WLCG in the EGI/NGI era

Introduction

Today WLCG relies quite extensively on services and software provided by EGEE in Europe, as well as on processes and support systems that have been produced or evolved by EGEE. Partly this originates in the fact that WLCG fully committed itself to relying on EGEE at the beginning of the EGEE project cycle. During the time since then EGEE has grown significantly, but WLCG has remained by far the largest user community and has been the strongest driving force. It has also of course itself invested heavily in EGEE in many aspects – human and computing resources, operational coherence and so on. It is fair to say that WLCG is still far and away the largest and most demanding scientific grid user community and would like to rely on there being a continuing European (and world-wide) grid infrastructure of equivalent functionality, reliability, and scale to the EGEE infrastructure today. Thus it is the single largest stakeholder in any future European Grid infrastructure.

In addition, the EGEE efforts have aided the integration with WLCG partners in the US and Canada, and in Asia. The procedures derived by EGEE and WLCG together have become the basis for support and operational procedures covering the interoperation between EGEE, OSG, and other WLCG grid sites.

It is vital to WLCG that the present level of service continue uninterrupted after the close of the third phase of EGEE, and that all of the services and support structures upon which WLCG relies today have a clear transition or continuation strategy. The time period of the close of EGEE and potential transition to an EGI is critical for WLCG as this will be the first year of LHC operation and the focus must be on providing a stable and reliable service. Undertaking large scale changes to the existing services at such a time will bring an unacceptable level of risk.

Experience during the EGEE projects has shown that having clear mechanisms for interaction between the user communities and the infrastructure providers are important, particularly in such a distributed environment. The EGI blueprint proposes the creation of Specialised Support Centres (SSC) for specific application communities. Thus it would be advantageous to the community if WLCG were to benefit from the existence of such an SSC for HEP.

WLCG, though the Overview Board has expressed its strong support for the setting up of the EGI organisation and National Infrastructures:

- *"The WLCG Overview Board strongly supports the creation of a European Grid Infrastructure based on National Grid Initiatives with a European level coordination. In particular WLCG will rely on the National infrastructures to provide operational tools and services for the Tier 1 and Tier 2 sites in each country, and requires a European coordination body with which it, as an application community, can work together on requirements and evolution of the services. The Overview Board also supports the concept of a Specialised Support Centre for High Energy Physics, and WLCG would collaborate with EGI.org in the setting up of such an organisation.*

- *The Overview Board is concerned about the timescales involved, in particular the timing of a transition between EGEE and the EGI/NGI model, which comes at a time during the first year of accelerator running when the disruption of existing services will be least tolerable. To this end the WLCG will work together with EGEE and the EGI_DS projects to propose and evaluate acceptable transition scenarios. There is also concern over the preparedness of the NGIs to*

be able to take over the core operation in 2010, and the Overview Board would like to see evidence of progress of the NGIs committing themselves to the EGI model."

The Services

Clearly the production service is the most important piece, but is really the sum of all the constituent services and processes. As far as WLCG is concerned the computing and storage systems required have been committed to WLCG as part of the MoU. Of course for optimum use each facility or country may well be funding the resources for multiple uses.

The pre-production service is a set of hardware that is used to test new services or software before full scale deployment. WLCG would need to continue to have access to such a service in order to determine the effects of new software releases.

Grid Operations

WLCG has worked closely with EGEE over the last 5 years to build a grid operation that satisfies its needs. WLCG currently relies on the EGEE infrastructure to provide certain services and functionality, some of which are specific to the EGEE sites, but some (e.g. accounting, SAM) are also used to integrate input also from other grid infrastructures.

The existing operational structures (Operations Coordination, the Regional Operations Centres, the ENOC, the GGUS infrastructure, operational security coordination, etc.) are used as the heart of both the EGEE and the WLCG operational services. In the sense that WLCG runs a service for LHC on the top of the infrastructure services provided by EGEE and others, it makes direct use of the EGEE operations structures to coordinate and manage that service to avoid duplication for the site and service managers. How these structures will transition to EGI and the NGIs is a focus of work in EGEE-III, and the subject of the EGEE-III transition planning. In particular, GGUS and many of the other operational procedures are fully integrated with other collaborating infrastructures (e.g. OSG), and how this integration will be maintained must also be described.

