3.– 6. September 2012
in Nürnberg

Herbstcampus

Wissenstransfer
par excellence

Ausgeschlafen?!

Wie BPMN die Java-Entwicklung bei der Implementierung von Integrationsprozessen bereichert

Volker Stiehl

SAP AG

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Agenda

1. Taking a look at BPMN from an integration developer’s point of view
2. BPMN usage in integration centric processes
3. Summary

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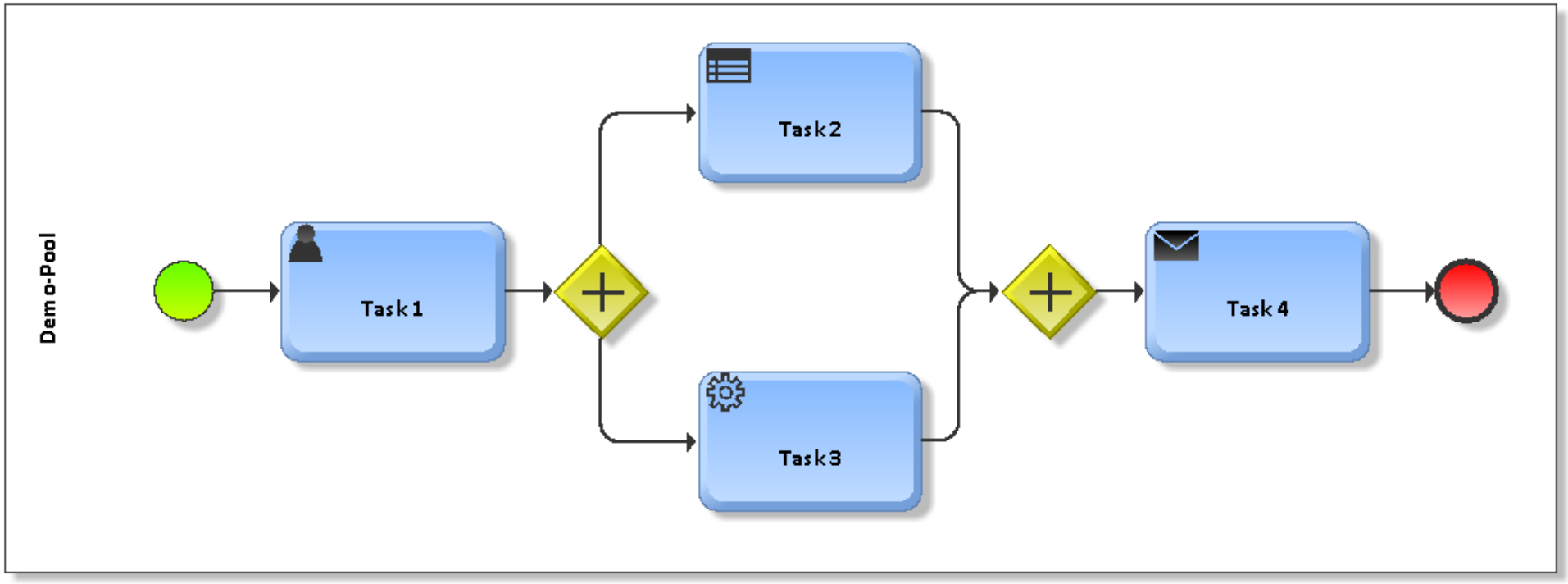
Business Process Model and Notation

"The primary goal of BPMN is to provide a notation that is readily understandable by all business users, from the business analysts that create the initial drafts of the processes, to the technical developers responsible for implementing the technology that will perform those processes, and finally, to the business people who will manage and monitor those processes. Thus, BPMN creates a standardized bridge for the gap between the business process design and process implementation."

OMG, BPMN 2.0 Specification

- First published in 2002
- Official standard of the Object Management Group (OMG) since 2006
- SAP, Oracle and IBM worked on specification and implementations since 2007
- Current Version: BPMN 2.0 (released in January 2011)

Explaining BPMN semantics: Tokens traversing the sequence flow



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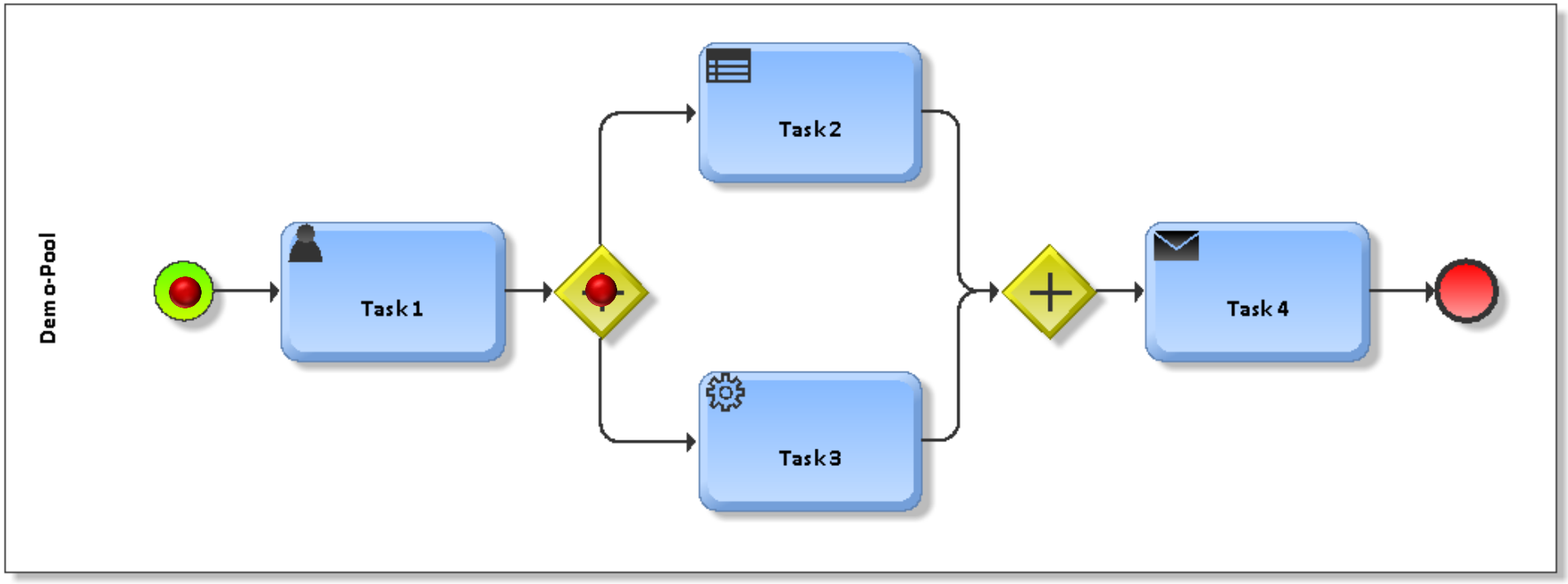

