INTRODUCTION TO BUSINESS PROCESS MODELING NOTATION

BPMN 1.2 AND BPMN 2.0

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Agenda

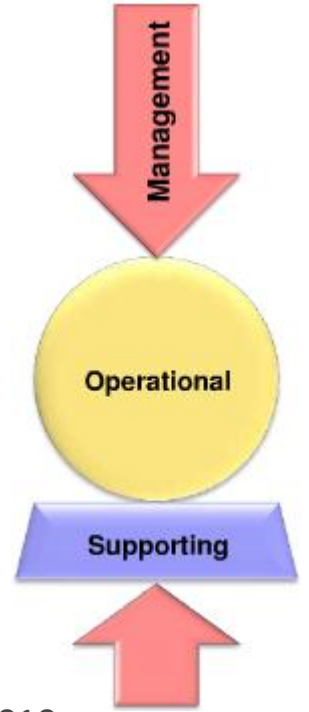
- Introduction to Business Processes
- BPMN 1.2
  - Introduction
  - Elements
  - Examples
  - BPMN ↔ BPEL
- BPMN 2.0
  - What's new?
- BPMN Tools

Business Process

- A sequence of activities performed by one or more business participants in order to deliver value to the business
  - Dr Jim Arlow (Clear View Training)
- The definition emphasizes the following points
  - The process can be broken intro a **sequence** of simpler **activities**
  - These activities have to be performed by someone or something (a **participant**)
  - The ultimate goal is to deliver **value** to the business whether directly or indirectly
- Alternative definition (adapted from Wiki)
  - Collection of related, structured activities that produce a specific service or product for a particular customer or group of customers

Types of business process

- Management process
  - Govern the operation of a business
- Operational processes
  - Constitute the core business activities and create the primary value stream
- Supporting processes
  - Support the core processes



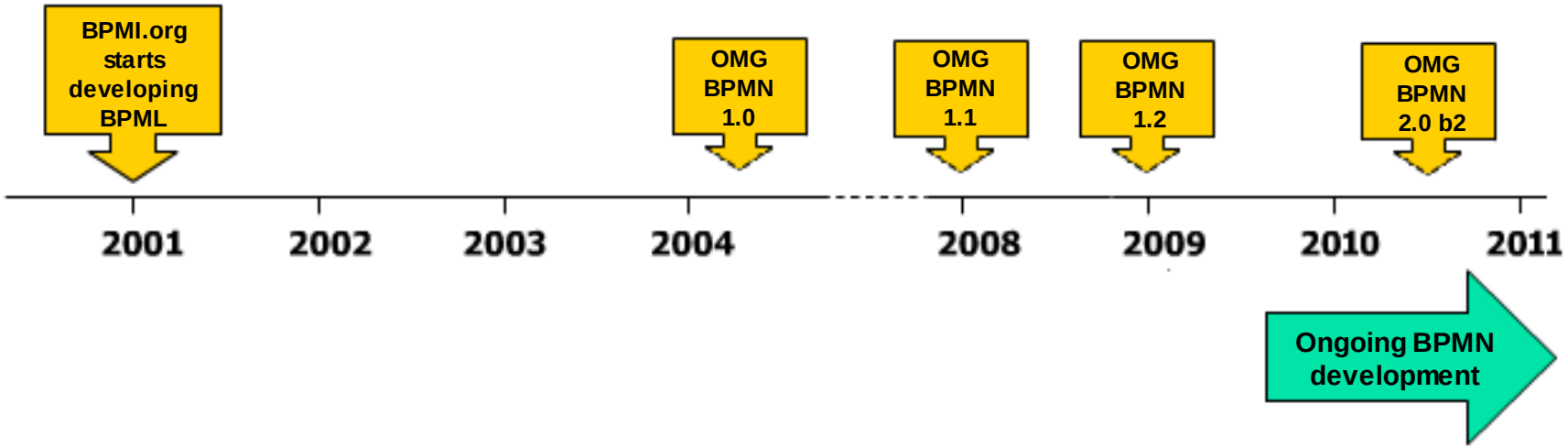
Why model processes?

- Understand and control current processes
  - Measure time, cost, resources
- Improve current processes
  - Streamline, identify missing steps, rationalize
- Design new processes
  - Realize business requirements and new processes
- Communicate existing and new processes
  - Process models are a very effective way to communicate existing and new processes
- Automate processes
  - Apply a process execution engine

What is BPMN?

- Business Process Modeling Notation (BPMN)
  - Human-oriented industry standard graphical notation for modeling business processes
  - Based on flow charts (similar to UML Activity Diagrams)
  - Incorporates a mapping to BPEL4WS
- Scope
  - Only concepts of modeling that are applicable to business processes
    - Strategies
    - Business Rules

BPMN – Release History



BPMN 1.2 - Modeling

- Modeling is made by simple diagrams with a small set of graphical elements
  - Flow and process are (at least should be) easily understood by business users and developers
  - Business Process Diagrams (BPD)

BPMN 1.2 - Core Elements

- Elements
  - Flow Objects
    - Events, Activities, Gateways
  - Connecting Objects
    - Sequence Flow, Message Flow, Association
  - Swimlanes
    - Pool, Lane
  - Artifacts
    - Data Object, Group, Annotation

Flow Objects

- Flow objects are the main describing elements within BPMN and consist of three core elements
  - Events
  - Activities
  - Gateways

Flow Objects - Events

- Events denote **something that happens**
- Represented with a circle
  - Icons within the cycle denotes
    - Envelope for message
    - Clock for time
- Classified as
  - Catching
    - Might catch incoming message to start the process
  - Throwing
    - Might throw a message at the end of the process

Flow Objects - Events

- Start event
  - Acts as a **trigger** for the process
  - Only catch
  - Narrow border
- End event
  - Represents **the result** of a process
  - Only throw
  - Bold border
- Intermediate event
  - Represents something that happens **between the start and end events**
  - Throw or Catch
  - Tramline border

Flow Objects - Activities

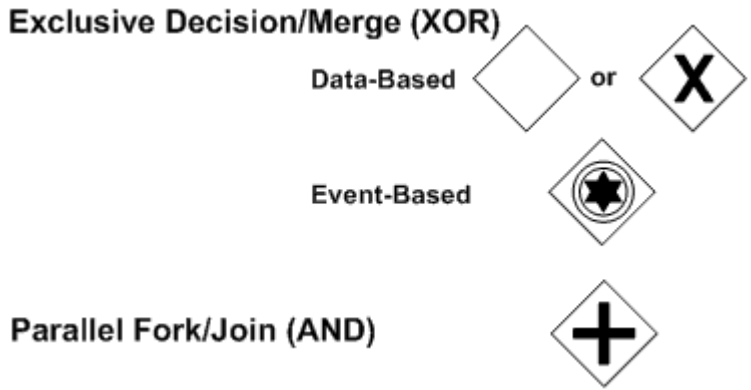
- Activity describes the **kind of work** that must be done
- Represented with a rounded-corner rectangle

