Services Modeling Using BPMN 2.0

- It’s Not Just Boxes and Arrows Anymore! -

Presented By Lloyd Dugan

September 11, 2013
Outline

• Overview of BPMN

• Services Modeling with BPMN

• Enterprise Services in BPMN

• Semantic BPMN (Teaser)

• Author’s Information
Business Process Modeling Notation - BPMN 2.0 Introduction -

- Business Process Model & Notation (BPMN) – BPMN 2.0 spec released 1/2011
  - Developed by the Object Management Group (OMG) as the standard notational language for modeling business processes
  - Based on the leading graphical process modeling techniques (UML Activity Diagrams and Sequence Diagrams, IDEF0, Flowcharts, IDEF, EPCs)
    - Added some new elements (e.g., new event types and activity types)
    - Defined conformance classes (Descriptive, Analytical, and Common Executable)
    - Promoted data representations (data objects, data inputs/outputs, data stores) to first class elements
    - Formalized spec in XMI-based meta model, and serialized model into a standard XML format
    - Added the use of item definition to define structure for data representations, including messages
    - Interchange of model data and diagram across tools
      {see recent demonstration at OMG Tech Meeting in Berlin http://www.omg.org/news/releases/pr2013/07-23-13.htm}

- BPMN specifies a Business Process Diagram (BPD)
  - Features:
    - Easy to model BPDs and easy to understand (must be understandable to non-technical audiences)
    - Able to depict complex business processes (must be translatable to process execution languages)
  - Approach:
    - BPMN uses shapes that are familiar to most process modelers and business process management system (BPMS) development platforms (e.g., rectangles for activities, diamonds for gateways, arrows for sequence, or messages, etc.)
    - Each of the shapes can be used in a simplistic manner or can be extended with more semantics (e.g., further subtypes of events, activities, gateways)
    - With the advent of “model as data” comes the need to bring strong modeling guidance (modeling primitives and patterns) and attribution schemes (for generating the desired XML data) to ensure the creation of quality models that are inter-comparable and consistent
## Business Process Modeling Notation

*Qualifies as Visual Programming Language*

<table>
<thead>
<tr>
<th>Major Improvement</th>
<th>Examples from the Spec</th>
<th>Impact on Executability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Richer notational set and associated modeled behaviors</td>
<td>New or improved event types and behaviors, and addition of reusable Call Activity</td>
<td>Comprehensively covers programmable functions and system behaviors</td>
</tr>
<tr>
<td>Better support for abstraction of executable functionality</td>
<td>Requirement of WSDL for service calls, and addition of Business Rule Task</td>
<td>Enhances the role of orchestration and makes it more stateless</td>
</tr>
<tr>
<td>Better representation of components in process execution</td>
<td>Improved mapping to BPEL, and new attributes of messages and data objects</td>
<td>Enables alignment with service representations (e.g., SCA component assembly)</td>
</tr>
<tr>
<td>Structured capture and standardization of implementation detail</td>
<td>Use of standards (WSDL, XPath, XSD), and serialized XML for model attributes</td>
<td>Design-time model can be exported or interpreted as a run-time construct</td>
</tr>
</tbody>
</table>
Services Modeling with BPMN
- Overview of What BPMN Provides -

- BPMN incorporates the use and representation of services
  - Certain task types and message event types use messages, interfaces, and services with named operations
  - Service level modeling (for more structured processes) is ripe for BPMN R&D (other is case management)
    
    *Source: “Future of BPMN” presented on 9/6/2012 at BPM 2012 Conference by Stephen White, IBM BPM Architect*

- Service modeling issues to resolve include:
  - Which representation alternatives to use: SoaML (OMG), SCA (OASIS), SOA ontology (The Open Group), BPMN ontology (several candidates), others?
  - BPMN meta model, schema, and spec rules are...challenging to interpret and realize, leading to inconsistent interpretations (and no reference model or implementation exists)
  - Concept of executable BPMN complicates discussion, particularly with BPMS pure play vendors (with engine only) vs. BPMS platform vendors (also with middleware) competing for market share
  - Full support for BPMN and attribution of BPMN XML elements is problematic due to tooling limitations and lack of clarity in certain cases as to spec’s intentions and meanings
Services Modeling with BPMN
- Early Mapping of BPMN To Services -

(Source: “Supporting MDA through Integration of BPMN and SoaML” presented on 9/30/2010 at the 5th International Forum on Agile Modeling Architecture by Stephen White, IBM BPM Architect)
Services Modeling with BPMN

- BPMN Model for a System/Service -

Defined Interface

Defined Message

Defined Message Item Definition

Message Event Definition

Defined Lane (as Role)

