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1. Executive Summary

The Standards work in project UniGrids builds on the proven expertise and reputation of the collaborators that was established in previous projects, e.g. EUROGRID, GRIP, GRIDSTART. It focuses on European collaboration in the Grid Standards Collaboration Group (GSCG) and international work in the Global Grid Forum (GGF) and OASIS. The work is undertaken at all levels in the various organisations: Dave Snelling, FLE, became acting Vice Chair Standards managing the seven standards areas in the restructured GGF Steering Group. Dietmar Erwin, FZJ, became chairman of the GGF Nominating Committee which selects the future GGF Steering Group members. On the technical level, the focus is on specifications and best practices that are important to UniGrids. This includes the definition of the JSDL proposed standard, which was completed with major contributions from FLE and UoM, the preparation of GGF working groups to define detailed OGSA specifications, like Resource Selection Services, and Basic Execution Services. Standardisation of WS-* specifications takes place in OASIS. Here FLE and FZJ are voting members and major contributor to the Web Services Resource Framework (WSRF) and WS-Notification. Dave Snelling, FLE, is co-chair of the WSRF working group. The standards work of GRIDSTART which had been coordinated by Dietmar Erwin, FZJ, became one of the starting points for the FP6 Grid Standards Coordination Group, which is lead by Philipp Wieder, FZJ, for project NextGRID.

Although UniGrids is a relatively small project it is making major contributions to the international standards work.

2. Objectives and starting point

UniGrids intended to influence the standardisation process for selected grid standards. Members of the UniGrids consortium remain or will become active participants in relevant working groups of standards organisations, especially GGF, and if possible take leadership roles, for example as chair persons to influence the directions of the standards development and to promote European research results. The areas in which UniGrids will be particularly influential were foreseen to be:

- Open Grid Services Architecture
- Grid Economics
- Production Grid Management

The standards organisations that are interested in these areas are: GGF, IETF, OASIS and W3C. FZJ, UoM, and FLE were already active in the Global Grid Forum (GGF) and OASIS.

D. Erwin was contributing to the GGF Production Management Research Group (PGM) and a member of the GGF Nominations Committee 2004.

In order to be able to vote on the WSRF standards proposal in OASIS, FZJ became institutional member of OASIS.

At the beginning of the project, Donal Fellows (UoM) was closely involved in the JSDL-WG (Job Submission Description Language Working Group) at the GGF.

3. Achievements in GGF

The Global Grid (GGF) Forum has been founded in 2001 in Amsterdam as the successor to the US initiated Grid Forum, combining the European (Egrid), Asia-Pacific, and US (Grid Forum) grid activities. Europeans have contributed substantially from the beginning, however, the directions
were influenced by the US to a large extend. To play a full role in the international grid scene presence and active participation at all levels of the organisation is mandatory. ¹

3.1 GGF Management

The initial GGF Steering Group (GFSG) constituted itself from the management in the US (Grid Forum, 12 persons), Europe (Egrid, 4 persons), and two persons from Japan. They were appointed by acclamation at the first GGF meeting.

To fill posts that are vacant in the GFSG, a process has been put in place which is modeled after IETF. GGF participants nominate candidates for a nominating committee (NomCom). Ten of these nominated persons are chosen through a predefined random process. This committee selects and proposes suitable candidates for the open positions from a pool of nominated candidates. After approval by the GFSG, they are appointed to their function.

In 2004 eight positions were open in GFSG. The nomination committee had three Europeans: Dietmar Erwin partnered in FP5 projects and in GRIDSTART, Ramin Yahyapour represented a University, and Wolfgang Ziegler a Research lab. All are expected to be partners in FP6 projects.

The 2004 NOMCOM screened nearly 50 proposals for candidates and conducted written and telephone interviews with more than half of them. Four Europeans, two members for AP and two from the US were elected into the GFSG and took office as of GGF12.

3.2 Changes in GGF

At GGF 12, Mark Linesch, HP, became the new GGF chair succeeding Charlie Catlett, Argonne National Labs, who led GGF from the beginning. He initiated an extensive 10 week strategy process to review the GGF strategy and operating model. The analysis of the data along with the recommended action were discussed and agreed to during the January 2005 GFSG face-to-face meeting. The results can be found in a document titled “Global Grid Forum – Changes to GGF Operating Model” which is available on the GGF web pages.

