DSA1.4

REPORT ON IMPLEMENTATION OF MONITORING AND OPERATIONAL SUPPORT SYSTEM

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Abstract: During the first nine months of the BalticGrid project there are many resources made available at production quality for users in Baltic States. For monitoring that infrastructure and for supporting the operational personnel the monitoring and operational support systems have been set up.

This document describes the current implementation of both the monitoring system for BalticGrid as well as operations and support for both sites and users.

Document review and moderation

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Contents

1. INTRODUCTION

The Baltic Grid project aims i) to develop and integrate the research and education computing and communication infrastructure of the Baltic States into emerging European Grid Infrastructure, ii) to bring the knowledge in Grid technologies and use of Grids in the Baltic States to a level comparable to that in EU member states with a longer experience in the development, deployment and operation of Grids, and iii) to further engage the Baltic States in policy and standards setting activities. The integration of The Baltic States into the European Grid infrastructure will primarily focus on extending the EGEE to the Baltic States.

At the moment of writing this deliverable the project had been operational for almost one third of its designated time and many resources were considered available at production quality, therefore the need for monitoring this infrastructure as well as providing both operational and user support to the community was crucial.

The current situation of the BalticGrid is that most parts of it can already be used for production quality scientific computations. The hardware used varies with sites being from Opteron clusters to Itanium2 clusters with also some ordinary P4 farms converted from computing classes. At the writing of this report all central services had been doubled at least in Estonia and Lithuania to provide possible fallback situations in case one of the services is down. These central services are run on virtualized machines at EENet and Vilnius University.

The middleware currently used is gLite 3.0 albeit only one gLite computing element has been deployed due to multiple problems with parallel use of both LCG computing elements and gLite computing elements. However migration to gLite based system in sense of computing elements and WMS is underway.

This document describes the current implementation in both the monitoring system for BalticGrid as well as operations and support for both sites and users.

1.1. ACRONYMS

ARC	Advanced Resource Connector
BDII	Index Information Database
BalticGrid	Baltic Grid Project
BG	Baltic Grid
CA	Certification Authority
CIC	Core Infrastructure Center
CERN	European Organization for Nuclear Research
EENet	Estonian Educational and Research Network
EGEE	Enabling Grids for E-science
GGUS	Global Grid User Support
gLite	EGEE Middleware suite
GOCdb	Grid Operations Centre database
GridICE	Monitoring Service for Grid systems
LCG	LHC Computing Grid
LHC	Large Hadron Collider
NICPB	National Institute of Chemical Physics and Biophysics

SAM	Service Availability Monitoring
SFT	Site Functionality Tests
VO	Virtual Organisation
VOMS	Virtual Organisation Management Service

1.2. REFERENCES

[1] Baltic Grid Project	http://www.balticgrid.org/
[2] EGEE Northern Europe Regional Operating Centre (NE ROC)	http://www.egee-ne.org/
[3] GÉANT network	http://www.geant.net/
[4] GStat monitoring for BalticGrid	http://goc.grid.sinica.edu.tw/gstat/baltic/
[5] NorduGrid ARC middleware	http://www.nordugrid.org/middleware/
[6] Xen virtualization software	http://www.xensource.com/xen/xen/
[7] LCG Savannah	https://savannah.cern.ch/

