

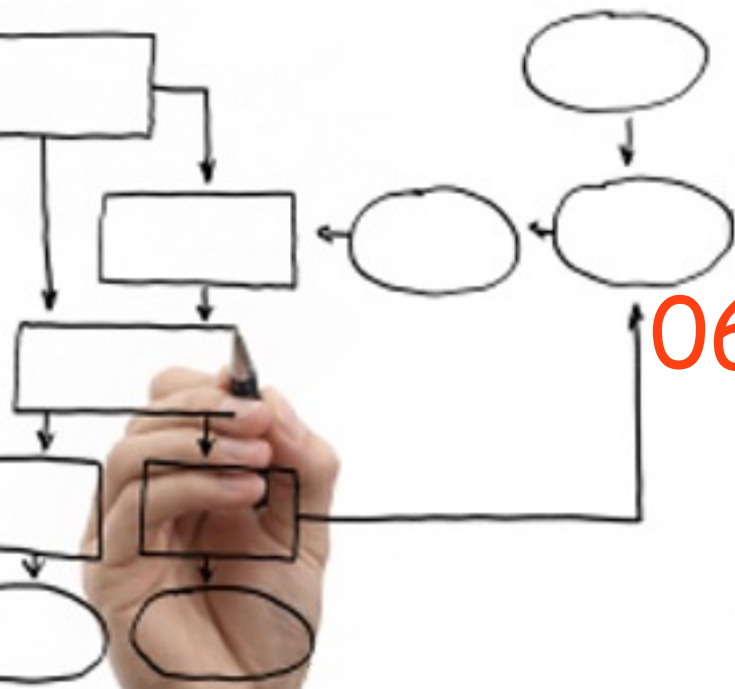
Business Processes Modelling

MPB (6 cfu, 295AA)

Roberto Bruni

<http://www.di.unipi.it/~bruni>

06 - Orchestration, collaboration



Why do we need diagrams?

Graphical languages **communicate** concepts

Careful selection of symbols

shapes, colors, arrows

(the alphabet is necessary for communication)

Greatest common denominator of the people involved

Intuitive meaning

(verbal description, no math involved)

Why do we need diagrams?

People remember:



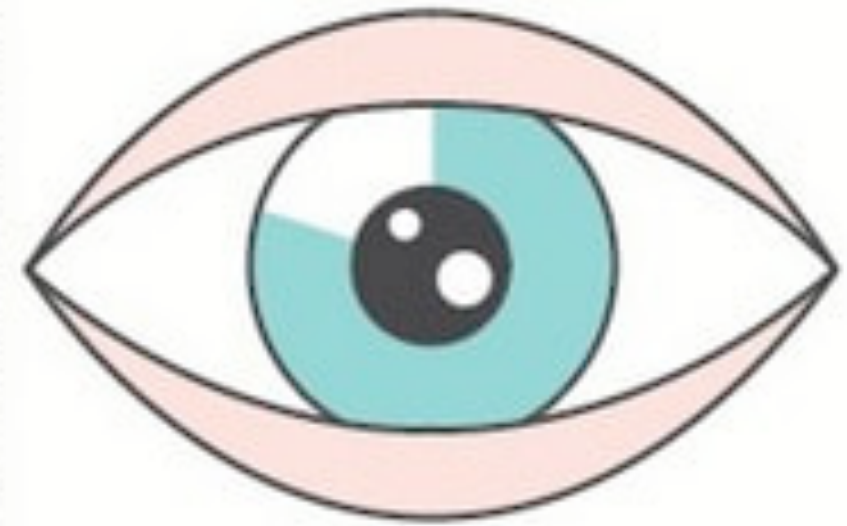
10%

of what they **HEAR**



20%

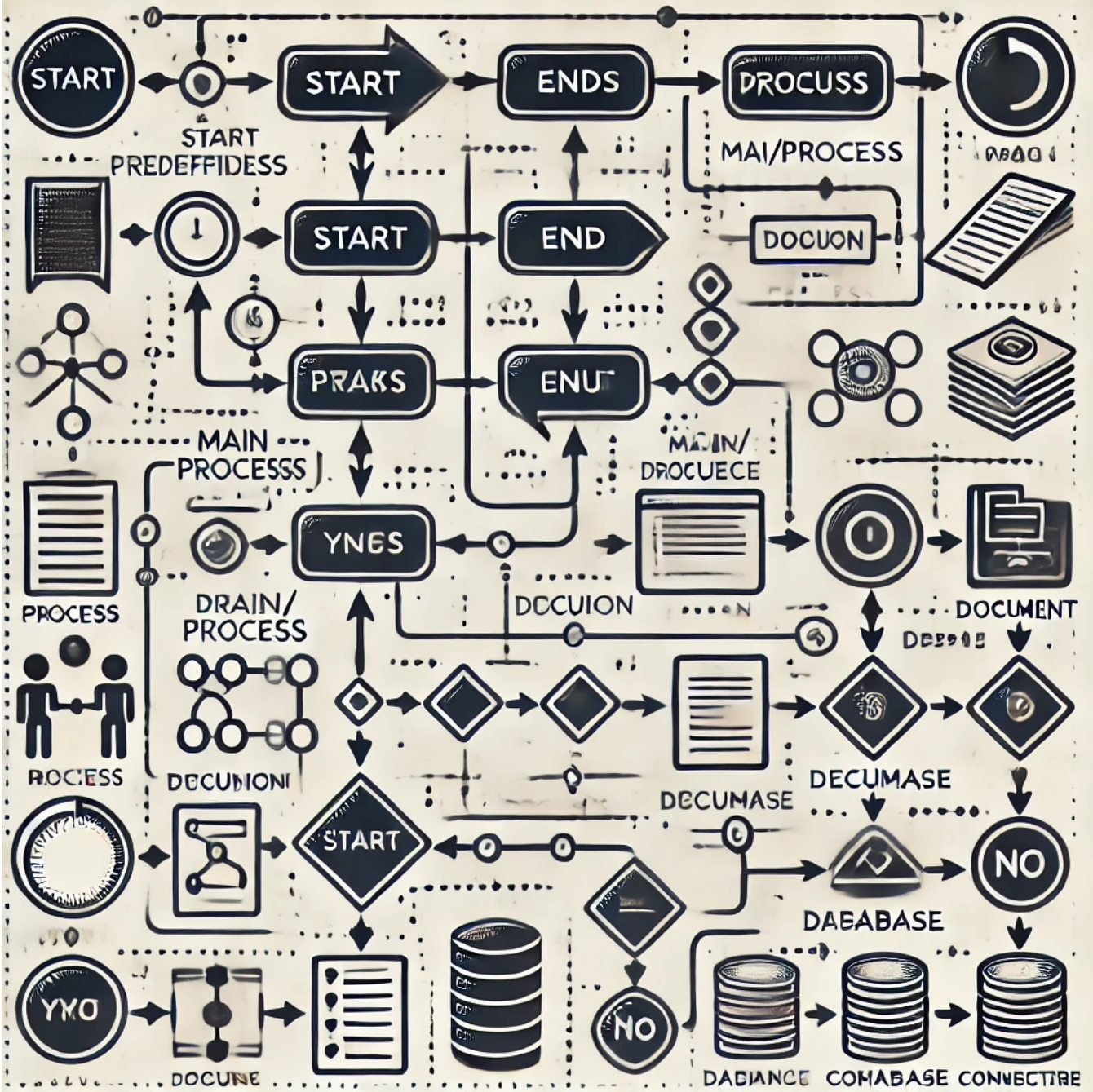
of what they **READ**



80%

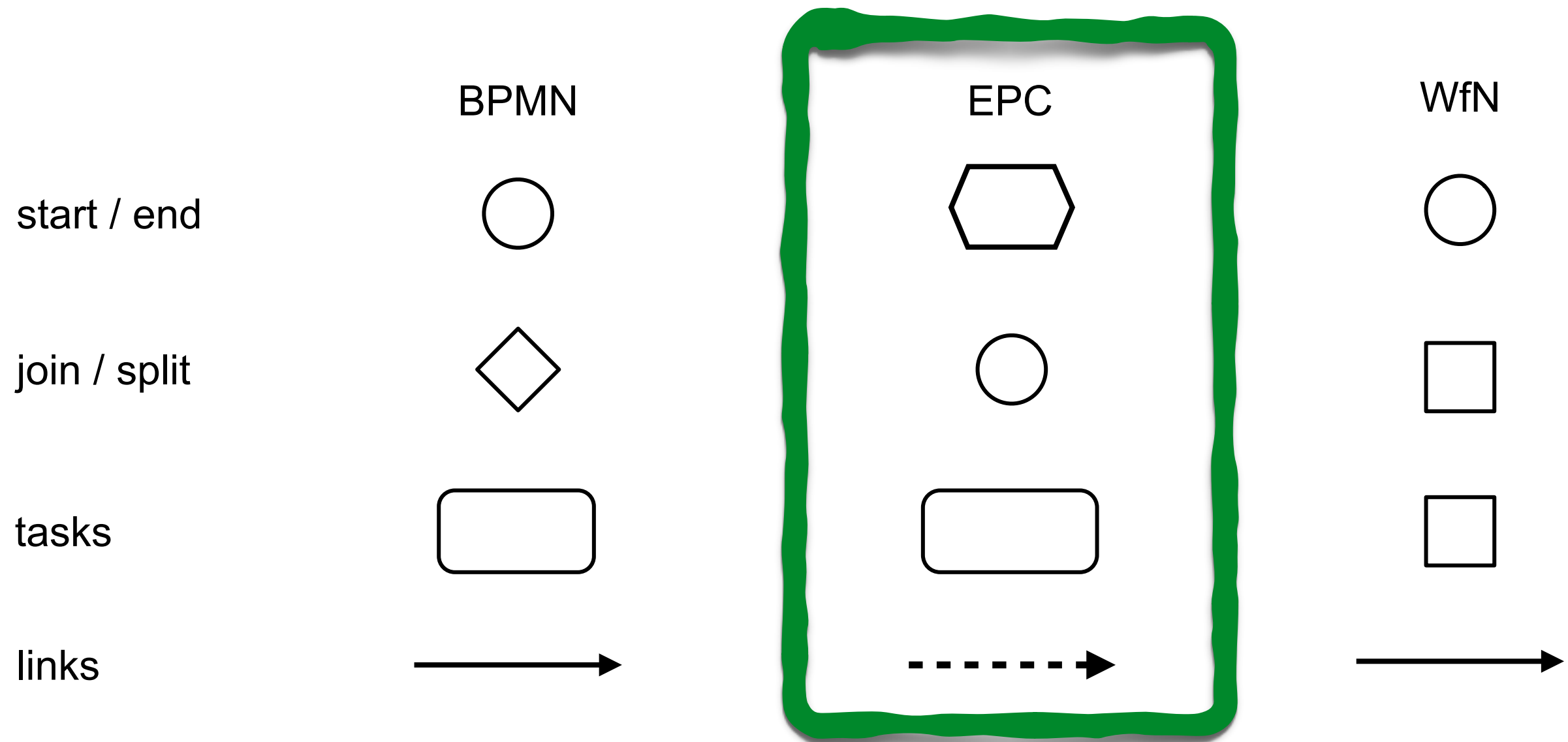
of what they **SEE and DO**

Keep it simple!

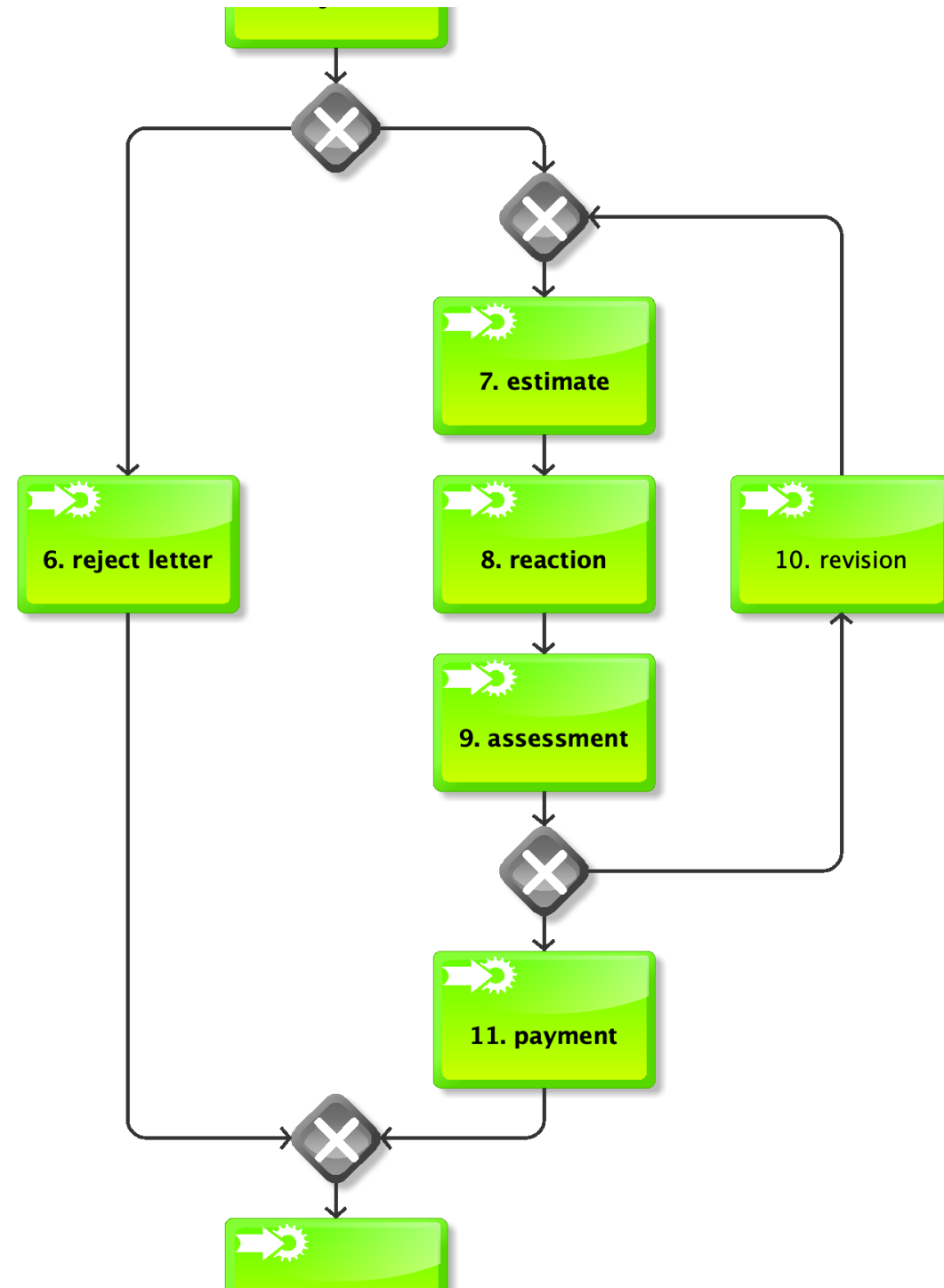
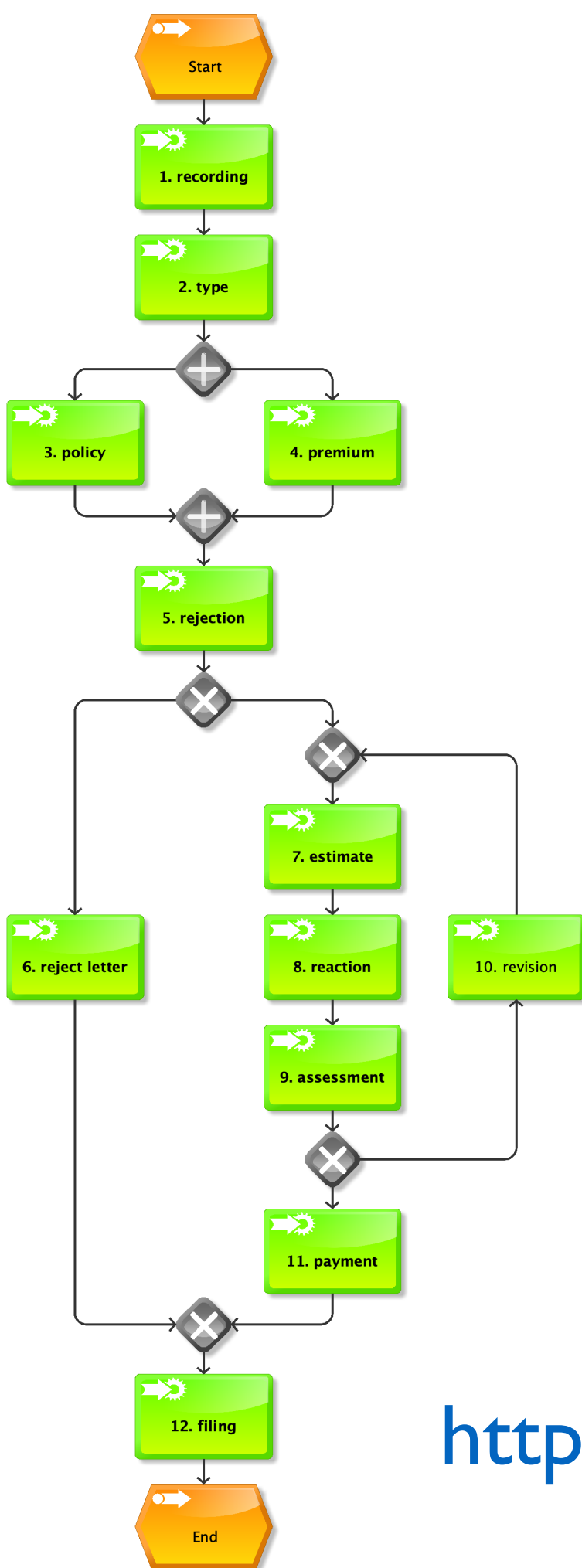