Flow Objects - Activities

- Task
  - Represents a **single unit of work** that cannot be broken down to a further level of business process detail
- Sub-process
  - Used to **hide or reveal additional levels** of business process detail
  - Has its own self-contained start and end events
    - Sequence flows from the parent process must not cross the boundary
- Transaction
  - A form of subprocess in which all contained activities must be **treated as whole**
  - Subprocess icon surrounded by a tramline border

Flow Objects - Gateways

- Gateway semantics depend on events and conditions on incoming and outgoing flows
- Exclusive gateway
  - Express decisions
- Parallel gateway
  - Express parallelism



Connecting Objects

- Flow objects are connected to each other using connecting objects, which consist of three types
  - Sequences
  - Messages
  - Associations

Connecting Objects – Sequence/Message

- Sequence Flow
  - Shows in **which order** the activities are performed
  - Solid line with arrow head
    - A diagonal slash indicates the default flow from a decision or activity with conditional flows

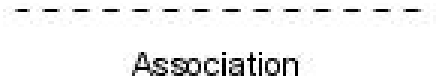
Sequence Flow

- Message Flow
  - Shows message that flow **across organization boundaries** (i.e. between pools)
  - Can never be used to connect activities or events within the same pool
  - Dashed line with open circle at start and open arrowhead at end

Message Flow

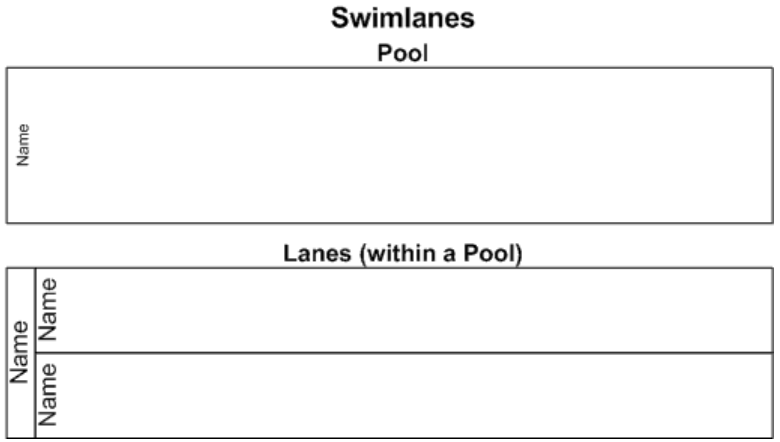
Connecting Objects - Association

- **Associates an artifact or text to a flow object**
- Represented by a dotted line
- Some direction can be indicated using an open arrowhead
  - Toward the artifact to represent a result
  - From the artifact to represent an input
  - Both to indicate is is read and updated



Swimlanes

- Swimlanes are a visual mechanism of **organizing and categorizing activities** based on cross functional flowcharting
  - Pool
  - Lane



Swimlanes - Pool

- Represents **major participants in a process**, typically **separating different organizations**
- Contains one or more lanes
- Represented as a rectangle
  - Open (showing internal details)
    - Large rectangle showing one or more lanes
  - Collapsed (hiding internal details)
    - Empty rectangle stretching width or height of the diagram

Swimlanes - Lanes

- Used to **organize and categorize** activities within a pool **according to function or role**
- Depicted as a rectangle stretching the width or height of the pool
- A lane contains the Flow Objects, Connecting Objects and Artifacts

Artifacts

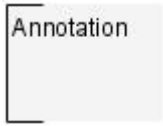
- Allow developers to **bring some information into the model/diagram**
- Increases readability
  - Data objects
  - Group
  - Annotation

Artifacts

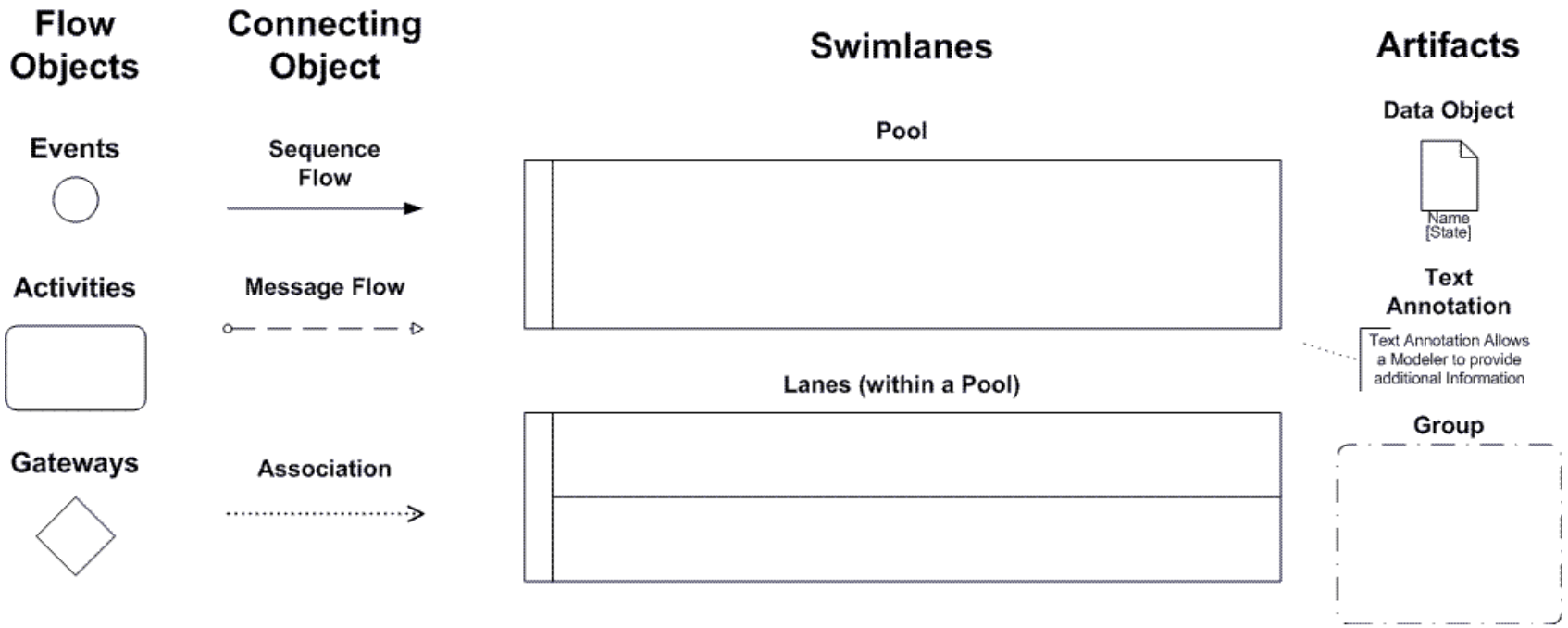
- Data objects
  - Show the reader which **data is required or produced** in an activity