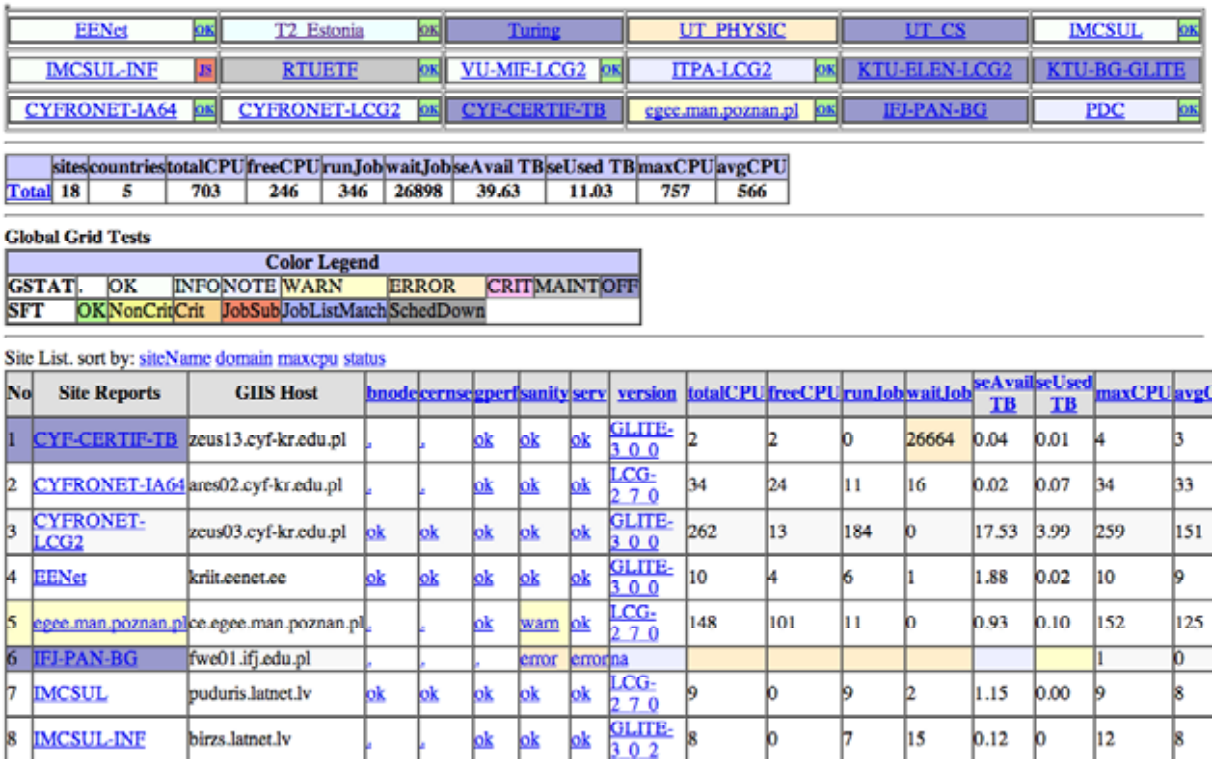
2. MONITORING SYSTEM

For the monitoring of BalticGrid infrastructure and services we have opted to use the well defined and proven tools of EGEE project. In addition to the already developed tools we have added a few smaller tools to validate some scenarios not currently covered or to bring out potential errors which are not shown in the usual tests.

2.1. GSTAT

GStat portal is developed and maintained by EGEE. BalticGrid uses it for monitoring of available resources and for central access to GOCdb and SFTs based on the summary information available. There has been created a separate region in GStat to allow for quick overview of BalticGrid resources only. The link to this specific regions monitoring page is as follows:

http://goc.grid.sinica.edu.tw/gstat/baltic/



	EENet OK	T2_Estonia OK	Turing	UT_PHYSIC	UT_CS	IMCSUL OK
	IMCSUL-INF JS	RTUETF OK	VU-MIF-LCG2 OK	ITPA-LCG2 OK	KTU-ELEN-LCG2	KTU-BG-GLITE
	CYFRONET-IA64 OK	CYFRONET-LCG2 OK	CYF-CERTIF-TB	egee.man.poznan.pl OK	IFJ-PAN-BG	PDC OK

	sites	countries	totalCPU	freeCPU	runJob	waitJob	seAvail TB	seUsed TB	maxCPU	avgCPU
Total	18	5	703	246	346	26898	39.63	11.03	757	566

Global Grid Tests

Color Legend								
GSTAT	.	OK	INFO	NOTE	WARN	ERROR	CRIT	MAINT	OFF
SFT	OK	NonCrit	Crit	JobSub	JobListMatch	SchedDown			

Site List. sort by: siteName domain maxcpu status

No	Site Reports	GIIS Host	bnode	cernse	gperf	sanity	serv	version	totalCPU	freeCPU	runJob	waitJob	seAvail TB	seUsed TB	maxCPU	avgC
1	CYF-CERTIF-TB	zeus13.cyf-kr.edu.pl	.	.	ok	ok	ok	GLITE-3_0_0	2	2	0	26664	0.04	0.01	4	3
2	CYFRONET-IA64	ares02.cyf-kr.edu.pl	.	.	ok	ok	ok	LCG-2_7_0	34	24	11	16	0.02	0.07	34	33
3	CYFRONET-LCG2	zeus03.cyf-kr.edu.pl	ok	ok	ok	ok	ok	GLITE-3_0_0	262	13	184	0	17.53	3.99	259	151
4	EENet	kriit.eenet.ee	ok	ok	ok	ok	ok	GLITE-3_0_0	10	4	6	1	1.88	0.02	10	9
5	egee.man.poznan.pl	ce.egee.man.poznan.pl	.	.	ok	warn	ok	LCG-2_7_0	148	101	11	0	0.93	0.10	152	125
6	IFJ-PAN-BG	fwe01.ifj.edu.pl	.	.	.	error	error	na							1	0
7	IMCSUL	puduris.latnet.lv	ok	ok	ok	ok	ok	LCG-2_7_0	9	0	9	2	1.15	0.00	9	8
8	IMCSUL-INF	birzs.latnet.lv	.	.	ok	ok	ok	GLITE-3_0_2	8	0	7	15	0.12	0	12	8

Figure 1 - GStat portal

2.2. SFT – SITE FUNCTIONALITY TESTS

The regularly running tests to monitor the health of the resources in the standard usage patterns (CA collection's validity, replica management, jobs submission, grid middleware health etc) is done using central SFT (Site Functional Tests) run by two different locations. We use both the central SFT run by CERN for resources which are registered already in GOCdb and of production quality.

In addition we run a separate instance of SFT in BalticGrid under the balticgrid VO to cover two different aspects:

