

Unit 8 Web Services with Resources

Unit Outcomes. Here you will learn

- About the latest standards for describing WS with stateful resources.
- To develop and deploy WS with resources using the Globus Toolkit.
- How WS resources integrate with other WS features, namely notification.

Further Reading: Globus Toolkit 4 online tutorial 1.3, 3--8

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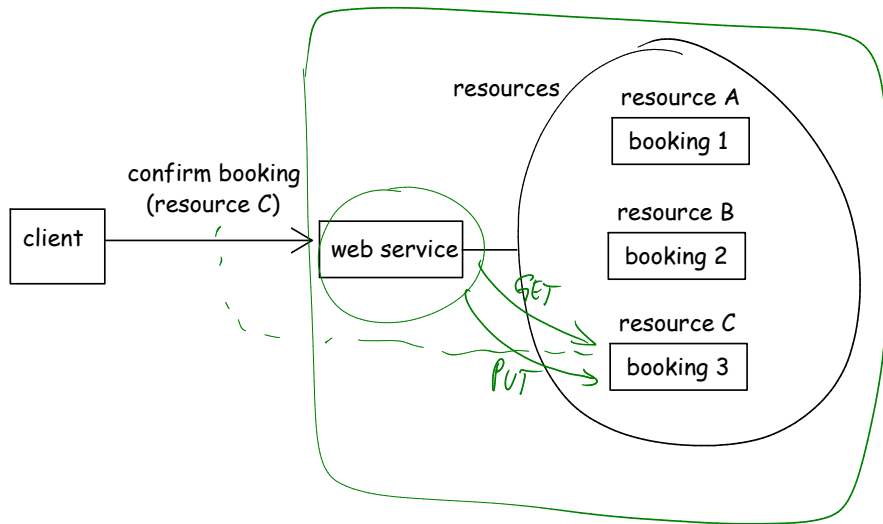
- WS-Notification

Systematic Stateful WS

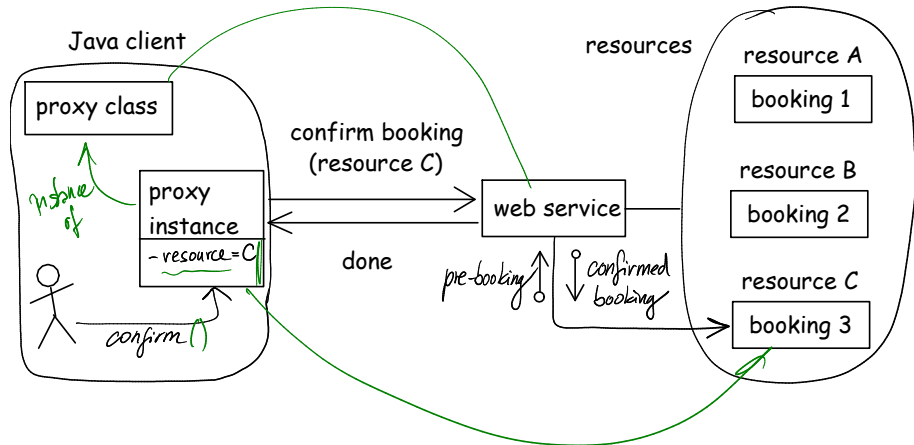
Stateless vs stateful WS

- SOA definition:
“services accessed in a *stateless* request-response manner”
- eg service for adding many numbers:
 - stateless: all numbers passed at once
 - stateful: can add one number at a time and then request sum
- stateless services good for maintainability, scalability