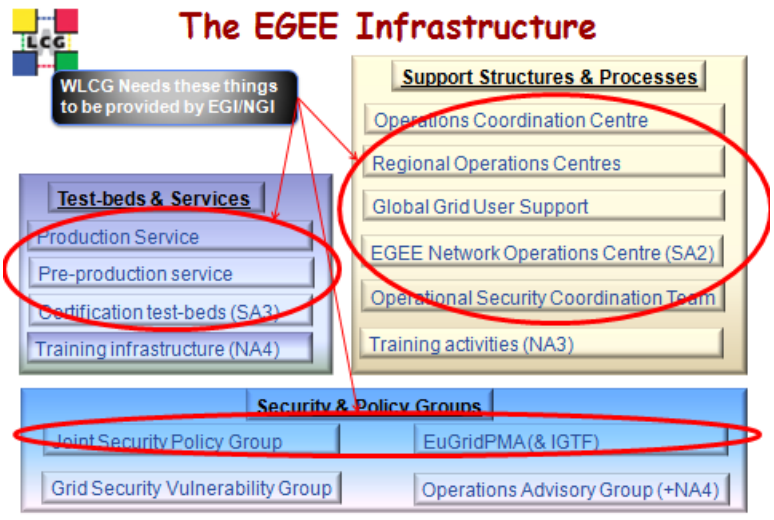

Figure 1: EGEE infrastructure services used by WLCG

The present scale of WLCG and EGEE would not be possible without all of the significant effort and thought that has been put into building the set of policies. These policies are essential for the acceptance and the operation of such a service. It is very important that the policy work continues and evolves in the future. It should be noted that from the very beginning this work has been explicitly inter-continental and has where possible tried to include as many grid infrastructure operators as possible. This level of international coordination must be continued; WLCG cannot exist within Europe alone, and must have a coherent set of operational policies that can be used or adapted worldwide.

While it is certainly true that many of today's operational services are becoming more and more distributed, with the goal even within EGEE-III of moving as much of the operational responsibility to ROCs and sites, it nevertheless appears that the level of effort required in the EGI organisation for

operational coordination on an international scale is underestimated. This may well have been done to keep the cost to a minimum, but unrealistic estimates will not build a reliable infrastructure.

In the following we describe the services and support required by WLCG, which today come via EGEE. In Appendix 1 are given a list of services, which countries provide them today, and how they will be provided after the end of EGEE-III. Appendix 2 lists the middleware components from EGEE that are required for WLCG and lists their main developer/maintainer.

Support Services

Support Infrastructure

The GGUS infrastructure provided by FZK/KIT today is at the heart of all of the operations and user support procedures. It relies on connections to local support teams and ticketing systems at the EGEE Regional Operations Centres (ROC) and at sites. It is also integrated with the OSG ticket system. The Operator on Duty (COD) makes use of GGUS for sending trouble tickets to sites and ROCs, and for tracking progress. The User Support teams also use GGUS for direct support for experiments. The system is set up to provide different levels of ticket – including Alarms and urgent issues. There are many different workflows set up within GGUS to support the various support scenarios.

This service must continue, and must allow for the Tier 1 sites to take over the role of the ROCs, unless the NGIs are developed enough to take over this role.

Operations and Service coordination

This is the responsibility of CERN for coordination and the EGEE ROCs in Europe (the OSG iGOC plays this role in the US). While the WLCG service coordination will remain at CERN as it is now, it is to be anticipated that the regional operations coordination for WLCG will move to the Tier 1s, unless again the NGIs are in place and able to do this. Presumably in that environment the WLCG sites would have SLAs with the local NGI operations centre for this task.

Application support

This is provided by a small team (Experiment Integration Support – EIS) based at CERN. While this has always been a WLCG function, EGEE has also provided contributions to this effort through NA4 and the HEP applications cluster.

For the future, one possibility is to create a Specialised Support Centre (SSC) for HEP, as foreseen in the EGI blueprint. This centre could take the role of the EIS teams that currently exist, and could be the basis for a structure that could obtain additional support funding.

Network Coordination

Today, the EGEE ENOC provides the operational connection between the grid operations and GEANT and the NRENS. It uses GGUS to support the workflows, including a central clearing house for all network trouble tickets published by the NRENS. It allows the coordination of grid issues and a single point of contact to the network community. The LHC OPN makes use of the ENOC as part of the operations workflows. Today the ENOC is largely provided by France.

Middleware Deployment Support

Today this is a complex function supported through the EGEE SA3 activity with a geographically distributed team. The need for continued support for testing, certifying and building a middleware distribution for WLCG remains, as does the need for coordination of the roll out, deployment,

debugging and support of the middleware services. In addition the need for some level of pre-production deployment testing has been shown to be indispensable and must be maintained at some level. The certification testing should be done in a single location for simplicity, but the pre-production testing must be a distributed task, but a few collaborating sites is sufficient.