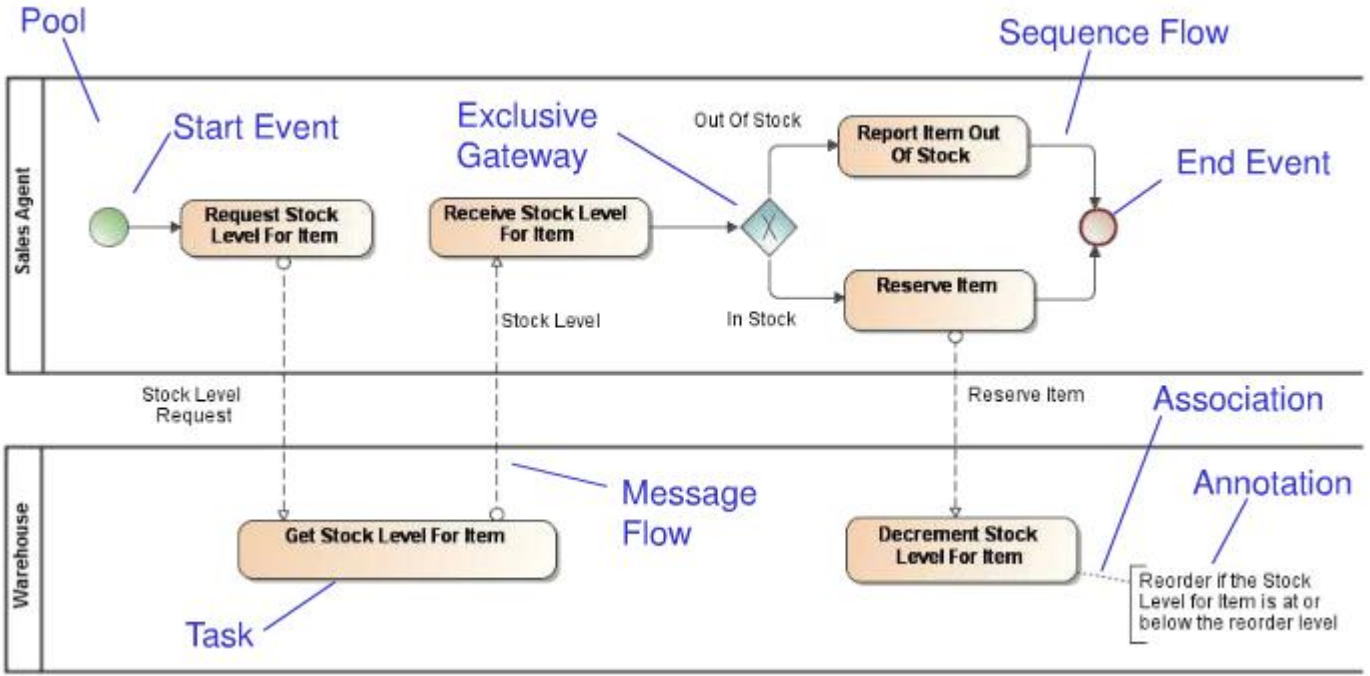
- Group
  - Used to **group different activities** but does not affect the flow in the diagram
  - Represented with a rounded-corner rectangle and dashed lines

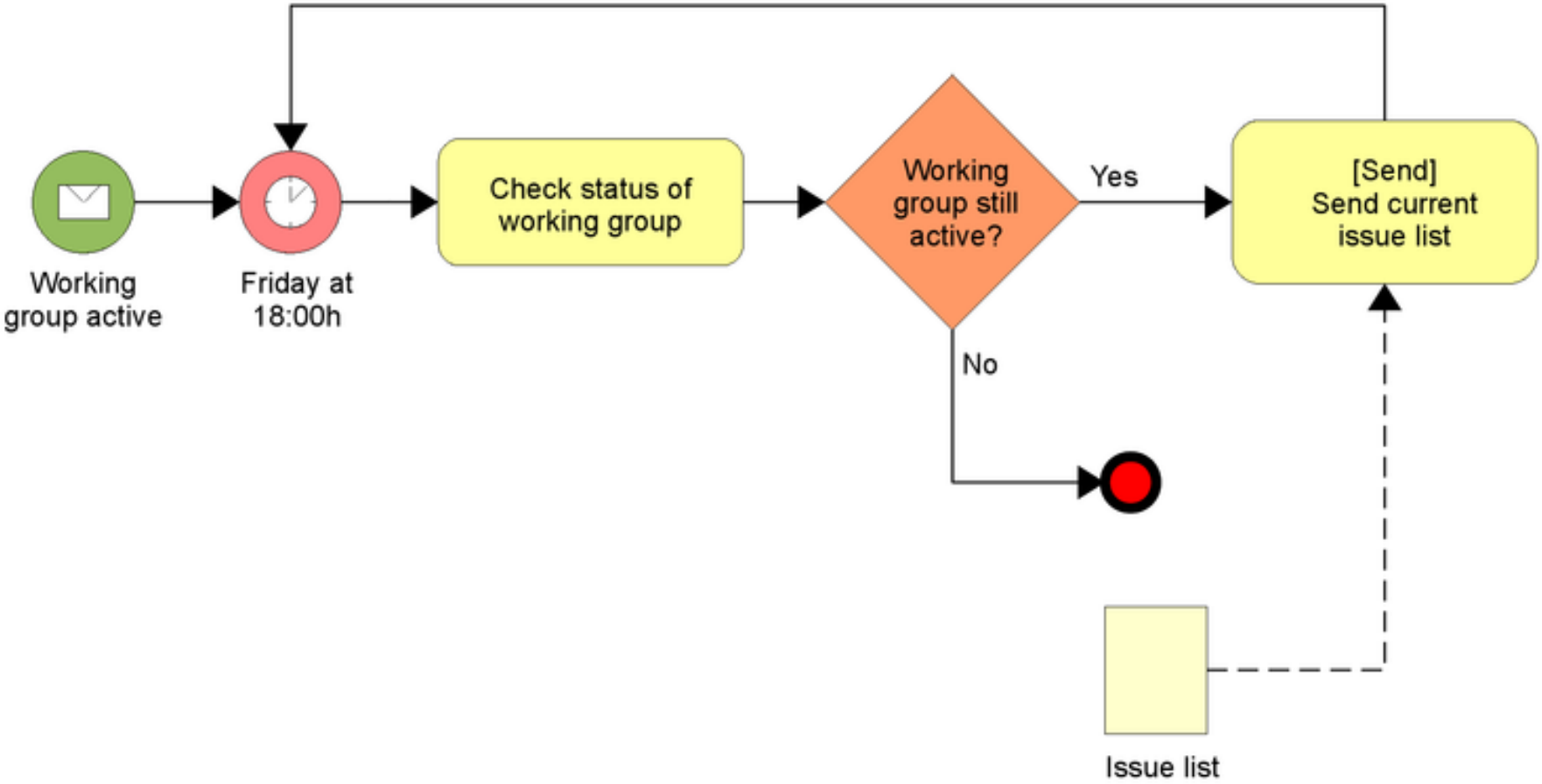
- Annotation
  - Give the reader of the model/diagram an **understandable impression**

