

# CENTRAL SERVICES IN OPERATION IN ALL COUNTRIES

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**Abstract:** This document gives an overview of the state of the BalticGrid-II project's central services installation and operation in all the partner countries.





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# CONTENTS

<b>LIST OF ACRONYMS</b> .....	<b>4</b>
<b>INTRODUCTION</b> .....	<b>5</b>
PURPOSE.....	5
<b>THE OPERATIONAL MODEL OF BALTICGRID-II</b> .....	<b>6</b>
CENTRAL MANAGEMENT OF OPERATIONS .....	6
CENTRAL SERVICES PROVIDED FOR THE GRID.....	6
QUALITY OF SERVICE .....	6
PROCEDURES FOR PROBLEM SOLVING .....	7
<i>Solving user-centric problems</i> .....	7
<i>Solving of middleware related problems</i> .....	7
INSTALLATION OF VO SOFTWARE .....	7
<b>STRUCTURE AND PRIORSITIES OF CENTRAL SERVICES</b> .....	<b>8</b>
DISTRIBUTION COUNTRY WISE.....	8
<i>Regions that are not part of EGEE</i> .....	8
Estonia.....	8
Latvia .....	8
Lithuania .....	9
Belarus .....	9
<i>Regions that are part of EGEE</i> .....	9
Poland.....	9
Sweden .....	10
CERN .....	11
DISTRIBUTION SERVICE WISE.....	11
<i>Multiple instances of highly used services for availability</i> .....	11
<i>Multiple instances for sustainability per country</i> .....	12
<b>SUMMARY</b> .....	<b>13</b>



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## LIST OF ACRONYMS

AL	Activity Leader
BAT	Batch System Analysis Tool
BDII	Berkely Database Information Index
BG-I	BalticGrid, EU FP6 project
BG-II	BalticGrid Second Phase, EU FP7 project, continuation of the BalticGrid-I project
CA	Certification Authority
CE	Computing Element
CNAME	Canonical Name record within the DNS
CYFRONET	Academic Computer Centre in Krakow
DNS	Domain Name System
EB	Executive Board
EGEE	Enabling Grids for E-science, EU FP7 project
EENet	Estonian National Research and Education Network
EU	European Union
EUGridPMA	European Policy Management Authority for Grid Authentication
FCR	Freedom of Choice for Resources
GGUS	Global Grid User Support
GOcdb	Grid Operations Center Database
IFJ-PAN	Henryk Niewodniczanski Institute of Nuclear Physics, Polish Academy of Sciences
IMCS UL	Institute of Mathematics and Computer Science
LFC	Lightweight file catalog
LitGrid	Lithuanian Grid
NGI	National Grid Infrastructure
QoS	Quality of Service
RA	Registration Authority
RB	Resource Broker
ROC	Regional Operations Center
RTU ETF	Riga Technical University, Faculty of Electronics and Telecommunications
SAM	Service Availability Monitoring
SE	Storage Element
UI	User Interface
UIIP NASB	United Institute of Informatics Problems, National Academy of Sciences of Belarus
VO	Virtual Organisation
VOMS	Virtual Organization Management System
VU	Vilnius University
VG TU	Vilnius Gediminas Technical University
WMS	Workload managements system



## INTRODUCTION

### PURPOSE

Among primary aims of SA1 activity is maintaining central services for the Grid middleware. As one of the objectives is to develop a sustainable infrastructure beyond this project, it is essential to have all central services available in all associated countries to allow the emergence of National Grid Initiatives (NGIs) or to allow the existing NGIs carry out separate sustainable management of the Grid infrastructure.

In the document we report the situation with the central services in all the partner countries related to the BG-II project. Following the Annex I of the project, the document describes set up, changes and maintenance of the components of the central services:

- Certification Authority (CA) and Registration Authority (RA) work:
  - o The Baltic Grid CA (across the three Baltic States).
  - o The CA infrastructure and policy and RA network.
  - o The new Belarus CA.
- Operation of the central middleware services needed for all users:
  - o WMS and RB services for job submission
  - o Information system to allow resource discovery
  - o VOMS services for local VO support
  - o LFC and other services necessary for the operation of the Grid
- Deployment and support of tools of the BalticGrid JRA1 project.

The document also includes overview of the maintenance procedures and description of some problems identified during the project phase.



