Service Data and Notifications

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Service Data

Notifications

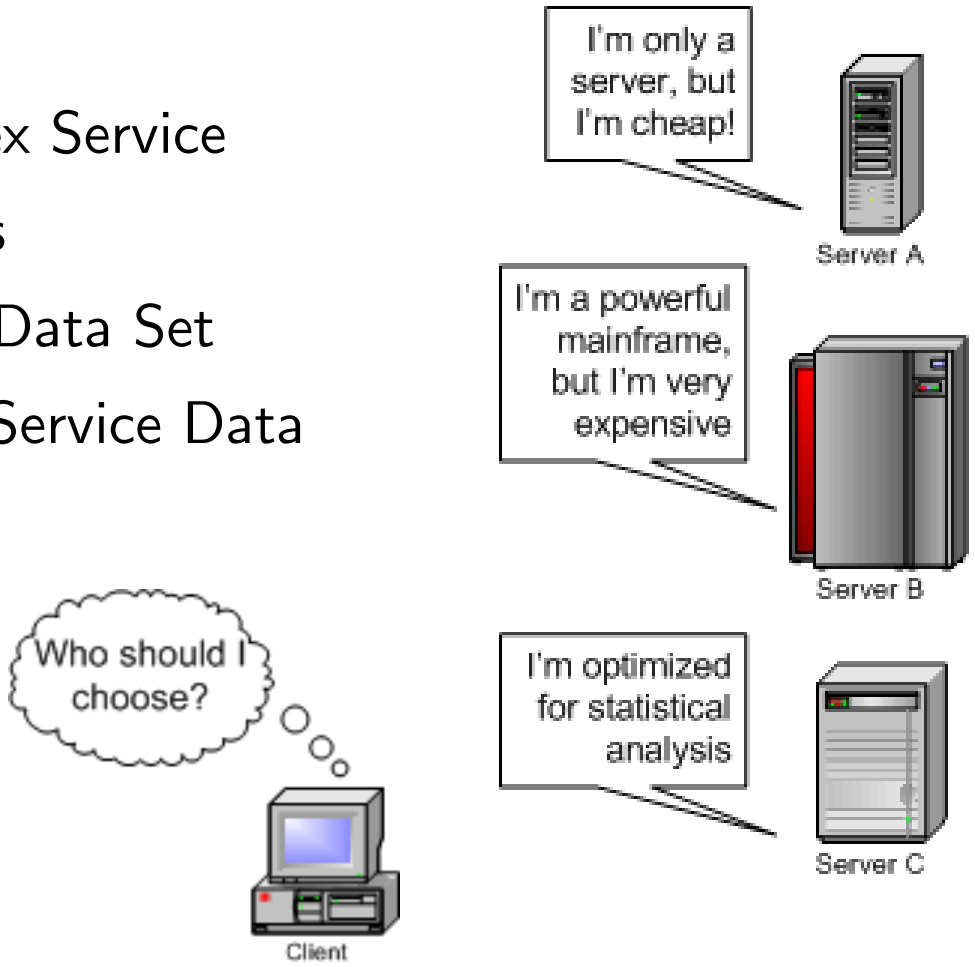
Fazit

Service Data

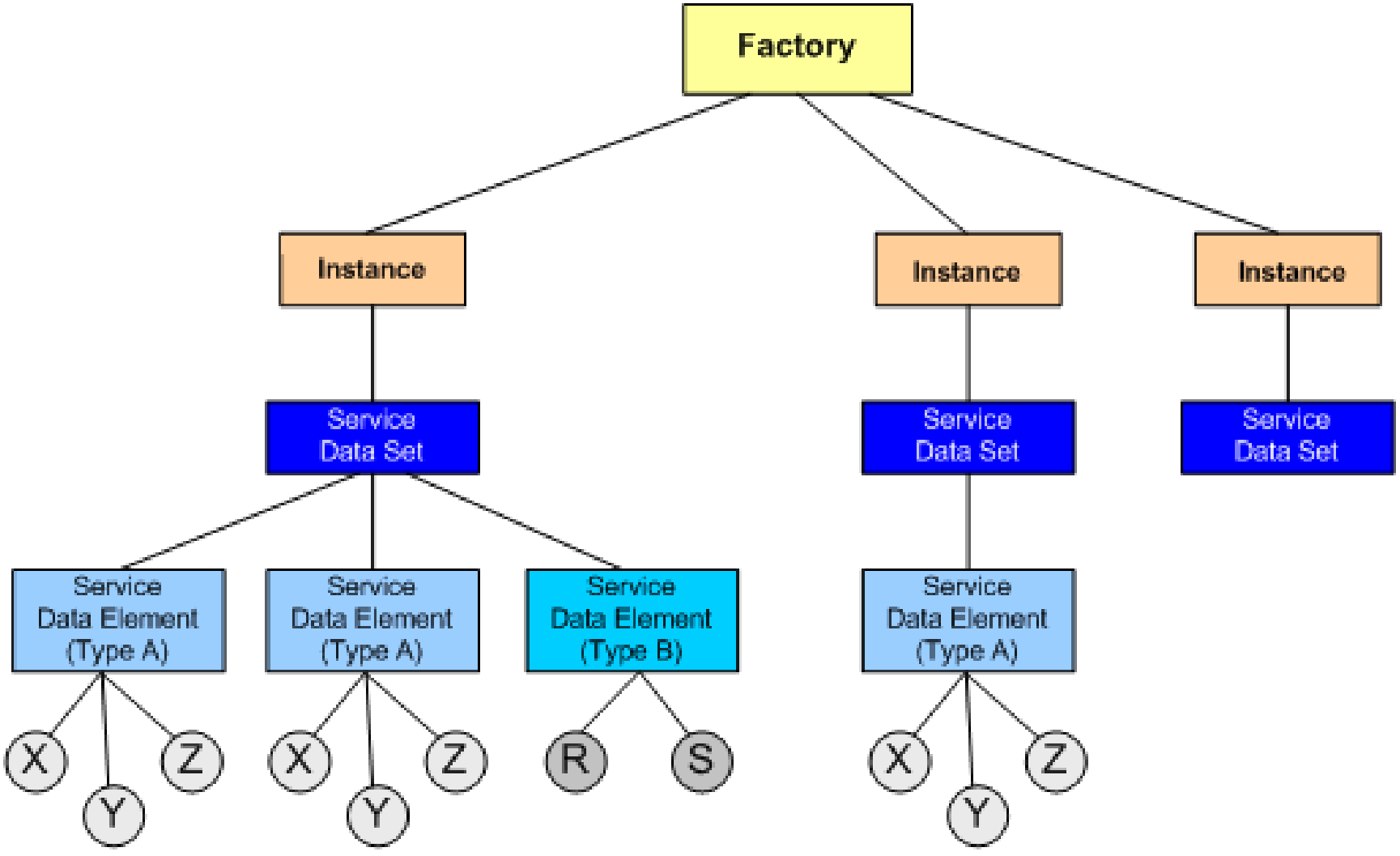
Definition von Service Data

Every Grid service can expose internal state as serviceData elements.

- Notwendig für stateful Services
- "Bewirbt" einen Grid Service
- Auswahl z.B. über einen Index Service
- Implementiert als Java Beans
- Jede Instanz hat ein Service Data Set
- Service Data Sets enthalten Service Data Elements



Organisation von Service Data



Service Data Element

Definition des SDE: AuctionData.xsd

```
<wsdl:types>
<schema
 targetNamespace="http://xnap.org/namespaces/0.1/AuctionData"
 attributeFormDefault="qualified"
 elementFormDefault="qualified"
 xmlns="http://www.w3.org/2001/XMLSchema">

   <complexType name="AuctionDataType">
      <sequence>
         <element name="endDate" type="long"/>
         <element name="location" type="string"/>
         <element name="product" type="string"/>
         <element name="shipping" type="int"/>
      </sequence>
   </complexType>

</schema>
</wsdl:types>
```

Service Data Element

Das generierte Java Bean: AuctionDataType.java

```
public class AuctionDataType  implements java.io.Serializable {
    private long endDate;
    private java.lang.String location;
    private java.lang.String product;
    private int shipping;

    public AuctionDataType() {
    }

    public long getEndDate() {
        return endDate;
    }

    public void setEndDate(long endDate) {
        this.endDate = endDate;
    }


...
```

Service Interface

GWSDL Schnittstellen Beschreibung: Auction.gwsdl (1)

