Lecture 3

Process Modelling (part 1)

Learning Objectives

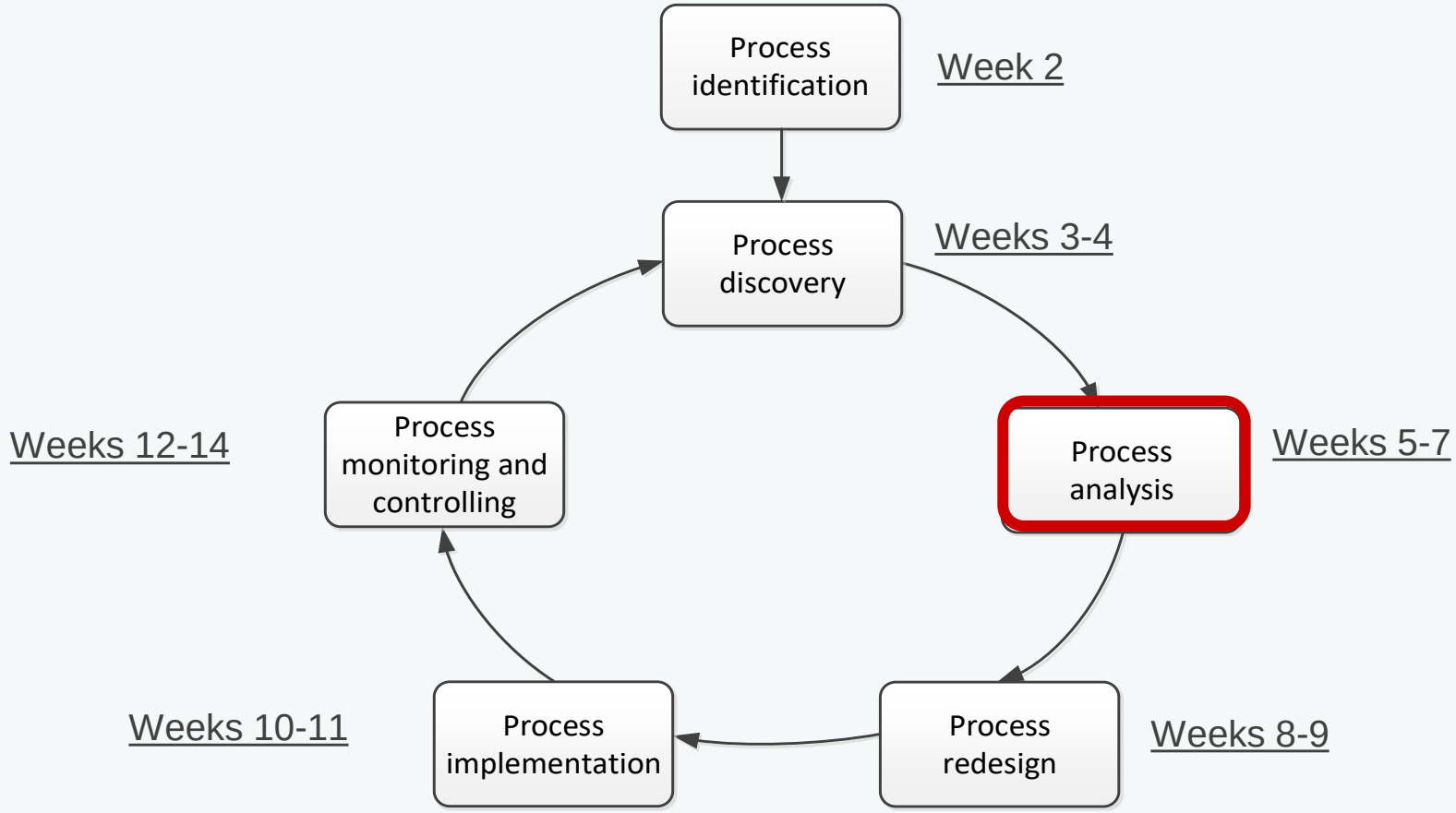
- Understand key concepts of business processes, and the importance of systematically managing such processes to improve organizational performance
- Identify and document business processes at different levels of detail using contemporary process modelling techniques

Content

Process Modelling

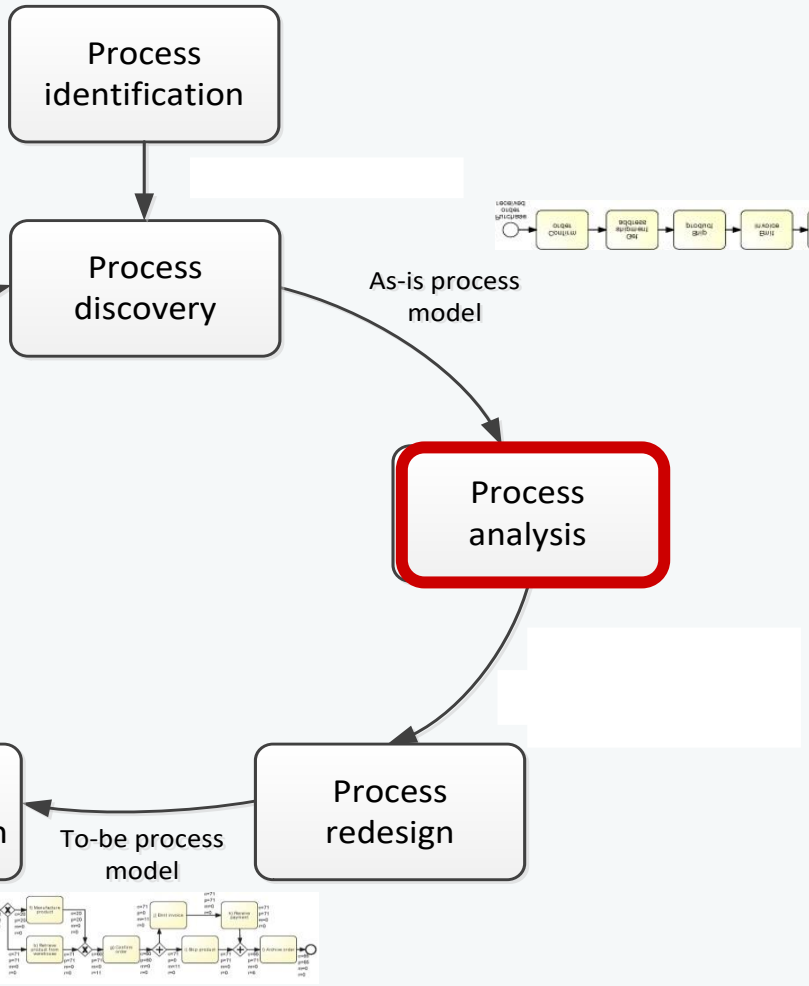
- Describe the essential concepts of process models, namely how process models relate to process instances.
- Definition of the Process Architecture.
- Explain the four main structural blocks of branching and merging in process
  models. These define exclusive decisions, parallel execution, inclusive decisions, and repetition
- Learn how to use sub-processes to reduce
  the model's complexity, and how to reuse these sub-process models from within different process models
- Exercise 3 -4

Course structure



Purposes of process modeling

- Communication
- Documentation
- Analysis (e.g. simulation)



MAPPING, ABSTRACTION, AND PURPOSE OF A MODEL

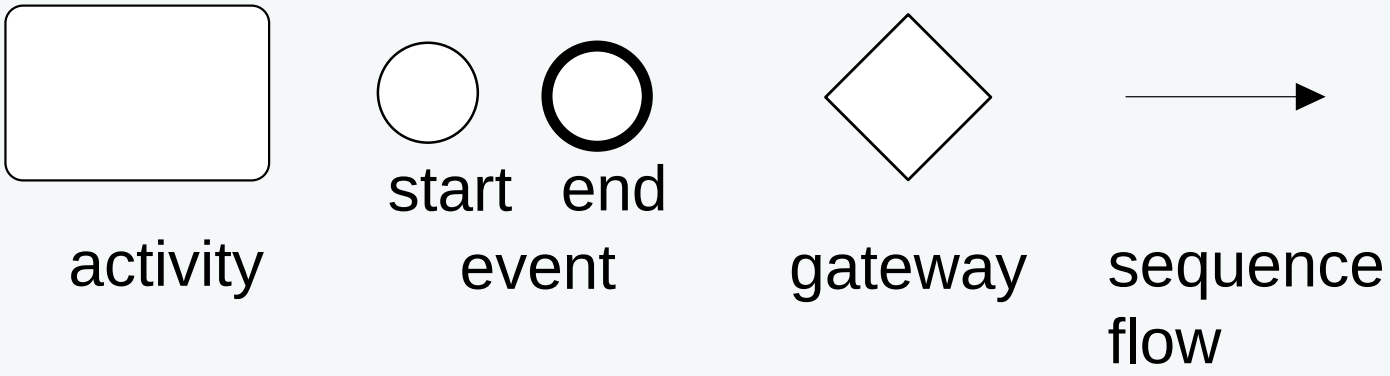
- A model is characterized by three properties: mapping, abstraction, and purpose.
- First, a model implies a mapping of a real-world phenomenon—the modeling subject
- Second, a model only documents relevant aspects of the subject, i.e. it abstracts from certain details that are irrelevant.
- Third, a model serves a particular purpose, which determines the aspects of reality to omit when creating a model.

Business Process Model and Notation (BPMN)

- The Object Management Group (OMG) standard
- Suitable for capturing models for process discovery, analysis, and implementation
- Supported by numerous tools, incl.
  - Apromore **– available for free to students in this course (see Slack)**
  - GBTEC BIC Design
  - Bizagi Process Modeler (free)
  - Signavio (academic version: academic.signavio.com)

BPMN from 10,000 miles…

A BPMN process model is a graph consisting of four types of **core elements**:



Let’s start modelling

Order-to-cash

An order-to-cash process is triggered by the receipt of a purchase order from a customer. Upon receipt, the purchase order has to be checked against the stock to determine if the the requested item(s) are available. Depending on stock availability the purchase order may be confirmed or rejected.

If the purchase order is confirmed, an invoice is emitted and the goods requested are shipped. The process completes by archiving the order.

