

Hewlett-Packard

A Review of WSMF
and OGSi



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technical paper

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executive summary

This document compares Web Services Management Framework (WSMF) and Open Grid Services Infrastructure (OGSI). Table 1 on page 7 provides detailed information to understand how WSMF and Grid relate and what issues need to be resolved if we want to combine the above technologies.

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background

10 The **Web Services Management Framework (WSMF)** [1] is a logical architecture for the management of resources, including Web services themselves, through Web services¹. This framework is based on the notion of managed objects and their relationships. A managed object essentially represents a resource and exposes a set of management interfaces through which the underlying resource could be managed (see the overview document in [1]). Similarly, relationships among managed objects represent relationships among underlying resources. The management functions addressed by WSMF include: discovery of the management WSDL definitions; discovery of the topology of the managed objects; registrations and retrieval of notifications; monitoring, auditing, and controlling various aspects of managed objects by using the supported management operations

15 The **Open Grid Services Architecture (OGSA)** [2] addresses the challenges in integrating services across distributed, heterogeneous, dynamic "virtual organizations" formed from the disparate resources within a single enterprise and/or from external resource sharing and service provider relationships. Building on concepts and technologies from the Grid and Web services communities, this architecture defines a uniform exposed service semantics (the *Grid service*); defines standard mechanisms for creating, naming, and discovering transient Grid service instances; provides location transparency and multiple protocol bindings for service instances; and supports integration with underlying native platform facilities.

20 The OGSA platform encompasses the **Open Grid Services Infrastructure (OGSI)**. From the completed OGSI draft [3]: "[...] the Open Grid Services Infrastructure (OGSI) defines mechanisms for creating, managing, and exchanging information among entities called *Grid services*. Succinctly, a Grid service is a Web service that conforms to a set of conventions (interfaces and behaviors) that define how a client interacts with a Grid service. These conventions, and other OGSI mechanisms associated with Grid service creation and discovery, provide for the controlled, fault-resilient, and secure management of the distributed and often long-lived state that is commonly required in advanced distributed applications. In a separate document, we have presented in detail the motivation, requirements, structure, and applications that underlie OGSI."

25 The **Common Management Model (CMM)** is a working group within Global Grid Forum (GGF). From its chapter [4]: "The purpose of this WG will be to define the Common Management Model in which [...] entities will be represented as manageable resources and services. Manageable resources and services can include any type of entity, ranging from hardware (such as a disk drive), to software components (such as a database or message queue), to complete solutions (such as a billing system or provisioning), and also to transient things such as print jobs. The Common Management Model will provide a set of port types that build on and supplement the GGF's OGSI Specification [3] that are of broad and general use for management in the Grid."

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¹ The term Web services is used to describe the approach to loosely-coupled distributed computing in which interactions are carried out through the exchange of XML messages, exchanged in accordance to the Simple Object Access Protocol (SOAP) specification and described through the Web Services Description Language (WSDL).

relationship between Grid and WSMF

Figure 1 shows the relationships of WSMF with the OGSA Platform as they stand today. In the figure:

- The Grid resources reside in the Physical Resources area.
- 40 • OGSI provides operational interfaces and associated behaviors for various Grid services.
- OGSA is the framework in which all Grid services are created and deployed.
- WSMF will initially manage the services deployed in OGSA that represent the physical resources. WSMF defines a management interface for managing the OGSA services.
- 45 • WSMF can also manage resources that are not under the Grid framework yet are important in the management view of the physical resources domain.
- This management interface is created using WSDL and portTypes.

