



Enabling Grids for E-science

# EGEE: Grid Operations & Management

*Ian Bird*  
**CERN**  
*SA1 Activity Leader*

*EGEE Industry Day*

*Paris, 27<sup>th</sup> April 2006*

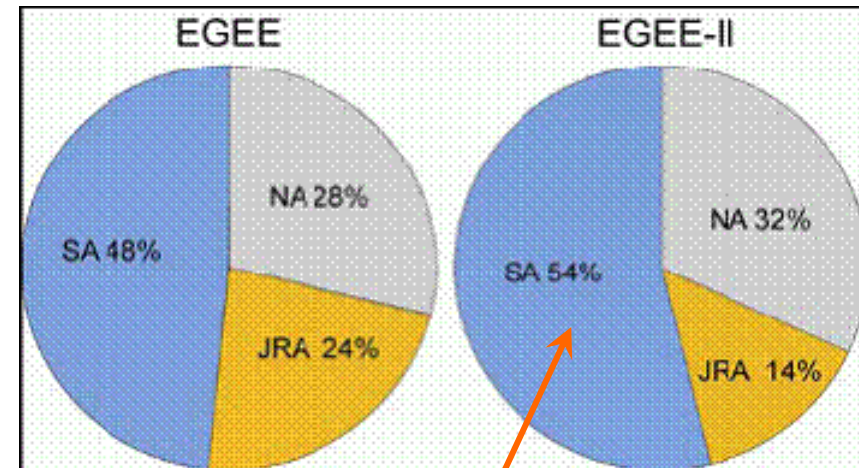
[www.eu-egee.org](http://www.eu-egee.org)



Information Society  
and Media



- EGEE – SA1/SA3
- EGEE infrastructure – status
- Grid Operations
- Grid Deployment
- User Support
- Security & Policy
- Potential Industry Collaboration
- Summary



SA: 54% of total

- SA1 (operations) : 86%
- SA2 (network) : 3%
- SA3 (certification): 11%



# EGEE Grid Sites : Q1 2006



## EGEE:

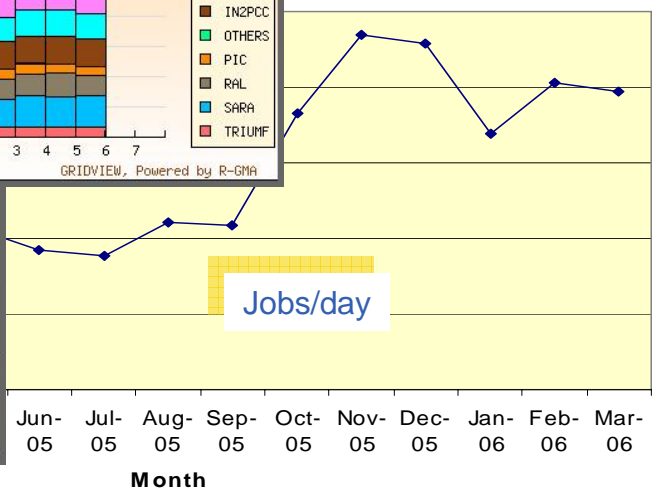
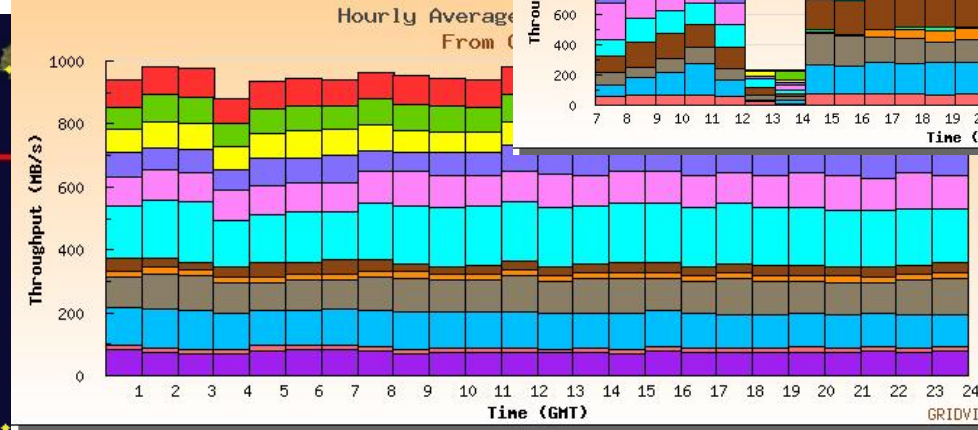
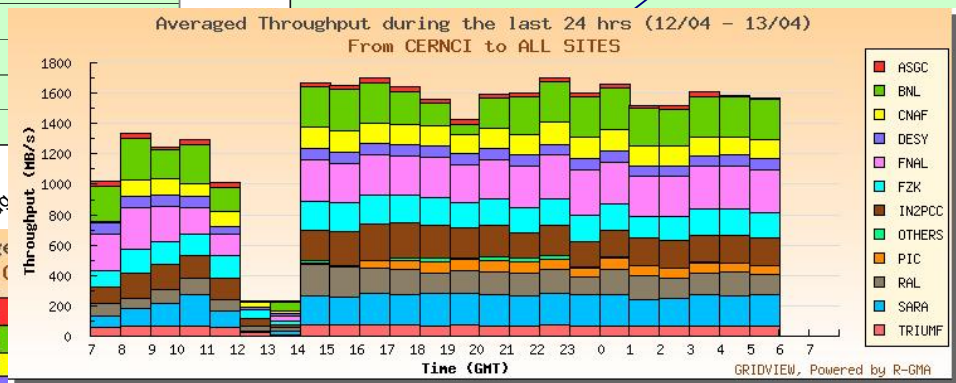
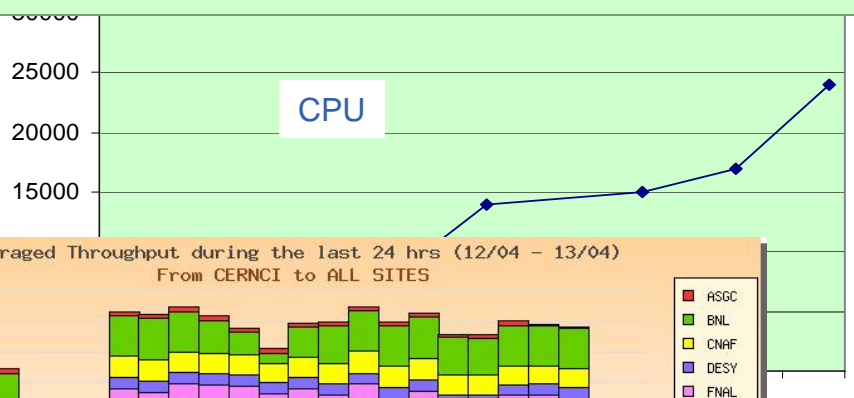
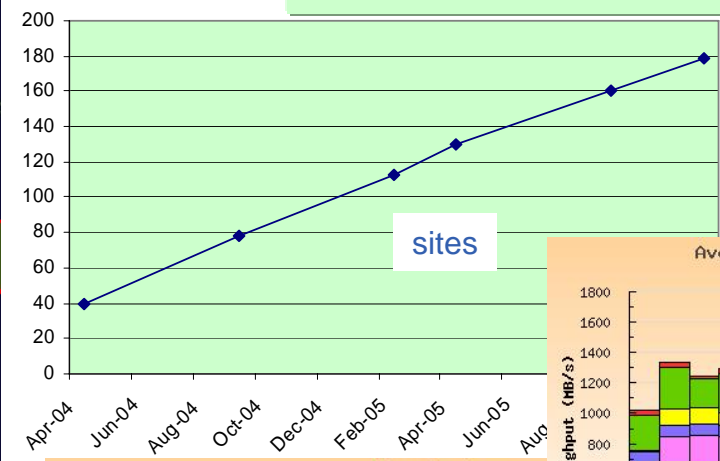
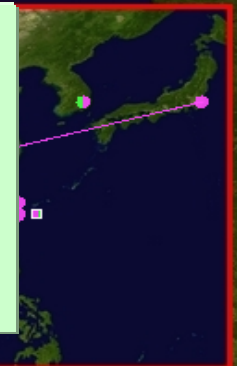
- > 180 sites, 40 countries
- > 24,000 processors,
- ~ 5 PB storage