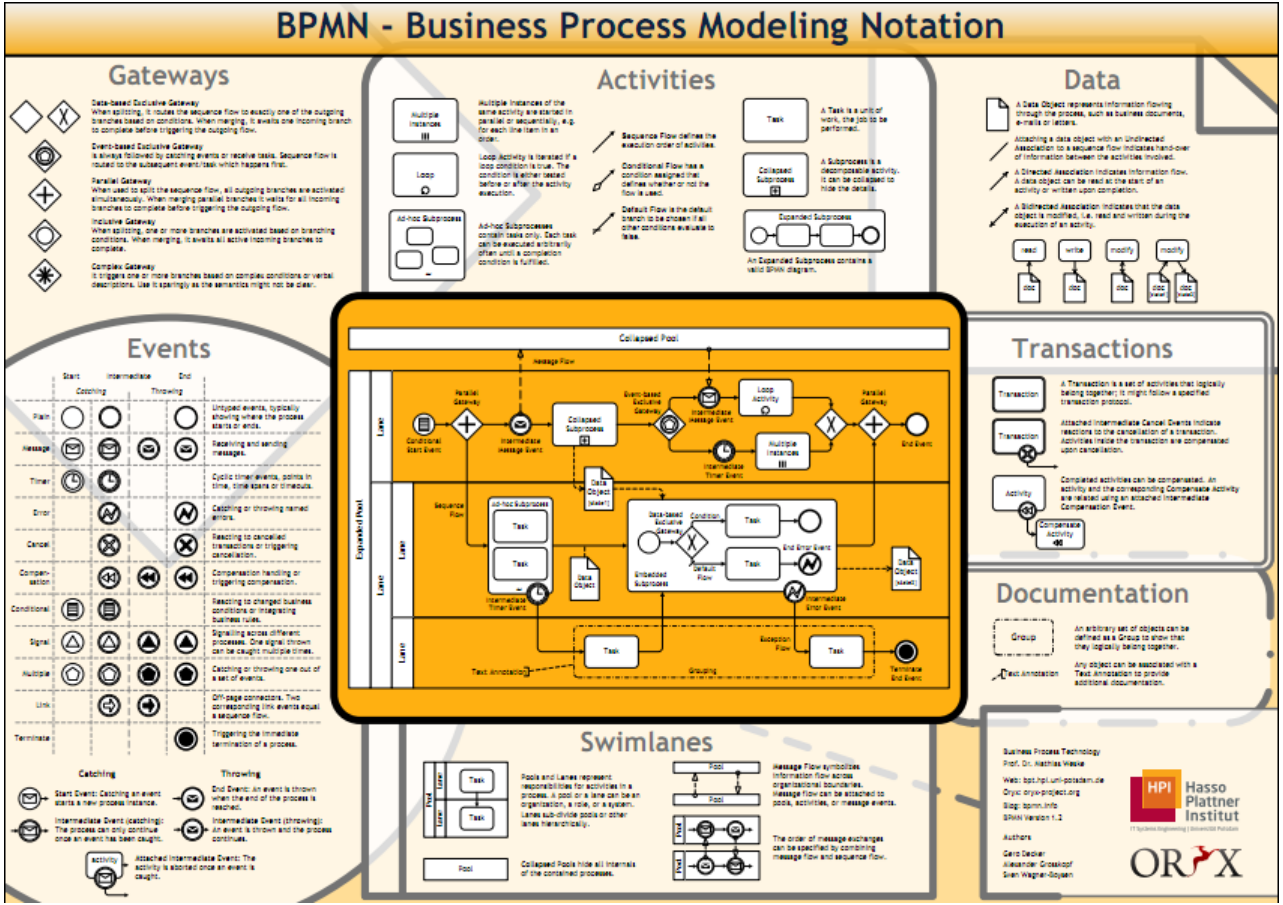


BPMN 1.2 – Core elements overview




Pool
Sequence Flow
Start Event
Exclusive Gateway
Out Of Stock
Report Item Out Of Stock
End Event
Sales Agent
Request Stock Level For Item
Receive Stock Level For Item
Reserve Item
Stock Level
In Stock
Stock Level Request
Reserve Item
Association
Message Flow
Annotation
Warehouse
Get Stock Level For Item
Decrement Stock Level For Item
Reorder if the Stock Level for Item is at or below the reorder level
Task


Working group active
Friday at 18:00h
Check status of working group
Working group still active?
Yes
No
[Send] Send current issue list
Issue list


BPMN - Business Process Modeling Notation
Gateways
Activities
Data
Events
Transactions
Documentation
Swimlanes
Collapsed Pool
Expanded Pool
Lane
Message Flow
Sequence Flow
Text Annotation
Grouping
Task
Collapsed Subprocess
Expanded Subprocess
Loop Activity
Multiple Instances
Ad-hoc Subprocess
Data Object
Group
Business Process Technology
Prof. Dr. Mathias Weske
Hasso Plattner Institut
ORYX
Authors
Gero Decker
Alexander Grosskopf
Sven Wagner-Goyen

BPEL4WS

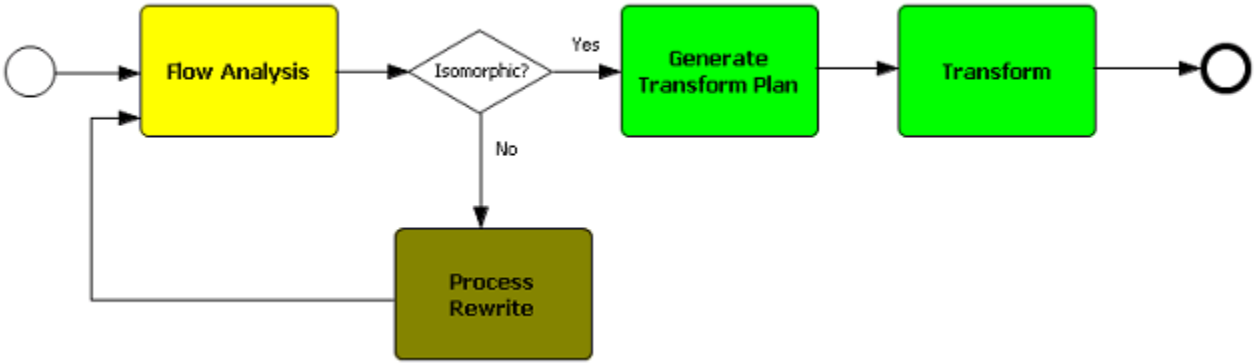
- Business Process Execution Language for Web Services
- OASIS standard executable language for specifying actions within business processes with web services.
- Extends the web services interaction model and enables it to support business transactions
- Processes in BPEL4WS export and import information by using web services interfaces exclusively
- Industry standard for web service composition
- BPMN has been used as a graphical front-end to capture BPEL process descriptions

BPMN 1.2 → BPEL4WS

- Challenging from scientific viewpoint
  - BPMN is graph oriented (flowchart with parallelism) and BPEL4WS is mainly block structured
- BPMN can be seen as a super set of BPEL4WS
  - BPEL4WS → BPMN is usually easy
- Arbitrary sequence flows allowed in BPMN are similar to the GOTO statements, which are not available in BPEL4WS