A sneak peek at standards

BPMN, EPC, Workflow nets



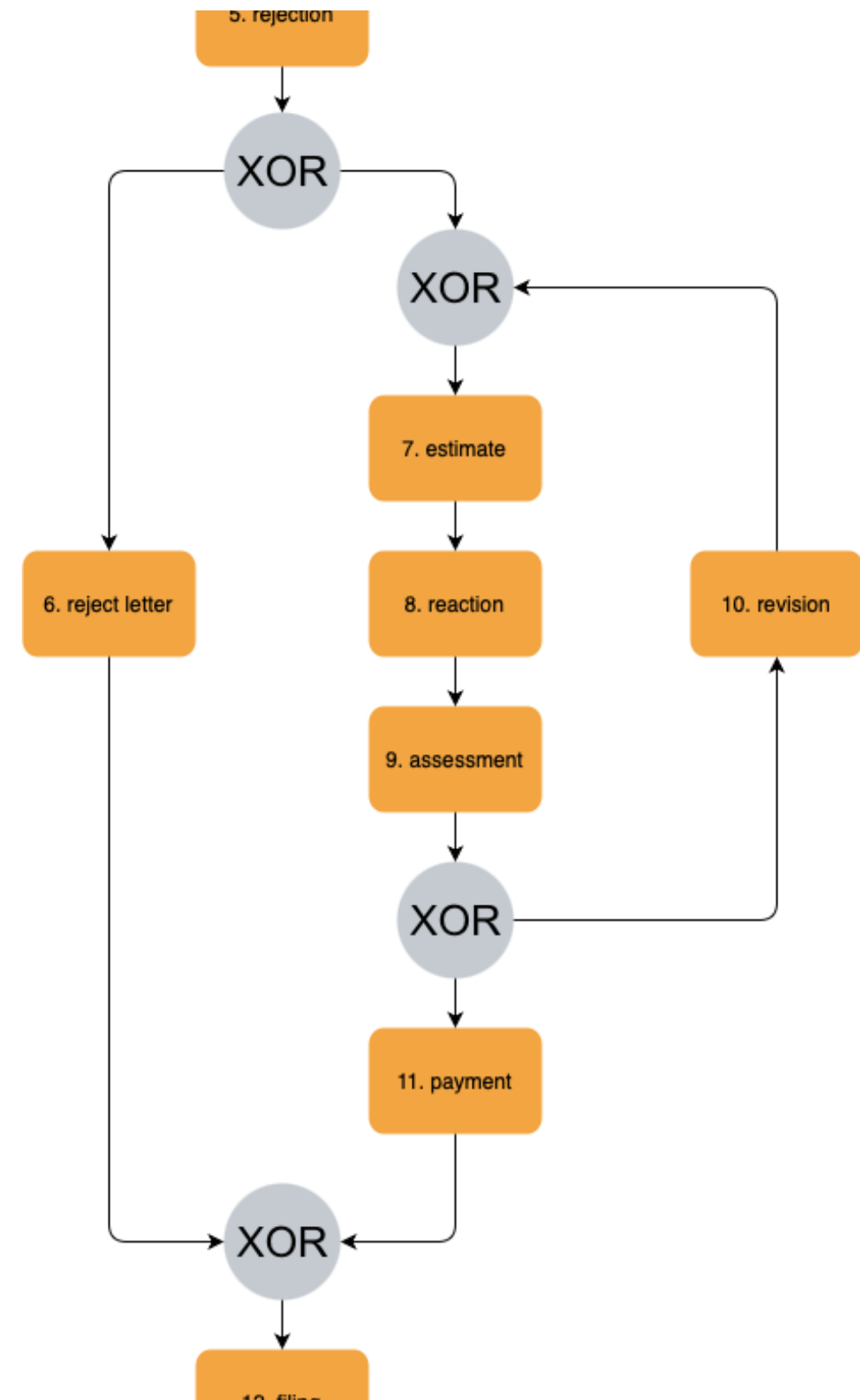
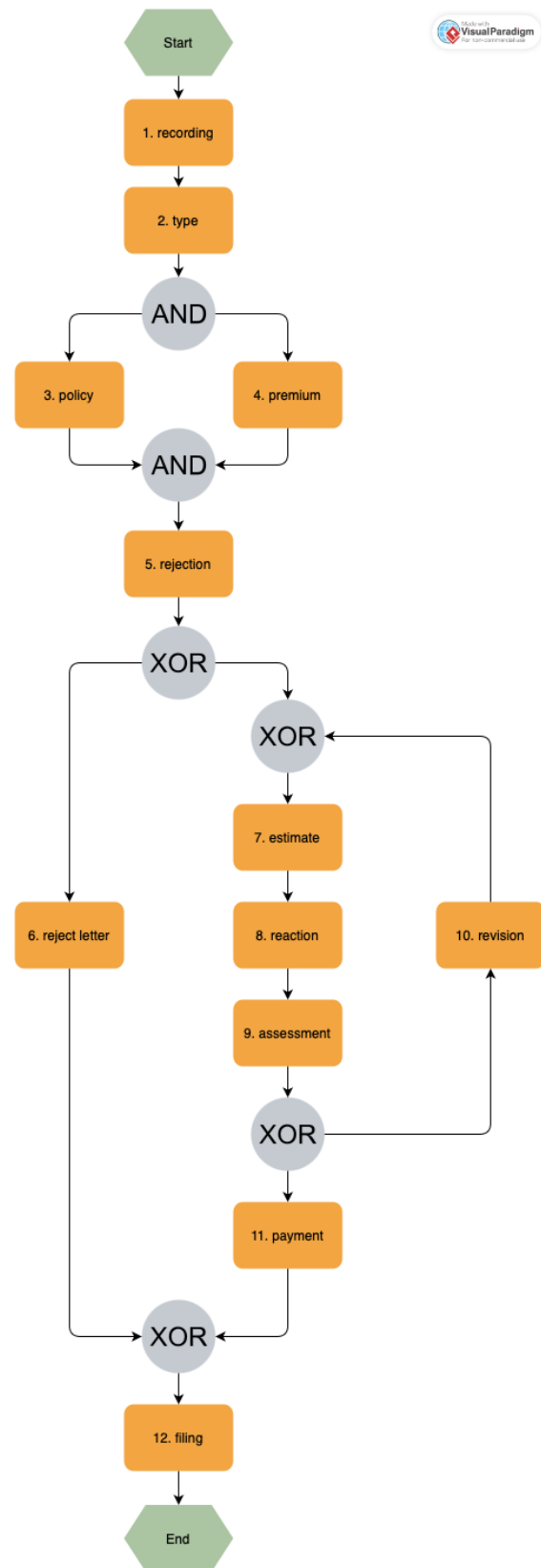
EPC: example



<https://ariscommunity.com/arisc-express>

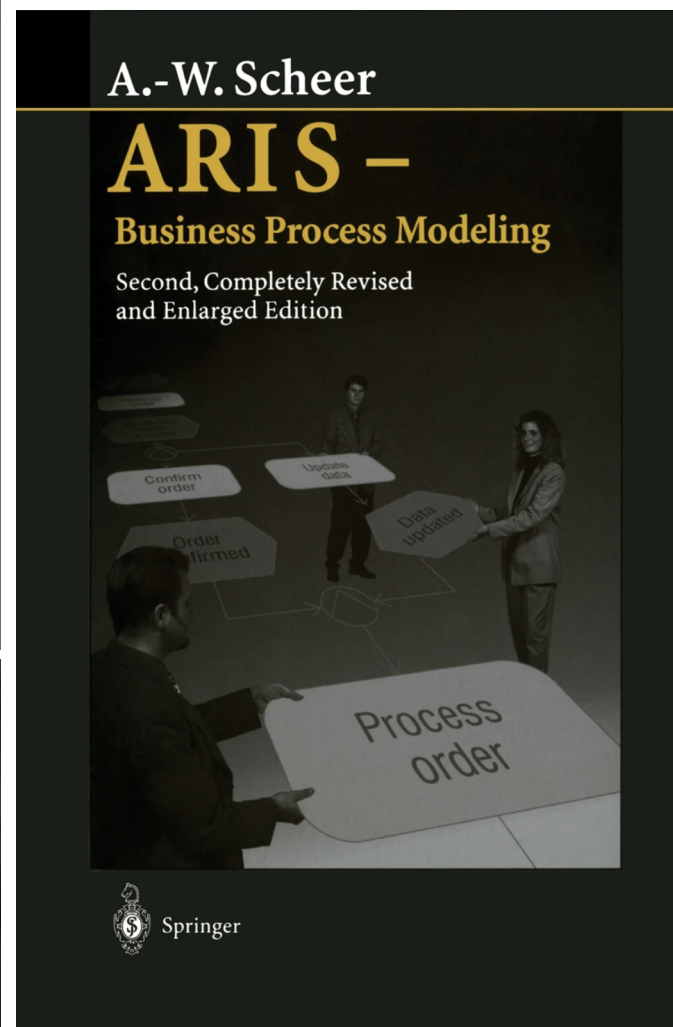


EPC: Example (VP online)



Event-driven process chain: EPC Diagrams

EPC origin (early 1990's)



EPC method originally developed as part of a holistic modelling approach called **ARIS framework** (Architecture of Integrated Information Systems) by Wilhelm-August Scheer

EPC in a nutshell

Flow-chart language that can be used:
to configure an Enterprise Resource Planning implementation
to drive the modelling, analysis, redesign of business process

Informal notation (no "legenda" needed):
simple, minimal, intuitive and easy-to-understand

XML interchange format:
EPC Markup Language (.epml)

Event-driven Process Chain

Definition: An **Event-driven process chain (EPC)** is an ordered graph of **events** and **functions**. It provides various **connectors** that allow alternative and parallel execution of processes. Furthermore it is specified by the usages of **logical operators**, such as OR, AND, and XOR.

A major strength of EPC is claimed to be its ***simplicity*** and ***easy-to-understand*** notation. This makes EPC a widely acceptable technique to denote business processes.

EPC informally

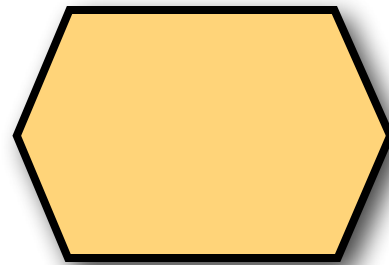
An EPC is a graph of **events** and **functions**

It provides some logical **connectors** that allow alternative and parallel execution of processes
(AND, XOR, OR)

Events

Any EPC diagram must start / end with **event(s)**

Graphical representation: hexagons



Passive elements used to describe
under which circumstances a process (or a function) works
or which state a process (or a function) results in
(like pre- / post-conditions)

Functions

Any EPC diagram may involve several **functions**

Graphical representation: rounded rectangles



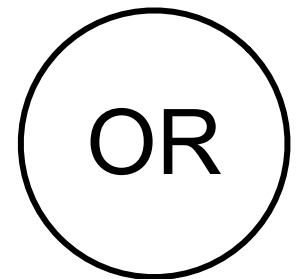
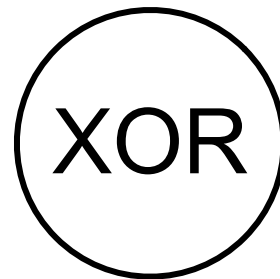
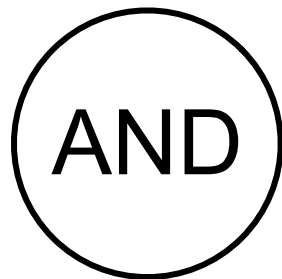
Active elements used to describe
the tasks or activities of a business process

Functions can be refined to other EPC diagrams

Logical connectors

Any EPC diagram may involve several **connectors**

Graphical representation: circles (or also octagons)



Elements used to describe
the logical relationships between split/join branches

Control flow

Any EPC diagram may involve several **connections**

Graphical representation: dashed arrows



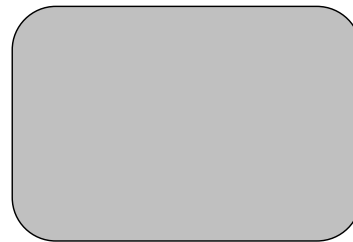
Control flow is used to connect events with functions and connectors by expressing causal dependencies

EPC ingredients at a glance

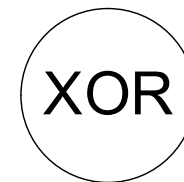
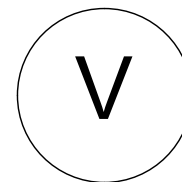
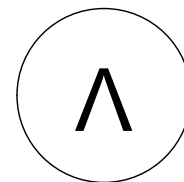
Event



Function



Connectors



Control Flow



Logical connectors: logical symbols

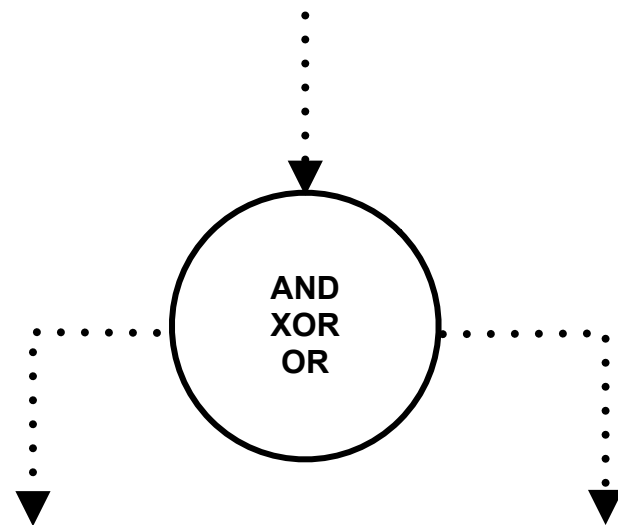
$$\bigwedge = \text{AND}$$

$$\oplus = \text{XOR}$$

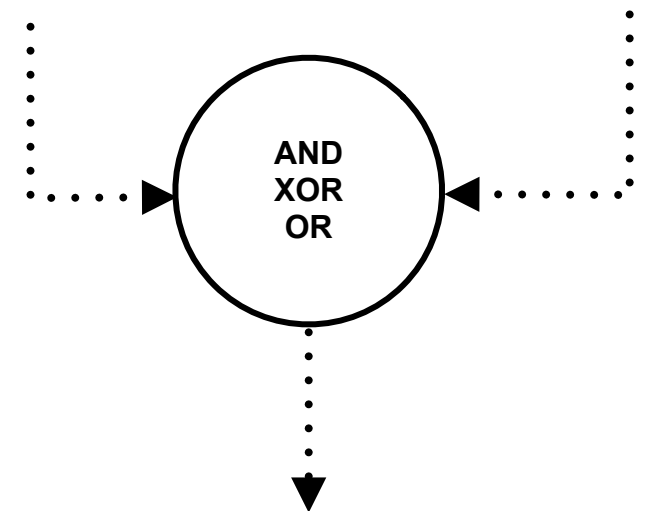
$$\bigvee = \text{OR}$$

Logical connectors: splits and joins

Splits

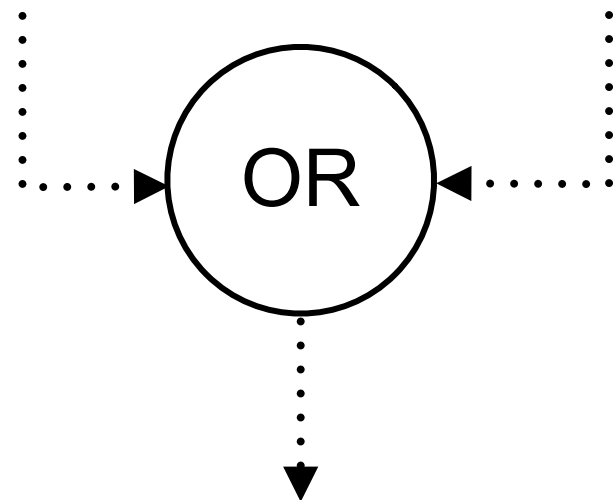


Joins



OR join: intended meaning

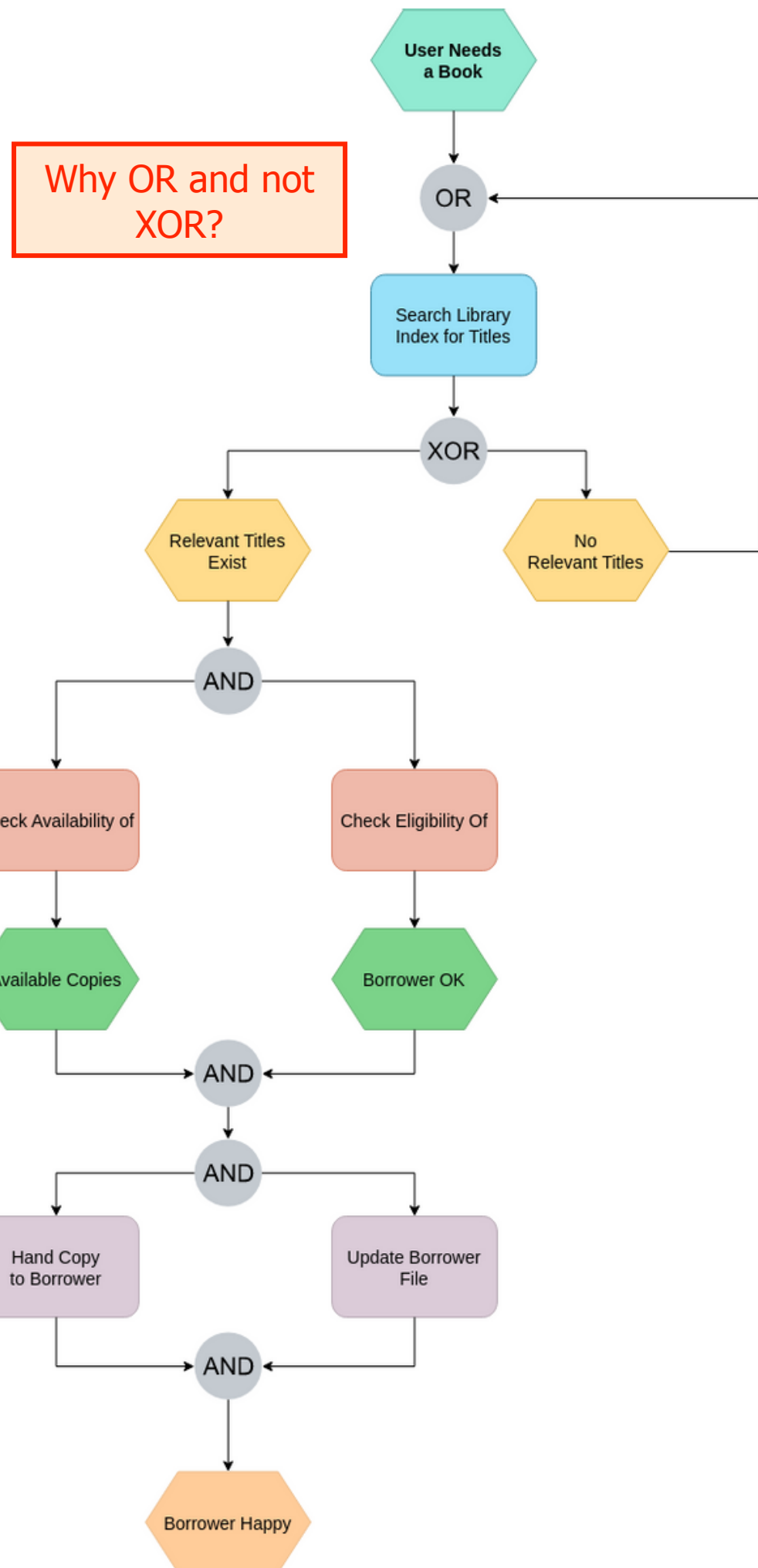
if only one input arrives,
it should release the flow



if both inputs arrive,
it should release only one output

if one input arrives,
it must wait until the other arrives or
it is guaranteed that the other will never arrive

Example: comments?



A taste of .epml

Online Shopping

```
<?xml version="1.0" encoding="UTF-8"?>
<epml:epml xmlns:epml="http://www.epml.de">
```

```
  <coordinates
    xOrigin="leftToRight"
    yOrigin="topToBottom"/>
```

```
  <directory name="Root">
```

```
    <epc epcId="1"
      name="Online Shopping">
```

```
      <event id="1">
        <name>Start Online Shopping</name>
      </event>
```

```
      <arc id="10">
        <flow source="1" target="2"/>
      </arc>
```

```
      <function id="2">
        <name>Determine List of Products</name>
      </function>
```

```
      <arc id="11">
        <flow source="2" target="3"/>
      </arc>
```

```
      <event id="3">
        <name>Not all Products in Cart</name>
      </event>
```

```
      <arc id="12">
        <flow source="3" target="4"/>
      </arc>
```

```
      <xor id="4"/>
```

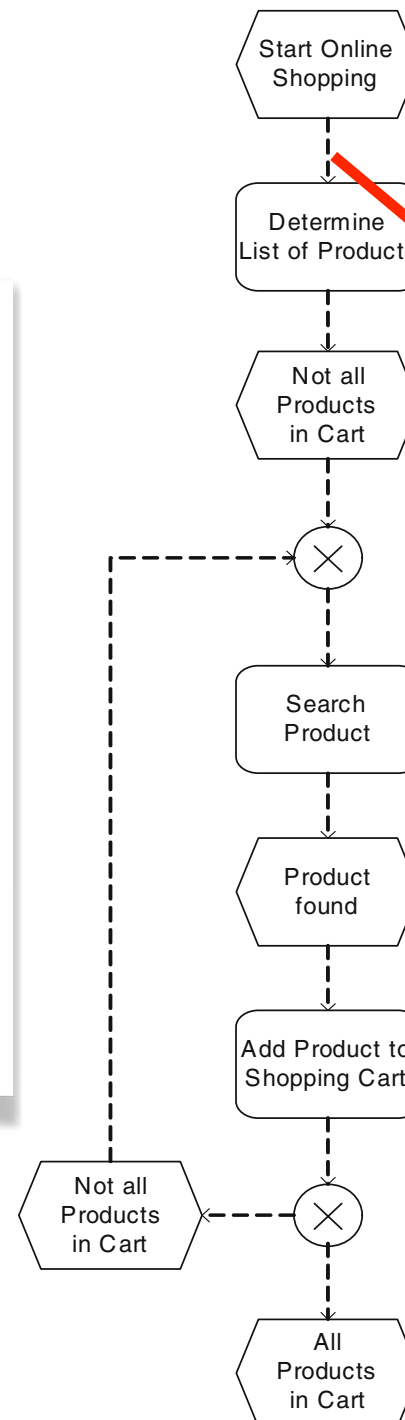
```
      <arc id="13">
        <flow source="4" target="5"/>
      </arc>
```

```
      ...
```

```
    </epc>
```

```
  </directory>
```

```
</epml:epml>
```



ISeB (2006) 4: 245–263
DOI 10.1007/s10257-005-0026-1

ORIGINAL PAPER

Jan Mendling · Markus Nüttgens

EPC markup language (EPML): an XML-based interchange format for event-driven process chains (EPC)

Published online: 22 October 2005
© Springer-Verlag 2005

Buyer & Reseller example

Sect.1.1 of Business Process Management: Concepts, Languages, Architectures

Orchestration (single viewpoint)

Orchestration

Business process models are performed in a single organization by definition

Thus, the **ordering of activities** can be controlled by a **business process management system** as a **centralized** software component run by the organization