These issues are discussed further below in the middleware discussion.

Operations Tools

The essential tools that are required for the daily operation of WLCG, as well as the overall management and reporting include accounting, configuration management, and operations support. The EGI blueprint does not foresee maintenance and development of these tools as a function of the EGI.org but assumes this will be done by the NGIs.

Accounting

The APEL accounting database and the data gathering infrastructure are today provided and maintained by STFC/RAL. Note, that Italy uses the DGAS system in order to gather the information. All WLCG infrastructures (EGEE, OSG, DGAS, NDGF) publish the data into the APEL database.

The web portal through which all the queries on the accounting database are supported is provided by CESGA (Spain). This portal also provides the automated report generation for the Tier 2 accounting reports, and hopefully in the future will also support an automated report for the Tier 1s.

Configuration Management

The grid operations configuration data base (GOCDB) is also provided by STFC/RAL. This is a critical service and is used to define all the services and sites within the grid, as well as contact and management data for the services. It is used by all of the monitoring and reporting tools, it is also where site downtimes are advertised.

Operations Portal

This is a web portal provided by IN2P3. While some of the services it provides today may be less essential in the future as the operational oversight becomes more distributed, there are several functions that will continue to be important for WLCG. These include:

- Contact information for sites and services,
- VO-ID cards that are a mechanism for the VOs to provide details of their operational requirements,
- The broadcast tool that provides a mechanism for grid-wide publication of service changes etc.,
- The portal also supports the automated reporting of daily and weekly operations issues.

Availability/Reliability tools

There are several different pieces needed in this area.

SAM Framework, NAGIOS etc.

The SAM framework that allows the operations team and VOs to submit tests and gather results is a key part of the management of the service. SAM and its associated database, including configurations, are maintained by CERN. The SAM tests are provided by CERN and others, including the experiments. The SAM submission and reporting framework is being migrated to Nagios, and it is anticipated that most sites will use Nagios as a site monitoring tool. Interfaces are provided also

to Lemon and Ganglia. The SAM (and VO) tests can generate alarms at sites. All alarms and test results should appear in the site monitoring tools.

GridView

The GridView portal allows graphical display of many metrics, including the reporting of the availability and reliability information (using SAM test results and downtimes from the GOCDB). The algorithms for availability/reliability calculation are part of the GridView system. GridView is maintained by CERN and BARC (Mumbai).

GrdiMap

The GridMap tool which is now used for visualisation of many operational parameters is the result of a collaboration with EDS through the CERN openlab. As this collaboration is formally at an end, CERN will continue to support the tool.

Messaging

A reliable messaging system based on open source products is replacing the transport mechanisms used in various areas (e.g. R-GMA, publication of SAM results, interconnection between OSG and EGEE monitoring data). This has been developed at CERN, also as part of an openlab collaboration.

Dashboards

The various dashboards are now essential for the experiments operations, and also provide views of key metrics tailored for various stakeholders including sites. The service, the framework and common services are provided by CERN. It may be desirable that in the future the experiments take responsibility for the experiment-specific developments.

Security and Policy

Operational Security Coordination

One of the essential parts of grid operations is that of Operational security coordination. The Coordinator is provided by CERN today, but relies on good contacts in major sites and NRENs. In the past few years a strong operational security community has grown up, driven by the needs of ensuring that security problems are well coordinated across the distributed infrastructure. If the NGIs are in place, they should take this coordination role, as should EGI.org at the European level. If the NGIs are not in place, we must rely on good coordination through the NRENs and Tier 1s. However, it is advisable to maintain WLCG coordination in addition.

Policy development:

Today this is coordinated by STFC/RAL, and the JSPG has a wide participation across all the grid infrastructures collaborating in WLCG. While the EGI.org and NGIs will presumably have a similar function, our experience has been that it is only with the appropriate policies in place are we able to actually operate. Thus WLCG must foresee maintaining such a function, at least to ensure that our needs are presented to the EGI/NGI organisations, or to exert pressure where required.

Grid Services

These are in any case already run as part of the existing MoU agreements, and include:

- VOMS – registration portal, connection to HR databases, etc. (CERN)
- FTS, LFC, WMS, 3-D etc. as required by experiments and stable operations
- Pre-production service as noted above.

These are not detailed further here as changes are not anticipated.

