



# *GSI Computing infrastructure & PANDA Grid Status*

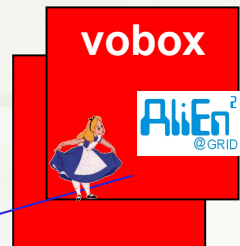
*Kilian Schwarz*  
SC, GSI Darmstadt

# GSI Grid Cluster - present status

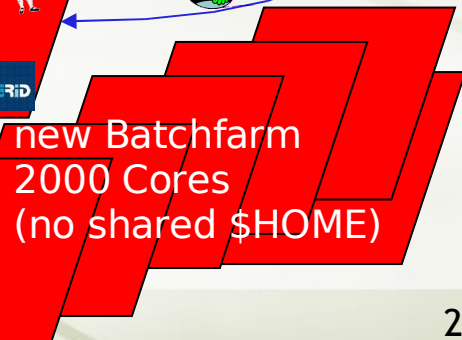
Internet: 1 Gbps



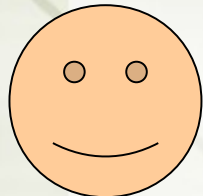
Platform LSF®



LINVA Grid Engine



PROOF/ Batch



GSI

Grid Engine

10000 Cores  
3 PB Lustre  
Infiniband  
computing + storage  
in same place

RZ 4  
2012

RZ 2  
2007

# Ebene 10

Parkplatz

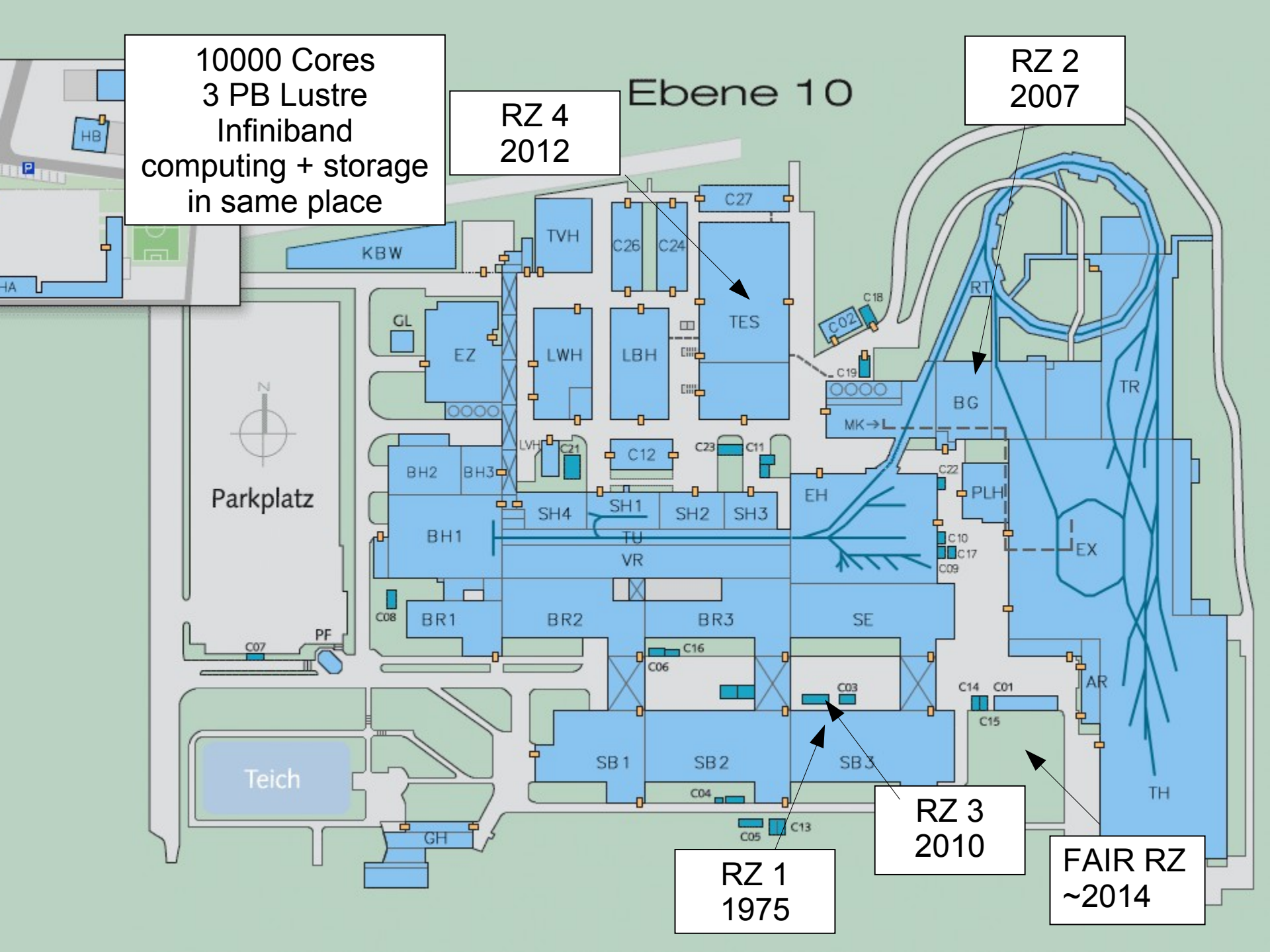


Teich

RZ 1  
1975

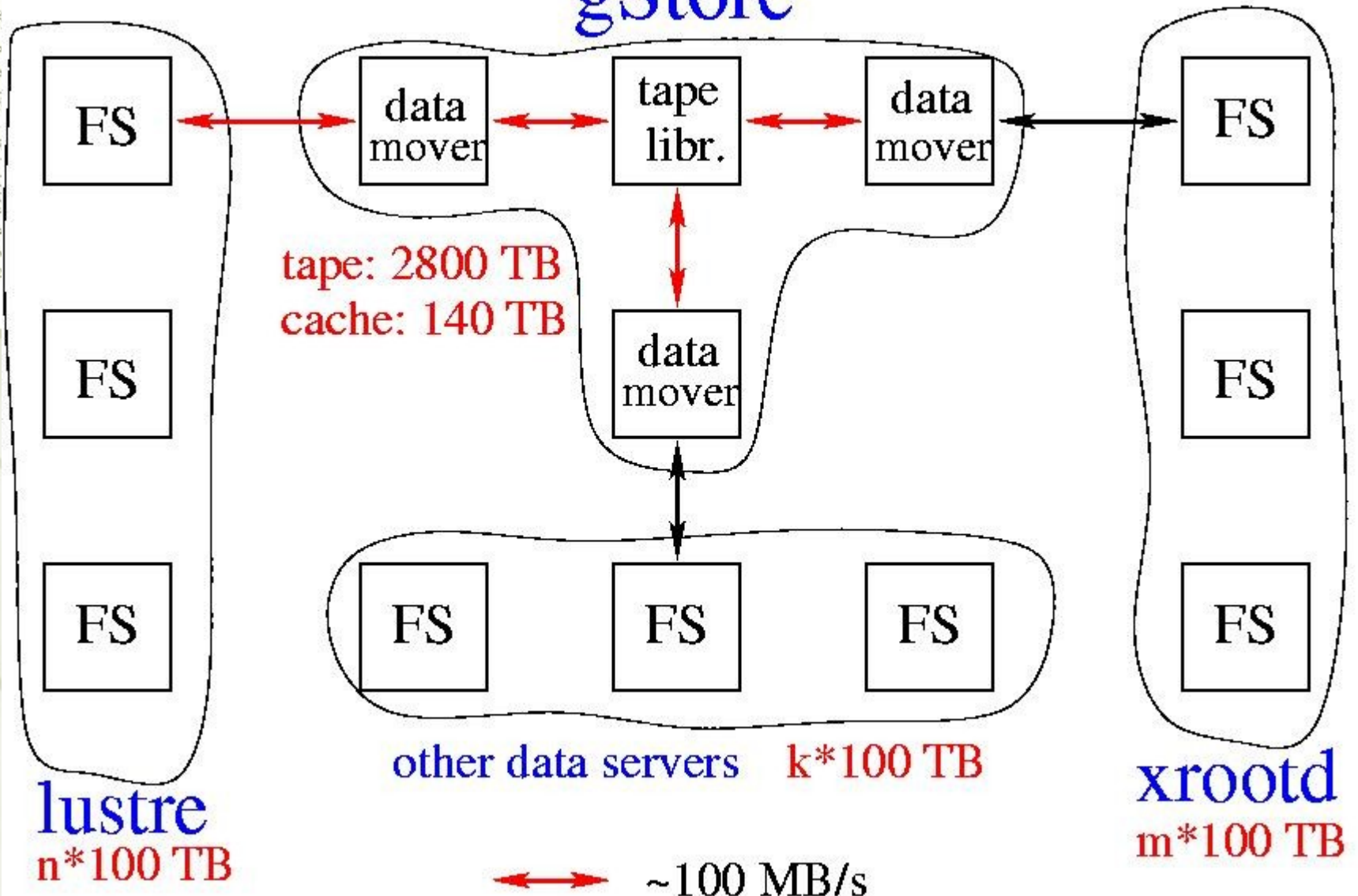
RZ 3  
2010

FAIR RZ  
~2014



# *gStore: storage overview*

## gStore





# *What is PANDA Grid ?*

**PANDA Grid is now:**

- ✦ The first up-and-running PANDA experiment component
- ✦ The infrastructure of PANDA offline computing
- ✦ A test bench for PandaRoot

**One now can:**

- Run simulations and other production jobs
- Test latest software
- Store, analyse, and share data with the whole PANDA Grid community



## *Aim, features, issues*

- The aim is to provide a seamlessly integrated solution for physics simulation, reconstruction and analysis: **middleware+software+data management**
- AliEn provides advanced data production tools: job splitting and merging, catalogue tags and triggers, file collections, automated data replication to multiple SEs
- MonALISA integration layer allows monitoring, supervision tools, command mechanisms for easy administration
- Invites close communication between sites/subgroups
- Continuous improvement via hands-on workshops and Data Challenges, and soon ‘continuous production’ mode