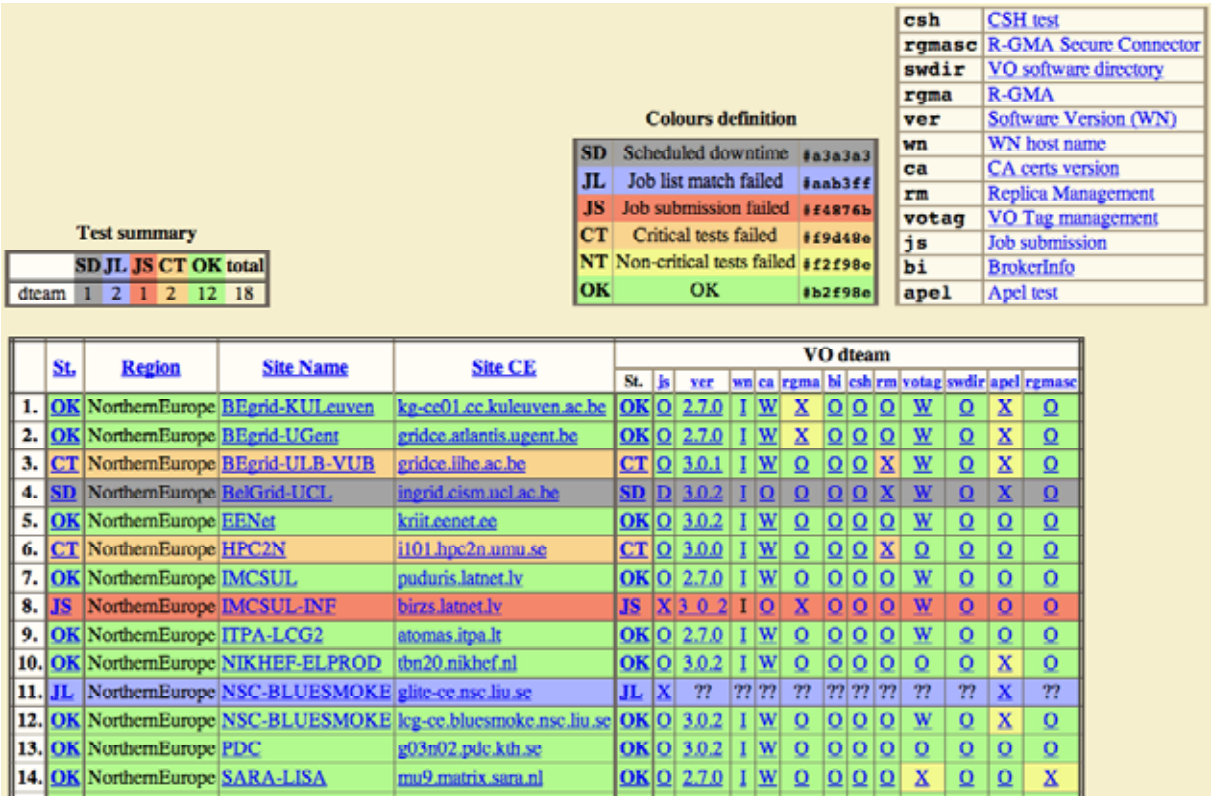
- Running SFT for sites which are not in GOCdb yet
- To validate that everything works under balticgrid VO.

2.2.1. SFT at CERN

The tests are used not only for BalticGrid, but are used for all of EGEE2 and associated projects to check in a common way that the site is passing a certain amount of basic tests like validating that CA packages are up to date, job submission and execution are running smoothly, replica management, accounting data is being gathered etc. These tests are usually run in a few hour intervals. If two or more tests fail in row it is picked up by EGEE2 operational staff and a GGUS ticket is assigned to the site to fix the errors.

The website for CERN SFT is:

https://lcg-sft.cern.ch/sft/lastreport.cgi



Test summary

	SD	JL	JS	CT	OK	total
dteam	1	2	1	2	12	18

Colours definition

SD	Scheduled downtime	#a3a3a3
JL	Job list match failed	#aab3ff
JS	Job submission failed	#f4876b
CT	Critical tests failed	#f9d48e
NT	Non-critical tests failed	#f2f98e
OK	OK	#b2f98e

csh	CSH test
rgmasc	R-GMA Secure Connector
swdir	VO software directory
rgma	R-GMA
ver	Software Version (WN)
wn	WN host name
ca	CA certs version
rm	Replica Management
votag	VO Tag management
js	Job submission
bi	BrokerInfo
apel	Apel test

	St.	Region	Site Name	Site CE	VO dteam												
					St.	js	ver	wn	ca	rgma	bi	csh	rm	votag	swdir	apel	rgmasc
1.	OK	NorthernEurope	BEgrid-KULeuven	kg-ce01.cc.kuleuven.ac.be	OK	Q	2.7.0	I	W	X	Q	Q	Q	W	Q	X	Q
2.	OK	NorthernEurope	BEgrid-UGent	gridce.atlantis.ugent.be	OK	Q	2.7.0	I	W	X	Q	Q	Q	W	Q	X	Q
3.	CT	NorthernEurope	BEgrid-ULB-VUB	gridce.ihe.ac.be	CT	Q	3.0.1	I	W	Q	Q	Q	X	W	Q	X	Q
4.	SD	NorthernEurope	BelGrid-UCL	ingrid.cism.ucl.ac.be	SD	D	3.0.2	I	Q	Q	Q	Q	X	W	Q	X	Q
5.	OK	NorthernEurope	EENet	kriit.eenet.ee	OK	Q	3.0.2	I	W	Q	Q	Q	Q	W	Q	Q	Q
6.	CT	NorthernEurope	HPC2N	i101.hpc2n.umu.se	CT	Q	3.0.0	I	W	Q	Q	Q	X	Q	Q	Q	Q
7.	OK	NorthernEurope	IMCSUL	puduris.latnet.lv	OK	Q	2.7.0	I	W	Q	Q	Q	Q	W	Q	Q	Q
8.	JS	NorthernEurope	IMCSUL-INF	birzs.latnet.lv	JS	X	3_0_2	I	Q	X	Q	Q	Q	W	Q	Q	Q
9.	OK	NorthernEurope	ITPA-LCG2	atomas.itpa.lt	OK	Q	2.7.0	I	W	Q	Q	Q	Q	W	Q	Q	Q
10.	OK	NorthernEurope	NIKHEF-ELPROD	tbn20.nikhef.nl	OK	Q	3.0.2	I	W	Q	Q	Q	Q	Q	Q	X	Q
11.	JL	NorthernEurope	NSC-BLUESMOKE	glite-ce.nsc.liu.se	JL	X	??	??	??	??	??	??	??	??	??	X	??
12.	OK	NorthernEurope	NSC-BLUESMOKE	lcg-ce.bluesmoke.nsc.liu.se	OK	Q	3.0.2	I	W	Q	Q	Q	Q	W	Q	X	Q
13.	OK	NorthernEurope	PDC	g03n02.pdc.kth.se	OK	Q	3.0.2	I	W	Q	Q	Q	Q	Q	Q	Q	Q
14.	OK	NorthernEurope	SARA-LISA	mu9.matrix.sara.nl	OK	Q	2.7.0	I	W	Q	Q	Q	Q	X	Q	Q	X

