

Overview of Web Services with Examples

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Outline

Web Services Architecture

Service Provider

Service Requester

Service Broker

Web Services Protocol Stack

WSDL based

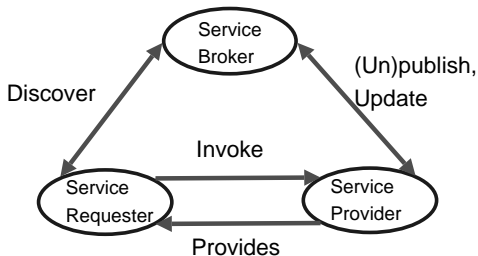
Semantics based

Web Services Composition

Editors

Web Services Architecture

- ▶ Web service is web-based enterprise application that use open, XML-based standards and transport protocols to exchange data with calling clients.



Service Provider - Provides Web Service

Creates and publishes:

- ▶ Service
- ▶ Service description (WSDL)
- ▶ Publishing:
 - ▶ Any action that makes WSDL document available
 - ▶ Sending WSDL as an e-mail
 - ▶ Advertising the WSDL in a UDDI registry

Service Requester - Uses Web Service

- ▶ Discovery:
 - ▶ Any action that gives access to the WSDL of the service
 - ▶ Accessing a file or URL containing the WSDL
 - ▶ Querying a UDDI registry and using the WSDL file(s) to select one of many potential services.
- ▶ Invocation
 - ▶ By some messaging protocol (for example SOAP)

Service Broker - Web Services Discovery

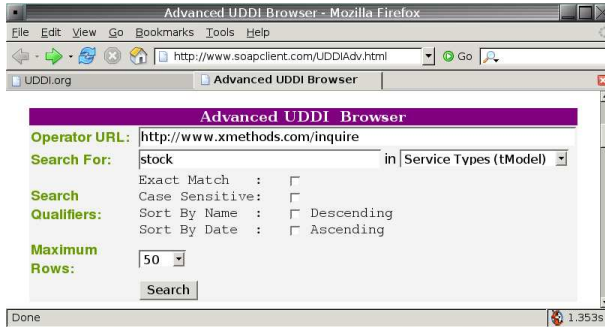
- ▶ Public, private, semi-private
- ▶ Client has to know the location of the registries

- ▶ Web Services Description Language
- ▶ Defines properties of the web service:
 - ▶ Web service description
 - ▶ Where it is located
 - ▶ How to invoke it
- ▶ Examples:
 - ▶ <http://api.google.com/GoogleSearch.wsdl>
 - ▶ <http://www.amazon.com/webservices>

UDDI

- ▶ Universal Description, Discovery and Integration
- ▶ Defines a set of standard interfaces for accessing a database of web services
- ▶ Web service that manages information about
 - ▶ Service providers
 - ▶ Service implementations
 - ▶ Service metadata (technical information)
- ▶ Examples:
 - ▶ <http://www.xmethods.com>
 - ▶ <http://uddi.microsoft.com>
 - ▶ UDDI Business Registry (discontinued)
 - ▶ Advanced UDDI Browser
(<http://www.soapclient.com/UDDIAdv.html>)

Advanced UDDI Browser



Advanced UDDI Browser - results

Service Type (tModel Name)	tModel Key
Stock quote for Oracle	uuid:1B828AD4-534C-627B-B414-BBDADC504D7C
StockPriceService	uuid:AC87A074-A10E-2C0F-9D8A-A8074994C7EA
Stock Services	uuid:F7B01EC2-A86A-C185-B57F-9AA0A175C16D
Stock Quotes	uuid:C3C1DA9E-DDD3-E659-F519-16C91AA48E16
StockQuote	uuid:52A2D109-F37A-7DE1-E66B-C477BC8FF764
Stock Quote	uuid:A5846937-910C-EF2E-2387-7D6B3A8DC619
StockQuotes Web Service	uuid:3D33FD8F-5D28-A2BA-FB75-3229662FDBBD
StockQuotes Web Service	uuid:24A1C90D-691F-B5E2-88EB-AE305F9BDE37

UDDI registry implementations:

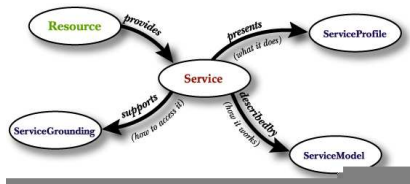
- ▶ jUDDI (Apache)
- ▶ WebSphere UDDI Registry (IBM)
- ▶ Microsoft® Windows Server 2003 Enterprise UDDI Services
- ▶ Novell Nsure UDDI Server
- ▶ OracleAS UDDI Registry
- ▶ The Java Web Services Developer Pack (SUN)

SOAP

- ▶ Simple Object Access Protocol
- ▶ Used for invoking web services and exchanging structured data and type information in a decentralised, distributed environment.