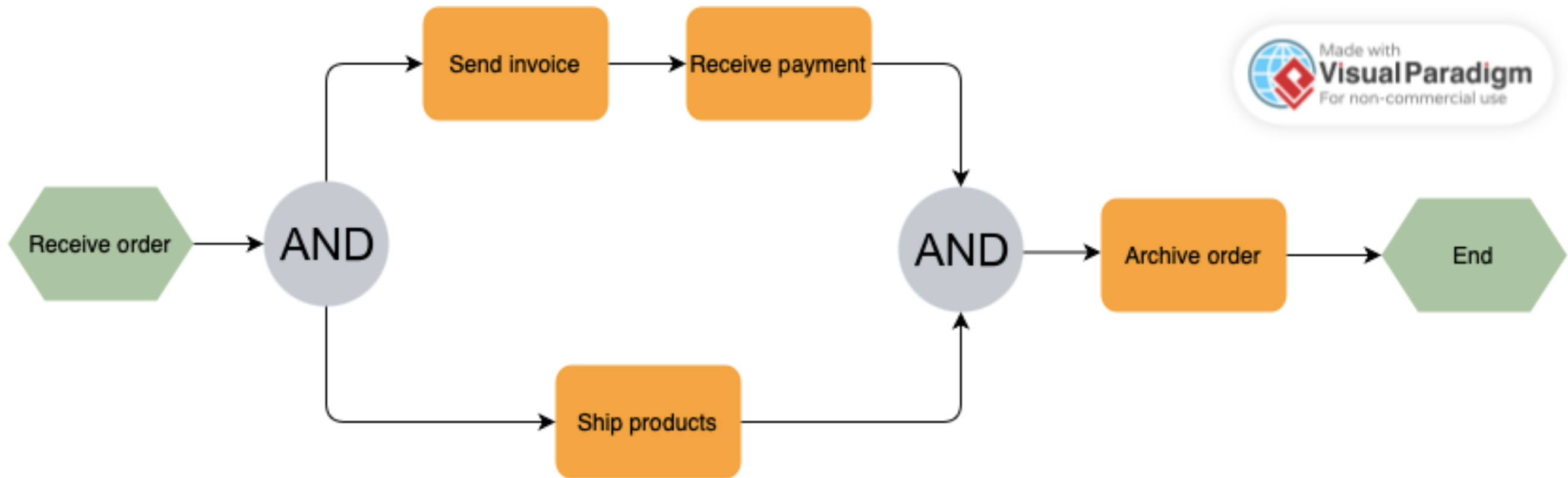
This kind of control is called **orchestration**



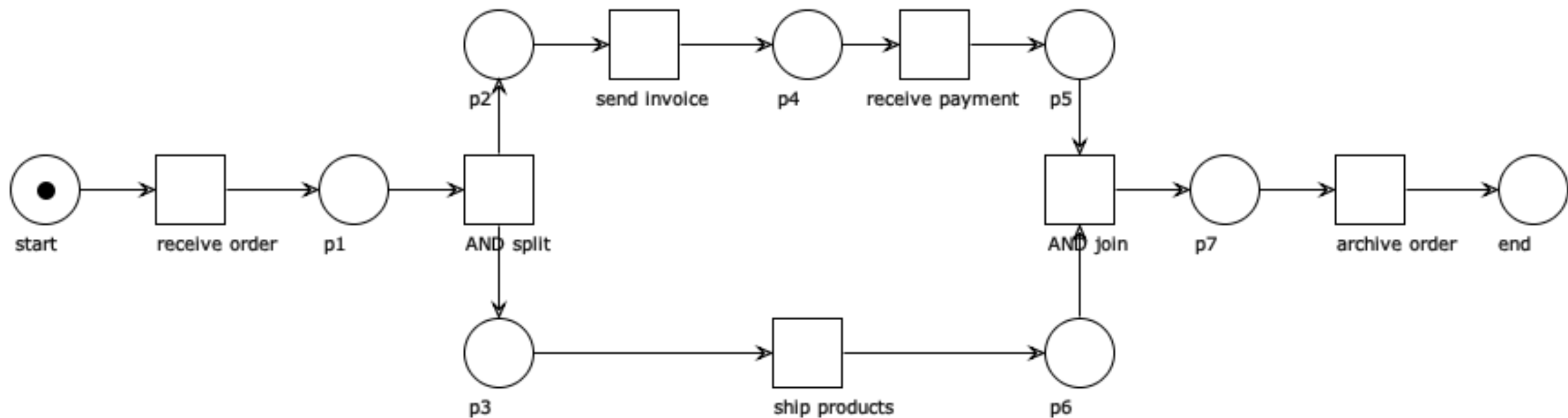
An orchestration describes a **single viewpoint** model

The analogy is with the conductor who centrally controls the musicians in an orchestra

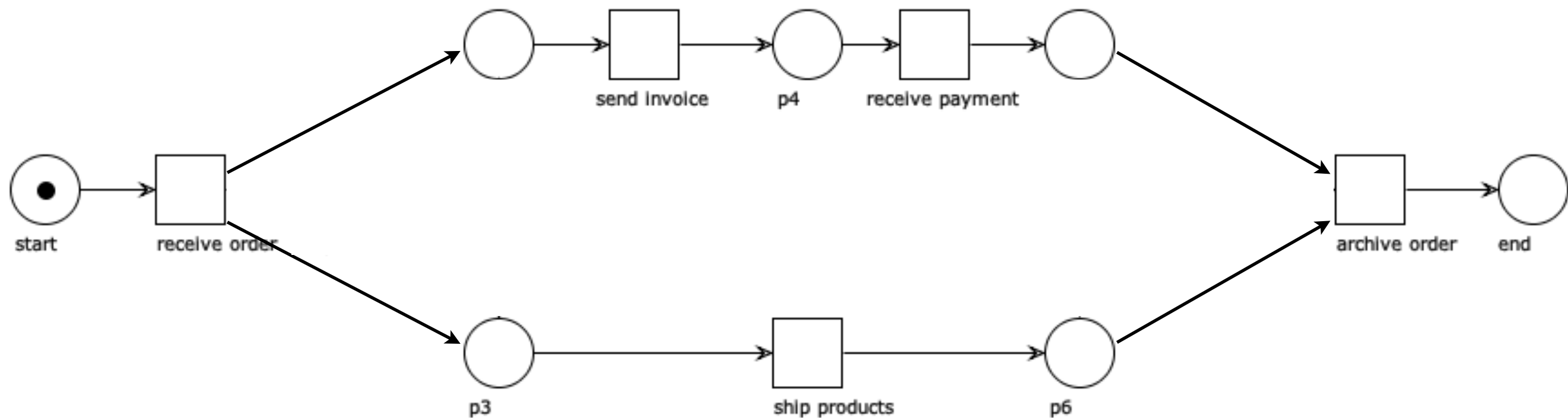
Example: Reseller EPC



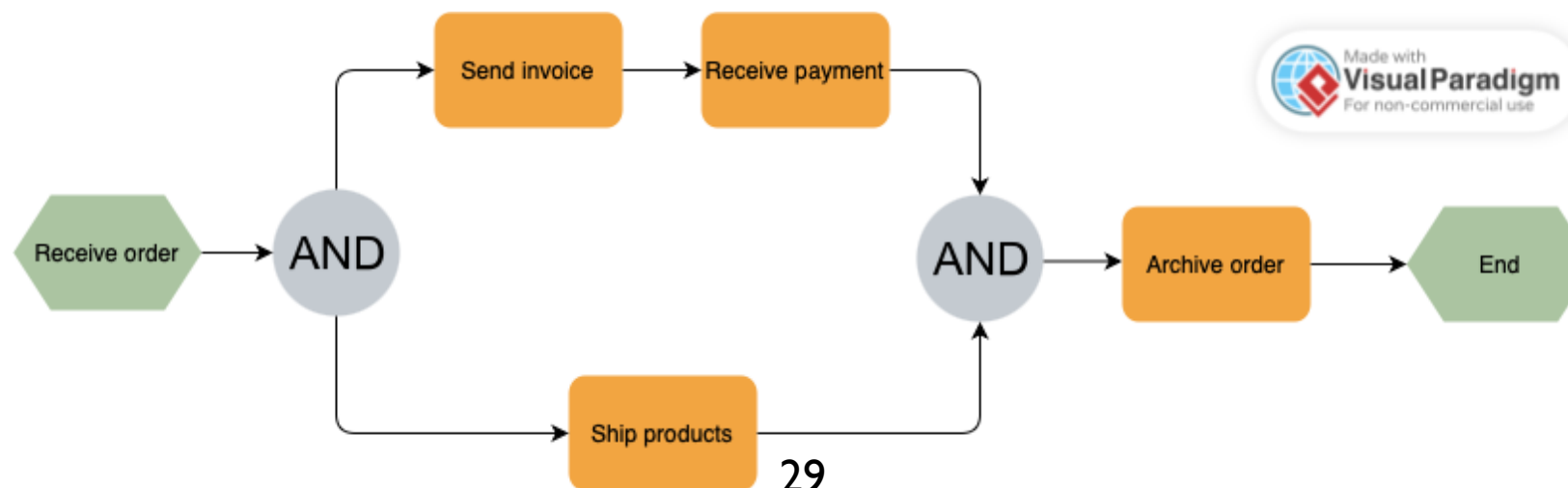
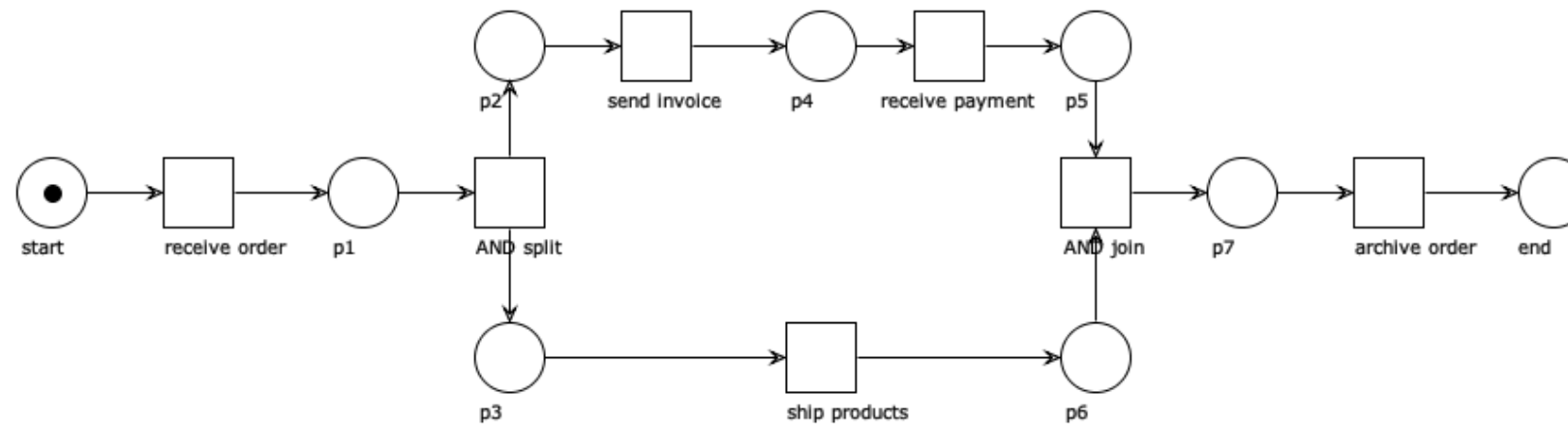
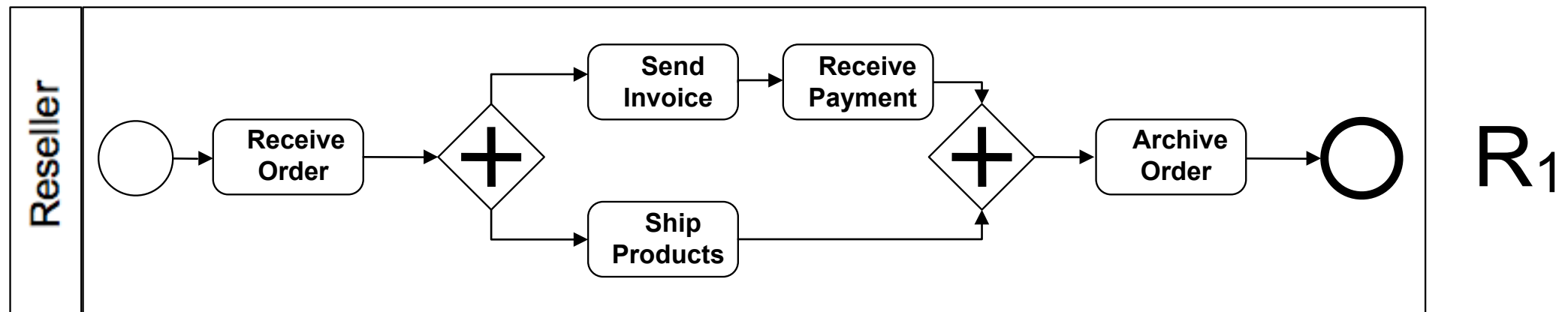
Example: Reseller WfN



Example: Reseller WfN



Example: Reseller BPMN



Collaboration (multiple viewpoints)

Collaboration

Each business process is enacted by one organization

Cross-organizational business processes can interact with each other

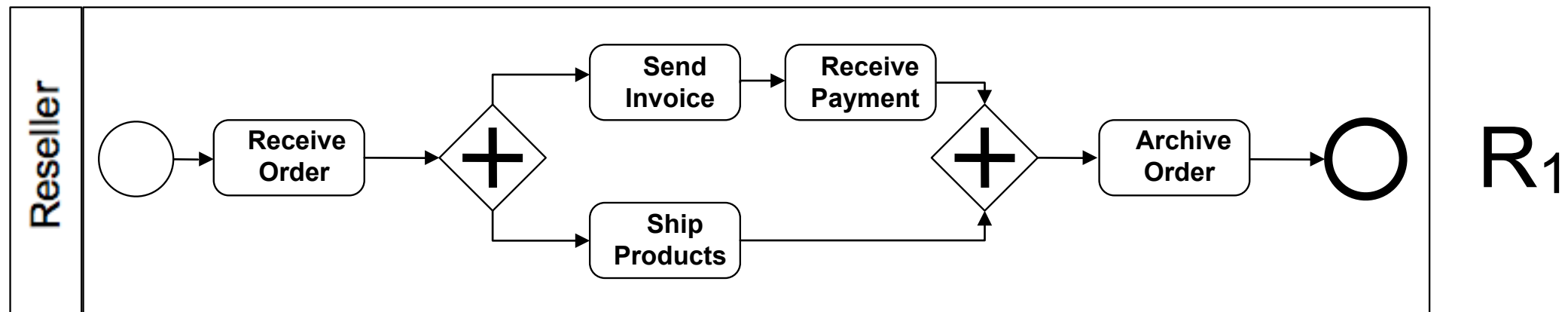
Linking the activities of single business processes that are related together is called **collaboration**



A collaboration describes a decentralized **multi-point view** model

It comprises the activities of autonomous business processes and how they interact to achieve some common goal

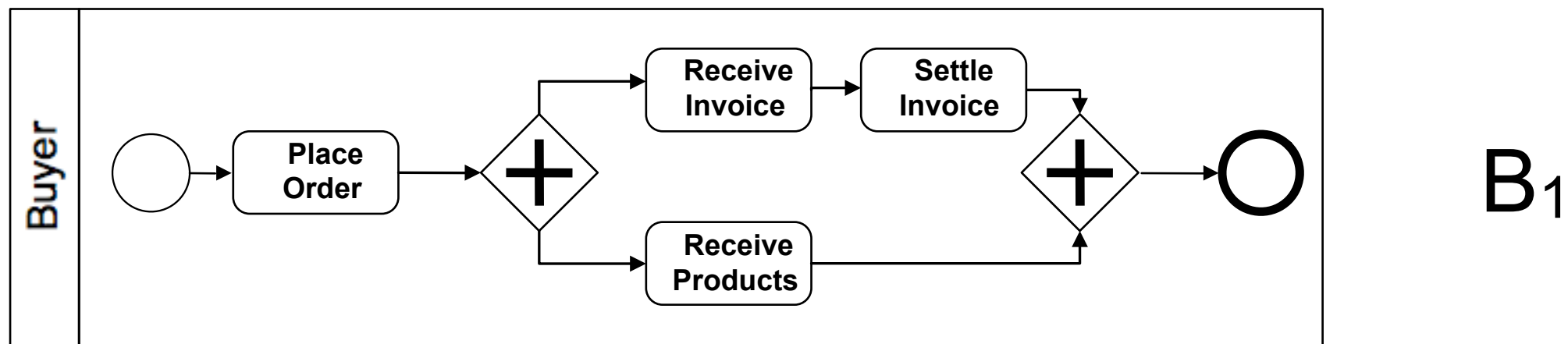
Example: Reseller BPMN



A reseller can use the business process model above to configure the business process management system accordingly

All instances will be executed as specified (after receiving the order, send and ship activities are concurrently executed)

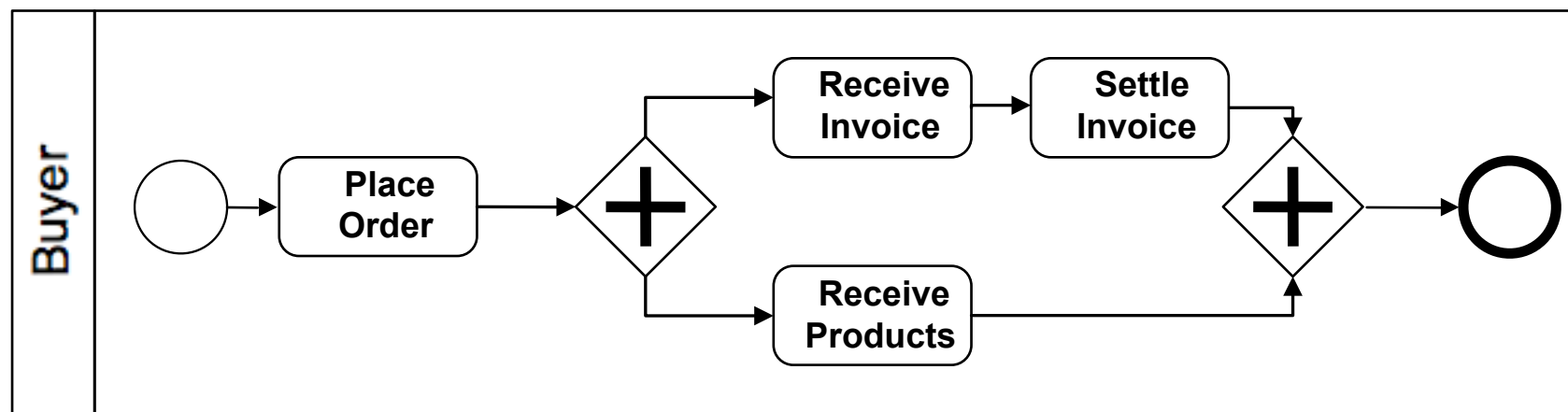
Example: Buyer



Also a buyer can use the business process model above to configure the business process management system accordingly

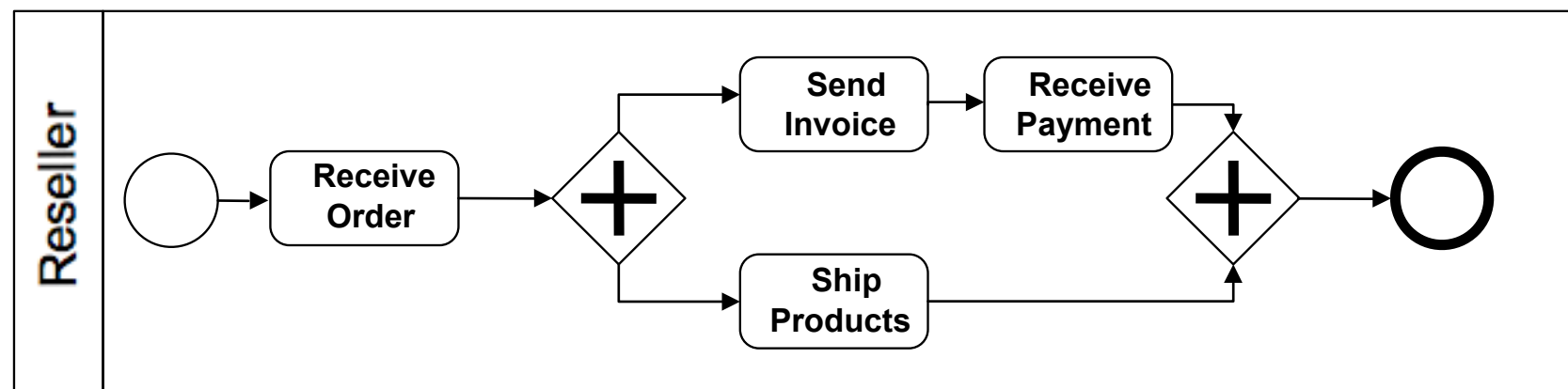
All instances will be executed as specified (after receiving the order, send and ship activities are concurrently executed)

