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Tutorial 2: Service Development

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Problem Set 3

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- **Main points:**
  - Familiarise yourself with the development process
  - Gain experience with GT3.3 tools
  - Prepare for more advanced service creation

- **What you should have learned:**
  - Environment, environment, environment!
    - Nearly every problem encountered this week was due to incorrect environment settings
    - Check now that your user account and globus account contain the GT library sources and proxy variable dec. in ~/.bash_profile
    - If `echo $CLASSPATH` returns nothing… get sourcing…

5-step Service

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- Service Interface
  - Defined in GWSDL
- Service Implementation
  - Written in Java
- Deployment Descriptor
  - Defined in WSDD
- Compilation into .gar
  - Using Apache ANT
- Client Implementation and compilation
  - Written in Java, compiled using javac

Directory Structure

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- The tutorial expands into the following directory structure
  - {home} (ANT build file, tutorial_build.sh, namespaces)
  - {home}/schema/progtutorial (GWSDL files)
  - {home}/org/globus/progtutorial/services (Service Imp)
  - {home}/org/globus/progtutorial/clients (client imp)

- It is best to keep this structure when writing your own services as you will be able to use the `tutorial_build.sh` script to create the service

Service Interface

- **Lecture 6 described some fundamental concepts of Web Services**
  - **Most importantly, the language used to describe the operations these services will provide (WSDL).**
  - **GT3.3, because it implements OGSA, requires some extensions to the language to turn it into a Grid Service (GWSDL).**
    - Since Web Services (implementations of the WSRF) are the current desired standard, it is useful to have a look at some of the differences between WSDL and GWSDL, with specific reference to the counter example

Service Interface

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- **A WSDL document looks like**

`<definitions>`	root element, defines name, namespaces
`<types>`	defines the data types used by the service
`<message>`	defines message exchange the service requires
`<portType>`	defines the service operations
`<bindings>`	defines the message type and protocols
`<service>`	defines the address for invocation
`</definitions>`	

- **There are only a few changes to be made to make this a GWSDL file…**

Service Interface

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- **A GWSDL document looks like**

```
<definitions>      root element, defines name, namespaces
    <import>       OGSI functionality
    <types>        defines the data types used by the service
    <message>      defines message exchange the service requires
    <gwsdl:portType>  defines the service operations
</definitions>
```

- **Note:**
  - **No <bindings> tag – generated automatically with ANT**
  - **No <service> tag – deployment descriptor does this**

Service Interface

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- **<definitions> attributes:**
  - **name**
    - Just the name of this GWSDL file
  - **targetNamespace**
    - Target namespace of this GWSDL file
    - All operations (and portTypes) defined in this GWSDL file will belong to this namespace
  - **xmlns:tns**
    - Another definition of targetNamespace
  - **xmlns:ogsi, gwsdl**
    - Standard OGSI namespaces which are required for GSWDL

Service Interface

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- <import>
  - This file contains all OGSI types, messages and portTypes that are required
- <gwsdl:portType>
  - Name:
    - Name of portType
  - Extends:
    - GWSDL extension of generic GridService PortType
  - Operation:
    - Defines the methods the implementation provides
- All other types as WSDL

Service Interface

- **GWSDL is langauge neutral**
  - But namespaces we have used need to be related to real packages
  - This is the job of the namespace mappings file

```
~/namespace2package.mappings
```

  - 1st line: target namespace of GWSDL file
    - Points to MathService stub
  - 2nd and 3rd lines: auto generated by GT3
  - These stubs don't exist until built by ant

Service Implementation

- WSDL PortType defines operations our service can perform.
- How this is performed is defined in the implementation class
  - Found in:

```
~/org/globus/progtutorial/services/core/
  first/impl/MathImpl.java
```

Service Implementation

- `package org.globus.progtutorial.services.core.first.impl`
  - This defines the implemetation package we are about to create
- `import org.globus.ogsa.impl.ogsi.GridServiceImpl;`
  - This class is required by ALL grid services and is known as SKELETON class
  - It contains all the extra functionality that Grid Services require.
  - Implements operations declared in generic Grid Service portType
- `import org.globus.progtutorial.stubs.MathService.MathPortType;`
  - MathPortType is the STUB file generated from the GWSDL interface file once ANT has compiled it.
- `import java.rmi.RemoteException`

Service Implementation

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- MathImpl class is defined as:
  - `public class MathImpl extends GridServiceImpl implements MathPortType`
  - Our MathImpl class extends from the generic GridServiceImpl base class (skeleton) and implements the MathPortType stub
- Constructor presents string to GridServiceImpl constructor (Simple Math Service)
- private int value line makes service ‘stateful’
- Methods can throw RemoteException
  - Network between client and server may be down

Deployment Descriptor

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- **Key stage of deployment is the creation of the deployment descriptor**
  - XML document written in WSDD format
  - Informs the web server how to publish this service to the outside world

  - Open the file (from the root of your distribution)

```
/org/globus/progtutorial/services/core \
  /first/server-deploy.wsdd
```

Deployment Descriptor

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- **<service> tag defines the location of the Grid Service and its classes**
  - **Publishes a Grid Service Handle (GSH)**
  - **<service name=“”> field contains extension to the container base address**
    - E.g. name=“progtutorial/core/first/MathService”
    - Container contacted at http://your.machine.ip:8080/ogsa/services
    - So full GSH is

http://your.machine.ip:8080/ogsa/services/progtutorial/core/first/MathService

Deployment Descriptor

- **Several parameters follow within the service tag which locate the service files**
  - **className**
    - Points to the STUB interface for the MathPortType which supplies the operations this service allows
  - **baseClassName**
    - Points to the service implementation class MathImpl
  - **schemaPath**
    - Points to the WSDL file for the service
    - This WSDL file is created from the GWSDL file when compiled with ANT
  - **Plus several parameters common to all grid services**

Grid Archive

- Ant takes over once the portType, implementation and descriptor are in place
  - Utilises GT3 build files and its own build.xml file to create a grid archive file.
  - Stored in ~/build/lib
- This file is deployed by ant into the web services container
  - After deployment open:

```
$GLOBUS_LOCATION/server-config.wsdd
```

  - Search through for your service!
    - You will notice this is basically your deployment descriptor

Client

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- For this exercise client takes two arguments
  - The Grid Service Handle
  - A number to add to the service

- Top few lines define package, and import appropriate stub classes (built by ant)
  - File in:

~/org/globus/progtutorial/clients/MathService/Client.java

Questions

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- Continue with exercise
- If you are having problems with environment etc. please ask now, otherwise problems will be harder to track down after we start really getting to grips with security next week….
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