- **Area that needs improvement: data transfer and I/O**

Total: 14 sites (3 LCG-type) 800-1200 CPUs

## Map of sites



### Changes::

- Pavia
- + Orsay
- + USJR
- (+ ASTI, Manila, created new cluster for PandaGrid usage)

GSI, November 2011



# Last workshop

## AliEn Developers Week PANDA Grid Workshop

Intro

Description

Registration

Programme

Travel Info

Accommodation

Participants

Photos

12<sup>th</sup> PANDA Grid Workshop and 2<sup>nd</sup> AliEn Developers Week, Münchweiler an der Alsenz,  
Germany, September 19 - 23, 2011

organised by  
GSI Darmstadt

co-funded by HI Mainz !!!  
decision: AliEn Developers Week and  
PandaGrid workshop in conjunction  
twice a year !!!

...ing together grid  
administrators and software developers in an informal  
setting, involving open discussions. The focus will  
include grid maintenance and monitoring and data  
production with PandaRoot.

### Organising committee:

Kilian Schwarz (GSI),  
Dan Protopopescu (Glasgow)



### Contact person:

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Tel: phone: +49-6159-71-2076  
Fax: +49-6159-71-2986

### Address:

Landidyll Hotel Klostermühle,  
Münchweiler an der Alsenz, Germany  
<http://www.klostermuehle.com>





## *Achievements at last workshop*

- ★ Upgrade of central services and all sites to AliEn v2.20

- ★ features:

- MonaLisa cache service, single database for catalogue, no PackMan site service, Memory limits on jobs

- ★ We were working on:

- ★ file removal, improved documentation, duplication of central services, ticketing system, ...