Buyer & Reseller



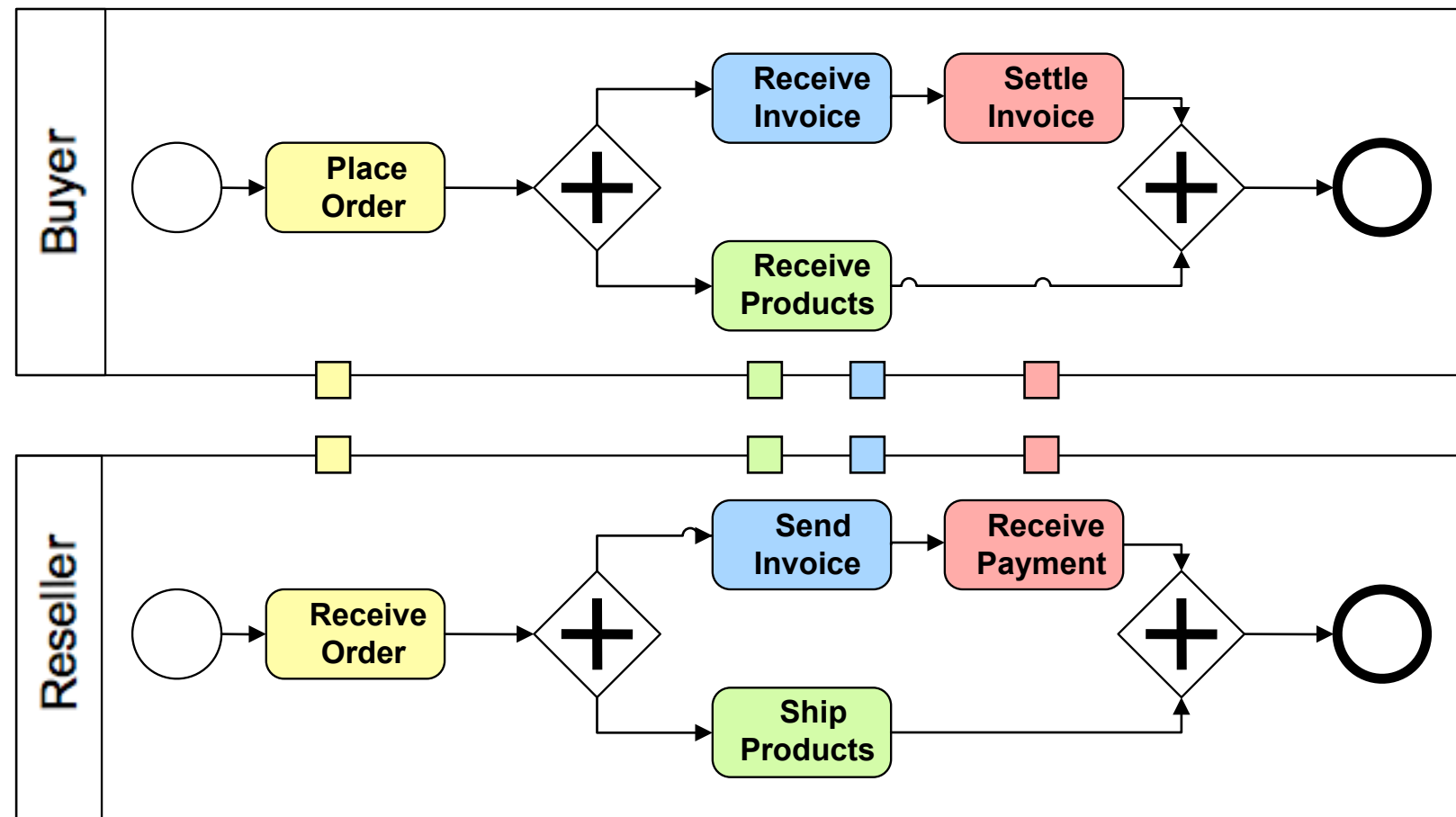
B₁

Separately developed processes need to communicate!



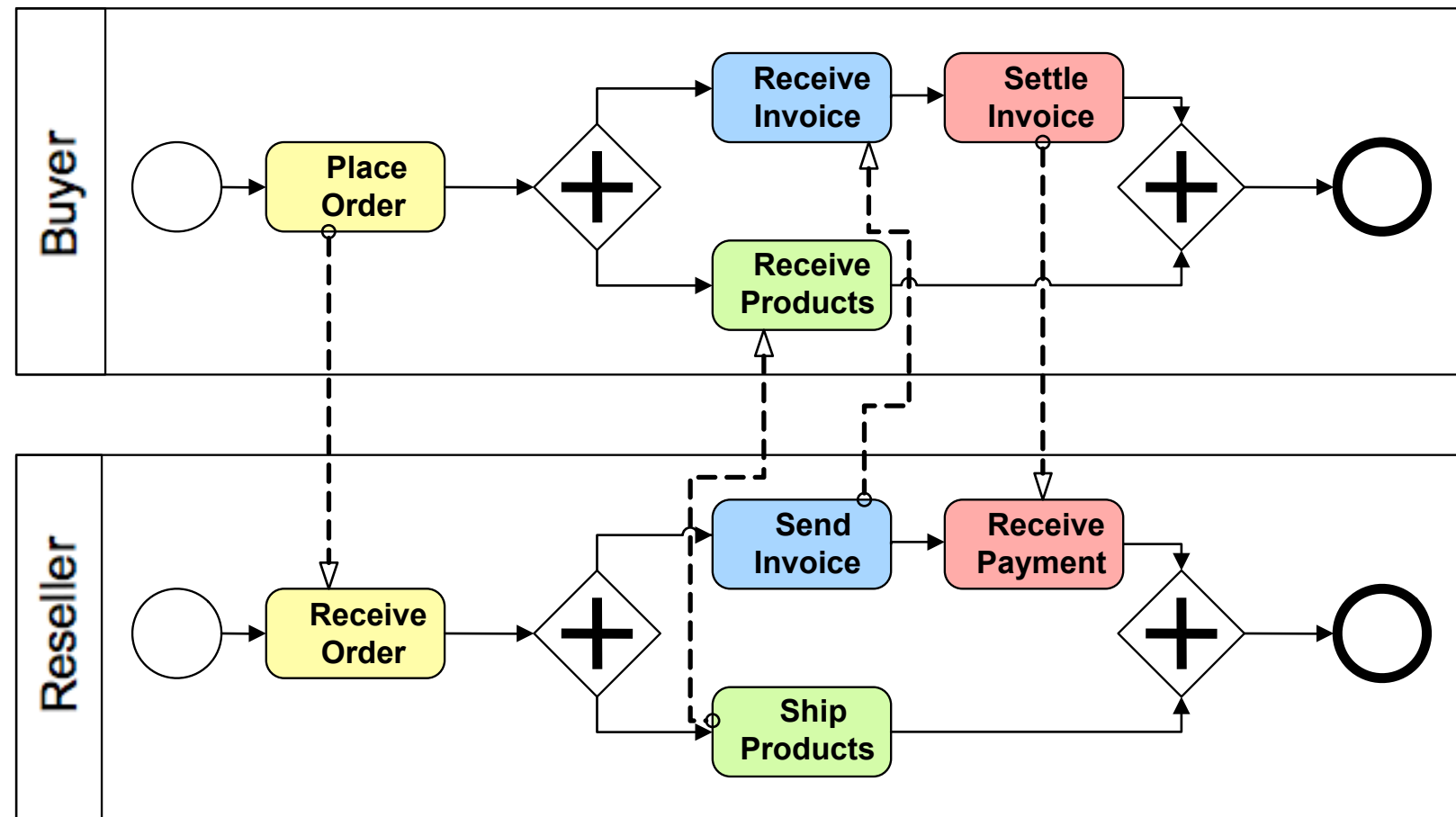
R₁

Interacting processes



Interacting processes can exchange information (electronic messages, physically transported objects)

Example: collaboration



BPMN-like syntax

Message flow is represented by dotted arcs

Choreography (global viewpoint)

Choreography

The interactions of a set of business processes can be specified also as a **process choreography**

Difference w.r.t. orchestration:

The absence of a central agent that controls the activities in the business processes involved

Difference w.r.t. collaboration:

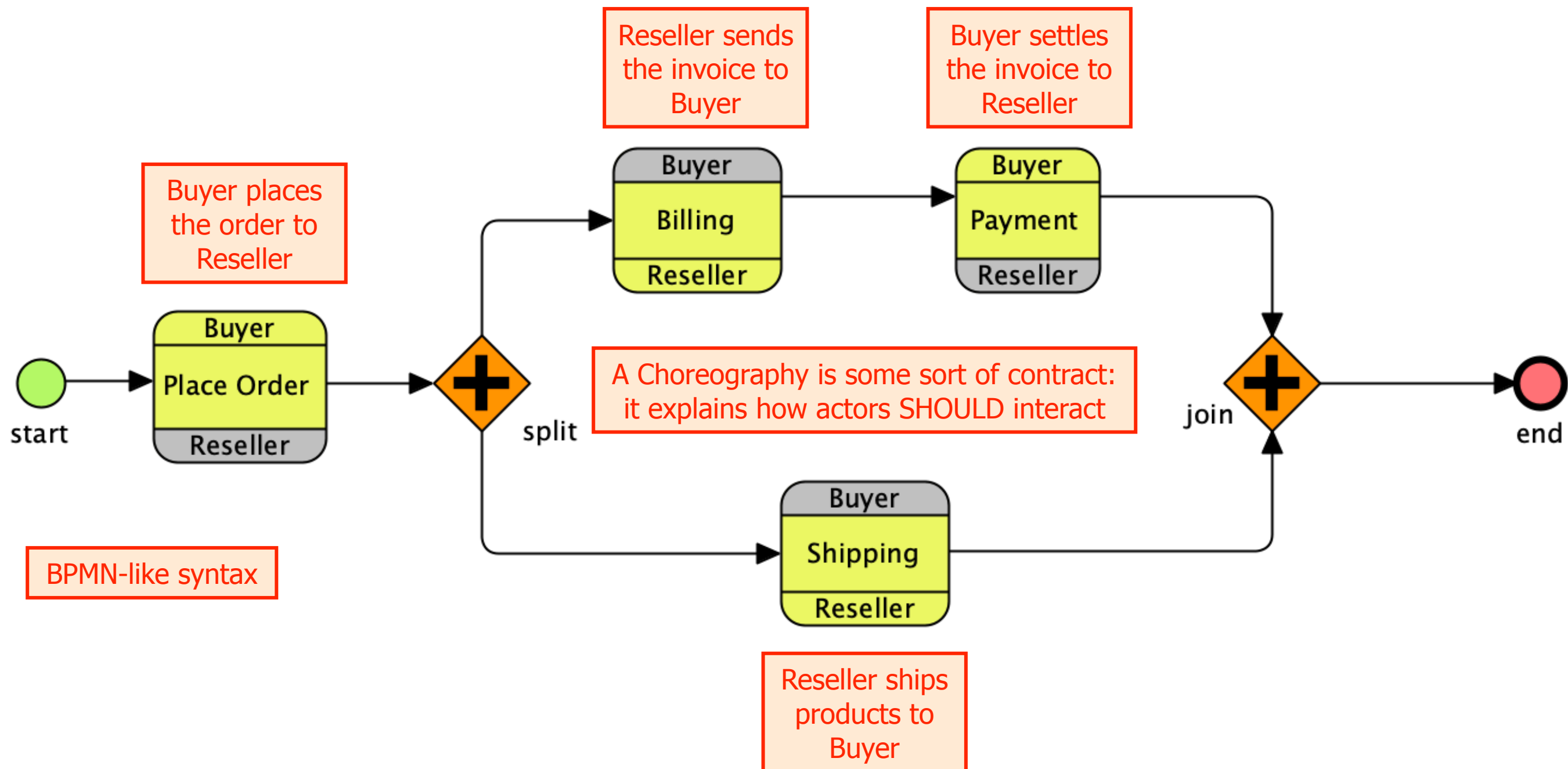
Only contains activities that are related to interactions between participants



A choreography describes a **global viewpoint** model

The analogy is with the dancers who behave autonomously, but follow their parts in the choreography

Choreography



Different viewpoints

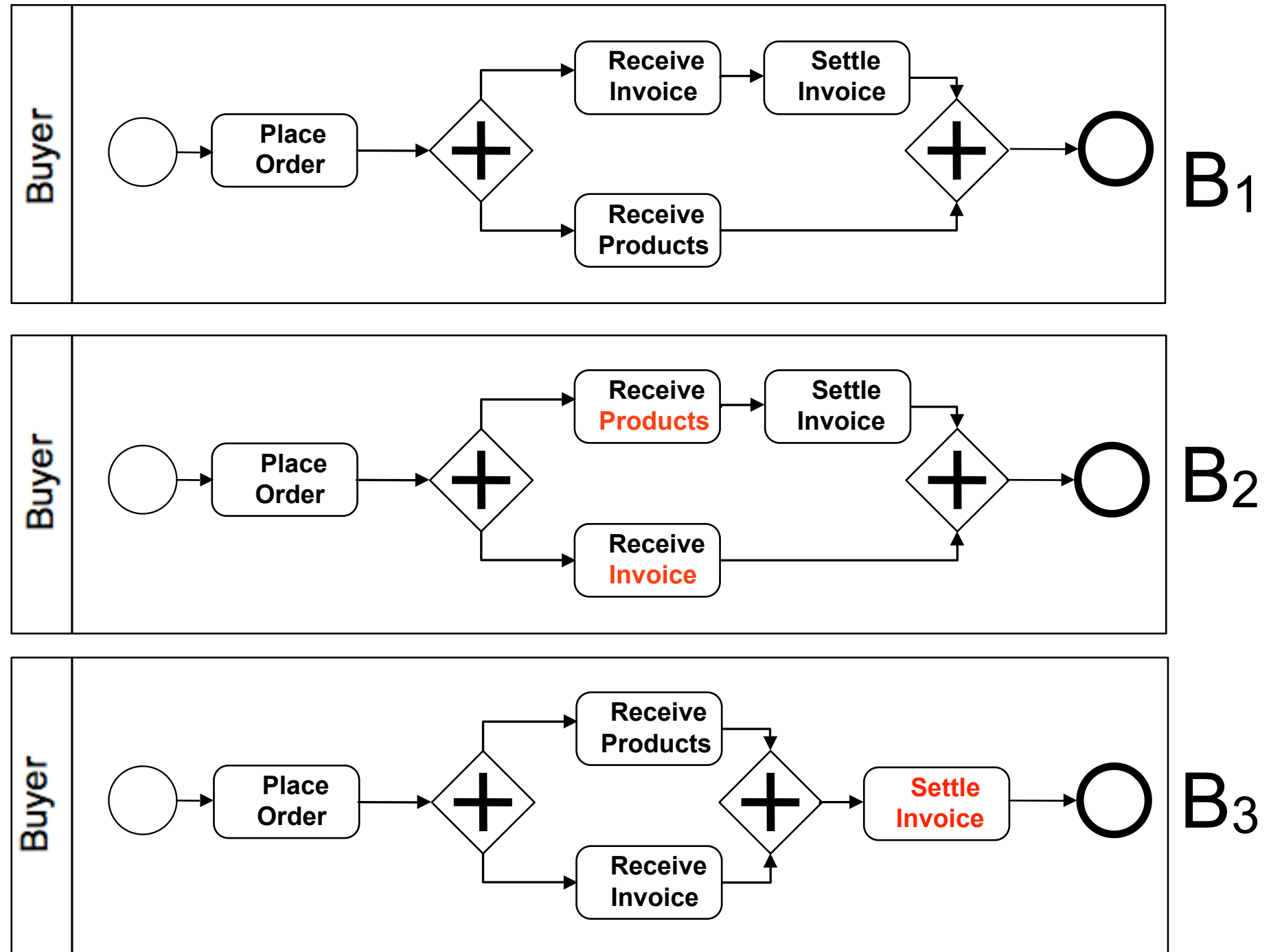
Orchestration diagram: single viewpoint

Collaboration diagram: multiple viewpoints

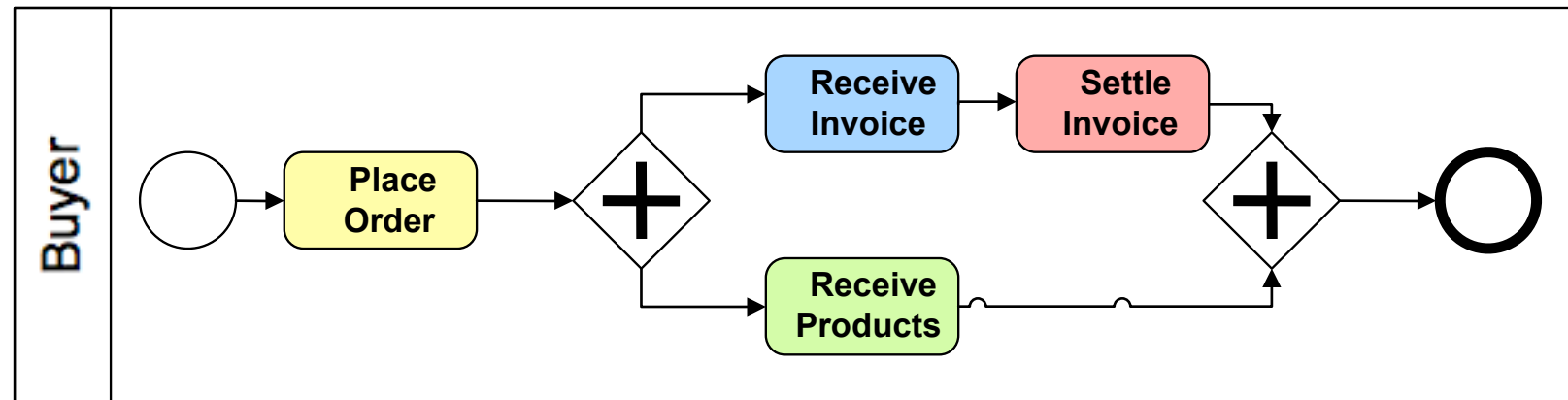
Choreography diagram: global viewpoint

Example: Buyers

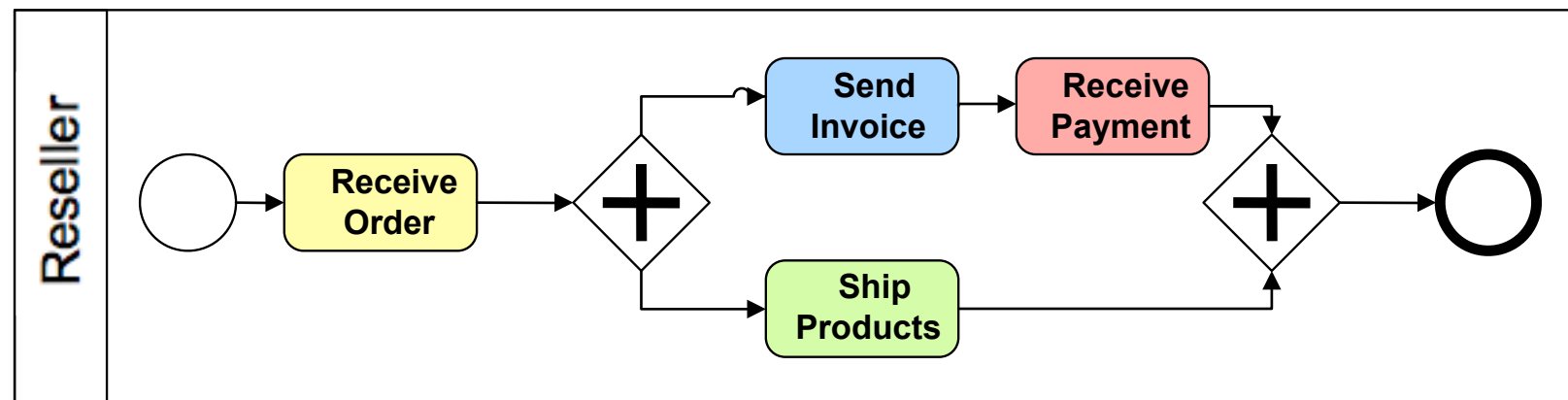
Different processes are possible, but... do they all make sense?



