BPMN

- The **Business Process Modeling Notation (BPMN)** is a standardised graphical notation for drawing business processes in a workflow. It is being maintained by the Object Management Group (OMG).
- The primary goal of BPMN is to provide a standard notation that is readily understandable by all business stakeholders.
- BPMN is constrained to support only the concepts of modeling that are applicable to business processes; that i.e. means, organisational structures or data models are not part of the BPMN scope.
- There's four basic element categories to create a Business Process Diagram (BPD):
  - Flow Objects (Events, Activities, Gateways)
  - Connecting Objects (Sequence Flow, Message Flow, Association)
  - Swimlanes (Pool, Lane)
  - Artifacts (Data Objects, Group, Annotation)
Excurs: Stakeholder

- A stakeholder is a person or organization that has a legitimate interest in a project or entity (this only appears in a business context).
Core Set of BPMN Elements

Flow Objects
- Events
- Activities
- Gateways

Connecting Object
- Sequence Flow
- Message Flow
- Association

Swimlanes
- Pool
- Lanes (within a Pool)

Artifacts
- Data Object
  - Name
  - Text Annotation
    - Text Annotation Allows a Modeler to provide additional Information
- Group

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BPMN Activities
BPMN Events

Events

Start | Intermediate | End
--- | --- | ---
[Image] | [Image] | [Image]

Event Types

- Message
- Timer
- Error
- Cancel
- Compensation
- Rule
- Link
- Terminate
- Multiple
BPMN Gateways

Gateways

Exclusive Decision/Merge (XOR)
Data-Based or
Event-Based

Inclusive Decision/Merge (OR)

Complex Decision/Merge

Parallel Fork/Join (AND)
BPMN Connections

Connections

Sequence Flow
- Name, Condition
  - Code, or Message

Message Flow
- Name or Message

Association
- Name or Message
  - Default
BPMN Artifacts

Artifacts

Data Object

Name

Text

Annotation

Add Text Here

Group
BPMN Swimlanes

Swimlanes
Pool

Lanes (within a Pool)

Name
Name
Name
Name
Example I – Normal Flow

- Working Group Active
- Check Status of Working Group
- Working Group Still Active? (Yes/No)
- [Send] Send Current Issue List
- Issue List
- Friday at 6 PM Pacific Time
Example II – Discussion Cycle

- Issue Voting List [0 to 5 Issues]
- Announce issues for Discussion
- Moderate E-mail Discussion
  - 7 Days
- Delay 6 days from Announcement
- Check Calendar for Conference Call
- Conference Call in Discussion Week?
  - Yes
  - Wait until Thursday, 9am
  - Moderate Conference Call Discussion
  - The Sub-Process will repeat if the DiscussionOver variable is False
- No
- E-Mail Discussion Deadline Warning
- Evaluate Discussion Progress
- This Task returns the value of the Discussion Over to True or False
Example III – Collect Votes
BPMN Process Types

- private processes
- abstract processes
- collaboration processes
Private Processes

- **Private (internal) business processes**
  - Private business processes are those internal to a specific organization and are the type of processes that have been generally called workflow or BPM processes. If swim lanes are used then a private business process will be contained within a single Pool. The Sequence Flow of the Process is therefore contained within the Pool and cannot cross the boundaries of the Pool. Message Flow can cross the Pool boundary to show the interactions that exist between separate private business processes.
Abstract Processes

- **Abstract (public) processes**
  - These represent the interactions between a private business process and another process or participant. Only those activities that communicate outside the private business process are included in the abstract process. All other “internal” activities of the private business process are not shown in the abstract process. Thus, the abstract process shows to the outside world the sequence of messages that are required to interact with that business process. Abstract processes are contained within a Pool and can be modeled separately or within a larger BPMN diagram to show the Message Flow between the abstract process activities and other entities.
Collaboration Processes

• **Collaboration (global) processes**
  - A collaboration process depicts the interactions between two or more business entities. These interactions are defined as a sequence of activities that represent the message exchange patterns between the entities involved. Collaboration processes may be contained within a Pool and the different participant business interactions are shown as Lanes within the Pool. They may also be shown as two or more Abstract Processes interacting through Message Flow (as described in the previous section). These processes can be modeled separately or within a larger BPMN Diagram to show the Associations between the collaboration process activities and other entities.
ARIS BPMN

- offers all elements and content being part of BPMN
- converts BPMN <-> EPK / backwards (if allowed) and checks semantics
Resources

- Object Management Group – Business Process Management Initiative
  - [http://bpmn.org/](http://bpmn.org/)
- BPMN Supporters
  - [http://bpmn.org/BPMN_Supporters.htm](http://bpmn.org/BPMN_Supporters.htm)
- BPMN 1.0 OMG Specification
  - [http://bpmn.org/Documents/OMG%20Final%20Adopted%20BPMN%201-0%20Spec%202006-02-01.pdf](http://bpmn.org/Documents/OMG%20Final%20Adopted%20BPMN%201-0%20Spec%202006-02-01.pdf)
- BPMN Introduction, Survey & Training Kit
  - [http://www.diveintobpm.org/](http://www.diveintobpm.org/)
Tools