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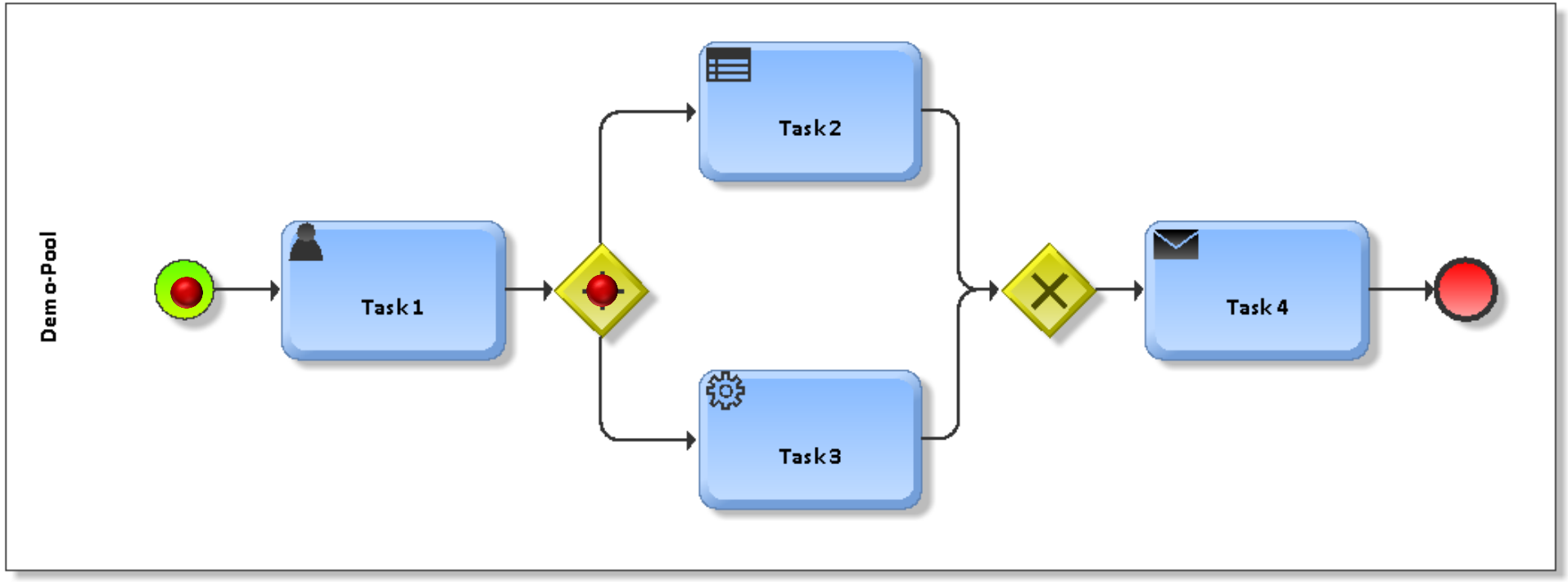
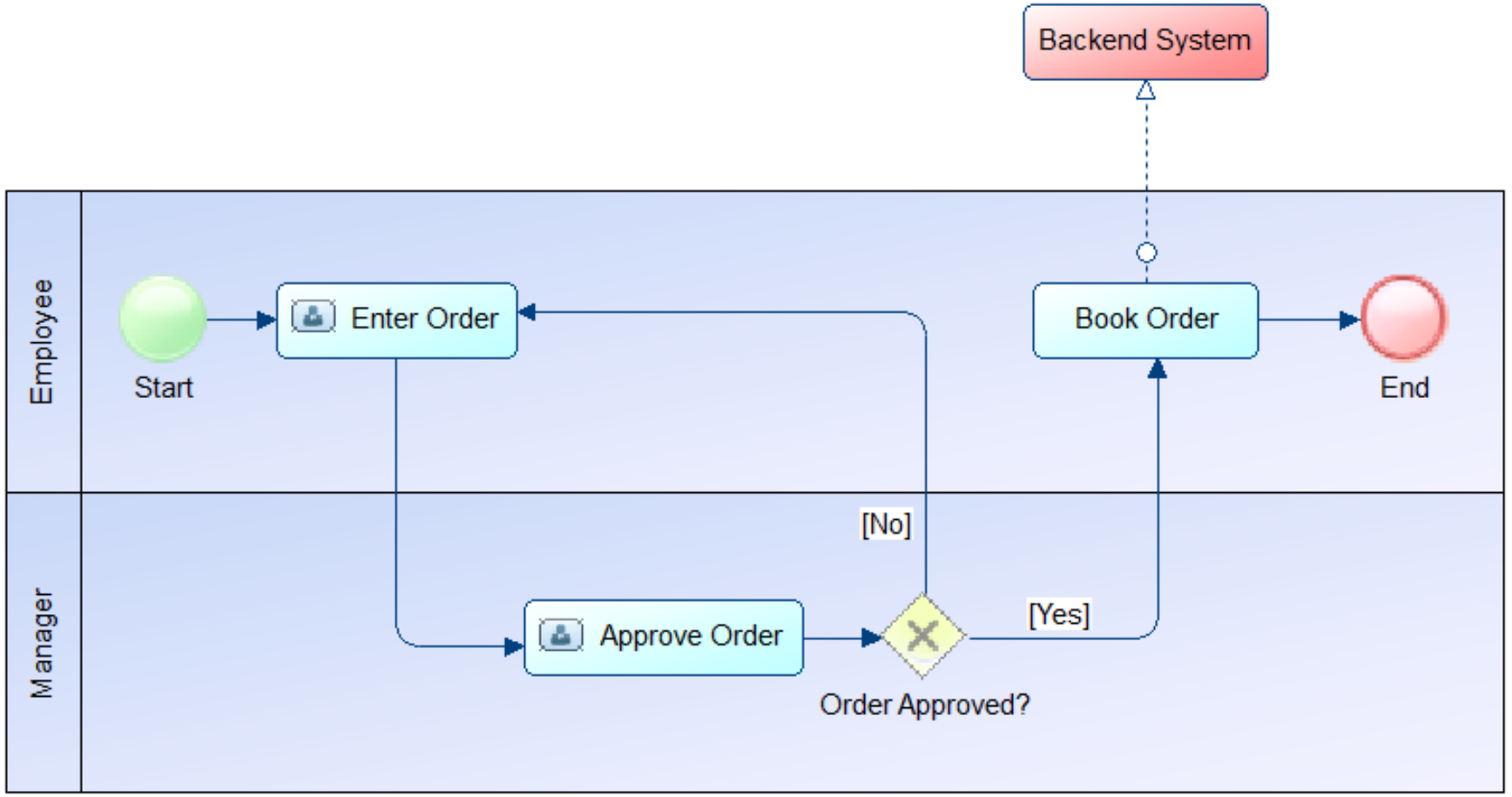
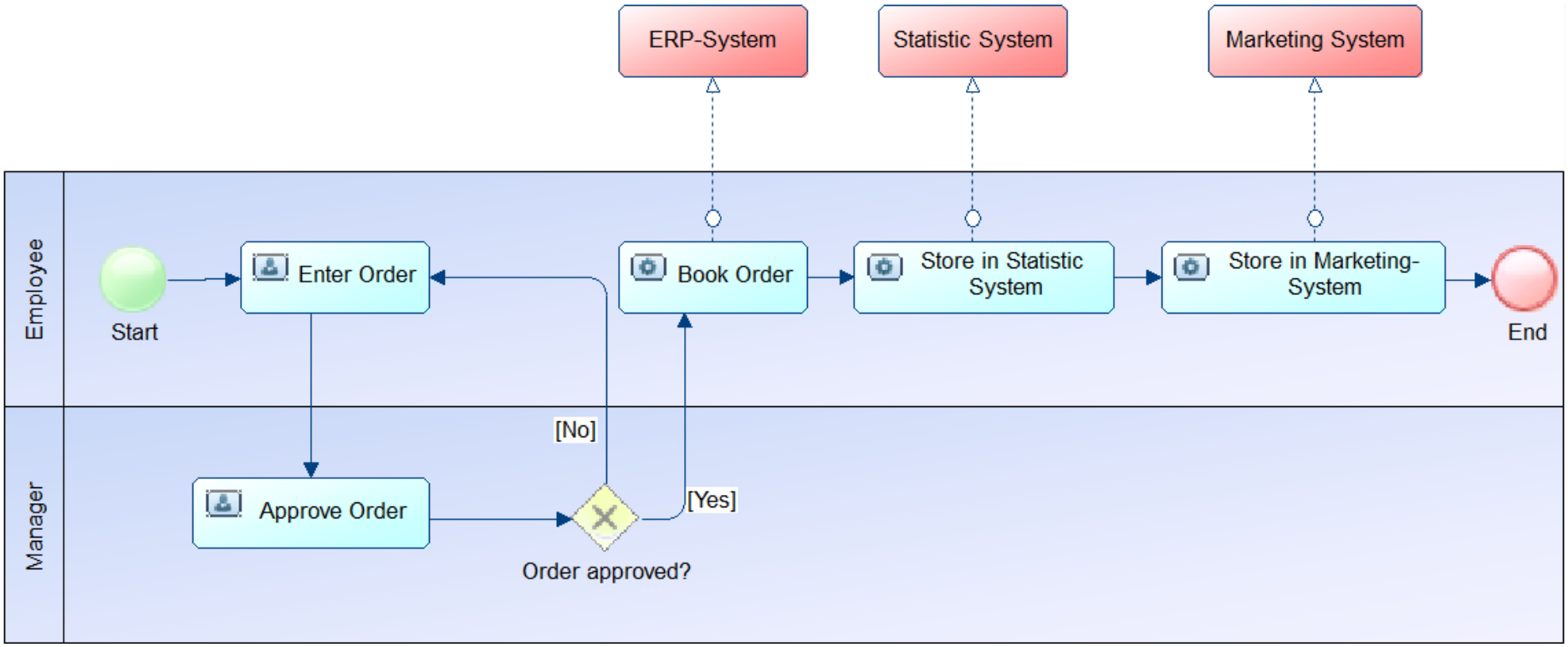