country	sites	country	sites	country	sites
Austria	2	India	2	Russia	12
Belgium	3	Ireland	15	Serbia	1
Bulgaria	4	Israel	3	Singapore	1
Canada	7	Italy	25	Slovakia	4
China	3	Japan	1	Slovenia	1
Croatia	1	Korea	1	Spain	13
Cyprus	1	Netherlands	3	Sweden	4
Czech Republic	2	Macedonia	1	Switzerland	1
Denmark	1	Pakistan	2	Taipei	4
France	8	Poland	5	Turkey	1
Germany	10	Portugal	1	UK	22
Greece	6	Puerto Rico	1	USA	4
Hungary	1	Romania	1	CERN	1



## EGEE has achieved a lot in first 2 years

- 👉 ~180 sites; 25k CPU
- 👉 sustained & regular workloads of 20K jobs/day
- 👉 massive data transfers > 1.5 GB/s





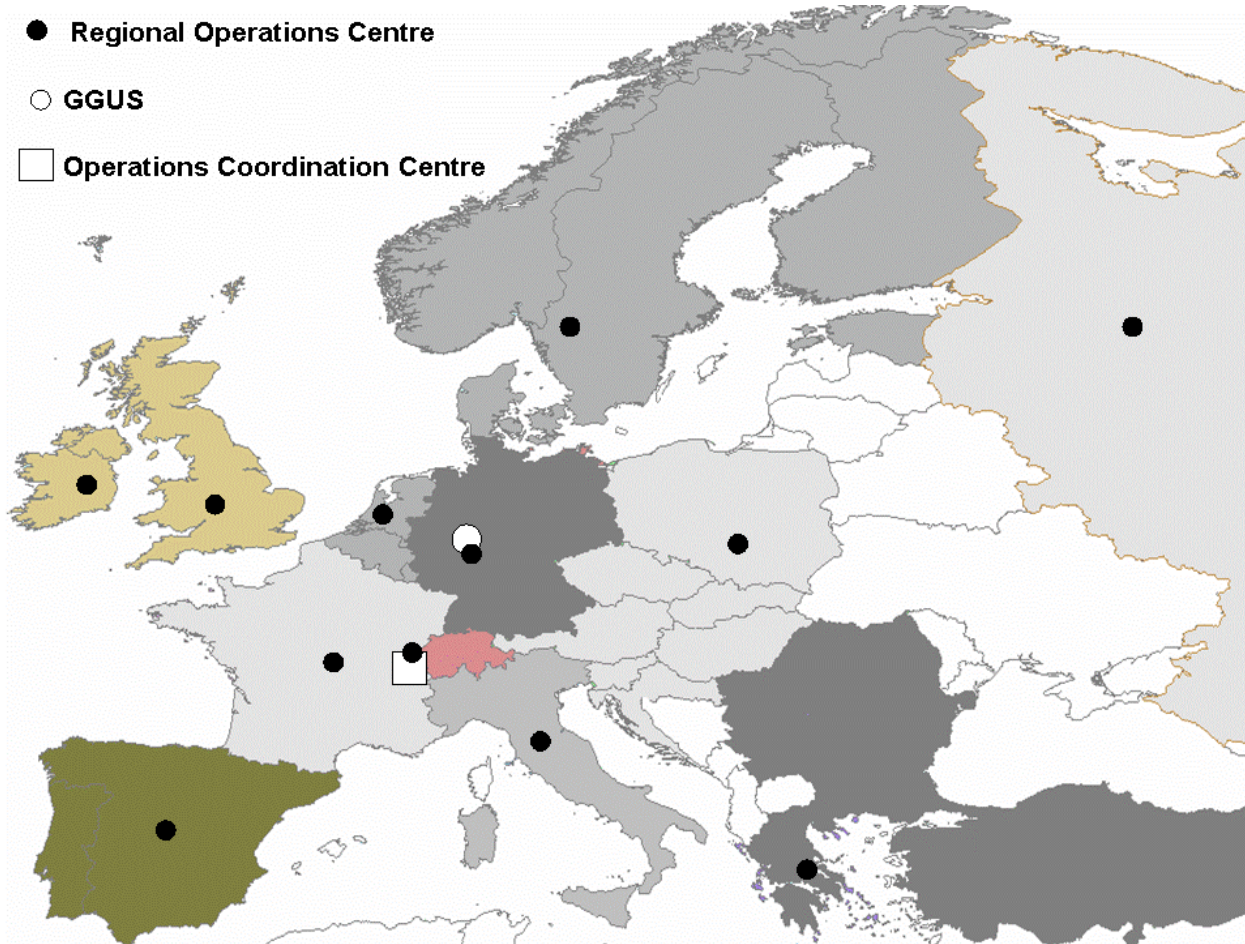
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# Grid Operations

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- Regional Operations Centre
- GGUS
- Operations Coordination Centre