Question time



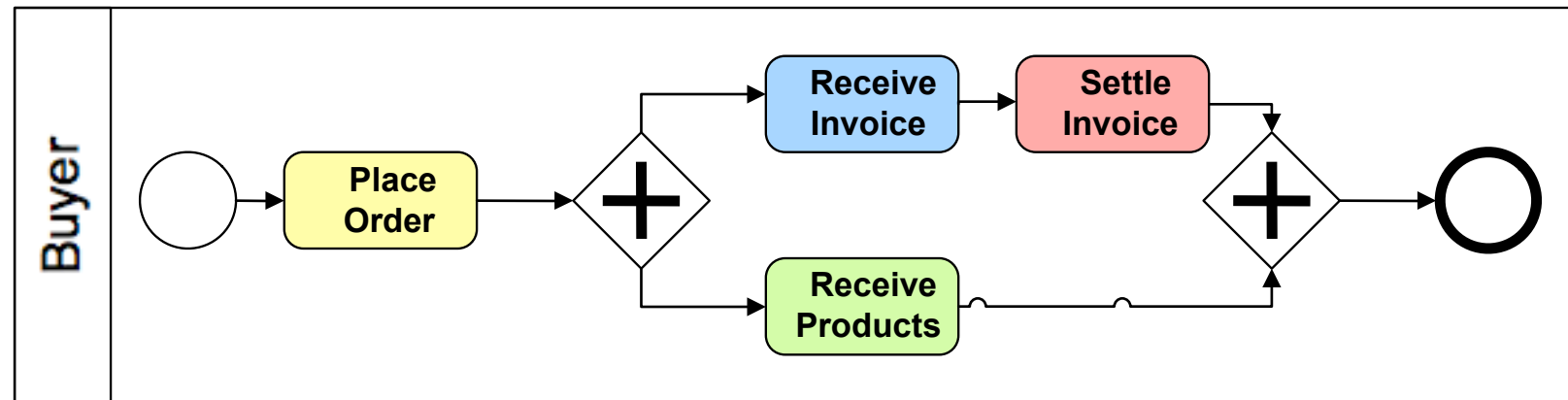
B₁



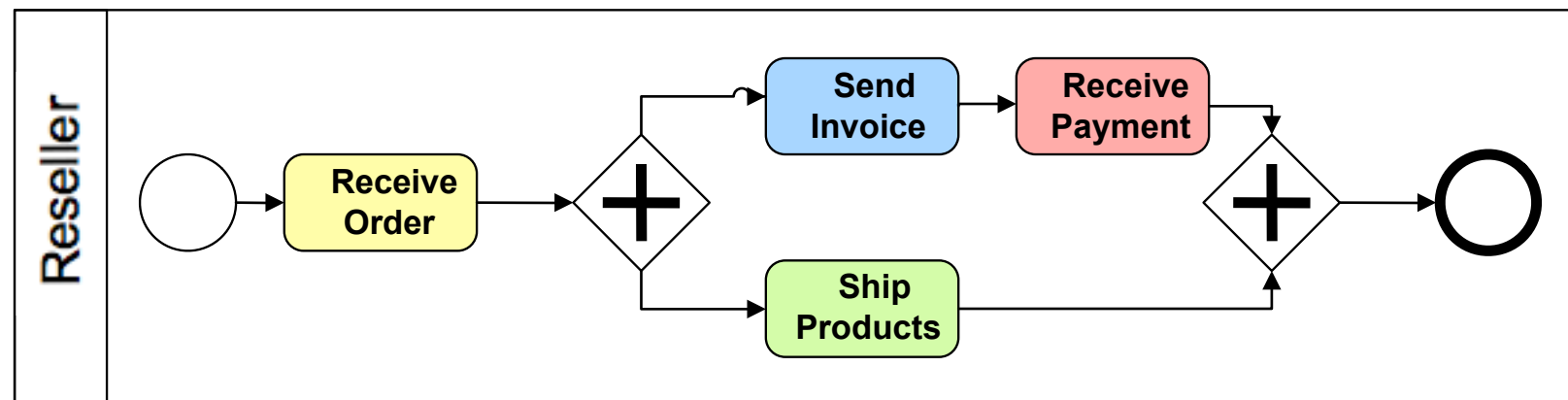
R₁

Do they work fine together?

Question time



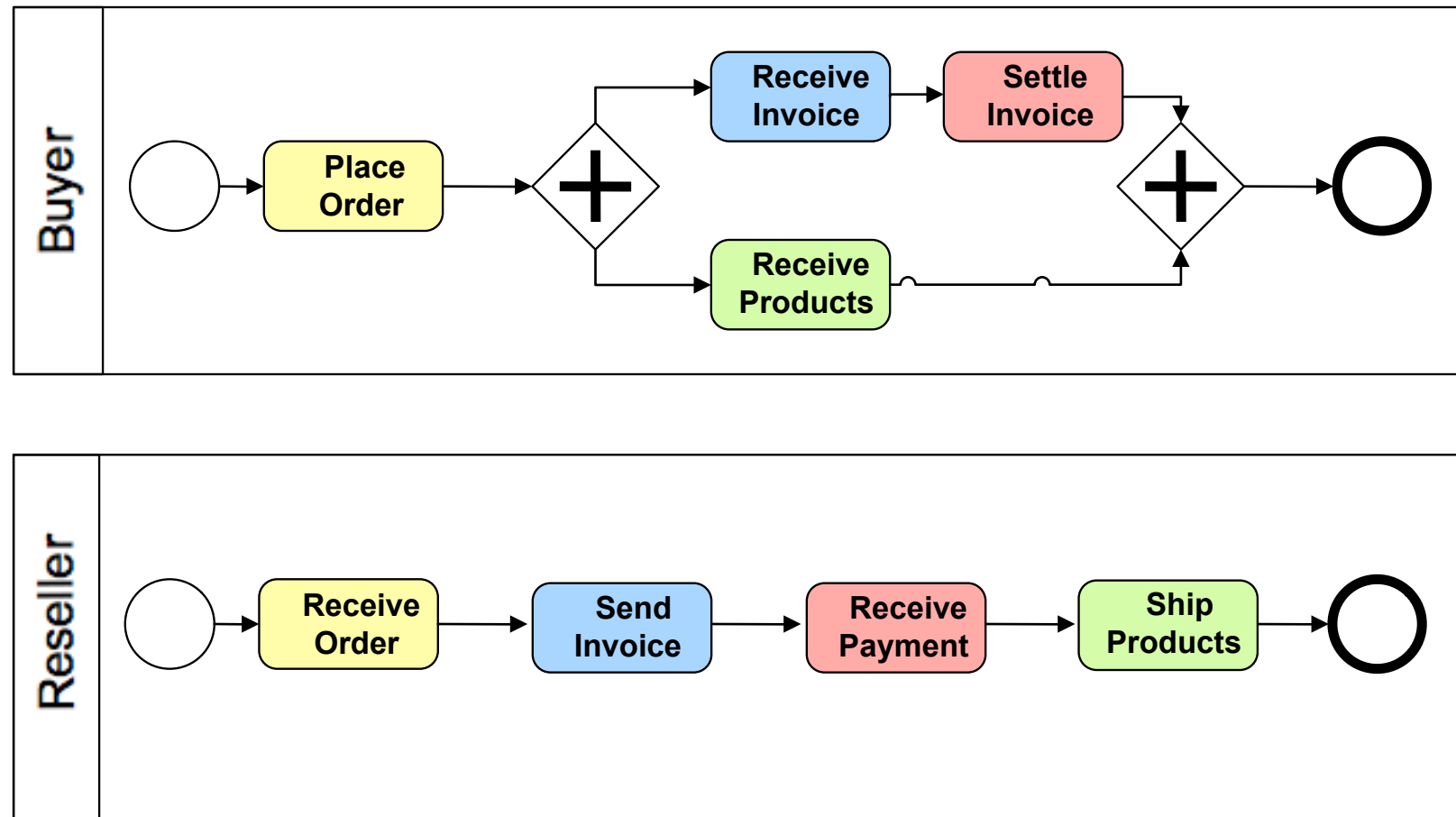
B₁



R₁

Work fine together!

Question time

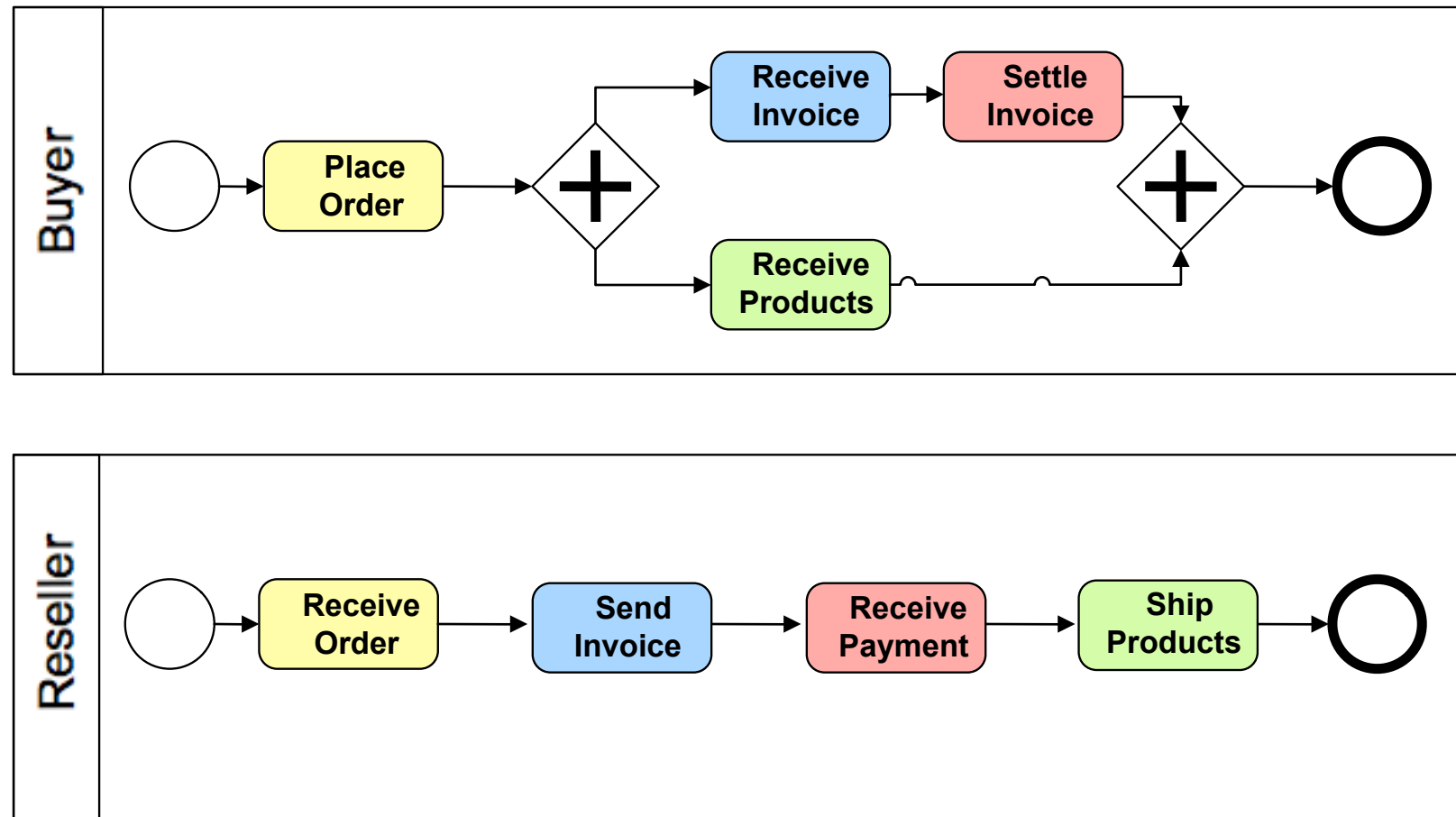


B₁

R₂

Still working fine?

Question time

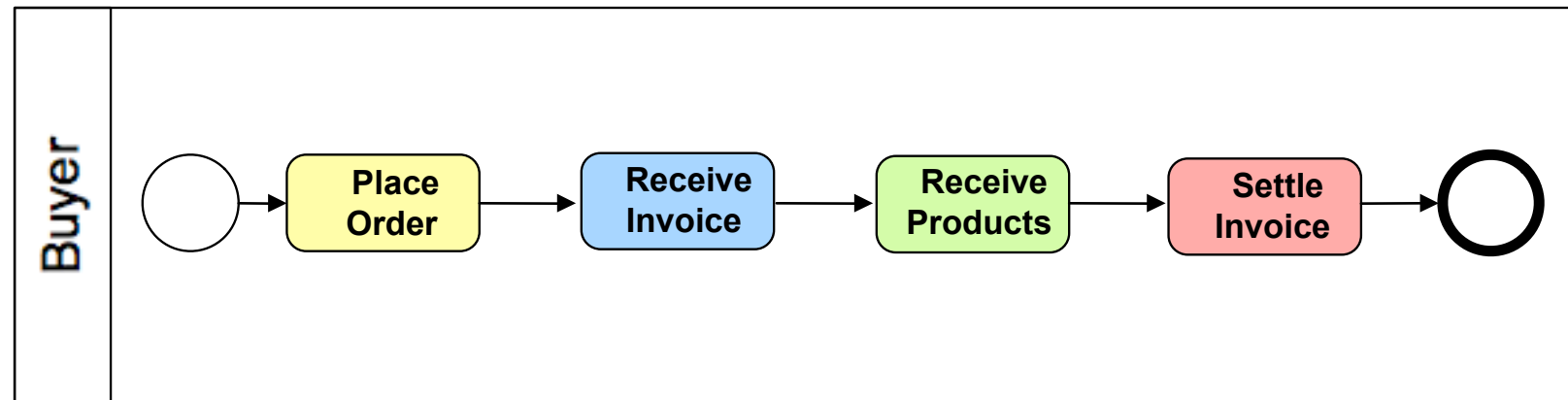


B₁

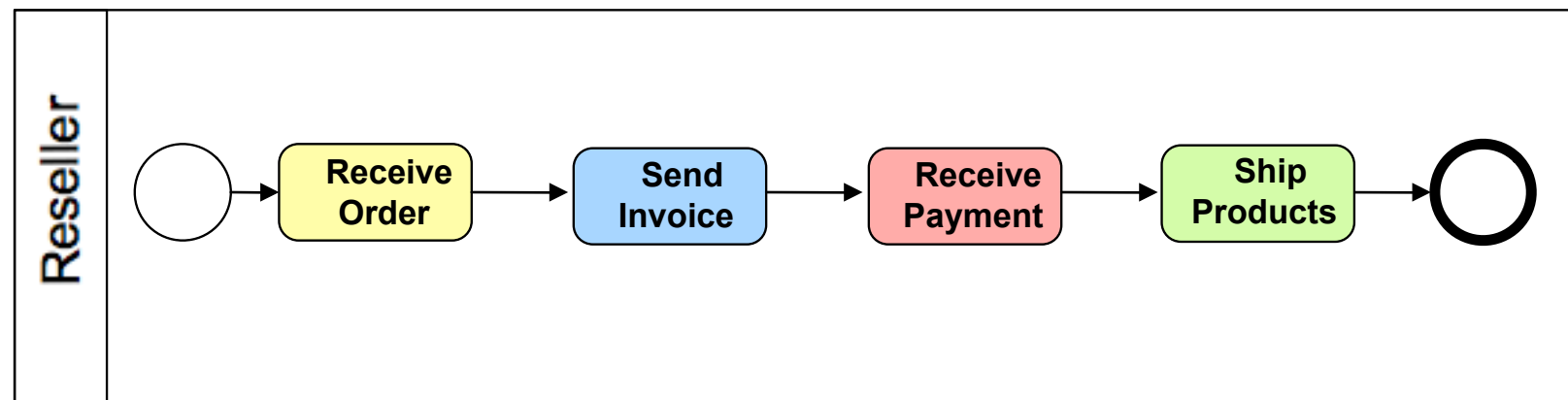
R₂

Work fine together!

Question time



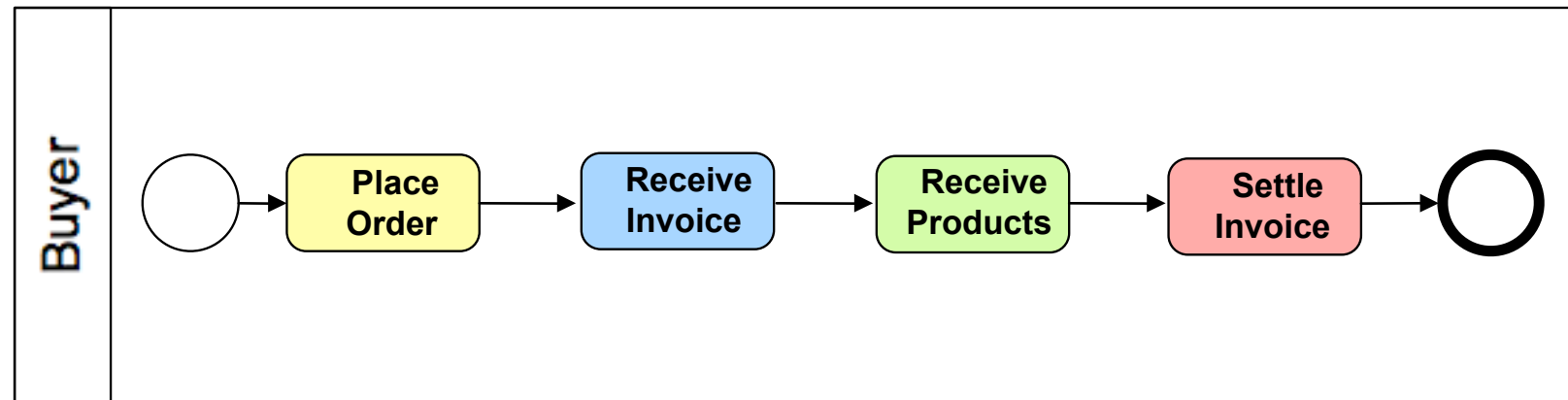
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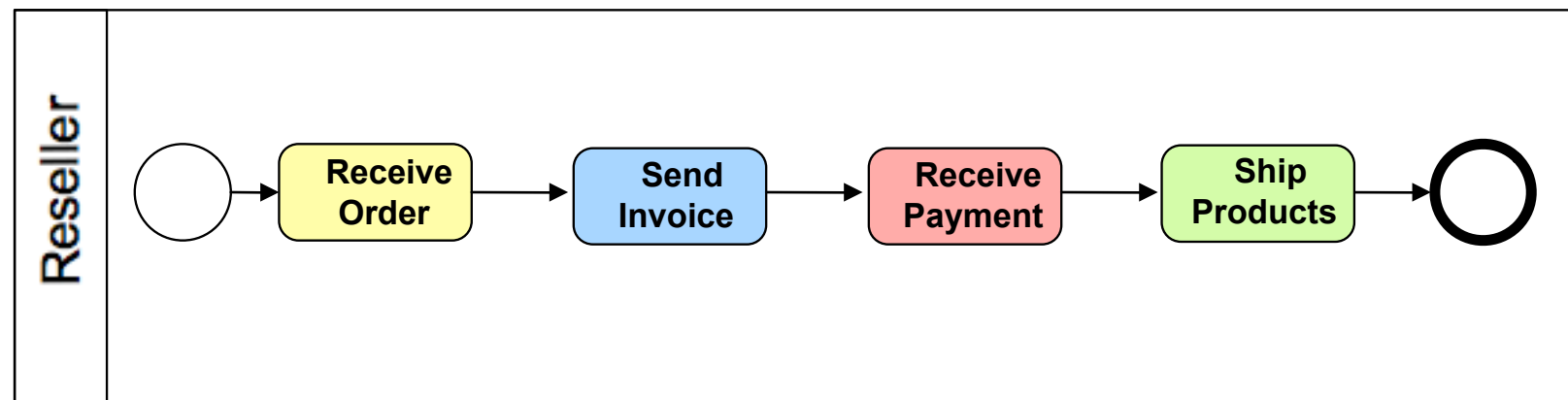
R₂

Still working fine?