Let's start modelling – break it down

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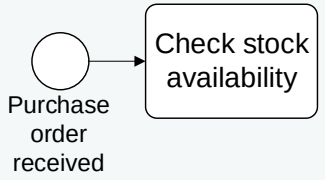
BPMN Model

Order-to-cash



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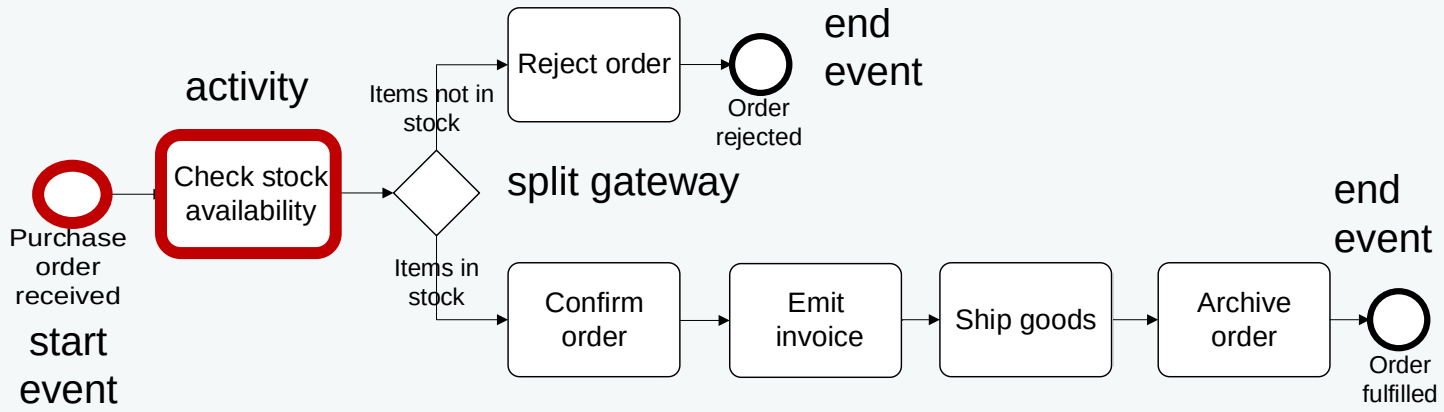
BPMN Model

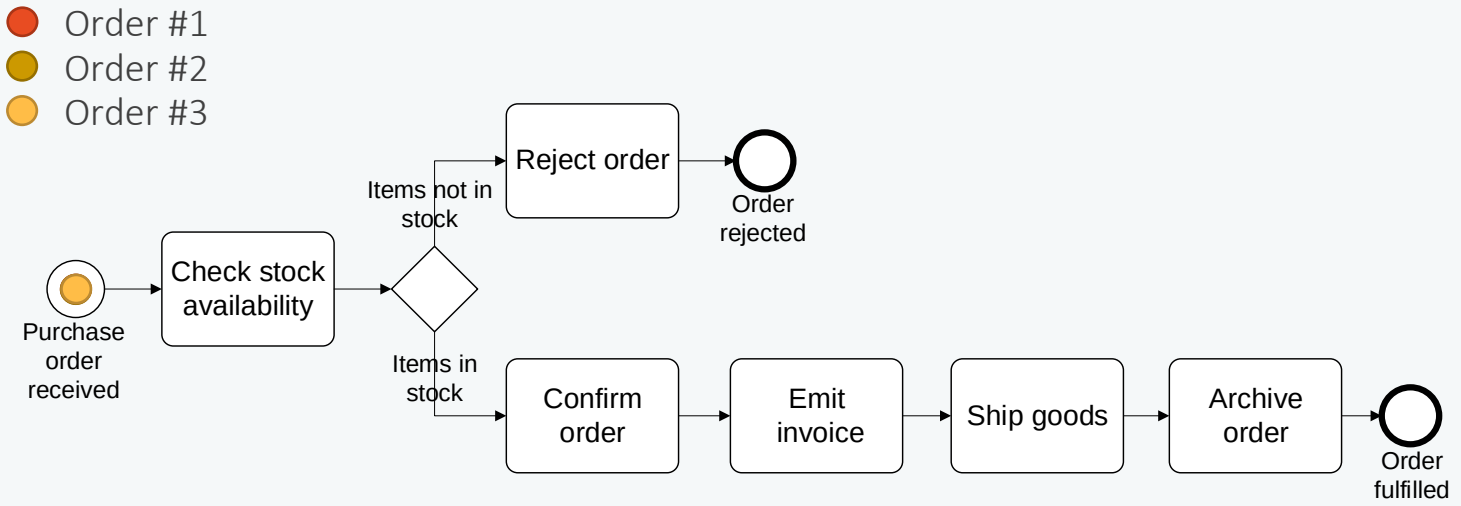
Order-to-cash



Naming conventions

- Event: noun + past-participle verb (e.g. insurance claim lodged)
- Activity: verb + noun (e.g. assess credit risk)

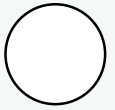
Execution of a process model
The “token game”



the difference between design-time and run-time

A little bit more on events…

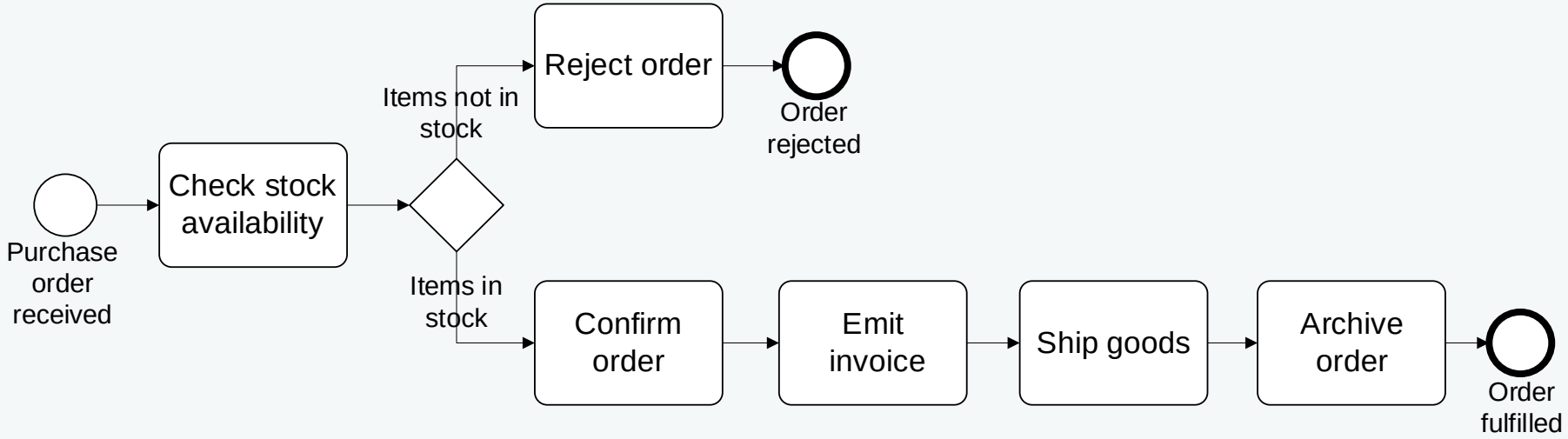
A *start event* triggers a new process instance by generating a token that traverses the sequence flow (“tokens source”)



An *end event* signals that a process instance has completed with a given outcome by consuming a token (“tokens sink”)

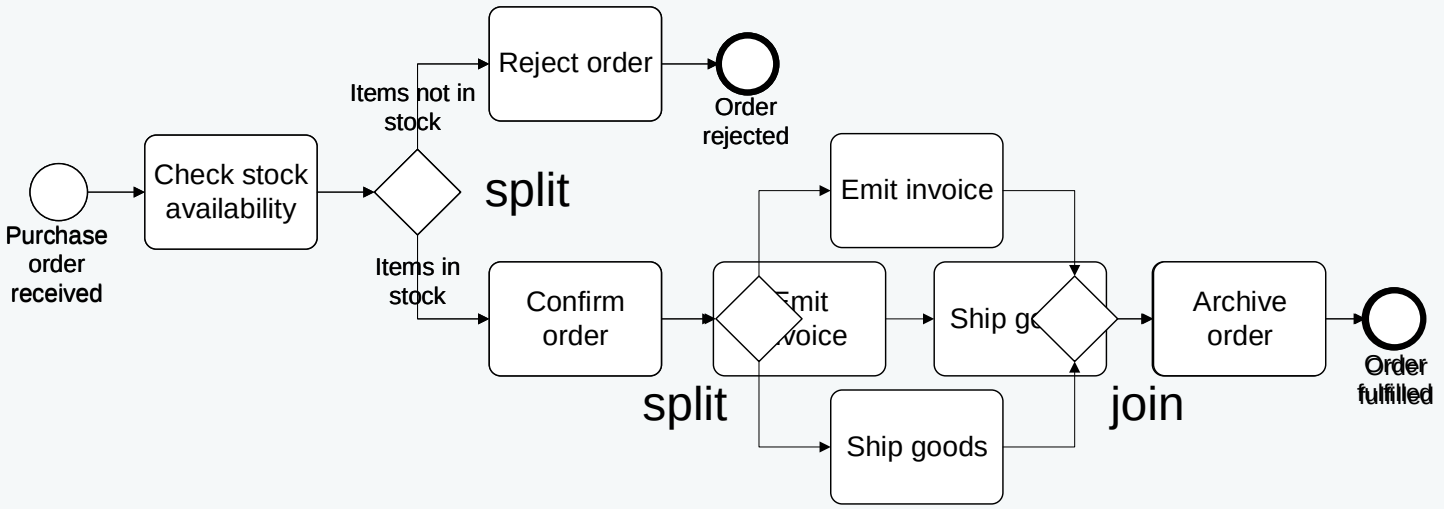
Order-to-cash example revisited…

[…] If the purchase order is confirmed, **an invoice is emitted and the goods requested are shipped (in any order)**. The process completes by archiving the order. […]



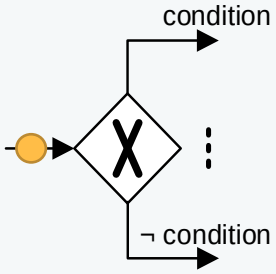
First try

Order-to-cash

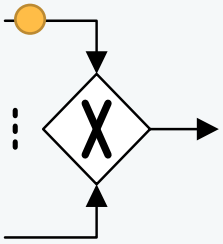


A little more on gateways: XOR Gateway

An *XOR Gateway* captures decision points (XOR-split) and points where alternative flows are merged (XOR-join)