- Intalio Business Process Management Suite (Eclipse-based)
- Soyatec eBPMN (Eclipse-based)
- Eclipse STP BPMN Modeler
  - http://www.eclipse.org/stp/bpmn/
BPEL

- The **Business Process Execution Language (BPEL)** is an executive business process modeling language. It is serialised via XML and describes processes whose activities are implemented through web services.
- BPEL cannot interact directly with human resources, but only with web services, which then can take the part of interfaces to humans.
- The initiators are Microsoft, IBM and BEA.
- BPEL itself doesn't describe a way for graphical illustrations of business processes; this is part of BPMN.
- BPEL was designed for "Programming in the Large".

What's that?
Executable vs. Abstract Processes

- executable processes
  - can be deployed on a workflow engine and then be run

- abstract processes
  - are views on executable processes, to describe the latter ones (so-called behavioral interfaces)
  - are used to hide the details of a process from e.g. business partners
BPEL4People / Subprocesses

- **BPEL4People**
  - IBM and SAP created an initiative called BPEL4People to collect specifications for interaction with humans. So far only a whitepaper exists.

- **WS-BPEL 2.0 Extension for Subprocesses**
  - BPEL doesn’t know subprocesses. This results in difficulties, as BPEL’s not intended to terminate a subprocess when the main one gets terminated. Such functionality has to be implemented by a further specific web service (which then is not part of the BPEL standard).
  - Once again IBM and SAP introduced a whitepaper named "WS-BPEL 2.0 Extension for Subprocesses" that explains an extension for subprocesses within BPEL.
BPEL – Elements (I)

- `<receive> / <reply>`
  - Warten auf Nachricht (`<receive>`) und Antwort auf eine Nachricht (`<reply>`). Die Kombination beider Aktivitäten ermöglicht eine request - response Operation für einen WSDL portType des Prozesses.

- `<invoke>`
  - Aufruf eines Web Services.

- `<assign>`
  - Updaten von Variablen mit neuen Daten.

- `<throw> / <catch>`
  - Interne Fehler eines Geschäftsprozesses signalisieren (throw) bzw. abfangen (catch).

- `<terminate>`
  - Explizites Beenden des Prozesses.
BPEL – Elements (II)

• `<wait>`
  - Der Prozess wartet eine definierte Zeit.

• `<empty>`
  - Leere Aktivität - wird verwendet, um Fehler abzufangen oder um Aktivitäten eines Geschäftsprozesses zu synchronisieren.

• `<sequence>`
  - Sequentielle Ausführung der nachgereihten Aktivitäten.

• `<switch>`
  - Aktivität zur Modellierung von Verzweigungen. Kann eine oder mehrere Bedingungen (`<case condition="boolscher Ausdruck">`) und optional einen alternativen Zweig (`<otherwise>`) enthalten.
BPEL – Elements (III)

- `<while>`
  - Mittels `<while>` wird die betroffene Aktivität so lange wiederholt ausgeführt, bis der boolesche Ausdruck nicht mehr erfüllt wird.

- `<pick>`
  - Diese Aktivität wartet auf das Auftreten eines Ereignisses aus einer Menge von Ereignissen und führt danach die entsprechend angeführte Aktivität aus.

- `<flow>`
  - Das `<flow>` Konstrukt ermöglicht die parallele Verarbeitung von einer oder mehreren Aktivitäten. Mittels des `<link>`-Konstruktes können direkt oder indirekt eingebettete Aktivitäten synchronisiert werden.
BPEL – Elements (IV)

- `<scope>`

- `<compensate>`
  - `<compensate>` wird verwendet, wenn eine in einen `<scope>` eingebettete Aktion erfolgreich durchgeführt wurde, diese Aktion aber kompensiert werden muss. Dieses Konstrukt kann nur von einem anderen compensation handler oder vom fault handling aufgerufen werden.
Resources

- WS BPEL 2.0 Specification
  - http://docs.oasis-open.org/wsbpel/2.0/OS/wsbpel-v2.0-OS.html

- Advanced BPEL – Oracle SOA Best Practices

- Pattern-based Evaluation of Oracle BPEL
  - http://is.tm.tue.nl/research/patterns/download/Oracle_BPEL_v.10.1.2.pdf

- Article: BPEL & Java

Tools

- Active BPEL Open Source Engine

- NetBeans Enterprise Pack with BPEL Support
  - http://www.netbeans.org/products/enterprise/

- Apache ODE (Orchestration Director Engine)
  - http://ode.apache.org/

- Queensland University of Technology – Translators (BPMN to BPEL, BPMN to Petri Nets, BPEL to Petri Nets)