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## THE OPERATIONAL MODEL OF BALTICGRID-II

### CENTRAL MANAGEMENT OF OPERATIONS

Central management of operations is carried out in accordance to the established operation procedures, i.e., through several collaboration means and using support software and data bases – SA1 meetings, weekly ticket watches and posts on the relevant mailing lists. SA1 meetings are held at least weekly in EVO environment, unless most of the SA1 partners have met previous week during some EGEE or BalticGrid-II event.

Current issues and all open tickets are discussed during weekly SA1 meetings, and the next person from SA1 partners responsible for ticket watch is appointed on a round robin basis. Although every SA1 partner's obligation is to perform regular review and update of tickets regarding problems at the corresponding site, the person responsible for the weekly ticket watch makes sure that every ticket is being either in process of resolving (site administrator working on the issue) or waiting for user reply. The ticket watchers on duty also contact persons responsible for site maintenance in case some tickets are not updated for considerable time (usually one week).

If grid user submits a ticket request regarding an issue that is not site-specific but dependant on common running policy of sites within BalticGrid-II, the policy is discussed at the next SA1 meeting to decide upon necessary actions.

Third of the most common activities regarding management of operations is maintenance of SA1 mailing list ([balticgrid-sa1@balticgrid.org](mailto:balticgrid-sa1@balticgrid.org)). All topics and issues of current interest (problems with services, updates, procedures, notifications about relevant events, etc.) are discussed on this list.

### CENTRAL SERVICES PROVIDED FOR THE GRID

Central services are services that need at least one instance of them available in order to provide certain functionality. In BG-II we have the following services available:

- WMS – one of the most important components in the system. Provides functionality for submitting and managing jobs.
- Top level BDII – provides actual information about available resources (computational, storage, etc) on the Grid.
- LFC – provides central interface for data management, giving each file a unique name and handling replicas transparently.
- VOMS – system for managing VO membership and role.
- BalticGrid CA – CA that covers Baltic region. This CA is a member of the EUGridPMA organization.

In order to achieve higher availability and sustainability within different regions we have deployed several instances of these services. A more exact distribution of services can be found in section 0.

### QUALITY OF SERVICE

Under QoS we understand several things. First of all we are trying to provide Grid service that is transparent to the end-users, hence we track all site instabilities and try to avoid sending user jobs to the unstable or unreliable sites. Second, we would like to give an overview of the Grid status to the users, site administrators and other parties that might be interested in BG-II operations. This overview is expressed in terms of different monitoring services tracking various aspects of the BG-II installation, e.g. number of free job slots, software available for VOs, efficiency of the user jobs, etc.

Although the services below are in some sense central, they can still be viewed separately from the core services as they add mostly to the QoS and not to the functionality of the Grid. These support services are:



- BalticGrid SAM – regional SAM installation for regular monitoring and testing of the resource availability;
- BalticGrid Infosite – provides user-friendly overview of available resources and current status of the BalticGrid infrastructure;
- FCR based on BalticGrid SAM results – allows to dynamically block access to resources that are unstable (e.g., failing SAM tests) in order to raise QoS for the user;
- BAT – system for analyzing the efficiency of jobs run at sites;
- Central Ganglia installation – provides detailed historic and current overview of consumed network and hardware resources.

## PROCEDURES FOR PROBLEM SOLVING

### Solving user-centric problems

Not too complicated and reoccurring problems are usually dealt swiftly using SA1 tools and procedures (mailing list, RT, meetings). Procedure for resolution of complex and specific issues is not established well yet. The reasons are:

- lack of sites' motivation to invest significant effort in resolution of problems, which don't affect local users' experience or site statistics;
- complex communication, when users, developers and supporters are in different locations;
- lack of expertise to modify scientific software developed outside the BalticGrid community;

These problems are usually addressed either by personal communication or at the ROC level.

### Solving of middleware related problems

BG-II support system is integrated neither with GGUS, nor GOCDB. Site administrators are expected to be registered in both systems and to handle problem reports coming from both sources. GGUS tickets are usually opened at site administrator discretion, mostly after consultation and attempt to resolve the issue within BG.

## INSTALLATION OF VO SOFTWARE

In many cases users want to get some non-standard application or specific version of compiler available at sites. We have created a repository of most often used software and tools to easily install the required ones at the sites. Additional software packages can be added to the repository on user request. This procedure is documented and installation is automated using custom scripts.



