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Defining the Grid: A Roadmap for OGSA[®] Standards

Version 1.1

Status of This Document

This document provides information to the Grid community regarding the roadmap of the Open Grid Services Architecture (OGSA). It does not define any standards or technical recommendations. Distribution is unlimited.

This document contains schedule information for work being carried out by multiple OGF working groups and external organizations. The document will be updated periodically to reflect schedule changes.

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Obsoletes

This document obsoletes GFD-52 [ROADMAP1].

Abstract

The Open Grid Forum (OGF) has embraced the Open Grid Services Architecture (OGSA) as the blueprint for standards-based grid computing. "Open" refers to the process used to develop standards that achieve interoperability. "Grid" is concerned with the integration, virtualization, and management of services and resources in a distributed, heterogeneous environment. It is "service-oriented" because it delivers functionality as loosely coupled, interacting services aligned with industry-accepted Web service standards. The "architecture" defines the components, their organizations and interactions, and the design philosophy used.

The purpose of this document is to provide an overview of the many interrelated recommendations and informational documents being produced by the OGSA and related working groups. Although, some documents are not OGSA specific, for example "reference model" and "HPC profile," they have an important role within the OGSA concept, as they are used to complete an OGSA system and hence are explained in this document. This document also provides information regarding the intended completion dates of the documents in question, along with their dependencies on other OGSA and non-OGSA documents.

Contents

1. INTRODUCTION	4
2. OGSA: PROCESS, SPECIFICATIONS AND PROFILES, AND SOFTWARE	5
2.1 OGSA REQUIREMENTS.....	7
2.2 OGSA PROFILES	7
2.3 OGSA BRANDING.....	8
3. OGSA INFORMATIONAL DOCUMENT SCHEDULE	8
3.1 OGSA ARCHITECTURE VERSION 1.5	8
3.2 OGSA GLOSSARY VERSION 1.6.....	9
3.3 OGSA BYTEIO USE-CASES VERSION 1.0	9
3.4 OGSA DATA ARCHITECTURE VERSION 1.0	10
3.5 NAMING ISSUES IN DISTRIBUTED SYSTEMS VERSION 1.0	10
3.6 OGSA EMS ARCHITECTURE SCENARIOS VERSION 1.0.....	11
3.7 NAMING MECHANISMS AND THEIR SUPPORT IN DMI.....	11
3.8 INFORMATION-SECURITY USE-CASES FOR GRID ARCHITECTURES 1.0.....	12
3.9 GUIDELINES FOR INFORMATION MODELING FOR OGSA ENTITIES VERSION 1.0	12
3.10 EXECUTION ENVIRONMENT AND BASIC EXECUTION SERVICE MODEL IN OGSA GRIDS VERSION 1.0.....	13
3.11 OGSA INFORMATION MODELING ARCHITECTURE VERSION 1.0.....	13
4. OGSA NORMATIVE DOCUMENT SCHEDULE	14
4.1 BYTEIO SPECIFICATION 1.0.....	14
4.2 BYTEIO OGSA WSRF BASIC PROFILE RENDERING 1.0.....	15
4.3 OGSA BASIC EXECUTION SERVICES VERSION 1.0	15
4.4 JOB SUBMISSION DESCRIPTION LANGUAGE SPECIFICATION VERSION 1.0.....	16
4.5 RESOURCE NAMESPACE SERVICE SPECIFICATION VERSION 1.0.....	18
4.6 WS-NAMING SPECIFICATION VERSION 1.0.....	19
4.7 APPLICATION CONTENTS SERVICE SPECIFICATION VERSION 1.0	19
4.8 WS-AGREEMENT SPECIFICATION VERSION 1.0.....	20
4.9 ATTRIBUTES USED IN OGSF AUTHORIZATION VERSION 1.0	21
4.10 DATA MOVEMENT FUNCTIONAL SPECIFICATION	22
4.11 DATA MOVEMENT TRANSPORT PROTOCOLS AND THEIR USE IN DMI	22
4.12 RESOURCE SELECTION SERVICE.....	23
5. OGSA RECOMMENDED PROFILE SCHEDULE	23
5.1 OGSA WSRF BASIC PROFILE VERSION 1.0	24
5.2 OGSA BASIC SECURITY PROFILE 1.0 – CORE.....	24
5.3 OGSA SECURITY PROFILE 1.0 – SECURE CHANNEL.....	25
5.4 OGSA SECURITY PROFILE 2.0 - SECURE ADDRESSING	26
5.5 OGSA SECURITY PROFILE 2.0 - SECURE SOAP MESSAGING	27
5.6 OGSA SECURITY PROFILE 2.0 - SECURE TRANSPORT	28
5.7 WS-I BASIC PROFILE RENDERING OF DATA MOVEMENT FUNCTIONAL SPECIFICATION	28
5.8 WS-RF BASIC PROFILE RENDERING OF DATA MOVEMENT FUNCTIONAL SPECIFICATION.....	29
5.9 HPC BASIC PROFILE 1.0	33
6. OGSA INFORMATIONAL PROFILE SCHEDULE	34
7. COLLABORATION WITH OTHER ORGANIZATIONS	34
7.1 LIAISONS.....	34
7.2 STANDARDS DEVELOPMENT ORGANIZATIONS COLLABORATION ON NETWORKED RESOURCES MANAGEMENT (SCRM).....	35
8. OPEN-SOURCE SOFTWARE PROJECTS	35
9. SECURITY CONSIDERATIONS	37
EDITOR INFORMATION	37

[AUTHORS](#)37
[CONTRIBUTORS](#)37
[ACKNOWLEDGMENTS](#)37
[10. INTELLECTUAL PROPERTY STATEMENT](#)37
[11. DISCLAIMER](#)38
[12. FULL COPYRIGHT NOTICE](#)38
[REFERENCES](#)38
[APPENDIX A. SUMMARY OF REFERENCED SPECIFICATIONS & PROFILES](#)40
[APPENDIX B. WEB SERVICES CONTEXT](#)42

1. Introduction

The Open Grid Forum (OGF) has embraced the Open Grid Services Architecture (OGSA) as the blueprint for standards-based grid computing. "Open" refers to the process used to develop standards that achieve interoperability. "Grid" is concerned with the integration, virtualization, and management of services and resources in a distributed, heterogeneous environment. It is "service-oriented" because it delivers functionality as loosely coupled, interacting services aligned with industry-accepted Web service standards. The "architecture" defines the components, their organizations and interactions, and the design philosophy used.

OGF's OGSA Working group (OGSA-WG) has completed several major work products:

- The OGSA Use Cases document [OGSA Use Cases] describes a set of use cases from a range of enterprise and scientific settings, intended as a source of requirements for OGSA services.
- The Open Grid Services Architecture, Version 1.5 document (also called OGSA Architecture 1.5 in this document) [OGSA Arch] collates requirements for an Open Grid Services Architecture and identifies a large number of service interfaces that may be required to meet those requirements.

The completion of these documents leads to the question: what is the path by which OGSA will now be further developed and defined? An answer to this question is important to a variety of people:

- Many OGF participants have accepted the notion that OGSA can serve as an overarching architectural framework for different OGF activities. They now want to understand what this framework implies for their work.
- Developers and users want to know "what they can expect when" in terms of standards, so that they can make plans for product developments and technology acquisitions.
- There are one or more high-level architectural working groups such as OGSA-Data, which are responsible for significant components of the OGSA architecture. It is important for the members of these groups and others to understand the overall OGSA document framework and schedule.

In response to these and other pressures, we are moving quickly to fill out the OGSA definition and produce a set of normative specifications that define in great detail what it means to be OGSA-compliant. However, we must also be aware of a number of other factors:

- The broad importance of Grid and the tight alignment of OGSA with Web services means that further work on OGSA cannot proceed as a purely OGF activity, but must rather be viewed as one (hopefully important) input to a larger process aimed at defining service-oriented solutions to distributed computing problems.
- As in any standardization process, we need to be careful not to standardize prematurely, i.e., standardize without adequate experience and/or buy-in from its eventual users. These issues are particularly important in the case of OGSA, due to the particularly large gap between our ambition and experience.
- While the OGSA design teams have considered a variety of use cases we expect that there will always be important existing perspectives that have not yet been considered, and new use cases will continue to develop with the overall Grid standards infrastructure. We expect the consideration of use cases to be an ongoing process.
- The OGSA Architecture 1.5 covers a broad technical scope, and to date only a relatively small part of the subject matter has been addressed in normative or informational documents. Given the need for careful management of the process, the work must be undertaken in stages. Consequently we expect that it will take several years to develop normative documents that cover all of OGSA's capabilities.

These considerations motivate this document, which seeks to clarify the role of OGSA and the steps required to refine its definition by addressing the following issues:

- With a view to clarifying the important standards maintained outside of the context of OGSA and OGF, we provide a brief overview of important standards related to service-oriented architectures in general, and which provide an important underpinning to many of the normative specifications which will be produced by OGSA and related working groups. Basic information on the relevance of these standards to OGSA work is provided.
- With a view to clarifying the process by which OGSA definition may proceed, we recommend a process by which technical specifications developed within or outside OGF can be identified as meeting OGSA requirements. The selection and combination of element specifications that are required to achieve interoperability are described in chapter 2.
- With a view to identifying factors that might help prioritize work on OGSA, we identify dependencies among different OGSA interfaces and the interfaces that appear needed within different deployment and application scenarios. The schedule of the first set of informational documents, normative documents, and profiles is described in chapters 3 through 6.
- With a view to identifying external constraints on OGSA, we review major relevant standardization activities external to OGF. We discuss both past activities that have produced specifications on which OGSA can build, and current and planned activities that may contribute to, and/or constrain, OGSA's evolution. The collaborations among major standards development organizations are outlined in chapter 7.
- With a view to illustrating the breadth of interest in OGSA across the grid community, we describe in chapter 8 a range of open-source software projects that are actively engaged in implementing grid components and applications based on OGSA and related specifications. These projects are yielding valuable experience that enables their participants to contribute to the further development of OGSA.

2. OGSA: Process, Specifications and Profiles, and Software

We distinguish between the *OGSA architectural process*, *OGSA specifications and profiles*, and *OGSA software*: all of these are important to maintain coherence around OGSA and grid standards. These three areas are:

1. OGSA is first and foremost an **architectural process**, managed by the OGSA-WG, which works to collect requirements, evaluate the maturity of specifications, and produce periodic updates to the following OGSA informational documents:
 - A set of informational *OGSA Use Case* documents list end-user application scenarios that are thought to be relevant to OGSA design.
 - The *Open Grid Services Architecture* [OGSA Arch] [OGSA Glossary] identifies framework, taxonomy, and functionality that should be provided to address use case requirements.
 - Service Description documents, which are written and maintained by the appropriate domain-expert working groups or design teams, describe the services in the area in natural language, listing the interfaces and operations defined by each service. OGSA data architecture document (see section 3.4) is such document.
 - Scenario documents, also written by domain-expert working groups or design teams, demonstrate how these services can implement the use cases, using a combination of natural language and UML. OGSA EMS architecture scenarios document (see section 3.5) is such document.
 - Guideline documents, written by OGSA-WG, define concepts and methods in specific area in order to explain how to write OGSA specifications in each area. OGSA profile definition [OGSA Profile Definition] and modeling guideline (see section 3.8) are such guideline documents.
 - An *OGSA Roadmap*, this document, expresses OGSA-WG views on the likely future evolution of OGSA to address unmet requirements and/or respond to technology evolution.