## *Backup of central services at GSI and Juelich*

- ★ A backup instance of LDAP (GSI) and MonaLisa (Juelich) has been instantiated.
- ★ Backup MySQL DB has been prepared. MySQL allows several slave Dbs, e.g. 1 at GSI. The slave DB is supposed to stay in sync with the main DB at Glasgow. At some point the slave DB could become the main DB
- ★ Corresponding hardware has been bought at GSI and Juelich

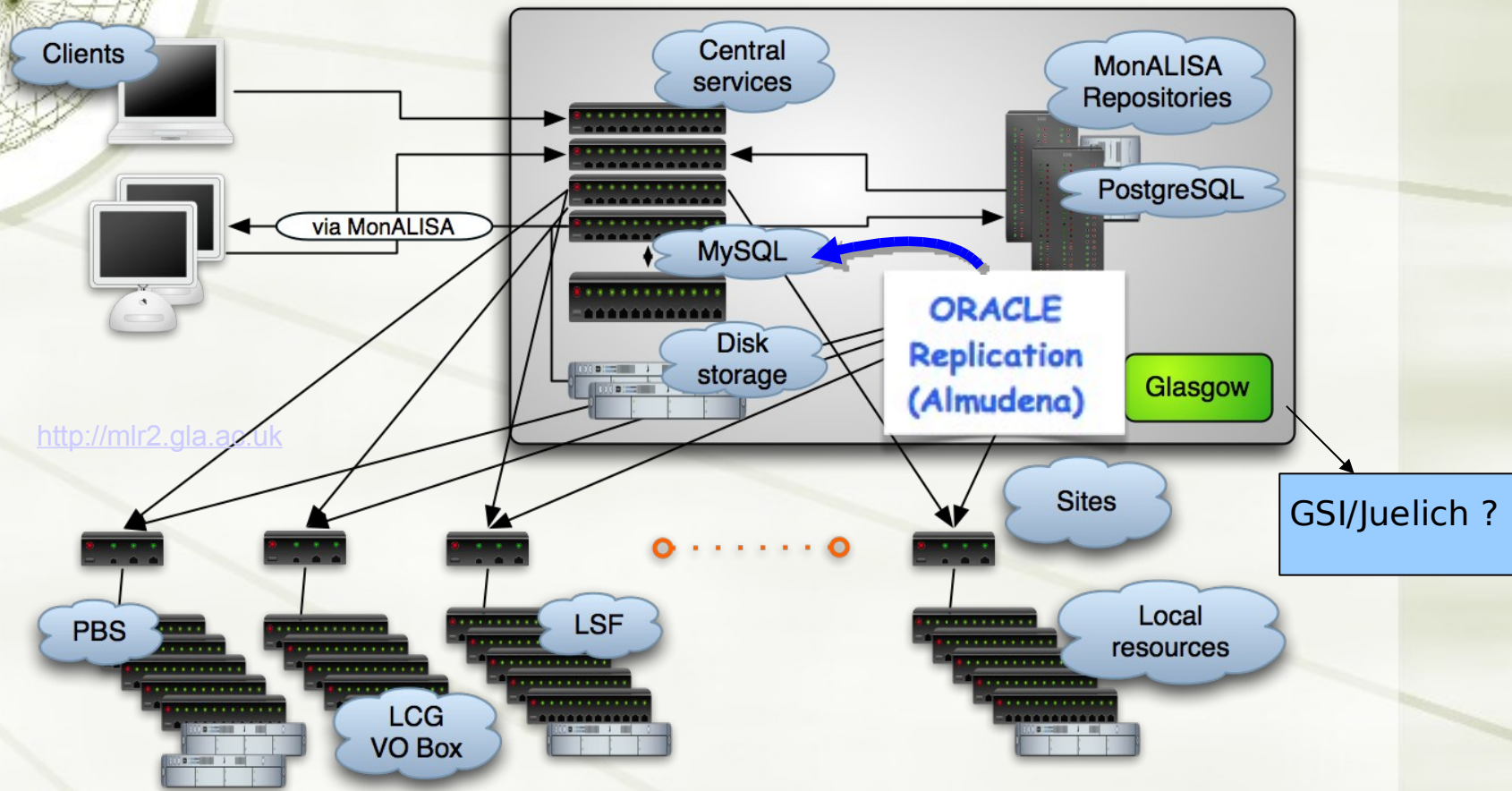
# Sites & services

PANDA Grid Machines

	VOBox		AliEn services					Proxy
Site	Machine	AliEn version	ML	CE	PackMan	CM	CMreport	timeleft
1. Bucharest	panda01.nipne.ro	v2-20.10						1d 22:16
2. Dubna	lxpanda.jinr.ru	v2-20.10						28d 22:57
3. Glasgow_CE1	ce1.physics.gla.ac.uk	v2-20.10						3d 11:54
4. Glasgow_CE2	ce2.physics.gla.ac.uk	v2-20.10			-			3d 11:53
5. Glasgow_SE1	se1.physics.gla.ac.uk	v2-17.61		-	-	-	-	13:56
6. GridServer	panda.gla.ac.uk	v2-20.4		-				10:03
7. GSI	lxgrid8.gsi.de	v2-20.14						2d 6:38
8. GSI_SUT	203.158.7.193	v2-20.14						20d 9:11
9. GSI_USJR	61.9.87.219		-	-	-	-	-	-
10. Juelich	ikp642.ikp.kfa-juelich.de	v2-20.10						1d 8:47
11. KVI	kvit14.kvi.nl	v2-20.10						11:57
12. KVI-2G	panda.grid.rug.nl		-	-	-	-	-	-
13. Orsay-2G	ipnvobox-panda.in2p3.fr	v2-20.10						-
14. Torino	pandafarm01.to.infn.it	v2-20.11					-	4d 1:11
15. Torino-2G	pandabox.to.infn.it	v2-20.10					-	1d 23:59
16. Vienna	smigrid02.smi.oeaw.ac.at	v2-20.10						11:14

http

# PANDA Grid Structure



# Data storage

Almost all Storage Elements migrated to xrootd  
+ 300,000 files compared to last year