```
<import location="AuctionDataType.xsd"
   namespace="http://xnap.org/namespaces/0.1/AuctionData"/>
<types>
<xsd:schema targetNamespace="http://xnap.org/namespaces/0.1/Auction"
    attributeFormDefault="qualified" elementFormDefault="qualified"
    xmlns="http://www.w3.org/2001/XMLSchema">

    <xsd:element name="bid" type="tns:bid">
        <xsd:complexType name="bid"><xsd:sequence>
           <xsd:element name="nick" type="xsd:string"/>
           <xsd:element name="amount" type="xsd:int"/>
        </xsd:sequence></xsd:complexType>
    </xsd:element>

    <xsd:element name="bidResponse" type="tns:bidResponse">
        <xsd:complexType name="bidResponse"><xsd:sequence>
           <xsd:element name="return" type="xsd:boolean"/>
        </xsd:sequence></xsd:complexType>
    </xsd:element>
</xsd:schema>
</types>

<message name="BidInputMessage">
  <part name="parameters" element="tns:bid"/>
</message>
<message name="BidOutputMessage">
  <part name="parameters" element="tns:bidResponse"/>
</message>
```

Service Interface

2. GWSDL Schnittstellen Beschreibung: Auction.gwsdl (2)

```
<gwsdl:portType name="AuctionPortType"
                extends="ogsi:GridService">
  <operation name="bid">
    <input message="tns:BidInputMessage"/>
    <output message="tns:BidOutputMessage"/>
    <fault name="Fault" message="ogsi:FaultMessage"/>
  </operation>
  <sd:serviceData name="AuctionData"
                  type="data:AuctionDataType"
                  minOccurs="1"
                  maxOccurs="1"
                  mutability="mutable"
                  modifiable="false"
                  nillable="false">
  </sd:serviceData>
</gwsdl:portType>
</definitions>
```