We emphasize that these informational documents are intended to provide guidance to OGSA designers, but are not binding on current or future versions of normative OGSA documents.

2. **OGSA specifications and profiles** are normative documents. A **specification** documents the precise technical requirements, typically including interfaces, protocols and behaviors, for a conforming hardware or software component. An **OGSA Profile** identifies a set of broadly adopted normative technical specifications that collectively capture current understanding of what software must do to operate and manage interoperable grid environments. In developing such normative documents, OGSA-WG is informed by, and aligned with, user experiences with software that implements the relevant specifications. *When this document mentions “OGSA” in any normative sense, it refers to such normative documents.*

See section 2.2 for further discussion of OGSA Profiles.

3. **OGSA software** adheres to OGSA normative specifications and profiles, and thus enables customers to deploy grid solutions that interoperate even when based on different open-source or commercial software vendors’ implementations.

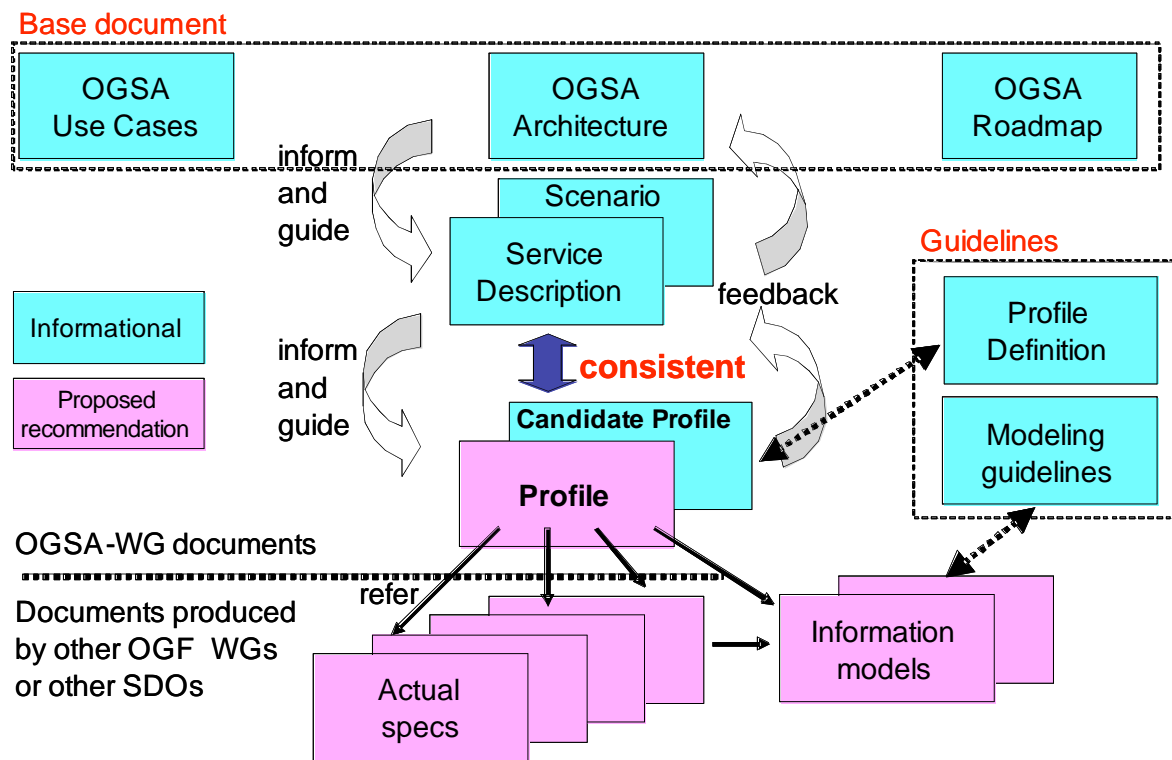


Table 2-1 OGSA documents and their structure

Table 2-1 shows the structure of whole OGSA documents, especially the relationship among high-level informational documents, profiles, and actual normative specifications.

At the time of writing, we have several OGSA informational documents, specifications and profiles. We do not yet have any OGSA-compliant software implementations or OGSA compliance tests. (See section 2.3 for more details.)

OGSA documents will evolve over time. Thus, any discussion of OGSA must always be qualified with a version number: e.g., “This software is compliant with OGSA WSRF Basic Profile 1.0,” or “OGSA WSRF Basic Profile 1.0 addresses X, Y, and Z in the OGSA Architecture 1.5.”

2.1 OGSA Requirements

OGSA requirements are derived from the study of use cases that are felt to be relevant to OGSA's goals of service-oriented infrastructure and grids. Such use cases and the requirements are derived from OGF members at large.

2.2 OGSA Profiles

OGSA, in the normative sense, is defined by a set of recommended specifications and *OGSA Recommended Profiles* (also referred to simply as "OGSA Profiles" in this document). The term *profile* is adopted from the WS-Interoperability (WS-I) organization, which has defined a Basic Profile 1.1 [WS-I BP 1.1] as a foundation for Web services interoperability, and also other profiles such as the Basic Security Profile [WS-I BSP 1.0] and Basic Attachments Profile [WS-I AP 1.0] that build on the Basic Profile.

An OGSA Profile, like a WS-I Profile, references a set of technical specifications and prescribes the ways in which those specifications should be implemented and used in order to perform various classes of operation in an interoperable fashion. However, the OGSA Profile is different from WS-I Profile in the sense that OGSA defines feature-rich combinable functionalities while WS-I Profile defines infrastructure-level specifications.

Individually and collectively, the specifications that are combined in an OGSA Profile:

- Address important end-user requirements, such as those described in the OGSA Use Case and Architecture documents;
- Are specified at a level sufficient to enable the development of interoperable implementations;
- Complement the other specifications contained in this and other OGSA Profiles;
- Have implementation experience; and
- Have been adopted—i.e., are already in use by, or have a high degree of expectation that they will soon be in use by, numerous technology providers and consumers.

OGSA Profiles are thus concerned above all with documenting acceptable practice and enabling interoperability, rather than with prescribing practice for the future.

In addition, OGSA Profiles seek to fill apparent gaps in the specifications. For example, the OGSA Security design team has defined how to include a service's public credential in an endpoint reference (EPR), and the OGSA WSRF Basic Profile team has specified a number of resource property elements that a client can expect to find—e.g., ResourcePropertyNames.

We expect that various OGSA Profiles will be defined over time, each independently versioned. We propose in this document an initial set of such profiles, some of which might be augmented with extension profiles for more advanced functionality.

This approach of defining multiple independent profiles is important because as OGSA grows, no single vendor is likely to implement everything. Profiles allow vendors to claim unambiguously conformance to relevant portions of OGSA. For example, a scheduler vendor might claim conformance to the OGSA Basic Execution Management Profile 1.0, but not to the OGSA Basic Data Profile 1.0.

We use the term **OGSA Recommended Profile** to assure potential implementers that all of the normative documents—specifications or other profiles—referenced by the Profile meet certain criteria of status and community adoption, as described in the OGSA Profile Definition document [OGSA Profile Definition].

We will also define **OGSA Informational Profiles**, which do not yet meet the criteria required to be OGSA Recommended Profiles, but which are meant to inform the development of technical specifications that might be referenced by OGSA Recommended Profiles in the future. An important task of the OGSA-WG is thus, periodically, to identify and document in revised OGSA Profiles the sets of specifications that meet the criteria outlined above, and to revise the Informational documents based on the latest specifications and community views.

OGSA Recommended and Informational Profiles may be developed either by the OGSA-WG or by domain-expert working groups, but it is important to note that they must adhere to OGF's OGSA branding guidelines, which are discussed in section 2.3.

Members of the OGSA-WG will also engage in development of specifications within appropriate working groups (*not* within the OGSA-WG itself), as well as in coordination and promotion activities aimed at bringing other specifications to the point where they are ready for inclusion in future versions of relevant OGSA Profiles.

The OGSA Profile Definition document outlines how to write Recommended and Informational Profiles that describe collections of specifications and their interactions, and defines the criteria to be used in determining the status and adoption levels of the underlying specifications.

2.3 OGSA Branding

Given the requirement for consistency across OGSA specifications and other documents, OGF defines in [OGSA-Related Naming Guidelines] the criteria to be used in determining whether to brand entities such as working groups and documents with an OGSA prefix.

The OGSA normative documents are expected to be implemented by multiple open-source software (OSS) projects and commercial software vendors. Authors of OGSA Software may claim one of three levels of agreement with the OGSA normative documents:

1. A claim to **implement** a specification or profile is a statement of "best effort" to satisfy the requirements of the specification. There are no test mechanisms to guarantee the correctness of the implementation.
2. A claim of **conformance** to a specification or profile is a statement of intent to interoperate with other conformant implementations. Two or more implementations may test their conformance by testing how well they interoperate. A conformance claim mechanism as defined in the profile should be used to communicate conformance.
3. A claim of **compliance** would imply acceptance by a set of *OGSA Compliance Tests*. At the time of writing no such tests exist.

We may expect that OGSA compliance tests will be developed that define the practical criteria that must be satisfied for a software system to be called "OGSA-compliant." Until such a suite is available, claims of OGSA compliance should not be made.

3. OGSA Informational Document Schedule

This chapter provides the development schedule of OGSA-related informational documents. Informational documents include Use Case documents, Architecture documents, Service Description documents, Scenario documents, and Guideline documents.

Documents described in this chapter are OGF Informational Documents (GFD-I) and Experimental Document (GFD-E), as defined in [OGF Documents].

3.1 OGSA Architecture Version 1.5

This document provides a high-level OGSA definition by focusing on requirements and the scope of important capabilities required to support Grid systems and applications in both eScience and eBusiness. The capabilities described are Execution Management, Data, Resource Management, Security, Self-Management, and Information. Version 1.5 was released in September 2006 as GFD.80 and obsoletes OGSA Architecture Version 1.0 (GFD.30).

3.1.1 Development Schedule

Changes to this document will be made by OGSA-WG. At the time of writing, there is not a well-defined schedule for the next version of the document. The next version is expected to include minor changes necessary to bring this document in line with related capability documents, such as the OGSA Data Architecture 1.0 (see section 3.4), as well as more major changes required for reconciliation with the Reference Model (see section 4.12).