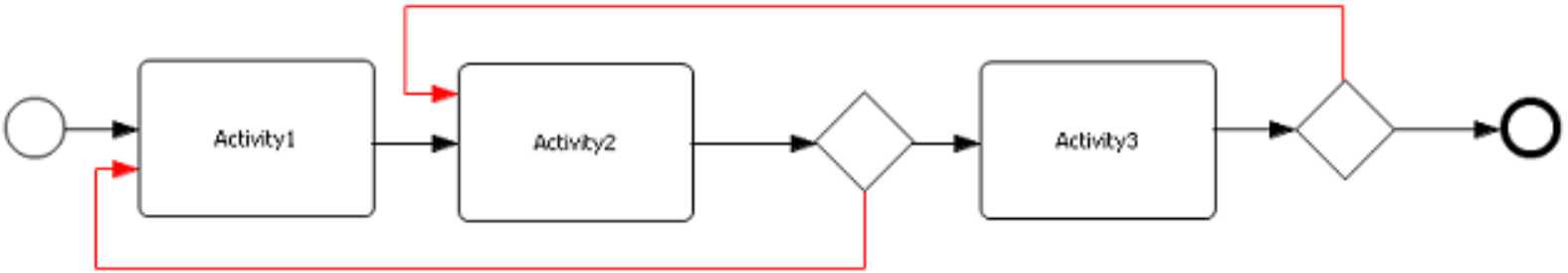
BPMN 1.2 → BPEL4WS

- Validate, rewrite and transform workflow



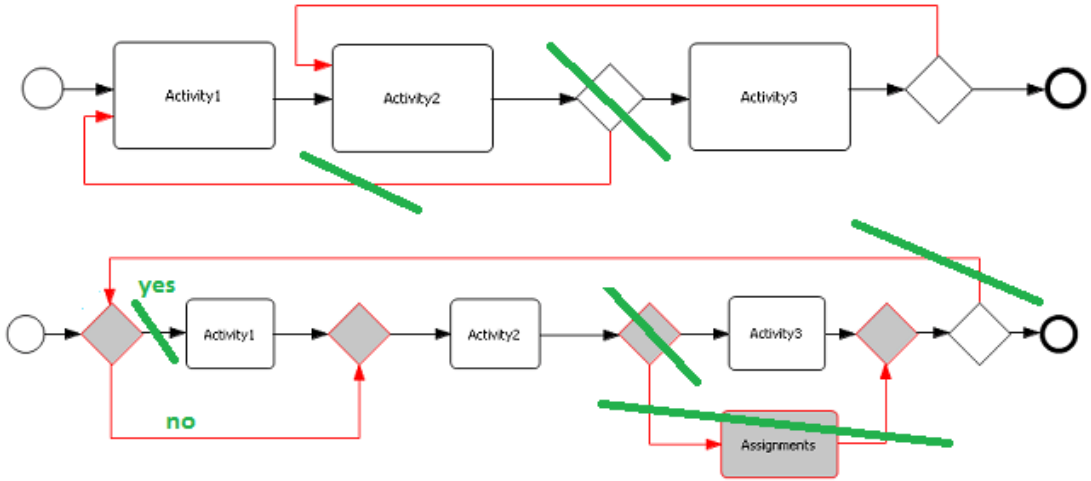
BPMN 1.2 → BPEL4WS – Rewrite needed

- Overlapped loops (gotos)



BPMN 1.2 → BPEL4WS – Process rewrite

- Rewritten diagram



BPMN 1.2 → BPEL4WS

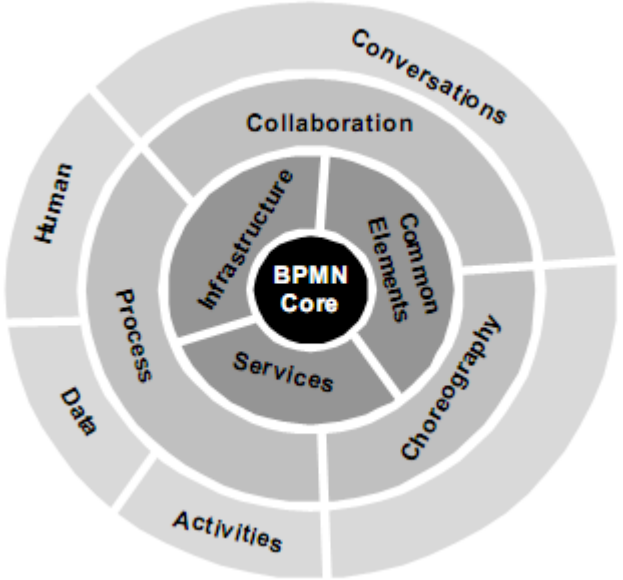
- Informal and partial mapping defined in BPMN specification (Annex A)
  - “BPMN specification itself is known to be incomplete with respect to capturing all the required information for BPEL4WS”
- More detailed mapping of BPMN to BPEL4WS has been implemented in a number of tools
  - Open-source BPMN2BPEL eclipse plugin

BPMN 2.0 – What's new?

- BPMN Core
- New diagrams
  - Choreographies-model
  - Conversation-model
- Complete Metamodel
  - XML Serialization and Diagram Interchange
- BPMN Execution Semantics

BPMN 2.0 – BPMN Core

- Extended graphical notation
  - No significant change on notation elements from BPMN 1.2
  - Models based on BPMN 1.2 are usually upwards compatible

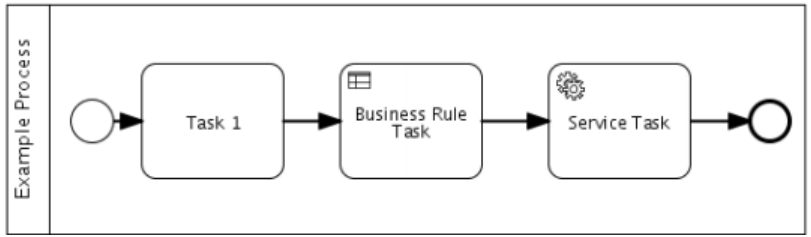


BPMN 2.0 – Updated elements

- Activities
  - Sequential/Parallel multi-instance activity
    - A form of **loop** that allows for the creation of a desired **number of activity** instances that may execute
      - Sequentially – Rectangle with horizontal lines
      - Parallel – Rectangle with vertical lines

BPMN 2.0 – Updated elements

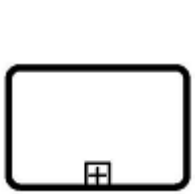
- Activities
  - Business Rule Tasks
    - Offer a mechanism for the process to provide input to a Business Rules Engine and to get the output of calculations that the engine might provide
  - Service Tasks
    - Use some sort of service, such as Web Service or an automated application
    - In the context of Web Services, the task's inputs map to message parts of a WSDL

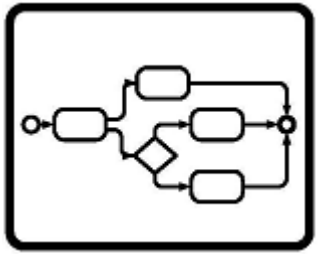


BPMN 2.0 – Updated elements

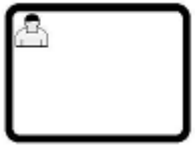
- Activities
  - Callable Element
    - Activities defined outside of a process or choreography
      - **Globally** defined **(sub)process**
      - **Global tasks**
  - Call Activity
    - Calls callable elements