Grid Service Implementierung

AuctionService.java (1)

```
public class AuctionService extends GridServiceImpl
    implements AuctionPortType {

    private String currentBuyer;
    private int currentPrice = 100;

    public AuctionService() {
        super("Simple Auction Grid Service");
    }

    public synchronized boolean bid(String nick, int value)
        throws RemoteException {

        if (value > currentPrice) {
            currentPrice = value;
            currentBuyer = nick;
            return true;
        }
        return false;
    }
```

Grid Service Implementierung

AuctionService.java (2)

```
public void postCreate(GridContext context)
     throws GridServiceException {

    // Create Service Data Element
    ServiceData serviceData
         = this.getServiceDataSet().create("AuctionData");

    // Set the value of the SDE to a AuctionDataType instance
    AuctionDataType auctionData = new AuctionDataType();
    serviceData.setValue(auctionData);

    // Set intial values of AuctionServiceData
    auctionData.setProduct("XNap Gold Edition");
    auctionData.setShipping(410);
    auctionData.setEndDate(System.currentTimeMillis() + THREE_DAYS);
    auctionData.setLocation("Stuttgart");

    // Add SDE to Service Data Set
    this.getServiceDataSet().add(serviceData);
}
```

Deployment

Ant Ausgabe

```
Buildfile: build.xml
copyFiles:
mergeMapping:
mappingAvailable:
mergePackageMapping:
setenv:
generateWSDLfromJava:
generateWSDLfromGWSDL:
WSDLUptodate:
GWSDL2WSDL: [echo] Generating wsdl for
Auction.gwsdl
BindingUptodate:
generateBinding: [echo] Generating
schema for Auction
stubs:
generateStubs: [echo] Generating stubs
compileStubs: [javac] Compiling 29
source files
compile: [javac] Compiling 1 source file
stubjar: [jar] Building jar
jar: [jar] Building jar
gar:
makeGar:
testJars:
copyJars: [copy] Copying 2 files
testSchema:
copySchema: [copy] Copying 6 files
testEtc:
copyEtc:
testDocs:
copyDocs:
testBin:
copyBin:
setGarID:
testPostDeployAvailable:
copyPostDeploy: [copy] Copying 1 file
[jar] Building jar [delete] Deleting
directory
all:
BUILD SUCCESSFUL Total time: 40 seconds
```

Zusammenfassung der Schritte

Erstellung eines Grid Services mit Service Data

1. Definition des Service Data Elements
2. Definition der Grid Service Schnittstelle
3. Implementierung des Grid Services
4. Deployment

Finden von Service Data

findServiceData (req., OGSI)

- queryByServiceDataNames (req., OGSI)
  - Übertragung des ganzen Service Data Elements
- queryByXPath (GT3)

Beispiel

Anfrage:

```
Host[Name=@marvin.informatik.uni-stuttgart.de]/CPULoad
```

Ergebniss:

```
<CPULoad Last1Min="4.8" Last5Min="0.1" Last15Min="00">
```

Client Implementierung

AuctionClient.java (1)

```
URL GSH = new java.net.URL
    ("http://127.0.0.1:8080/ogsa/services/xnap/AuctionService/xnap");

// Get a reference to the Math PortType
AuctionServiceGridLocator serviceLocator
    = new AuctionServiceGridLocator();
AuctionPortType auction = serviceLocator.getAuctionServicePort(GSH);

// Get a reference to the GridService PortType
OGSIServiceGridLocator locator = new OGSIServiceGridLocator();
GridService gridService = locator.getGridServicePort(GSH);

// Get Service Data Element
ExtensibilityType extensibility = gridService.findServiceData
    (QueryHelper.getNamesQuery("AuctionData"));
ServiceDataValuesType serviceData = AnyHelper.getAsServiceDataValues
    (extensibility);
AuctionDataType auctionData
    = (AuctionDataType)AnyHelper.getAsSingleObject
    (serviceData, AuctionDataType.class);
```

Client Implementierung

AuctionClient.java (2)

```
// Print Service Data
System.out.println("Shipping: " + auctionData.getShipping());
System.out.println("Location: " + auctionData.getLocation());

// Start the bidding
BufferedReader in = new BufferedReader(new InputStreamReader(System.in));
while (true) {
    System.out.println("--------------------------------");
    System.out.print("Your bid: ");

    String s = in.readLine();
    if (s == null) { break; }

    if (auction.bid("foobar", Integer.parseInt(s))) {
        System.out.println("> Your bid is currently the highest!");
    } else {
        System.out.println("> Sorry, try again.");
    }
}
```