## Operations Coordination Centre (OCC)

## Regional Operations Centres (ROC)

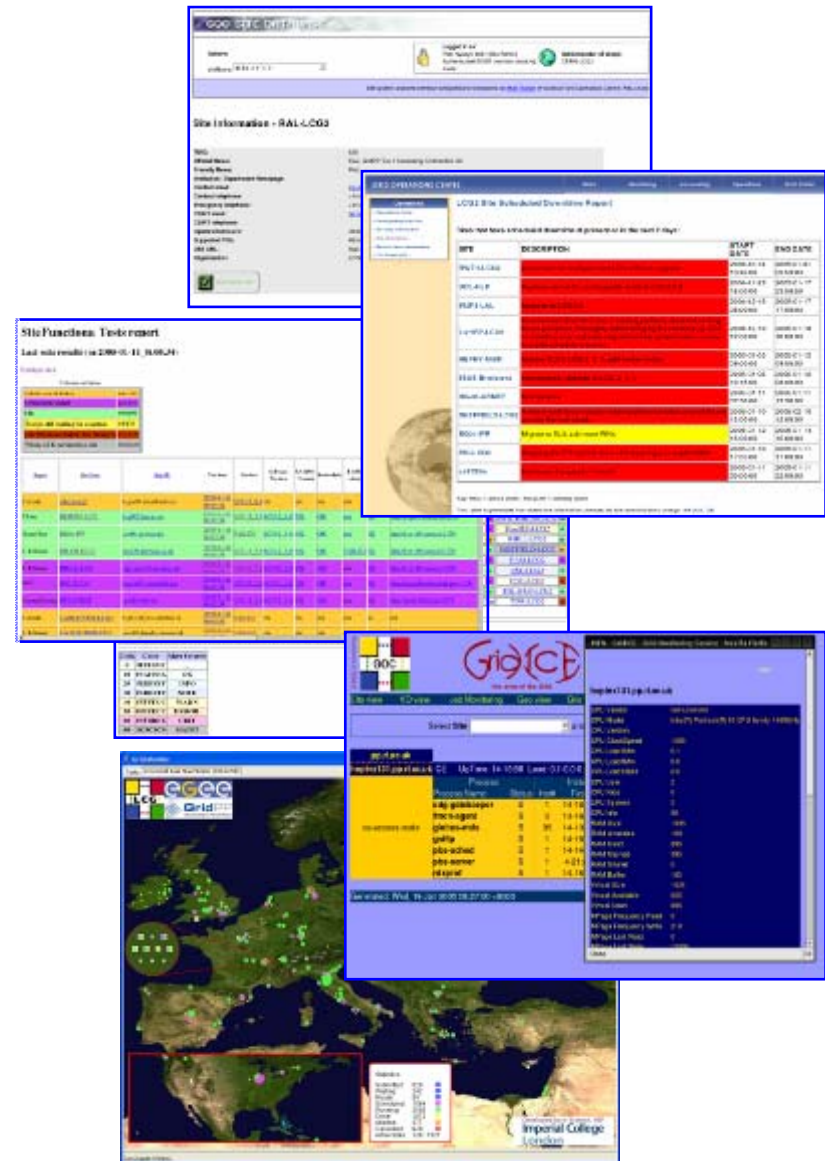
- Front-line support for user and operations issues
- Provide local knowledge and adaptations
- One in each region – many distributed (inc. A-P)
- Manage daily grid operations – oversight, troubleshooting
  - “Operator on Duty”
- Run infrastructure services

## User Support Centre (GGUS)

- In FZK: provide single point of contact (service desk) + portal.

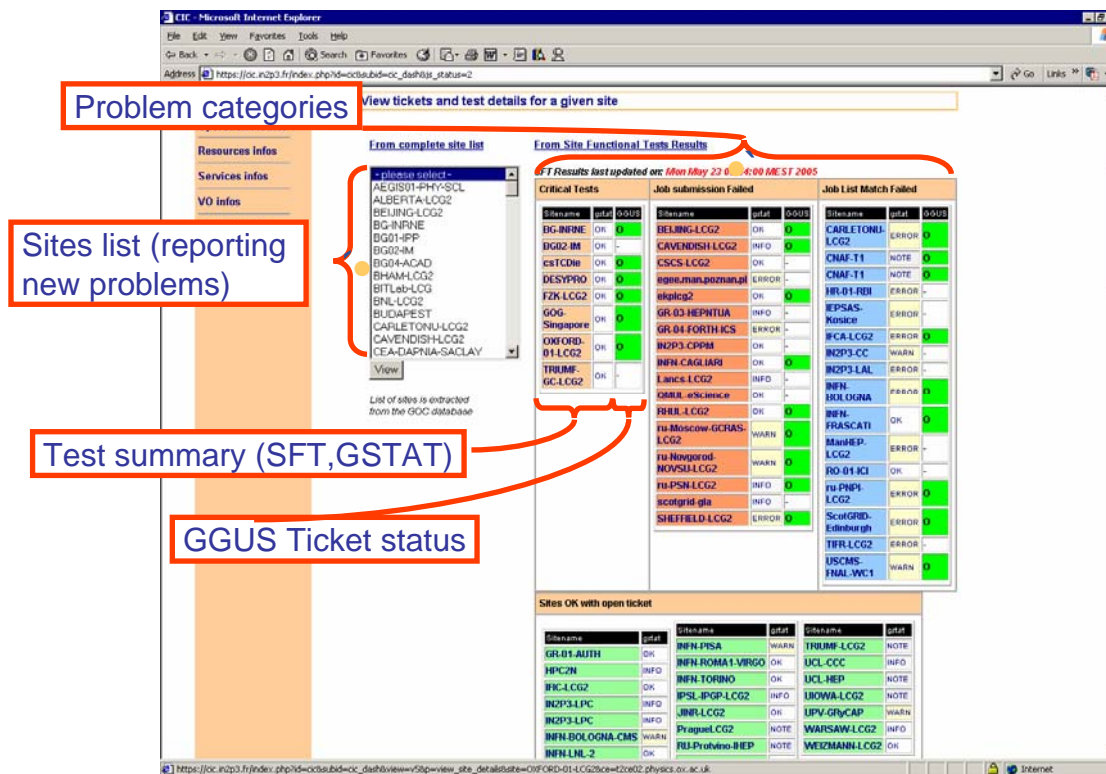


- **Grid operator on duty**
  - 6 teams working in weekly rotation
    - CERN, IN2P3, INFN, UK/I, Ru, Taipei
  - Crucial in improving site stability and management
  - Expanding to all ROCs in EGEE-II
- **Operations coordination**
  - Weekly operations meetings
  - Regular ROC managers meetings
  - Series of EGEE Operations Workshops
    - Nov 04, May 05, Sep 05, (June 06)
- **Geographically distributed responsibility for operations:**
  - There is no “central” operation
  - **Tools are developed/hosted at different sites:**
    - GOC DB (RAL), SFT (CERN), GStat (Taipei), CIC Portal (Lyon)
- **Procedures described in Operations Manual**
  - Introducing new sites
  - Site downtime scheduling
  - Suspending a site
  - Escalation procedures
  - etc



- Dashboard provides top level view of problems:

- Integrated view of monitoring tools (SFT, GStat) shows only failures and assigned tickets
- Single tool for ticket creation and notification emails with detailed problem categorisation and templates
- Detailed site view with table of open tickets and links to monitoring results
- Ticket browser highlighting expired tickets