3.1.2 Related Documents

This document will refer to the OGSA Profile documents, and many other documents produced by OGSA-WG, by other OGF working groups, and by other standards development organizations.

OGSA Glossary versions will continue to be published as a companion document.

3.2 OGSA Glossary Version 1.6

The OGSA Glossary provides definitions of key terms used in the OGSA Architecture and in related documents. Version 1.5 was released in September 2006 as GFD.81, along with the OGSA Architecture 1.5 and obsoletes OGSA Glossary Version 1.0 (GFD.44).

The Glossary will continue to be updated to include terms that are required as a result of changes made in the OGSA Architecture, and will be released in conjunction with new versions of that document. Existing terms will be reviewed and revised where appropriate, and outstanding tracker items will be resolved.

3.2.1 Development Schedule

Changes to this document will be made by OGSA-WG. Version 1.6 of this document with new and revised terms from the OGSA Data Architecture document (see section 3.4) and Reference Model specification (see section 4.12) is under development. Publication of version 1.6 will be out-of-step with the OGSA Architecture.

Milestone	Date
First draft available	May 2007
Ready for public comment review	September 2007
GFD-I publication	November 2007

Table 3-1 OGSA Glossary 1.6 document schedule

3.2.2 Related Documents

Version 1.5 of this document is a companion to the OGSA Architecture 1.5 document. Version 1.6 includes necessary changes based on the OGSA Data Architecture 1.0, as well as changes for initial alignment with Reference Model terminology.

3.3 OGSA ByteIO Use-Cases Version 1.0

The purpose of this document is to identify the requirements for the OGSA ByteIO interface. It is expected that the use cases will include reading from and writing to a binary file, reading the results of certain DAIS queries and reading data from a sensor, among other scenarios. The intention is that existing APIs, such as the POSIX API, should map easily to the ByteIO Web service interface.

3.3.1 Development Schedule

The OGSA ByteIO working group (ByteIO-WG) is now developing this document.

Milestone	Date
First draft available	June 2005
Ready for public comment review	December 2007
GFD-I publication	February 2008

Table 3-2 OGSA BytelO use-case 1.0 document schedule

3.3.2 Related Documents

This use-case document is intended to be an input to the normative OGSA BytelO interface document.

3.4 OGSA Data Architecture Version 1.0

The purpose of this document is to describe an overall data architecture for OGSA. It will identify message patterns and interfaces that form part of that architecture. Where possible, it will use existing specifications to form appropriate parts of this architecture, liaising with the groups defining those specifications to encourage them to fit into the overall OGSA picture. Where existing specifications are not available, the document will point out the need for work by other OGF working groups to fill the gaps. The document will not define detailed specifications; these are for other specifications.

3.4.1 Development Schedule

The OGSA Data Architecture working group (OGSA-D) is now developing this document.

Milestone	Date
First draft available	June 2005
Ready for public comment review	September 2007
GFD-I publication	November 2007

Table 3-3 OGSA Data Architecture 1.0 document schedule

3.4.2 Related Documents

This document will make extensive cross-references to other specifications, including WS-DAI, Storage Resource Management (SRM), BytelO, Data Access and Integration (DAIS), Data Format Description Language (DFDL), GridFTP, Message Transmission Optimization Mechanism (MTOM), SOAP with Attachment (SwA), Resource Namespace Service (RNS), and WS-Naming.

3.5 OGSA EMS Architecture Scenarios Version 1.1

The OGSA EMS architecture in its entirety is, quite rightly, a complex set of interdependent services. However, not all of these services are required to perform simpler operations within the EMS space. This document describes a set of scenarios starting from fundamental job execution, and also including resource selection, deployment, and simple interactions with data services. The focus for version 1.0 was on describing how already published, or close to completion, specifications can be leveraged. Version 1.0 was released in April 2007 as GFD-I.106. Version 1.1 is expected to incorporate HPC Basic Profile, data staging scenarios and also identify gaps where additional specifications are needed.

3.5.1 Development Schedule

Changes to this document will be made by OGSA-WG.

Milestone	Date
First draft available	November 2007
Ready for public comment review	February 2008
GFD-I publication	April 2008

Table 3-4 OGSA EMS Architecture Scenarios 1.1 document schedule

3.5.2 Related Documents

This document will make extensive cross-references to other specifications, including Job Submission Description Language (JSDL), Basic Execution Service (BES), Configuration Description Language (CDL), Application Contents Service (ACS), Resource Selection Services (RSS), Resource Namespace Service (RNS), and HPC Basic Profile.

3.6 Naming Mechanisms and their support in DMI

Although initially OGSA-DMI will focus on file movement, where possible we intend to design for general data movement. A significant aspect of this will be how data is named, and represented during communication with the service. In this document we will discuss existing naming systems and specify what will be supported by OGSA-DMI.

3.6.1 Development Status

The OGSA-Data Movement Interface working group (OGSA-DMI-WG) is now developing this document.

Milestone	Date
First draft available	March 2007
Ready for public comment review	November 2007
GFD-I publication	March 2008

Table 3-5 Naming Mechanisms and their support in DMI document schedule

3.6.2 Related Documents

This document is conceptually related to the Naming Issues in Distributed Systems document, and will reference the WS-Naming specification being developed by the OGSA-Naming working group, as well as the Resource Namespace Service specification being developed by the Grid File Systems Working Group. It will also reference underlying specifications developed by external entities, such as WS-Addressing.

3.7 Information-Security Use-Cases for Grid Architectures 1.0

This document serves to identify several common use-cases for aspects of information security within an open grid architecture.

The identification of operational use-cases plays an important role in deriving functional requirements, which in turn suggest design and implementation mechanisms. Use-cases are traditionally human-centric: they define actions between external actors (users) and the system (which is typically treated as a black box) to achieve specific business goals or tasks. Use-case descriptions generally strive to avoid implementation-specific language, focusing more on the purpose and properties of how the actor(s) and system(s) interact.

3.7.1 Development Schedule

The OGSA security design team is continuing to develop this document for publication.

Milestone	Date
First draft available	May 2007
Ready for public comment review	Oct 2007
GFD-I publication	Jan 2008

Table 3-6 Information-Security Use-Cases for Grid Architectures 1.0 document schedule

3.7.2 Related Documents

This use-case document is intended to be an input to the normative OGSA Security Profile 2.0 family.

3.8 Guidelines for Information Modeling for OGSA Entities Version 1.0

This document explains the process used to create information models for OGSA entities. Information models describe resources by defining their properties, operations, events, and their relationships with each other. Resources are managed (monitored, allocated, etc.) by following the description given by the model, and therefore information models are essential to all facets of resource management. An information model for OGSA entities allows the integration and interoperability of the services and resources participating in an OGSA system, and is consequently an important and fundamental piece of the architecture.

3.8.1 Development Schedule

The OGSA resource management design team is continuing to develop this document for publication.

Milestone	Date
First draft available	Jan. 2005
Ready for public comment review	July 2007
GFD-I publication	Sept 2007

Table 3-7 Guidelines for Information Modeling for OGSA Entities 1.0 document schedule

3.8.2 Related Documents

This document can be used when readers develop informational model document like Execution Environment and BES model (see section 3.9). Also, OGSA information modeling architecture (see section 3.10) provides overall architecture for information modeling.

3.9 Execution Environment and Basic Execution Service Model in OGSA Grids Version 1.0

This document provides information on the information modeling of execution environment and a basic execution service for OGSA. It defines the proposed execution environment element and basic execution service element for inclusion in DMTF's Common Information Model. Specific execution environments, such as the OGSA Basic Execution Services execution environment, should be defined as profiles and/or extension elements of execution environment. Operations specific to a service should not be part of the execution environment.

3.9.1 Development Schedule

The OGSA resource management design team is continuing to develop this document for publication.

Milestone	Date
First draft available	Jan. 2005
Ready for public comment review	July 2007
GFD-I publication	Sept 2007

Table 3-8 Execution Environment and BES Model in OGSA Grids 1.0 document schedule

3.9.2 Related Documents

This document is based on the OGSA BES document (see section 4.3) and DMTF CIM 2.15. Proposed CIM extension has been incorporated into CIM 2.16.

3.10 OGSA information modeling architecture Version 1.0

This document provides information on the direction for information modeling of OGSA entities. Entities in a grid need to advertise their capabilities and activities in a grid need to consume those entities. This document defines the way to model entities' capabilities and requirements in the OGSA. It builds on the wealth of existing systems management information already modeled and instantiated in systems today. Examples are included.

3.10.1 Development Schedule

The OGSA resource management design team is continuing to develop this document for publication.

Milestone	Date
First draft available	Oct. 2007
Ready for public comment review	Jan. 2008
GFD-I publication	March 2008

Table 3-9 OGSA info model architecture 1.0 document schedule

3.10.2 Related Documents

This document explains information modeling bird-view landscape including Reference Model 2.0 (see section 4.12), GLUE 2.0 (see section 4.13), and CIM. Guideline for Information Modeling document (see section 3.8) is a step-by-step guidebook for modeling.

3.11 GLUE use cases document Version 1.0

The GLUE-WG is focusing on the definition of an abstract schema for use within a grid infrastructure. A variety of scenarios used in existing production infrastructures are introduced in this document to illustrate what requirements the schema must meet. The use cases refer to production experience of various Grid middlewares and infrastructures and imply the definition of pieces of information.

3.11.1 Development Schedule

The GLUE Working Group is developing this document.

Milestone	Date
First draft available	Oct. 2007
Ready for public comment review	Jan. 2008
GFD-I publication	April 2008

Table 3-10 GLUE use cases 1.0 document schedule

3.11.2 Related Documents

This use-case document drives the definition of the GLUE information model 1.0 (see section 4.13).

3.12 Reconciling OGSA Architecture v1.5 and Reference Model v2.0, Version 1.0

This document explains that OGSA is a Service Oriented Architecture (SoA) and web services based instantiation of Reference Model. Applying Reference Model to current OGSA specs brings forth multiple useful findings including extensive use cases, revealing dependencies among components, and well-defined state transition.

3.12.1 Development Schedule

The Reference Model working group (RM-WG) is continuing to develop this document for publication.

Milestone	Date
First draft available	July 2007
Ready for public comment review	November 2007
GFD-I publication	December 2007

Table 3-11 Reconciling OGSA Architecture and Reference Model 1.0 document schedule

3.12.2 Related Documents

This document explains relationship between OGSA 1.5 (see section 3.1) and Reference Model (see section 4.12).

3.13 HPC Job Scheduling: Base Case and Common Cases

This document provides information on batch job scheduling of scientific/technical applications, also broadly referred to as the “core” high performance computing (HPC) use case. This document is closely related to OGSA efforts, but it is not strictly an OGSA document, and is being developed independently of the OGSA working group. Version 1.0 was released in May 2007 as GFD-I.100.

3.13.1 Development Schedule

Changes to this document will be made by OGSA-HPCP-WG. At the time of writing, there is not a well-defined schedule for the next version of the document.