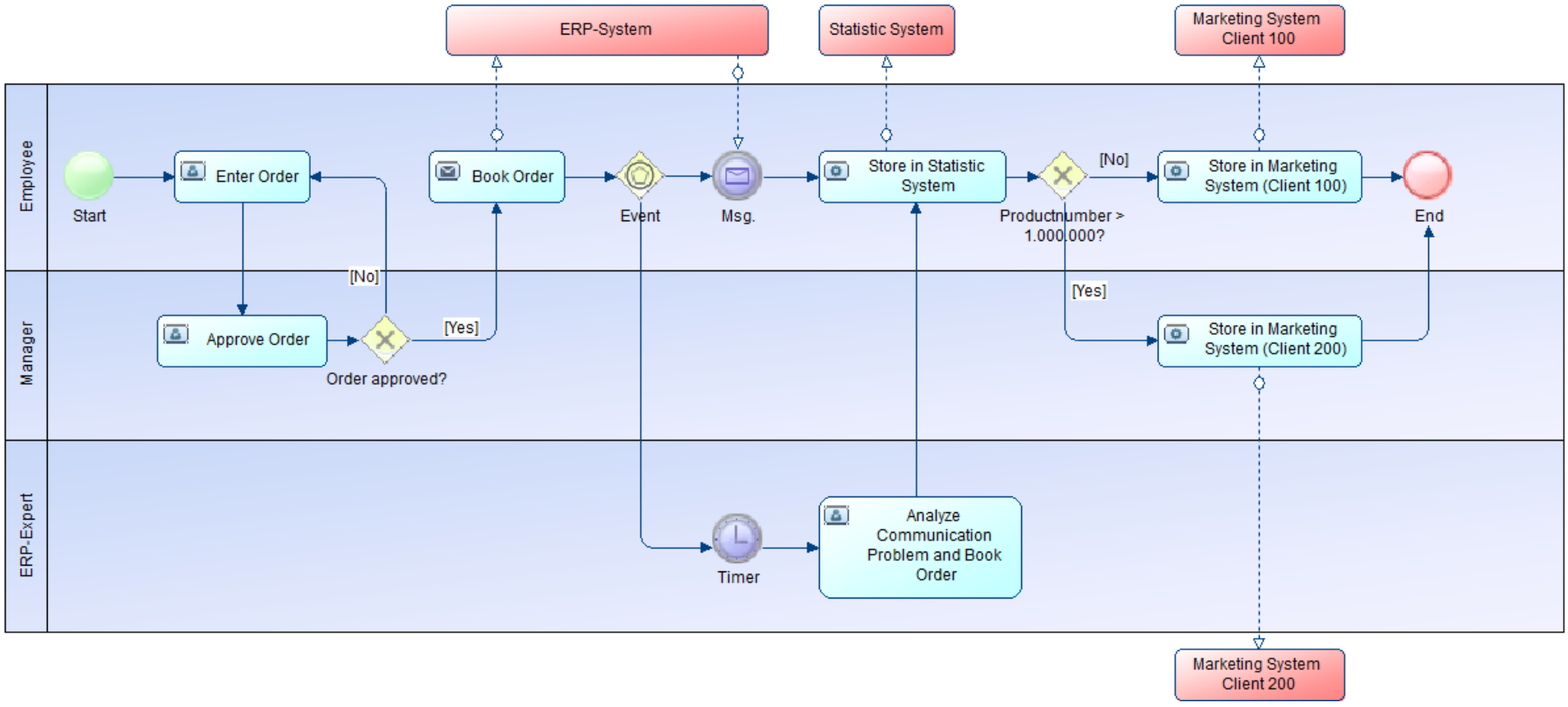
Evolution of a process model in general (1)



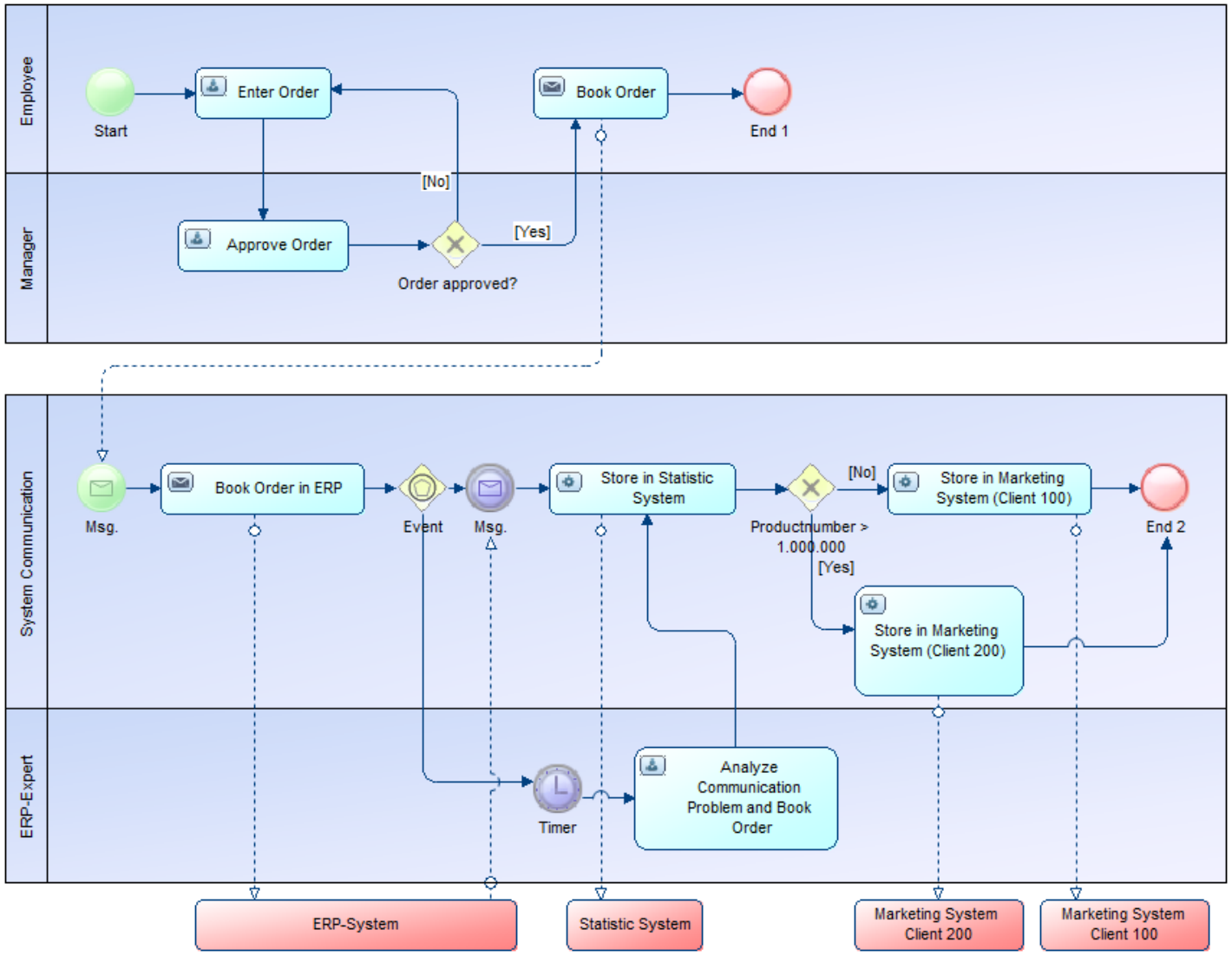
Evolution of a process model in general (2)



Evolution of a process model in general (3)

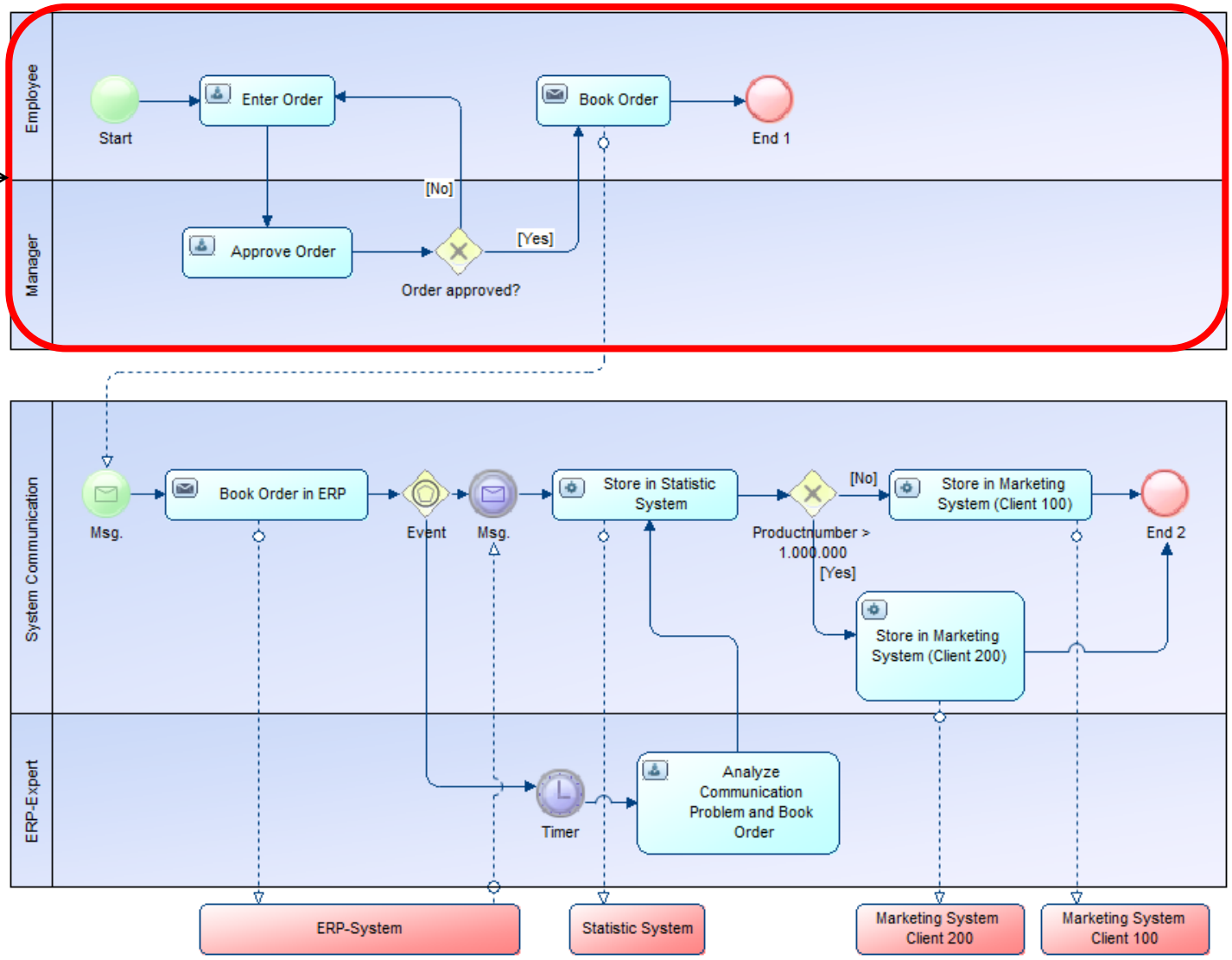


Process driven architecture (1)