Web Services Protocol Stack - WSDL based

Service Negotiation	TPA
Workflow	WS-BPEL, BPML
Transaction/ Coordination	WS-Coordination WS-Transaction, WS-BPEL
Discovery, Registries	UDDI
Service Description Language	WSDL
Messaging	SOAP (WS-Security)
Transport	HTTP, FTP, SMTP



- ▶ ServiceProfile – high-level description of the service
- ▶ ServiceModel – detailed description of the service in which it is modeled as a process
- ▶ ServiceGrounding – binding level information of how a client can access the service

Web Services Protocol Stack - Semantics based

Service Negotiation	
Workflow	OWL-S ServiceModel
Transaction/ Coordination	OWL-S ServiceModel
Discovery, Registries	OWL-S ServiceProfile
Service Description Language	OWL-S ServiceProfile OWL-S ServiceGrounding
Messaging	SOAP
Transport	HTTP, FTP, SMTP

Web Services Composition

- ▶ Is the task of combining and linking existing web services to create new Web processes in order to add value to the collection of services.

Web Services Composition 2

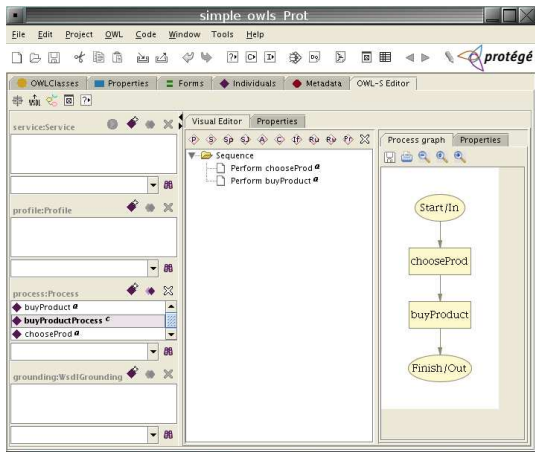
- ▶ OWL-S:
 - ▶ OWL-S editor <http://owlseditor.semwebcentral.org/>
 - ▶ OWL-S editor
<http://staff.um.edu.mt/cabe2/supervising/undergraduate/owlseditFYP/OwlSEdit.html>
 - ▶ OWL-S IDE
<http://projects.semwebcentral.org/projects/owl-s-ide/>
- ▶ WS-BPEL/BPEL4WS editors:
 - ▶ BPWS4J: <http://www.alphaworks.ibm.com/tech/bpws4j>

OWL-S Editor (Protege)

The screenshot displays the OWL-S Editor (Protege) interface. The main window is titled "simple owls Prot" and features a menu bar (File, Edit, Project, OWL, Code, Window, Tools, Help) and a toolbar. The interface is divided into several panes:

- Left Pane:** A tree view showing the ontology structure. The selected path is `process:Process`, which contains instances: `buyProduct a`, `buyProductProcess c`, and `chooseProd a`. Other visible classes include `service:Service`, `profile:Profile`, and `grounding:WsdGrounding`.
- Top Pane:** The "INDIVIDUAL EDITOR" for the instance `buyProductProcess` (instance of `process:CompositeProcess`). It includes:
 - Name:** `buyProductProcess`
 - Annotations:** A table with columns "Property", "Value", and "Lang". It contains one entry: `rdfs:comment` with the value "Simple example".
 - Properties:** A list of properties associated with the instance, including `process:invocable`, `process:hasInput`, `process:hasPrecond`, `process:computedE1`, `process:computedIn`, `process:hasLocal`, `process:hasResult`, `process:computedO1`, `process:hasOutput`, `process:computedP1`, `process:hasOutput`, and `process:performedE1`. Some values are shown as "?money" and "?receipt".