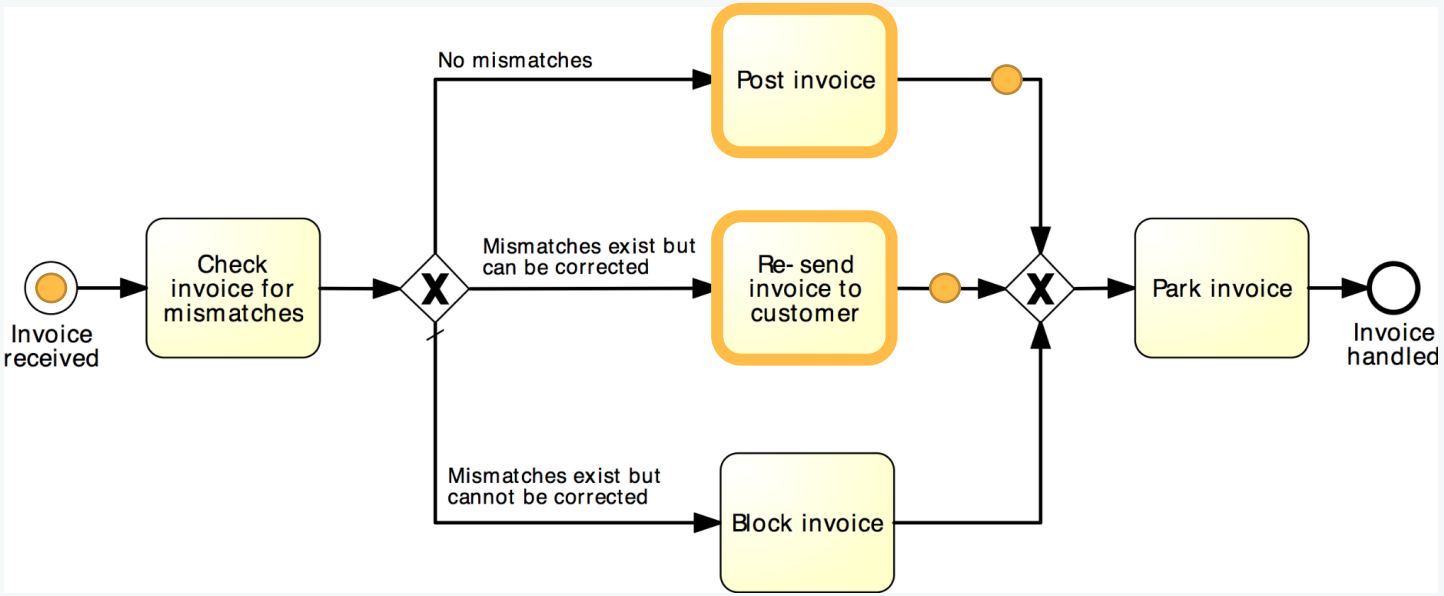
XOR-split ➔ takes **one** outgoing branch



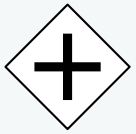
XOR-join ➔ proceeds when **one** incoming branch has completed

Example: XOR Gateway

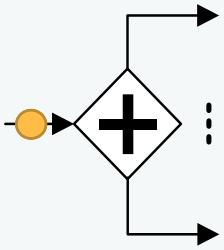
Invoice checking process



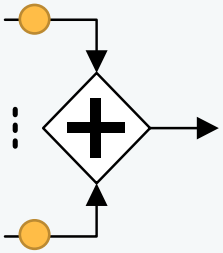
A little more on gateways: AND Gateway



An *AND Gateway* provides a mechanism to create and synchronize “parallel” flows.



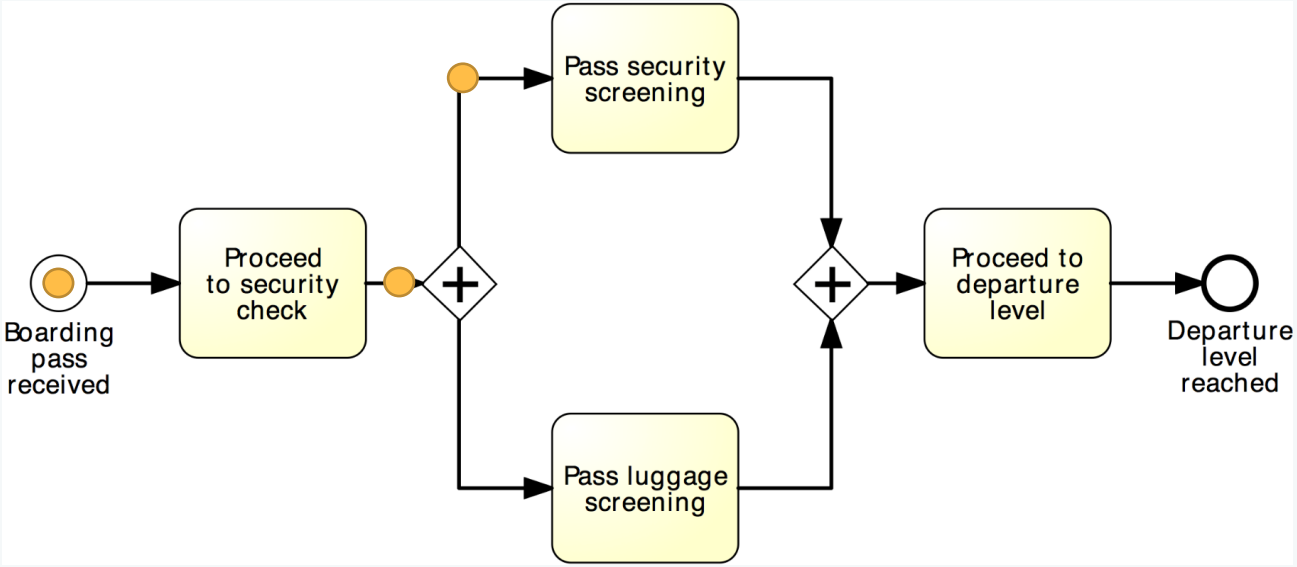
AND-split ➔ takes **all** outgoing branches



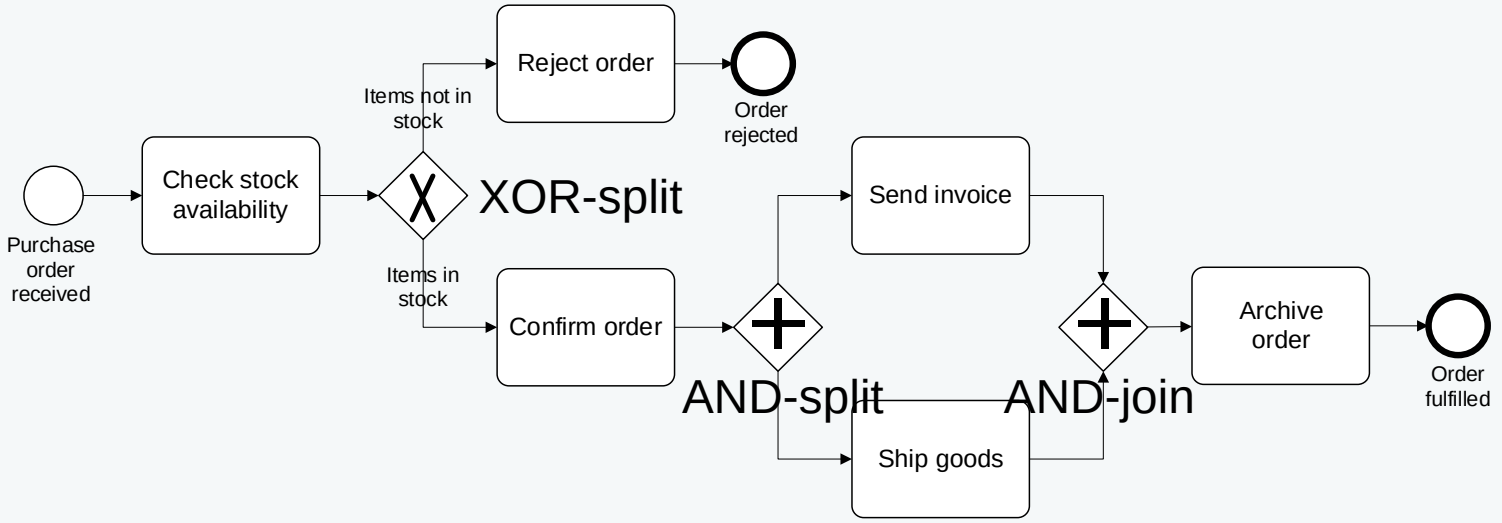
AND-join ➔ proceeds when **all** incoming branches have completed

Example: AND Gateway

Airport security check



Revised order-to-cash process model



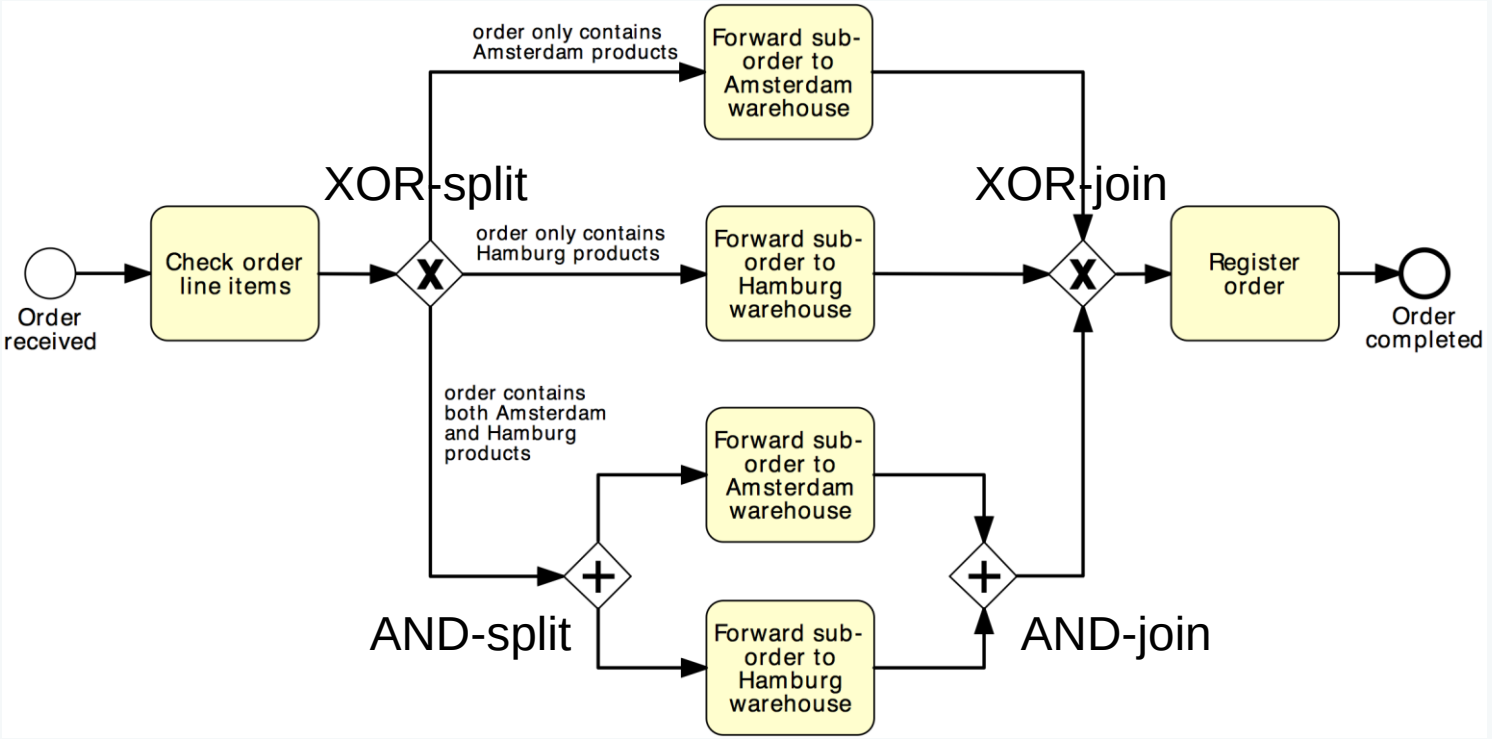
Between XOR and AND

Order distribution process

A company has two warehouses that store different products: Amsterdam and Hamburg. When an order is received, it is distributed across these warehouses: if some of the relevant products are maintained in Amsterdam, a sub-order is sent there; likewise, if some relevant products are maintained in Hamburg, a sub-order is sent there. Afterwards, the order is registered and the process completes.