Process driven architecture (2)

Process Driven Application (PDA):
The Company's „Gold Nugget" – not polluted with technical artifacts



Process driven architecture (3)

Process Driven Application (PDA):
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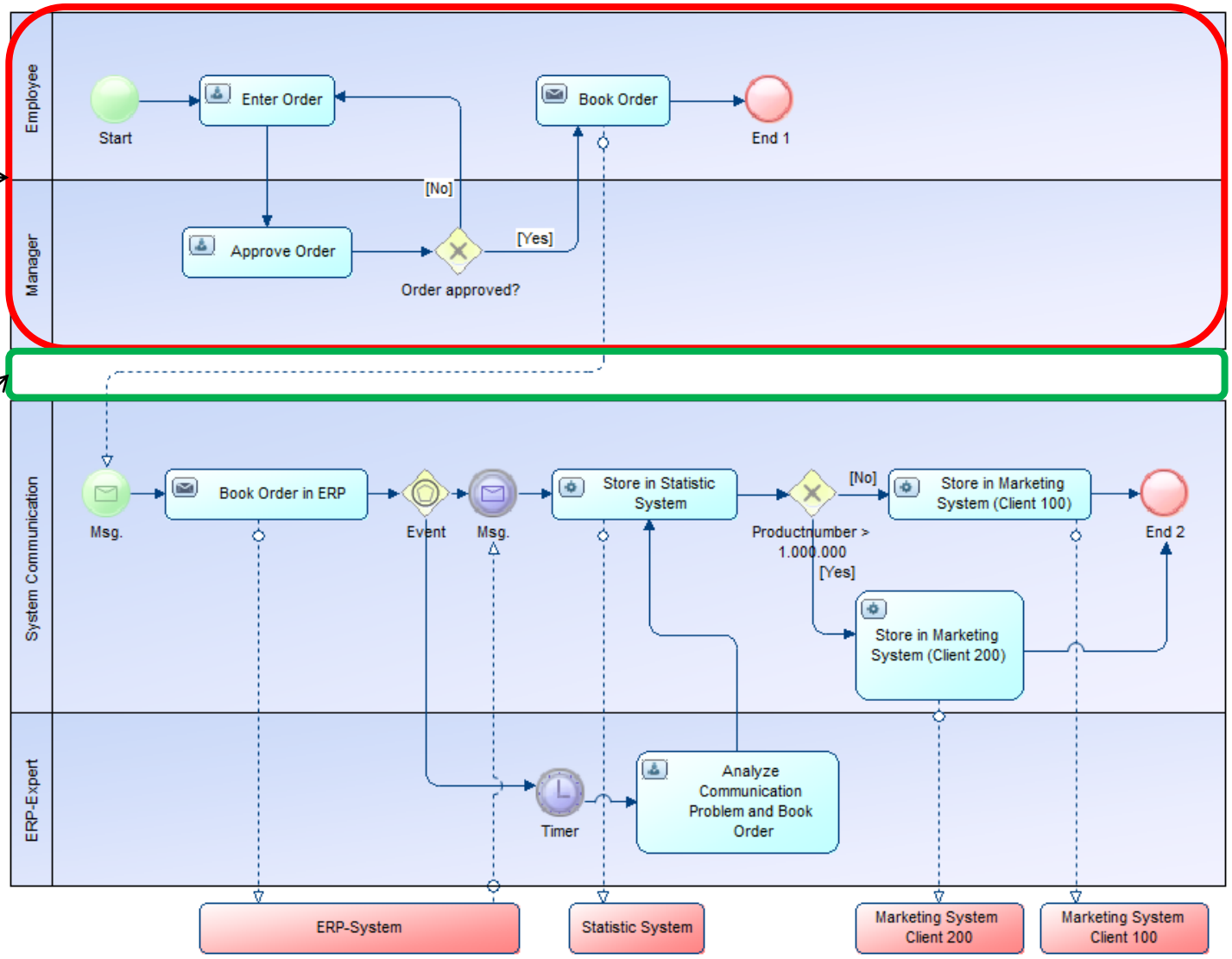
Service Contract
derived from the requirements of the PDA

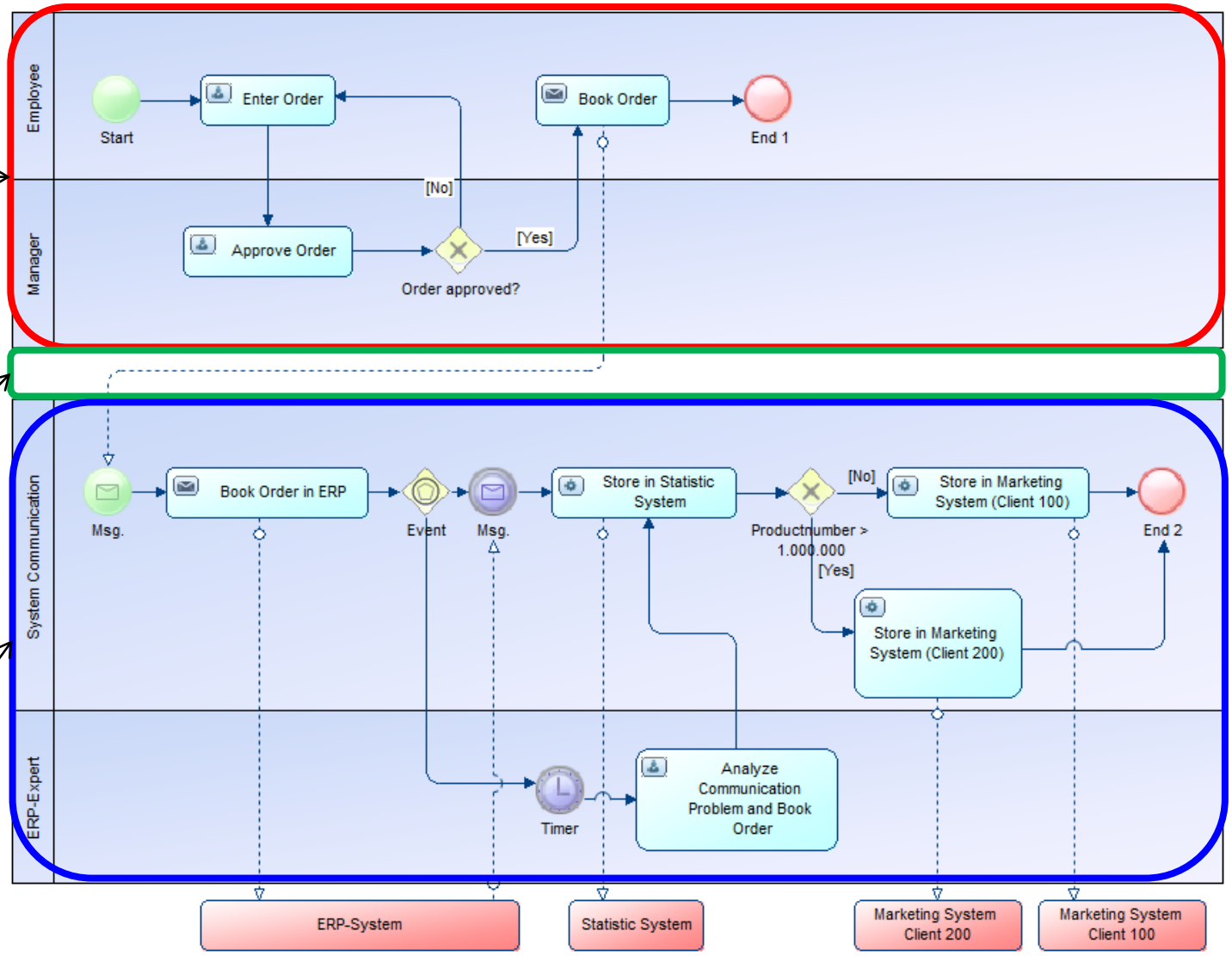


Process driven architecture (4)

Process Driven Application (PDA): The Company's „Gold Nugget" – not polluted with technical artifacts

Service Contract derived from the requirements of the PDA

Service Contract Implementation Layer (SCIL) = Integration centric processes



What is a process driven application?