Figure 2 - CERN SFT status page

2.2.2. SFT at Vilnius University

Separate instance of SFT is being run by the Vilnius University to monitor the resources which are new and not yet registered or only have candidate status in the EGEE GOCdb. This service is used also to validate the operation of sites which support the balticgrid VO. These tests are running every hour and perform the same functions as the CERN SFT with a few exceptions in configuration (BalticGrid central services is being used instead of EGEE's). A separate portal is available to monitor the test results. The results can be seen at the following address:

https://grid2.mif.vu.lt/sft/lastreport.cgi

	St.	Region	Site Name	Site CE	VO balticgrid										
					St.	js	wn	ver	ca	rgma	bi	csh	rm	votag	swdir
1.	JL	CentralEurope	AMD64.PSNC.PL	fangorn.man.poznan.pl	JL	X	??	??	??	??	??	??	??	??	??
2.	JS	CentralEurope	CYF-CERTIF-TB	zeus13.cyf-kr.edu.pl	JS	X	??	??	??	??	??	??	??	??	??
3.	OK	CentralEurope	CYFRONET-IA64	ares02.cyf-kr.edu.pl	OK	O	I	2.7.0	O	O	O	O	O	O	X
4.	OK	CentralEurope	CYFRONET-LCG2	zeus02.cyf-kr.edu.pl	OK	O	I	3.0.2	O	O	O	O	O	O	O
5.	OK	NorthernEurope	EENet	kriit.eenet.ee	OK	O	I	3.0.2	O	O	O	O	O	O	O
6.	OK	CentralEurope	egee.man.poznan.pl	ce.egee.man.poznan.pl	OK	O	I	2.7.0	O	O	O	O	O	O	O
7.	JL	NorthernEurope	IBT-LCG2	scientific.ibt.lt	JL	X	??	??	??	??	??	??	??	??	??
8.	CT	CentralEurope	IFJ-PAN-BG	fwe01.ifj.edu.pl	CT	O	I	3.0.2	O	X	O	O	O	W	O
9.	CT	NorthernEurope	IMCSUL	puduris.latnet.lv	CT	O	I	2.7.0	O	O	O	O	X	O	O
10.	JS	NorthernEurope	IMCSUL-INF	birzs.latnet.lv	JS	X	I	3.0.2	O	X	O	O	O	O	O
11.	OK	NorthernEurope	ITPA-LCG2	atomas.itpa.lt	OK	O	I	2.7.0	O	O	O	O	O	W	O
12.	JS	NorthernEurope	KTU-BG-GLITE	ce.bg.ktu.lt	JS	X	I	3.0.2	O	X	O	O	O	O	O
13.	OK	NorthernEurope	KTU-ELEN-LCG2	pupa.elen.ktu.lt	OK	O	I	3.0.2	O	O	O	O	O	W	O

Figure 3 - SFT overview page for BalticGrid run with BalticGrid VO

2.3. SAM - SERVICE AVAILABILITY MONITORING

http://goc.grid.sinica.edu.tw/gocwiki/Service_Availability_Monitoring

The Service Availability Monitoring framework (SAM) aims to provide a site independent, centralized and uniform monitoring tool for all grid services. It is the main source of monitoring information for high-level grid operations and is being used in the validation of sites and services with calculation of availability metrics.

It is currently implemented in a test environment and will be fully integrated with BalticGrid monitoring framework depending on the preliminary tests of this new monitoring tool and once a suitable resource to run the tests from has been found (pending access to Oracle database).

The current implementation can be seen at the following address: https://lxb6112.cern.ch/sam/sam.py