Based on the strategic work, the GFSG has refined the mission of GGF to

“lead the pervasive adoption of grid computing for research and industry”.

To accomplish this mission by GGF will be

1. defining grid specifications that lead to broadly adopted standards and interoperable software, and
2. building a broad international community for the exchange of ideas, experiences, requirements, and best practices.

The structure of GGF will evolve to enable more focused leadership and accountability and is depicted below:

¹ The information about the GGF structure and the Nominations Committee are given here to provide the context.
GGF will have a new Board of Directors (BOD) structure representing the stakeholders in GGF.

**Grid Forum Advisory Council: (GFAC).** The Advisory Council will continue as a source of strategic guidance and input on critical grid-related issues.

**Grid Forum Steering Group: (GFSG).** The Steering Council will evolve to provide more focused leadership and support to accomplish the GGF mission. Changes to the GFSG include a new Management Committee structure along with more focused Community, Standards and Operation functions to improve execution and accountability for key objectives and measures. Each of the key functions (Community, Standards, and Operations) will be lead by a Vice-Chair – a new leadership position created as a result of the proposed operating model. Vice-Chairs are envisioned to be full-time volunteer positions to allow for focused leadership and management of each critical function. Candidates for the Community and Standards Vice-Chair positions are selected through the NOMCOM process based on GFSG approved requirements. The Operations Vice-Chair will be the Executive Director of GGF - a paid, staff position. All appointments are GGF Board approved.

**Management Committee:** The Management Committee will be composed of the GGF Chair, GGF Executive Director, Community and Standards Vice-Chairs, with administrative support provided by GGF staff. The Committee will be responsible for long-term strategic development, financial planning, allocation of human and financial resources, and oversight of the councils. A key focus of the Management Council will be to insure that each of the major functions are optimized while fostering collaboration and synergy between functions (for instance ensuring close collaboration between our community areas and the work of our standards areas).

**Community Function:** The Community function will be led by a full-time volunteer Community Vice-Chair. Communities will be grouped into areas and led by area directors (2 per area where appropriate). The Vice Chair, Area Directors, Editor and GGF staff support will form the Community Council and provide leadership and oversight for community activities and assume previous GROC functions. Activities
will be focused on supporting and broadening communities across research and industry including working with technology innovators, grid operators and the grid software community.

**Standards Function:** The Standards function will be led by a full-time volunteer Standards Vice-Chair. Standards will be grouped into areas and led by area directors (2 per area where appropriate). This function will also include a Liaison area director and designated GGF liaison representatives for critical standards organizations such as IETF, W3C, OASIS and others. This area will manage key strategies between GGF and other standards organizations – ensuing delivery against GGF objectives and measures. The Vice-Chair, Area Directors, Liaison Area Director, Editor and GGF administrative staff support will form the Standards Council and provide leadership and oversight for standards-related activities. Activities will be focused on defining the GGF standards and liaison strategy, GGF roadmap and driving standards and specification development.

**Operations Function:** The Operations function will be led by a full-time Operations Vice Chair (GGF Executive Director) selected by the GGF board to provide oversight and management for key operation functions. Each Operations area (Marketing, finance, sponsorship, IT and events) will be led by an area director from the community and supported by GGF staff. The areas will manage to goals established by the Operations Council and will also provide support to the community and standards organizations through full-time administrative staff and IT support.

David Snelling, FLE, who had been a driving force behind OGSA specification, became acting Vice Chair Standards under the new GGF structure.

### 3.3 Nominations for GGF Steering Group 2005

Starting in October 2004, D. Erwin, the chairman of the GGF Nominations Committee (NOMCOM) for 2005 started the call for volunteers to serve on the NOMCOM. This process included verifying the eligibility of candidates together with the GGF headquarters and numerous personal, email, and telephone discussions with grid researchers from the US, Europe, Japan, Korea, Taiwan, and the Peoples Republic of China. As it turned out, most of the interested candidates in the countries emerging with strong grid projects (China, Korea) did not qualify formally since they just started to attend GGF and so far sent different people, mostly to learn.

The process resulted in 10 people being elected through a random process based on IETF RFC 2777. This section was run at FZJ. The NOMCOM for 2005 has the following members:

**Non-voting members:**

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<thead>
<tr>
<th>Name</th>
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<td>Martin, David</td>
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<td>IBM (GFSG liaison)</td>
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² This work was funded up to March 2005 in part by project GRIDSTART. The results of this work are reported here for completeness.