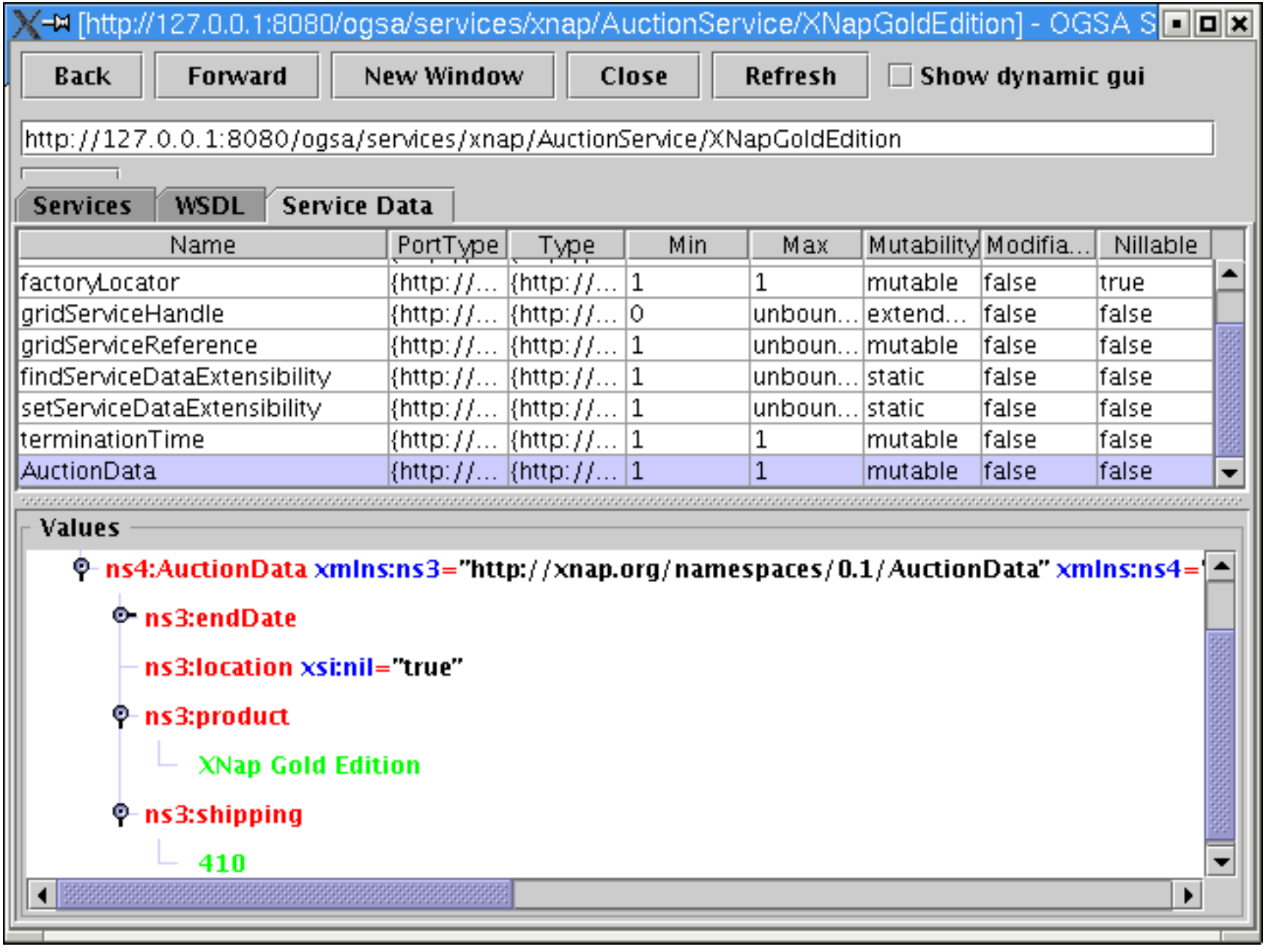
Standard Service Data

Der obligatorische GridService PortType stellt Standard SDEs zur Verfügung:

- interfaces
- serviceDataName
- factoryLocator
- gridServiceHandle
- gridServiceReference
- findServiceDataExtensibility
- setServiceDataExtensibility
- terminationTime