OWL-S Editor (Protege)



OWL-S Editor (OwlsWiz)

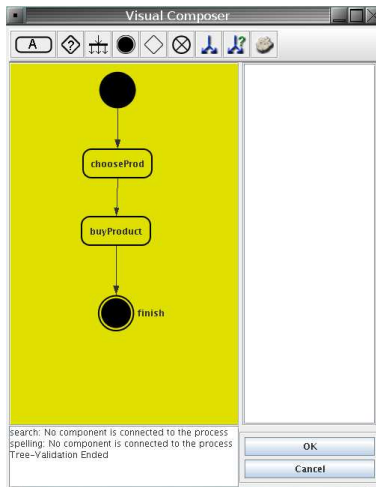


The screenshot shows a window titled "OwlsWiz" with a sidebar on the left containing six buttons: "WSDL", "Service", "Profile" (highlighted in green), "Process", "Grounding", and "OWL-S". The main area is titled "Profile Ontology" and contains the following fields:

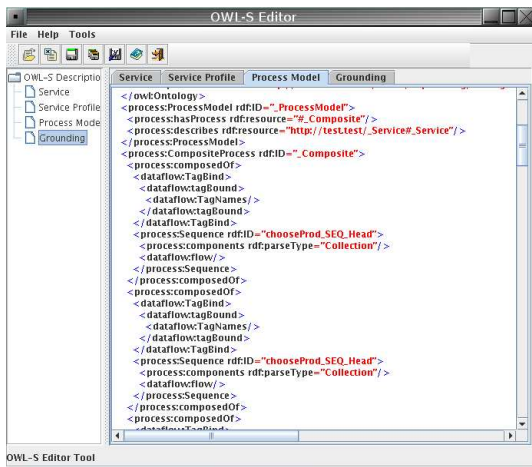
- Full Service Name**: An empty text input field.
- Description of Service**: A text area containing the text "simple service".
- Contact Information**: An empty text area.
- Quality Ratings**: An empty text area.

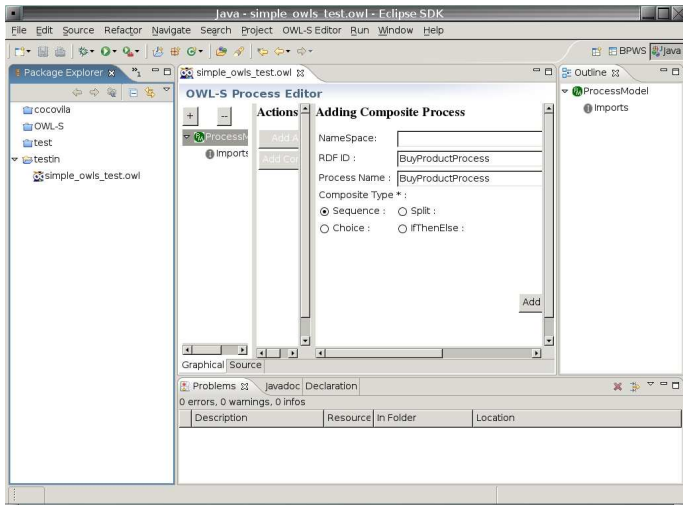
At the bottom of the window are three buttons: "Cancel", "Back", and "Next".

OWL-S Editor (OwlsWiz)

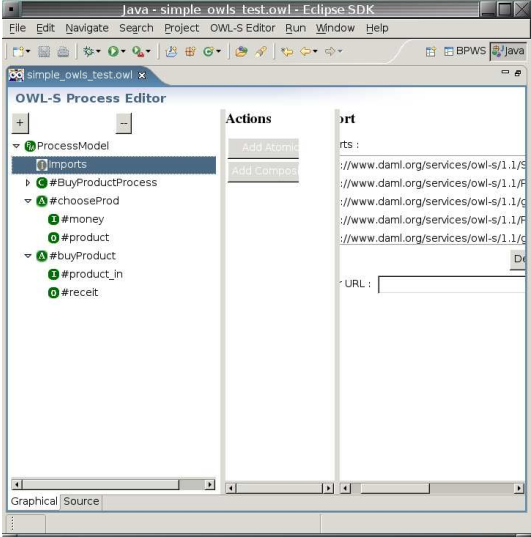


OWL-S Editor (OwlsWiz)