³ Beth Plale was later replaced by Laura McGinnis, Pittsburgh Supercomputer Center, as advisor.
Voting members:

Arnold, Jill   jillar@internet2.edu   Internet 2, US
Berket, Karlo   kberket@lbl.gov   Lawrence Berkley Lab, US
Cowles, Robert   rdc@slac.stanford.edu   Stanford Linear Accelerator, US
Gunter, Dan   dkgunter@lbl.gov   Lawrence Berkley Lab, US
Haupt, Tomasz   haupt@CAVS.MsState.Edu   Mississippi State University, US
Quesnel, Darcy   darcy.quesnel@canarie.ca   Canarie, Canada
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Ziegler, Wolfgang   Wolfgang.Ziegler@scai.fraunhofer.de   Fraunhofer, Germany

D. Erwin was involved in the discussions about the proposed new GFSG structure with Mark Linesch since this deeply affected the Nominations Process. D. Erwin developed a new call for nominations and worked with the (acting) vice chairs (Dave Snelling for Standards, Geoffrey Fox for Communities, and Steve Crumb for Operations) on job descriptions for the Area Directors to be elected. D. Erwin defined the NOMCOM internal processes that would allow to complete a three times as large workload for NOMCOM (over 20 AD positions and two Vice Chair position had to be filled) in a timely fashion.

All deliberations of NOMCOM are confidential. Only the names of confirmed candidates are announced when they take office at GGF 15. The names of candidates that were nominated but declined and those that accepted but were not selected by NOMCOM will not be made public.

The NOMCOM is holding regular bi-weekly telephone conferences and met face to face at GGF 13 and GGF 14. Over 50 nominations had to be screened and followed up by. Each candidate has to submit a questionnaire and CV. Nearly 30 telephone interviews with the candidates were conducted followed by face to face interviews at GGF 15 (Chicago, June 2005) in three days of closed session. The selections will be completed in August and September and the announcement of the new GFSG members will be at GGF15.

Open positions in the 2005 GFSG are:

**Standards Function:**

- Vice Chair Standards
- Area Director (AD) Infrastructure
- AD Compute
- AD Applications
- AD Standards Liaison

**Community Function:**

- Vice chair Communities
- AD Research Applications
- AD Industrial Applications
- AD Grid Operations
- AD Technology Innovators
- AD Major Grid Projects
- AD Community Affairs
**Operations Function:**

- AD Marketing
- AD Events
- AD Finance
- AD Sponsorship
- AD Information Technology

Although, the work in NOMCOM does not create standards, it is important that people with the right qualifications are elected into positions that can determine the directions grid computing will take. The work by Sven van den Berghe, FLE, and Dietmar Erwin, FZJ, can be considered a major contribution, not only to standards but especially to the evolvement of Grids and Europe’s influence on Grid development.

### 3.4 GGF technical work

The technical work in GGF focuses on OGSA related specification which are important to UniGrids. In addition best practices and case studies are contributed. At GGF 14, a paper by D. Erwin, M. Rambadt, A. Streit, and Ph. Wieder, "Production-Quality Grid Environments with UNICORE" was presented in the workshop on Grid Applications: From Early Adopters to Mainstream Users.

#### 3.4.1 JSDL

The Job Submission and Description Language has, since it came into existence, passed through several important iterations. The draft has been completed and entered the GGF Public Comment period. It is expected that JSDL v1.0 will be accepted without major changes after the 60 days Public Comment Period, which will end 10 September 2005.

FLE joined the GGF JSDL-WG starting with the Face-to-Face meeting in London at 18 November 2004. Michel Drescher, FLE, and Donal Fellows, UoM, are co-authors and major contributors to the JSDL draft. Roger Menday, FZJ, was one of the reviewers of this document.

JSDL defines a job template. That is, the information given in a XML document instance, conforming to the JSDL XML schema document, is intended to be interpreted by an otherwise specified job reception mechanism. The result of a reception of such a JSDL conformant job description is a job instance being submitted to a Grid Computing element suitable to process and execute this job. This process of receiving a job description and turning it into the desired outcome is defined elsewhere, particularly in the GGF OGSA-WG.