**Problem categories**

**Sites list (reporting new problems)**

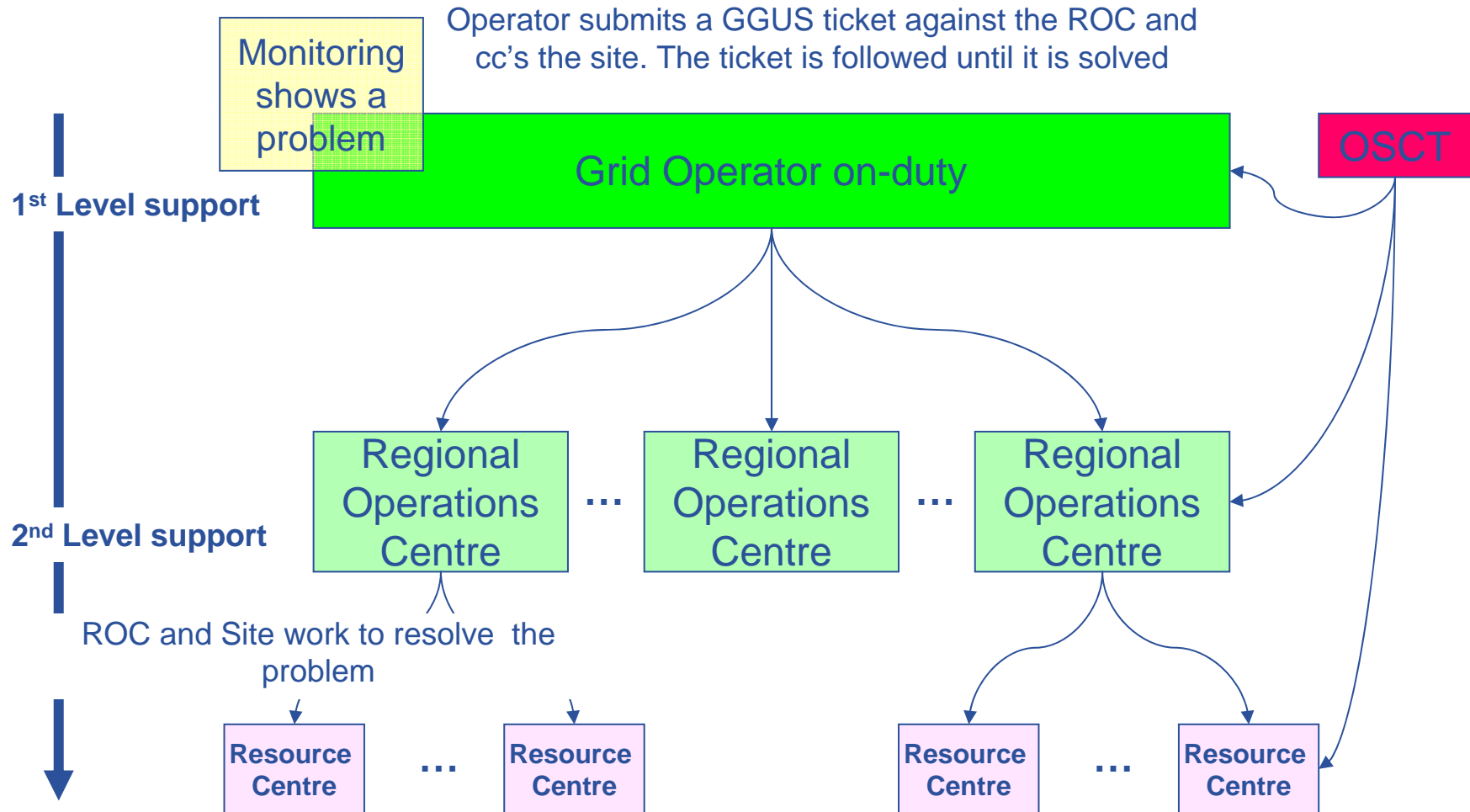
**Test summary (SFT, GSTAT)**

**GGUS Ticket status**

Site Name	Status	Test/Ticket
ALBERTA.LCG2	OK	
BELING.LCG2	OK	
BG-INPNE	OK	
BG01-PP	OK	
BG02-IM	OK	
BG02-IM	OK	
BG04-ACAD	OK	
BHAM.LCG2	OK	
BFTLab.LCG	OK	
BNL.LCG2	OK	
BUDAPEST	OK	
CARLETON.U.LCG2	OK	
CAVENDISH.LCG2	OK	
CEA-DAPNIA-SACLAY	OK	
TRUMF	OK	
GC.LCG2	OK	
BEIJING.LCG2	OK	
CAVENDISH.LCG2	INFO	
CSCS.LCG2	INFO	
ipge.man.poznan.pl	ERROR	
akiplog2	OK	
GR 03 HEP/TUA	INFO	
GR 04 FORTH ICS	ERROR	
IN2P3.CPPM	OK	
INFN.CAGLIARI	OK	
Lancs.LCG2	INFO	
OMRIL_e-science	OK	
RRRI.LCG2	OK	
Tu-Moscow-GGRAS.LCG2	WARN	
Tu-Novosibirsk	WARN	
NOVSU.LCG2	INFO	
TU-PSN.LCG2	INFO	
scotgrid-gta	INFO	
SHEFFIELD.LCG2	ERROR	
CARLETON.LCG2	ERROR	
CHAF-T1	NOTE	
CHAF-T1	NOTE	
INFN-IPED	ERROR	
EPSCS-Kesice	ERROR	
ICCL.LCG2	ERROR	
IN2P3-CC	WARN	
IN2P3-LAL	ERROR	
INFN-BULOGNA	ERROR	
INFN-FRASCATI	OK	
ManREP.LCG2	ERROR	
RO-01-ICI	OK	
TU-PNPI.LCG2	ERROR	
ScotGrid-Edinburgh	ERROR	
TFR.LCG2	ERROR	
USCMS-FNAL-WC1	WARN	
INFN-PIISA	WARN	
INFN-ROMA1-VIRGO	OK	
INFN-TORINO	OK	
IPSL-IPGP.LCG2	INFO	
INFN.LCG2	OK	
Prague.LCG2	NOTE	
INFN-BULOGNA-CMS	WARN	
INFN-LNL-2	OK	
TRUMF.LCG2	NOTE	
UCL-CCC	INFO	
UCL-HEP	NOTE	
UBOWA.LCG2	NOTE	
UPV-GRyCAP	WARN	
WARSAW.LCG2	INFO	
WEIZMANN.LCG2	OK	

Developed and operated by CC-IN2P3: <http://cic.in2p3.fr/>





- **Site Functional Tests (SFT)**
  - Framework to test (sample) services at all sites
  - Shows results matrix
  - Detailed test log available for troubleshooting and debugging
  - History of individual tests is kept
  - Can include VO-specific tests (e.g. sw environment)
  - Normally >80% of sites pass SFTs
    - NB of 180 sites, some are not well managed

- **Very important in stabilising sites:**
  - Apps use only good sites
  - Bad sites are automatically excluded
  - Sites work hard to fix problems

Colours definition			ver	Software Version (WN)
SD	Scheduled downtime	#a3a3a3	wn	WN host name
JL	Job list match failed	#aab3ff	ca	CA certs version
JS	Job submission failed	#f4876b	crl	CRL timestamp test
CT	Critical tests failed	#f9d48e	rm	Replica Management
NT	Non-critical tests failed	#f2f98e	votag	VO Tag management
OK	OK	#b2f98e	js	Job submission
			bi	BrokerInfo

Test summary						
	SD	JL	JS	CT	OK	total
dteam	15	12	4	6	139	176
lhcb	15	81	5	35	39	175

## Extending to service availability:

- measure availability by service, site, VO
- each service has associated service class defining required availability (Critical, highly available, etc.)