Demonstration

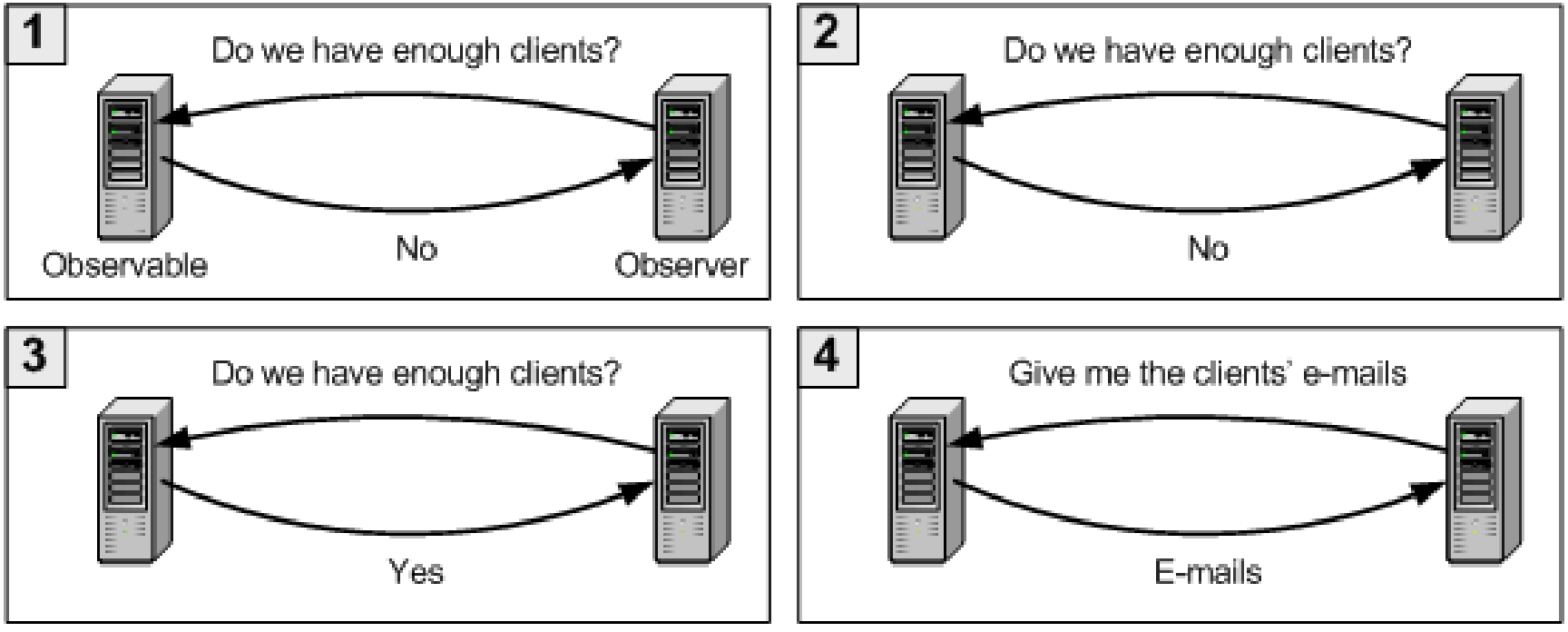
▸ Skip Demonstration


[http://127.0.0.1:8080/ogsa/services/xnap/AuctionService/XNapGoldEdition] - OGSA S
Back
Forward
New Window
Close
Refresh
Show dynamic gui
http://127.0.0.1:8080/ogsa/services/xnap/AuctionService/XNapGoldEdition
Services
WSDL
Service Data
Name
PortType
Type
Min
Max
Mutability
Modifia...
Nillable
factoryLocator
{http://...
{http://...
1
1
mutable
false
true
gridServiceHandle
{http://...
{http://...
0
unboun...
extend...
false
false
gridServiceReference
{http://...
{http://...
1
unboun...
mutable
false
false
findServiceDataExtensibility
{http://...
{http://...
1
unboun...
static
false
false
setServiceDataExtensibility
{http://...
{http://...
1
unboun...
static
false
false
terminationTime
{http://...
{http://...
1
1
mutable
false
false
AuctionData
{http://...
{http://...
1
1
mutable
false
false
Values
ns4:AuctionData xmlns:ns3="http://xnap.org/namespaces/0.1/AuctionData" xmlns:ns4="
ns3:endDate
ns3:location xsi:nil="true"
ns3:product
XNap Gold Edition
ns3:shipping
410

Notifications

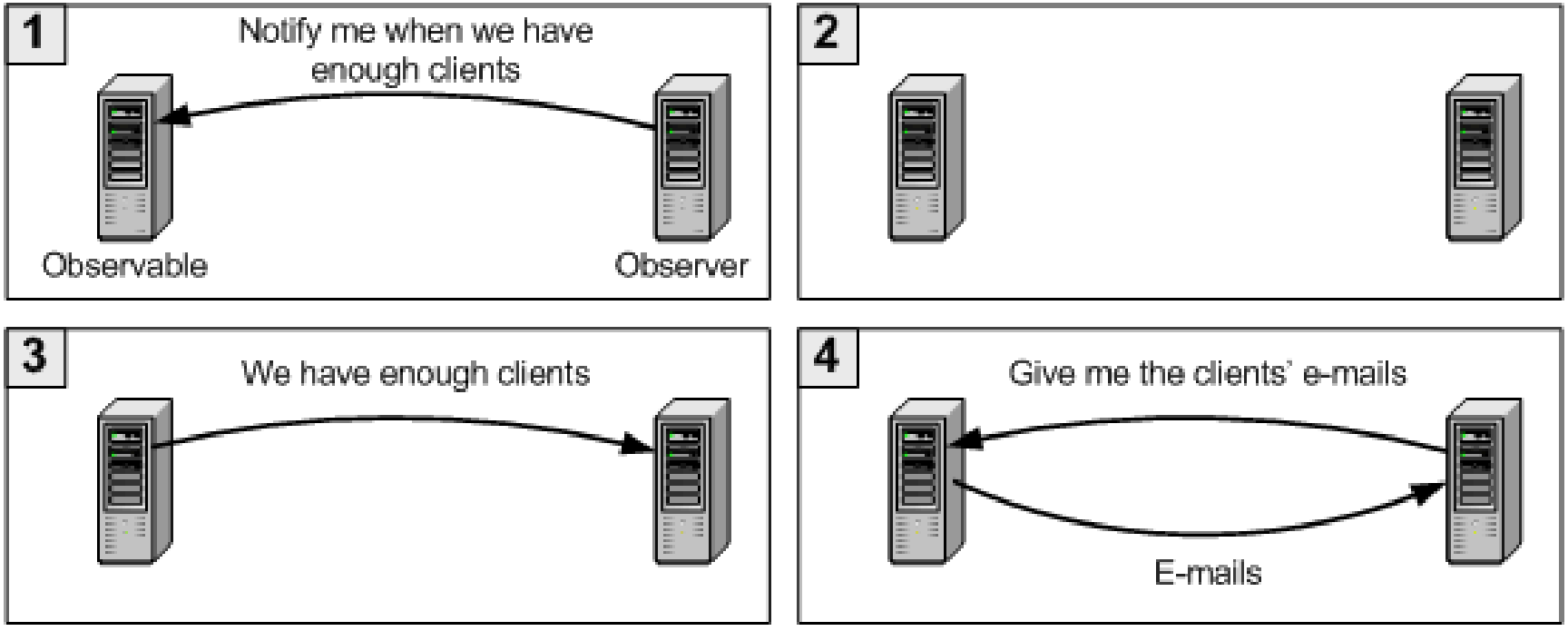
Polling Approach

Der Client fragt in Intervallen so lange nach, bis der gewünschte Zustand erreicht ist.