JSDL v1.0 describes the least common denominator of all interested and contributing partners. While this may be a drawback in the first view, this reveals a very widespread interest in the standardisation of such language, as opposed to a hypothetical scenario where a standardisation group shares a large amount of requirements and, as a consequence, covers only a small part of the relevant community.

The JSDL working group achieved to agree to a language despite the large and differing interests and requirements of its participating colleagues. It did so in offering extension points to the specification itself, allowing implementers to add specific information where necessary. This way, the overall structure of a job template is still clear to all other implementers even without knowing or supporting specific extensions.

To ignite rapid extension development, JSDL defines a normative extension to itself by defining a language to describe POSIX compliant job submissions. This extension has been quickly identified as one of the most needed and useful extensions to the Grid community. While, on first thought, integrating this extension into the JSDL specification itself would have been a natural
consequence, it would have had bad effects on the overall structure and “cleanliness” of the JSDL itself by letting POSIX specific elements creep into other parts of JSDL despite not belonging there.

The JSDL working group expects a rapid and dynamic evolution of extensions to JSDL of which some, after careful considerations, may be added to JSDL as normative extensions in later versions.

The JSDL has already been widely adopted despite not yet being published as a GGF Final Document. It has been selected as the language of choice within the OGSA Basic Execution Service Working Group (OGSA-BES), and as a member of the OGSA Basic Profile v1.0. The NAREGI project (http://www.naregi.org/index_e.html) is one of the earliest adopters of JSDL. In fact, the NAREGI project contributed to the JSDL standardisation effort. Also contributing and guaranteeing to adopt JSDL are the OMII (http://www.omii.ac.uk/) through their Job Submission and Job Monitoring Service component.

3.4.2 OGSA-RSS

Donal Fellows (UoM) has been working to establish a new working group at the GGF, the OGSA Resource Selection Services working group, and has volunteered to be a co-chair of the WG. He has also volunteered to be the editor of one of the two major deliverables of the WG.

The OGSA Resource Selection Services (OGSA-RSS) working group has had its charter discussion BoF meeting at GGF14 in Chicago (June 2005) and should be a confirmed working group sometime in July or August of the same year. This new working group has been founded to develop the inter-service communication specifications for services involved in the selection of resources (i.e. brokering and super-scheduling) and will be working to fill in parts of the overall Open Grid Service Architecture. Donal Fellows (UoM) is to be a co-chair of the working group.

The OGSA-RSS working group will be specifying protocols and interface definitions for the resource selection portion of the OGSA Execution Management Services (itself, an aspect of the Open Grid Services Architecture) as set out in section 3.4.6, page 22 of GFD.30 (OGSA v1.0). The particular focus of the working group will be the Candidate Set Generator (CSG) and the Execution Planning System (EPS). The CSG can be used to generate a set of computational resources that are able to run a job in general, while the EPS uses this list to decide where to run the job. The aim of the working group is to have the specifications into the public comment stage of the lifecycle by GGF18 (the first GGF after the end of UniGrids).

As part of doing this, the working group will work to build links with other groups, most notably the OGSA-WG and the Grid Scheduling Architecture research group. The work of this working group is very much about bringing much of the technology development of WP3 to standardization within the overall OGSA architecture, and public deliverables of that work-package will be used as use-cases and foundational documents by the working group.

3.4.3 OGSA-BES

FLE and UoM have contributed to the preparation and setting up of the Basic Execution Service (BES) Working Group prior and at GGF 14.

The OGSA V1.0 document section 3.4, pages 17-25, describes an EMS (Execution Management Services) architecture consisting of a number of different services. This document describes one of these services – the “service container” – which is the focus of the Basic Execution Service (BES) specification developed by this working group. BES models execution of services in “containers” that may be implemented in a variety of ways, e.g., by a single Unix or Windows host, by a queuing system, by a hosting environment such as .Net or J2EE, or by more specialized execution containers yet to be invented. BES defines a set of port-types as well as resource properties (attributes) for the simplest – most basic container.
Given that a job description in a JSDL document instance is given at a particular level of abstraction (i.e. logical filenames), BES assumes that, before this JSDL document instance is submitted to the BES container, this document has been concretised elsewhere. That is, logical file names have been replaced by concrete, real file locations specific to the environment that this very BES container covers. This piece of work is covered by OGSA-RSS liaised to OGSA-BES through Donal Fellows who co-chairs the OGSA-RSS group.