Middleware

Middleware support

There are several key middleware components in gLite that WLCG relies upon. While it is appropriate that the middleware development itself is outside of the EGI structure, it is nevertheless very important that there is sufficient effort devoted by EGI towards the integration, testing, and certification process. This has been shown over and over again to be an absolutely key ingredient in enabling a reliable infrastructure. The amount of effort required to carry out these tasks is grossly underestimated in the current blueprint. It is also unrealistic to expect that a very distributed effort in these functions will work. It has been shown during the last 5 years to be impossible to operate as a distributed activity. Ultimately, there must be a single point of control over what is put into the middleware distribution.

In the next few years WLCG will require a stable middleware distribution that is not being changed, except in very controlled ways. WLCG sites will need to continue to deploy and support the gLite distribution as they do now. It is very difficult to integrate different middleware distributions and requires a major effort by each experiment to do so, or a significant effort in building interoperability between middleware distributions. The next few years are not the time when WLCG should need to have to worry about such changes; the focus of effort must be on stability and improving the existing service.

It is important that the proposal to create a gLite consortium before the end of EGEE-III in order that there is a structure within which the existing middleware components can be supported and maintained. This structure should be a straightforward as possible and focus on the existing deployed software.

In the case the middleware development is not well supported by EGI, it will be necessary for WLCG to support the middleware it needs directly. As most of the components in use today are developed and maintained by HEP institutes this may not be such a difficult problem. The institutes involved would agree an SLA with WLCG in such a scenario.

What does WLCG require?

While the gLite consortium is needed in order to provide a framework within which to continue support for the gLite middleware, the need to continue development of middleware may not provide WLCG with the stability that it needs in the next few years. In order to address this, it may be more practical for WLCG to go back to the idea of a stable middleware distribution based on stable releases of gLite and other software. In fact all post-EGEE era applications will need to have a process to understand these issues (or follow one provided by another application):

- It needs a tested, certified, integrated “distribution” of middleware. In this sense the “distribution” can simply be a list of acceptable versions of components that can be run by a site. Thus the integration work is simply building this list (or matrix) of combinations of package versions that work together.
- WLCG would thus provide a repository with reference combinations of these components.

The EGI.org middleware unit could equally take this responsibility, or indeed it could be that each (or some) NGI would define their own sets.

It would thus make one or two such releases per year, with essential bug and security fixes. This will decouple such a distribution from a more rapidly developing and changing gLite consortium

distribution. This provides potential benefits from both sides. Of course it would still be essential that the gLite consortium treat the WLCG requirements as important, whilst allowing the development and testing of new services to be done without impacting the support for the stable WLCG "releases". Similarly, the work between gLite, ARC, and UNICORE to integrate the various middleware stacks could be done with little disturbance to WLCG, which ultimately would benefit from the standardisation and integration work.

Software components used by WLCG

See list in Appendix 2.

Integration

There are several outstanding issues to be resolved.

- How do Tier 2's not in a country with a Tier 1 get operational support? Clearly if there is an NGI this is the mechanism. If not, agreements with other countries and or the Tier 1s will be required.
- In many countries today the ROC staff are not the same as the Tier 1 support staff, which lead to communication problems (e.g.T2 → ROC → CERN → T1 (should be T2 → T1)!). This area of concern has been raised in several fora recently – both with the EGEE operations teams and within WLCG. Today the Tier 1s use the EGEE communication mechanisms.
- NGIs/ROCs need transition plans in each country
- A model is needed for providing support to non-EU/non-US sites. For example China, Latin America do not have an obvious support agent. Clarification of future EGI plans for support outside of Europe would be useful.

How WLCG will integrate with NGIs

It will be essential that each country defines and agrees with its NGI how the support for WLCG will work. A statement clarifying this will be needed from each country with Tier 1 or Tier 2 sites. In essence, it is to be expected that the WLCG sites within a country will obtain operations support in all its aspects from the NGI. The NGI should play the roles in future currently assumed by the EGEE ROCs.

How WLCG will work with EGI.org

The EGI.org will clearly play a coordination role of the NGI services. Several things will still need to be clarified and agreed for WLCG:

- How does WLCG coordinate its services with the NGIs? This may be at the country level, through the Tier 1s, or it could be directly with the appropriate teams within EGI.org.
- How will WLCG as a large user community communicate its needs to the EGI and NGI infrastructure providers?
- How will the HEP community be supported by EGI.org and the NGIs. Part of the EGI blueprint is to have Specialised Support Centres (SSC) that provide application/user support to application domains. Such an SSC for HEP could be foreseen, and build upon the existing EIS-type expertise and roles. This may also provide a possible mechanism to fund this kind of support.

NGI Status and Plans for Supporting WLCG

CERN

CERN is not an NGI, but will continue to provide the services and software required for WLCG.