No	RegionName	SiteName	NodeName	Status	balticgrid									
					rgmasc	rm	votag	swdir	csh	ca	ver	bi	rgma	js
1	Baltic	cyf-certif-tb	zeus13.cyf-kr.edu.pl	ERROR	na	na	na	na	na	na	na	na	na	error
2	Baltic	cyfronet-ia64	ares02.cyf-kr.edu.pl	ERROR	ok	ok	ok	error	ok	ok	ok	ok	ok	ok
3	Baltic	cyfronet-lcg2	zeus02.cyf-kr.edu.pl	OK	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok
4	Baltic	eenet	kriit.eenet.ee	OK	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok
5	Baltic	egee.man.poznan.pl	ce.egee.man.poznan.pl	OK	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok
6	Baltic	ifj-pan-bg	fwe01.ifj.edu.pl	ERROR	error	ok	warn	ok	ok	ok	ok	ok	error	ok
7	Baltic	imcsul	puduris.latnet.lv	ERROR	ok	error	ok	ok	ok	ok	ok	ok	ok	ok
8	Baltic	imcsul-inf	birzs.latnet.lv	ERROR	ok	ok	ok	ok	ok	ok	ok	ok	error	error
9	Baltic	itpa-lcg2	atomas.itpa.lt	WARN	ok	ok	warn	ok	ok	ok	ok	ok	ok	ok
10	Baltic	ktu-bg-glite	ce.bg.ktu.lt	ERROR	error	ok	ok	ok	ok	ok	ok	ok	error	error
11	Baltic	ktu-elen-lcg2	pupa.elen.ktu.lt	WARN	ok	ok	warn	ok	ok	ok	ok	ok	ok	ok
12	Baltic	pdc	g03n02.pdc.kth.se	ERROR	error	ok	warn	ok	ok	ok	ok	ok	ok	ok
13	Baltic	rtuetf	ce01.grid.etf.rtu.lv	OK	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok
14	Baltic	t2_estonia	oberon.hep.kbfi.ee	OK	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok
15	Baltic	ut_cs	pinguin.mt.ut.ee	ERROR	error	ok	warn	ok	ok	ok	ok	ok	error	ok
16	Baltic	vu-mif-lcg2	grid2.mif.vu.lt	OK	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok

Figure 4 - excerpt from SAM (computing elements test results)

2.4. STRESS TESTS

Additionally to SFT and later SAM, the Baltic Grid Stress Tests were developed for monitoring the status of computing elements. SFT tests primarily the functions of the front-end. It showed that sites are working properly, but users were still complaining about aborted jobs. The SFT has quite short and simple tests. It was proposed that longer jobs taking about an hour would reveal some additional problems with clusters.

The basic intent is to validate that the clusters service is adequate for production use. The Stress Tests have shown that both constant and intermittent problems arise even in clusters which seem to pass SFT on a regular basis. If the need arises the Stress Tests can be extended further and additional test scenarios can be added.

The Stress Tests were developed by EENet. Stress Tests are real CPU-intensive jobs similar to those run by users every day and the reports are available on web. The jobs are about one hour long and those jobs are CPU-intensive. The Stress Tests results can be seen at the following address:

http://targutaja.eenet.ee/stress-test/

	CE	Last test	Last result
1.	ares02.cyf-kr.edu.pl	2006-09-11 16:01:02	Done
2.	atomas.itpa.lt	2006-09-11 16:01:02	Done
3.	birzs.latnet.lv	2006-09-11 16:01:02	Done
4.	ce.bg.ktu.lt	2006-09-11 16:01:02	Done
5.	ce.egee.man.poznan.pl	2006-09-11 16:01:02	Done
6.	ce01.grid.etf.rtu.lv	2006-09-11 16:01:02	Done
7.	fangorn.man.poznan.pl	2006-09-07 10:01:02	Aborted
8.	fwe01.ifj.edu.pl	2006-09-11 16:01:02	Aborted
9.	g03n02.pdc.kth.se	2006-09-11 16:01:02	Aborted
10.	grid.vtu.lt	2006-08-28 16:01:02	Aborted
11.	grid2.mif.vu.lt	2006-09-11 16:01:02	Done
12.	kriit.eenet.ee	2006-09-11 16:01:02	Done
13.	oberon.hep.kbfi.ee	2006-09-11 16:01:02	Done
14.	pinguin.mt.ut.ee	2006-09-11 16:01:02	Done
15.	puduris.latnet.lv	2006-09-11 16:01:02	Done
16.	pupa.elen.ktu.lt	2006-09-11 16:01:02	Done
17.	zeus02.cyf-kr.edu.pl	2006-09-11 16:01:02	Aborted
18.	zeus13.cyf-kr.edu.pl	2006-09-11 16:01:02	Aborted

Figure 5 – Stress Tests status page

2.5. GRIDICE

In the beginning of the project, GridICE was installed for getting monitoring overview. The service was retired because of the following reasons:

1. it needed separate information gathering plug-in to be installed at sites
2. it had instabilities in the information gathering, from time to time the information it had was not correct.
3. couple of features did not work and the support had ended.

3. OPERATIONAL SUPPORT SYSTEM

Operational support infrastructure has been built with three layers in mind to provide an all-round service to the Grid in both it's ramp-up phase as well as later on the production use of the resources.