~~PDA = BPM + SOA~~

PDA = DEFINITION + METHODOLOGIE + ARCHITEKTUR

Definition of an Integration Centric Process

AN

INTEGRATION CENTRIC PROCESS

IS COMPOSED OF A

SPECIFIC FLOW OF STEPS
(INCLUDING SENDING AND RECEIVING OF MESSAGES),

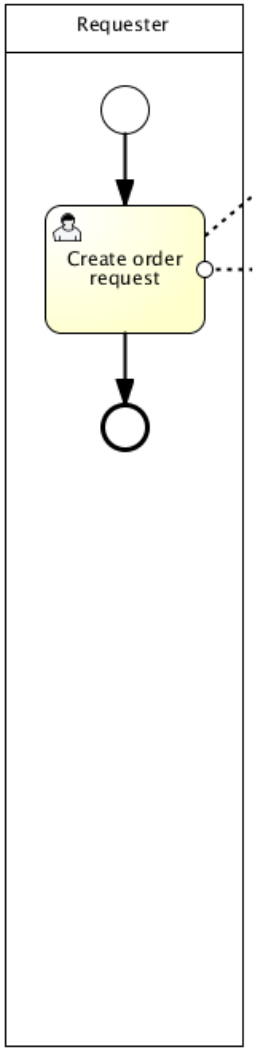
DURING WHICH THE

STATUS

OF THE PROCESS IS

PERSISTED ON THE INTEGRATION SERVER

Using BPMN for Business Processes as well as Integration Processes – an Example



* Taken from the forthcoming book „Prozessgesteuerte Anwendungen entwickeln und ausführen mit BPMN “ by V. Stiehl (dpunkt.verlag, 2012)

Demo

Using BPMN for Business Processes as well as Integration Processes

Business Process Model and Notation – Key Shapes

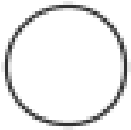
Activity:

- A step in a process
- Represents work or action to be **performed**
- Statement

Gateway

Gateway:

- **Controls flow branching**, merging and parallel actions
- Pure logic – does not do the decision itself
- Control flow



Event

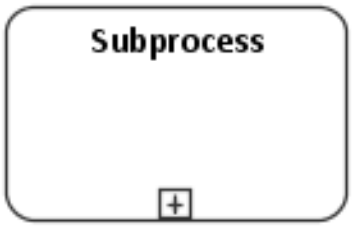
Event:

- A signal that „something has happened“
- Can start, pause and resume or interrupt and redirect a process or activity
- Throw/catch

Business Process Model and Notation – Activities

User Task:
- Activity that has to be processed by a natural person
- Typically associated with a user interface (JSF, JSP, servlet,…)

Service Task:
- Activity that is processed by a system
- Defined via an interface description (e.g. WSDL)
- Typically calling a web service or an EJB



Sub-Process:
- A compound (decomposable) activity that holds a sub-process modeled with BPMN
- Can be shown collapsed or expanded
- Can be embedded (local) or referenced (global)
- Used for structuring processes
- Subroutine

Call Activity:
- Used to call a global sub-process or a global single task
- Subroutine call

Business Process Model and Notation – Gateways

Exclusive Choice (data-based):

- Only one path can be taken
- Each gate has a boolean data expression
- if-then-else, switch

Parallel Split/Fork (also AND gateway):

- Splits sequence flow in parallel streams
- “Multithreading”

Event-based Exclusive Choice:

- Only one path can be taken
- Decision is based on events, not data condition

Exclusive/Uncontrolled Merge:

- Merge exclusive alternative incoming sequence flows to one outgoing sequence flow

Parallel Join:

- Merge parallel alternative incoming sequence flows to one outgoing sequence flow
- Waiting for all threads to finish

Business Process Model and Notation – Events

Message Start Event:

- Waits for a message and creates a new process instance or indicates start of a sub-process

Intermediate Timer Event:

- Pauses the sequence flow of a process or a sub-process for/until a specific time

Intermediate Message Event:

- Waits for and receives a message

Error End Event:

- Stops the process or sub-process immediately and throws an error

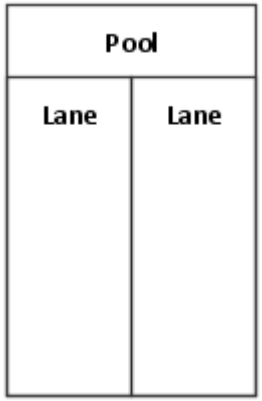
Message End Event:

- Ends a sequence flow in a process or a sub-process and sends a message

Termination:

- Stops the process or sub-process immediately

Business Process Model and Notation – Orchestration and Collaboration



Pool:

- A Pool contains a single „BPMN- Process“
- A sequence flow is constrained in exactly one pool
- A Process diagram may contain several pools
- A pool generally represents a logical collection of roles, organizational units and systems

Lane:

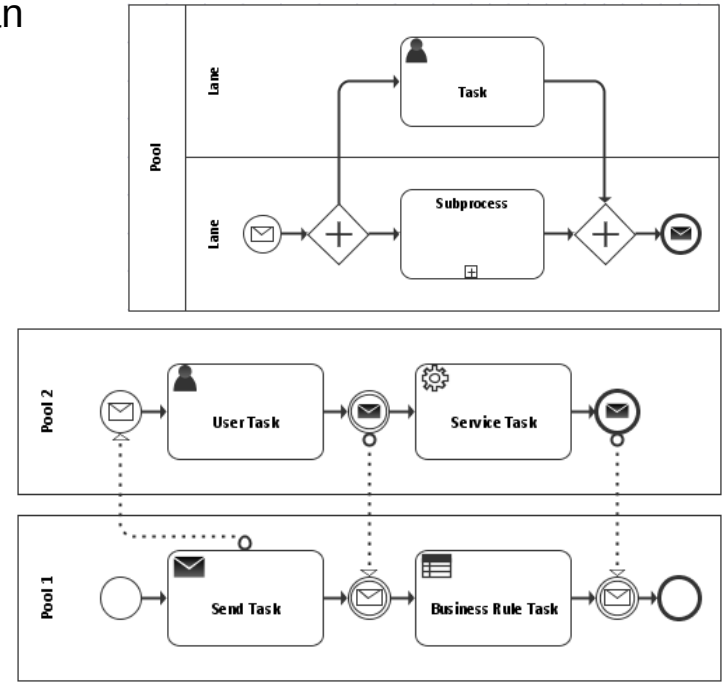
- A pool may be divided into lanes
- A lane generally represents a role or an organizational unit

Orchestration:

- Modeling a process **flow of control** in a single internal (active) pool
- Representation as **sequence flow**
- Execution Sequence

Collaboration:

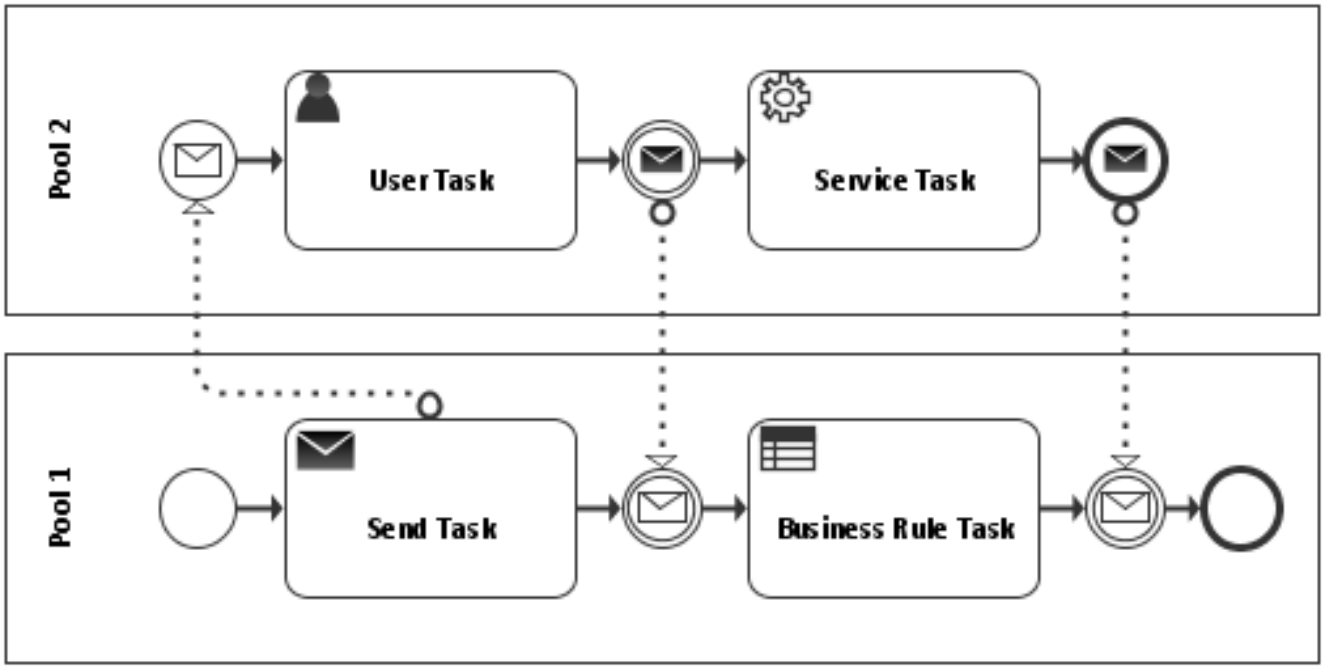
- Modeling interaction between pools (not flow of control!)
- Representation as **message flow**
- Very powerful means for integration processes



Business Process Model and Notation – Differentiating Message and Signal Events

Messages are triggers, which are generated **outside of the Pool they are published in**. They typically describe B2B **communication between different Processes in different Pools**. When Messages need to reach a specific Process instance, **correlation** is used to identify the particular instance.