3.13.2 Related Documents

This use-case document is intended to be an input to the normative HPC Basic Profile 1.0 (see section 5.9).

3.14 Attributes Used in OGSi Authorization Version 1.0

This specification specifies elements and vocabulary for expressing attributes to be used in the context of OGSA authorization. The intention of defining standard formats and meanings (vocabulary) for these assertions is to facilitate interoperability between issuers of attribute assertions and the authorization services that consume them. This specification also defines profiles for using Security Access Markup Language (SAML) attribute assertions and X.509 attribute certificates as the standard OGSA attribute assertions.

3.14.1 Development Schedule

The OGSA Authorization working group (OGSA-Authz-WG) has now completed work on this document and it has been published as GFD-E.57.

The OGSA-Authz-WG is now re-chartering to define the next step of their standardization activities. As a result of the re-chartering discussion, the working group plans to revise the document to adopt the latest versions of the SAML specifications, which have themselves been revised and are available now.

3.14.2 Referenced Specifications

This document is based on the Assertions and Protocols for the OASIS Security Assertion Markup Language (SAML) V1.1 specification [SAML-core-1.1] and RFC 3281—An Internet Attribute Certificate Profile for Authorization [RFC-3281]. The following table shows the referenced specifications and their status and adoption levels.

OGSA Referenced Specifications: Attributes Used in OGSi Authorization 1.0													
September 12, 2007	Status						Adoption					Note	
	De Facto	Institutional	Evolving Institutional	Draft Institutional	Consortium	Evolving Consortium	Draft	Ubiquitous	Adopted	Community	Interoperable		Implemented
Specification/Profile Name													
Specifications													
Assertions & Protocols for SAML 1.1		X								X			
RFC3281: Internet Attribute Certification Profile for Authz		X								X			
Profiles													
WS-I Basic Profile 1.1		X											Final Material
WS-I Basic Security Profile 1.0		<	X										Working Group Draft
WS-I SAML 1.0		<	X										Working Group Draft

Legend:

X	Specification or profile is currently at this status or adoption level
<	Specification or profile is approaching this status or adoption level
	Status or adoption level is not applicable

Table 3-12 Attributes Used in OGSi Authorization 1.0 referenced specifications

3.14.3 Expected Use

Future OGSA Security Profile, to be developed by the OGSA-WG Security design team, is expected to reference future version of this specification.

4. OGSA Normative Document Schedule

This chapter provides the development schedule for OGSA-related normative specifications. These documents are the products of domain-expert working groups other than OGSA-WG. The OGSA Profiles reference these documents.

Documents described in this chapter will initially be published as OGF Proposed Recommendations (GFD-R.P), as defined in [OGF Documents]. For each document we provide schedule information and a summary of referenced specifications, including status and adoption levels as defined in the OGSA Profile Definition document [OGSA Profile Definition]. Note that specifications that are considered to be at a foundation level for Web services are not included in the specification summaries.

4.1 ByteIO Specification 1.0

Various OGSA design team, research, and working groups have identified a need for a simple interface for reading and writing sequences of bytes to and from various sources. This interface document specifies a minimal Web service interface for this functionality. The resultant interface will fit into the overall architecture, and the OGSA ByteIO working group will liaise with other OGF groups, especially the OGSA, GFS, GSM, DAIS, InfoD and SAGA working groups, and also with active projects such as OGSA-DAI, Globus, NextGrid and WSRF.Net. Version 1.0 was released in Jan. 2007 as GFD-R.P.-87.

4.1.1 Development Schedule

Changes to this document will be made by OGSA-ByteIO-WG. At the time of writing, there is not a well-defined schedule for the next version of the document.

An experience document which describes interoperability test among two or more implementations based on this interface will also be produced, and is planned to be available in December 2007. This experience document applies to both the ByteIO specification and the ByteIO WSRF rendering documents.

4.1.2 Referenced Specifications

This interface should be based on WS-addressing. The following table shows the referenced specifications and their status and adoption levels.

OGSA Referenced Specifications: ByteIO Interfaces 1.0													
September 12, 2007	Status							Adoption					Note
	De Facto	Institutional	Evolving Institutional	Draft Institutional	Consortium	Evolving Consortium	Draft	Ubiquitous	Adopted	Community	Interoperable	Implemented	
Specification/Profile Name													
Specifications													
WS-Addressing 1.0		X									<	X	IBM, Apache implementing
Profiles													
None													

Legend:

X	Specification or profile is currently at this status or adoption level
<	Specification or profile is approaching this status or adoption level
///	Status or adoption level is not applicable

Table 4-1 ByteIO specification 1.0 referenced specifications

4.1.3 Expected Use

The Data Movement Interface specification developed by the OGSA-DMI working group, refers to this specification.

4.2 ByteIO OGSA WSRF Basic Profile Rendering 1.0

This document is the normative description of the ByteIO specification in terms of the OGSA WSRF Basic Profile 1.0. The ByteIO specification describes most operations in detail and where possible, information from that document is not repeated in this document. In addition to information contained within this document, all implementations of the OGSA WSRF Basic Profile 1.0 rendering of the ByteIO specification MUST conform to the requirements contained within the OGSA WSRF Basic Profile 1.0 document. Version 1.0 was released in Jan. 2007 as GFD-R.P.-88.

4.2.1 Development Schedule

Changes to this document will be made by OGSA-ByteIO-WG. At the time of writing, there is not a well-defined schedule for the next version of the document.

An experience document which describes interoperability test among two or more implementations based on this interface will also be produced, and is planned to be available in December 2007. This experience document applies to both the ByteIO specification and the ByteIO WSRF rendering documents.

4.2.2 Referenced Specifications

This interface should be based on the OGSA WSRF Basic Profile 1.0 [OGSA WSRF Basic Profile]. The following table shows the referenced specifications and their status and adoption levels.

OGSA Referenced Specifications: ByteIO OGSA WSRF Basic Profile rendering 1.0													
September 12, 2007	Status						Adoption					Note	
	De Facto	Institutional	Evolving Institutional	Draft Institutional	Consortium	Evolving Consortium	Draft	Ubiquitous	Adopted	Community	Interoperable		Implemented
Specification/Profile Name													
Specifications													
None													
Profiles													
OGSA WSRF Basic Profile 1.0		X						/	/	/	/	/	/

Legend:

X	Specification or profile is currently at this status or adoption level
<	Specification or profile is approaching this status or adoption level
/	Status or adoption level is not applicable

Table 4-2 ByteIO OGSA WSRF Basic Profile Rendering

4.2.3 Expected Use

As a specification rendering document, it is expected that references to this document will be made from similar rendering specifications. At the moment no such specifications have been identified.

4.3 OGSA Basic Execution Services Version 1.0

OGSA Basic Execution Services Working Group (BES-WG) is concerned with the interfaces (port types, resource properties, etc.) of *service containers* as defined in the OGSA Architecture document. Recall that service containers are execution environments in which other services—including legacy

applications—execute. Service containers represent execution in the grid. A service container may represent a single processor, a virtual processor, a hosting environment such as .Net, a supercomputer, or a cluster managed by a queue management system such as LSF, PBS, or SGE. Service containers are one part in the overall EMS architecture (also described in OGSA Architecture). Version 1.0 was released in Aug. 2007 as GFD-R.P.-108.

4.3.1 Development Schedule

Changes to this document will be made by OGSA-BES-WG. At the time of writing, there is not a well-defined schedule for the next version of the document.

4.3.2 Referenced Specifications

This specification should be based on WS-Naming 1.0, JSDL 1.0, RNS 1.0, and OGSA WSRF Basic Profile 1.0 [OGSA WSRF Basic Profile]. The following table shows the referenced specifications and their status and adoption levels.

OGSA Referenced Specifications: Basic Execution Services (BES) Interfaces 1.0													
September 12, 2007	Status						Adoption					Note	
	De Facto	Institutional	Evolving Institutional	Draft Institutional	Consortium	Evolving Consortium	Draft	Ubiquitous	Adopted	Community	Interoperable		Implemented
Specification/Profile Name													
Specifications													
WS-Naming 1.0		X										X	Input to new WG
Job Submission Description Language (JSDL) 1.0		X									X		
Profiles													
OGSA WSRF Basic Profile 1.0		X						/	/	/	/	/	

Legend:

X	Specification or profile is currently at this status or adoption level
<	Specification or profile is approaching this status or adoption level
/	Status or adoption level is not applicable

Table 4-3 OGSA BES 1.0 referenced specifications

4.3.3 Expected Use

BES is at the “base” of the EMS architecture.

4.4 Job Submission Description Language Specification Version 1.0

The Job Submission Description Language (JSDL) is a language for describing the submission requirements of computational jobs. The JSDL specification defines a normative XML schema. No submission API is defined and no assumptions are made about how a JSDL document may be submitted to a job execution system.

In OGSA, JSDL is expected to be combined with the work of other groups: WS-Agreement (GRAAP-WG), Basic Execution Service (BES-WG), etc.

4.4.1 Development Schedule

The JSDL 1.0 specification has been published as GFD-R-P.056 in November 2005.

The JSDL working group (JSDL-WG) is now developing an errata release of JSDL 1.0. This is a maintenance release and will not introduce new functionality.

Milestone	Date
First draft available	January 2007
Ready for submission to Editor	August 2007
Errata GFD-R.P publication	October 2007

Table 4-4 JSDL 1.0 Errata release specification schedule

The JSDL-WG is developing a number of extensions to JSDL 1.0: The “[JSDL SPMD Application Extension, Version 1.0](#)” and “[JSDL HPC Profile Application Extension, Version 1.0](#)” are published as GFD-R.P-115 and GFD-R.P.-111 respectively in August 2007.

A first draft of the “JSDL Parameter Sweep Job Extension” was available in June 2007 and is expected to be ready for public comment by October 2007.

The JSDL-WG is also planning the next major release of the specification, JSDL 2.0. A detailed schedule is not available at this time. A number of features expected to be part of JSDL 2.0 will first be published as extensions to JSDL 1.0. The group is now working on an XQuery extension and a first draft is expected by October 2007.

An experience document which describes interoperability tests between two or more implementations based on the JSDL specification is in the initial stages. A first draft is expected by August 2007.

4.4.2 Referenced Specifications

JSDL 1.0 references the Common Information Model (CIM) version 2.9 and ISO/IEC 9945:2003 (POSIX v3).

OGSA Referenced Specifications: Job Submission Description Language Specification 1.0														
June 1, 2007	Status							Adoption						Note
	De Facto	Institutional	Evolving Institutional	Draft Institutional	Consortium	Evolving Consortium	Draft	Ubiquitous	Adopted	Community	Interoperable	Implemented	Unimplemented	
Specification/Profile Name														
Specifications														
Common Information Model (CIM) 2.9		X							X	0				
ISO/IEC 9945:2003 (Posix v3)		X							X					
Profiles														
None														

Legend:

X	Specification or profile is currently at this status or adoption level
<	Specification or profile is approaching this status or adoption level
-	Status or adoption level is not applicable

Table 4-5 JSDL 1.0 referenced specifications

Note that implementations of these two specifications are not required to implement JSDL.