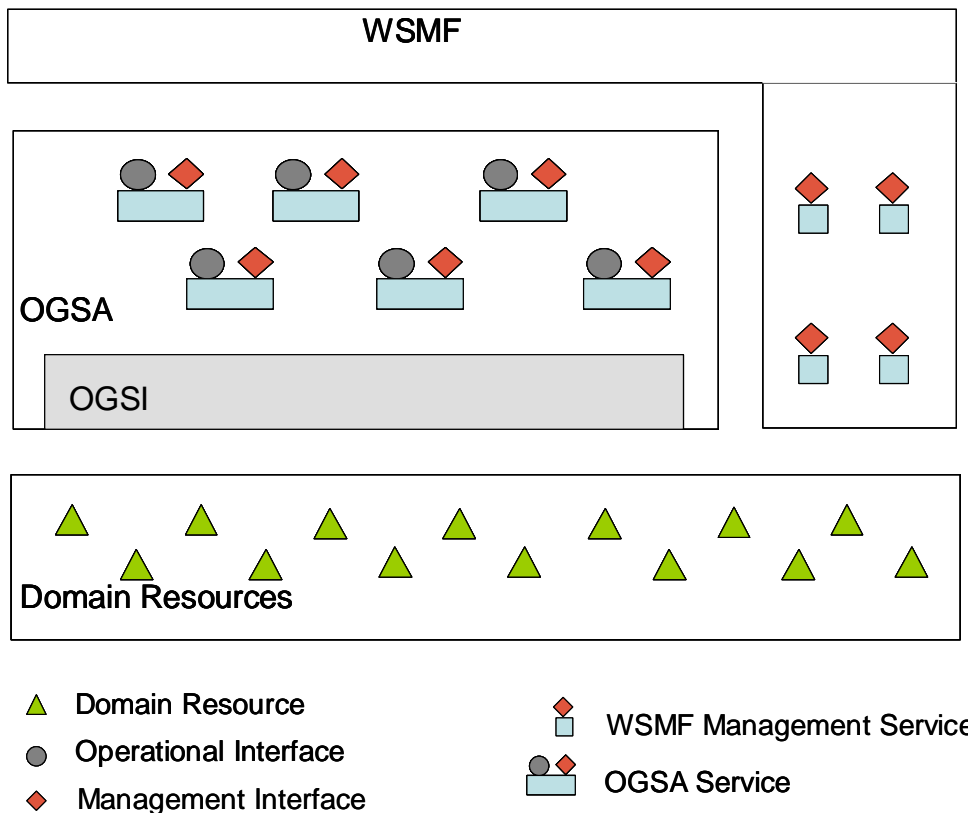


Figure 1: Component Relationships

- 50 There is however more that we believe should be done to validate the use and viability of the Grid for its adopters, and that is only achievable by providing a complete management solution. Such a comprehensive solution will not only include management of the Grid resources via the Grid services, but also the management of the Grid services and the environment that supports them, as well as the management of the Grid meta services, and finally the management of the infrastructure (e.g. the event sub-system) that is used by these services.

comparison of features

55 The following table provides a detailed comparison of features offered by each of the core specifications under review.

Subject	OGSI/OGSA	WSMF	Notes
WSDL version	WSDL 1.2 compatible (needs inheritance and information elements)	WSDL 1.1 – waiting for 1.2 features to become available	OGSI uses GWSDL (WSDL 1.1 with OGSI extensions). GWSDL will be retired when WSDL 1.2 is available.
resource representation	Grid service	managed object	
port types	GridService, HandleResolver, NotificationSource, NotificationSubscription, NotificationSink, Factory, ServiceGroup, ServiceGroupRegistration, ServiceGroupEntry	managedObjectIdentity, monitoring, discovery, control, performance, configuration, security, EventPush, EventPull	WSMF multiple port types allows adopters to gradually build management information into their systems -- e.g. first monitoring, then discovery, and control, etc.
service data	all GridServices have serviceDataElement, does not define 'notification types' as WSMF	no service data concept explicitly introduced, but implicit in managed object through the meta information and attributes support..	Service data element typically associated with each port type and resource type
fault handling	Exceptions/Faults specified in interface definition, provides locator of the fault	Similar to OGSI. Defined faults are listed in the WSMF technical doc.	
life cycle definition	OGSI uses lifetime declaration properties such as goodUntil to describe lifetimes associated with data, and terminationTime associated with Grid services	WSMF has state values that represent the lifetime values of a resource.	
event model	various notification port types; only supports a push model Defines notifications in terms of sources and sinks.	Supports EventPush, EventPull and bulk mechanisms Uses notifications to capture & correlate events from managed objects.. Uses the Expiration property to describe event lifetimes.	Both OGSI and WSMF specify lifetime of the subscriptions.
policies	OGSA wants to define this: definition, maintenance, enforcement	policy-neutral. Will work with other policies – e.g. WS-Policy.	
compatibility/ cross-fertilization with SNMP and CIM		model-neutral – will work with SNMP/MIB, CIM, and others.	
users, objectives, roles			Neither CMM nor WSMF addresses concepts such as actors, roles or views. However, WSMF could address these concepts with some minor work.
data models for web services	out of scope	Web services, its hosting environment (WSEE), conversation, intermediary, and registry.	
security	OGSA refers to WS Security	Delegated. WSMF will offer suggestions for security, and will work with security standards such as WS-Security. The meta information structure in WSMF will support addition of security schemas or standards.	
discovery	WS-Inspection	WS-Inspection, UDDI	
get/set properties	property is parameter of FindServiceData operation	'get/set' operation per property—will be deprecated	OGSI uses XQuery etc. for richer querying; OGSI properties may change depending on phase of life cycle