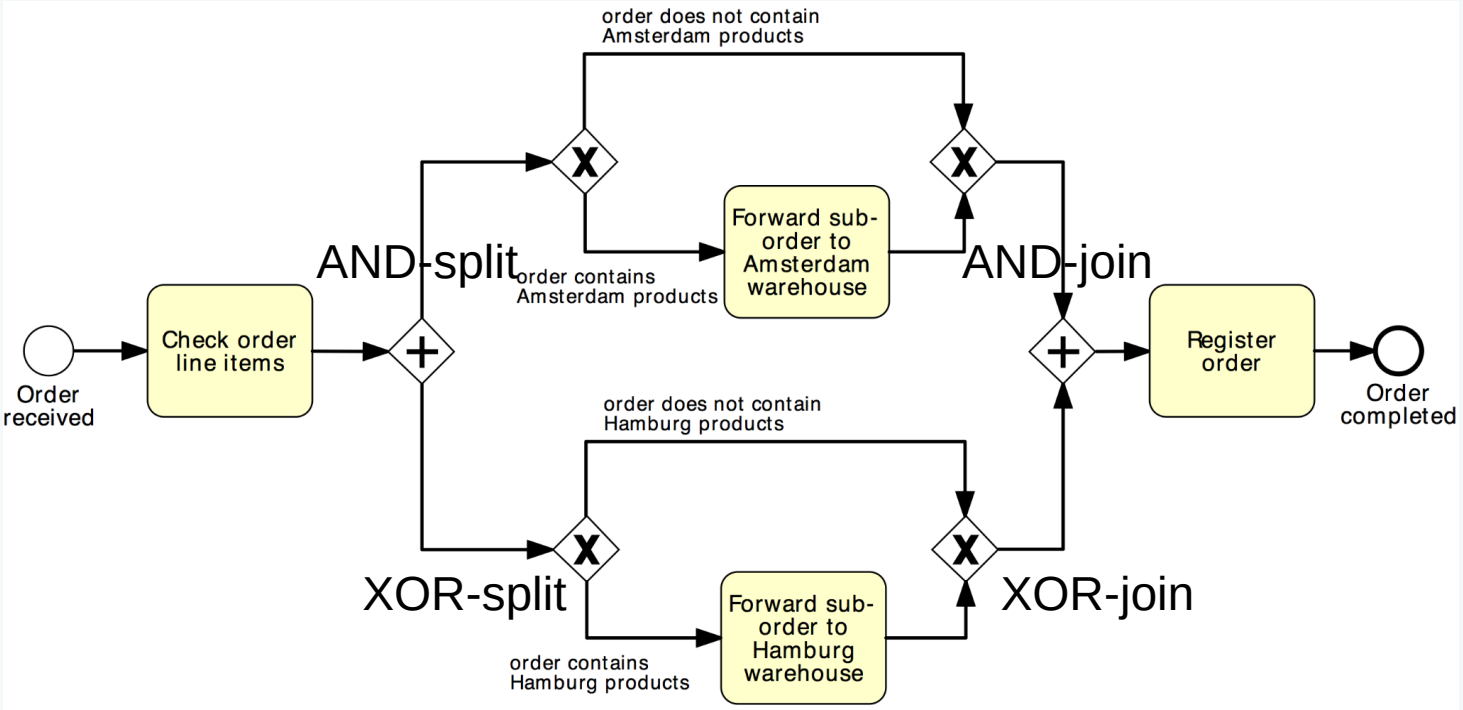
Solution 1

Order distribution process

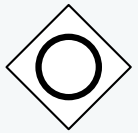


Solution 2

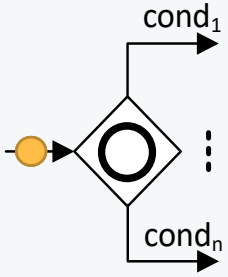
Order distribution process



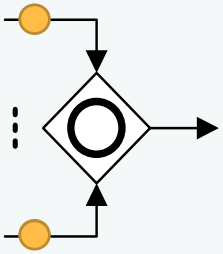
OR Gateway



An *OR Gateway* provides a mechanism to create and synchronize n out of m parallel flows.



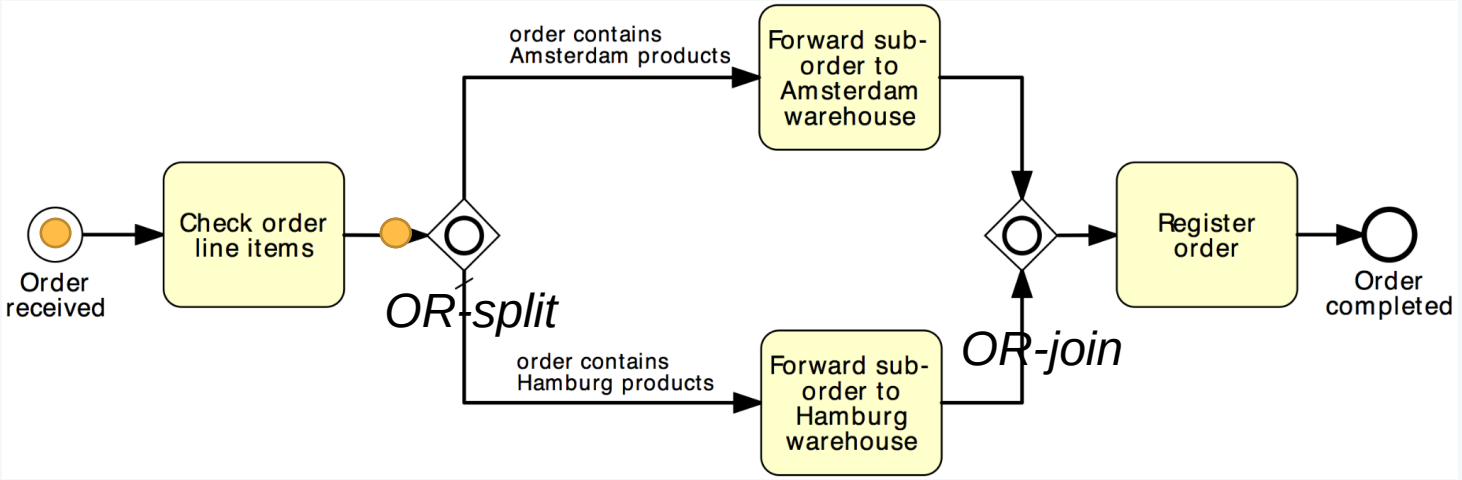
OR-split ➔ takes one or more branches depending on conditions



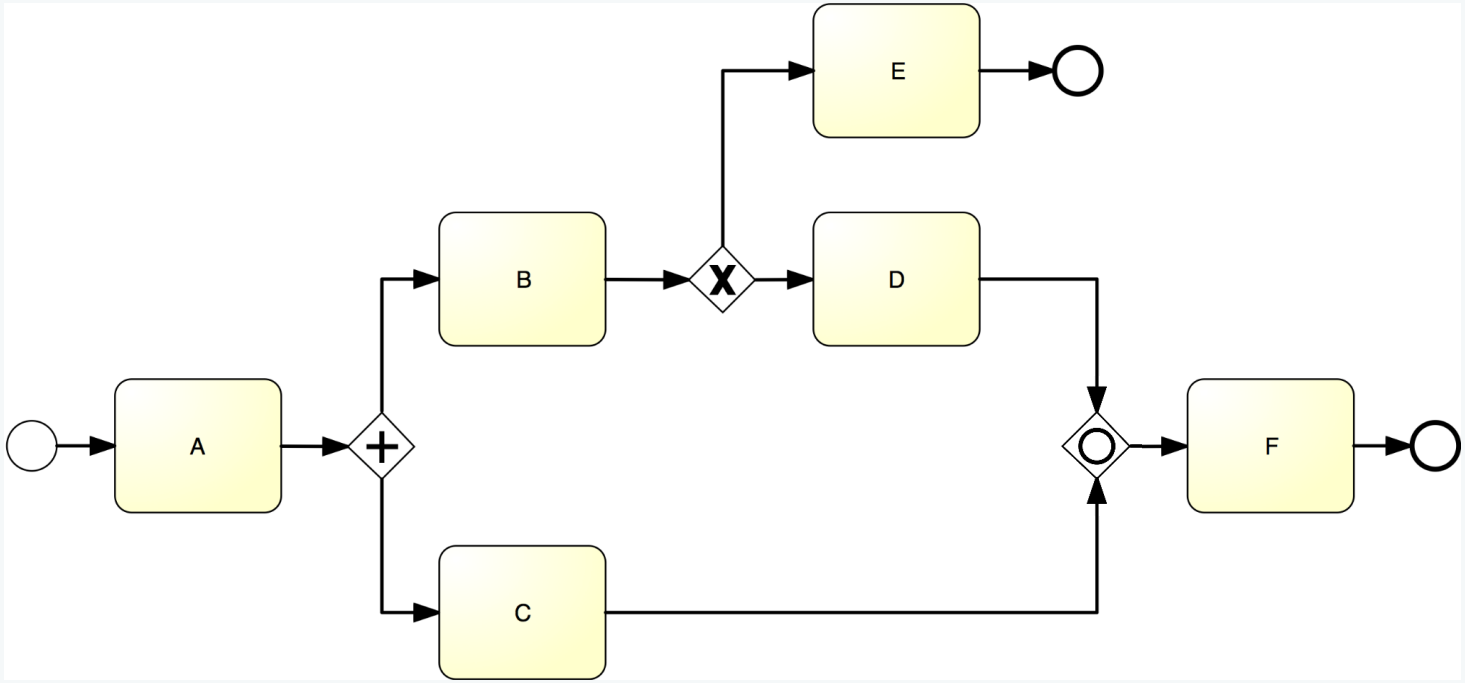
OR-join ➔ proceeds when all **active** incoming branches have completed