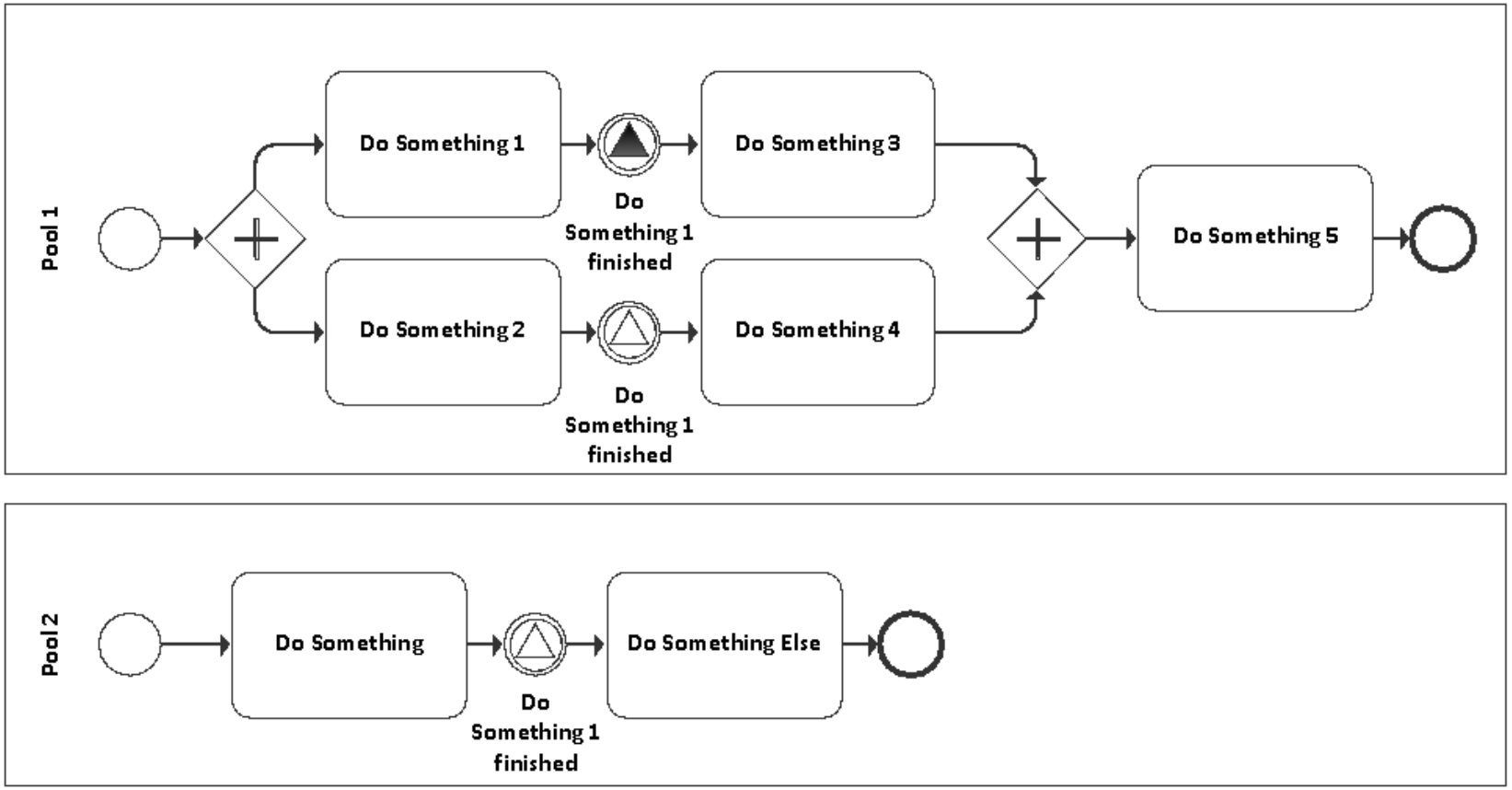
OMG, BPMN 2.0 Specification



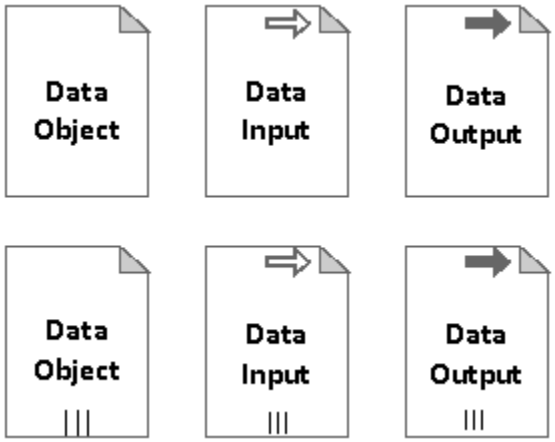
Business Process Model and Notation – Differentiating Message and Signal Events

Signals are triggers generated **in the Pool they are published**. They are typically used for **broadcast communication within and across Processes**, **across Pools**, and **between Process diagrams**.