Storage elements

Properties		Xrootd info					Functional tests					Last day tests	
SE Name	AliEn Name	Type	No. of files	Size	Used	Free	add	ls	get	whereis	rm	Last OK test	OK
1. Bucharest - SE2	PANDA::Bucharest::SE2	File	211,161	1.789 TB	1.76 TB	30.02 GB						09.12.2011 15:33	48
2. Dubna - SE2	PANDA::Dubna::SE2	File	137,699	6.821 TB	3.085 TB	3.736 TB						09.12.2011 15:37	46
3. Glasgow - RAID0	PANDA::Glasgow::RAID0	File	273,605	1.343 TB	73.5 GB	1.271 TB						09.12.2011 15:35	46
4. Glasgow - SE1	PANDA::Glasgow::SE1	File	263,201	0	0	0	The ...	Last...	Last...	Last...	Last...	29.11.2011 02:36	0
5. GSI - FILE	PANDA::GSI::FILE	File	64,911	-	-	-	The ...	Last...	Last...	Last...	Last...	12.09.2011 08:35	0
6. GSI - VIRTUAL2	PANDA::GSI::VIRTUAL2	File	351,724	2.19 PB	1.76 PB	440.2 TB						09.12.2011 15:37	44
7. GSI_SUT - FILE	PANDA::GSI_SUT::FILE	File	1	-	-	-	The ...	Last...	Last...	Last...	Last...	12.09.2011 08:36	0
8. Juelich - SE2	PANDA::Juelich::SE2	File	60,530	687.5 GB	430 GB	257.5 GB						09.12.2011 15:37	46
9. KVI - FILE	PANDA::KVI::FILE	File	427,273	11.25 TB	8.64 TB	2.61 TB						09.12.2011 15:33	46
10. Orsay - FILE	PANDA::Orsay::FILE	File	620	-	-	-	The ...	Last...	Last...	Last...	Last...	08.07.2011 12:33	0
11. Torino - FILE	PANDA::Torino::FILE	File	196,582	8.954 TB	1.045 TB	7.909 TB						09.12.2011 16:33	48
12. Torino - SE2	PANDA::Torino::SE2	File	71,219	132.4 GB	96.76 GB	35.64 GB						09.12.2011 16:34	49
13. UIBK - SE2	PANDA::UIBK::SE2	File	2,167	-	-	-	The ...	Last...	Last...	Last...	Last...	15.04.2011 04:37	0
14. Vienna - SE2	PANDA::Vienna::SE2	File	45,161	5.28 TB	2.546 TB	2.734 TB						09.12.2011 15:32	48
<b>Total</b>			<b>2,105,854</b>	<b>2.225 PB</b>	<b>1.777 PB</b>	<b>458.8 TB</b>							<b>421</b>

# Data transfer (room for significant improvement)

**Transfer requests (add new request)**

ID	Path	Target SE	Status	Progress	Files	Total size	Started	Ende
37.	PANDA::Orsay::FILE	PANDA::GSI::VIRTUAL2	Done	<div style="width: 100%; height: 10px; background-color: gray;"></div>	0		26 Oct 2011 16:25	26 Oct 2011
36.	PANDA::Orsay::FILE	PANDA::GSI::VIRTUAL2	Done	<div style="width: 100%; height: 10px; background-color: gray;"></div>	0		26 Oct 2011 13:18	26 Oct 2011
35.	/panda/user/k/kschwarz/mirortests/gsvirt2	PANDA::BUCHAREST::SE2	Error	<div style="width: 100%; height: 10px; background-color: red;"></div>	1	100 MB	16 Feb 2011 10:47	31 May 2011
34.	PANDA::GSI::FILE	PANDA::GSI::VIRTUAL2	Error	<div style="width: 100%; height: 10px; background-color: red;"></div>	6999	267.8 GB	03 Dec 2010 14:26	10 Jun 2011
33.	/panda/user/p/pbarserv/alien-tests/my2gigrand1-neu	PANDA::DUBNA::SE2	Error	<div style="width: 100%; height: 10px; background-color: red;"></div>	1	2 GB	19 Oct 2010 19:17	31 May 2011
32.	PANDA::Dubna::file	PANDA::DUBNA::SE2	Error	<div style="width: 100%; height: 10px; background-color: red;"></div>	248	9.003 GB	27 May 2010 09:52	27 May 2011
31.	PANDA::Dubna::file	PANDA::DUBNA::SE2	Error	<div style="width: 100%; height: 10px; background-color: red;"></div>	248	9.003 GB	26 May 2010 14:43	26 May 2011
30.	PANDA::Dubna::FILE	PANDA::DUBNA::SE2	Error	<div style="width: 100%; height: 10px; background-color: red;"></div>	248	9.003 GB	26 May 2010 13:29	26 May 2011
29.	PANDA::Dubna::file	PANDA::DUBNA::SE2	Error	<div style="width: 100%; height: 10px; background-color: red;"></div>	361	10.19 GB	26 May 2010 11:03	26 May 2011
28.	PANDA::Dubna::FILE	PANDA::DUBNA::SE2	Error	<div style="width: 100%; height: 10px; background-color: red;"></div>	14535	159.7 GB	25 May 2010 11:33	26 May 2011
27.	/panda/user/p/pbarprod/PermProd/jdl	PANDA::GLASGOW::RAID0	Error	<div style="width: 100%; height: 10px; background-color: red;"></div>	1	588 B	01 Apr 2010 18:56	01 Apr 2011
26.	/panda/user/p/pbarprod/PermProd/jdl	PANDA::TORINO::SE2	Error	<div style="width: 100%; height: 10px; background-color: red;"></div>	1	588 B	01 Apr 2010 17:50	01 Apr 2011
25.	PANDA::Glasgow::RAID0	PANDA::GLASGOW::SE1	Error	<div style="width: 100%; height: 10px; background-color: red;"></div>	874	53.61 MB	01 Apr 2010 14:57	01 Apr 2011
24.	PANDA::Glasgow::RAID0	PANDA::GLASGOW::SE1	Error	<div style="width: 100%; height: 10px; background-color: red;"></div>	2006	34.13 GB	31 Mar 2010 23:18	01 Apr 2011
23.	PANDA::Glasgow::RAID0	PANDA::GLASGOW::SE1	Error	<div style="width: 100%; height: 10px; background-color: red;"></div>	1769	593 MB	31 Mar 2010 10:37	31 Mar 2011
<b>15 requests</b>				<div style="width: 100%; height: 10px; background-color: red;"></div>	<b>27292</b>	<b>501.6 GB</b>		

# Catalogue browser

via the online MonALISA interface

The screenshot shows the PANDA Repository Catalogue browser interface. The left sidebar contains navigation menus for 'PANDA Repository', 'Job Information', 'Production', 'Data Storage', 'xrootd', and 'Services'. The central pane displays a file tree structure under the path '/panda/user/p/pbarserv', showing folders like 'bin', 'packages', 'production', 'reconstruction', 'tags', 'triggers', 'user', and sub-folders 'a' through 'p', including 'panda01' through 'panda07'. The right pane shows a table of files with columns for 'Permissions', 'Owner', and 'Timestamp'. Below the table is a 'Create new folder' section with another table of files.