Notification Approach

Der Server schickt eine Nachricht an den Client, sobald sich der Zustand ändert.



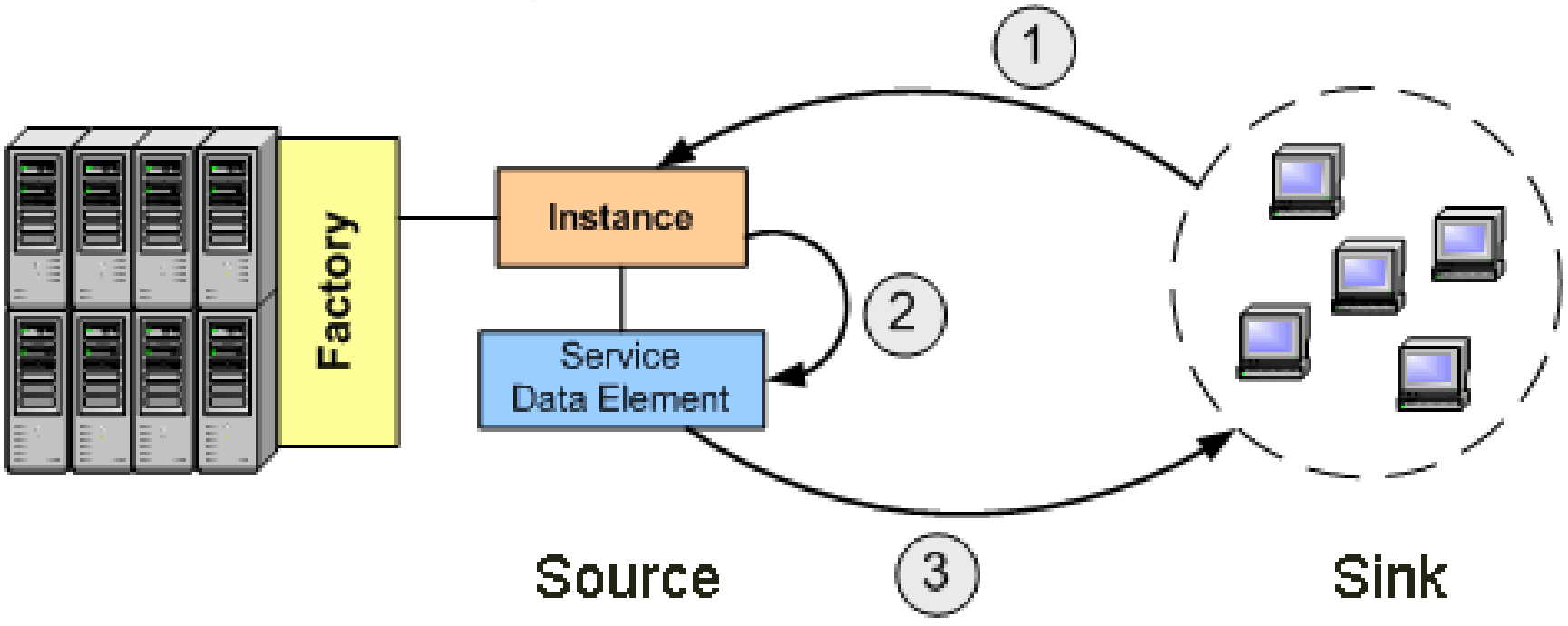
Einführung

The purpose of notification is to deliver interesting messages from a notification source to a notification sink.

- Notifications sind ein populäres Entwurfsmuster
  - Observer/Observable
  - Model-View-Controller
- Client Anwendungen "beobachten" Service Data Elemente
- Im GT3 Jargon
  - Observer $\longrightarrow$ Notification Sink
  - Observables $\longrightarrow$ Notification Source

Einführung

Notifications laufen folgendermaßen ab:



1. **addListener** Die Sink hängt sich an ein SDE
2. **notifyChange** Die Instanz beauftragt sein SDE die Sinks zu benachrichtigen
3. **deliverNotification** Die Source (das SDE) benachrichtigt alle Sinks

Service Data Element

Erweiterung des SDE: AuctionData.xsd

```
<wsdl:types>
<schema
 targetNamespace="http://xnap.org/namespaces/0.2/AuctionData"
 attributeFormDefault="qualified"
 elementFormDefault="qualified"
 xmlns="http://www.w3.org/2001/XMLSchema">
    <complexType name="AuctionDataType">
        <sequence>
            <element name="currentBuyer" type="string"/>
            <element name="currentPrice" type="int"/>
             <element name="endDate" type="long"/>
             <element name="location" type="string"/>
             <element name="product" type="string"/>
             <element name="shipping" type="int"/>
        </sequence>
    </complexType>
</schema>
</wsdl:types>
```