Defined Data Input

Defined Data Input Item Definition

Defined Signal

Defined Signal Item Definition

Defined Correlation

Called Global Process

Imported WSDL and XSD

Defined Interface

Called Perform Activity B

End Successful Called Perform Activity B

End Unsuccessful Called Perform Activity B

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Services Modeling with BPMN
- Message Exchange Patterns (1) -

These are Blocking Until Response is Received...So these Should be for Short-running Transactions

### Synchronous Request/Response – Service Task

**Operation**

- **Service Provider**
  - **Invoke Service Task**

<table>
<thead>
<tr>
<th>SCA Invocation Type</th>
<th>Name</th>
</tr>
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<tr>
<td>type = call</td>
<td>Appropriate Name</td>
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<th>Implementation Component</th>
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<tr>
<td>Name = Corresponds to Type</td>
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<td><strong>Request to Service</strong></td>
</tr>
<tr>
<td>Message Name/ID = Appropriate Name</td>
</tr>
<tr>
<td>Payload = Inbound Subset per Defined Schema for Service</td>
</tr>
<tr>
<td>Correlation Key = Same as for Response</td>
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### Synchronous Request/Response – Business Rule Task

**Operation**

- **Business Rules Engine**
  - **Invoke Business Rule Task**

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<tr>
<th>SCA Invocation Type</th>
<th>Name</th>
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<tbody>
<tr>
<td>type = call</td>
<td>None – Is Assumed</td>
</tr>
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Services Modeling with BPMN
- Message Exchange Patterns (2) -

These are not Blocking Until Response is Received...So these Should be for Long-running Transactions

### Asynchronous Request/Response – Request

**Operation**
- **SCA Invocation Type:** call
- **Name:** Appropriate Name

**Implementation Component**
- **Type:** Web Srvc, URI, Other
- **Name:** Corresponds to Type

**Messages**
- **Request to Service**
  - **Message Name/ID:** Appropriate Name
  - **Type:** Initiating
  - **Payload:** Inbound Subset per Defined Schema for Service
  - **Correlation Key:** Same as for Response

- **Response from Service**
  - **Message Name/ID:** Appropriate Name
  - **Type:** Initiating
  - **Payload:** Outbound Subset per Defined Schema for Service
  - **Correlation Key:** Same as for Request

### Asynchronous Request/Response – Response

**Operation**
- **SCA Invocation Type:** callBack
- **Name:** Appropriate Name

**Implementation Component**
- **Type:** Web Srvc, URI, Other
- **Name:** Corresponds to Type

**Messages**
- **Request to Service**
  - **Message Name/ID:** Appropriate Name
  - **Type:** Initiating
  - **Payload:** Inbound Subset per Defined Schema for Service
  - **Correlation Key:** Same as for Response

- **Response from Service**
  - **Message Name/ID:** Appropriate Name
  - **Type:** Initiating
  - **Payload:** Outbound Subset per Defined Schema for Service
  - **Correlation Key:** Same as for Request
Enterprise Services in BPMN
- Example: Request/Response Services -

Requesting System Invokes Service Via Gateway/ESB

Responding Service Calls Back With Result Via Gateway/ESB
Enterprise Services in BPMN
- Example: Publish/Subscribe Services -

Publishing System Invokes the Publication Service

Subscribing System Is Alerted To Published Event

Subscribing System Gets Needed Data Based on Published Event
Semantic BPMN (Teaser)  
- Conceptual Overview -

Semantic Representations and Engine

Semantic BPMN

It's Not Just Drawing Boxes and Arrows Anymore!

Modeling Primitives and Patterns

Meta Model Schemas

Governing Ontology Schemas

Semantic Technologies

Extreme BPMN 2.0 Modeling
Semantic BPMN (Teaser)
- Enables Queries About Model Structure -

**Sample Queries:**
- Identifying services used in the model (interfaces, messages, and operations) – Shows alignment with SOA framework
- Determining structural relationships in the model that define sequence or use of modeling guidance – Shows conformance with defined conventions or methods/styles (e.g., Gateway use)
- Representing key architectural concepts in spec-conforming ways – Ensures that model data can be inserted into parent architectures in a semantically correct manner
Semantic BPMN (Teaser)

- Sample Query: Find All Service Task Classes -

Enterprise Data Model

Loan Instance Data

Make Disbursement Sub-Process
Semantic BPMN (Teaser)

- Sample Results: Found All Service Task Classes -

Query-1
# Find all ServiceTask classes
SELECT ?serviceTaskName
WHERE {
  ?serviceTask rdfs:subClassOf Activities:ServiceTask;
  rdfs:label ?serviceTaskName.
}

Results-1
1 - Deposit in Loan Account
2 - Check Credit Rating
3 - Approve Credential
4 - Check Background
5 - Deposit in Bank Account
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