Enabling Grids for E-science in Europe

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Introduction

Overview of Grid Services and GT3

How to Build a Grid Service Using GT3

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- **Overview of Grid Services and GT3**
- Build a Grid Service
  - Overview
  - 1. Deployment: Stand Up a FileShare Service
  - 2. Naming: Share Files using Identifiers
  - 3. Inspection: Add Service Data
  - 4. Virtual Organization: Register with a Community Index
  - 5. Lifetime Management: Maintain service registration
  - 6. Discovery: Find a File
  - 7. GT3 Security: Share Files Securely

  Time permitting:
  - 8. Transience: Create and Destroy FileShares
- Publish your Grid Service: The GTR

Web Services

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- A Web Service can be viewed as a network-accessible function that can be invoked via a well-defined remote interface
- The interface for Web Services is defined using the standard Web Services Description Language (WSDL)
- Web Services enable service-oriented architectures
  - computational tasks are performed using a loosely-coupled collection of services

Grid Service

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- A Grid Service is a standard Web Service, plus extensions
- The extensions are defined in a community standard called the Open Grid Services Infrastructure (OGSI)
- This tutorial is designed to highlight these extensions

OGSI Specification

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- The OGSI Specification v1 is a draft in the Global Grid Forum
- It defines basic levels of functionality needed for solving complex problems in distributed computing
  - Atomic, composable patterns in the form of interfaces
  - A model for service composition
- The spec defines a language and building blocks for constructing grid services

Open Grid Services Architecture (OGSA)

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- OGSA is built on top of OGSI
- The focus of OGSA is on higher-level constructs, such as archetypal grid services
- Current areas of work on OGSA-level standardization include
  - Resource management
  - Security
  - Workflow
  - Data

Globus Toolkit® 3.0 Components

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- A full Java implementation of Version 1 of the OGSI Specification
- A framework for developing and hosting OGSI-compliant grid services
- GT3 security infrastructure
- New services built on OGSI
  - Managed Jobs (akin to gatekeeper/jobmanager)
  - Reliable File Transfer (RFT)
  - Index Service (akin to GIIS)
- A new service not yet OGSI-fied
  - Replica Location Service (RLS)
- A complete GT2.4 distribution

GT3 Components used in this Tutorial

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- A full Java implementation of Version 1 of the OGSI Specification
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Implementation Overview

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- Service interface
- Service implementation
- Runtime environment
- The Five Steps

Implementation Basics Interface

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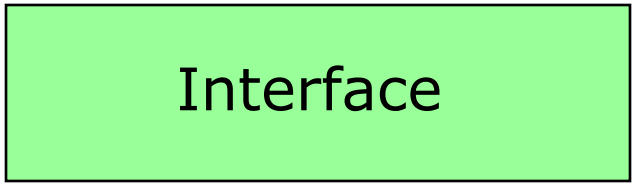
- A Grid Service advertises its capabilities via a well-defined remote interface



Implementation Basics Implementation

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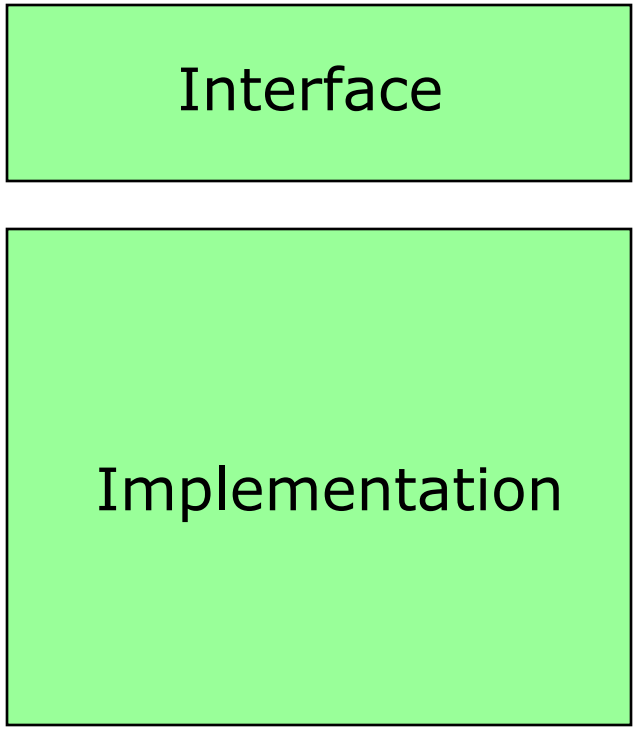
- A Grid Service advertises its capabilities via a well-defined remote interface
- The implementation of a Grid Service is separated from its definition