The UniGrids atomic services layer serves as one blueprint model for how these kind of services may work, and may eventually fully implement the OGSA-BES interface.

The BES working group has taken up concrete work starting short before GGF14, and expects to finish with the delivery of a final recommendation in late spring 2006.

3.5 OGSA-ByteIO

Michel Drescher, FLE, works with the OGSA-ByteIO Working Group, which has been approved as a GGF Working Group after a BoF at GGF13 in Seoul, Korea. It expects to publish the final Use Case and Recommendation documents in late Spring 2006.

The OGSA-ByteIO working group defines a minimal Web Service interface for reading and writing arbitrary sequences of bytes to and from a variety of data resources. The proposed interface will cover a range of client-side APIs such as POSIX, NFS and SAGA. Other data transfer protocols, such as GridFTP, have shown interest to contribute an implementation towards ByteIO.

The interface specification is client-oriented, that is, the specification will only consider scenarios and use cases where the client of the Web Service initiates an operation, whether data retrieval or data storage.

4. OASIS

OASIS was selected to become the organisation to standardise Web Service related specifications that are required to complete the OGSA specifications. FLE and FZJ are members of the the OASIS organisation and as such are entitled to vote on the standards to be defined.

David Snelling (FLE) is co-chair of the Web Services Resource Framework (WSRF) Technical Committee in OASIS and the liaison between GGF and OASIS. This requires oversight of the entire process of creating a collection of OASIS specifications, including detailed attendance tracking, document management, agenda setting, and conflict resolution. The later is a major part of standards work in the Web services community. In addition, he serves as joint editor of the ServiceGroup specification. Roger Menday (FZJ) is member of the WSRF working group and co-editor of the "WSRF Application Notes" document.

4.1 WSRF

The term Web Services Resource Framework (WSRF) subsumes a set of specifications that together define a generic and open framework for modelling and accessing stateful resources using Web services.

The specification of the Web Services Resource Framework (WSRF) has been completed. It has now entered a period of public review for three months. This started on the 6th July 2005, and ends on the 5th September 2005.


Together, this set of specifications define the relationship between a Web Service and a Resource, and how resources are accessed through Web Services (WS-Resource), a way to declare a Web Service Resource’s properties and means to query and update the properties’ states.
(WSResourceProperties), WS messages and additional, resource lifetime related WS-Resource properties, standardising the means by which WS-Resources may be destroyed and by which lifetime status of WS-Resources may be queried and monitored (WS-ResourceLifetime), patterns of possible groupings of WS-Resources to form i.e. service registries (WS-ServiceGroup), and a set of fault types standardising problem determination and communication in Web Service environments. The document "WSRF Application Notes" for which Roger Menday has assumed the role as co-editor is an important document as it provides an introduction for WSRF application developers, via examples, best practices, and clarification of potential usage scenarios. It specifies how implementers might use the WSRF family of specifications The UniGrids project is well placed to edit such content, as it has been deeply involved in the 'nuts and bolts' issues of implementing WSRF.

The WSRF subordinate specifications are currently in Public Review phase.

### 4.2 WS-Notification

The WS-Notification Working Group, like the WS-ResourceFramework working group, publishes a set of specifications that standardise a Web Service based approach to notification based inter-object communication patterns.

In particular, WS-Notification specifies Web Services based notification using the publish-subscribe pattern found in many notification middleware products.

The three subordinate specifications partition the domain as follows:

WS-BaseNotification defines the Web services interfaces for NotificationProducers and NotificationConsumers. It includes standard message exchanges to be implemented by service providers that wish to act in these roles, along with operational requirements expected of them.

WS-Topics defines a mechanism to organize and categorize items of interest for subscription known as “topics”. These are used in conjunction with the notification mechanisms defined in WS-Base Notification. WS-Topics defines three topic expression dialects that can be used as subscription expressions in subscribe request messages and other parts of the WS-Notification system.

WS-BrokeredNotification defines the Web services interface for the NotificationBroker. A NotificationBroker is an intermediary, which, among other things, allows publication of messages from entities that are not themselves service providers. It includes standard message exchanges to be implemented by NotificationBroker service providers along with operational requirements expected of service providers and requestors that participate in brokered notifications.

WS-Notification has not yet reached the Public Review period, which, however, is expected to happen in the near future.