OMG, BPMN 2.0 Specification



Business Process Model and Notation – Data Objects

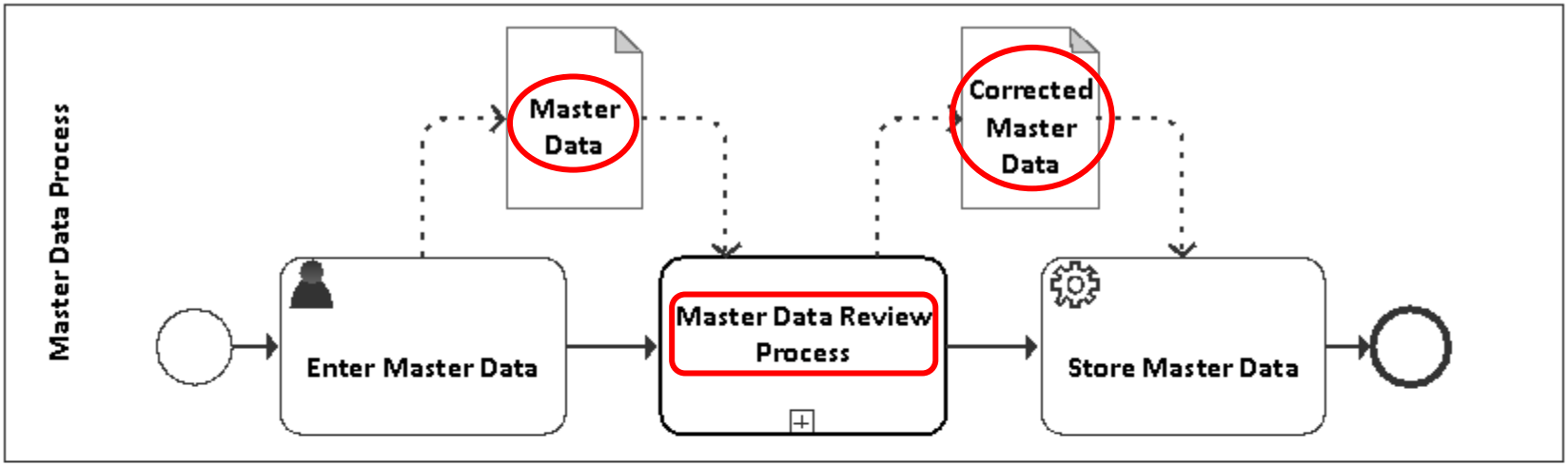


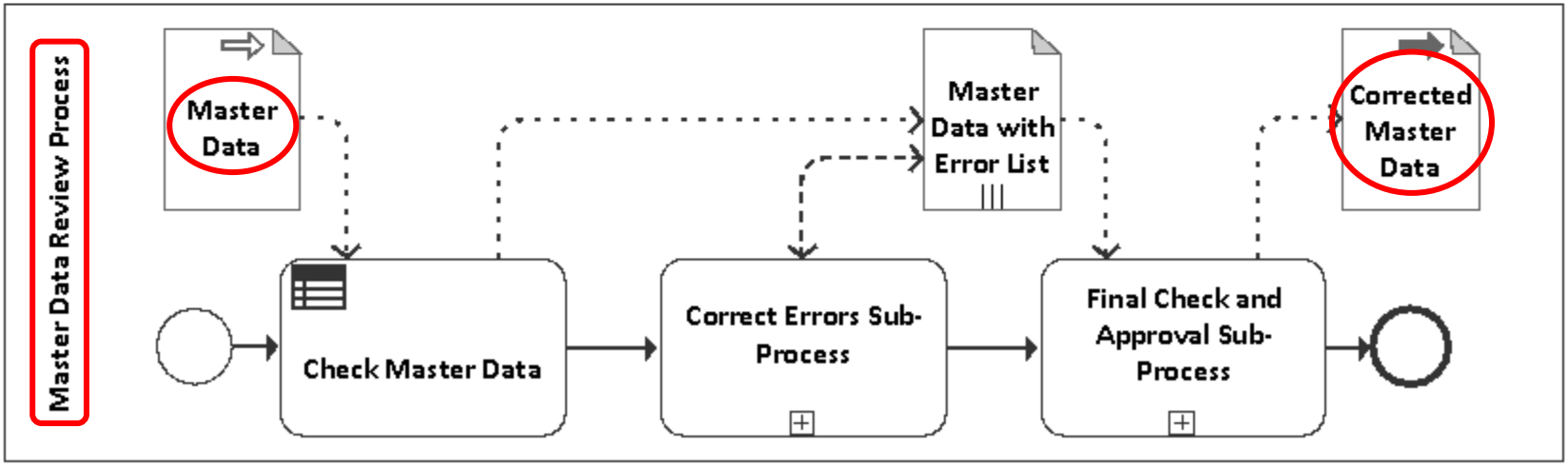
Data Object

Data Object:

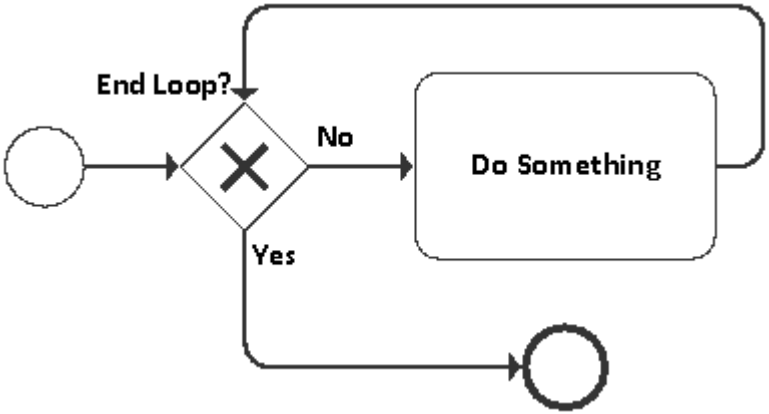
- An artifact that stores data in the **process context**
- Can be a single object or a list of objects (|||)
- XML Schema Definition used to define data objects
- Visibility of data objects in sub-processes
  - Data objects defined on a higher level are visible to all activities on the same level and on all lower levels (e.g. embedded sub-processes)
  - Data objects defined on a lower level are not visible on higher levels
  - Data objects of external (reference) sub-processes don't have access to any data object of the caller's process context → data has to be transferred by means of Data Input and Data Output
- Variables

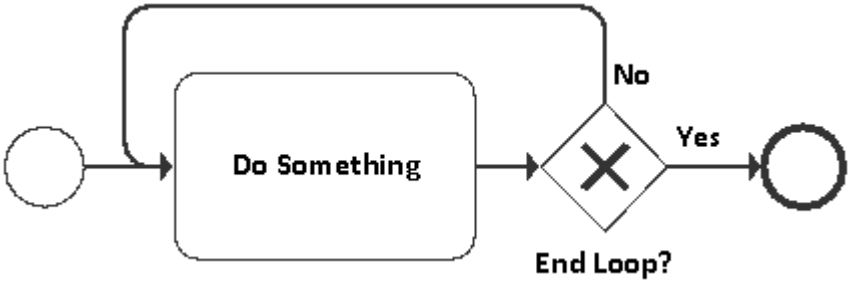
Business Process Model and Notation – Data Objects and Sub-Processes

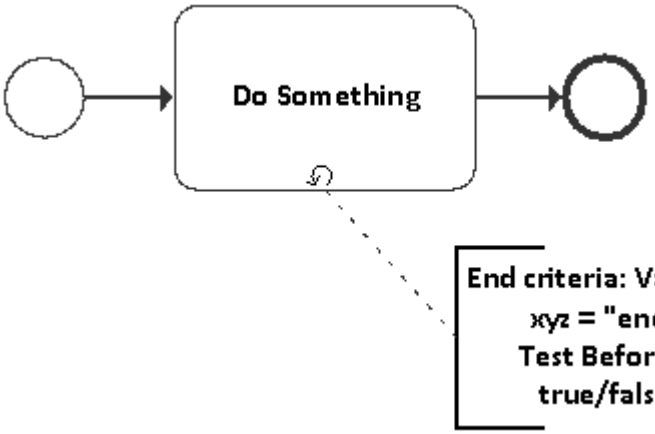


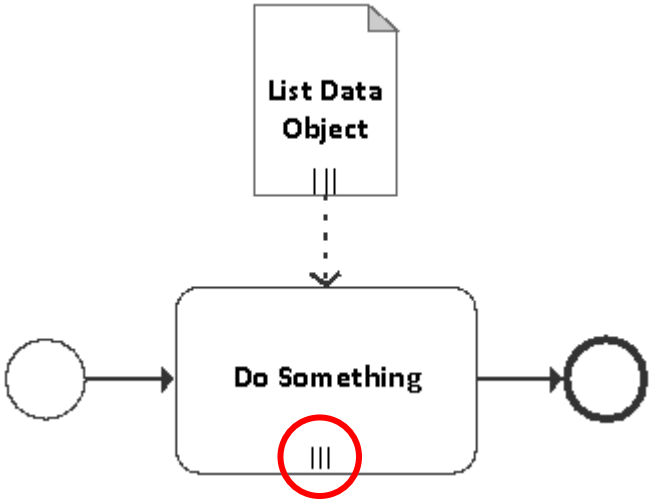


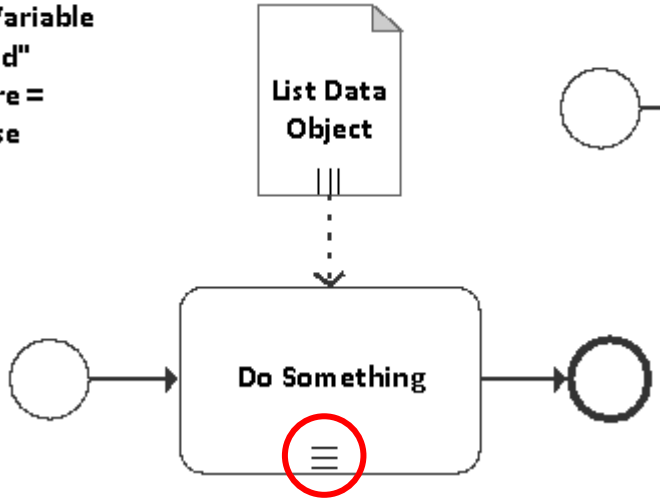
Business Process Model and Notation – Looping











Loop markers can also be applied to sub-processes!

BPMN 2.0 - Business Process Model and Notation

http://bpmb.de/poster

Activities

Task
A Task is a unit of work, the job to be performed. When marked with a [+] symbol it indicates a Subprocess, an activity that can be refined.

Transaction
A Transaction is a set of activities that logically belong together; it might follow a specified transaction protocol.

Event-Subprocess
An Event-Subprocess is placed into another Subprocess. It is activated when its start event gets triggered and can interrupt the Subprocess context or run in parallel (non-interrupting) depending on the start event.

Call Activity
A Call Activity is a wrapper for a globally defined Subprocess or Task that is reused in the current process.

Activity Markers
Markers indicate execution behavior of activities:

- Subprocess Marker
- Loop Marker
- Parallel MI Marker
- Sequential MI Marker
- Ad Hoc Marker
- Compensation Marker

Task Types
Types specify the nature of the action to be performed:

- Send Task
- Receive Task
- User Task
- Manual Task
- Business Rule Task
- Service Task
- Script Task

Sequence Flow
defines the execution order of activities.

Default Flow
is the default branch to be chosen if all other conditions evaluate to false.

Conditional Flow
has a condition assigned that defines whether or not the flow is used.

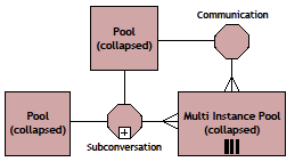
Conversations

A Communication defines a set of logically related message exchanges.

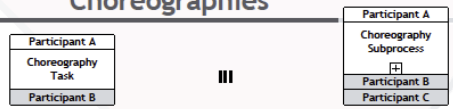
A Conversation Link connects Communications and Participants.

A Forked Conversation Link connects Communications and multiple Participants.