## First approach to SLA

## Use to generate alarms

- generate trouble tickets
- call out support staff

St.	Site Name	Site CE	VO dteam											VO lhcb					
			St.	js	ver	wn	ca	rgma	bi	csh	rm	votag	swdir	crl	St.	js	dirac-test		
<b>AsiaPacific</b>																			
CT	INDIACMS-TIFR	ce.indiacms.res.in	CT	O	2	6	0	I	O	O	O	O	X	O	O	!!!	JL	X	??
OK	TW-NCUHEP	grid01.phy.ncu.edu.tw	OK	O	2	6	0	I	O	O	O	O	O	O	O	!!!	JL	X	??
OK	TOKYO-LCG2	dgce0.icepp.jp	OK	O	2	4	0	I	O	O	O	O	O	O	O	!!!	JL	X	??
OK	Taiwan-LCG2	lcg00125.grid.sinica.edu.tw	OK	O	2	6	0	I	O	O	O	O	O	O	O	!!!	JL	X	??
OK	Taiwan-IPAS-LCG2	testbed001.phys.sinica.edu.tw	OK	O	2	6	0	I	O	O	O	O	O	O	O	!!!	JL	X	??
OK	GOG-Singapore	melon.ngpp.ngp.org.sg	OK	O	2	6	0	I	O	O	O	O	O	O	O	!!!	JL	X	??
OK	Taiwan-NCUCC-LCG2	ce.cc.ncu.edu.tw	OK	O	2	6	0	I	O	O	O	O	O	O	O	!!!	OK	O	O
OK	LCG_KNU	cluster50.knu.ac.kr	OK	O	2	5	0	I	O	O	O	O	O	O	O	!!!	CT	O	!!!
<b>BNL</b>																			
SD	BNL-LCG2	lcg-cc01.usatlas.bnl.gov	SD	X	??	??	??	??	??	??	??	??	??	??	??	??	SD	X	??
<b>Canada</b>																			
JL	TORONTO-LCG2	bigmac-lcg-ce.physics.utoronto.ca	JL	X	2	6	0	I	O	O	O	O	O	W	O	!!!	OK	O	O
11.	SD	CARLETONU-LCG2	lcg02.physics.carleton.ca	SD	X	??	??	??	??	??	??	??	??	??	??	??	SD	X	??
12.	OK	TRIUMF-LCG2	lgce01.triumf.ca	OK	O	2	6	0	I	O	O	O	O	O	O	O	OK	O	O
13.	OK	Umontreal-LCG2	lcg-ce.lps.umontreal.ca	OK	O	2	6	0	I	O	O	O	O	W	O	!!!	OK	O	O

# Checklist for a new service

- **User support procedures (GGUS)**
  - Troubleshooting guides + FAQs
  - User guides
- **Operations Team Training**
  - Site admins
  - CIC personnel
  - GGUS personnel
- **Monitoring**
  - Service status reporting
  - Performance data
- **Accounting**
- **S**
  - **This is what it takes to make a reliable production service from a middleware component**
  - **Not much middleware is delivered with all this ... yet**
- **Contact Info**
  - Developers
  - Support Contact
  - Escalation procedure to developers
- **Interoperation**
  - Documented issues
- **First level support procedures**
  - How to start/stop/restart service
  - How to check it's up
  - Which logs are useful to send to CIC/Developers
    - and where they are
- **SFT Tests**
  - Client validation
  - Server validation
- **ROC Dashboard**
  - Alarms
- **Deployment Info**
  - RPM list
  - Configuration details
  - Security audit