Implementation Basics Runtime Environment

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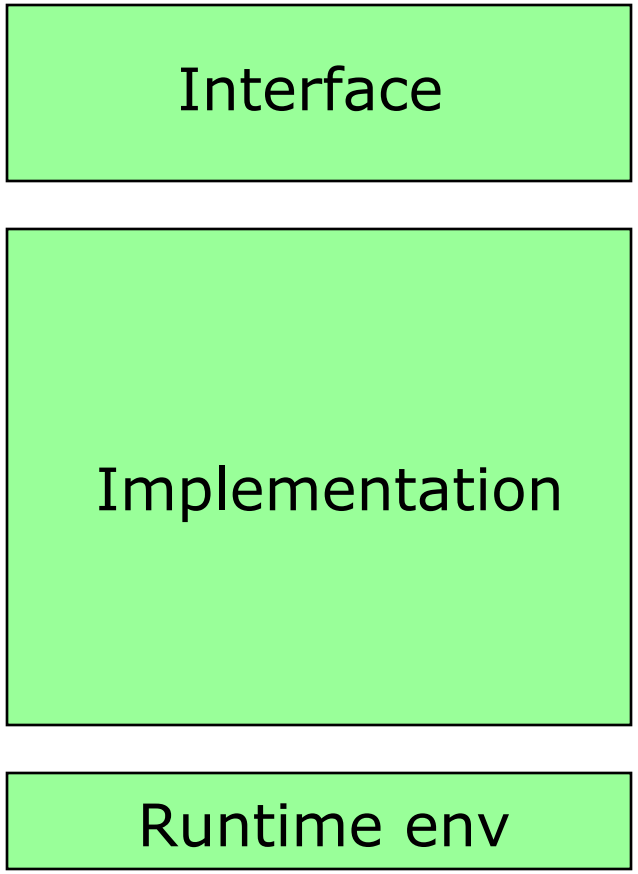
- A Grid Service advertises its capabilities via a well-defined remote interface
- The implementation of a Grid Service is separated from its definition
- A Grid Service is deployed in a runtime environment



Implementation Basics
The Five Steps

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1. Create the interface
2. Write the implementation
3. Write the deployment descriptor
4. Build the service, creating a GAR
5. Deploy into the runtime environment

The Five Steps
1. Create the Interface

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- The capabilities and behaviors of services are described using WSDL
- In your design, be mindful of service composability
  - The capabilities that you expose in the interface will be discoverable by other services

1. Create the Interface WSDL

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- Web Service Description Language
- XML-based language for:
  - Abstractly describing message exchanges between clients and services
    - Types defined using XML Schema
    - Message comprising one or more parts of XML Schema types/elements
    - Operation = input/output or input only messages
    - Interface = named group of operations
  - Binding the interfaces to concrete protocols
    - E.g. SOAP/http

1. Create the Interface GWSDL

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- Grid Service interfaces are specified in GWSDL files
- GT3 includes tooling to convert GWSDL into WSDL 1.1
- Standard Grid Service operations are obtained by extending the GridService portType

```
<grid:portType name="MyServicePortType"
    extends="ogsi:GridService">
```

The Five Steps
2. Write the Implementation

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- Server
  - Your service should inherit from the GT3 class GridServiceImpl
  - Your service must provide an implementation for all of the operations defined in the GWSDL
  - Methods and data that you wish to keep private should not appear in the GWSDL
- Client
  - When you build the service, GT3 will automatically generate a class that clients can use to connect to the service at runtime

2. Write the Implementation Operation Providers

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- GT3 includes support for a delegation-based programming model, in the form of Operation Providers
- An operation provider is created by implementing the org.globus.ogsa.OperationProvider interface
- Operation providers enable developers to encapsulate functionality so that it can be reused in different services
- Can ease the task of bringing legacy code into OGSI-compliance

The Five Steps 3.Write the Deployment Descriptor

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- Grid service runtime configuration is described in a WSDD file
- The file includes parameters such as
  - Security configuration for the service
  - Path to the service's WSDL file
  - Base class of the service implementation
  - Operation providers

The Five Steps 4.Build the Service, Creating a GAR

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- GT3 provides standard build targets that can be used for compiling Grid Services
  - The build targets take the GWSDL, Java and WSDD files as input
  - The output of the build process is a portable grid service binary, called a GAR file
- The GAR file contains information needed to install a service in the runtime environment
  - Similar to a WAR (used for distributing webservices)

The Five Steps 5. Deploy into the Runtime Environment

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- ant deploy –Dgar.name=myService.gar