Solution using OR Gateway

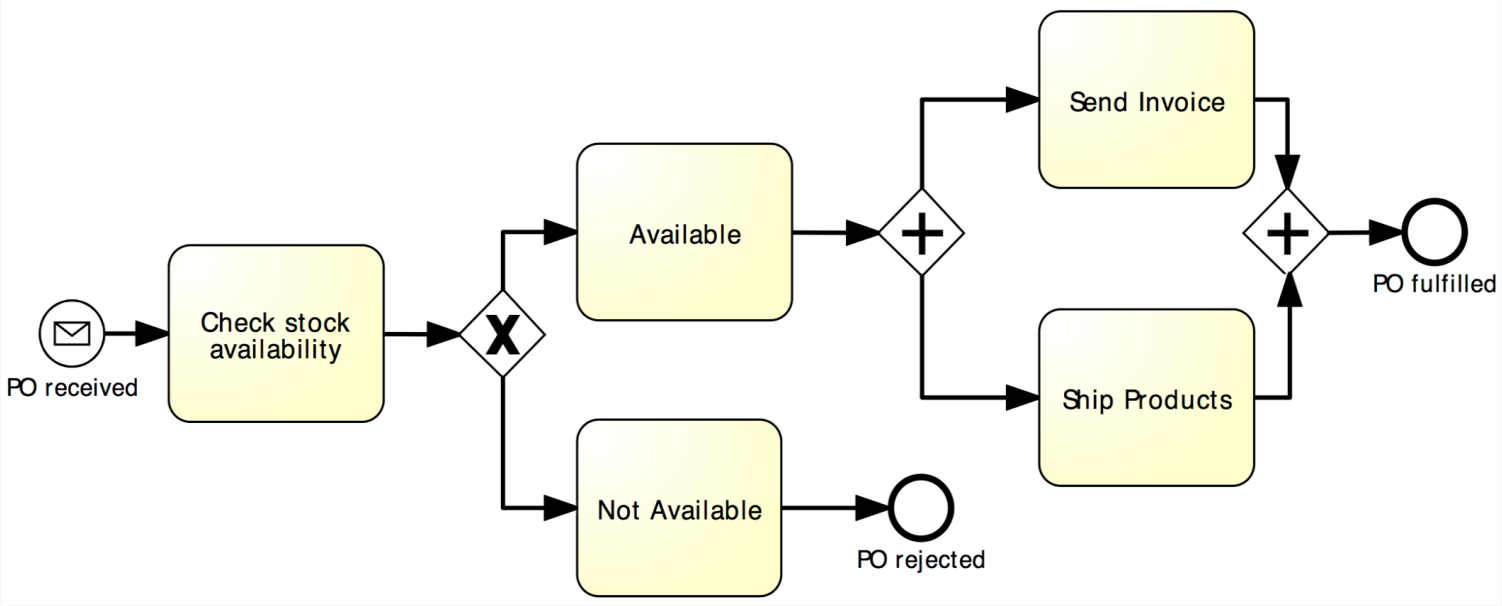
Order distribution process



What join type do we need here?



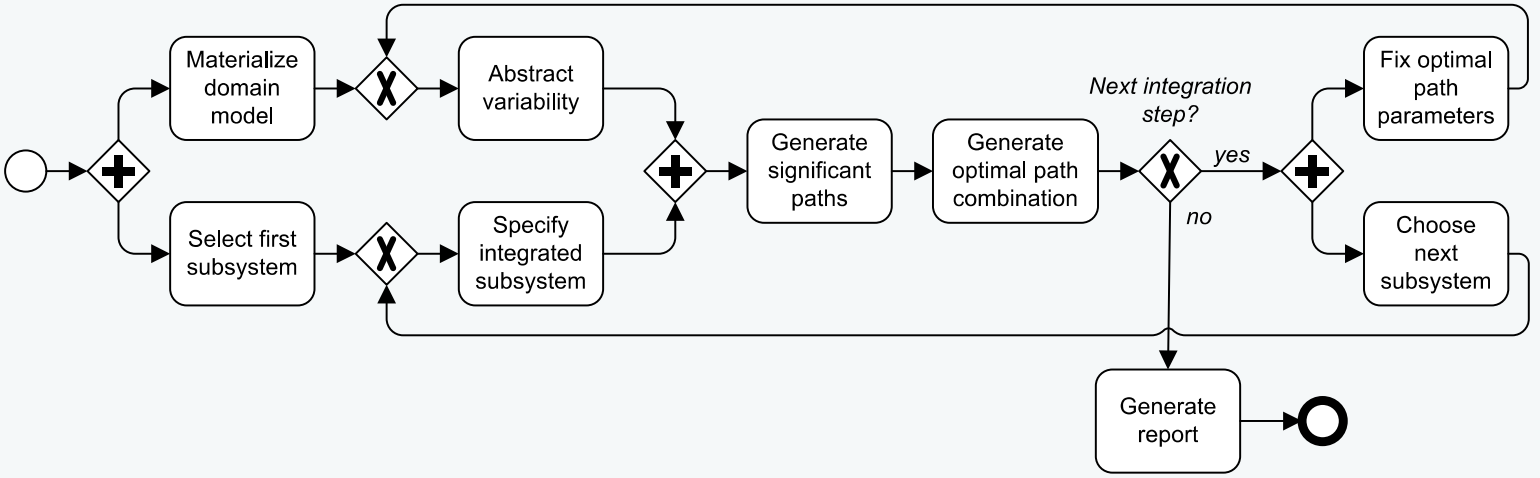
Beware: Beginner's Mistake…

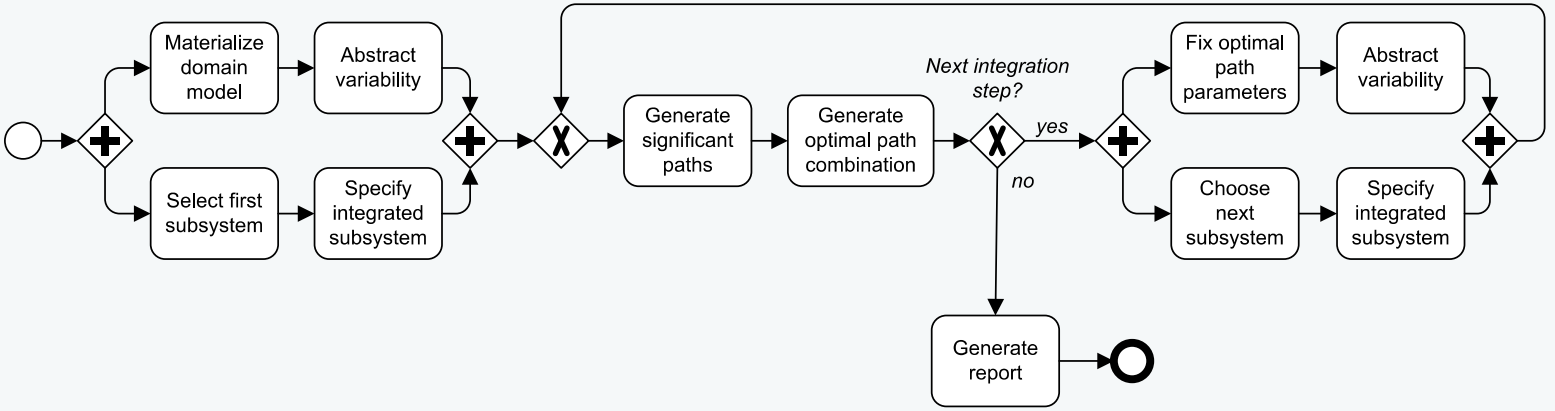


Guidelines: Naming Conventions

1. Give a name to every event and task
2. For tasks: verb followed by business object name and possibly a complement
   - **Issue Driver Licence**, **Renew Licence via Agency**
3. For message events: object + past participle
   - Invoice received, Claim settled
4. Avoid generic verbs such as Handle, Record…
5. Label each XOR-split with a condition
   - Policy is invalid, Claim is inadmissible

Poll: Which model do you prefer?





One more guideline…

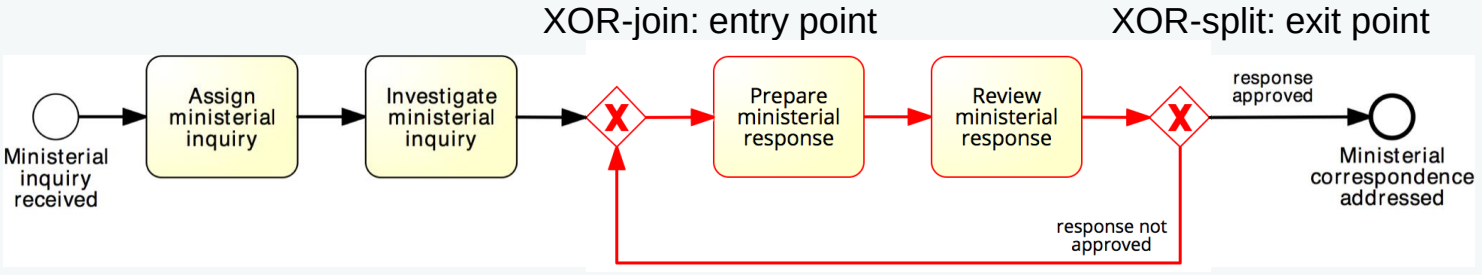
- Model in blocks
  - Pair up each AND-split with an AND-join and each XOR-split with a XOR-join, whenever possible
  - **Exception:** sometimes a XOR-split leads to two end events – different outcomes (cf. order management example)

Rework and repetition

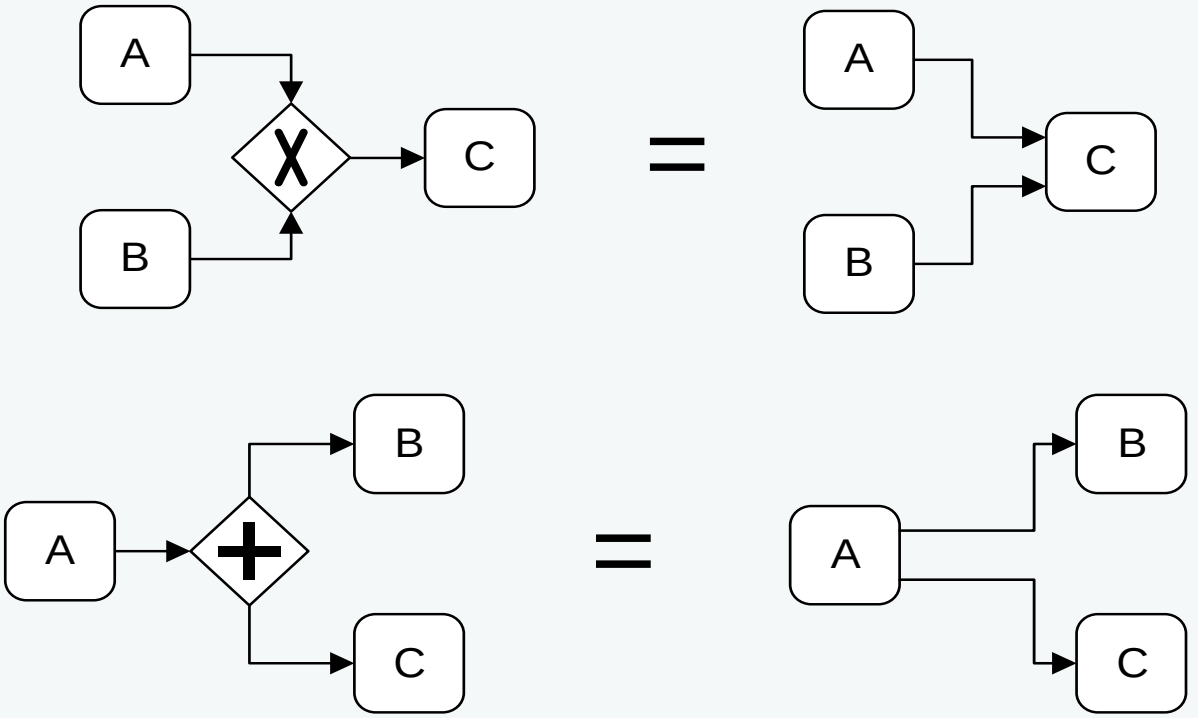
Address ministerial correspondence

In the minister's office, when a ministerial inquiry has been received, it is registered into the system. Then the inquiry is investigated so that a ministerial response can be prepared.