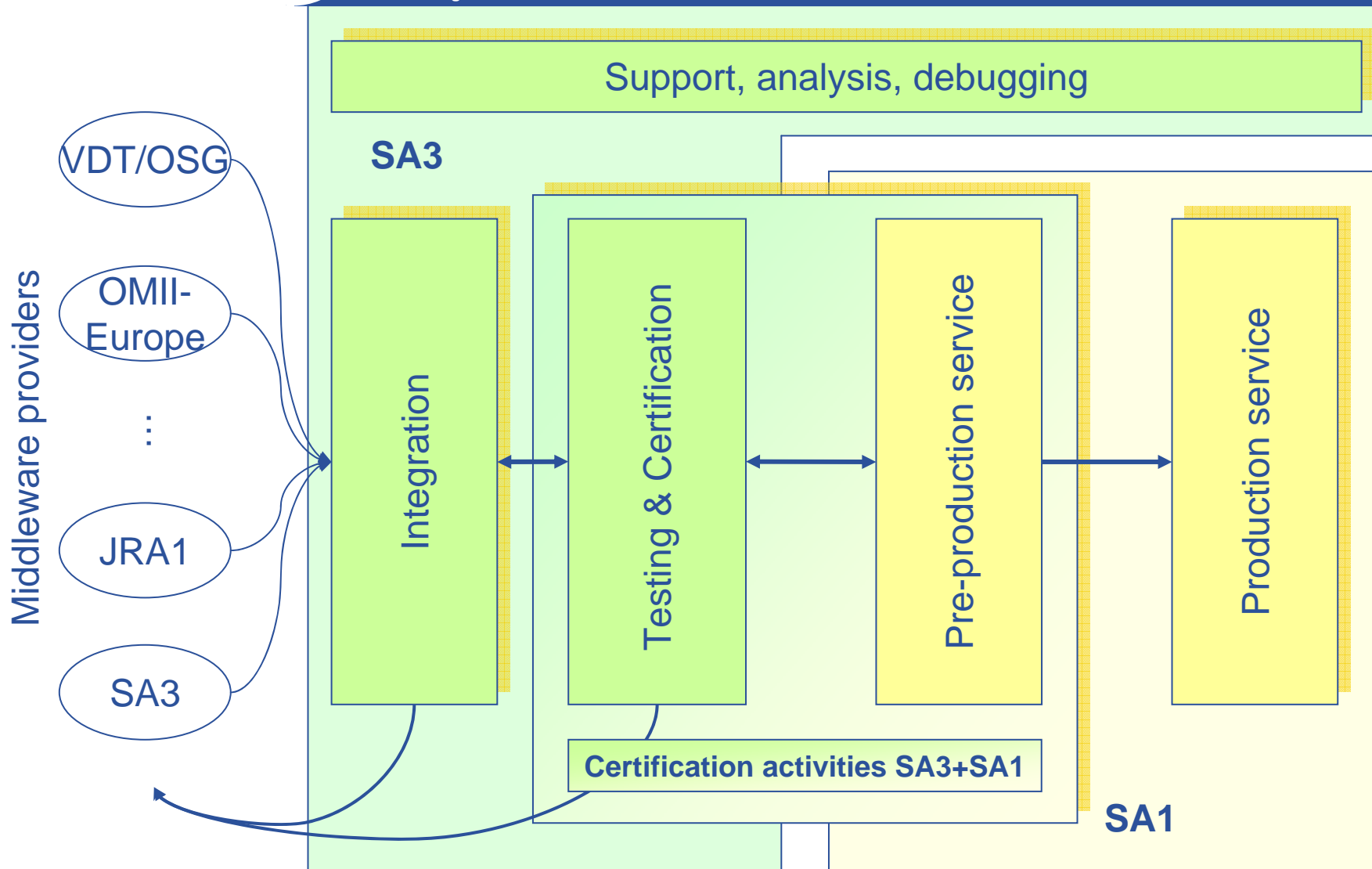


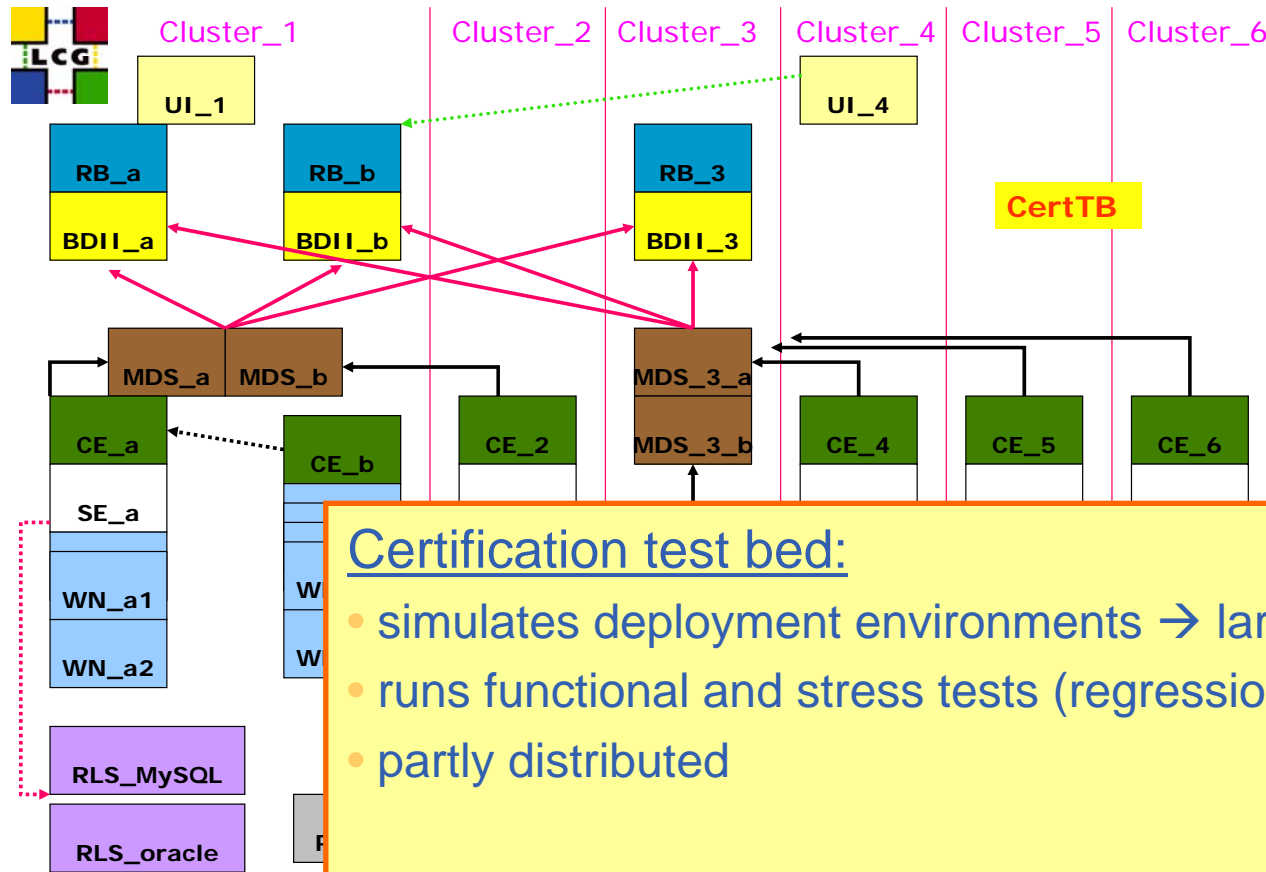
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## Release preparation & deployment

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## Certification test bed:

- simulates deployment environments → large (~80 machines)
- runs functional and stress tests (regression testing)
- partly distributed

## Pre-production service

- run as a service – preview of next production versions
- fully distributed (10-20 sites)
- application integration and testing





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# User Support

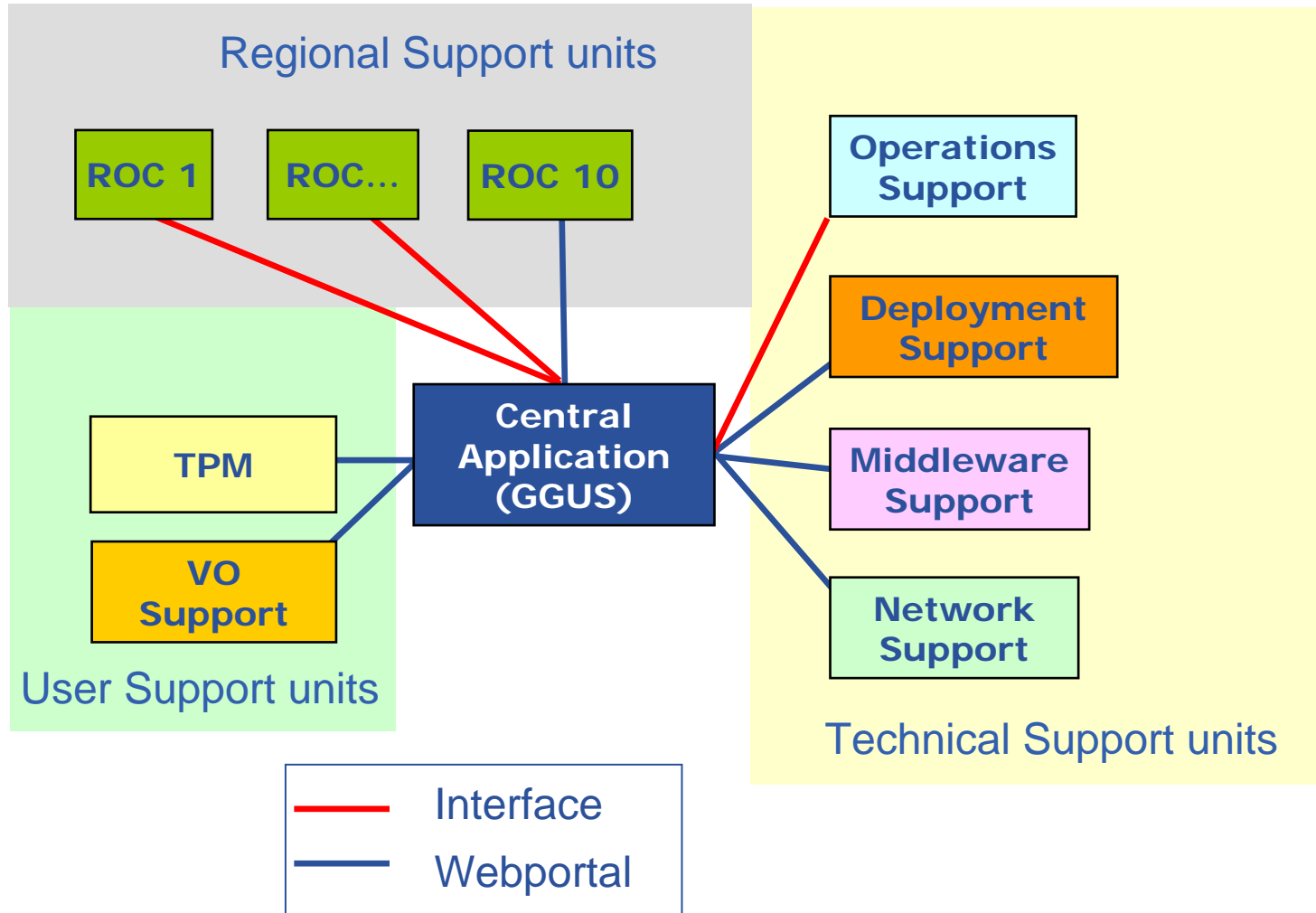
[www.eu-egee.org](http://www.eu-egee.org)