4.4.3 Expected Use

The BES 1.0 is using JSDL 1.0 for the definition of the submission interface. The OGSA HPC Profile WG is profiling JSDL 1.0 with a focus on interoperability.

4.5 Resource Namespace Service Specification Version 1.0

Various OGSA design team, research, and working groups, including the Grid File System Working Group (GFS-WG), have identified a need for a simple namespace service to accommodate a wide variety of grid applications. This service can be employed to manage the namespace of federated and virtualized data, services, or effectively any resource capable of being referenced in a grid/web service environment, with a particular emphasis on hierarchically managed names that may be used in human interface applications.

The RNS specification describes the operations, resource properties, and semantics of the namespace service. The resultant Web service will fit into the overall architecture, providing a core feature of OGSA.

4.5.1 Development Schedule

The RNS Specification version 1.0 has been published as GFD 101. Future versions will be developed by the OGSA-Naming working group. At the time of writing, there is not a well-defined schedule for the next version of the document.

4.5.2 Referenced Specifications

RNS exists in the context of the OGSA three-level naming scheme—it makes use of WSRF, WS-Notification, WS-Naming, and WS-Addressing.

OGSA Referenced Specifications: Resource Namespace Service (RNS) Specification 1.0													
June 1, 2007	Status						Adoption					Note	
Specification/Profile Name	De Facto	Institutional	Evolving Institutional	Draft Institutional	Consortium	Evolving Consortium	Draft	Ubiquitous	Adopted	Community	Interoperable		Implemented
Specifications													
WS-Addressing 1.0		X									<	X	
WS-ResourceProperties 1.2		X									<	X	
WS-ResourceLifetime 1.2		X									<	X	
WS-BaseFaults 1.2		X									<	X	
WS-BaseNotification 1.2		X									X		
WS-Naming 1.0							X						X
Profiles													
None													

Legend:	X	Specification or profile is currently at this status or adoption level
	<	Specification or profile is approaching this status or adoption level
		Status or adoption level is not applicable

Table 4-6 RNS 1.0 referenced specifications

Note that a future revision of RNS is expected to reference the OGSA WSRF Basic Profile.

4.5.3 Expected Use

Naming is ubiquitous in OGSA. Thus many documents, including OGSA Architecture 1.5 and OGSA Data Architecture 1.0 may refer to RNS names in one context or the other. Also, multiple normative specifications, including The Grid File System Profile being developed by the GFS-WG, are expected to reference this specification.

4.6 WS-Naming Specification Version 1.0

The WS-Naming Specification describes a standard naming scheme that allows endpoints in a distributed system to be referred to in a high-level, abstract way. WS-Naming builds on the WS-Addressing specification, and extends it in such a way that neither Web service clients nor Web service endpoints need to be aware of the extension, and are free to fail to generate or understand the WS-Naming elements. In such a case, the normal WS-Addressing behavior still works exactly as described in that specification. If Web service clients or Web service endpoints are aware of this extension, they can attempt to locate a resilient address even if the peer has failed or encounters communication failures. Version 1.0 is released July 2007 as GFD-R.P.-109.

4.6.1 Development Schedule

Changes to this document will be made by OGSA-Naming-WG. At the time of writing, there is not a well-defined schedule for the next version of the document.

4.6.2 Referenced Specifications

This specification is based on WS-Addressing, and is combinable with the OGSA WSRF Basic Profile 1.0.

OGSA Referenced Specifications: WS-Naming Specification 1.0														
June 1, 2007	Status							Adoption						Note
	De Facto	Institutional	Evolving Institutional	Draft Institutional	Consortium	Evolving Consortium	Draft	Ubiquitous	Adopted	Community	Interoperable	Implemented	Unimplemented	
Specification/Profile Name														
Specifications														
WS-Addressing 1.0		X									<	X		IBM, Apache implementing
Profiles														
None														

Legend:

X	Specification or profile is currently at this status or adoption level
<	Specification or profile is approaching this status or adoption level
-	Status or adoption level is not applicable

Table 4-7 WS-Naming Specification 1.0 referenced specifications

4.6.3 Expected Use

This specification is expected to be used by OGSA and many other documents, including OGSA Architecture 1.5 OGSA Data Architecture 1.0, RNS 1.0, and BES 1.0.

4.7 Application Contents Service Specification Version 1.0

The grid community currently manually creates and manages grid application content consisting of executables, scripts, and data. The Application Content Service (ACS) specification specifies a set of Web services that provide a way to archive components for stable storage and retrieval within a standardized format. This allows grid applications and their data to be packaged, stored, and then referenced over time as needed across domains.

ACS does not interpret or execute information in the contents; rather it just manages the contents for use by other OGSA services.

4.7.1 Development Schedule

The Application Content Service Working Group (ACS-WG) has completed this specification and it has been published as GFD-R-P.073. The next version of the specification has undergone some early discussions, but at the time of writing there is no well-defined schedule for publication.

4.7.2 Referenced Specifications

This specification will refer to OGSA WSRF Basic Profile 1.0. Either RNS or WS-Naming may be utilized by ACS, since application archives can be referenced externally.

OGSA Referenced Specifications: Application Content Service (ACS) 1.0													
September 21, 2007	Status						Adoption					Note	
	De Facto	Institutional	Evolving Institutional	Draft Institutional	Consortium	Evolving Consortium	Draft	Ubiquitous	Adopted	Community	Interoperable		Implemented
Specification/Profile Name													
Specifications													
SchemaCentricCanonicalization			X									X	Committee Specification
XACML 2.0		X									X		OASIS Standard
Profiles													
OGSA WSRF Basic Profile 1.0		X											

Legend:

X	Specification or profile is currently at this status or adoption level
<	Specification or profile is approaching this status or adoption level
	Status or adoption level is not applicable

Table 4-8 ACS 1.0 referenced specifications

4.7.3 Expected Use

Since ACS provides an API to an archive for applications and data, it is anticipated that job management and advanced execution specifications would use the application archive interface. Thus future EMS architecture documents and advanced EM profiles may refer to the ACS specification. Also, since the application archive may include multiple component types, including configuration description and job control flow, future versions of the XML-CDL specification may be combinable with the ACS specification.

4.8 WS-Agreement Specification Version 1.0

This specification defines the Web Services Agreement Specification (WS-Agreement), a Web services protocol for establishing agreement between two parties, such as between a service provider and a consumer. WS-Agreement uses an extensible XML language for specifying the nature of the agreement, and agreement templates to facilitate discovery of compatible agreement terms.

4.8.1 Development Schedule

Version 1.0 has been released May 2007 as GFD-R.P.-107. Changes to this document will be made by GRAAP-WG. At the time of writing, there is not a well-defined schedule for the next version of the document.

4.8.2 Referenced Specifications

WS-Agreement normatively refers to WS-ResourceProperties and WS-Addressing.

OGSA Referenced Specifications: WS-Agreement Specification 1.0													
June 1, 2007	Status						Adoption					Note	
	De Facto	Institutional	Evolving Institutional	Draft Institutional	Consortium	Evolving Consortium	Draft	Ubiquitous	Adopted	Community	Interoperable		Implemented
Specification/Profile Name													
Specifications													
WS-Addressing 1.0		X								<	X		IBM, Apache implementing
WS-ResourceProperties 1.2		X								<	X		OASIS Standard
Profiles													
None													

Legend:

X	Specification or profile is currently at this status or adoption level
<	Specification or profile is approaching this status or adoption level
—	Status or adoption level is not applicable

Table 4-9 WS-Agreement Specification 1.0 referenced specifications

4.8.3 Expected Use

In OGSA, it is expected that WS-Agreement 1.0 may be used in conjunction with JSDL. The OGSA EMS design team may define a Basic EMS profile referring to WS-Agreement 1.0, and in the future WS-Agreement may be used by other OGSA Profiles, including the proposed OGSA Basic Execution Management Profile.

4.9 Data Movement Functional Specification Version 1.0

This document defines operations, inputs, outputs, and the underlying semantics for a service that can provide data movement services. These definitions are in the form of an abstract description, not actual code, XML, WSDL, etc.

4.9.1 Development Schedule

The OGSA-Data Movement Interface working group (OGSA-DMI-WG) is now developing this document.

Milestone	Date
First draft available	March 2007
Ready for public comment review	November 2007
GFD-I publication	March 2008

Table 4-10 OGSA-DMI Data Movement Functional Specification document schedule

4.9.2 Referenced Specifications

This specification is based on WS-Addressing, and is combinable with the OGSA WSRF Basic Profile 1.0 or WS-I Basic Profile 1.1 (see section 5.8 and 5.7).

OGSA Referenced Specifications: Data Movement Function Specification 1.0													
September 21, 2007	Status						Adoption					Note	
	De Facto	Institutional	Evolving Institutional	Draft Institutional	Consortium	Evolving Consortium	Draft	Ubiquitous	Adopted	Community	Interoperable		Implemented
Specification/Profile Name													
Specifications													
WS-Addressing 1.0		X									<	X	IBM, Apache implementing
Profiles													


Legend:	X	Specification or profile is currently at this status or adoption level
	<	Specification or profile is approaching this status or adoption level
		Status or adoption level is not applicable

Table 4-11 Data Movement Function 1.0 referenced specifications

4.10 Data Movement Transport Protocols and their use in DMI Version 1.0

The data movement service will be transport protocol agnostic. However, to be effective, it must be able negotiate an acceptable protocol between the endpoints, and provide protocol specific information in a standard, extensible way. This document will describe how this negotiation will take place, how extensibility will be achieved, and list the initial set of protocols and their interfaces.

4.10.1 Development Schedule

The OGSA Data Movement Interface working group (OGSA-DMI-WG) is now developing this document,

Milestone	Date
First draft available	March 2007
Ready for public comment review	November 2007
GFD-R.P publication	March 2008

Table 4-12 Data Movement Transport Protocols document schedule

4.10.2 Related Documents

OGSA-DMI-WG is working on identifying referenced specification.

4.11 OGSA Resource Selection Service Version 1.0

The RSS specification describes a mechanism for building general services that select other services for carrying out particular activities. It also specializes that mechanism for the case of selecting BES containers to submit JSDL-described jobs, using WS-RF resources to describe the transfer mechanism so that large sets of options can be managed.

4.11.1 Development Schedule

The OGSA Resource Selection Service working group (OGSA-RSS-WG) is currently developing this specification.

Milestone	Date
First draft available	March 2007
Ready for public comment review	September 2007
GFD-R.P publication	February 2008

Table 4-17 Resource Selection Service document schedule

4.11.2 Referenced Specifications

The RSS specification references BES 1.0, JSDL 1.0, WS-Addressing 1.0, OGSA Basic Profile 1.0, and XPath 2.