Permissions	Owner	Timestamp
drwxr-xr-x	pbarserv:pbarserv	06 May 20
drwxr-xr-x	pbarserv:pbarserv	08 May 20
drwxr-xr-x	pbarserv:pbarserv	08 May 20
drwxr-xr-x	pbarserv:pbarserv	30 Oct 20
drwxr-xr-x	pbarserv:pbarserv	16 Sep 20
drwxr-xr-x	pbarserv:pbarserv	08 May 20
drwxr-xr-x	pbarserv:pbarserv	07 Oct 20
drwxr-xr-x	pbarserv:pbarserv	25 Aug 20

Permissions	Owner	Timestamp
-rwxr-xr-x	pbarserv:pbarserv	31 Mar 2010 10:24
-rwxr-xr-x	pbarserv:pbarserv	13 Oct 2010 16:07
-rwxr-xr-x	pbarserv:pbarserv	13 Oct 2010 11:43
-rwxr-xr-x	pbarserv:pbarserv	30 Oct 2010 23:04
-rwxr-xr-x	pbarserv:pbarserv	30 Oct 2010 23:06
-rwxr-xr-x	pbarserv:pbarserv	01 Nov 2010 13:40
-rwxr-xr-x	pbarserv:pbarserv	01 Nov 2010 13:40
-rwxr-xr-x	pbarserv:pbarserv	13 Oct 2010 11:43

# Production tools

## PANDA Grid - Admin Page

 Lazy production manager

[Sites editor](#) | 
 [Colour scheme](#) | 
 [Annotations](#) | 
 [Control panel](#) | 
 [Admin](#) | 
 **LPM** | 
 [Sites grouping](#) | 
 [Pledged resources](#) | 
 [Last values dump](#)
[Back to the repository](#)

LPM Management										LPM Settings	
ID	JDL	Parameters	Target % completion	AliEn user	Weight	Last run no	Submitted	Options	Override		
10.	<a href="#">/panda/user/p/pbarprod/PermProd/jdl (view   edit)</a>	#RUN#	95 %	pbarprod	50	2707 (2010-04-06)	708	Add dependency   Edit   Delete   Enable	Execute	LPM Status: <b>DISABLED</b>	
9.	<a href="#">/panda/user/p/pbarprod/jdl/pb_test.jdl (view   edit)</a>	#RUN#	95 %	pbarprod	50	1010 (2010-04-01)	11	Add dependency   Edit   Delete   Enable	Execute	(Re)submission trigger: 100	(Re)submission target: 1000
										Stop after resubmitting: 2000	Max resubmissions: 3
										<a href="#">Edit LPM Settings</a>	

[Start a new chain](#)

### PRODUCTION CYCLES

Job Details » No filter

ID	Production	Description	Status	Run Range	Events Count	Comments	Type
4	test01sim	DC03, sim/digi/reco/pid	Completed	-1 - 1048	7,310		MC
3	test01	DC03, UrQMD, 4.06 GeV/c, Ca-40	Completed	-1 - 60001	796		MC
5	loadgenerator001	regular test runs, ID #001	Technical stop	101 - 1008	-6	regular test runs, ID #001	MC
6	PermProd #10	Permanent production 2010/04	Running	2000 - 2707	-708	Permanent production test setup LPM_ID#10	MC

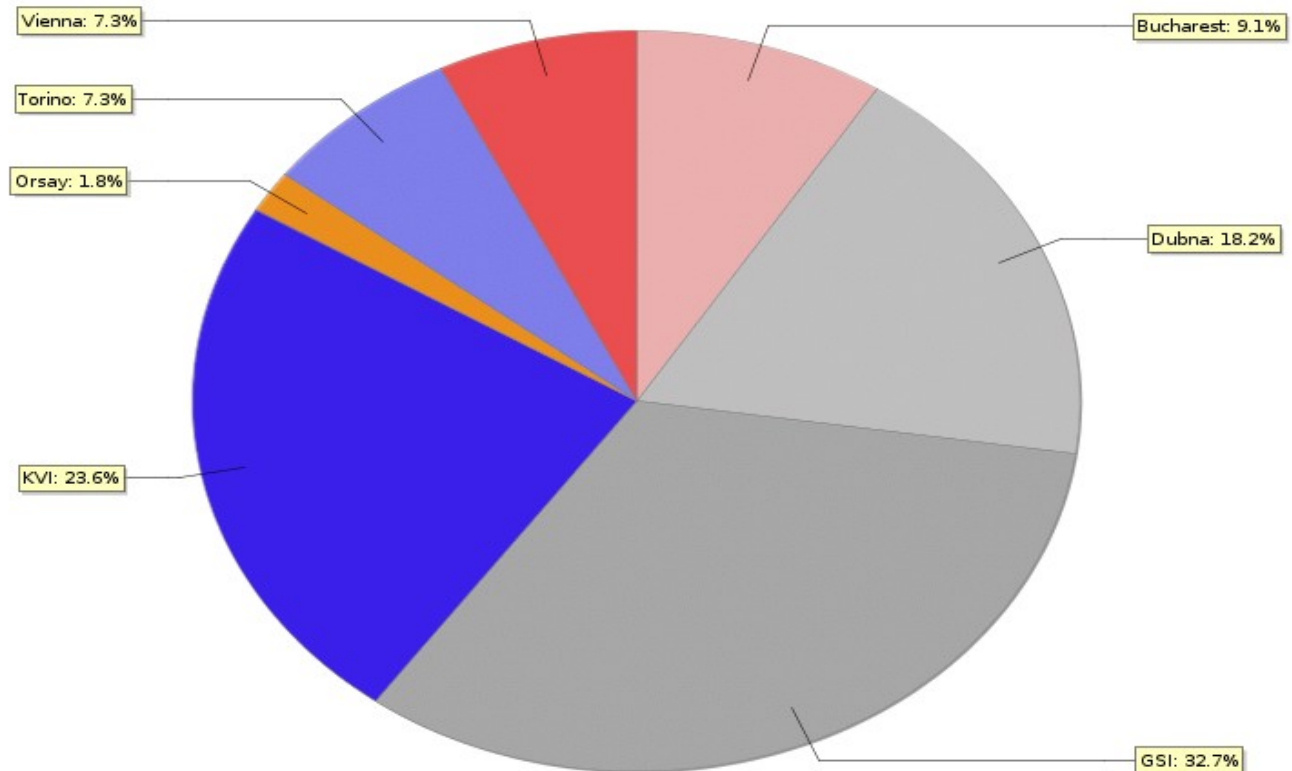


In the weeks before the collaboration meeting quite intensive usage of PandaGrid.  
 Mathias Lutz from GSI Theory group would like to run Panda related theory applications on PandaGrid.  
 A corresponding PhD sandwich project with SUT Thailand is in the making.