Service Interface

Erweiterung der Schnittstelle: Auction.gwsdl

```
<gwsdl:portType name="AuctionPortType"
                extends="ogsi:GridService  ogsi:NotificationSource">
  <operation name="bid">
    <input message="tns:BidInputMessage"/>
    <output message="tns:BidOutputMessage"/>
    <fault name="Fault" message="ogsi:FaultMessage"/>
  </operation>
  <sd:serviceData name="AuctionData"
                  type="data:AuctionDataType"
                  minOccurs="1"
                  maxOccurs="1"
                  mutability="mutable"
                  modifiable="false"
                  nillable="false">
  </sd:serviceData>
</gwsdl:portType>
</definitions>
```

Grid Service Implementierung

Erweiterung des Services: AuctionProvider.java (1)

```
public class AuctionProvider
  implements OperationProvider, GridServiceCallback {

    private ServiceData serviceData;
    private AuctionDataType auctionData;

    private static final QName[] operations
        = new QName[]{ new QName("", "*") };
    private GridServiceBase base;

    public AuctionProvider() { }

    public void initialize(GridServiceBase base)
      throws GridServiceException {
        this.base = base;
    }

    public QName[] getOperations() {
        return operations;
    }
```

Grid Service Implementierung

Erweiterung des Services: AuctionProvider.java (2)

```
public void postCreate(GridContext context)
  throws GridServiceException {
    // Create Service Data Element
    [...]
    // Set intial values of AuctionServiceData
    [...]
    // Add SDE to Service Data Set
    [...]
}

public synchronized boolean bid(String nick, int value)
  throws RemoteException {
    if (value > auctionData.getCurrentPrice()) {
        auctionData.setCurrentBuyer(nick);
        auctionData.setCurrentPrice(value);
        serviceData.notifyChange();
        return true;
    }
    return false;
}
```

Client Implementierung

Der Client wird zum Server: AuctionClient.java (2)

```
public class AuctionClient extends ServicePropertiesImpl
    implements NotificationSinkCallback {

   public AuctionClient(String nick) throws Exception {
      // Set schema root, important: Trailing /!
      System.setProperty("org.globus.ogsa.schema.root",
                         "http://localhost:8080/");

      // Start listening to the MathService
      NotificationSinkManager nm = NotificationSinkManager.getManager();
      nm.startListening(NotificationSinkManager.MAIN_THREAD);
      String sh = nm.addListener("AuctionData", null, GSH, this);

      // Start the bidding
      [...]

      // Clean up: Stop Listening
      notifManager.removeListener(sh);
      notifManager.stopListening();
  }
```