OGSA Referenced Specifications: OGSA Resource Selection Service 1.0													
September 21, 2007	Status							Adoption					Note
	De Facto	Institutional	Evolving Institutional	Draft Institutional	Consortium	Evolving Consortium	Draft	Ubiquitous	Adopted	Community	Interoperable	Implemented	
Specification/Profile Name													
Specifications													
WS-Addressing 1.0		X									<	X	IBM, Apache implementing
Job Submission Description Language (JSDL) 1.0		X									X		
Basic Execution Service(BES) 1.0		X									X		
XPath 2.0		X									<	X	W3C Recommendation
Profiles													
None													
OGSA WSRF Basic Profile 1.0		X											

Legend:

X	Specification or profile is currently at this status or adoption level
<	Specification or profile is approaching this status or adoption level
/ / / / /	Status or adoption level is not applicable

Table 4-13 OGSA RSS 1.0 referenced specifications

4.12 Reference Model Version 2.0

The Reference Model is the basis for describing complex distributed infrastructures and services, i.e. Grids, in terms of a set of relatively simple components, interactions and life cycles. The model thus provides the context for solving the problems associated with managing these environments. This document provides both an informal description of the concepts that underpin the reference model, and a formal definition (UML 2.0 and annotation) of that model. This document is closely related to OGSA efforts, but it is not strictly an OGSA document, and is being developed independently of the OGSA working group.

4.12.1 Development Schedule

The Reference Model working group (RM-WG) is continuing to develop this document for publication.

Milestone	Date
First draft available	August 2007
Ready for public comment review	November 2007
GFD-P.R. publication	February 2008

Table 4-14 Reference Model 2.0 document schedule

4.12.2 Related Documents

RM-WG is working on identifying referenced specification.

4.13 *GLUE Information Model Specification Version 2.0*

This document provides a conceptual information model for Grid entities described in natural language enriched with a graphical representation using the UML Class Diagram. As a conceptual model, this is meant to be implementation-independent. This information model is based on the experience of several modeling approaches being used in current production Grid infrastructures.

4.13.1 Development Schedule

The GLUE Working Group is defining an information model for Grid resources that leverage existing proposals and unify them into a community standard.

Milestone	Date
First draft available	October 2007
Ready for public comment review	January 2008
GFD-P.R. publication	April 2008

Table 4-15 GLUE 2.0 document schedule

4.13.2 Related Documents

This document depends on no other specification except fundamental level XML specifications.

4.13.3 Expected Use

JSDL 2.0 and future major versions of BES will reference the GLUE 2 spec.

5. OGSA Recommended Profile Schedule

This chapter provides the development schedule of OGSA Profile documents. These documents will be created by OGSA-WG or other domain-expert working groups. Profile documents described in this section should follow the guidelines set forth in the OGSA Profile Definition document [OGSA Profile Definition].

Documents described in this chapter will initially be published as OGF Proposed Recommendations (GFD-R.P), as defined in [OGF Documents]. For each document we provide schedule information and a summary of referenced specifications, including status and adoption levels as defined in the OGSA Profile Definition document [OGSA Profile Definition]. Note that specifications that are considered to be at a foundation level for Web services are not included in the specification summaries.

5.1 OGSA WSRF Basic Profile Version 1.0

The Profile is intended for use when implementing services that are concerned with distributed resource management, grid computing, or for other purposes that involve the modeling and management of stateful entities. These services frequently can benefit from the use of interfaces and behaviors defined in the WS-Addressing, WS-Resource Framework, and WS-Notification families of specifications.

5.1.1 Development Schedule

The OGSA-WG has completed work on Version 1.0 of this profile and it has been published as GFD.72. At the time of writing, there is not a well-defined schedule for release of any subsequent versions.

5.1.2 Referenced Specifications

This profile is based on the WS-I Basic Profile 1.1, WS-Addressing, WS-ResourceProperties, WS-ResourceLifetime, WS-BaseNotification, and WS-BaseFaults. The following table shows the referenced specifications and their status and adoption levels.

OGSA Referenced Specifications: OGSA WSRF Basic Profile 1.0														
June 1, 2007	Status						Adoption					Note		
Specification/Profile Name	De Facto	Institutional	Evolving Institutional	Draft Institutional	Consortium	Evolving Consortium	Draft	Ubiquitous	Adopted	Community	Interoperable		Implemented	Unimplemented
Specifications														
WS-Addressing 1.0		X									<	X		IBM, Apache implementing
WS-ResourceProperties 1.2		X									<	X		OASIS Standard
WS-ResourceLifetime 1.2		X									<	X		OASIS Standard
WS-BaseFaults 1.2		X									<	X		OASIS Standard
WS-BaseNotification 1.3		<	X								<	X		At public review
SchemaCentricCanonicalization			X									X		Committee Specification
Profiles														
WS-I Basic Profile 1.1		X						-	-	-	-	-	-	Final Material

Legend:

X	Specification or profile is currently at this status or adoption level
<	Specification or profile is approaching this status or adoption level
-	Status or adoption level is not applicable

Table 5-1 OGSA WSRF Basic Profile 1.0 referenced specifications

5.1.3 Expected Use

This profile is expected to be the foundation for numerous specifications and profiles being developed by OGSA-WG and other working groups, including BytelO, Application Content Service (ACS), and Basic Execution Services (BES).

5.2 OGSA Basic Security Profile 1.0 – Core

The Profile is intended for use in conjunction with OGSA WSRF Basic Profile Version 1.0 in order to ensure security of services that are concerned with distributed resource management, grid computing, or for other purposes that involve the modeling and management of stateful entities.

The Profile defines binding of key information to Endpoint References which may be used to associate and exchange key information of services. The Profile is intended to be used at least another security profile such as OGSA Security Profile 1.0 - Secure Channel.

5.2.1 Development Schedule

The OGSA-WG has completed work on Version 1.0 of this profile and it has been published as GFD.86. OGSA security design team is now working on OGSA Basic Security Profile 2.0 – Secure Addressing (see section 5.4).

5.2.2 Referenced Specifications

This profile is based on the WS-I Basic Security Profile 1.0, WS-addressing, WS-security and XML-signature. The following table shows the referenced specifications and their status and adoption levels.

OGSA Referenced Specifications: OGSA Basic Security Profile 1.0 - Core													
September 21, 2007	Status						Adoption					Note	
	De Facto	Institutional	Evolving Institutional	Draft Institutional	Consortium	Evolving Consortium	Draft	Ubiquitous	Adopted	Community	Interoperable		Implemented
Specification/Profile Name													
<u>Specifications</u>													
WS-Addressing 1.0		X								<	X		IBM, Apache implementing
XML-Signature		X								X			
WS-Security 1.0		X								X			
<u>Profiles</u>													
WS-I Basic Security Profile 1.0		<	X										Working Group Draft

Legend:

X	Specification or profile is currently at this status or adoption level
<	Specification or profile is approaching this status or adoption level
	Status or adoption level is not applicable

Table 5-2 OGSA Basic Security Profile 1.0 – Core referenced specifications

5.2.3 Expected Use

This profile is expected to be the foundation for numerous specifications and profiles being developed by OGSA-WG and other working groups, including BytelIO, ACS, and BES.

5.3 OGSA Security Profile 1.0 – Secure Channel

The Profile is intended for use when implementing services that are concerned with distributed resources in a grid computing environment with secure authenticated communication channel for their interactions.

5.3.1 Development Schedule

The OGSA-WG has completed work on Version 1.0 of this profile and it has been published as GFD.99. OGSA security design team is now working on OGSA Security Profile 2.0 – Secure Transport (see section 5.6).

5.3.2 Referenced Specifications

This profile is based on the OGSA Basic Security Profile Core, WS-I Basic Security Profile 1.0, TLS, HTTP over TLS, and SAML.

OGSA Referenced Specifications: OGSA Basic Security Profile 1.0 - Secure Channel														
June 1, 2007	Status							Adoption						Note
	De Facto	Institutional	Evolving Institutional	Draft Institutional	Consortium	Evolving Consortium	Draft	Ubiquitous	Adopted	Community	Interoperable	Implemented	Unimplemented	
Specification/Profile Name														
Specifications														
Profiles														
WS-I Basic Security Profile 1.0		<	X					-	-	-	-	-	-	Working Group Draft

Legend:

X	Specification or profile is currently at this status or adoption level
<	Specification or profile is approaching this status or adoption level
-	Status or adoption level is not applicable

Table 5-3 OGSA Security Profile 1.0 – Secure Channel referenced specifications

5.3.3 Expected Use

This profile is expected to be the foundation for numerous specifications and profiles being developed by OGSA-WG and other working groups, including BytelIO, ACS, and BES.

5.4 OGSA Basic Security Profile 2.0 - Secure Addressing

This document provides a recommendation on how to bind the secure communication requirements (and ancillary security tokens) of OGSA services within WS-Addressing endpoint references. This profile describes precisely the requirements placed on the structure and handling of such endpoint references to ensure interoperability.

5.4.1 Development Schedule

The OGSA security design team is continuing to develop this document for publication.

Milestone	Date
First draft available	May 2007
Ready for public comment review	Oct 2007
GFD-I publication	Jan 2008

Table 5-4 OGSA Security Profile 2.0 – Secure Addressing document schedule

5.4.2 Related Documents

This document is depends on the following specifications and profiles.

OGSA Referenced Specifications: Basic Security Profile 2.0 - Secure Addressing														
September 21, 2007	Status						Adoption					Note		
	De Facto	Institutional	Evolving Institutional	Draft Institutional	Consortium	Evolving Consortium	Draft	Ubiquitous	Adopted	Community	Interoperable		Implemented	Unimplemented
Specification/Profile Name	De Facto	Institutional	Evolving Institutional	Draft Institutional	Consortium	Evolving Consortium	Draft	Ubiquitous	Adopted	Community	Interoperable	Implemented	Unimplemented	Note
Specifications														
None														
WS-Addressing 1.0		X									<	X		IBM, Apache implementing
WS-Security 1.0		X									X			
WS-Policy 1.0		X									X			
WS-Security Policy 1.0		X									X			
Profiles														
None														
WS-I Basic Profile 1.1		X												Final Material
WS-I Basic Security Profile 1.0		X												Final Material


Legend: X Specification or profile is currently at this status or adoption level
 < Specification or profile is approaching this status or adoption level
 Status or adoption level is not applicable

Table 5-5 OGSA Basic Security Profile 2.0 – Secure Addressing specifications

5.4.3 Expected Use

This profile is expected to be the foundation for numerous specifications and profiles being developed by OGSA-WG and other working groups, including BytelIO, ACS, and BES.

5.5 OGSA Security Profile 2.0 - Secure SOAP Messaging

This document provides a recommendation to the Grid community on how to secure SOAP message-layer interactions with OGSA services. This profile describes precisely the requirements placed on the security mechanisms for communications of such services to ensure interoperability.