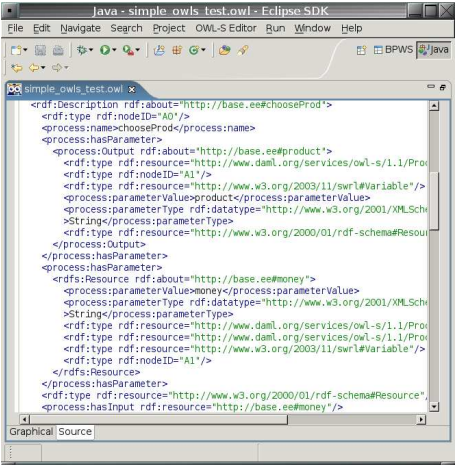




OWL-S IDE



OWL-S IDE



The screenshot shows the Eclipse IDE window titled "Java - simple_owls_test.owl - Eclipse SDK". The main editor displays the following XML code:

```
<rdf:Description rdf:about="http://base.ee#chooseProd">
  <rdf:type rdf:nodeID="A0"/>
  <process:name>chooseProd</process:name>
  <process:hasParameter>
    <process:Output rdf:about="http://base.ee#product">
      <rdf:type rdf:resource="http://www.daml.org/services/owl-s/1.1/Proc
      <rdf:type rdf:nodeID="A1"/>
      <rdf:type rdf:resource="http://www.w3.org/2003/11/swrl#Variable"/>
      <process:parameterValue>product</process:parameterValue>
      <process:parameterType rdf:datatype="http://www.w3.org/2001/XMLSchema
      >String</process:parameterType>
      <rdf:type rdf:resource="http://www.w3.org/2000/01/rdf-schema#Resour
    </process:Output>
  </process:hasParameter>
  <process:hasParameter>
    <rdfs:Resource rdf:about="http://base.ee#money">
      <process:parameterValue>money</process:parameterValue>
      <process:parameterType rdf:datatype="http://www.w3.org/2001/XMLSchema
      >String</process:parameterType>
      <rdf:type rdf:resource="http://www.daml.org/services/owl-s/1.1/Proc
      <rdf:type rdf:resource="http://www.daml.org/services/owl-s/1.1/Proc
      <rdf:type rdf:resource="http://www.w3.org/2003/11/swrl#Variable"/>
      <rdf:type rdf:nodeID="A1"/>
    </rdfs:Resource>
  </process:hasParameter>
  <rdf:type rdf:resource="http://www.w3.org/2000/01/rdf-schema#Resource",
  <process:hasInput rdf:resource="http://base.ee#money"/>

```

The screenshot displays the BPWS4J Editor interface within the Eclipse SDK. The main editor window shows the WSDL content for 'simple.wsdl'. The Navigator on the left shows the project structure, including 'testin' and 'simple_owis_test.owl'. The Properties view on the right shows the 'Info' tab with various metadata.

```
<definitions targetNamespace="urn:simple:stockQuoteService"
  xmlns:tns="urn:simple:stockQuoteService"
  xmlns:plt="http://schemas.xmlsoap.org/ws/2001/12/XMLSchema"
  xmlns:xsd="http://www.w3.org/2001/XMLSchema"
  xmlns="http://schemas.xmlsoap.org/wsdl/">

  <message name="request">
    <part name="symbol" type="xsd:string"/>
  </message>

  <message name="response">
    <part name="quote" type="xsd:float"/>
  </message>

  <portType name="StockQuotePT">
    <operation name="gimmeQuote">
      <input message="tns:request"/>
      <output message="tns:response"/>
    </operation>
  </portType>

  <plt:partnerLinkType name="StockQuotePLT">
    <plt:role name="service">
      <plt:portType name="tns:StockQuotePT"/>
    </plt:role>
  </plt:partnerLinkType>
</definitions>
```

Properties View (Info tab):

Property	Value
derived	false
editable	true
last modified	5/11, 2006
linked	false
location	/hor...
name	simp
path	/testi...
size	7208

Tasks View:

Description	Resource	In Folder	Location
Process must contain an activity	sample2.t	testin	line 1

BPWS4J Editor

The screenshot displays the BPWS4J Editor interface within the Eclipse SDK. The main window title is "BPWS - simple.bpel - Eclipse SDK". The menu bar includes File, Edit, Navigate, Search, Project, BPWS, Run, Window, and Help. The toolbar contains various icons for file operations and editing.