- Call activity invoking globally defined processes



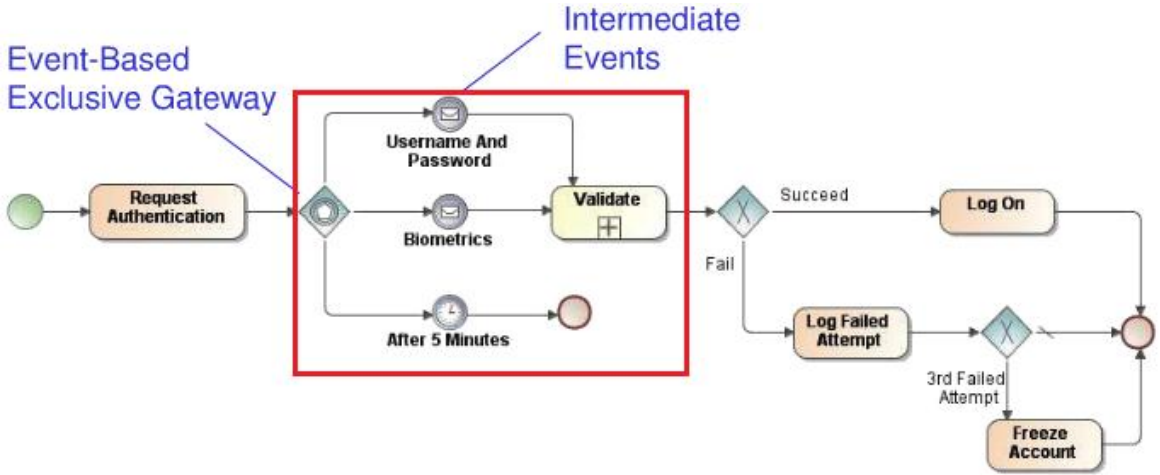


- Call activity invoking global task



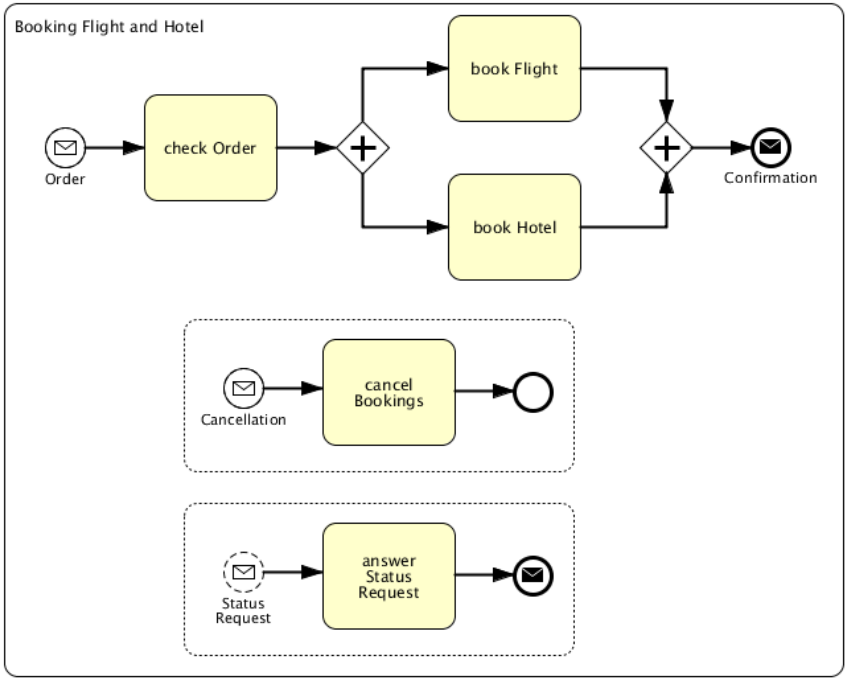
BPMN 2.0 – Updated elements

- Gateways
  - Event-based exclusive/parallel gateway



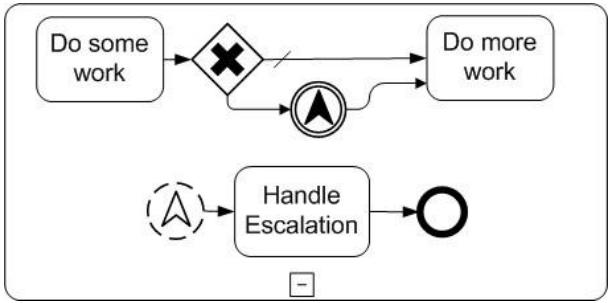
BPMN 2.0 – Updated elements

- Events
  - Event-Subprocess Interrupting and Non-Interrupting events
  - Optional part of Subprocesses that are used to handle occurring Events in the bounding Subprocess



BPMN 2.0 – Updated elements

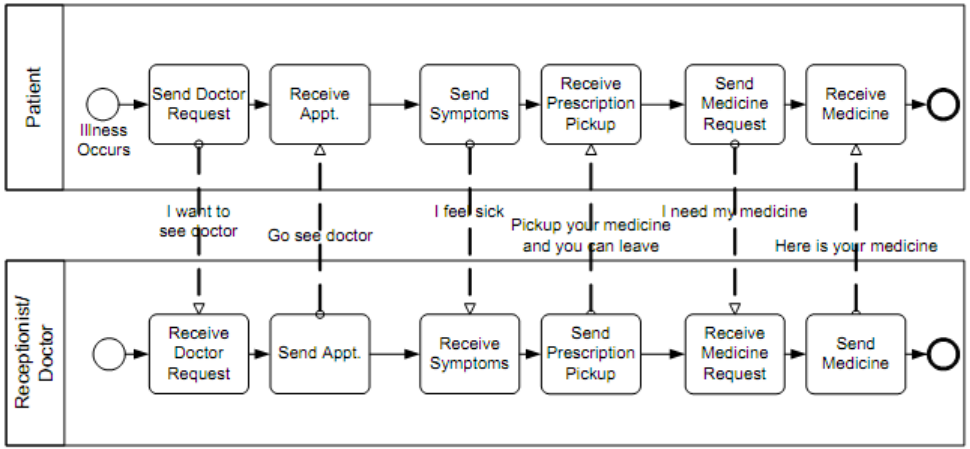
- Events
  - Escalation
    - If an escalation happens, the next **higher level of responsibility** shall be involved
    - For example, a participant is working on a problem which requires escalation to a manager



- Artifacts
  - Data Objects
    - Used to model data especially as **input and output to activities**
    - It is now possible to define process global documents

BPMN 2.0 – New diagrams

- Conversation models brief description
  - Particular usage of and an informal description of a collaboration diagram – Focus on message exchanges instead of control flow
    - A collaboration diagram depicts the interaction between two or more business entities (as shown below)