Conversation Diagram



Choreographies

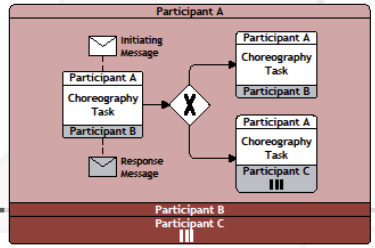


A Choreography Task represents an Interaction (Message Exchange) between two Participants.

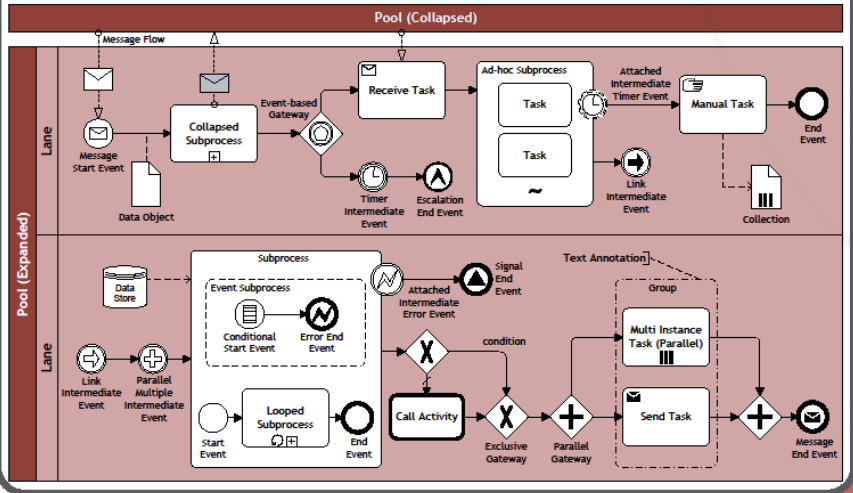
Multiple Participants Marker denotes a set of Participants of the same kind.

A Choreography Sub-process contains a refined choreography with several Interactions.

Choreography Diagram



Collaboration Diagram



Events

	Start: Top-Level	Start: Event Sub-Process Interrupting	Start: Event Sub-Process Non-interrupting	Intermediate: Catching	Intermediate: Boundary Interrupting	Intermediate: Boundary Non-interrupting	Intermediate: Throwing	End
None: Untyped events, typically showing where the process starts or ends.	○						○	○
Message: Receiving and sending messages.	✉	✉	✉	✉	✉	✉	✉	✉
Timer: Cyclic timer events, points in time, time spans or timeouts.	🕒	🕒	🕒	🕒	🕒	🕒		
Escalation: Escalating to the next higher level of responsibility.		⌃	⌃		⌃	⌃	⌃	⌃
Conditional: Reacting to changed business conditions or integrating business rules.	☰	☰	☰	☰	☰	☰		
Link: Off-page connectors. Two corresponding link events equal a sequence flow.				→			→	
Error: Catching or throwing named errors.		↯			↯			↯
Cancel: Reacting to cancelled transactions or triggering cancellation.					⊗			⊗
Compensation: Handling or triggering compensation.		⏪			⏪		⏪	⏪
Signal: Signalling across different processes. A signal thrown can be caught multiple times.	△	△	△	△	△	△	▲	▲
Multiple: Catching one out of a set of events. Throwing all events defined	⬠	⬠	⬠	⬠	⬠	⬠	⬟	⬟
Parallel Multiple: Catching all out of a set of parallel events.	✚	✚	✚	✚	✚	✚		
Terminate: Triggering the immediate termination of a process.								●

Gateways

Exclusive Gateway
When splitting, it routes the sequence flow to exactly one of the outgoing branches. When merging, it awaits one incoming branch to complete before triggering the outgoing flow.

Event-based Gateway
Is always followed by catching events or receive tasks. Sequence flow is routed to the subsequent event/task which happens first.

Parallel Gateway
When used to split the sequence flow, all outgoing branches are activated simultaneously. When merging parallel branches it waits for all incoming branches to complete before triggering the outgoing flow.

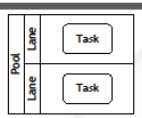
Inclusive Gateway
When splitting, one or more branches are activated. All active incoming branches must complete before merging.

Exclusive Event-based Gateway (instantiate)
Each occurrence of a subsequent event starts a new process instance.

Complex Gateway
Complex merging and branching behavior that is not captured by other gateways.

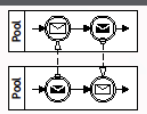
Parallel Event-based Gateway (instantiate)
The occurrence of all subsequent events starts a new process instance.

Swimlanes



Pools (Participants) and Lanes represent responsibilities for activities in a process. A pool or a lane can be an organization, a role, or a system. Lanes subdivide pools or other lanes hierarchically.

Message Flow symbolizes information flow across organizational boundaries. Message flow can be attached to pools, activities, or message events.



The order of message exchanges can be specified by combining message flow and sequence flow.

Data

A Data Input is an external input for the entire process. It can be read by an activity.

A Data Output is a variable available as result of the entire process.

A Data Object represents information flowing through the process, such as business documents, e-mails, or letters.

A Collection Data Object represents a collection of information, e.g. a list of order items.

Data Store

A Data Store is a place where the process can read or write data, e.g. a database or a filing cabinet. It persists beyond the lifetime of the process instance.

A Message is used to depict the contents of a communication between two Participants.

BPM Offensive Berlin · Hasso Plattner Institut · camunda · inubit · SIGNAVIO

Agenda

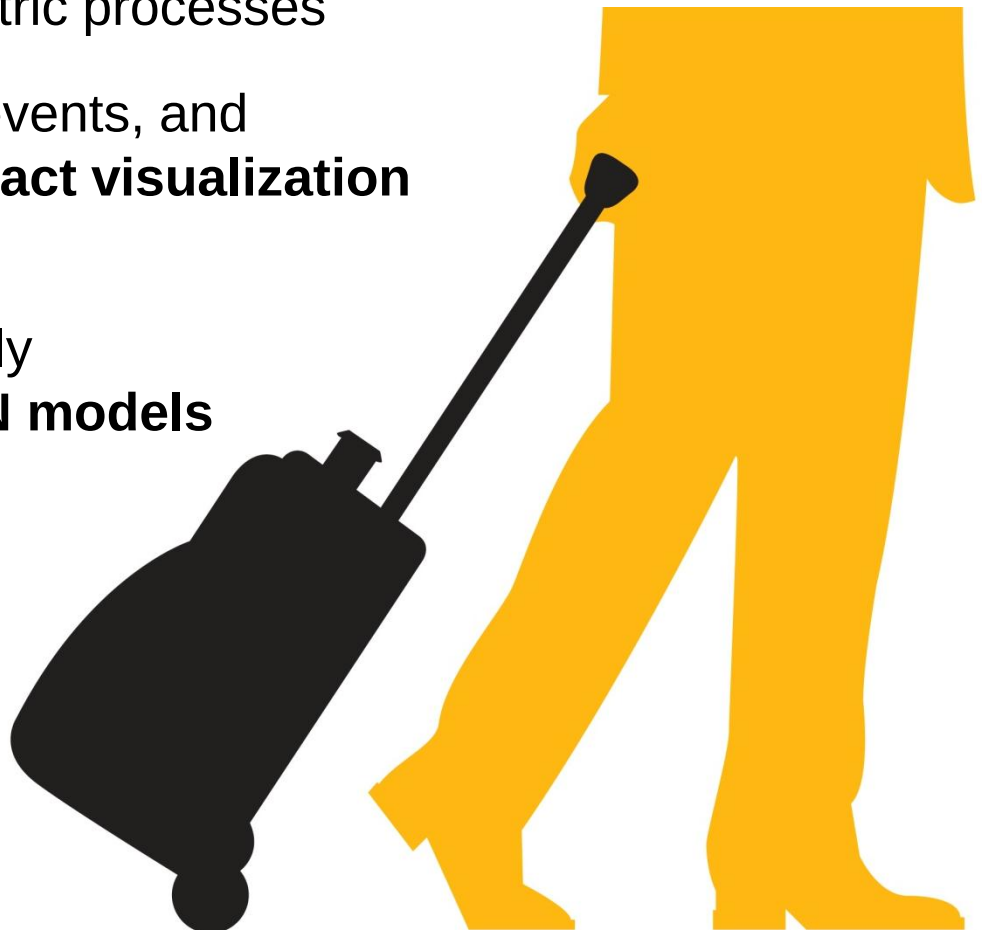
1. Taking a look at BPMN from an integration developer's point of view
2. BPMN usage in integration centric processes
3. Summary

Key Takeaways

BPMN is a **powerful** and **very expressive** notation, especially suited for integration centric processes

Collaboration diagrams, message events, and send/receive tasks support a **compact visualization** of integration scenarios

BPMN aware process engines finally allow **the execution of your BPMN models**



Coming Up

- **Prozessgesteuerte Anwendungen entwickeln und ausführen mit BPMN**
- dpunkt.verlag
- Approx. 400 pages
- **ISBN** 978-3-86490-007-5
- Estimated publication date: **October 2012**

Vielen Dank!

Dr. Volker Stiehl
SAP AG

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