5.5.1 Development Schedule

The OGSA security design team is continuing to develop this document for publication.

Milestone	Date
First draft available	May 2007
Ready for public comment review	Oct 2007
GFD-I publication	Jan 2008

Table 5-6 OGSA Security Profile 2.0 - Secure SOAP Messaging document schedule

5.5.2 Related Documents

This document is depends on the following specifications and profiles.

OGSA Referenced Specifications: Security Profile 2.0 - Secure SOAP Messaging													
September 21, 2007	Status						Adoption					Note	
	De Facto	Institutional	Evolving Institutional	Draft Institutional	Consortium	Evolving Consortium	Draft	Ubiquitous	Adopted	Community	Interoperable		Implemented
Specification/Profile Name													
Specifications													
None													
WS-Addressing 1.0		X									<	X	IBM, Apache implementing
WS-Security 1.0		X									X		
WS-Policy 1.0		X									X		
WS-Security Policy 1.0		X									X		
Profiles													
None													
WS-I Basic Profile 1.1		X											Final Material
WS-I Basic Security Profile 1.0		X											Final Material

Legend:

X	Specification or profile is currently at this status or adoption level
<	Specification or profile is approaching this status or adoption level
	Status or adoption level is not applicable

Table 5-7 OGSA Security Profile 2.0 – Secure SOAP Messaging specifications

5.5.3 Expected Use

This profile is expected to be the foundation for numerous specifications and profiles being developed by OGSA-WG and other working groups, including BytelIO, ACS, and BES.

5.6 OGSA Security Profile 2.0 - Secure Transport

This document provides a recommendation to the Grid community on how to secure transport-layer interactions with OGSA services. This profile describes precisely the requirements placed on the security mechanisms for communications of such services to ensure interoperability.

5.6.1 Development Schedule

The OGSA resource management design team is continuing to develop this document for publication.

Milestone	Date
First draft available	May 2007
Ready for public comment review	Oct 2007
GFD-I publication	Jan 2008

Table 5-8 OGSA Security Profile 2.0 - Secure Transport document schedule

5.6.2 Related Documents

This document is depends on the following specifications and profiles.

OGSA Referenced Specifications: OGSA Secure Profile 2.0 - Secure Transport													
September 21, 2007	Status						Adoption					Note	
	De Facto	Institutional	Evolving Institutional	Draft Institutional	Consortium	Evolving Consortium	Draft	Ubiquitous	Adopted	Community	Interoperable		Implemented
Specification/Profile Name													
Specifications													
None													
WS-Addressing 1.0		X									<	X	IBM, Apache implementing
WS-Security 1.0		X									X		
WS-Policy 1.0		X									X		
WS-Security Policy 1.0		X									X		
Transport Layer Security		X						X					
HTTP-TLS		X						X					
X.509		X						X					
Profiles													
WS-I Basic Profile 1.1		X											Final Material
WS-I Basic Security Profile 1.0		X											Final Material

Legend:

X	Specification or profile is currently at this status or adoption level
<	Specification or profile is approaching this status or adoption level
	Status or adoption level is not applicable

Table 5-9 OGSA Security Profile 2.0 – Secure Transport Messaging specifications

5.6.3 Expected Use

This profile is expected to be the foundation for numerous specifications and profiles being developed by OGSA-WG and other working groups, including BytelIO, ACS, and BES.

5.7 WS-I Basic Profile Rendering of Data Movement Functional Specification

This document provides explicit WSDL, schema, etc., that defines a WS-I Basic Profile Rendering of the data movement functional specification.

5.7.1 Development Schedule

The OGSA Data Movement Interface working group (OGSA-DMI-WG) is now developing this profile.

Milestone	Date
First draft available	September 2007
Ready for public comment review	May 2008
GFD-R.P publication	September 2008

Table 5-10 OGSA WS-I Basic Profile Rendering of Data Movement Functional Specification document schedule

5.7.2 Referenced Specifications

OGSA-DMI WG is working on identifying referenced specification.

5.8 *WS-RF Basic Profile Rendering of Data Movement Functional Specification*

This document provides explicit WSDL, schema, etc., that defines a WS-RF Basic Profile Rendering of the data movement functional specification.

5.8.1 Development Schedule

The OGSA Data Movement Interface working group (OGSA-DMI-WG) is now developing this profile.

Milestone	Date
First draft available	September 2007
Ready for public comment review	May 2008
GFD-R.P publication	September 2008

Table 5-11 OGSA WS-RF Basic Profile Rendering of Data Movement Functional Specification document schedule

5.8.2 Referenced Specifications

OGSA-DMI WG is working on identifying referenced specification.

5.9 *HPC Basic profile 1.0*

This document describes how a particular set of specifications are composed in order to solve some basic use cases around the use of HPC systems. For example, the use case of how to submit an executable job to run on a compute cluster. This document is closely related to OGSA efforts, but it is not strictly an OGSA document, and is being developed independently of the OGSA working group.

5.9.1 Development Schedule

The OGSA-HPCP-WG has completed work on Version 1.0 of this profile and it has been published as GFD-R.P.-144 in August 2007.

5.9.2 Referenced Specifications

This profile is based on the OGSA BES 1.0, JSDL 1.0, and JSDL HPC Profile Application Extension

OGSA Referenced Specifications: HPC Basic Profile 1.0													
September 21, 2007	Status							Adoption					Note
	De Facto	Institutional	Evolving Institutional	Draft Institutional	Consortium	Evolving Consortium	Draft	Ubiquitous	Adopted	Community	Interoperable	Implemented	
Specification/Profile Name													
Specifications													
Job Submission Description Language (JSDL) 1.0		X									X		
Job Submission Description Language (JSDL) HPC Application Extension 1.0		X									X		
Basic Execution Service(BES) 1.0		X									X		
X.509		X						X					
Profiles													
WS-I Basic Security Profile 1.0		X											Final Material
WS-Security Username Token Profile		<	X										Working Draft 2

Legend:

X	Specification or profile is currently at this status or adoption level
<	Specification or profile is approaching this status or adoption level
	Status or adoption level is not applicable

Table 5-13 OGSA HPC Profile 1.0 Specifications

6. OGSA Informational Profile Schedule

This chapter is intended to provide the development schedule of OGSA Informational Profile documents. These documents will be created by OGSA-WG or by other domain-expert working groups.

There are no plans to develop any informational profiles at present.

7. Collaboration with Other Organizations

7.1 Liaisons

In order to keep effective and productive communication and solve technical issues with concerted efforts, OGF as a whole or individual working groups maintain liaisons with other standards development organizations and with industry organizations.

Table 7-1 shows OGSA-related liaisons and their goals.

Organization	OGSA-WG Liaison	Goals
DMTF	Fred Maciel	Research how to apply the CIM model in OGSA resource management.

Table 7-1 OGSA liaisons and their goals

7.2 Standards Development Organizations Collaboration on Networked Resources Management (SCRM)

In addition to one-to-one liaison relationships both at the OGSA-WG level, explained in the previous section, and institutional level, major standards development organizations (SDOs) form a round table style, cross-institutional technical working group which will create a technologies and specifications landscape document and sort out terminology and taxonomy about Web service based management of networked resources. Such SDOs are including but not limited to DMTF, IETF, ITU-T, OASIS, OGF, SNIA, TMF, and W3C. This activity is called “Standards Development Organizations Collaboration on Networked Resources Management,” or SCRM (pronounced “scrum”). SCRM-WG is a regular OGF WG in the liaison area but this does not mean OGF will lead the SCRM work: OGF will provide an infrastructure for SCRM-WG, but the domain experts participating on behalf of the SDOs will equally contribute to and promote the SCRM work.

In May 2006, SCRM-WG released the online reference guide of specifications and standards for the management of networked resources. The wiki is available to anyone through OGF’s web site. Developed in wiki form, the information will be continuously updated by professionals throughout the world.¹ Experts and institutions interested in adopting or researching these technologies are encouraged to submit additional information as appropriate. The SCRM-WG will maintain the integrity and legitimacy of information posted to this wiki.

8. Open-Source Software Projects

OGSA is expected to be implemented by multiple open-source software (OSS) projects and commercial software vendors. In this section we describe some of the projects whose work is contributing to OGSA in some significant way.

The **Globus Toolkit** (Globus) is an example of a major OSS grid project. The Globus Alliance² is contributing to the development of OGSA by supporting the design and implementation of open-source software that implements specifications detailed in OGSA Profiles, and the participation of the implementers of that software in relevant standards processes. With its current version, GT4, based on early implementations of WSRF and WS-Notification and including implementations of all relevant security standards, Globus provides a comprehensive software infrastructure that allows developers and users to work with OGSA concepts now. Additional standards will be incorporated into future versions of the toolkit as they evolve.

The Globus Consortium is a group of companies with a common interest in promoting the development and adoption of the Globus Toolkit for commercial use. Consortium participants also have a strong interest in standards in general, and in OGSA in particular.

The Grid Research team at the **University of Virginia**³ (UVA) is committed to implementing several pieces of the OGSA Roadmap described here. Specifically, UVA will implement open versions of BytelIO, BES, RNS, and the WS-Naming specifications.

The **Business Grid Computing Project**⁴ is based on the OGSA Architecture specification. It is developing several services using specifications described in this Roadmap. Open source software implementations of the Application Contents Service (ACS), JSDL, and WS-Agreement are available.⁵

¹ <http://forge.ggf.org/sf/wiki/do/viewPage/projects.scrm-wg/wiki/HomePage>

² Globus Alliance: <http://www.globusalliance.org>

³ Virginia Center for Grid Research: <http://www.cs.virginia.edu/~vcgr/standards/main.html>

⁴ Business Grid Computing Project: <http://www.ipa.go.jp/about/english/project/grid.html> (English), <https://www.ipa.go.jp/software/bgrid/index.html> (Japanese)

⁵ BG download page: <http://businessgrid.ipa.go.jp/bgrid/> (Japanese)

NextGrid⁶ is an EU-funded project to develop an architecture for next-generation grids that will enable their widespread use. The project is taking the OGSA WSRF Basic Profile and also many OGSA use cases as input to its architecture. NextGrid provided initial input to the OGSA Profiles, providing the normative basis in terms of both strategy and content, and will continue to feed architectural ideas into the development of OGSA.

The **National Research Grid Initiative**⁷ (**NAREGI**) is a Japanese national e-science grid project aiming at developing a computational infrastructure for supporting scientific and engineering research. One of the primary goals of the NAREGI Project is to contribute to the OGF standardization activities. NAREGI has been interested in, participated in, and, where possible, given feedback to numerous OGF working groups and research groups. Amongst the various groups, NAREGI has recently placed high emphasis on the OGSA-WG activities, being the first project or group to implement the EMS architecture described in the OGSA Architecture.. The latest implementation, beta 1.0.1 version, is available.⁸

The **Open Middleware Infrastructure Institute**⁹ (**OMII**), located at the University of Southampton, is funded by the UK e-Science Core program. Its open-source distribution of Web services comprises services that are implementing current and emerging OGF- and OGSA-based standards, such as DAIS within the OGSA-DAI project, and JSDL and BES within the GridSAM projects. Both of these initiatives are funded through OMII's managed program.