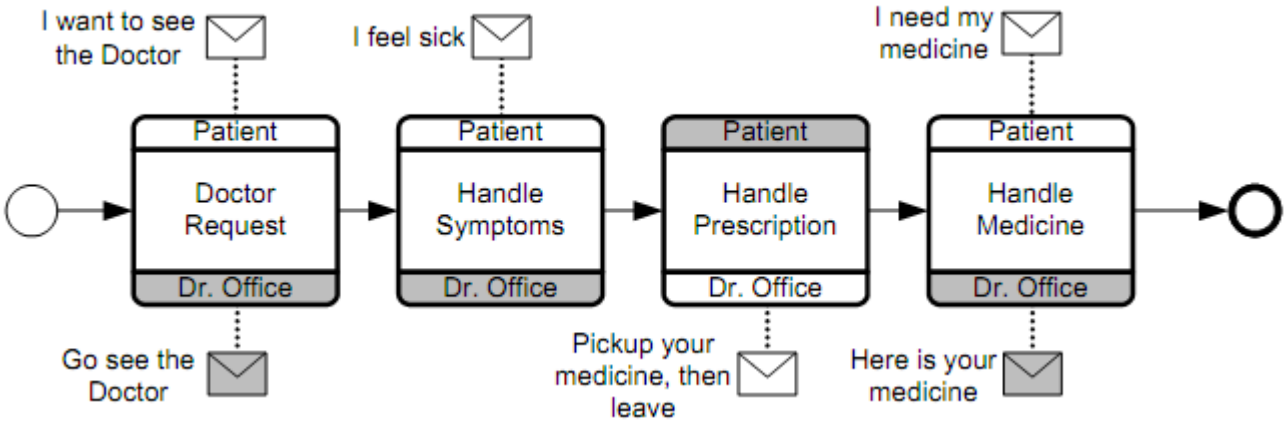
BPMN 2.0 – New diagrams

- Choreography models
  - Unlike a normal process (orchestration), there is no central controller, responsible entity or observer of the process
  - While a normal process exists within a pool, a choreography exists between pools (or participants)
  - In this diagram, activities are interactions that represent one or more message exchanges that involves two or more participants

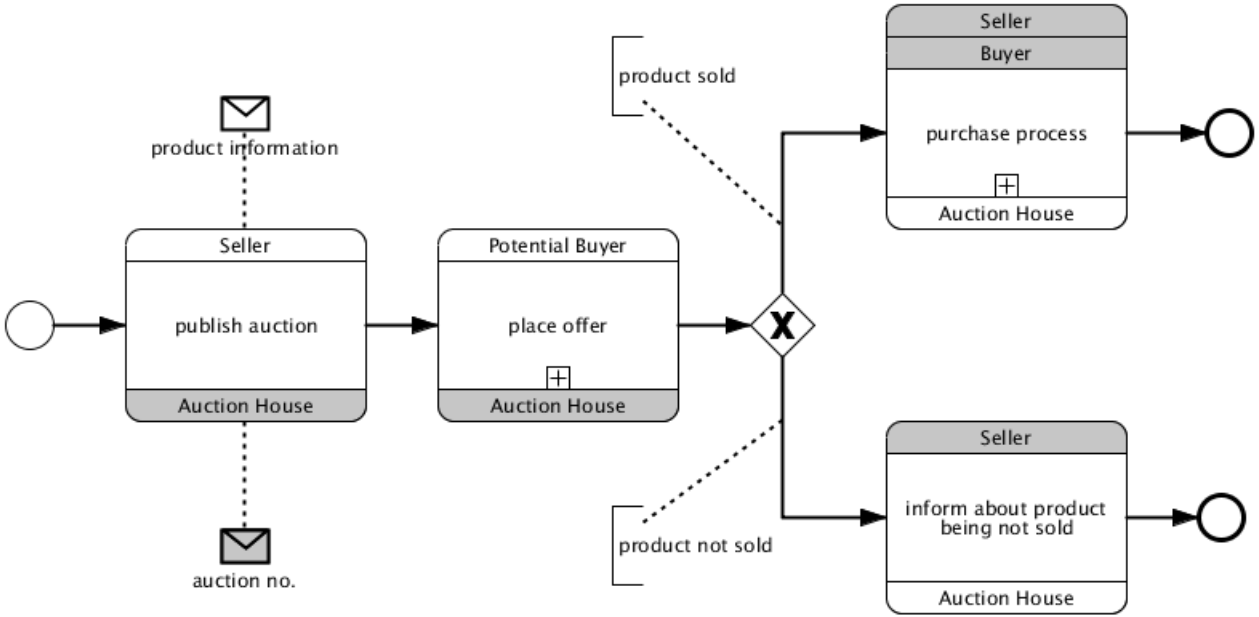
BPMN 2.0 – Choreography Model

- Choreography task
  - Represents interactions between two process participants
- Participants
  - Active part
    - Initiates the communication (only one)
    - Rectangle with white background
  - Passive part
    - Just “receives” communication (one or more)
    - Rectangle with grey background
- Choreography subprocesses resemble another choreography
- Choreography models consists of choreography tasks and subprocesses alongside with most common BPMN elements