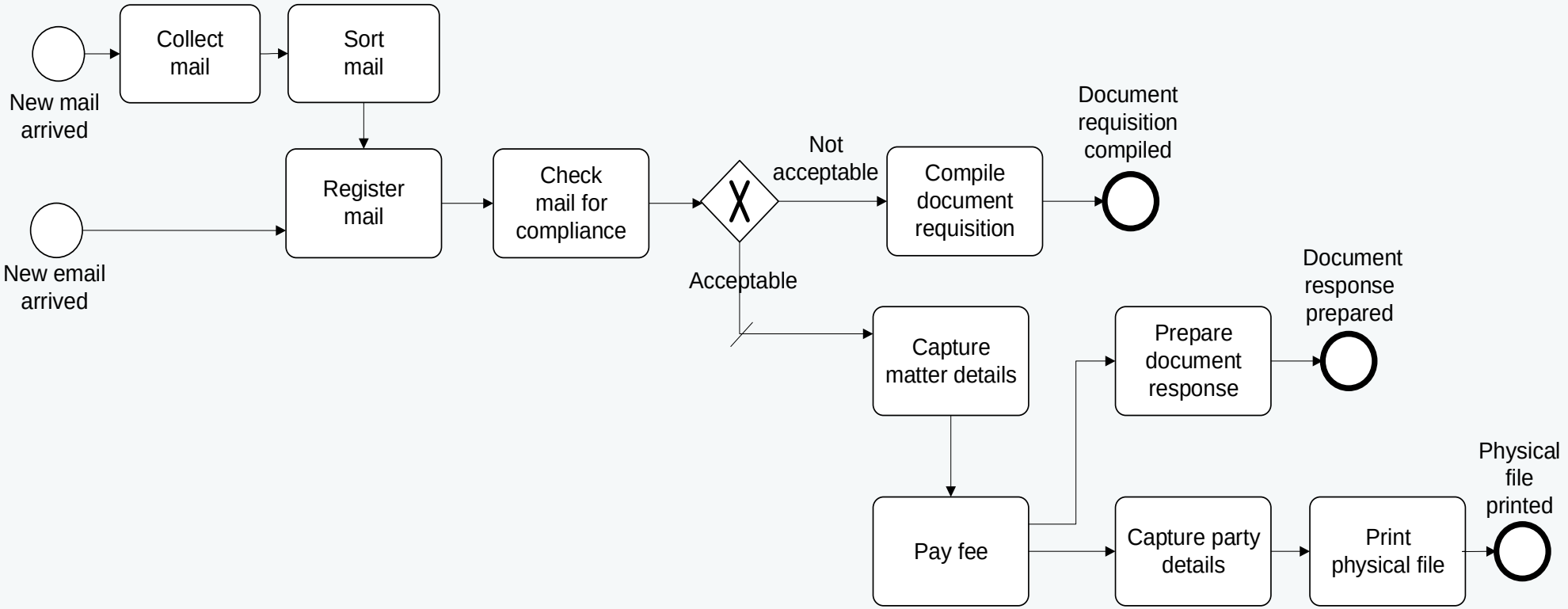
The finalization of a response includes the preparation of the response itself by the cabinet officer and the review of the response by the principal registrar. If the registrar does not approve the response, the latter needs to be prepared again by the cabinet officer for review. The process finishes only once the response has been approved.



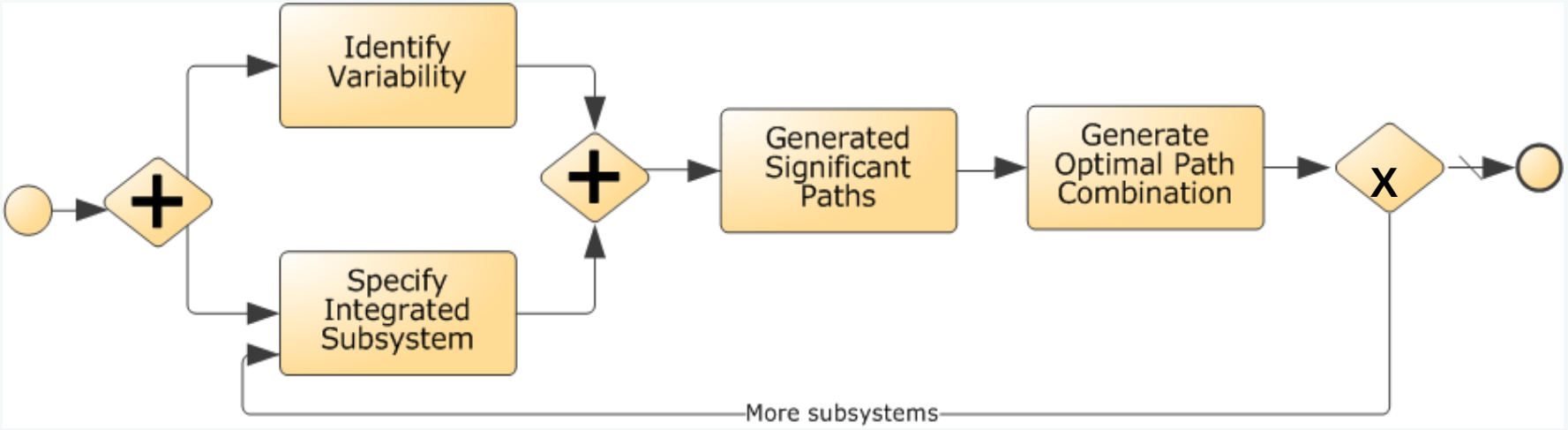
Quick Note: Implicit vs. explicit gateways



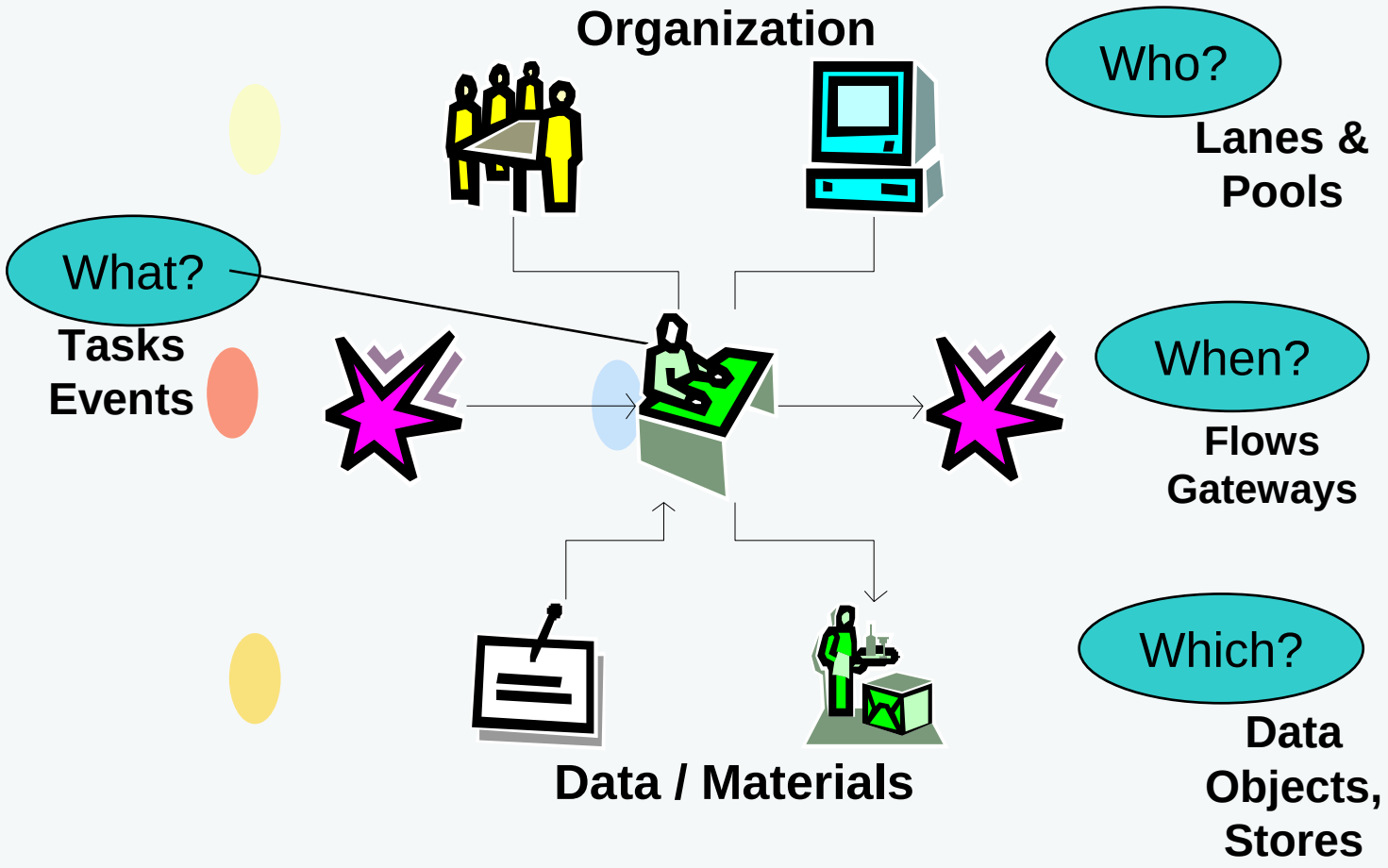
How this process starts? How it ends?