Question time



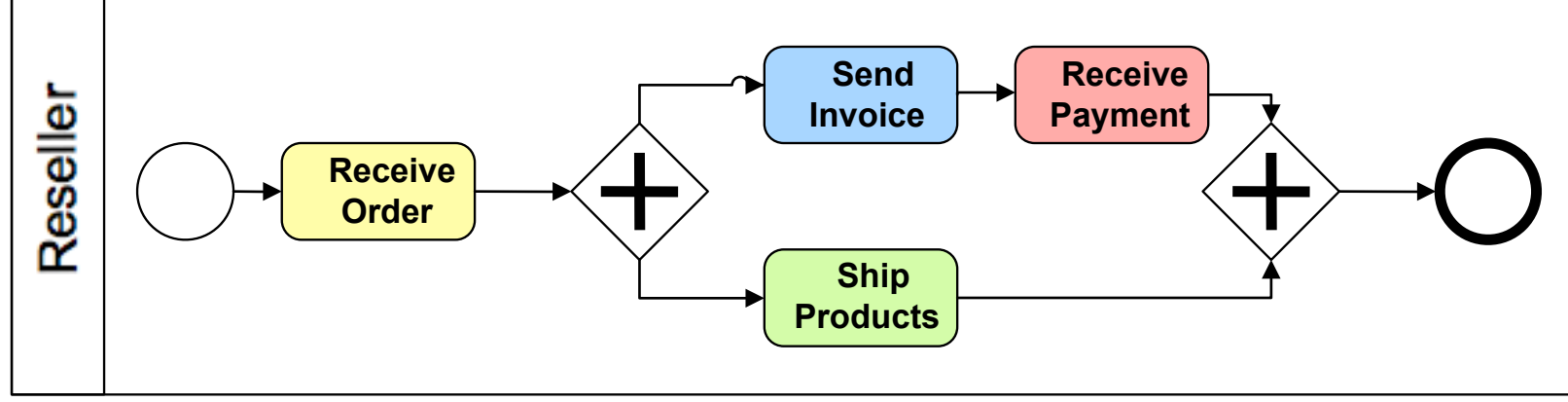
B₄



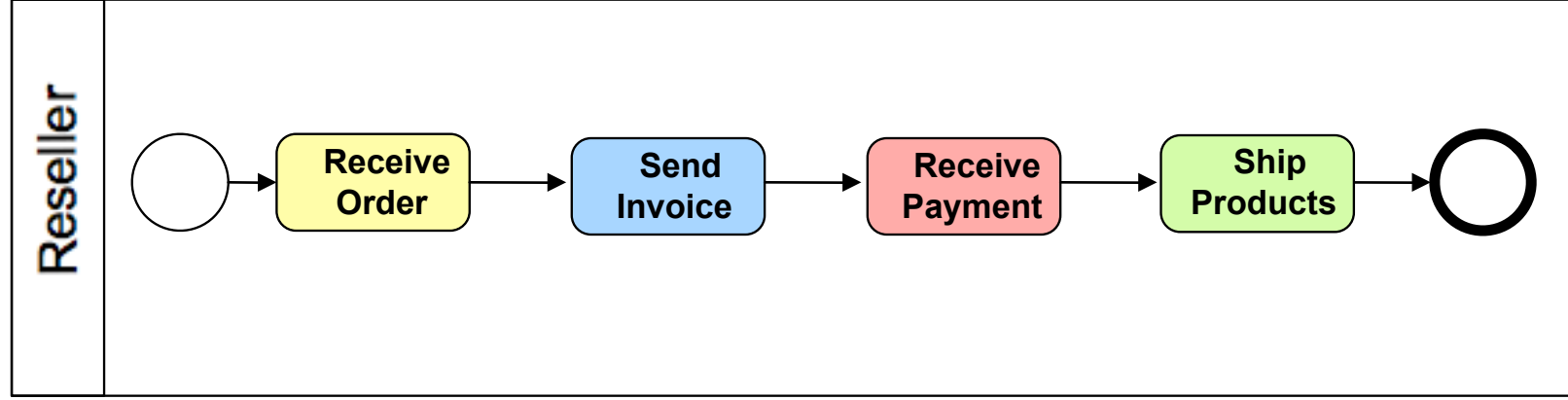
R₂

Not so much!

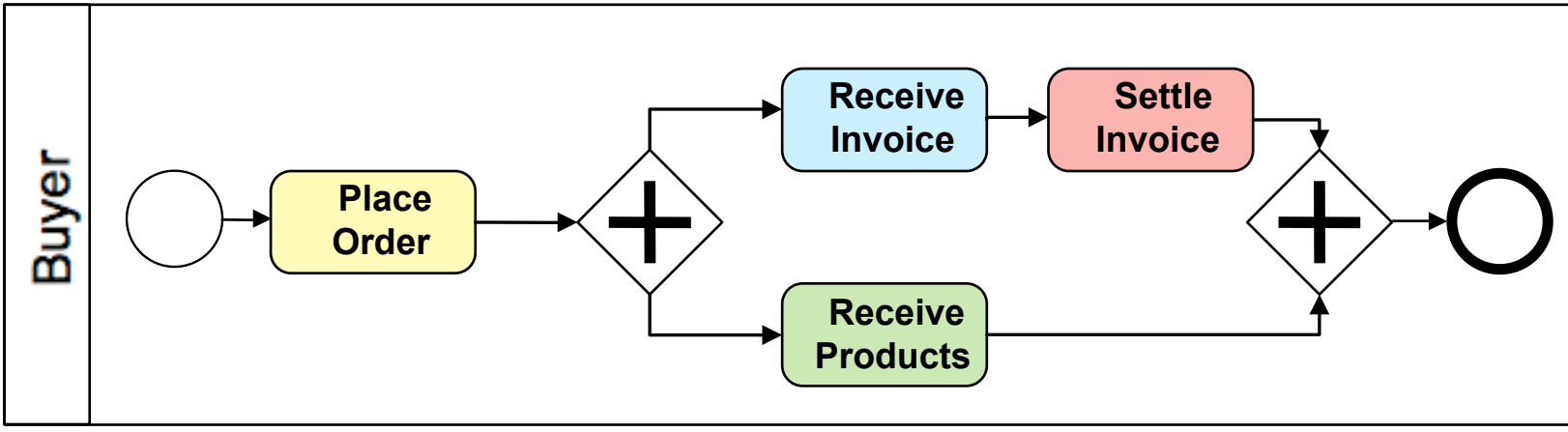
Buyer Reseller Compatibility



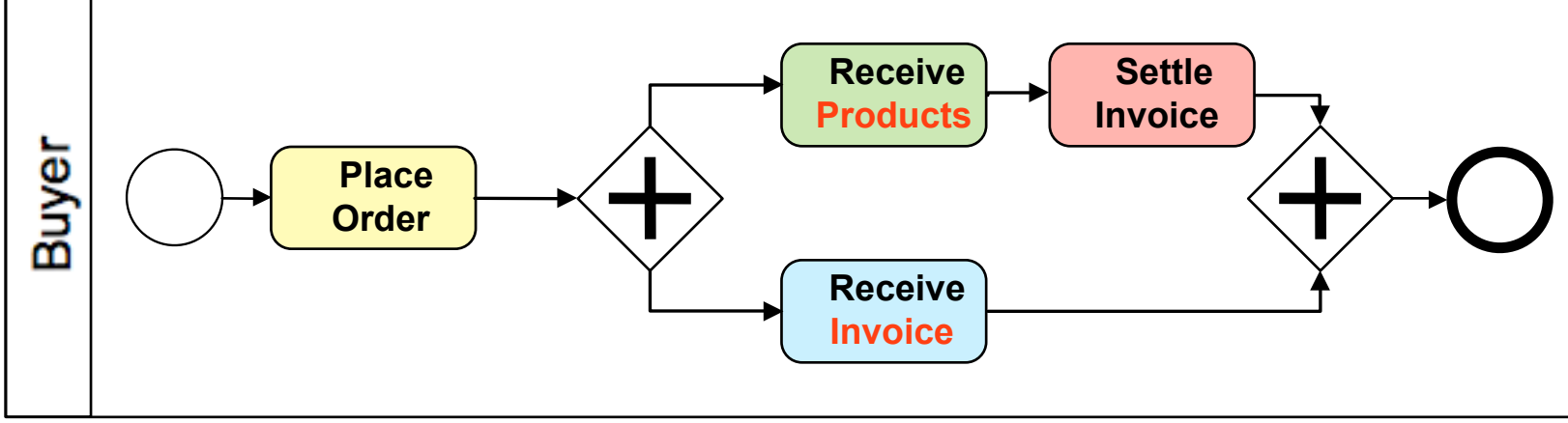
R₁



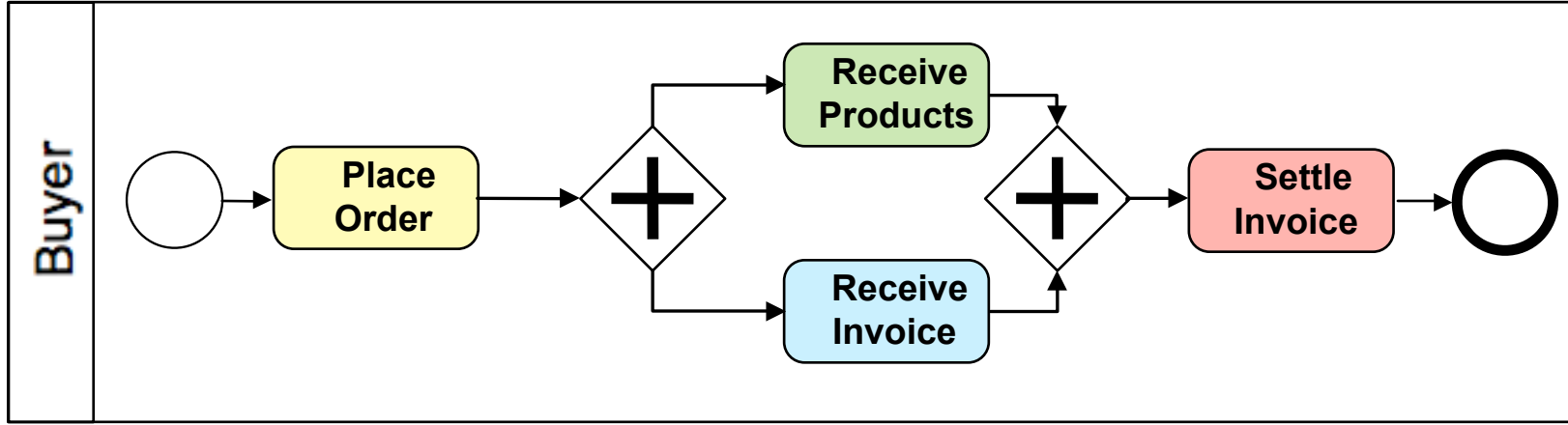
R₂



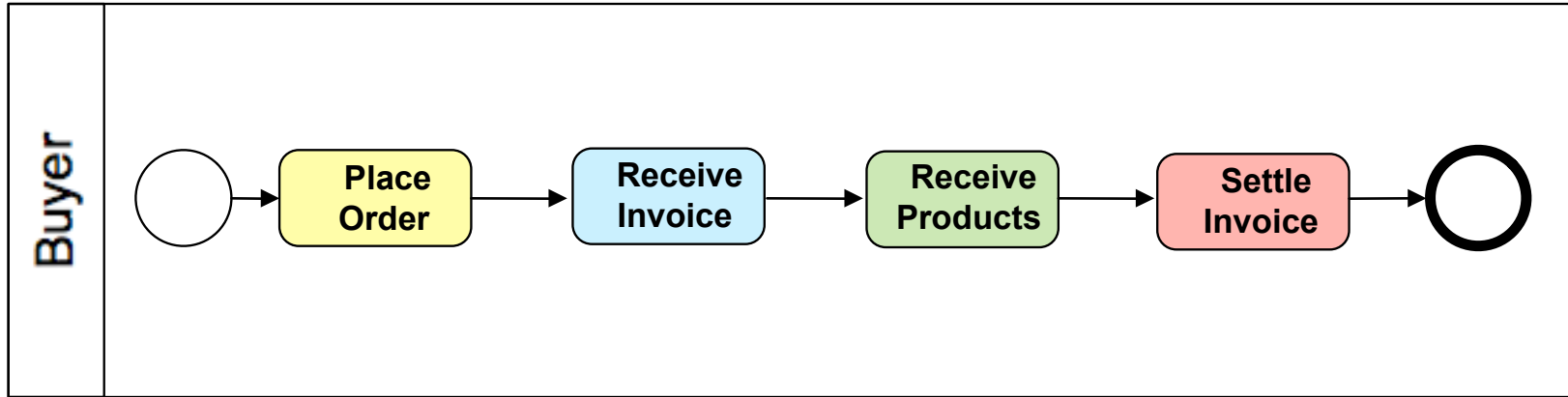
B₁



B₂



B₃



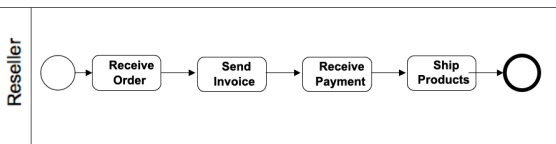
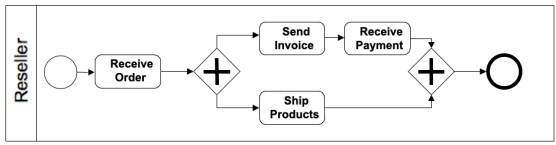
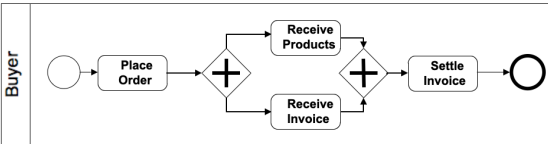
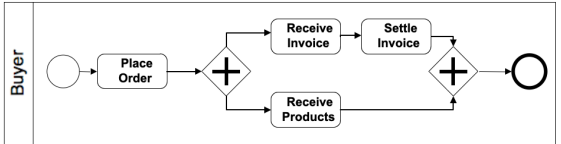
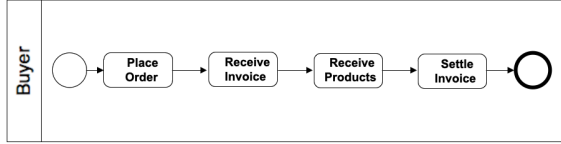
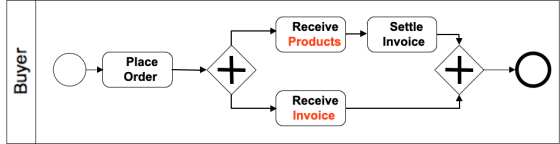
B₄

Exercises: collaborations

In previous slides, we have seen many variants of business processes for resellers (two) and buyers (four).

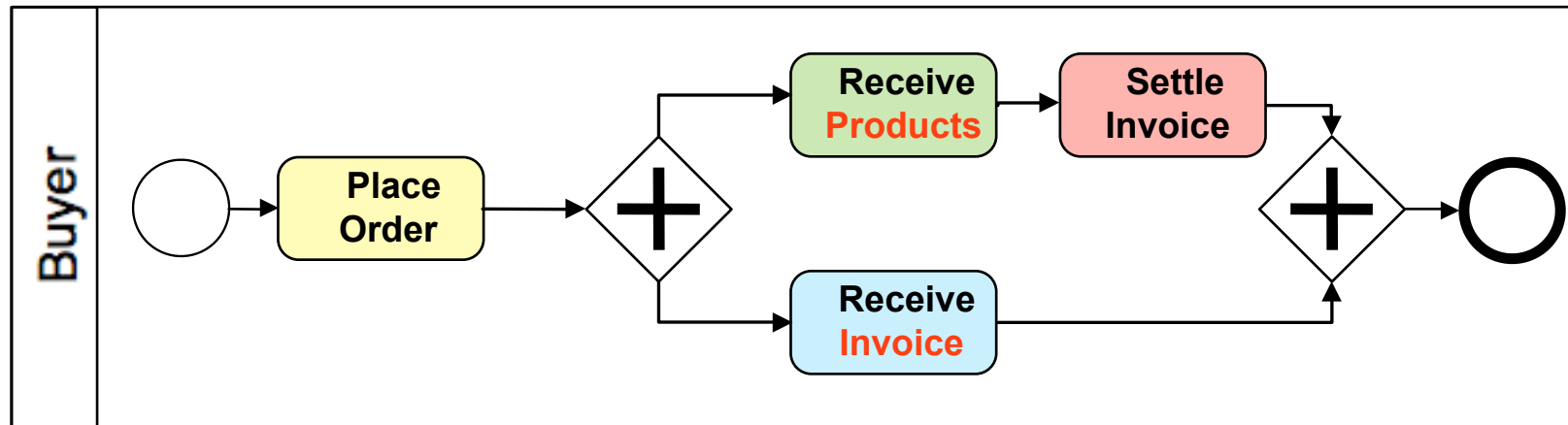
Build a “compatibility” matrix with two rows and four columns and mark all the combinations for which some problems may arise during the interaction because activities are not implemented in the expected order.

You are also free to consider other process diagrams, by adding the corresponding rows / columns to the matrix.



