobmanag	pbs
7	1	ce05.pic.ee	ScientificSL	Baron	i686	2500	0	16000	16000	0	0	0	0	38	736	jobmanag	torque
8	1	aridce01.ift	-	-	i686	0	0	0	0	0	0	0	0	130	729	jobmanag	torque

Number of hosts: 155.

GridWay activity map

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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

Showing jobs in Gridway system.

- Group of jobs
- Executing
- Pending
- Hold
- Done
- Fail

▼ Filters

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	0:01:47	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.

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ID	Name	Jobs wait	Max. time	Max. CPU time	Access
1	gmedium64	1	1440	720	atlas_ops...
2	gshort64	0	120	60	
3	glong64	123	4320	2880	

Map Satellite Hybrid Terrain

Showing hosts in Gridway system containing at least one queue with virtual organization atlas (queues th... ed in each host).

▼ 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	Jobs	Used	Free	Total	Name	Type
5	1	ce06.pic.es	ScientificS	Beryllium	i686	2500	0	16000	16000	0	0	0	0	568	1288	jobmanag	torque
9	1	ce07.pic.es	ScientificS	Beryllium	i686	2500	0	16000	16000	0	0	0	0	568	1296	jobmanag	torque
12	1	ce01.ific.uv	ScientificS	4	i686	3200	0	2048	2048	0	0	0	0	23	142	jobmanag	pbs
14	1	lcg2ce.ific.	ScientificS	SL	i686	1200	0	1024	1024	0	0	0	0	117	118	jobmanag	pbs
15	1	ce08.pic.es	ScientificS	Boron	i686	2500	0	16000	16000	0	0	0	0	0	0	jobmanag	torque
20	1	trekker.nik	CentOS	Final	i686	2500	0	3072	3072	0	0	0	0	0	1052	jobmanag	pbs
21	1	svr021.gla.	-	-	i686	0	0	0	0	0	0	0	0	1736	0	-	-
24	1	svr026.gla.	-	-	i686	0	0	0	0	0	0	0	0	1713	0	-	-
27	1	oridba2.ba	Scientific L	SLC	i686	3200	0	2000	2000	0	0	0	0	172	646	jobmanag	pbs

Number of hosts: 37.

- **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?**