What's wrong with this model? How to fix it?



Process Modelling Viewpoints



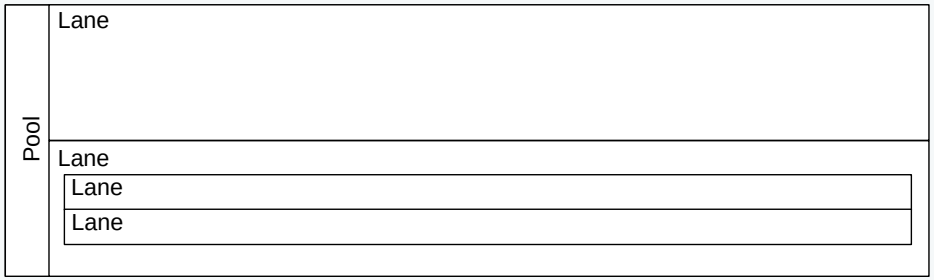
Organizational Elements in BPMN – Pools & Lanes

Pool

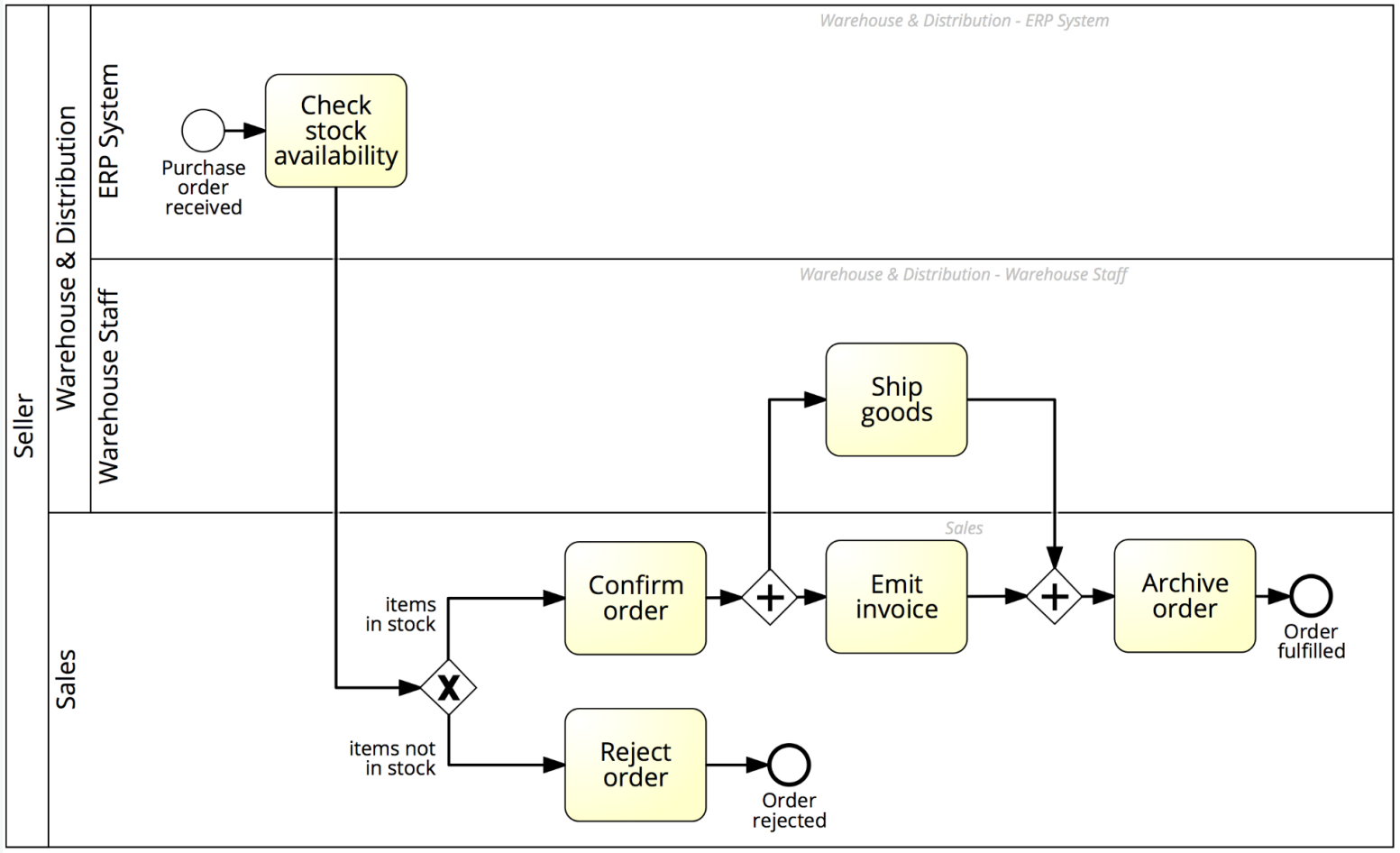
Captures a resource class. Generally used to model a business party (e.g. a whole company)

Lane

A *resource sub-class* within a pool. Generally used to model departments (e.g. shipping, finance), internal roles (e.g. Manager, Associate), software systems (e.g. ERP, CRM)



Order-to-cash process with lanes

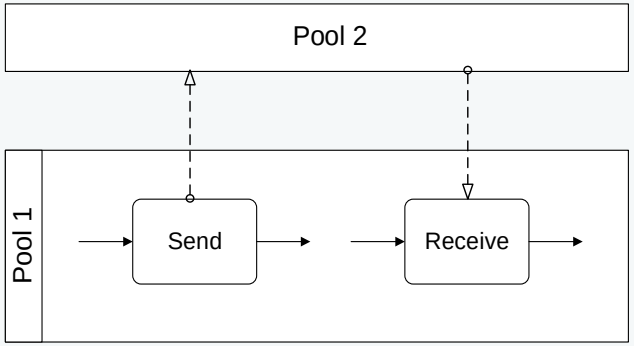


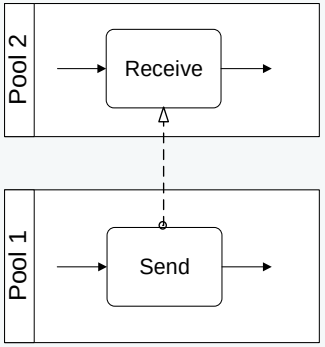
Message Flow

A *Message Flow* represents a flow of information between two process parties (Pools)

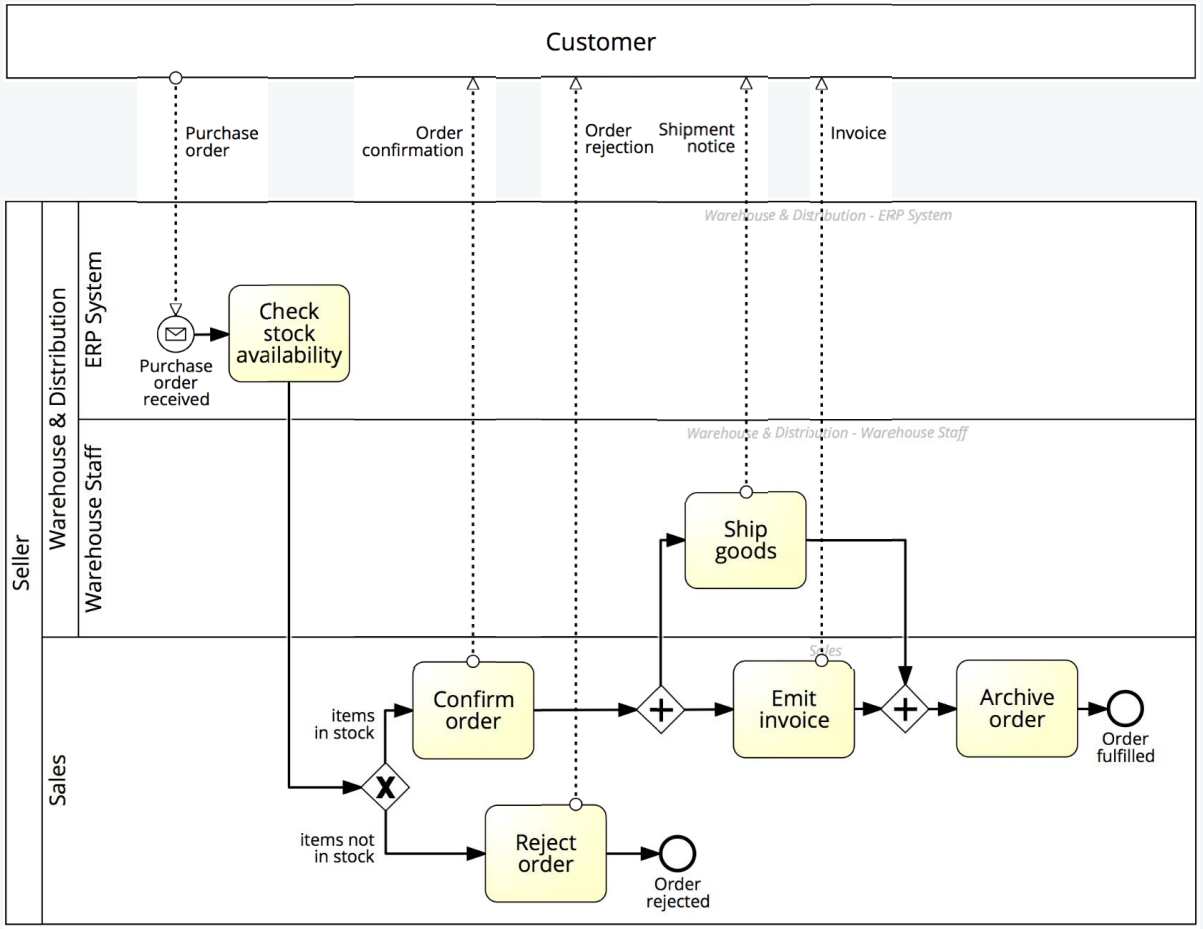
A Message Flow can connect:

- directly to the boundary of a Pool ➔ captures an *informative* message to/from that party
- to a specific activity or event within that Pool ➔ captures a message that triggers a specific activity/event within that party