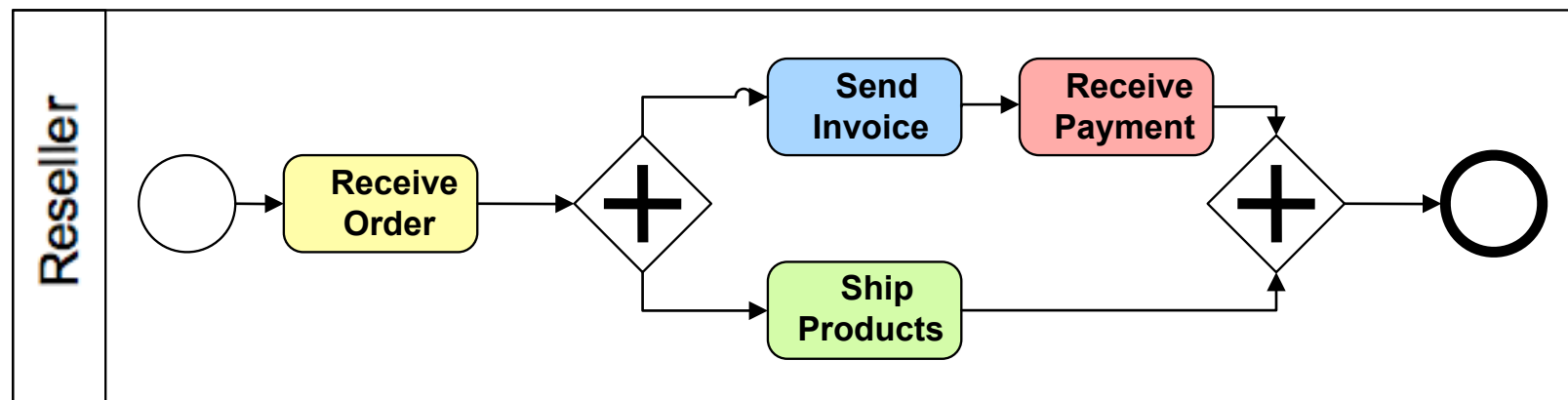
	B ₁	B ₂	B ₃	B ₄
R ₁	ok			
R ₂	ok			no

Exercises: collaborations



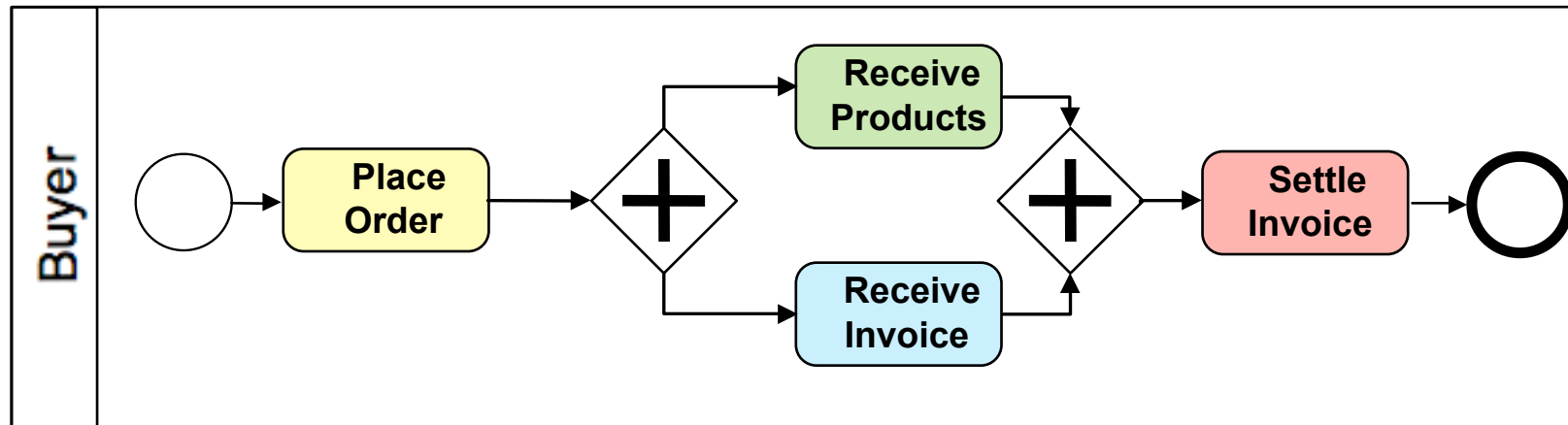
B₂

OK



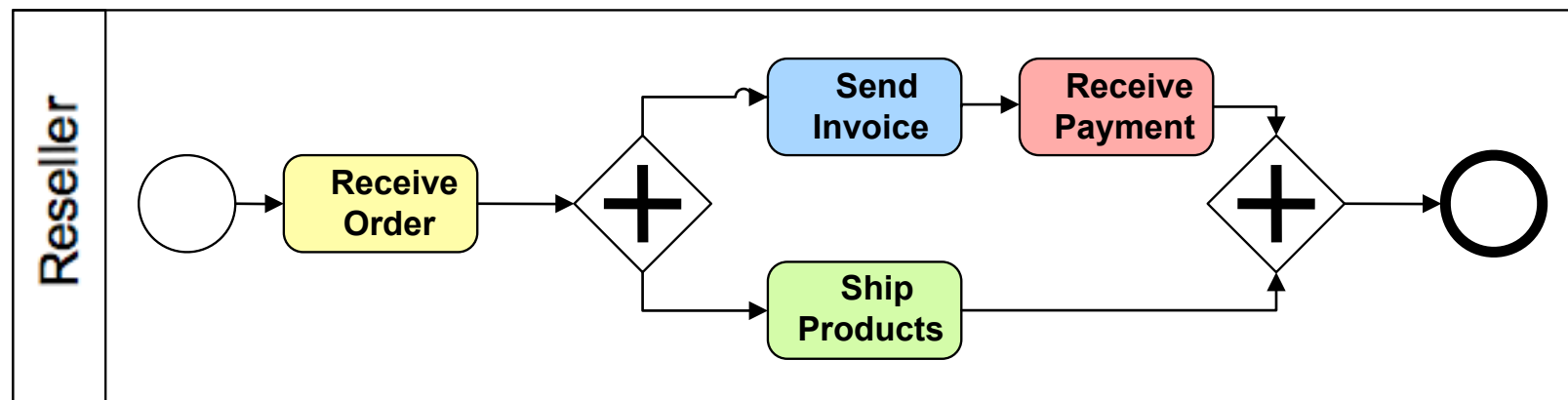
R₁

Exercises: collaborations



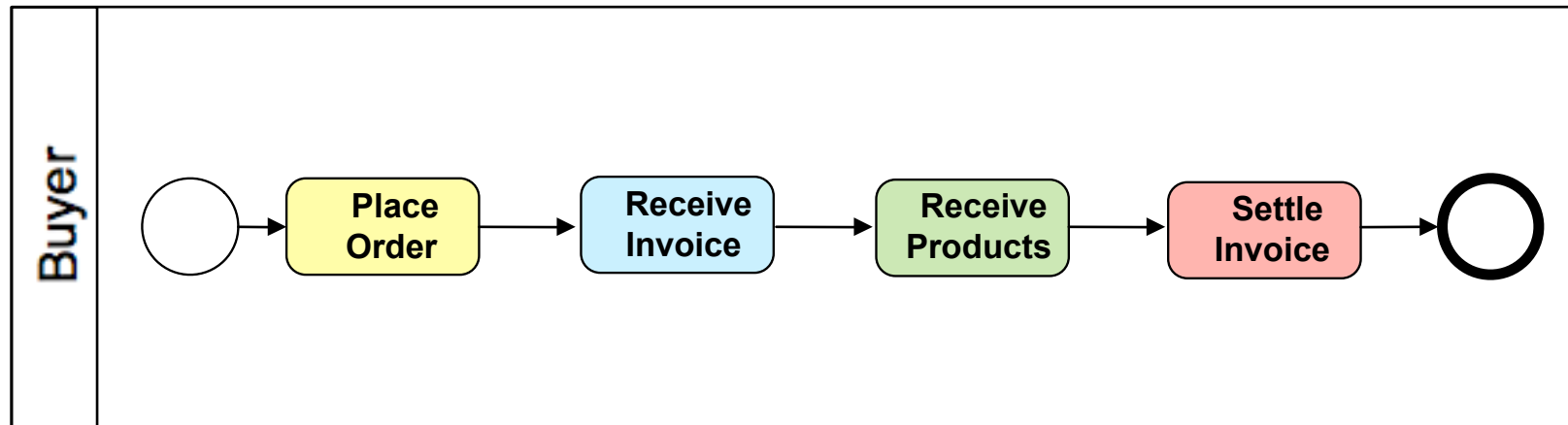
B₃

OK



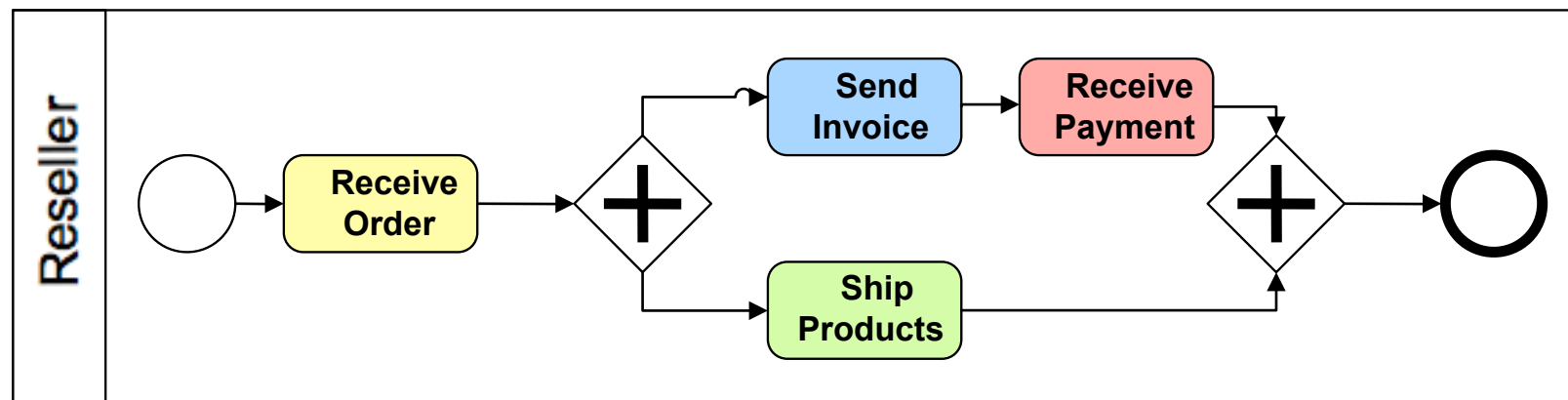
R₁

Exercises: collaborations



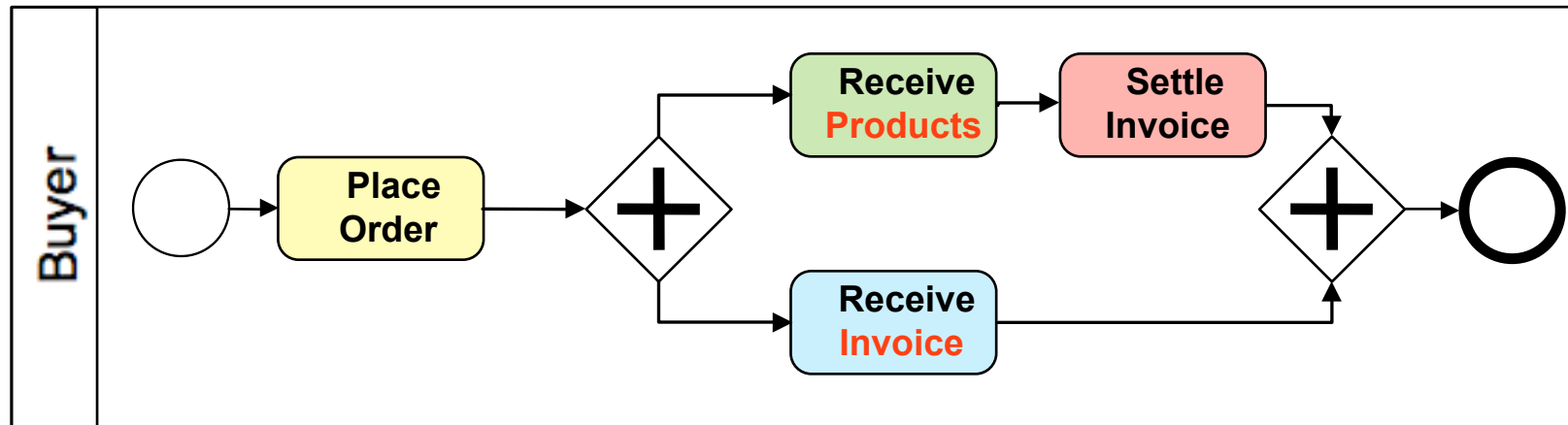
B₄

OK



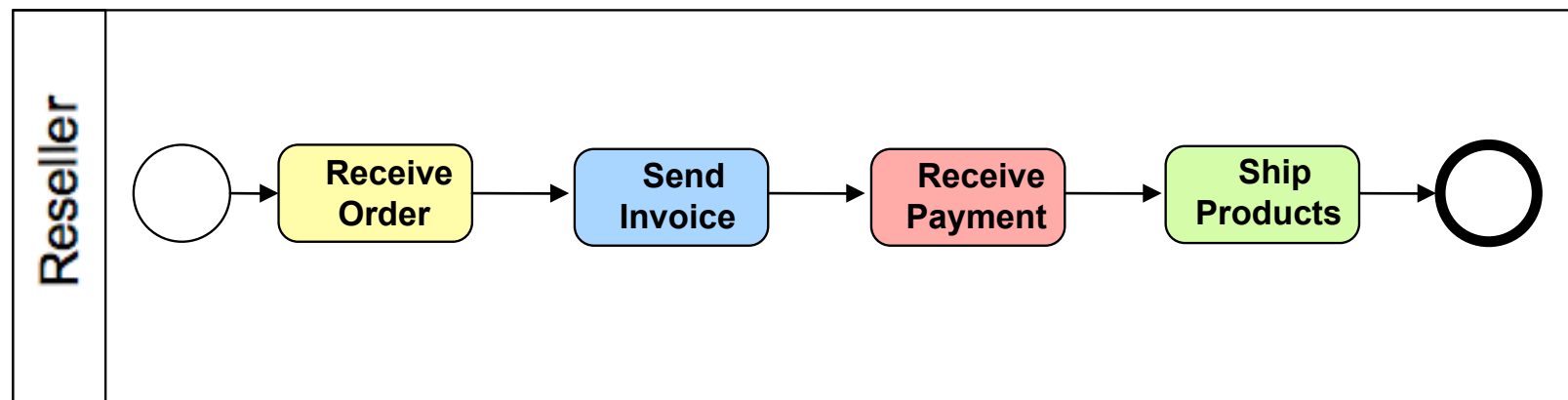
R₁

Exercises: collaborations



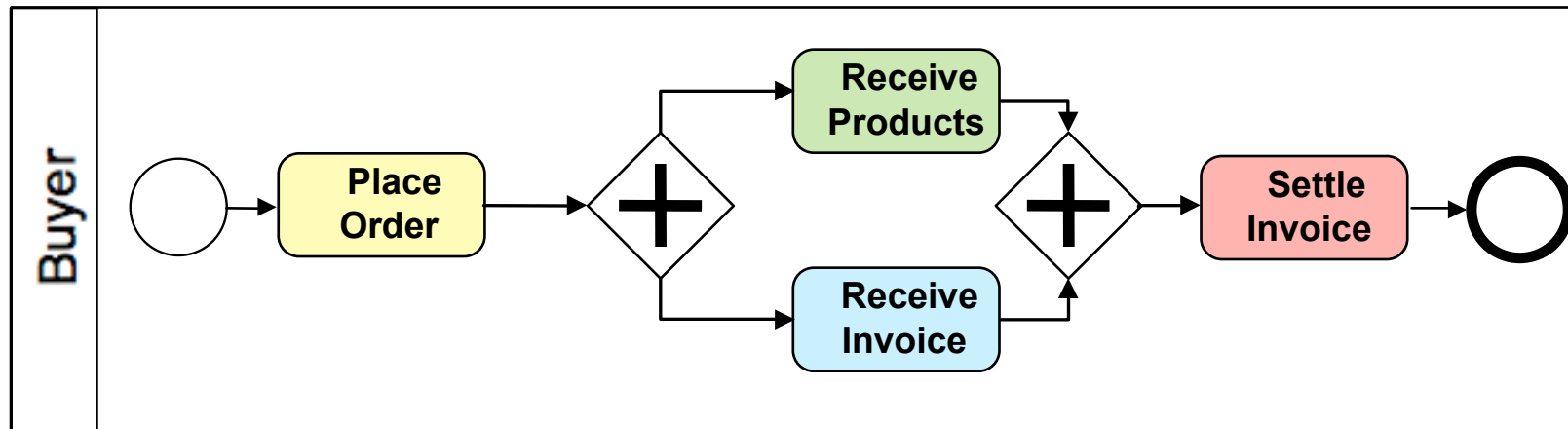
B₂

NO



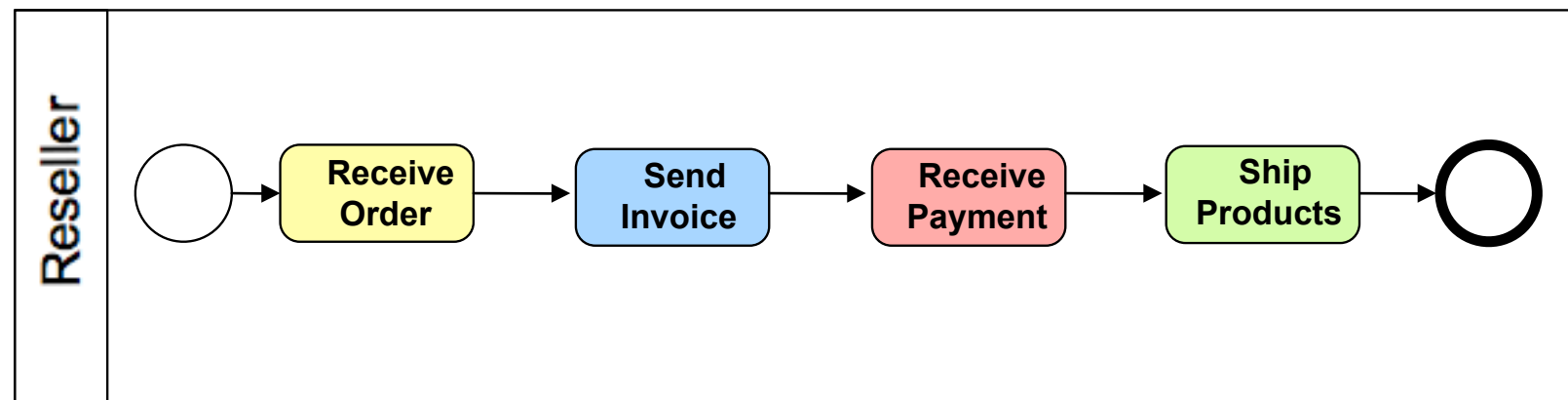
R₂

Exercises: collaborations

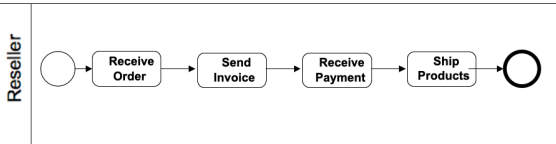
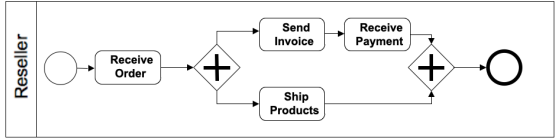
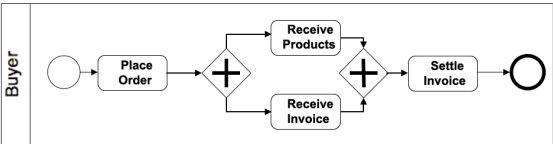
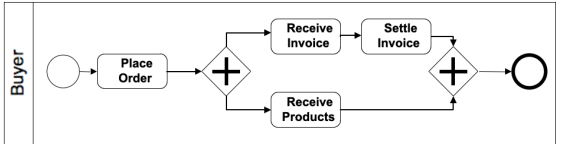
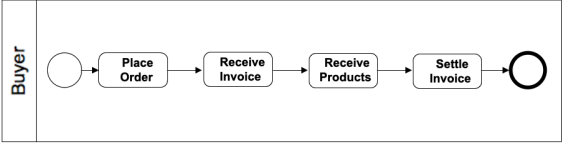
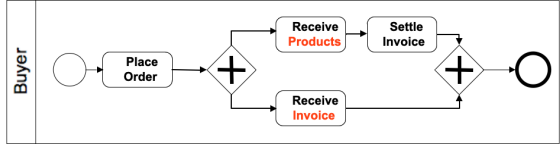


B₃

NO



R₂



	B ₁	B ₂	B ₃	B ₄
R ₁	ok	ok	ok	ok
R ₂	ok	no	no	no

Exercise: orchestration



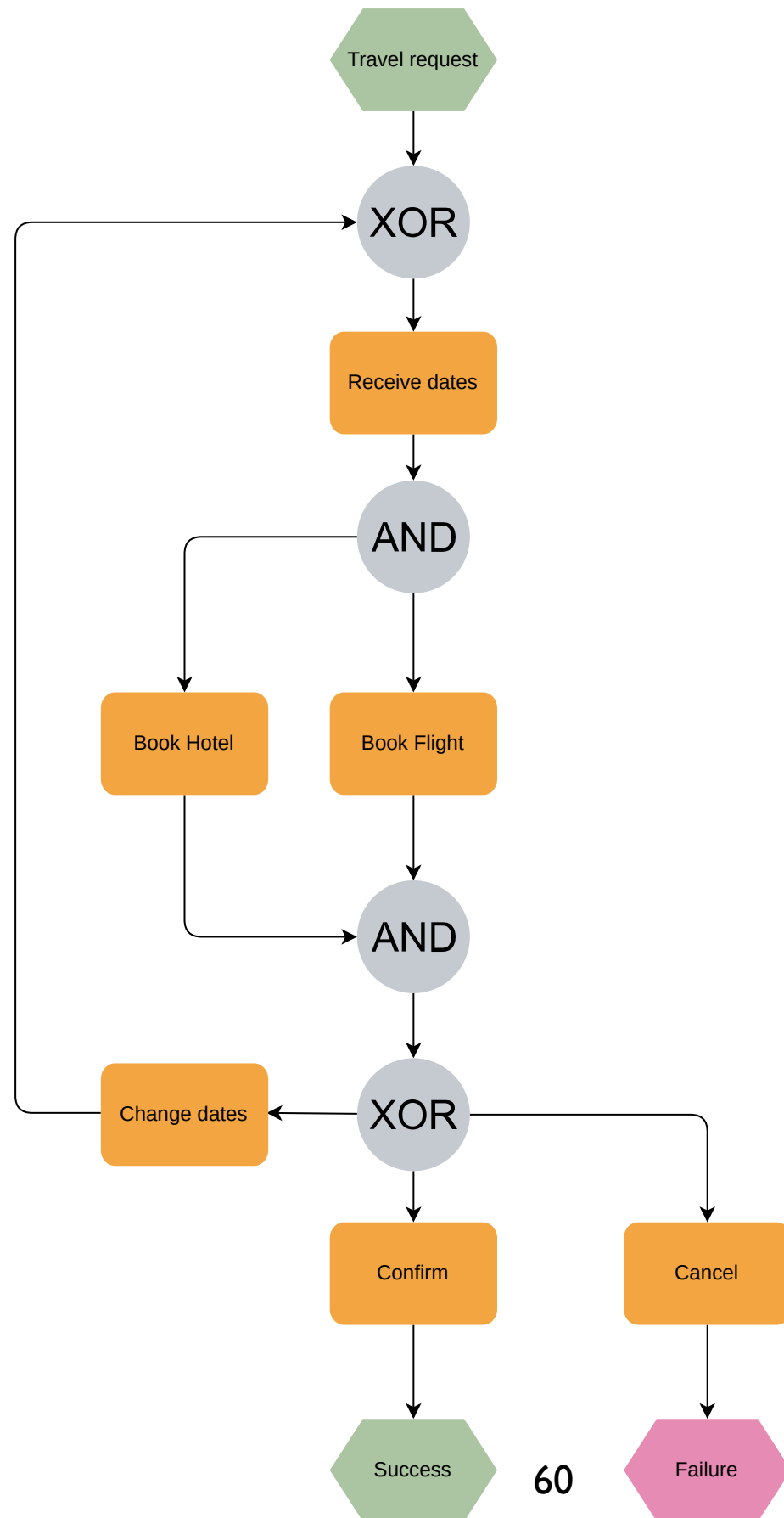
BPMN?
EPC?
WfN?

Travel agency orchestration (single view point):
define a series of tasks for handling a travel request
booking a flight and a hotel, with the possibility
to change dates,
to cancel the booking,
to confirm the booking.
Then, draw a process diagram relating the tasks.

