Precise Modeling of Business Processes with the Business Process Modeling Notation

BPMN 2.0

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ZRL BIT at a Glance

- Computer Science at ZRL:
  - Security/Cryptography and Systems Management
  - Business Process Management (BPM) and Software Technology (Eclipse/Jazz)

- Business Integration Technologies (BIT):
  - modeling languages, formal methods and verification, software engineering, software architecture
  - key focus: compiler technology for process-oriented languages & IT architecture design methods
  - main transfer channel: IBM WebSphere product family
  - participation in industry standards, customer consulting
Business Process Modeling Notation (BPMN)

- First initiative to develop a notation: September 2000
- Version 1.0 of the BPMN Standard (OMG): May 2004
  - set of graphical symbols, informal semantics, many examples, first vendor support
- Version 1.1 with minor bug fixing: August 2007, about 60 vendors
- Version 2.0 accepted for finalization at OMG (IBM/SAP/Oracle et al proposal) in June 2009
  - metamodel (unique exchange format), formally described semantics

What is BPMN 1.x?

- Standardized graphical notation for processes and interactions
- Aim: Easy to use for business analysts
- Widely adopted
  - 59 OMG listed implementations
Some BPMN vendors

Why BPMN 2.0?

- Current BPM suites use different languages in different stages of lifecycle (BPEL is widely used for execution)
  - translation vs. refinement
  - business to IT: Handover vs. collaboration
  - challenging change management
    - “roundtripping” problem
    - Use a single language: BPMN 2.0
- Shortcomings of BPMN 1.1:
  - no standardized execution semantics (How to build interoperable execution engines?)
  - no standardized serialization (How to exchange process models between tools?)
  - weak support for cross-organizational scenarios
BPMN 2.0 Scope

- Notation
  - processes (private or public), collaborations, choreographies, conversations
- Metamodel
  - XMI-based and XSD-based interchange formats
- Semantics
  - formal execution semantics for all BPMN elements
- Visual model and diagram interchange format
- Mapping of a BPMN subset to BPEL
  - demonstrates alignment with existing technologies and standard

BPMN 2.0 Out of Scope

- Definition of organizational models
- Modeling of functional breakdowns
- Data and information models
- Modeling of strategy
- Modeling of business rules

- BPMN 2.0 has an Extensibility concept (add information to a model without making it invalid with respect to BPMN)
BPMN 2.0 Process Modeling

Activity-Oriented Modeling of Behaviors

- Most commonly used and best understood approach
- Well established in various disciplines
  - software modeling: UML activity diagrams
  - “business informatics”: Event-driven Process Chains (EPC)
  - IT systems: workflows

- Major concepts shared by all approaches
  - activity (task, function, action) and its refinement into a subprocess
  - explicitly prescribed order of activities in a flow diagram
  - special types of diagram nodes to capture flow branching behavior (gateways, rules, connectors, control nodes)
    - parallel + alternative branching, cycles

- We do BPMN 2.0 “by example only” in this presentation
Flow of Activities and Messages

- Sequence Flow
- Message Flow
- Association

Ad-Hoc Process for writing a book chapter

1. Research the Topic
2. Write Text
3. Include Graphics in Text
4. Generate Graphics
5. Organize References
6. Finalize Chapter
7. Edit Text
Data and Sequence Dependencies in the Write Book Chapter Process

Pools and Lanes
- Pools represent participants in an interactive (B2B) Business Process Diagram
  - only message flow between pools
- Lanes represent sub-partitions for the objects within a pool
Events in Process Models

- Compensation events connecting to compensation tasks
- Interrupting error
- Non-interrupting message

Example “Orchestration”

- No pools and no message flows
Gateways Semantics

**Exclusive Gateway (XOR)**

Semantics described in terms of token flow (from Petri Net Theory)

- State of the business process = distribution of tokens (marking) in the diagram
- Petri Net Theory offers a calculus of equations over token distributions

**Parallel Gateway (AND)**

**Inclusive Gateway (OR)**

Choreography Model

- A self-contained Choreography (no Pools or Orchestration) is a definition of the expected behavior, basically a procedural contract, between interacting Participants. While a normal Process exists within a Pool, a Choreography exists between Pools (or Participants). (p. 44)
A Conversation is the logical relation of Message exchanges.

### Background Reading

- **All on BPMN** [http://www.bpmn.org/](http://www.bpmn.org/)
- ORYX Editor at Hasso Plattner Institute
  - open-source, web-based
  - [http://bpt.hpi.uni-potsdam.de/Oryx](http://bpt.hpi.uni-potsdam.de/Oryx)
- B. Silver: BPMN Method and Style, Cody Cassedy Press, 2009
- OMG BPMN 2.0 Specification
Summary

- BPMN is a key standard for BPM
- 2.0 version provides
  - expressive process modeling capabilities
  - support for orchestration, conversation and choreography modeling to integrate business processes
  - precisely defined execution semantics for better simulation and implementation
    - textual refinements of the graphical model for direct IT execution
  - unique metamodel for model exchange across tools

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