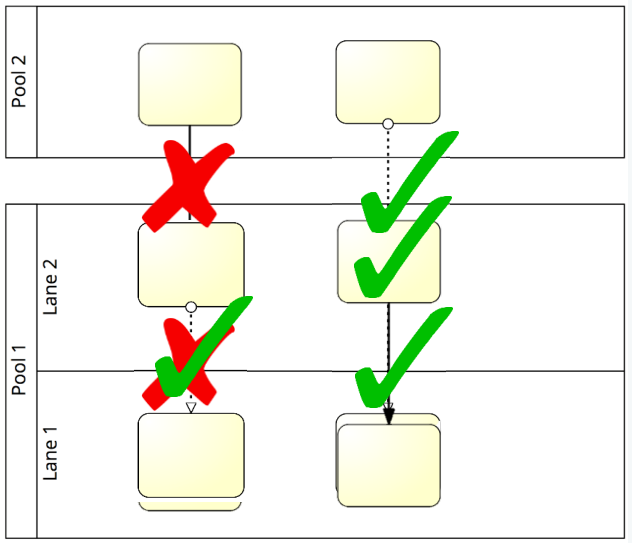


Order-to-cash process with a black-box customer pool



Pools, Lanes and Flows: syntactic rules

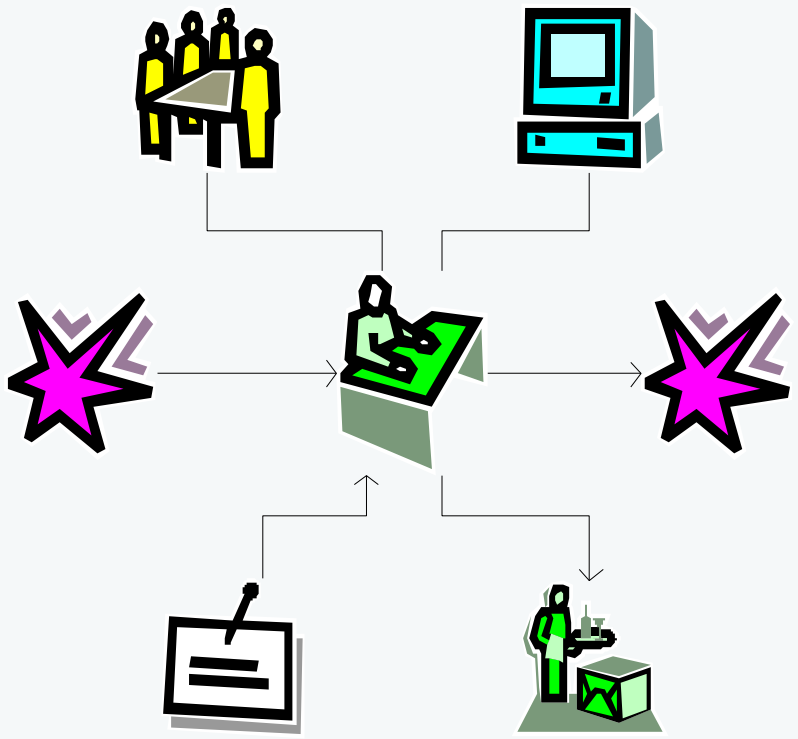
1. A Sequence Flow **cannot** cross the boundaries of a Pool (message flows can)
2. Both Sequence Flow and Message Flow **can cross** the boundaries of Lanes
3. A Message Flow **cannot connect** two flow elements within the same pool



One more guideline…

- Start modeling with one single “white-box” pool
  - Initially, put the events and tasks in only one pool – the pool of the party who is running the process
  - Leave all other pools “black-boxed”
  - Once you have modeled this way, and once the process diagram inside the white-box pool is complete, you can model the details (events and tasks) in the other pools if that is useful.
  - In this course we will only model processes with one single white-box pool – all other pools are black-box

Process Modelling Viewpoints

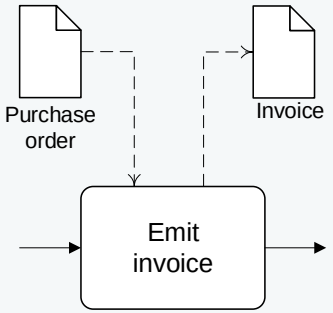


Data / Materials

Which?

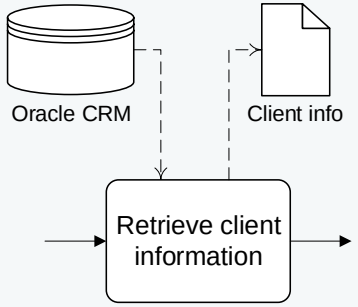
Data
Objects,
Stores

BPMN Information Artifacts



A *Data Object* captures an artifact required (input) or produced (output) by an activity.

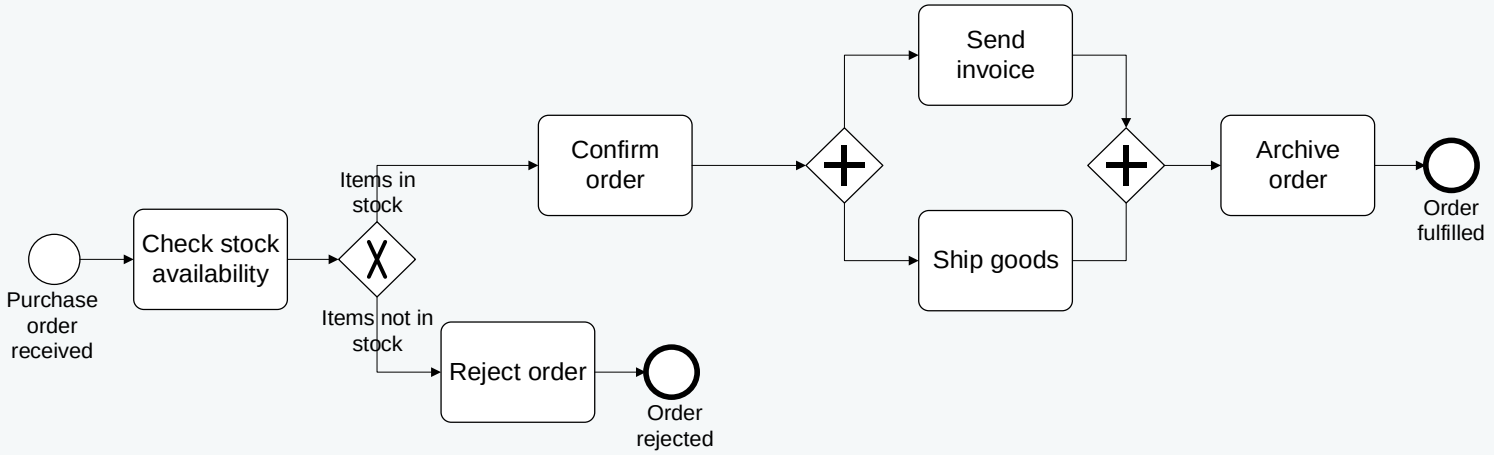
- Can be physical or electronic



A *Data Store* is a place containing data objects that must be persisted beyond the duration of a process instance.

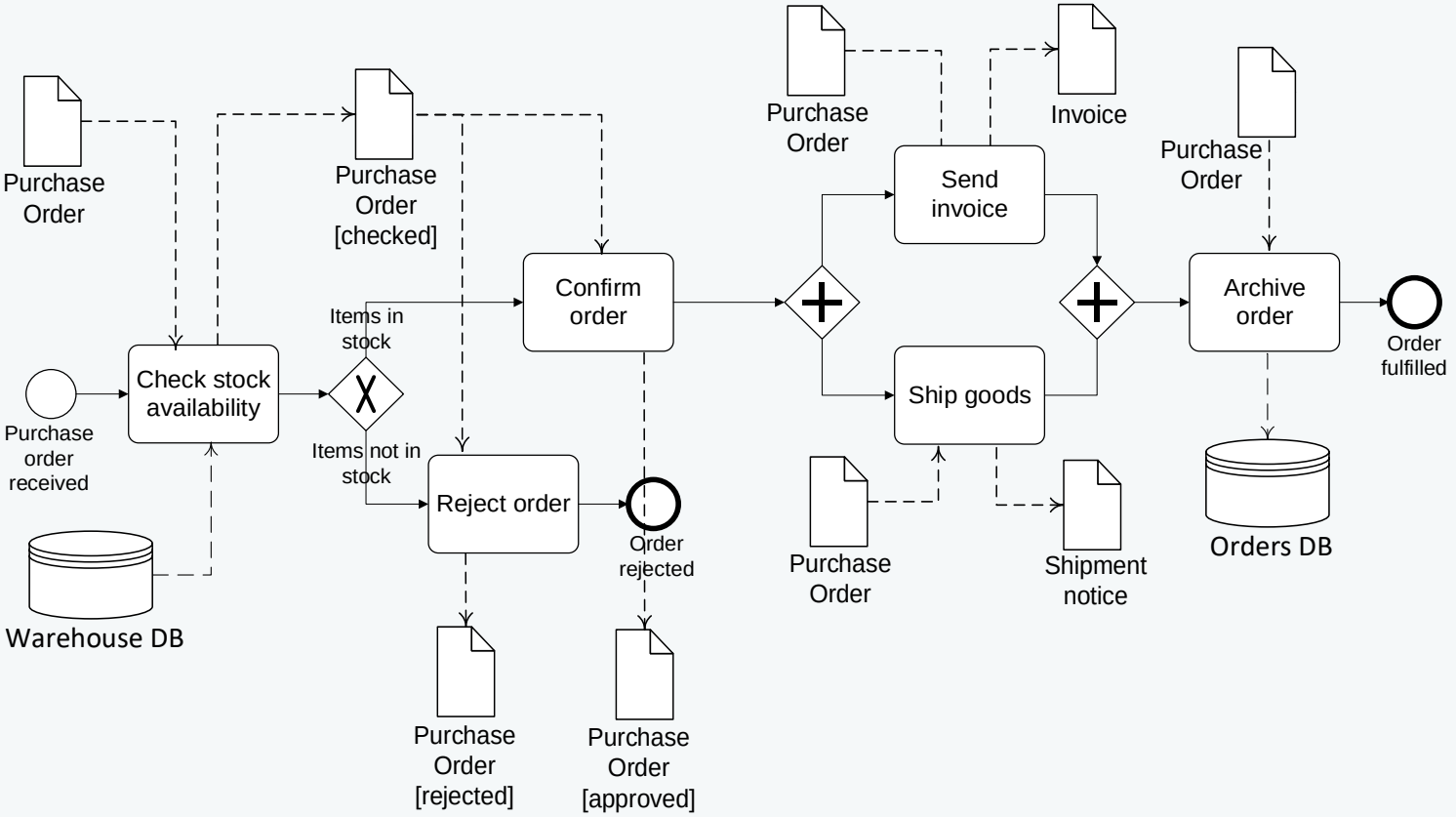
It is used by an activity to store (as output) or retrieve (as input) data objects.

Order-to-cash process, again



The purchase order document serves as an input to the stock availability check. Based on the outcome of this check, the status of the document is updated, either to “approved” or “rejected”. If the order is approved, an invoice and a shipment notice are produced.

Model with information artifacts



Beware: This diagram is a too detailed. It is for illustration purposes.
In practice, try to only model the most important data objects and associations.
Keep the model readable.

A Final Note: BPMN Text Annotations

A *Text Annotation* is a mechanism to provide additional text information to the model reader

- **Doesn't affect** the flow of tokens through the process

BPMN Poster (link in “Readings” page)