Tier 1 Countries

The Tier 1 countries have been asked to report on the following topics in order to build up a picture of progress in setting up the NGIs:

- Which services you currently provide for WLCG (via EGEE) that you will commit to continue to support (see attached slide) – what is the level of effort you currently provide for these (separated into operation, maintenance, and development)
- Which services you will not be able to continue to support or where the level of effort may be significantly decreased that may slow developments, bug fixes, etc.
- What is the state of the planning for the NGI:
    - Will it be in place (and fully operational!) by the end of EGEE-III?
    - What is the management structure of the NGI?, and
    - How do the Tier 1 and Tier 2s fit into that structure?
    - How the effort that today is part of the ROCs (e.g. COD, TPM, etc) for supporting the WLCG operations evolve? How will daily operations support be provided?
    - Does the country intend to sign the Letter of Intent and MoU expressing the intention to be a full member of EGI?
    - Which additional services could the Tier 1 offer if other Tier 1s are unable to provide them?
    - Other issues particular to the country, or general problems to be addressed.
    - What are the plans to maintain the WLCG service if the NGI is not in place by May 2010, or if EGI.org is not in place?
- For ASGC and Triumf it would be useful to hear on their plans in the absence of EGEE ROC support – i.e. do they have plans to continue or build local support centres? For BNL and FNAL it is assumed that nothing will really change on the timescale of the next year.

Other issues that need to be discussed include how the support for non-EU, non-US sites will be managed. For example sites in Latin America and others which are currently supported by the CERN ROC.

UK

The UK ...

France

France will ...

Italy

Germany

Spain

Nordic Countries

Netherlands

Canada

Taipei

USA

Tier 2 Countries (currently supported via EGEE)

Australia

Austria

Belgium

China

Czech Republic

Estonia

Hungary

India

Israel

Japan

Pakistan

Poland

Portugal

Republic of Korea

Romania

Russian Federation

Slovenia

Switzerland

Turkey

Ukraine

Appendix 1. Services required for WLCG

Service	EGEE provider	EGEE effort Service/maint+dev	EGI provider (or for WLCG)	Effort (in blueprint) Service/maint+dev
Grid Topology - GOCDB	STFC		STFC	1 + ??
Accounting repository – APEL	STFC + CESGA		STFC+CESGA	1 + ??
Monitoring data repositories – SAM etc	CERN		CERN	2.5
Operations portal –CIC portal	IN2P3		IN2P3	0.5
Ops oversight – OCC, COD	CERN, IN2P3		Coord CERN and Tier 1s	1 +??
Gstat	ASGC		ASGC	
Nagios + sensors	CERN, SRCE		CERN ??	
Messaging	CERN		CERN	1?
Dashboards	CERN		CERN	
Regional ops dashboard	IN2P3		?	
Ticketing system – GGUS	FZK		FZK	2
Ticket triage etc – TPM	ROCs		???	
Middleware deployment coord	CERN		CERN	1
Interoperation coord	CERN		CERN	0.5
Network coord - ENOC	IN2P3		??	
Ops procedures	CERN		CERN	
Policy development – JSPG	STFC		STFC	0.5
Ops security coord	CERN		CERN	1
Coord & maint of ops tools	CERN		CERN	1
Apps support – EIS	CERN/INFN		CERN/INFN	

Appendix 2. Software required for WLCG

Component	Developer/Maint	Component	Developer/Maint
Data Management		**Operations Tools**	
FTS	CERN	APEL	STFC
DPM	CERN	Accounting portal	CESGA
Castor	CERN	GOCDB	STFC
dCache	DESY/FNAL/NDGF	SAM	CERN
GFAL/lcg-utils	CERN	GridView	CERN/India
LFC	CERN	GridMap	CERN
Amga (? Needed?)	CERN	Dashboards	CERN
Workload Management		Nagios sensors	CERN + SRCE +??
WMS	INFN, ElsagDatamat	MSG	CERN
LB	Czech Rep.	Gstat	ASGC
CREAM/BLAH	INFN	CIC Portal	IN2P3
LCG-CE	CERN		
VOBox container	CERN		
AAA			
VOMS	INFN		
VOMRS	FNAL		
MyProxy	VDT		
Proxy renewal	CESNET		
LCAS/LCMAPS/SCAS	Nikhef		
gLexec	Nikhef		
Delegation framework	CERN, HIP, STFC		
Trustmanager	HIP		
GridSite	STFC		
General			
Information system	CERN		
YAIM framework	CERN		