The Navigator on the left shows a project structure with folders like "cocovila", "OWL-S", "test", and "testin". The "testin" folder is expanded, showing files such as ".project", "GetQuote.java", "sample2.bpel", "simple_owls_test.owl", "simple.bpel", "simple.wsdl", and "SimpleSample.cmd".

The Outline on the left shows a tree view of the process elements: "invocationrequest", "invocationresponse", "invoker", "caller", "serviceProvider", and "provider".

The main editor area displays the Business Process diagram for "simple". The diagram shows a "Sequence: sequence" containing the following tasks:

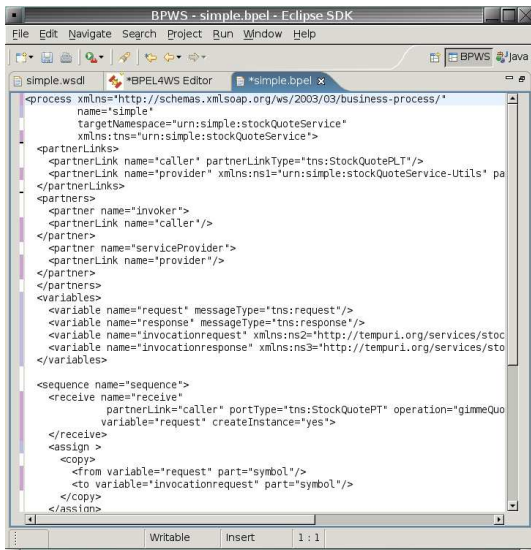
- Receive: receive
- Assignment: Unnamed
- Invoke: invoke
- Assignment: Unnamed
- Reply: reply

The Properties view on the right shows the "Value" tab for the selected element. The properties are:

Property	Value
Abstr	false
DocL	Unspecific
Enab	false
Name	simple
Supp	false

The Tasks view at the bottom shows a table with 1 item:

Description	Resource	In Folder	Location
Process must contain an activity	sample2.t	testin	line 1



The screenshot shows the Eclipse IDE interface with the BPWS4J Editor. The title bar reads "BPWS - simple.bpel - Eclipse SDK". The menu bar includes "File", "Edit", "Navigate", "Search", "Project", "Run", "Window", and "Help". The toolbar contains various icons for file operations and navigation. The editor window displays the following XML code:

```
<process xmlns="http://schemas.xmlsoap.org/ws/2003/03/business-process/"
  name="simple"
  targetNamespace="urn:simple:stockQuoteService"
  xmlns:tns="urn:simple:stockQuoteService">
  <partnerLinks>
    <partnerLink name="caller" partnerLinkType="tns:StockQuotePLT"/>
    <partnerLink name="provider" xmlns:ns1="urn:simple:stockQuoteService-Utils" pa
  </partnerLinks>
  <partners>
    <partner name="invoker">
      <partnerLink name="caller"/>
    </partner>
    <partner name="serviceProvider">
      <partnerLink name="provider"/>
    </partner>
  </partners>
  <variables>
    <variable name="request" messageType="tns:request"/>
    <variable name="response" messageType="tns:response"/>
    <variable name="invocationrequest" xmlns:ns2="http://tempuri.org/services/stoc
    <variable name="invocationresponse" xmlns:ns3="http://tempuri.org/services/sto
  </variables>
  <sequence name="sequence">
    <receive name="receive"
      partnerLink="caller" portType="tns:StockQuotePT" operation="gimmeQuo
      variable="request" createInstance="yes">
    </receive>
    <assign >
      <copy>
        <from variable="request" part="symbol"/>
        <to variable="invocationrequest" part="symbol"/>
      </copy>
    </assign>
  </sequence>
</process>
```

At the bottom of the editor, there are buttons for "Writable", "Insert", and a zoom level of "1 : 1".