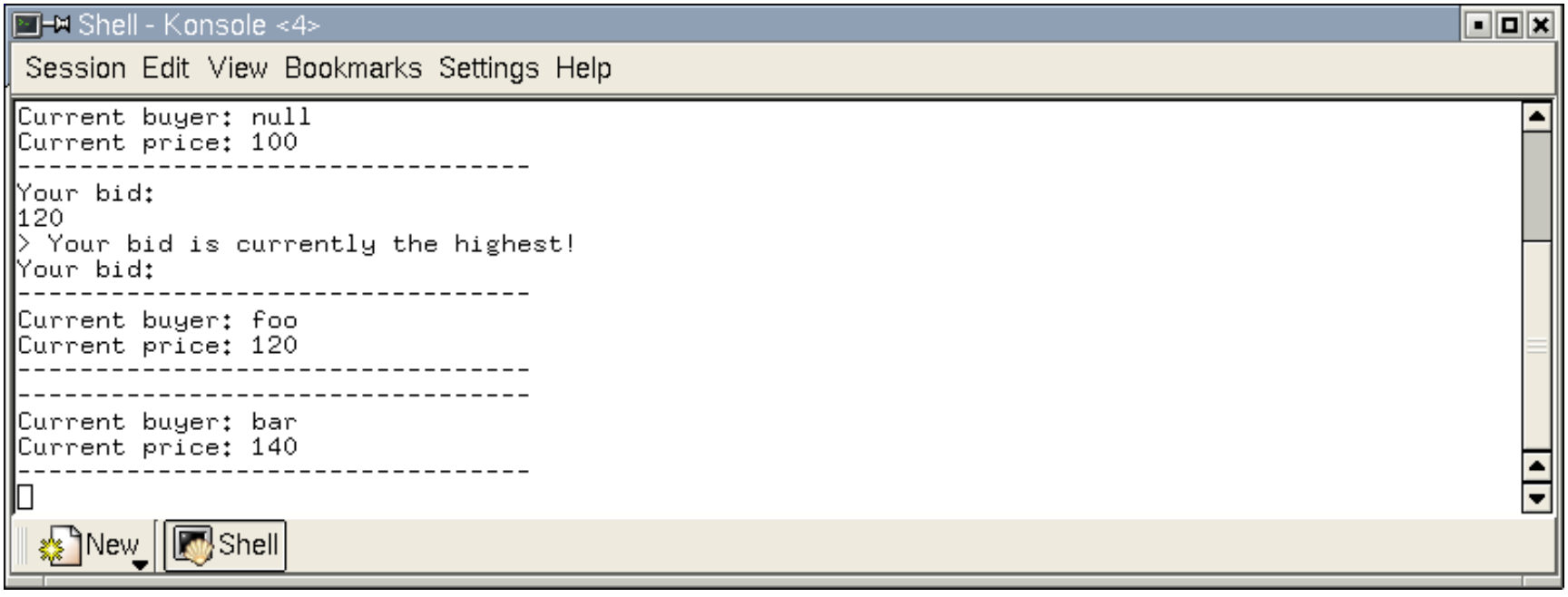
Client Implementierung

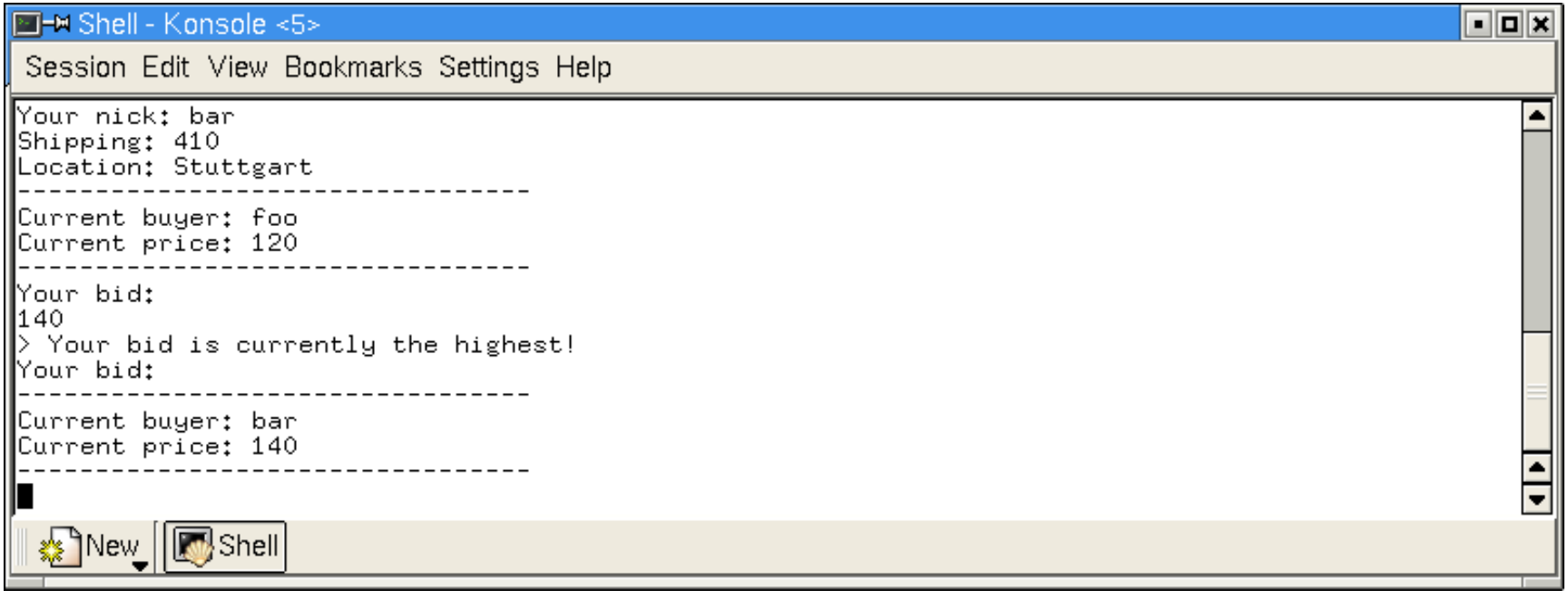
Der Client wird zum Server: AuctionClient.java (1)

```
public void deliverNotification(ExtensibilityType any)
    throws RemoteException {

    try {
        // Service Data has changed
        ServiceDataValuesType serviceData
            = AnyHelper.getAsServiceDataValues(any);
        AuctionDataType data
            = (AuctionDataType)AnyHelper.getAsSingleObject
                (serviceData, AuctionDataType.class);

        // Show current price and current buyer
        print(data);
    }
    catch(Exception e) {
        System.out.println("ERROR!");
        e.printStackTrace();
    }
}
```

Demonstration

▸ Skip Demonstration


Shell - Konsole <4>
Session Edit View Bookmarks Settings Help
Current buyer: null
Current price: 100
Your bid:
120
> Your bid is currently the highest!
Your bid:
Current buyer: foo
Current price: 120
Current buyer: bar
Current price: 140
New
Shell


Shell - Konsole <5>
Session Edit View Bookmarks Settings Help
Your nick: bar
Shipping: 410
Location: Stuttgart
Current buyer: foo
Current price: 120
Your bid:
140
> Your bid is currently the highest!
Your bid:
Current buyer: bar
Current price: 140
New
Shell

Fazit

Zusammenfassung

Service Data

- Macht Informationen über stateful Services zugänglich
- Nutzbar über die findServiceData Schnittstelle oder indirekt z.B. über Index Services
- Implementierung als Java Bean
- Ein Service Data Set pro Grid Service Instanz
- Mehrere Service Data Element pro Service Data Set

Notifications

- Benachrichtigung über Änderungen von Service Data Elements
- Implementiert ein gängiges Oberserver Pattern

Vielen Dank für Ihre Aufmerksamkeit!