# Grid Jobs

(last year job distribution)

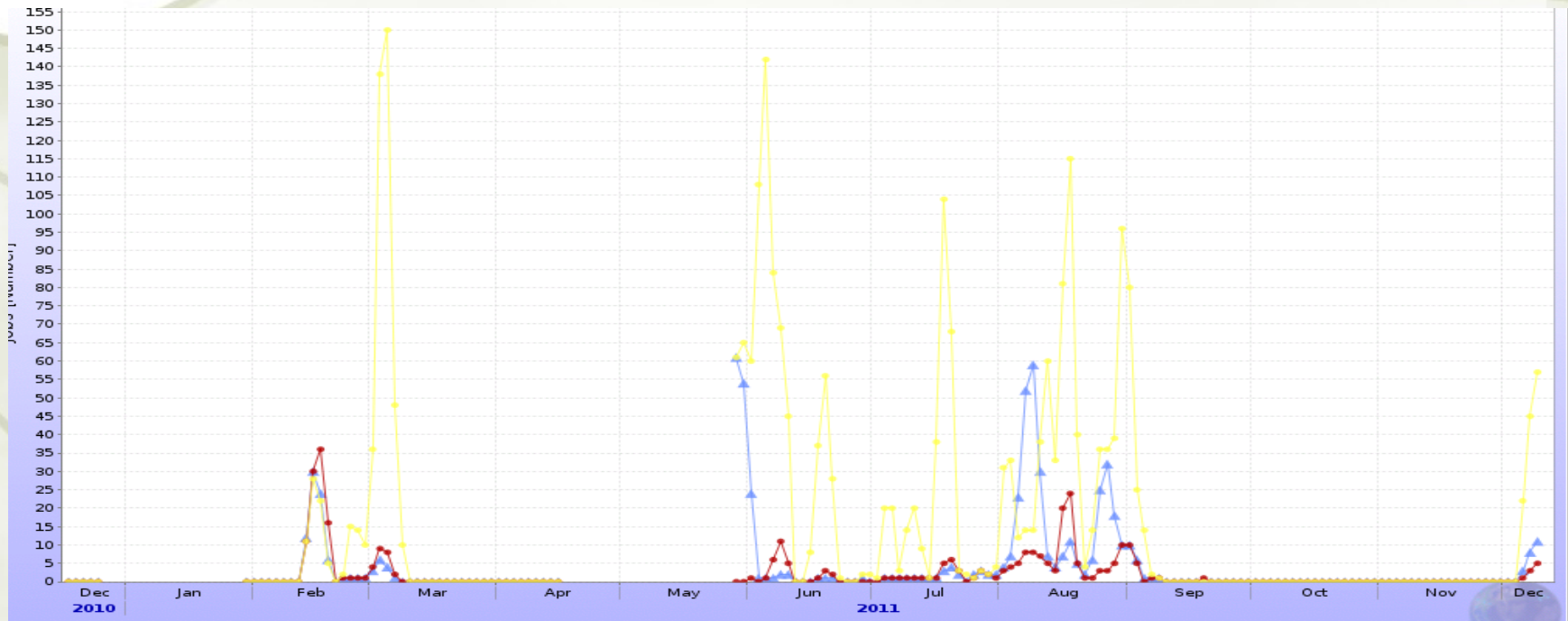
Average running jobs



ID	Type (job "comment")
6	Permanent production 2010/04
5	regular test runs, ID #001
4	DC03, sim/digi/reco/pid
3	DC03, UrQMD, 4.06 GeV/c, Ca-40

# PandaGrid usage in 2011

- ✦ In regular intervals quite intensive usage. Do usage periods always coincide with upcoming PANDA meetings ?