- **A single access point for support**
- **A portal with a well structured information and updated documentation**
- **Knowledgeable experts**
- **Correct, complete and responsive support**
- **Tools to help resolve problems**
  - search engines
  - monitoring applications
  - resources status
- **Examples, templates, specific distributions for software of interest**
- **Interface with other Grid support systems**
- **Connection with developers, deployment, operation teams**
- **Assistance during production use of the grid infrastructure**

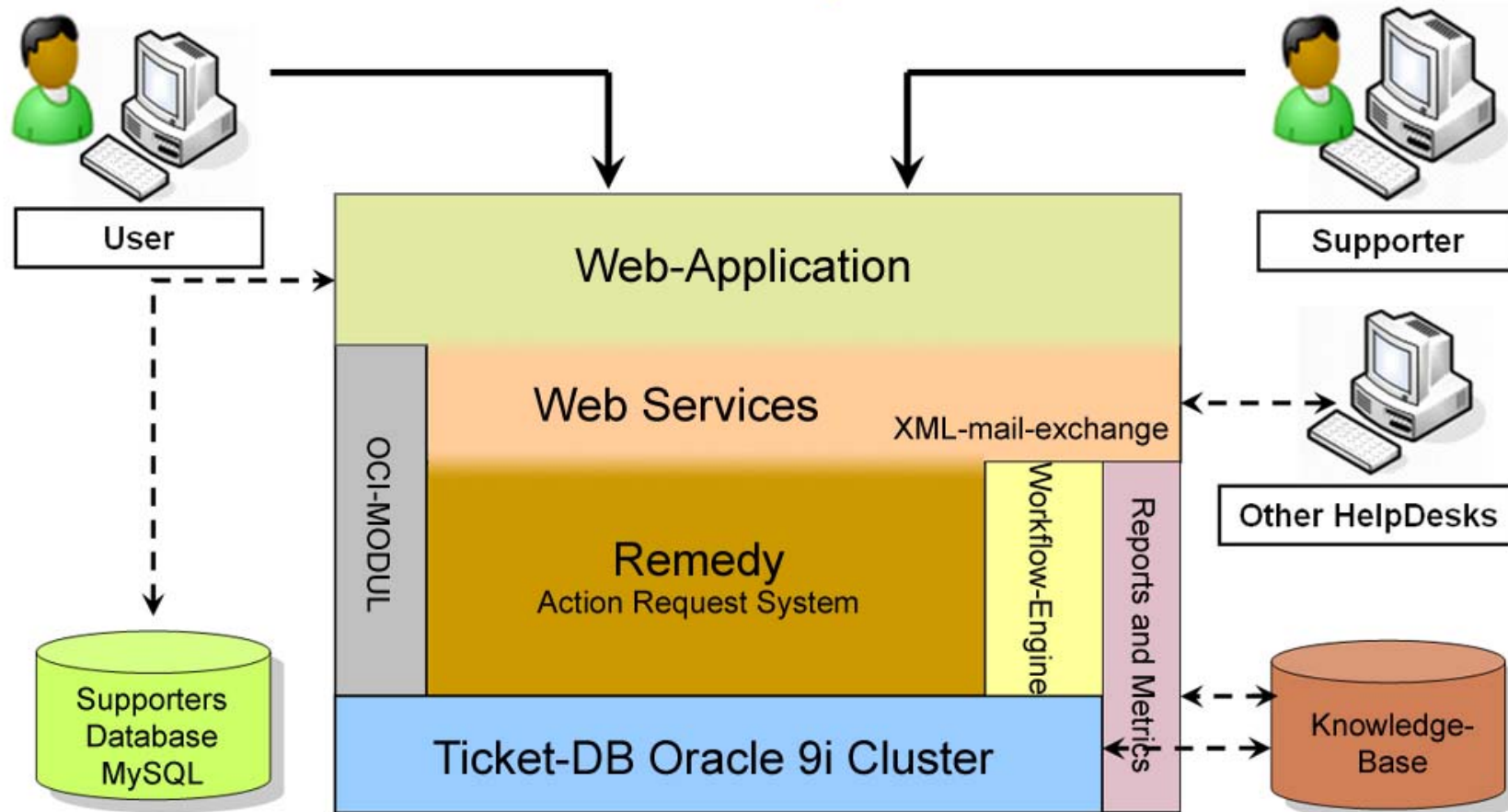
## "Regional Support with Central Coordination"

The ROCs, VOs and other project-wide groups such as the middleware groups ([JRA](#)), network groups ([NA](#)), service groups (SA) are connected via a central integration platform provided by GGUS.





## GGUS-System



The screenshot shows the GGUS portal interface. Key sections include:

- Welcome to Global Grid User Support**
- What is GGUS?** - Read more about the idea and the concept of GGUS
- Tickets @ GGUS**
  - Submit [new ticket](#)
  - new:** Create ticket using the email-interface. Find details [here](#)
- Tickets from Torsten Antoni (access via certificate)**

ID	Status	Date	Info
2599	solved	2005-05-23	SOD Handover Ticket
2509	solved	2005-05-17	SOD Handover Ticket
2424	solved	2005-05-10	SOD Handover Ticket
2166	solved	2005-04-16	SOD Handover ticket
2079	solved	2005-04-08	SOD Handover Ticket
2078	closed	2005-04-08	SOD Handover Ticket
1954	closed	2005-03-24	SOD Handover Ticket
1897	closed	2005-03-18	SOD Handover Ticket
- Open tickets of all users**

ID	VO	Date	Info
4867	none	n/a	down
4866	none	n/a	Job submission failed
4865	none	n/a	Job list match fails
4864	none	n/a	Job list match fails
4863	none	n/a	info not published
4860	atlas	2005-10-19	clricge01.in2p3.fr does not compile. C++...
4854	none	n/a	down
4852	none	n/a	CA rpms version
4848	cdf	2005-10-18	instable connection
4847	none	n/a	replication failed
4846	none	n/a	replication failed
4821	none	n/a	JS - Job got an error while in the Condo...
4814	biomed	2005-10-17	Problems to submit jobs to the vo Biomed
4797	atlas	2005-10-14	problems with 9.0.4 release on site node...
4763	none	n/a	Failed to connect to Producer
- Latest news**
  - News from [GGUS](#): New features in the current GGUS release
  - News from [GGUS](#): New portal for German/Swiss federation online
  - News from [GridKa](#): Upgrade of workmodes to LUG 2.6
- Monitoring Infos**
  - CIC-Portal
  - GOC Downtime Report
  - GOC Grid Monitoring
  - GridCE
  - Jobstatus GridKa
- GGUS Search**
  - GGUS-Search:
  - GGUS-Knowledge-Base u.c.
  - Documentation
  - GGUS-FAQ - Wiki pages

[Browseable tickets](#)

[Search through solved tickets](#)

[Useful links \(Wiki FAQ\)](#)

[Broadcast tools](#)

[Latest News](#)

[GGUS Search Engine](#)

[Updated documentation \(Wiki FAQ\)](#)