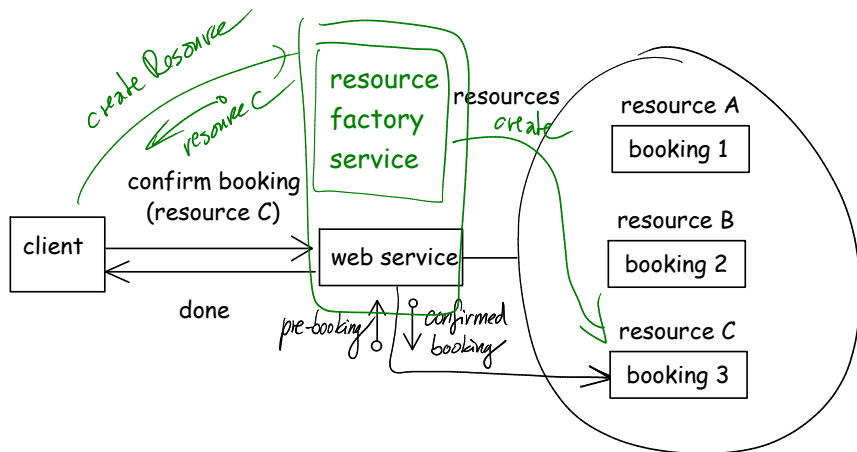
WS resources



WS resources and Java classes



Managing WS resources



GDT annotated class

```
@GridService
    (name = "Math",
     namespace = "http://localhost:8080/wsrf/services/MathService",
     ...)
public class Math
{
    @GridAttribute
    private int[] numbers = new int[MAX_NUMS];

    @GridAttribute
    private int numbersLength = 0;

    @GridMethod
    public void addNumber(int n)
    {
        if(numbersLength < MAX_NUMS)
        {
            numbers[numbersLength] = n;
            numbersLength++;
            System.out.printf("Math: Added number %d.%n", n);
        }
    }
}
```

Generated WSDLs

MathPortType		
* addNumber		
input	parameters	addNumber
output	parameters	addNumberResponse
* getSum		
input	parameters	getSum
output	parameters	getSumResponse
* GetResourceProperty		
input	GetResourcePropertyRequest	GetResourceProperty
output	GetResourcePropertyResponse	GetResourcePropertyResponse
InvalidResourcePropertyQNameFault	InvalidResourcePropertyQNameFault	InvalidResourcePropertyQNameFault
ResourceUnknownFault	ResourceUnknownFault	ResourceUnknownFault

MathFactoryPortType		
* createResource		
input	parameter	createResource
output	parameter	createResourceResponse

(createResourceResponseType)
EndpointReference EndpointReferenceType

WS-Addressing

- Endpoint Reference (EPR) = XML remote reference to a WS
- standard SOAP headers, eg `<wsa:To>`, `<wsa:From>`
- used to identify WS-Resources, eg:

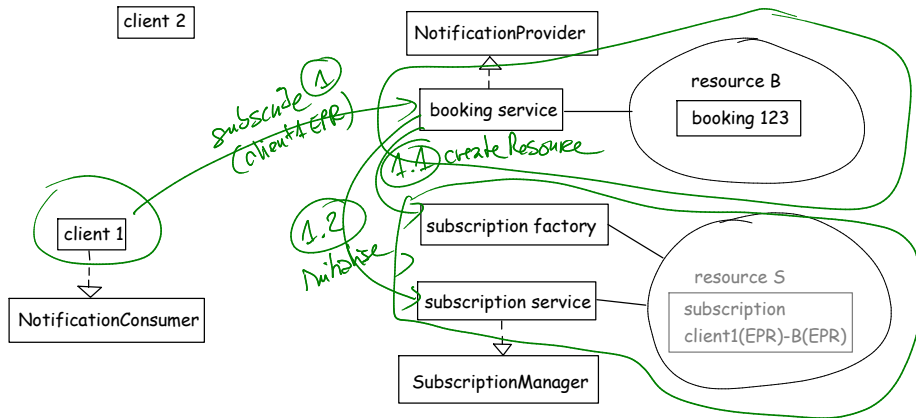
```
<soap:Envelope ...>
  <soap:Header>
    <wsa:To>
      http://a.com/services/Math?res=C
    </wsa:To>
    ...
  </soap:Header>
  <soap:Body>
    ...
  </soap:Body>
</soap:Envelope>
```

- also used as return value by factory service

WS-ResourceProperties

- four standard port types (with 1 operation each):
 - `GetResourceProperty` (in above WSDL)
 - `GetMultipleResourceProperties`
 - `SetResourceProperties`
 - `QueryResourceProperties`

WS-Notification



Learning Outcomes

Learning Outcomes. You should now be able to

- Describe the concept of WS-Resource using suitable examples and diagrams.
- Explain how WS-Addressing, WS-ResourceProperties and WS-Notification standards relate to WSRF, illustrating the ideas with examples.
- Name three standard port types used in basic notification according to WS-Notification and draw a collaboration diagram illustrating their use.