## STRUCTURE AND PRIORSITIES OF CENTRAL SERVICES

### DISTRIBUTION COUNTRY WISE

#### Regions that are not part of EGEE

##### ***Estonia***

Central services in Estonia are hosted by EENet.

WMS/MyProxy – [broker.eenet.ee](http://broker.eenet.ee)

BDII – [bdii.balticgrid.org](http://bdii.balticgrid.org)

Top level BDII is configured to use FCR service provided by Lithuanian partners.

LFC – [lfc.balticgrid.org](http://lfc.balticgrid.org)

VOMS – [voms.balticgrid.org](http://voms.balticgrid.org)

VOMS is providing VOMS services for the following virtual organizations: balticgrid, estonia, biit and gtlstudents.

In addition to the core grid services, there are a few supporting services run by EENet.

Baltic Grid Certificate Authority (<https://ca.balticgrid.org/>) is EUGridPMA accredited CA providing X. 509 certificates for all Baltic States. Request Tracker (<https://support.balticgrid.org/>) is BalticGrid ticketing system, targeted both towards site administrators and users.

EENet is also developing and maintaining BalticGrid Infosite.

##### ***Latvia***

At the moment of writing this document all central services in Latvia are hosted by RTU ETF. Previously users in Latvia used central services from other countries, but due to the connection problems with GEANT, it was decided to implement full set of central services locally. So far the installation provides most of the central services to the local users. Only VOMS service is not yet fully implemented and local users use VOMS provided by Estonian region. However, the hardware and software are already in place to bring VOMS up. The following central services are already implemented and running latest software version:

WMS – [wms.grid.etf.rtu.lv](http://wms.grid.etf.rtu.lv);

LFC – [lfc.grid.etf.rtu.lv](http://lfc.grid.etf.rtu.lv);

BDII – [bdii.grid.etf.rtu.lv](http://bdii.grid.etf.rtu.lv);

MyProxy – [myproxy.grid.etf.rtu.lv](http://myproxy.grid.etf.rtu.lv).

These services are mainly used by local users, but servers have enough capacity to work at much higher load. All services are configured to support local users and run most common Balticgrid-II project VOs and tutorial VO.

Most users in Latvia are either from IMCS UL or RTU ETF. Due to the growing amount of grid usage from IMCS UL and IMCS UL involvement in SA2 activity (network provisioning) it is necessary to provide redundant central services within IMCS UL. Since the central services hosted by RTU ETF are not loaded, redundant central service hosting is not required in utilization aspect, however IMCS UL performs testing of central services both to evaluate possible network and middleware risks (security, integrity, availability, etc), as well as to test central services under highly loaded or unstable network. Such kind of tests may lead to unstable central services, thus it is necessary to perform such tests on alternative servers hosting the central services. Another usage of the redundant central services would be the possibility to quickly switch from and back to RTU ETF and IMCS UL servers in case services at one of the partners becomes unavailable either due to hardware or network failure, or due to middleware failure or a broken software update.



## **Lithuania**

Top BDII – bdii.mif.vu.lt – is a separate IP address configured in one of two nodes lxb027.mif.vu.lt and lxb028.mif.vu.lt with manual switching in case of problems or when updating. Automatic HA (high availability) fail over or load balancing is not yet configured.

WMS – wms.mif.vu.lt – is a DNS alias (CNAME) to real WMS node (lxb026.mif.vu.lt for the moment) and could be changed to another (e.g., with newer version) node without losing currently managed jobs.

LFC – grid3.mif.vu.lt – is used as a central LFC for litgrid and games VOs.

MyProxy – grid3.mif.vu.lt – is configured to accept proxy renewal from all BalticGrid WMS.

VOMS – grid.mif.vu.lt – is hosting litgrid and games VOMS services.

SAM/FCR – sam.balticgrid.org – is testing (every two hours) BalticGrid and LitGrid LFC/SE/CE services and managing FCR lists for them in balticgrid VO. For testing CE it uses WMS (grid5.mif.vu.lt) which is configured to use top BDII from SAM machine (grid10.mif.vu.lt). This top BDII (grid10.mif.vu.lt) is configured without FCR.

Kaunas University of Technology (KTU), though not a BG-II partner directly, is moving towards running most of the central services. Top-BDII is already available, WMS should be available by the end of the year 2008. Reason for this is an attempt to maintain enough technical expertise for self-support on site and to support Grid related research carried out by local scientists.