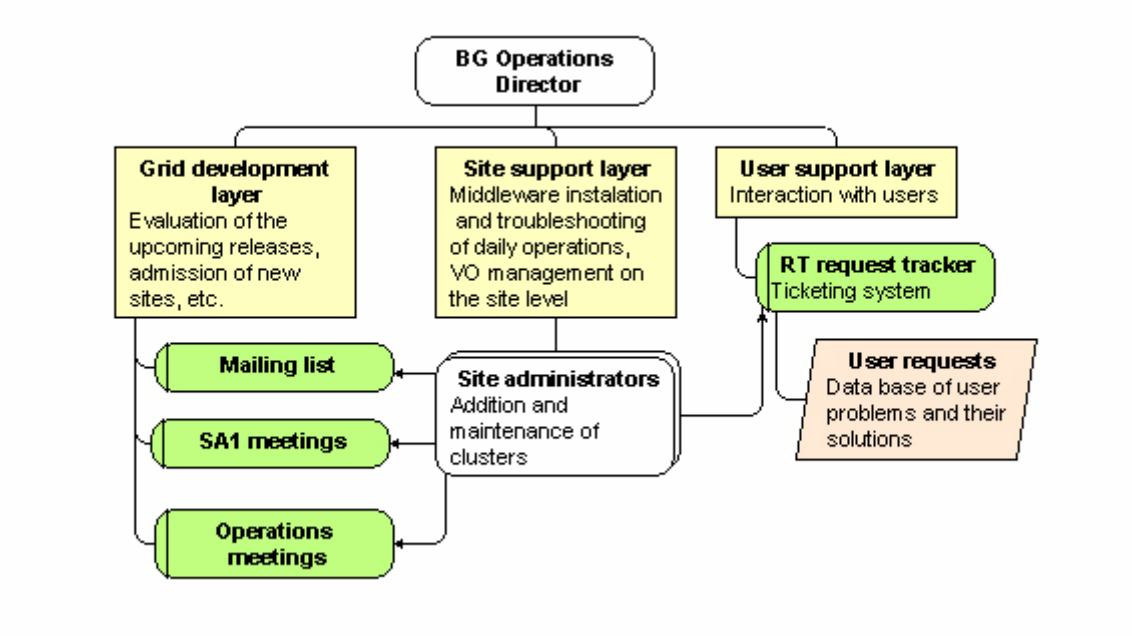


Figure 6 - Layers of support system

The first layer is the project development in which case discussions are necessary to evaluate the upcoming releases, new sites to be joining etc. These discussions take place in either the project SA1 activity mailing list or the weekly SA1 meetings. There are at this moment no separate operations meetings as in the current phase of the project the development and day-to-day operations are related and need to be addressed at the same time. Once the development phase is geared down and the project mostly deals with production use then there will also be separate operations meetings.

The second layer is support for sites in their middleware installation and troubleshooting of daily operations as well as software installations and VO management on the site level. Historically this support has also been part of SA1 activity mailing list however this is now migrating to a Request Tracker (RT) system installed at http://support.balticgrid.org/ or through e-mail interface of support@balticgrid.org. In addition the sites in production receive tickets from GGUS system as part of the central EGEE2 operational infrastructure and have to file operational reports through the CIC portal as any other site in EGEE2. In cases where the problem seems to be bigger than just the resources in BalticGrid or in case it cannot be resolved with local help, these tickets are escalated to GGUS for help from experts.

The third layer is the user support layer. Historically this was done through NA3 and SA1 e-mailing lists as the first nine months of the project were mostly used to build up the Grid infrastructure and start introducing the users to Grid concepts. In this environment the application activity (NA3) and Grid operations and development activity (SA1) had the knowledge and contacts to the users and could help them in this regard. The user support system has been set up using the same infrastructure of RT at support.balticgrid.org. There will be an e-mail gateway as well as web ticket opening options. The migration of user support from mailing lists to the new system is underway.

3.1. WEBPAGE

Web page is used for gathering different documents (instructions, tutorials, manuals etc) to one location. This has been in great part the SA1 activity internal pages of the BalticGrid project website (http://www.balticgrid.org/). Some of the more public documents like "How to request a certificate" etc have also been linked on the public parts of the website.