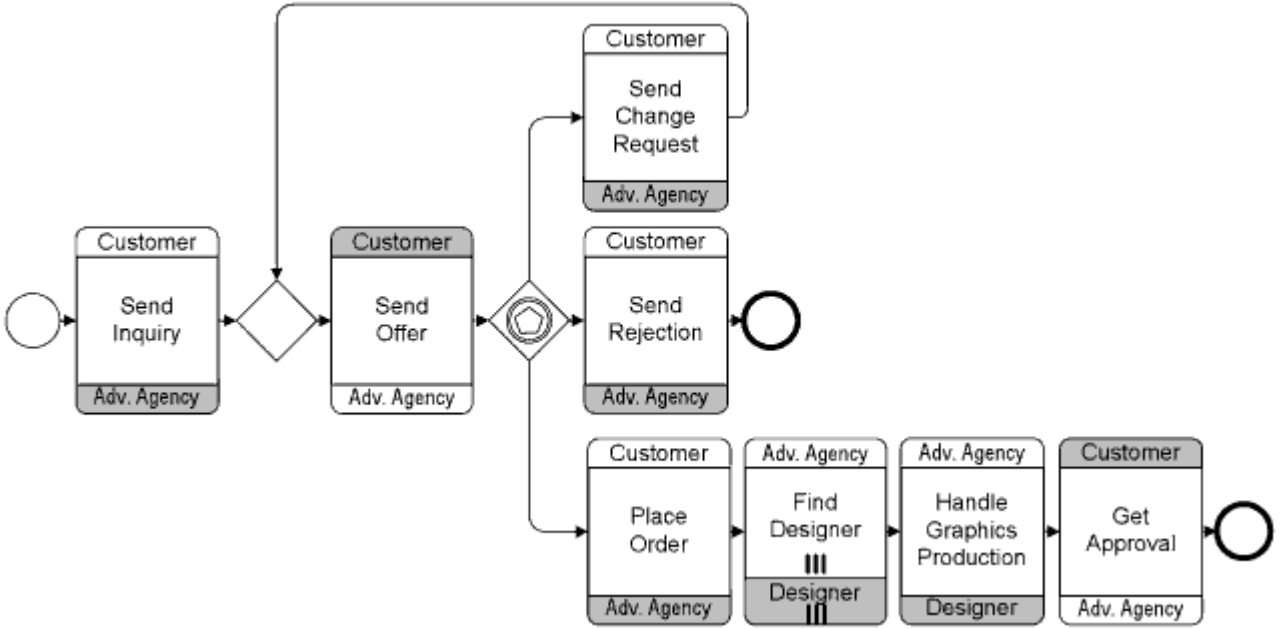
BPMN 2.0 – Choreography by examples

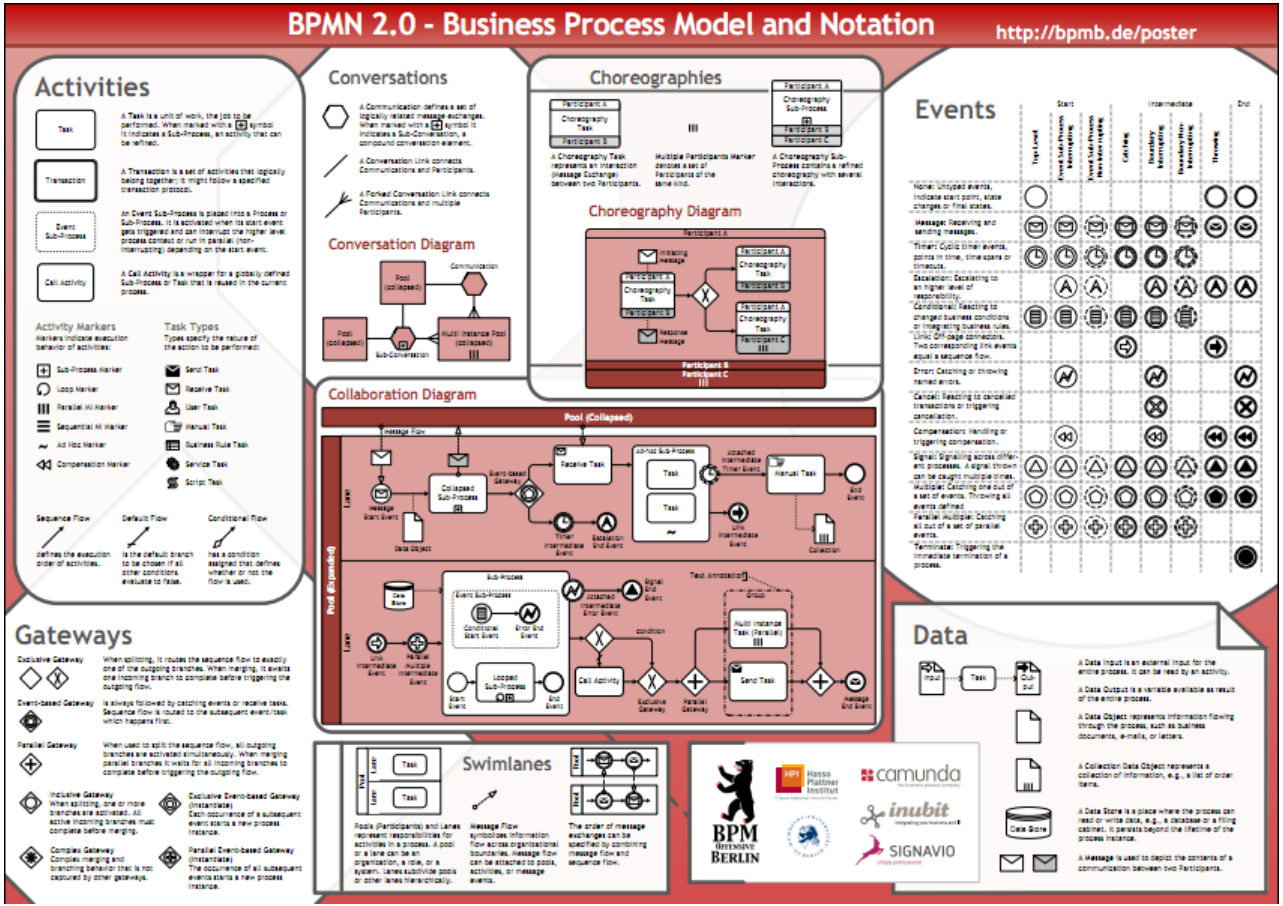


BPMN 2.0 – Choreography by examples



BPMN 2.0 – Choreography by examples




BPMN 2.0 - Business Process Model and Notation
http://bpmb.de/poster
Activities
Activity Markers
Task Types
Conversations
Conversation Diagram
Choreographies
Choreography Diagram
Collaboration Diagram
Events
Gateways
Swimlanes
Data
BPM
BERLIN
camunda
inubit
SIGNAVIO

BPMN 2.0 – Complete Metamodel

- Formal definition in the form a metamodel
  - UML class diagrams show features of different BPMN constructs and their relationship
  - Metamodel has additional language constructs to support process execution
  - Business Process Model and Notation (new name, same brand!)
- Own standardized exchange format
  - XML Serialization and Diagram Interchange

BPMN 2.0 – Execution Semantics

- Interpretation and execution BPMN models has been precisely described
- Process definition models can be executed as-is on any BPMN 2.0 compliant engine
- Specification still defines the BPMN to BPEL4WS mapping

Business Process Execution Strategies

- Strategy #1 - BPMN 2.0 → BPEL
  - “BPMN execution language is more complex than using BPMN with BPEL” thinking
  - http://www.vosibilities.com/bpel/bpmn-or-bpel-which-is-simpler/2009/11/19/

Business Process Execution Strategies

- Strategy #2 – BPMN 2.0 natively
  - Only time will tell whether the specification is robust and complete enough to replace BPMN→BPEL usage
  - Although BPMN 2.0 is still in beta phase, there are already implementations available

JBoss jBPM5

- Open-source flexible and robust BPM Suite (LGPL v2.1)
  - First version released on 2004
- Support process collaboration, monitoring and management
- jBPM5 focuses on BPMN2 as the language for expressing business processes (it supports other languages though)
  - BPMN2 process modeling (powered by Signavio)
    - Eclipse (developers)
    - Web (business users)
  - Native BPMN2 execution
- Good documentation available

Activiti 5.0 rc1

- Open source lightweight BPM with a “super-fast and rock-solid BPMN2 process engine for Java” (Apache license)
- Integration with Spring framework
- Requires only JVM 5+ and Tomcat
- Provides modeling (powered by Signavio) and monitoring features

OpenESB vs BPMN 2.0

- “OpenESB does not have a BPMN 2.0 execution engine. Now that Oracle has announced its reduced engineering investment in openesb I doubt there will be one coming from Oracle (although one does exist in the oracle fusion middleware). However, it may be possible for someone to take an external, open source BPMN2.0 engine (assuming one exists) and wrap it as a JBI service engine for use in openesb.”
  - OpenESB Forums

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  - http://jboss.org/jbpm
- Activiti
  - http://www.activiti.org