# PandaGrid operations

## ★ Problems should be reported to the GSI trouble ticket system: Grid queue

### IT Trouble Ticket System

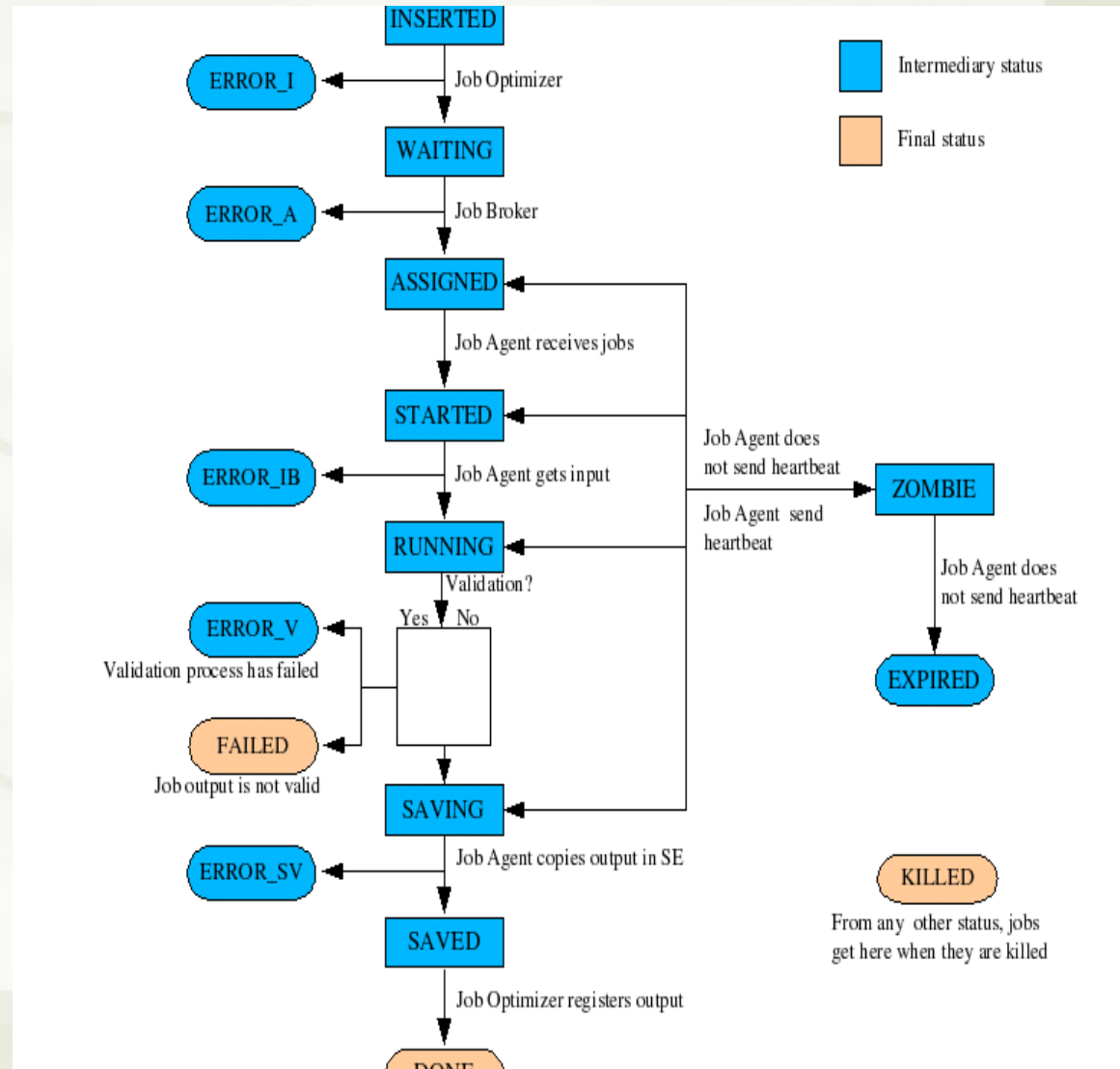
The IT Trouble Ticket System, in short TTS, handles incidents, questions or requests from our IT users. You can contact the IT staff via **e-mail**, **customer web interface** or **phone** by calling the [User Help Desk](#). The ticket will be assigned to IT staff members in order to process it. We will use your GSI Web Login to get your customer data, for guests we only need the e-mail address. You can access the TTS from outside GSI.

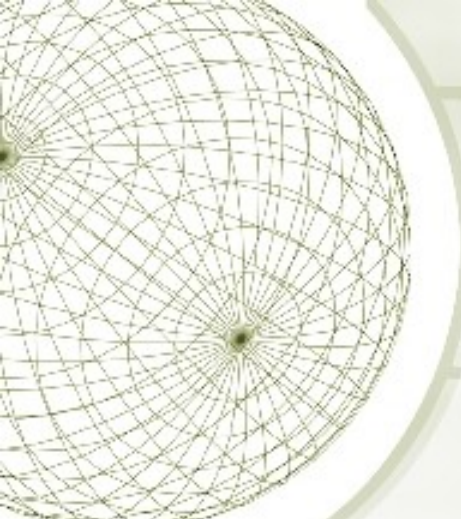
- Create a ticket via [e-mail addresses](#)
- Create a ticket via [customer web interface](#)
- TTS [Help](#)
- Web access for [TTS agents only](#)

If you have any further questions or remarks, please contact [it-service@gsi.de](mailto:it-service@gsi.de)

# AliEn job states

- ✦ In principle many things can go wrong at many places
- ✦ Currently we have many ZOMBIE jobs. We are investigating





# Test bench

for PandaRoot developers

Weekly builds:  
 Is my latest software compiling on all sites and OS-es ?  
 Can I run my jobs at GSI or KVI, or in Vienna ?

Packages on sites

Packages \ Sites	Count	Bucharest	Dubna	GSI	Glasgow	Juelich	KVI	SUT	Torino	Torino-2G	USJR	Vienna
pbarprod@mlcert::1.0	4	■	■	■	■	■	■	■	■	■	■	■
pbarprod@mlcert::1.1	10	■	■	■	■	■	■	■	■	■	■	■
pbarprod@panda_extern::jan10	6	■	■	■	■	■	■	■	■	■	■	■
pbarprod@panda_extern::may11	10	■	■	■	■	■	■	■	■	■	■	■
pbarprod@pandaroot-dev::latest	2	■	■	■	■	■	■	■	■	■	■	■
pbarprod@pandaroot::august11	9	■	■	■	■	■	■	■	■	■	■	■
pbarprod@pandaroot::dc4	10	■	■	■	■	■	■	■	■	■	■	■
pbarprod@pandaroot::july11	9	■	■	■	■	■	■	■	■	■	■	■
pbarprod@pandaroot::july11o	9	■	■	■	■	■	■	■	■	■	■	■
pbarprod@pandaroot::may11	9	■	■	■	■	■	■	■	■	■	■	■
pbarprod@pandaroot::nov11	9	■	■	■	■	■	■	■	■	■	■	■
pbarprod@pandaroot::rev13581	9	■	■	■	■	■	■	■	■	■	■	■
pbarprod@pandaroot::stable	2	■	■	■	■	■	■	■	■	■	■	■
<b>TOTAL</b>		<b>10</b>	<b>10</b>	<b>10</b>	<b>10</b>	<b>12</b>	<b>10</b>	<b>4</b>	<b>10</b>	<b>10</b>	<b>0</b>	<b>12</b>

# Presence at meetings and conferences

## PANDA Grid Talks Archive

This is the PANDA Grid talks repository where all related talks should be archived. Please attach

- ↓ PANDA Grid Talks Archive
  - ↓ CHEP, New York, 2012
  - ↓ DPG, Muenster, Spring 2011
  - ↓ GSI, December 2010
  - ↓ CHEP, Taipei, Autumn 2010
  - ↓ Regional Tier-2 WLCG workshop, Vienna, June 2010
  - ↓ DPG, Bonn, Spring 2010
  - ↓ ISGC, Taipei, Spring 2010
  - ↓ GSI, December 2009
  - ↓ Bohol, May 2009
  - ↓ Bochum, March 2009
  - ↓ GSI, December 2008
  - ↓ Krakow, June 2008
  - ↓ ALICE-FAIR Computing Meeting, GSI, April 2008
  - ↓ GSI, March 2008
  - ↓ GSI, December 2007
  - ↓ Dubna, June 2007
  - ↓ Genoa, March 2007

From our  
GSI wiki

### CHEP, New York, 2012

- ◆ talk registered

### DPG, Muenster, Spring 2011

- ◆ vom ALICE Tier2 zum FAIR Tier0 - Computing at GSI: by Kilian Schwarz, SC, GSI

### GSI, December 2010

- ◆ [Grid-2010-12.pdf](#): CM Plenary talk by Dan Protopopescu

### CHEP, Taipei, Autumn 2010

GSI, November 2011



## Join us

PANDA Grid is a fully functional system and, while computing power and disk storage are presently concentrated at a few sites (GSI, Dubna, KVI, Glasgow), more resources were recently added at existing sites and also Vienna, Bucharest, and Torino contributed significantly.