VG TU has testing site (test.ce.grid.vgtu.lt) with central services (test.wms.grid.vgtu.lt /WMS and test.bdii.grid.vgtu.lt/Top-BDII), also for production site (ce.grid.vgtu.lt) central services (wms.grid.vgtu.lt/WMS and bdii.grid.vgtu.lt/Top-BDII) are available. Testing infrastructure is used mostly for updating and testing services and software to ensure better performance for production site and central services. Also it is used for software development and testing.

## **Belarus**

All central services in Belarus are hosted by UIIP NASB:

WMS – wms.basnet.by;

LFC – lfc.basnet.by;

Top level BDII – topis.basnet.by;

VOMS - voms.basnet.by.

The services are mainly used by local users and configured to support common BG-II project VOs and national experimental VO dteamby.

## **Regions that are part of EGEE**

### **Poland**

IFJ-PAN is responsible for providing tutorial infrastructure for hands-on trainings and tutorials organized by the project. Good cooperation with CYFRONET computing centre that is coordinating Central European EGEE region allows the services to be shared partially on their resources.

Infrastructure for tutorial consists of:

- tutorial Certification Authority which issues short-term certificates for tutorial participants
- BalticGrid tutorial VO (bgtut VO) infrastructure
  - Grid central services (UI, WMS, LFC, VOMS)
  - monitoring (probe execution & publishing)
  - computing and storage resources supporting bgtut VO

The main challenge in providing tutorial infrastructure is related to low activity frequency (typically each 6 months) and very concentrated effort during short period of time. Tutorial infrastructure



including central services must be flawless as there is no time for a second chance to correct failures while tutorial participants do exercises on-line. Thus it is important to assure good maintainability and serviceability of resources used in the tutorial.

The tutorial Certification Authority issues short-term, no-name certificates to be used during training events. A requirement for no-name certificates excludes all EUGridPMA-approved CAs and comes from the fact that trainings are often organised for grid beginners who have never tried it before and thus do not have their personal certificates. Procedure of obtaining a personal certificate takes several days and is not always feasible before the event.

The tutorial Certification Authority is operated by IFJ-PAN. It has issued certificates for two events: Riga and Minsk tutorial sessions. Operation of the CA is supported by a set of scripts for automatic generation of no-name certificates, registration of these certificates in VO membership server and removing after the event.

Operation of BalticGrid tutorial VO needs central services to support this VO as well as monitoring services to report on the status of the resources supporting the VO.

Grid central services for bgtut VO include:

- VOMS - Virtual Organization Membership Services keeping record of people being registered in the VO
- WMS - Workload Management System which allows to submit and keep track of jobs belonging to the VO
- LFC - Logical File Catalogue keeping track of mapping between logical file names and their physical location
- UI - user interface allowing access to Grid for bgtut VO users

Another kind of service is a VO monitoring consisting of two parts - execution of probes and result collection and presentation described in the next chapter.

Among others the bgtut VO is hosted on stable and well-maintained machines at CYFRONET allowing reliable services at a low maintenance cost. The services for bgtut VO are deployed on the following hosts:

VOMS - voms.cyf-kr.edu.pl

WMS - rb1.cyf-kr.edu.pl

LFC - lfc.cyf-kr.edu.pl

The User Interface service is a gateway to Grid on which the users are given an account and can log in. This service is provided on "on-demand" basis exclusively for the training events. The limitation comes from the fact that local policy requires formal application for an account on the machine which, however, is not feasible for tutorial events due to the fact that the User Interface is deployed before the event and then destroyed after it.

Essential part of bgtut VO operation is monitoring which allows to check if the resources supporting the VO are in a good shape and thus suitable for performing a training event. Bgtut VO uses SAM monitoring framework. IFJ-PAN is responsible for maintenance and regular execution of the probes (tests) at sites. The results from the execution are published to BalticGrid SAM database and can be viewed at its web interface: <https://sam.balticgrid.org/sam/sam.py>

## **Sweden**

Sweden's infrastructure is not directly associated with BalticGrid's. Within BalticGrid project Sweden provides ROC services being responsible for the whole Baltic region. No other central services are provided to this project by the Swedish partner.