Subject	OGSI/OGSA	WSMF	Notes
handles and references	Grid Service Handle (unique life-time URI) and Grid Service Reference (transient and container implementation dependent)	WSMF uses an ID value that must be unique per managed object. However, it doesn't have a service like OGSI that can enforce this - it is up to the implementer to do that. A GSR-like capability could be added, and could use OGSA's GSR.	
group	ServiceGroup	notion of 'collections' although details differ from OGSI service group; grouping achieved by containment, dependency, correspondence	for certain utility computing actions you need farm/group notions: CMM allows search of group types
relationships		'Relationships', not 'dependencies': contains, containedin, dependson, dependsupon, correspondsto	WSMF plans to handle "Dependencies" through the combination of metric values, the event system, and what OV does well in regard to setting thresholds
added-value services	OGSA is about such services: reporting Grid service, logging service, etc.	opportunity to differentiate as WSMF is also considering support for management side services.	
type of resources		type attribute and implementation of collection of interfaces	
introspection	Yes	Yes. Provided through the meta information addition.	
modeling time	GMT time stamps	GMT time stamps	
factory	Factory and NotificationSource port type	not considered	
attribute types		Introduces other compatible types	

Table 1: A detailed review of the features of OGSI, OGSA & WSMF

glossary

- 60 **conversation.** A managed object that implements one or more of the *Conversation* management interfaces which represents one service's view of the state associated with a set of related messages.
- Common Management Model (CMM).** CMM is a working group in GGF to provide management interface definitions in Grid.
- data model.** See model, or information model.
- event.** An *event* is a change in the state of a resource or request for processing.
- Grid.** GGF standards, in particular OGSI and OGSA.
- 65 **Grid service.** Grid service is a service representation of a managed entity. It prescribes how to deal with state of managed entities through Service Data, and provides interfaces to manipulate the lifetime of the Grid Service. A Grid service does not further specify management, control or other port types, that is up to extensions like CMM.
- hosting environment.** The platform on which WSMF or Grid is running, e.g., J2EE, TIBCO, etc. For WSMF (as well as for CMM), an implementation of OGSI can be considered the hosting environment. Also called run-time environment.
- 70 **infrastructure services and infrastructure layer.** The Grid service extensions that deal with the lifecycle management of Grid services: creation, registration, discovery, deletion. In this document, infrastructure services include both OGSI lifecycle services and OGSA platform services.
- information model.** See model, or data model.
- 75 **interface collection.** An *interface collection* is a group of management interfaces that expose the management capabilities of a type of managed object.
- lifecycle services.** see services lifecycle layer.
- managed entity.** A managed entity is anything that is represented through a Grid service (in Grid) or Managed Object (in WSMF). A managed entity can be a hardware component, a software executable, a logical device such as an SLA contract, or an abstract notion such as 'solution.'
- 80 **management interface.** A management interface exposes management capabilities of a resource. A management interface is presented as a set of attributes, operations, and notifications to be accessed through a WSDL portType.

managed object. A managed object is a management representation of a resource. A managed object implements one or more management interfaces to provide a means to monitor and/or control the underlying resource.

85 **management interface.** A management interface exposes management capabilities of a resource. A management interface is presented as a set of attributes, operations, and notifications to be accessed through a WSDL portType.

meta model. A meta model specifies the available constructs in the model. A meta model does not specify instances of those constructs. For instance, the meta model for CIM has relationships in it, but does not specify what relationships are possible (that's left to the domain-specific information models, which have introduced hundreds of different relationships over the years.)

model. A model is a set of objects, properties, and their relationships.

90 **notification.** A notification is a message that is sent to or retrieved by one or more subscribers to inform them that an event has occurred.

platform services and platform services layer. The Grid service extensions in OGSA that deal with life cycle management of Grid services, in particular registry, authorization. See also infrastructure services.

resource. A resource is a component of a deployed environment. We preferably use managed entity instead of resource.

relation. A relation is a type of association between two managed objects.

95 **relationship.** A relationship specifies two managed objects and the relation to define how two specific objects are associated.

run-time environment. See hosting environment.

service. A managed object that implements the *Service* management interfaces which represents the management capabilities of a Web service. This Web service may be acting as the provider and/or the consumer of Web service messages.

100 **service lifecycle layer.** The elements in the OGSF specification that deal with lifecycle management of Grid services, in particular handle resolution, creation through factory. See also infrastructure services.

service representation. The service representation of a managed entity is the Grid service or WSMF managed object associated with the managed entity.

Simple Object Access Protocol (SOAP). SOAP is a transport protocol used in WSDL specifications to bind web service communication to a particular protocol (such as e-mail, http, remote procedure call)

105 **subscriber.** A subscriber is an entity that is interested in selected notifications from managed objects. These notifications contain information about the state change in a managed object.

virtual organization. A virtual organization (VO) is a group of Grid services... (get definition from OGSA)

web service. A web service is defined by its WSDL specification, and uses SOAP as its transport protocol.

110 **Web Services Definition Language (WSDL).** WSDL is a standard that prescribes the format web services specify their XML interfaces in. WSDL provides room for operations, binding details, messages, ... (check).

Web Services Execution Environment (WSEE). A managed object that implements the WSEE management interfaces which encapsulates the management capabilities of a Web service execution environment.

Web Service Management Framework (WSMF). Set of WSDL1.1 compliant interface, attribute and port type definitions, for the purpose of managing any type of entity. WSMF also comes with a management information model for the web services domain.

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