**But very few institutes joined during the last two years!**  
**Mainz ?**

### What to do ?

- Get involved: set up a site
- Learn how to use the Grid: extensive documentation available
- Start getting involved in middleware development: this will ensure long-term viability

**Collaboration:** 54 institutes, 17 countries  
**PANDA Grid:** 10 institutes, 7 countries



## *status Mainz*

- ★ Mainz participated in last PandaGrid workshop
- ★ vobox as Grid frontend exists already
  - ★ himster.him.uni-mainz.de
  - ★ configuration has been started
- ★ but firewall still needs to be configured
- ★ afterwards the configuration needs to be checked by security experts





# AliEn/ALICE & PANDA

## The PANDA - ALICE relationship:

- \* we use middleware written by ALICE
- \* we have our own requirements and requests
- \* **we don't give too much in return (!)**

## We were asked to, and we should:

- allocate dedicated manpower for middleware development and user support
- develop in-house expertise with this middleware, and not only as users
- ongoing AliEn developments at GSI/SC (but this is not yet sufficient !!!):
  - Oracle Interface
  - Slurm Interface
  - PoD Interface

in principle it would be nice to have shared positions (experiment/GSI IT) for Grid development following the example of the FAIRRoot positions !!!

# Last but not least ... synergy effects



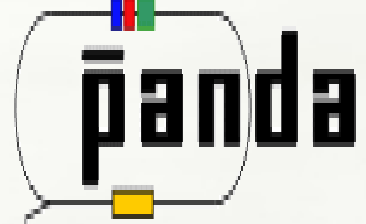
AliRoot



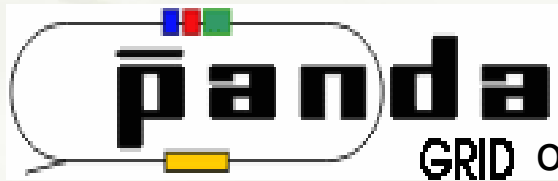
ROOT



ROOT



Nustar ?



GRID



Nustar ?

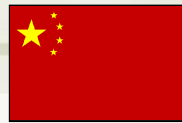


FAIR software tightly coupled to ALICE software and lots of ongoing developments will happen in close collaboration with ALICE (see FAIR - ALICE workshops 2008/2010)

# *Outview*



★ FAIRGrid ???



GOETHE  
UNIVERSITÄT  
FRANKFURT AM MAIN

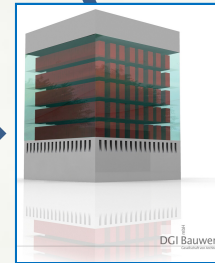
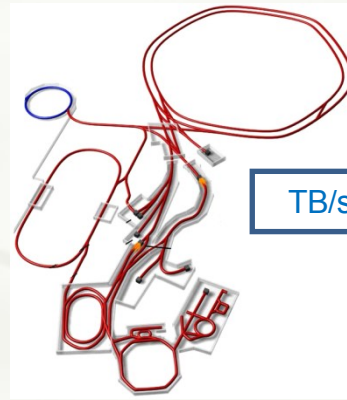


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MAINZ

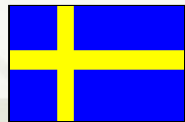
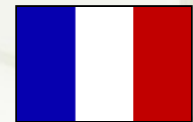


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UNIVERSITÄT  
DARMSTADT



# Tie the GRID(s)



Interfaces



Computing Infrastruktur der hessischen Universitäten

UNICORE



Verbundprojekt D-Grid\_HEP-Grid: Entwicklung von Anwendungen und Komponenten zur Datenauswertung in der Hochenergiephysik in einer nationalen e-Science-Umgebung.



In 2007:  
448.942€  
424 CPUs  
210 TByte

BMBF project PHP08/01: Philippine research institutions join PandaGrid



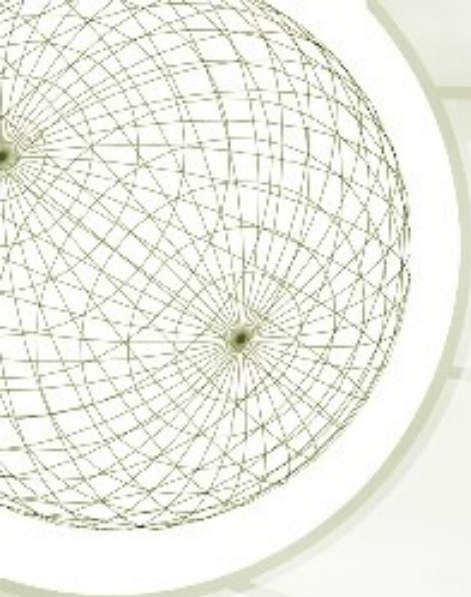
Bundesministerium für Bildung und Forschung

JINR-BMBF: proposal Development of the GRID-infrastructure and tools to provide joint investigations performed with participation of JINR and German research centers Computing & Networks



## *FAIRGrid*

- With relatively small invest in terms of manpower and money we came actually quite far with set up and operation of a distributed FAIR computing infrastructure
  - We do have users in PandaGrid and also user support needs to be set up
  - We should start a discussion, how to proceed, and also about funding !!!



# Next PANDA Grid workshop

Suranaree University of  
Technology - SUT  
(in conjunction with  
AliEn Developers Week #3  
and  
CERN school of Thailand #2),  
April 30 - May 4, 2012