## CERN

As planned, CERN does not provide hardware resources or host grid services for BalticGrid-II. CERN's main contribution in BalticGrid-II SA1 is to provide technical support in installing, maintaining, and operating the BalticGrid production infrastructure. This includes support, deployment and monitoring of core gLite services; provide up-to-date, timely and effective operations consultancy role in the project; act as facilitator for knowledge transfer from some of the core EGEE technical activities; and support liaison activities between BalticGrid-II, EGEE and other e-Infrastructure projects. As agreed with project management, specific grid support is also provided to VGTU.

In BalticGrid-II, as with similar regional e-Infrastructure projects, the CERN personnel hired for the project is from the region, in this case Lithuania (from new consortium partner VGTU). For the duration of the project, the Lithuanian associate is based at CERN and joins the on-site EGEE operations team. Following similar experience in BalticGrid, it is envisaged that this arrangement will allow CERN to provide effective consultancy in BalticGrid-II as a whole, and in addition, it facilitates effective knowledge-transfer scheme from CERN to VGTU to support its efforts for a sustainable e-Infrastructure development in the future.

## DISTRIBUTION SERVICE WISE

There are two main reasons for having more than one instance of central services: for availability and for sustainability.

Availability is an issue as high load on the service or service downtimes might make usage of the Grid uncomfortable. We solve that by providing several instances of each central service. The table below shows the distribution of service replicas in more detail.

After the end of the BalticGrid-II project the countries will enter NGI phase and there won't be central coordination anymore. Therefore we need to make sure that the created infrastructure is sustainable.

### Multiple instances of highly used services for availability

Services listed below are located in 4 countries: Estonia, Latvia, Lithuania and Belarus. Although Sweden, Poland and CERN are also parts of BalticGrid-II, these partners do not provide central services for the production VOs of BalticGrid.

Service type	Service instances and regions
WMS	<ul style="list-style-type: none"><li>broker.eenet.ee (Estonia)</li><li>wms.grid.etf.rtu.lv (Latvia)</li><li>wms.mif.vu.lt (Lithuania)</li><li>wms.grid.vgtu.lt (Lithuania)</li><li>wms.bashnet.by (Belarus)</li></ul>
BDII	<ul style="list-style-type: none"><li>bdi.balticgrid.org (Estonia)</li><li>bdi.grid.etf.rtu.lv (Latvia)</li><li>bdi.mif.vu.lt (Lithuania)</li><li>bdi.grid.vgtu.lt (Lithuania)</li><li>topis.basnet.by (Belarus)</li></ul>
LFC	<ul style="list-style-type: none"><li>lfc.balticgrid.org (Estonia)</li><li>lfc.grid.etf.rtu.lv (Latvia)</li><li>grid3.mif.vu.lt (Lithuania)</li><li>lfc.basnet.by (Belarus)</li></ul>



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MyProxy	<ul style="list-style-type: none"><li>• broker.eenet.ee (Estonia)</li><li>• myproxy.grid.etf.rtu.lv (Latvia)</li><li>• grid3.mif.vu.lt (Lithuania)</li></ul>
VOMS	<ul style="list-style-type: none"><li>• voms.balticgrid.org (Estonia)</li><li>• voms.basnet.by (Belarus)</li></ul>

**Multiple instances for sustainability per country**

As you can see from the table above, each country has at least one instance of each central service (with exception of VOMS due to its nature). Another reason for that is to provide sustainability of Grid also after the end of the project. As not all countries have exact plans for the NGI phase that should follow after the end of the BalticGrid II project, it should be possible to continue grid operations in each country independently from central service providers belonging to other NGIs.

Although in practice, most probably, there won't be a problem with sharing such resources as WMS or BDII, we have planned deployment of resources in a way that would help to resolve political/technical issues should they occur.



## SUMMARY

So far we have managed to have a central services infrastructure built in every region participating in the project. Even more, some regions have multiple instances available to assure high availability and sustainability in the future.

In order to support the infrastructure and the users we have also enhanced the quality of service system even further in comparison with the BalticGrid project. There is a number of widely used and custom made monitoring applications deployed in BalticGrid, e.g. custom SAM, BG InfoSite and BAT to name only a few.

For the operations to be smooth we have several activities: Request Tracker for managing issues, weekly EVO meetings for active discussions on serious problems and reporting of activities, mailing list for technical and organizational support.

We also provide service for software installation on demand that makes running of the user jobs much more transparent. The service is lightweight and not VO specific.

In general, technically we are well prepared for the daily operations and transition to the EGI phase after the end of the project.