Travel agency orchestration

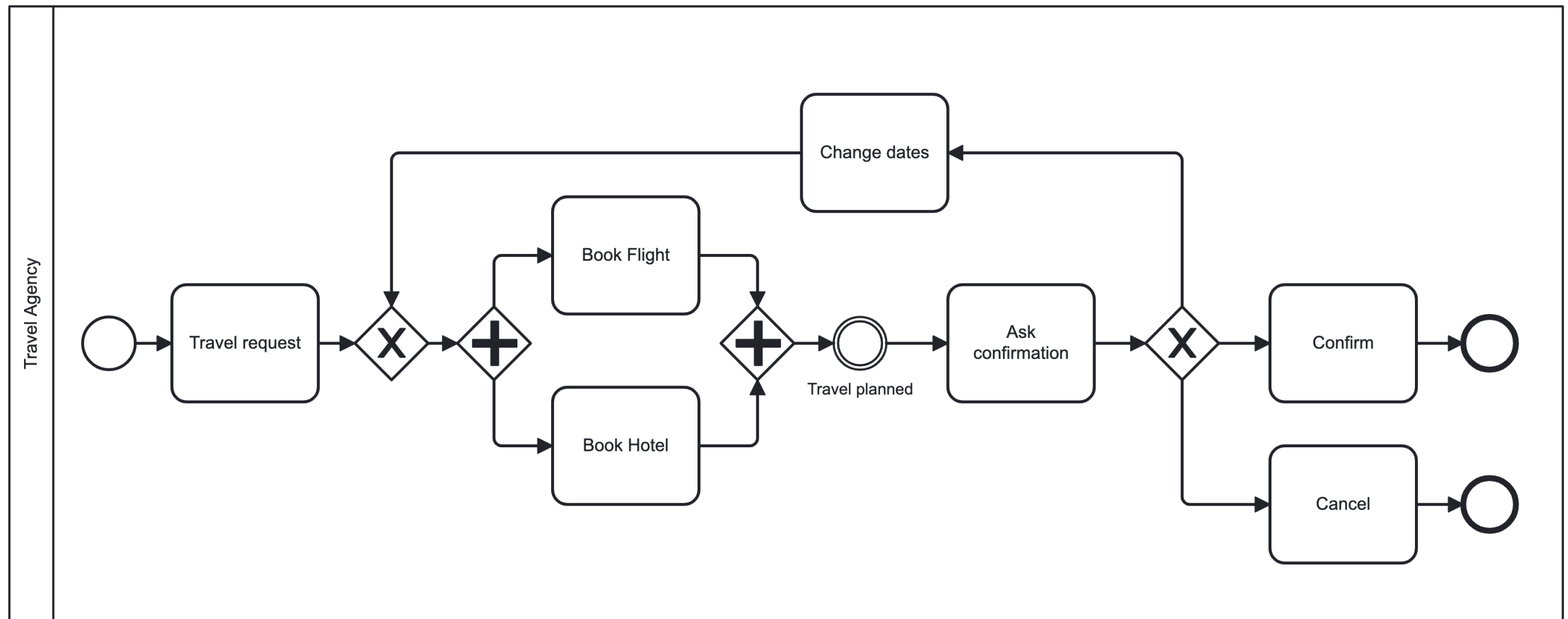


EPC



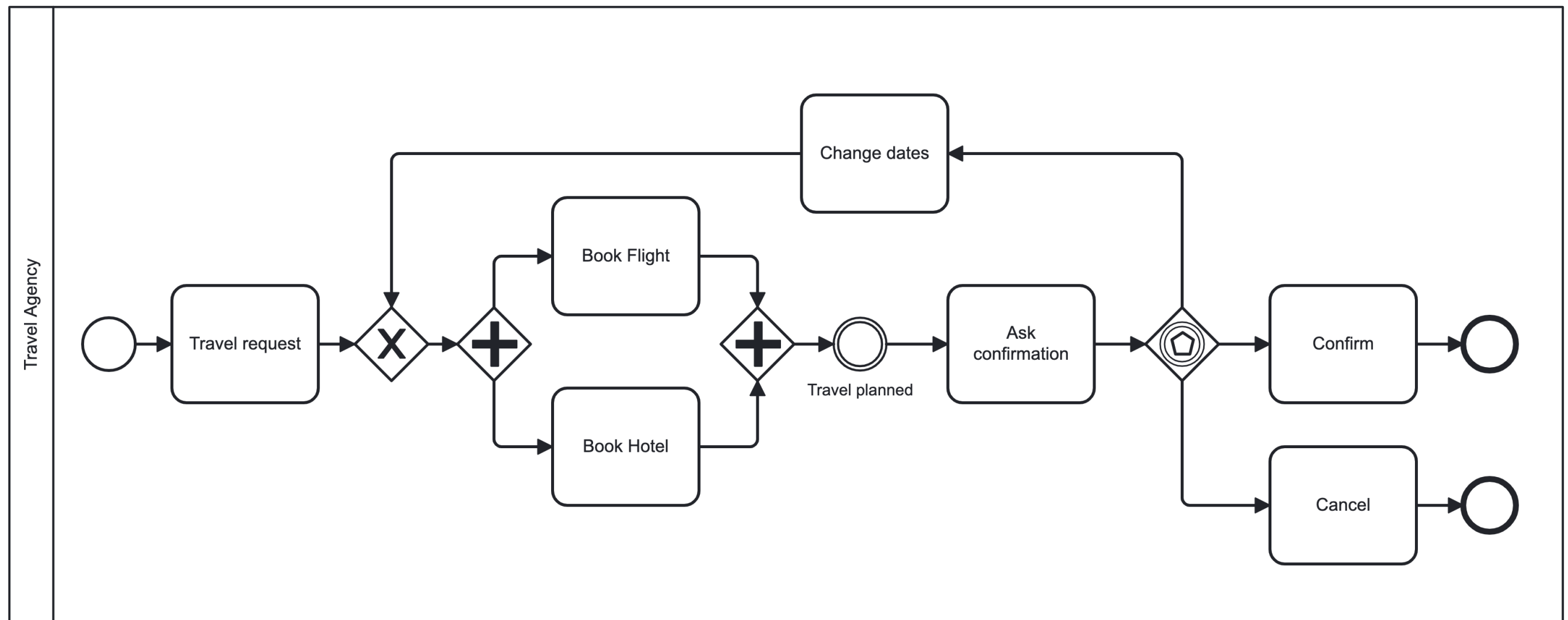
Travel agency orchestration

BPMN



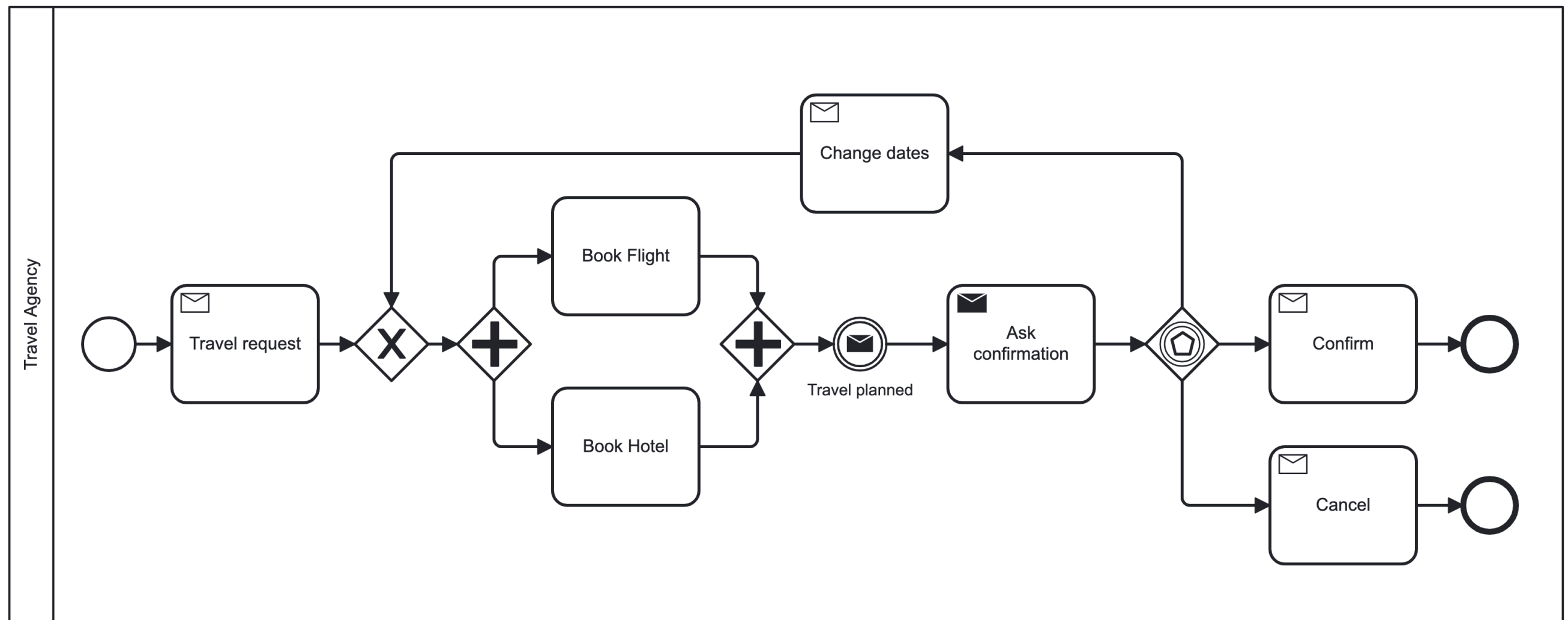
Travel agency orchestration

BPMN



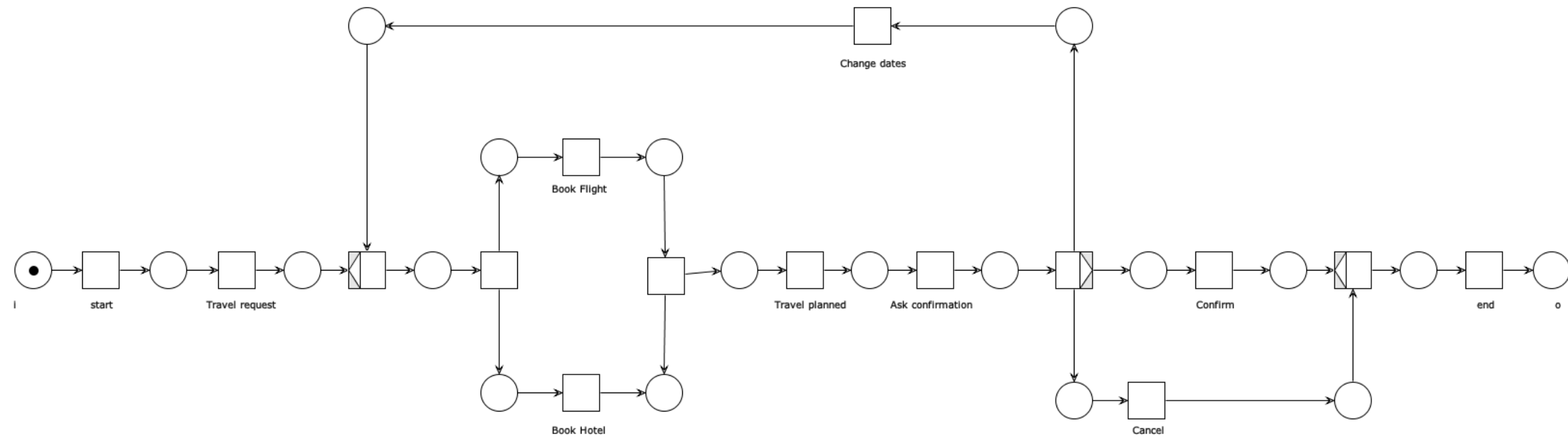
Travel agency orchestration

BPMN



Travel agency orchestration

WfN



Exercise: choreography



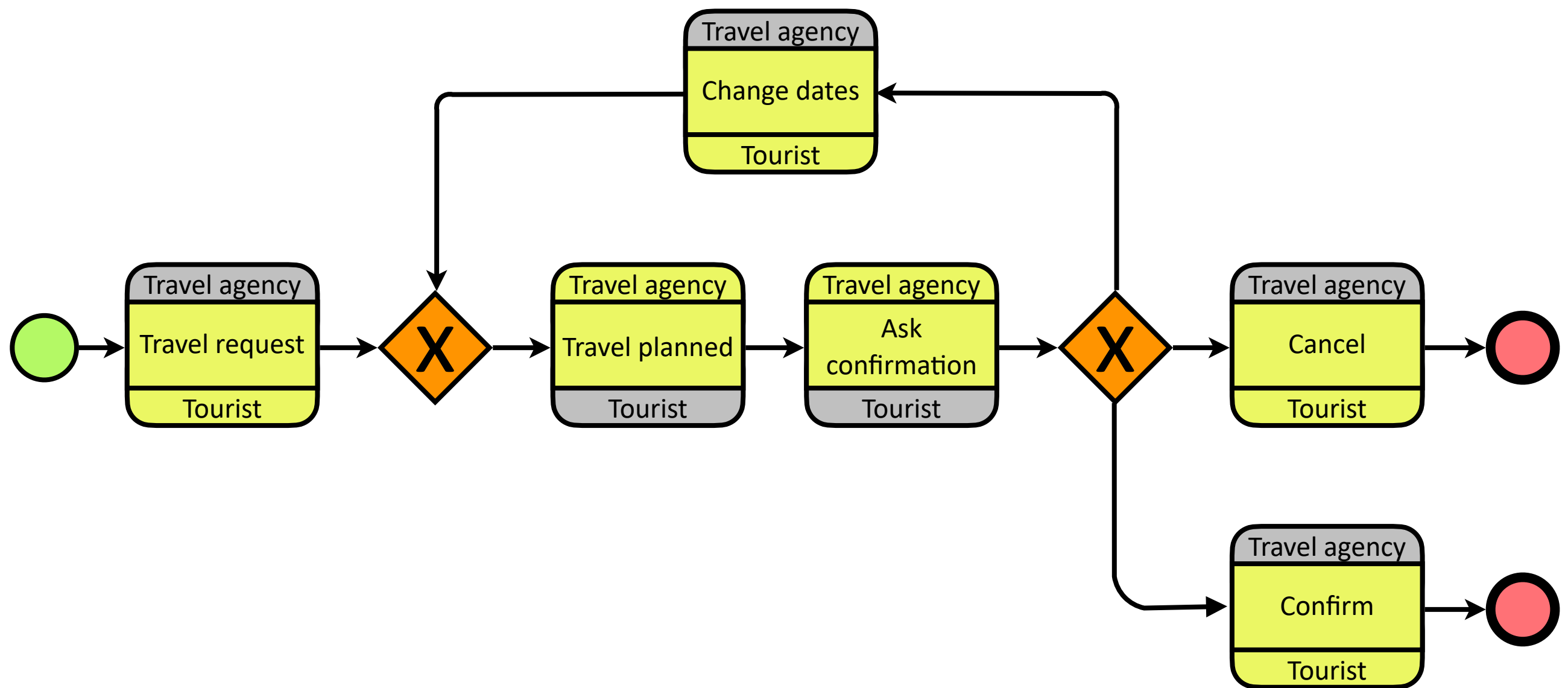
Travel choreography (global view point):

define a series of tasks for modelling a travel request
booking a flight and a hotel, with the possibility
to change dates,
to cancel the booking,
to confirm the booking.

Then, draw a process diagram relating the tasks.

Travel agency choreography

BPMN



Exercise: orchestration

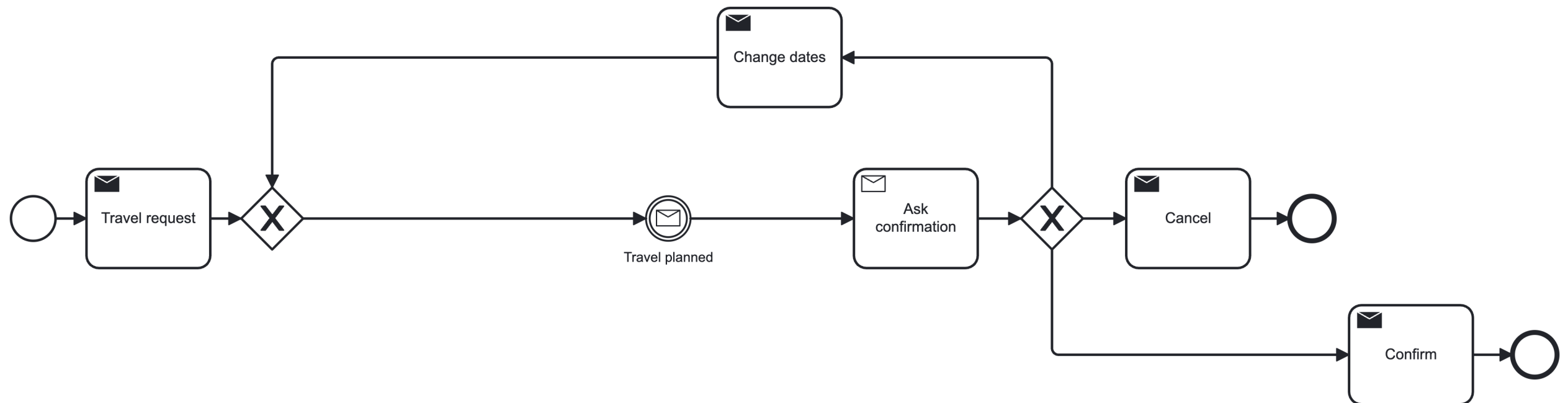


BPMN?
EPC?
WfN?

Tourist orchestration (single view point):
define a series of tasks for issuing a travel request
with the possibility
to change dates,
to cancel the booking,
to confirm the booking.
Then, draw a process diagram relating the tasks.

Tourist orchestration

BPMN



Exercise: collaboration



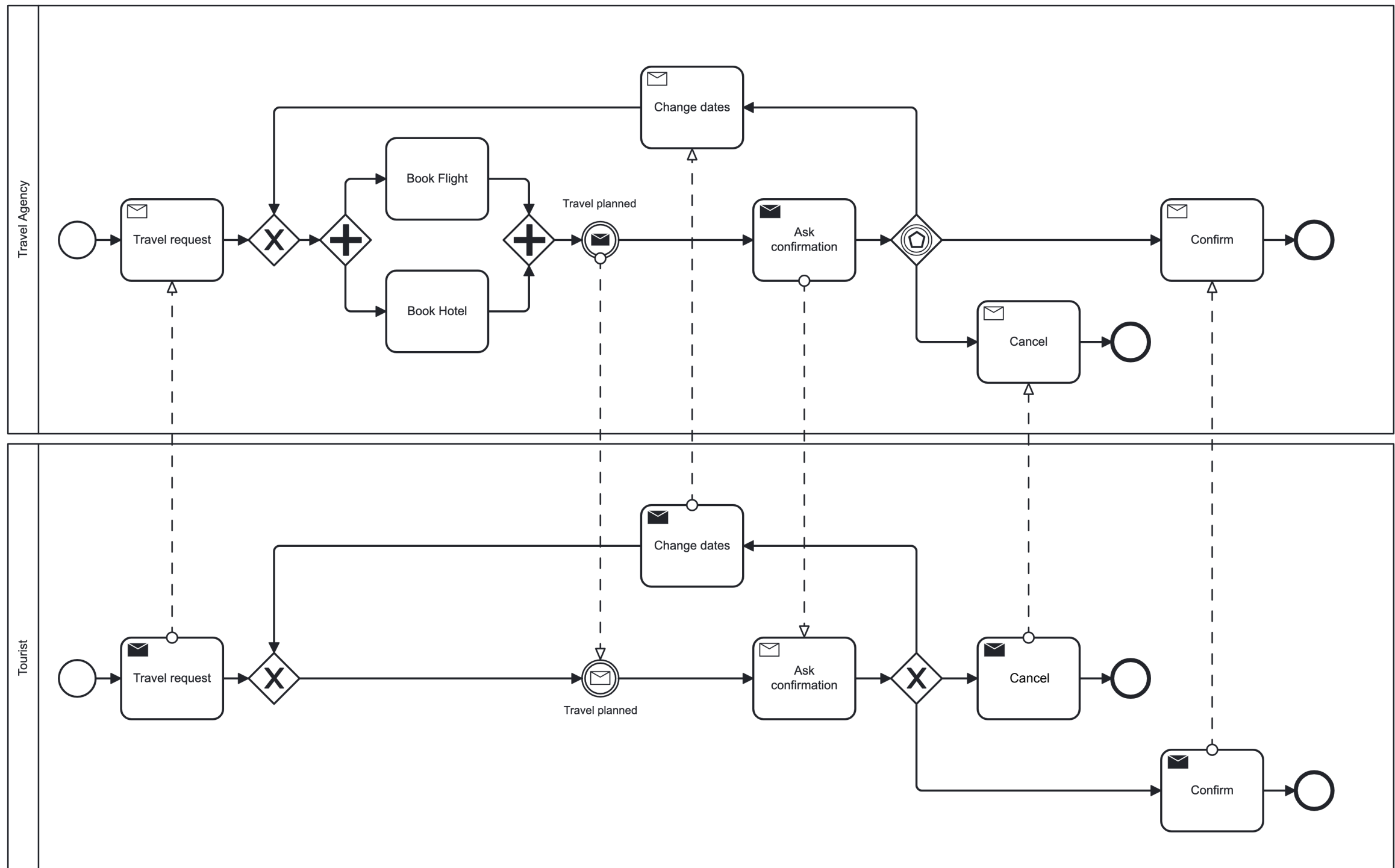
Travel collaboration (multiple view point):

define a series of tasks for modelling a travel request
booking a flight and a hotel, with the possibility
to change dates,
to cancel the booking,
to confirm the booking.

Then, draw a process diagram relating the tasks.

Travel agency collaboration

BPMN



Travel agency collaboration

BPMN