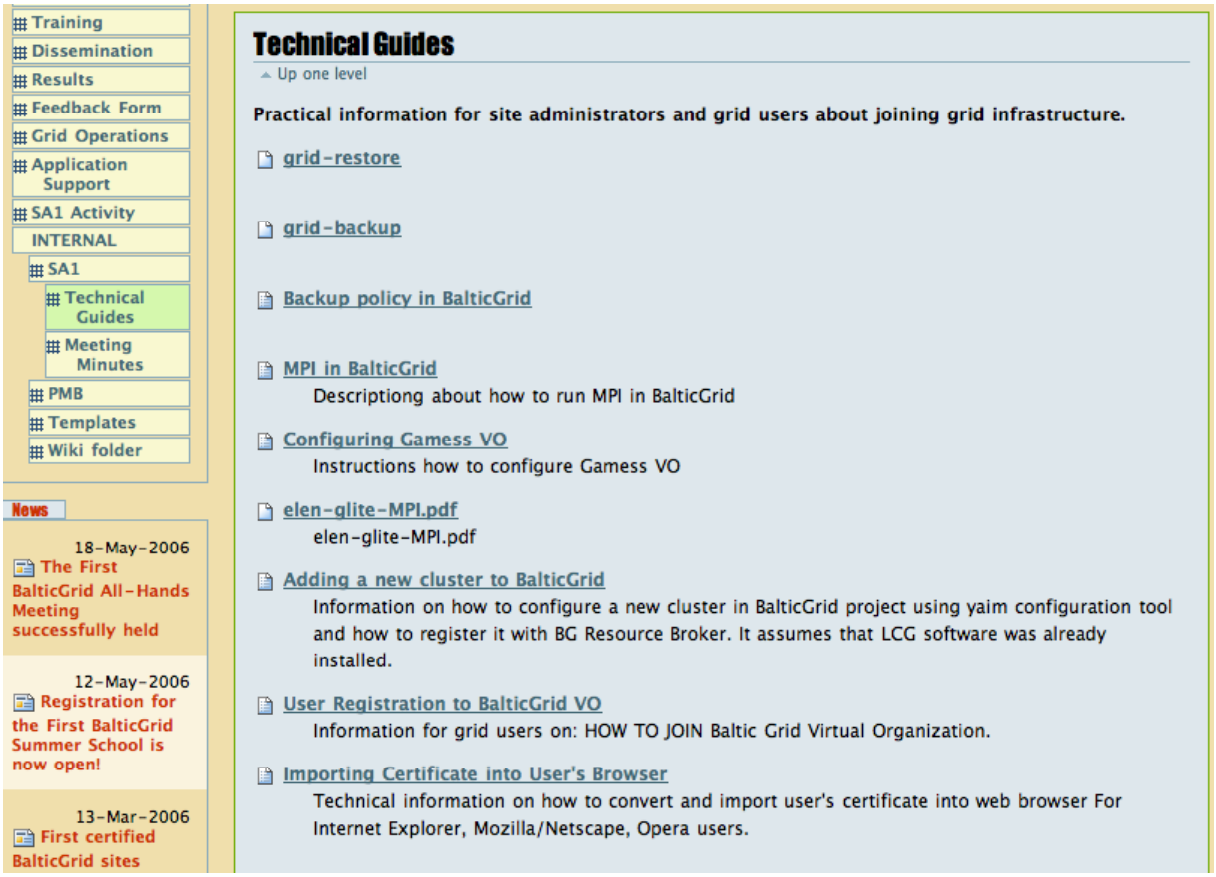


Figure 7 - excerpt from SA1 technical guides web page

In addition the webpage of http://voms.balticgrid.org/ contains also some technical documentation as well as custom packaged Plug-and-Play gLite/LCG User Interface (UIPnP) etc. These documents are planned to be moved to a central location under the project homepage to provide uniform access to all of the documentation. A Wiki is also set up under the SA1 activity internal part of the project website to gather together possible common problems with solutions. At this moment all of the sites in BalticGrid are also participants in the project and hence no access restrictions come from the current location of the Wiki. However, once the infrastructure expands beyond partners, then most of the documentation will be made public. This is also the full intention of the project members that much as possible of the documents from the BalticGrid project should be made public.

3.2. MAILINGLISTST

BalticGrid project uses EENet's listserver lists.eenet.ee. It uses Mailman (http://www.gnu.org/software/mailman/index.html) as its mailinglist management software. In the listserver, each activity has its own mailinglist as well as separate lists for Project Management Board and External Advisory Committee.

3.2.1. SA1 mailinglist

The SA1 activity, “BalticGrid Operations” uses mailinglist balticgrid-sa1@balticgrid.org

There were about 950 messages from the beginning of project till the end of August 2006. The list is mostly used for discussions on the BalticGrid infrastructure development and maintenance as well as questions on troubleshooting and setting up the operational infrastructure. It is a general-purpose technical discussions list of anything related to building or operating the BalticGrid.

3.2.2. NA3 mailinglist

The NA3 activity, “Application Identification and Support” uses mailinglist balticgrid-na3@balticgrid.org. There were around 80 messages from the project beginning to August 2006. The list is mostly used by the NA3 activity for applications related discussions however it has also been used for user support and in helping the VO managers in their tasks of remote software installation and VO management.

3.3. REQUEST TRACKER (RT)

For getting better overview of ongoing problems, the Request Tracker ™ was installed. EENet has used RT for 3 years for tracking open issues. It has helped to get good overview of the work to be done. Migration to this new system is still ongoing, but already now a lot of the error reports and trouble tickets are opened through the support interface or e-mail gateway instead of writing to SA1 mailing list.

