

RESTful Web Service Composition with JOpera

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Web Service Composition Today

The WS-BPEL process model is layered on top of the service model defined by WSDL 1.1. [...] Both the process and its partners are exposed as WSDL services [BPEL 2.0 Standard, Section 3]

WS-BPEL 2.0

WSDL 1.1

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Process Support for Web Services

RESTful Web Services APIs...

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...do not use WSDL 1.1



- Compose RESTful Web Services
- Compose WSDL Web Services
- Use Business Process Modeling Languages

JOpera

- Visual Flow Language with Abstract Service Model
- Extensible Autonomic Engine Architecture

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Agenda

Motivation

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- **REST Introduction**
- **Composing RESTful services**
 - Abstract Workflows
 - **Concrete Workflows**
 - **RESTful Workflows**
- JOpera Example: Doodle Map Mashup
- **Discussion, Conclusion, Outlook**

Process Support for Web Service



WS-* Web Services (2000)









REST in one slide

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 Web Services expose their data and functionality trough resources identified by URI



- Uniform Interface Principle: Clients interact with the state of resources through 4 verbs: GET (read), POST (create), PUT (update), DELETE
- Multiple representations for the same resource
- Hyperlinks model resource relationships and valid state transitions



- Resource addressing through URI
 - How to interact with dynamic, variable set of URI?
- Uniform Interface (GET, POST, PUT, DELETE)
 - Does it help to make the verbs explicit in the workflow?
- Multiple resource representations
 - How to negotiate the most appropriate representation?
- Hyperlinks

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 Can the workflow implement state transition logic of a resource and generate new URIs dynamically as processes run to guide the clients invoking them?

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BPM Workflow Languages

RESTful Web Service Composition

Solution Space

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- 1. Abstract Workflow
 - Service invocation technology does not matter
- 2. Concrete Workflow
 - Expose service invocation technologies as explicit constructs in the workflow language
- **3.** RESTful Workflow
 - Workflow as one kind of resource exposed by a RESTful service



BPM

Workflow

Languages

Process Support for Web Service

RESTful

Web Service

Composition





(WS-BPEL 2.0 does not support WSDL 2.0)



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2. Concrete Workflow: BPEL for REST

Idea: Make REST interaction primitives first-class language constructs





BPEL for REST – New Activities/Handlers





BPEL for REST – Resource Block

 Dynamically publish resources from BPEL processes and handle client requests







Workflows as Resources – URI

- Publish workflows as resources identified by the URIs: /package/process
 /package/process/version
 /package/process/version/instance
 - /package/process/version/instance/task
 - /package/process/version/instance/task/parameter

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Reading the state of the workflow resources

- GET / package / process
 - Enumerate deployed process versions
- GET / package / process / version
 - Enumerate active instances of a given process version
- GET / package / process / version / instance
 - Read the current state of a workflow instance
- GET / package/process/version/instance/task
 - Read the current state of a workflow instance task
- GET / package/process/version/instance/task/param
 - Read the current value of a workflow instance parameter



Creating new workflow resources

- POST / package
 - Deploy new process template into package
- POST / package / process
 - Deploy new version of a process
- POST / package / process / version
 - Create new process instance

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- PUT /package/process/version/instance/task
 - Update the state of a workflow task (e.g., finished, failed)
- PUT /package/process/version/instance/task/param
 - Write into task parameters some values

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Deleting workflow resources

- DELETE / package / process
 - Undeploy all versions of a process (and all the corresponding process instances)
- DELETE / package / process / version
 - Undeploy a version of a process (and all of its instances)
- DELETE / package/process/version/instance
 - Remove the state of a specific process instance only

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- Discussion, Conclusion, Outlook

Process Support for Web Service



JOpera Example: Doodle Map Mashup

 Setup a Doodle with Yahoo! Local search and visualize the results of the poll on Google Maps





Doodle Map Mashup Architecture







- Why should a workflow engine care about REST?
 - Use workflows to compose RESTful Web services
 - Implement RESTful services with a workflow
- Should a process explicitly include RESTful activities?
 - Or it is better/enough to model REST implicitly?
- How much of the state of a process instance should be exposed as a resource?
 - How to control which "parts" are visible?



- Business Process Modeling Languages have been applied with success to compose "traditional" WS-* Web Services (BPM = SOA + BPEL)
- Business Process Modeling Languages should also be applied to compose RESTful Web Services
- JOpera for Eclipse is a visual process modeling tool with an extensible engine for composing both kinds of services (and many more)



References

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PhD positions available!



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Second International Workshop on Web APIs and Services Mashups (Mashups'08)

http://icsoc-mashups.org/

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