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# Policy & Security

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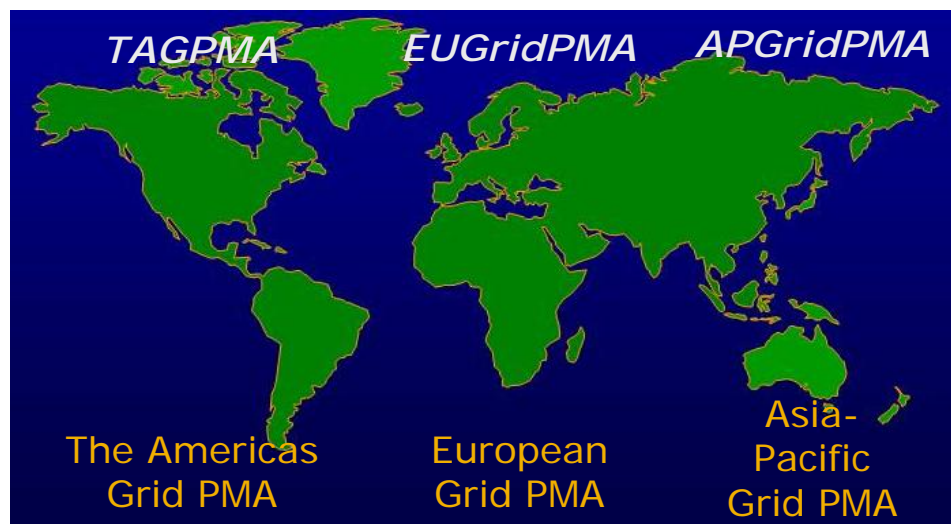


## Authentication

- **Use of GSI, X.509 certificates**
  - Generally issued by national certification authorities
- **Agreed network of trust:**
  - International Grid Trust Federation (IGTF)
    - EUGridPMA
    - APGridPMA
    - TAGPMA
  - All EGEE sites will usually trust all IGTF root CAs

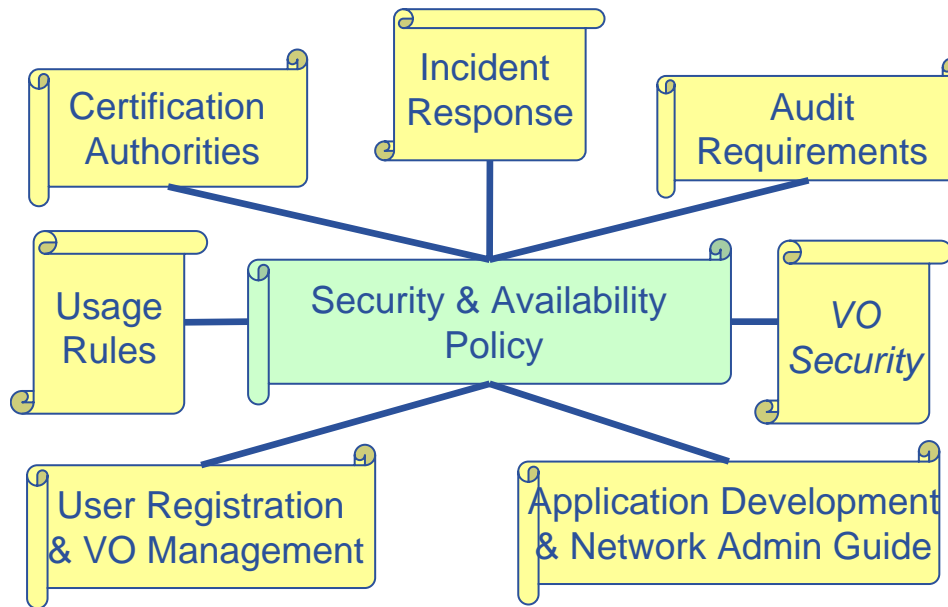
## Security Groups (Operations)

- **Joint Security Policy Group**
- **EUGridPMA**
- **Operational Security Coordination Team**
- **Vulnerability Group**





- **Joint Security Policy Group**
  - EGEE with strong input from OSG
  - Policy Set:



- **Policy Revisions**

- Grid Acceptable Use Policy (AUP)
  - <https://edms.cern.ch/document/428036/>
  - common, general and simple AUP
  - for all VO members using many Grid infrastructures
    - EGEE, OSG, SEE-GRID, DEISA, national Grids...
- VO Security
  - <https://edms.cern.ch/document/573348/>
  - responsibilities for VO managers and members
  - VO AUP to tie members to Grid AUP accepted at registration
- Incident Handling and Response
  - <https://edms.cern.ch/document/428035/>
  - defines basic communications paths
  - defines requirements (MUSTs) for IR
  - not to replace or interfere with local response plans

- **A managed operation – providing a service:**
  - A large number of sites of different sizes and capabilities
  - Developed operational procedures
    - Monitoring of the grid services providing access to resources
  - Operational security support; incident response coordination
  - Support services: user support, training, etc.
  - Building up considerable experience in grid-enabling a variety of different applications
  - Tools for monitoring of resources at a site ... if required
- **A new VO joining EGEE with a few sites:**
  - Benefits from the operations and support – the VO sites can be monitored and supported as part of the infrastructure
  - Potentially access to other resources
  - It is a significant effort to set up a grid infrastructure from scratch

- **“The application VO buys into the EGEE model”**
  - Actually not so restrictive now – supports many linux flavours, IA64, (other teams have worked on AIX, SGI ports)
  - Simple installation of client software now (can be done on the fly)
  - Basic grid services are quite general, nothing really application-specific
- **Some unresolved issues:**
  - Commercial licensed software used by an application
  - Levels of privacy/security needed in some life-science applications
  - True interactivity
- **... and of course, this is all new, rapidly evolving and many problems still to be overcome**
- **VOs should:**
  - Provide application support effort to help other VO users
  - Invest effort into helping improve the infrastructure and services – should not be simple “client – server” – rather a collaboration

- **Service Level Agreements**
  - What is a grid SLA?
    - We are investigating some first attempts
- **Accounting/market models:**
  - Charging for provision and use of services?
  - Connected to SLAs
- **Virtual machine technology**
  - Many applications:
    - Porting
    - Reduce certification/testing cluster requirements
    - User Environments
- **Deploying complex application environments**
  - Dependency management is complex
  - How to make use of opportunistic resources?
  - Commercial software – licensing?
- **Collaborations on specific topics:**
  - Standardising grid interfaces to fabric services (batch, etc).
  - Interoperability between EGEE and commercial grid middleware
- **Tools and operations**
  - What can we learn from industry ... and vice versa
  - Lower level tools are new – but how to generate aggregate views/alarms/etc
- **Use of EGEE infrastructure (or clones) in industry**
- **Deployment of industrial applications on EGEE**
  - Limitation of use of research networks, etc.



- **EGEE operates the world's largest multi-disciplinary grid infrastructure for scientific research**
  - In constant and significant production use
- **Operations procedures and tools under constant evolution**
  - Much is being learned – but there remains much to be done to achieve long term sustainability
- **We are only now looking at SLAs and what they mean in a grid environment**
- **We have gained significant experience in what it takes to deploy, operate and manage a large distributed infrastructure**
  - Including re-learning some lessons ...
- **Many opportunities for collaboration at all levels from usage to development of specific tools or processes, or sharing of experience and knowledge**