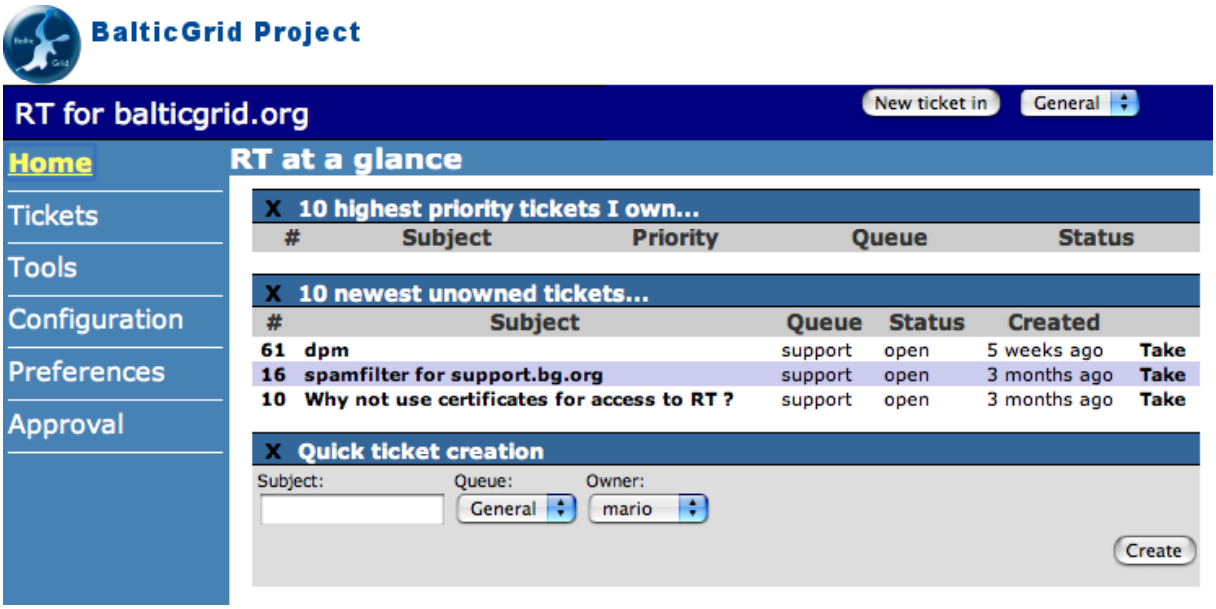


Figure 8 - RT administrators interface

3.4. GGUS

GGUS is EGEE2 central trouble ticket system used throughout Europe for problems ranging from single users having trouble with their applications to site level problems reported from central monitoring frameworks like SFT-s. It is a tool outside of the BalticGrid project, but as there is close collaboration between EGEE2 and BalticGrid in almost all aspects, then BalticGrid also uses the same trouble ticket system for escalations and problems beyond the control of Baltic partners. It is also used

for reporting problems from the monitoring system to site administrators who have to respond to all of the tickets opened against them in the ticketing system.

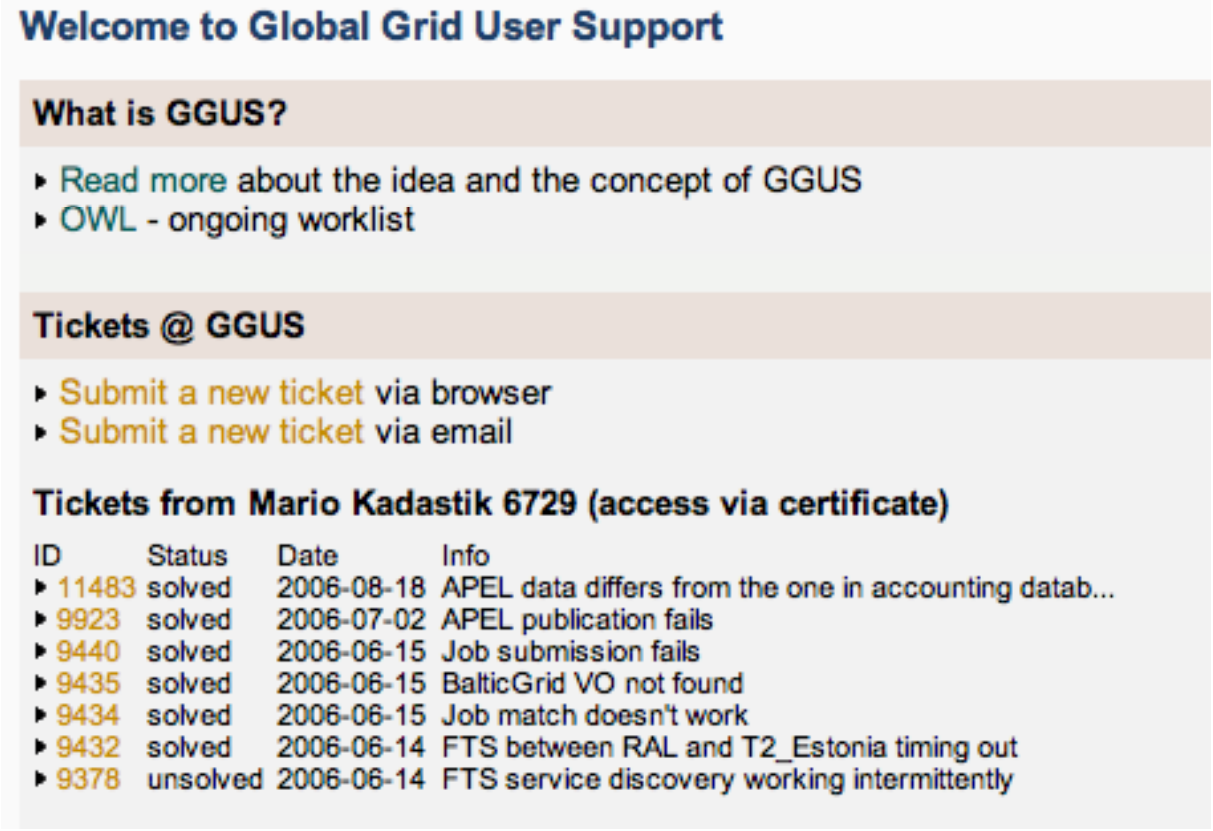


Figure 9 - part of GGUS interface for site admins

4. CONCLUSIONS

The current structure for monitoring provides sites with up-to-date information on their status history as well as the latest results through GStat, SFT and SAM. That way a site admin can easily monitor health of the site and take action if needed. However, if the site does not have an active helpdesk, then the monitoring tools also provide a means for opening trouble tickets to be assigned to the particular site.

The trouble ticketing system for sites is used in the same way as in EGEE2 project. BalticGrid project uses the same infrastructure and software (GGUS, GStat, SFT) and in addition we have created local monitoring and support structures (Stress Tests, RT). This enables small and local problems to be dealt with within the region using local monitoring and support structures while bigger problems or problems extending beyond Baltic region can be maintained using EGEE2 support structures.

User support is established using a ticketing system (RT) and migration from the previous discussion based support using mail lists is currently taking place. As the usage of the Grid grows, the need for user support will grow proportionally. To handle this efficiently all the different categories of supporters such as systems experts, and applications experts will use the common BalticGrid ticketing system.