The **UniGrids Project**¹⁰ will develop a Grid Service infrastructure compliant with the Open Grid Services Architecture (OGSA), and based on the Web Service Resource Framework (WSRF) and the UNICORE Grid software. The guiding principle of the project will be both to adopt and to influence standards in key project areas. The first version of Unicore/GS (the software developed by the UniGrids project) implements WSRF, WS-Addressing and JSDL. The second version of Unicore/GS will additionally implement OGSA-BES and provide support for WS-Security, SAML Authorization, and WS-Notification. The current implementation, Unicore 6, is available.¹¹

The **Gridbus Project**¹² at the University of Melbourne is a major OSS project focused on the design and development of service-oriented, utility computing grid technologies. The Gridbus project has designed and implemented an open-source version of Grid Service Broker (GSB), a grid workflow management system, GridBank (grid authorization, authentication, and accounting services), an SLA-based facility for allocation of grid resources, and a .NET-based enterprise grid manager.

All of these technologies either currently support or are committed to supporting interfaces that are compliant with specifications from OGF and other bodies. Gridbus makes use of WSRF-compliant technologies in its development of advanced grid services. The project contributes to and provides reference implementations of GSB, with interfaces conforming to the JSDL and Portlets specifications; the GridBank database conforms to Resource Usage Record (RUR); its access interfaces conform to WSRF; and its workflow management system interfaces conform to the Business Process Execution Language (WS-BPEL) specification. Release of the various components under development is planned for late 2005.

⁶ NextGrid Project: <http://www.nextgrid.org>

⁷ NAREGI Project: http://www.naregi.org/index_e.html (English), <http://www.naregi.org> (Japanese)

⁸ NAREGI download page: <http://www.naregi.org/download/index.html>

⁹ Open Middleware Infrastructure Institute (OMII): <http://www.omii.ac.uk/>

¹⁰ UniGrids project: <http://www.unigrids.org>

¹¹ Unicore 6: <http://www.unicore.eu/download/unicore6>

¹² Gridbus project: <http://www.gridbus.org/intro.html>

9. Security Considerations

Although this document does not have any specific security considerations, security requirements related to OGSA are covered in OGSA Security Profiles and related specifications.

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Appendix A. Summary of Referenced Specifications & Profiles

OGSA Referenced Specifications: Master Table														
September 21, 2007	Status						Adoption					Note		
	De Facto	Institutional	Evolving Institutional	Draft Institutional	Consortium	Evolving Consortium	Draft	Ubiquitous	Adopted	Community	Interoperable		Implemented	Unimplemented
Specification/Profile Name														
None														
Specifications														
WS-Addressing 1.0		X									<	X	IBM, Apache implementing	
WS-ResourceProperties 1.2		X										<	X	OASIS Standard
WS-ResourceLifetime 1.2		X										<	X	OASIS Standard
WS-BaseFaults 1.2		X										<	X	OASIS Standard
WS-BaseNotification 1.2		X									X			Stable, June 2004
WS-BaseNotification 1.3		<	X									<	X	At public review
WS-Security 1.0		X									X			
WS-Policy 1.0		X									X			
WS-Security Policy 1.0		X									X			
XML-Signature		X									X			
SchemaCentricCanonicalization			X									X		Committee Specification
XACML 2.0		X									X			OASIS Standard
WS-Naming 1.0		X										X		Input to new WG
Job Submission Description Language (JSDL) 1.0		X									X			
Job Submission Description Language (JSDL) HPC Application Extension 1.0		X									X			
Basic Execution Service(BES) 1.0		X									X			
Resource Namespace Service (RNS) 1.0			X									X		
Installable Unit Deployment Descriptor 1.0				<		X						X		Input doc from IBM; currently W3C member submission.
Common Information Model (CIM) 2.9		X						X						
ISO/IEC 9945:2003 (Posix v3)		X						X						
Assertions & Protocols for SAML 1.1		X							X					
RFC3281: Internet Attribute Certification Profile for Authz		X							X					
Transport Layer Security		X						X						
HTTP-TLS		X						X						
X.509		X						X						
XPath 2.0		X									<	X		W3C Recommendation
Profiles														
OGSA WSRF Basic Profile 1.0		X												
WS-I Basic Profile 1.1		X												Final Material
WS-I Basic Security Profile 1.0		<	X											Working Group Draft
WS-I Basic Security Profile 1.0		X												Final Material
WS-Security Username Token Profile 1.0		<	X											Working Draft 2
WS-I SAML 1.0		<	X											Working Group Draft




Legend:  Specification or profile is currently at this status or adoption level
 Specification or profile is approaching this status or adoption level
 Status or adoption level is not applicable

Table A-1: Referenced Specifications & Profiles Summary

Note: This table and all similar tables in this document are copied directly from the OGSA-WG tracking database. Lines labeled “None” have no significance in this copy and may be ignored.

Appendix B. Web Services Context

One of the most important changes to the overall distributed grid architecture model in recent years has been the adoption of Web services as a foundation for method invocation and data exchange over a network. These services are built upon well known Web service specifications and provide access to grid resources using XML messages communicated typically using the Simple Object Access Protocol (SOAP) protocol. XML Schema provides a common typing system which when combined with Web Services Description Language (WSDL) provide the building blocks to exchange information across disparate systems.

The evolving¹³ Web service specifications cover many different functional areas to include messaging content, transport, security, transactions, metadata, and workflow. The Web Services-Interoperability Organization (WS-I) has published the WS-I Basic Profile (BP) and the Basic Security Profile (BSP). OASIS has published the WS-Resource Framework (WSRF) which adds the notion of state to Web services which can be remotely accessed and monitored. Since individually, these specifications may be interpreted and combined in ways which inhibit interoperability, key Web service specifications have been composed together with guidelines to form profiles.

OGSA builds on this modular non-proprietary foundation to define specifications which enable grid systems to interoperate and to share resources between organizational boundaries, defining a standardized grid service infrastructure. OGSA publishes this combination of evolving Web service specifications as OGF developed OGSA profiles, establishing the definition of a standardized interoperable grid systems.

OGSA recognizes that it is important to track the evolution of Web service specifications and evaluate their impact periodically upon the OGSA Architecture as well as the grid community as a whole. This roadmap helps to serve that purpose by maintaining an enumeration of Web service dependencies and depicting their statuses in tables and graphics.

The OGSA-WSRF BP 1.0 profile extends the WS-I Base Profile by including specifications from the Web Services Resource Framework (WSRF) and WS-BaseNotification frameworks. The OGSA BSP 1.0 profile extends and qualifies the WS-I Basic Security Profile.

¹³ <http://roadmap.cbdiforum.com/reports/protocols/>

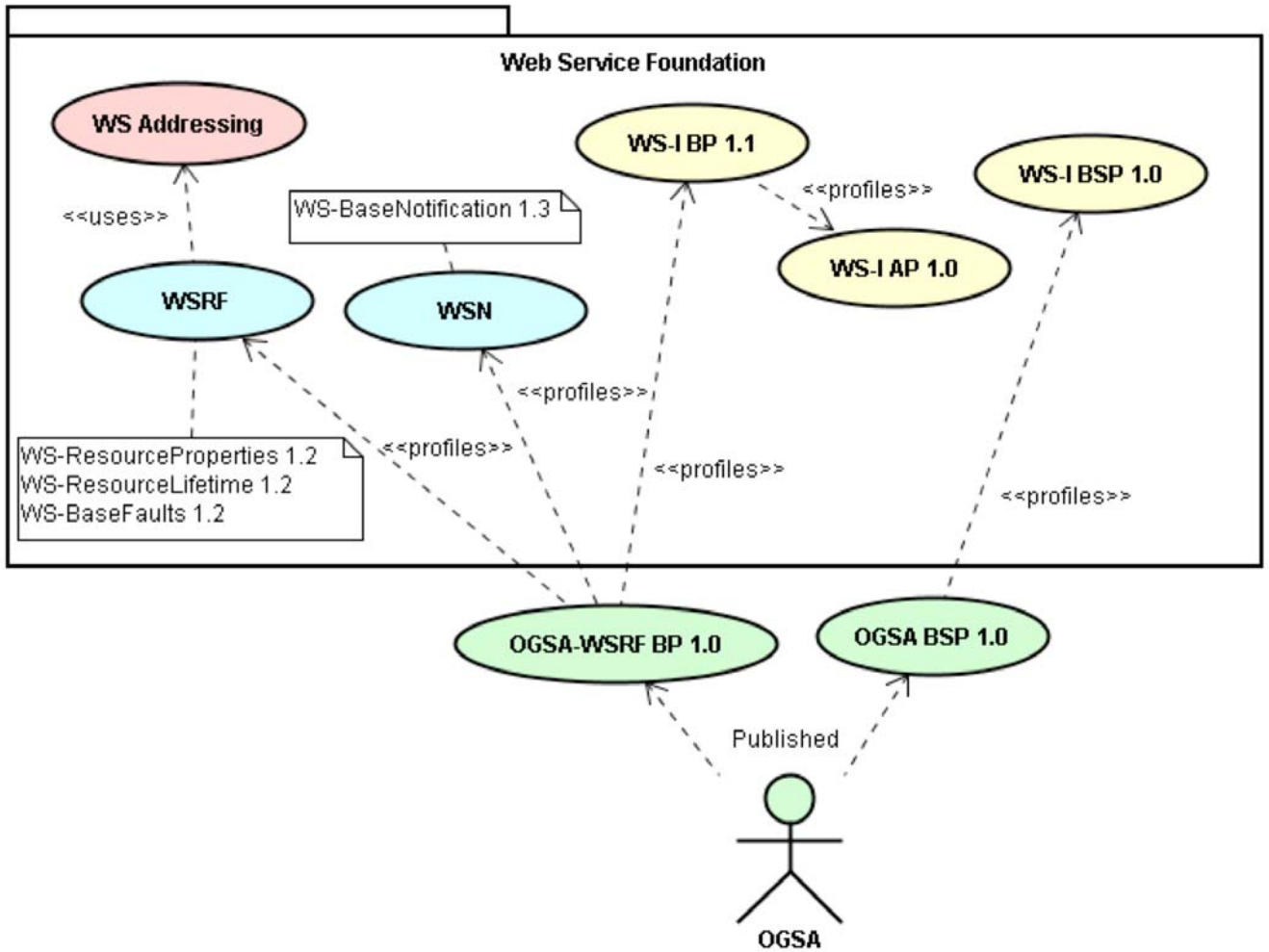


Figure. B-1 OGSA Basic Profiles and Web Services Specifications